SRU

The German
Advisory Council
on the Environment

Marine Environment Protection for the North and Baltic Seas

Special Report

February 2004

Address:

Secreteriat of the German Advisory Council on the Environment (SRU)

Reichpietschufer 60

D-10785 Berlin

phone.: +49 - (0)30 - 26 36 96-0

fax: +49 - (0)30 - 26 36 96-109

e-mail: sru@uba.de

http://www.umweltrat.de

The Council would like to thank representatives of the federal and state government ministries and offices, without whose knowledge, implementational expertise and research work this special report would not have been possible. The council gained invaluable insight and impetus from numerous discussions held with staff at the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (MinDirig Dr. Fritz Holzwarth, RegDir Hans-Georg Neuhoff, Dipl.-Ing. Cornelia Viertl), the Federal Environmental Agency (UBA) (Dipl.-Biologe Ulrich Claussen, DirProfin Dr. Christiane Markard, WissDir Heinz-Jochen Poremski, WissOR Dr. Jörg Rechenberg, Dipl.-Ing. Albrecht Tiedemann), the Federal Nature Conservation Agency (BfN) (Dipl.-Biologe Bernd Neukirchen, Dr. Jürgen Ritterhof), the Federal Maritime and Hydrographic Agency (BSH) (Präsident Prof. Dr. Peter Ehlers, Dr. Horst Albrecht, RegDir Christian Dahlke, Dr. H. Gaul, Dr. H. Heinrich, Dr. H. Nies, Dr. S. R. Schmolke, Dr. Norbert Theobald), the Federal Research Centre for Fisheries (BFA) (Dir. and Prof. Dr. rer. Gerd Hubold), the Schleswig-Holstein Wadden Sea National Park Office (Dr. Adolf Kellermann), the Schleswig-Holstein State Nature and Environment Agency (Dr. Jochen Voß), the Mecklenburg West Pomeranian State Ministry of the Environment (Dr. Andreas Röpke, Dr. Peter Schlichting) and the Länder Joint Working Group on Water (LAWA) (MmRat Dr. Günther-Michael Knopp, Bavarian State Ministry for the Environment, Health and Consumer Protection). The Council would also like to express its heartfelt thanks to colleagues at Hamburg University's Centre for Marine and Climate Research (ZMK), namely Prof. Dr. Jürgen Sündermann, Dr. Thomas Pohlmann and Dr. Hermann Lenhart (Institute of Oceanography) and Dr. Brockmann (Institute of Biogeochemistry and Marine Chemistry), for their assistance in preparing this report.

The Council also appreciated the opportunity to engage in numerous discussions and gather ideas at conferences, symposia and other events involving marine environment protection:

– 'European Strategy for Protection and Conservation of the Marine Environment', Stakeholder Conference, 4–6 December 2002, Køge, Denmark

– 'Umgestaltung des deutschen Chemikalienrechtes durch europäische Chemikalienpolitik', 9. Osnabrücker Gespräche zum deutschen und europäischen Umweltrecht ('Redesigning German Chemicals Law Through EU Chemicals Policy', 9th Osnabrück Talks on German and European Environmental Law), 27 to 28 February 2003, Osnabrück, Germany

– Symposium 'Warnsignale aus dem Meer – von den offenen Ozeanen bis zu den Randmeeren' (Warning Signs from the Sea – From Open Seas to Coastal Water), 31 March to 2 April 2003, Hamburg, Germany – Workshop on Ecosystem Approach to Baltic Sea Management, 22 to 24 April 2003, Vaxholm, Sweden

– Meeresumwelt-Symposium 2003 'Aktuelle Probleme der Meeresumwelt' (14th Marine Environment Symposium: Current Problems of the Marine Environment), 3 to 4 June 2003, Hamburg, Germany

– 'Working Together for Our Seas', Ministerial Meeting: HELCOM Commission, OSPAR Commission, Joint Meeting of the Commissions, 23 to 27 June 2003, Bremen, Germany

– 'Nutzungs- und Schutzkonflikte der Ausschließlichen Wirtschaftszone (AWZ) – rechtliche Steuerungsmöglichkeiten' (Conflicts Surrounding Use and Protection of the Exclusive Economic Zone – Regulatory Options for Management), 11th Rostocker Gespräche zum Seerecht, 14 November 2003, Rostock, Germany

(This report went to press on 31 December 2003)

Preface

The German Advisory Council on the Environment last undertook a full appraisal of marine environment protection issues in its pioneering Special Report on the Environmental Problems of the North Sea, published in 1980. While some reductions in pollution levels have been achieved in the North and Baltic seas over the past 25 years, a number of problems remain largely unsolved and others have exacerbated the situation. The seas thus remain at considerable risk. Increasing pressures of use on the North and Baltic seas call for far-reaching amendments in key policy areas.

– The German government should continue to pursue the positive approaches taken to reform the EU's Common Agricultural Policy. If subsidy of intensive agriculture continues, the demanding target set by the Parties to the OSPAR Agreement on Protection and Conservation of the North East Atlantic (OSPAR Convention), to reduce anthropogenic eutrophication to 'close to zero' by 2010, will certainly be missed.

– The international regime's generation target of zero emissions of hazardous substances by 2020 must be integrated into the regulatory model currently under discussion for EU chemicals policy. The reallocation of decisionmaking powers at European level from the Council of Environment Ministers to the Competition Council gives rise to fears that after the compromises that have already been made, the target will now be missed entirely.

– While the EU's Common Fisheries Policy has been given an acceptable legislative framework in environmental policy terms, systematic enforcement is still lacking. With over-fishing of most target fish species and what are sometimes extremely harmful catch methods, intensive fishing poses a risk to ecosystems in the North and Baltic seas. The German Advisory Council on the Environment recommends that the German government push for Europe-wide compliance with legal requirements, including the setting of stringent catch quotas according to the scientific recommendations made by the ICES.

– The Council welcomes the EU initiative on ship safety also advocated by German government, and particularly the accelerated phaseout of single-hull tankers. With what will soon amount to around 20% of world tonnage under EU Member State flags, the EU is most certainly in a position to play a pioneer role in the inappropriately hesitant International Maritime Organisation (IMO). The German government must call for and promote appropriate EU policy.

– Alongside the ubiquitous pressures that pollutants, fisheries and shipping place on the North and Baltic seas come rapidly increasing local encroachments from marine mining, dumping of dredged materials, pipelines, cable channels, mariculture, tourism and the planned expansion of offshore wind farms. In the face of such encroachments, planning regulations and licensing requirements must be further developed to ensure that the seas are protected despite the increasing pressures of use. The German Advisory Council on the Environment welcomes in particular the initiative of the Federal Environment Ministry to report protected areas to the European Commission under the Habitats Directive and the Birds Directive. For the benefit of those representing interests in the use of such areas, the Council wishes to point out that at present, selection of protected areas takes place on nature protection criteria alone. Conflicts of interest are only aired in the European Commission's Natura 2000 decisionmaking process.

From numerous discussions on the subject, the Council has the impression that there is much common ground between the German government's political strategies for marine environment protection and the recommendations for action contained in this report. The German Advisory Council on the Environment trusts that this comprehensive special report will assist the German government in further developing and structuring a national marine environment programme and a strategy to protect and conserve the marine environment as planned by the European Commission.

Berlin, January 2004

Max Dohmann, Thomas Eikmann, Christina von Haaren, Martin Jänicke,
Hans-Joachim Koch, Peter Michaelis, Konrad Ott

Contents Page

Summary Report 21

1 Introduction and Background 33

1.1 North and Baltic Seas Still at Risk 33

1.2 Main Pollution Sources: An Overview 33

1.3 Regimes and Actors in Marine Environment Protection: An Overview 35

1.4 Key Scientific Institutions and Basic Data 38

2 Protected Resources, Pollution Status and Pollution Pathways 41

2.1 The North Sea 41

2.1.1 Habitat and Economic Area 41

2.1.2 Pressures from Intensive Fisheries 43

2.1.2.1 Overexploitation of Fish Stocks 43

2.1.2.2 Negative Impacts on Non-Target Species 47

2.1.2.3 Summary 47

2.1.3 Pressures from Pollution 48

2.1.3.1 Heavy Metals and Arsenic 49

2.1.3.1.1 Heavy Metals 49

2.1.3.1.2 Arsenic 57

2.1.3.2 Organic Compounds 57

2.1.3.3 Oil Inputs 63

2.1.3.4 Radioactive Substances 65

2.1.4 Nutrient Inputs and Eutrophication 66

2.1.4.1 Eutrophication in the Wadden Sea 67

2.1.4.2 Nutrient Inputs: Sources and Trends 67

2.1.5 Environmental Risks and Pressures from Shipping 71

2.1.5.1 Atmospheric Emissions 72

2.1.5.2 Introduction of Non-Indigenous Species 74

2.1.6 Pressures from Local Encroachments 75

2.1.6.1 Raw Materials Extraction, Energy Generation, Dumping of Dredged Materials and Coastal Protection 75

2.1.6.2 Tourism 77

2.1.6.3 Environmental Risks from Mariculture 78

2.1.7 Cumulative Pressures and Decline in Marine Habitats 79

2.1.7.1 Loss of Species Diversity 79

2.1.7.2 Destruction and Loss of Habitats 81

Page

2.2 Baltic Sea 81
2.2.1 Habitat and Economic Area 81
2.2.2 Pressures from Intensive Fishing 85
2.2.2.1 Overexploitation of Fish Stocks 85
2.2.2.2 Negative Impacts on Non-Target Species 86
2.2.2.3 Summary 87
2.2.3 Pressures from Pollutants 87
2.2.3.1 Heavy Metals and Arsenic 87
2.2.3.1.1 Heavy Metals 87
2.2.3.1.2 Arsenic 91
2.2.3.2 Organic Compounds 91
2.2.3.3 Oil Inputs 93
2.2.3.4 Radioactive Substances 94
2.2.3.5 Military Legacies 95
2.2.4 Nutrient Inputs and Eutrophication 95
2.2.4.1 Eutrophication in the Baltic Sea 95
2.2.4.2 Nutrient Imputs: Sources and Trends 96
2.2.5 Environmental Risks and Pressures from Shipping 100
2.2.6 Pressures from Local Encroachments 101
2.2.6.1 Raw Materials Extraction, Energy Generation, Dumping of Dredged Materials and Coastal Protection 101
2.2.6.2 Tourism 102
2.2.6.3 Mariculture: Environmental Risks 103
2.2.7 Cumulative Pressures and Decline in Marine Habitats in the Baltic 103
2.2.7.1 Loss of Species Diversity 103
2.2.7.2 Destruction and Loss of Habitats 105
2.3 Summary: Outlook for the North and Baltic Seas 105
2.3.1 Human Impacts on the North and Baltic Seas 106
2.3.2 Research Programmes and Research Needed 107

3 Protecting the North and Baltic Seas: Action and Measures Needed 111

3.1 Paths to Sustainable Fisheries 111
3.1.1 Socio-Economic Conditions 111
3.1.2 International Management Rules 113
3.1.3 Paths to a Sustainable Common Fisheries Policy in the EU 115
3.1.3.1 Common Organisation of the Market: A New Approach 116

Page

3.1.3.2 Structural Policy: A Change in Course 116
3.1.3.3 Provisions for Environmentally Sound Management and Code of Practice 118
3.1.3.3.1 Fishing Quotas and Fishing Effort Restrictions 118
3.1.3.3.2 Area-Specific Fishing Restrictions and Bans 120
3.1.3.3.3 Measures to Reduce By-Catches and Protect the Sea Bed 120
3.1.3.3.4 Monitoring and Enforcement 121
3.1.3.3.5 Deficits in the Effectiveness of CFP Management Provisions and Code of Practice 122
3.1.3.4 The Extra-Community Fisheries Regime 122
3.1.3.5 Managing the Common Fisheries Policy 123
3.1.4 National Policy and Scope for Action 124
3.1.5 Flexible Management of Fishing Rights and a Sustainable Fisheries Industry 125
3.1.6 Summary and Recommendations for Sustainable Fisheries 128
3.2 Protecting the North and Baltic Seas: Harmful Substances and Radionuclides 130
3.2.1 Protection from Harmful Substances 130
3.2.1.1 Internationally Agreed Generation Target 130
3.2.1.2 Harmful Substances in the North and Baltic Seas: EU Measures and their Implementation at National Level 134
3.2.1.2.1 Water Framework Directive and Marine Environment Protection 134
3.2.1.2.2 Chemicals Policy and Marine Environment Protection 136
3.2.2 Protection From Radionuclides 139
3.2.3 Summary and Recommendations for Protection From Harmful Substances 140
3.3 Reducing Eutrophication in the North and Baltic Seas 141
3.3.1 Tough Targets at International Level 142
3.3.1.1 International Conference on the Protection of the North Sea and the OSPAR Agreement 142
3.3.1.2 Provisions of the Helsinki Convention 143
3.3.2 The Need for Coherent Action 144
3.3.3 EU Measures to Reduce Eutrophication and their Implementation at National Level 145
3.3.3.1 Common Agricultural Policy (CAP) 145
3.3.3.2 The Nitrates Directive 145
3.3.3.3 Deficits in Germany's Implementation of the Nitrates Directive 146
3.3.3.4 Urban Waste Water Directive 147

Page

3.3.3.5 Deficits in Germany's Implementation of the Urban Waste Water Directive 148
3.3.3.6 Implications of the Water Framework Directive's Focus on Results 148
3.3.3.7 Nitrogen Inputs and Transportation 149
3.3.4 Summary and Recommendations for Reducing Eutrophication . 150
3.4 Protection from Shipping-Related Pressures and Risks 151
3.4.1 Current Status 151
3.4.2 Multi-level Governance and Shipping 151
3.4.2.1 Flag State Principle and the Right to Innocent Passage 151
3.4.2.2 EU Legislation and its Increasing Impact on International Provisions 151
3.4.2.3 'Subordinated' National Level 153
3.4.3 Measures for Increased Shipping Safety 153
3.4.3.1 Port State Control and Classification 153
3.4.3.2 Phasing Out Single Hull Tankers 155
3.4.3.3 Training of Ships' Crews 157
3.4.3.4 Safe Navigation 157
3.4.4 Measures to Prevent Cumulative, Shipping-Related Pollution of the North and Baltic Seas 158
3.4.4.1 Preventing Discharges of Operating and Cargo Residues and the Dumping of Ship-Generated Waste 158
3.4.4.2 Atmospheric Emissions from Shipping 159
3.4.5 Liability, Compensation and Sanctions 159
3.4.6 Preventing the Introduction of Non-Native Species 160
3.4.7 Germany: Division of Shipping Regulation Responsibilities . . . 160
3.4.7.1 Basic Principles 160
3.4.7.2 Joint Accident Task Force 161
3.4.8 Protection from Shipping-Related Pressures and Risks: Summary and Recommendations 161
3.5 Protection of Regional Habitats and Species 163
3.5.1 Protected Areas 164
3.5.1.1 Habitat Protection under International Conventions on Protecting Species and Habitats 164
3.5.1.2 HELCOM and OSPAR Protected Area Programmes 165
3.5.1.3 Habitats and Birds Directives: Protected Areas 165
3.5.1.4 National Marine Protected Areas 166
3.5.1.4.1 Existing Protected Areas 166
3.5.1.4.2 Implementing the Habitats and Birds Directives 167
3.5.1.5 Evaluation 167

Page

3.5.2 Marine Planning 169
3.5.3 Regulation, Approval and Monitoring of Local Activities 170
3.5.3.1 Cross-Sectoral Management Targets and Tools 170
3.5.3.1.1 Best Available Technology and Ecosystem Approach 170
3.5.3.1.2 Further Research on Anthropogenic Impacts 171
3.5.3.1.3 Environmental Impact Assessments 171
3.5.3.1.4 Approval and Monitoring 172
3.5.3.1.5 Human Impacts and Compensatory Measures 174
3.5.3.1.6 Transparency in Activities and Environmental Impacts 174
3.5.3.2 Offshore Facilities 174
3.5.3.3 Special Focus: Expansion of Offshore Wind Energy 176
3.5.3.4 Cables and Pipelines 178
3.5.3.5 Sediment Extraction 178
3.5.3.6 Dredged Material 178
3.5.3.7 Coastal Protection 180
3.5.3.8 Mariculture 180
3.5.3.9 Tourism 181
3.5.4 Protecting Regional Habitats and Species: Summary and Recommendations 183
3.6 Protecting the North and Baltic Seas: Conclusions and Recommendations 184
3.6.1 Paths to Sustainable Fisheries 184
3.6.2 Reducing Pollution by Hazardous Substances 186
3.6.3 Reducing Nutrient Inputs 187
3.6.4 Combating Pressures and Risks from Shipping 188
3.6.5 Protecting Regional Habitats 190

4 Strategies for Effective Marine Environment Protection Policy 193
4.1 Setting Conservation Targets and Goals 193
4.1.1 The Ecosystem Approach 193
4.1.2 Adequate Conservation Goals for the North and Baltic Seas . . . 194
4.2 Division of Responsibilities and Powers in the Multi-Actor Setting 197
4.2.1 Implementing Regional Protection Provisions Versus International Requirements under the Law of the Sea Treaty and the International Maritime Organisation 198
4.2.2 Cooperation with the European Union 198

Page

4.2.3 The Relationship between the EU and its Member States 200

4.2.4 The Relationship between Germany's Federal and *Länder* Governments 200

4.3 Implementation Deficits and Instruments for Better Enforcement 200

4.3.1 Stringent Targets and Implementation Deficits 200

4.3.2 Reasons and Approaches for Improved Implementation 201

4.3.3 Outcomes 202

4.4 Integrated Management Instruments 202

4.5 Special Focus: Structuring a European Marine Protection Strategy 203

4.6 Conclusions and Recommendations 204

Annex I 207

Charter Establishing the Advisory Council on the Environment in the Ministry of the Environment, Nature Conservation and Nuclear Safety . . . 207

References 209

Abbreviations 225

Annex II 229

Maps 229

Ship List 245

List of Tables Page

1-1 Synoptic Overview of the Key Institutions (bold) and Legal Regimes in Marine Environment Protection 36

2-1 Landings (2001), estimated spawning stock biomass (2001) and ICES assessment of stock endangerment for the main North Sea commercial fish species 45

2-2 Heavy metal concentrations in North Sea water 49

2-3 Heavy metal concentrations in North Sea sediments 50

2-4 Heavy metal concentrations in North Sea biota 52

2-5 Emission sources, uses and possible input pathways into the North Sea for lead, cadmium, mercury and copper 56

2-6 PCB concentrations in North Sea estuary and coastal sediments . . . 58

2-7 PCB concentrations in North Sea biota 58

2-8 Observed γ-HCH concentrations in North Sea biota 59

2-9 PAH concentrations in North Sea sediments 60

2-10 Dioxin and Furan concentrations in Norway coastal biota 61

2-11 Strategies for reducing inputs of organic pollutants 62

2-12 Main sources of oil released into the North Sea 63

2-13 OSPAR statistics on liquid discharges of radioactive substances from nuclear installations 66

2-14 Anthropogenic nitrogen inputs in German surface waters draining into the North Sea, and reductions attained (1985/2000) 70

2-15 Anthropogenic phosphorus inputs in German surface waters draining into the North Sea, and reductions attained (1985/2000) 70

2-16 Emissions of sulphur dioxide (SO_2) and nitrogen oxides (NO_x) from land-based sources and shipping in 1990, 2000 and 2010 (projected) 73

2-17 Countries where shipping accounts for a significant share of total land deposition of sulphur dioxide (SO_2) and nitrogen oxides (NO_x) 73

2-18 Land use in the Baltic Sea catchment area 83

2-19 Concentrations of dissolved heavy metals (ng/kg) in the North Atlantic and the Baltic Sea 88

2-20 Comparison of maximum recorded concentrations of heavy metals in Baltic and North Sea Sediment 88

2-21 Heavy metals load going into the Baltic Sea from rivers, municipalities and industrial plants in 1995 90

2-22 Shares of the three main emitters in total atmospheric lead, cadmium and mercury emissions in the HELCOM region for 2000 90

2-23 Total input of ^{137}Cs to the Baltic marine area during the period 1950–96 95

2-24 Anthropogenic nitrogen inputs in German surface waters draining into the Baltic Sea, and reductions attained (late 1980s and 1995) . . 97

Page

2-25 Anthropogenic phosphorus inputs in German surface waters draining into the Baltic Sea, and reductions attained (late 1980s and 1995) . . 99

2-26 Ship movements in the Baltic, 2000 and 2010 (estimated) 100

2-27 Significance of tourism in the endangerment of vascular plants, beetles and breeding birds off the German Baltic coast 102

2-28 Fish and mussel production in the Baltic, 1997 (by producing country) 103

3-1 Ships, engine power and state aid: Overall figures and EU member state shares 112

3-2 2003 quotas for cod and other North Sea demersal species: ICES moratorium, EU Commission recommended catch limitations, and the Total Allowable Catches ultimately set by the EU Council 119

3-3 OSPAR list of chemicals for priority action in the North Sea region 131

3-4 Selected substances for immediate priority action in the Baltic region 133

3-5 Priority substances in the Water Framework Directive 136

3-6 Anthropogenic nitrogen input into surface waters in North Sea states (1985 to 1995) and anticipated reductions 142

3-7 Derivation of minimum area (ha) to spread 10 000 m^3 of cattle slurry under Germany's 'old' and 'new' Fertiliser Ordinance (DüngeVO) 147

3-8 Overview of EU action following the sinking of the Erika (1999) and the Prestige (2002) 152

3-9 Paris Memorandum of Understanding on Port State Control Black List 153

3-10 Oil tanker fleet as of 1/1/2000: Proportion of double-hull tankers . . 155

3-11 Distribution of powers in Germany relating to ports, coastal waters and the EEZ 161

3-12 National protected areas in coastal waters 166

3-13 OSPAR and HELCOM action on offshore installations 175

4-1 Quality elements for measuring attainment of ecological quality objectives for the North Sea marine environment as set out in the Bergen Declaration of the Fifth International Conference on the Protection of the North Sea, Annex 3, Table A 196

4-2 Examples of quality objectives for selected quality elements as set out in the Bergen Declaration of the 5th NSC, Annex 3 (Table B) 197

List of Figures page

2-1 Main circulatory systems in the North Sea 41

2-2 Cod fisheries and cod biomass in the North Sea, the Eastern Channel and the Skagerrak (1963–2002) 46

2-3 Plaice fisheries and plaice biomass in the North Sea (1963–2002) . 46

2-4 Mercury (Hg), cadmium (Cd), lead (Pb) and copper (Cu) concentrations in the fine fraction of sediments in the Inner German Bight (eastern part of mud deposits south-east of Heligoland) 51

2-5 Total waterborne inputs of cadmium, lead, mercury and copper to the North Sea (Mg/a) 54

2-6 Waterborne lead inputs from individual North Sea coastal states for 1990, 1996 and 2000 (Mg/a) 55

2-7 Waterborne cadmium inputs from individual North Sea coastal states for 1990, 1996 and 2000 (Mg/a) 55

2-8 Oil spillages observed in the North Sea and Baltic in 2001 64

2-9 Main nutrient input pathways into the North Sea 68

2-10 Nitrogen inputs in surface waters draining into problem areas regarding eutrophication, for selected North Sea States (1985/2000) 69

2-11 Phosphorus inputs in surface waters draining into problem areas regarding eutrophication, for selected North Sea States (1985/2000) 71

2-12 Shipments (10^6 Mg) in North Sea ports from 1989 to 1998 72

2-13 Distribution of introduced species now established in the North Sea, by major taxonomic groups 74

2-14 Seasonal overlap between natural cycles and tourism in the Lower Saxony Wadden Sea National Park 78

2-15 Summary of the Red Lists for the German North Sea marine and coastal zones. Endangerment given as a percentage of species in each group (numbers in brackets). 80

2-16 Topography of the Baltic Sea 82

2-17 Geographical distribution of coast types in the Baltic 84

2-18 Cod fisheries and cod biomass in the Baltic, from Bornholm Sea to Bothnian Bay and the Finnish coast (1966–2002) 86

2-19 Trends in heavy metals in Baltic herring: cadmium, lead and mercury during the period 1980 to 2001 in different parts of the Baltic Sea 89

2-20 Trend in surface water (3–5 m) α-HCH and γ-HCH concentrations in the Arkona Basin 92

2-21 Number of detected illegal oil discharges in the Baltic Sea, 1990–2002 94

2-22 Nitrogen inputs in surface waters in the Baltic Sea catchment area (late 1980s and 2000) 97

Page

2-23 Phosphorus inputs in surface waters in the Baltic Sea catchment area (late 1980s and 2000) 98

2-24 Numbers of alien species introduced into the Baltic Sea in the 20th Century 101

2-25 Summary of the Red Lists for the German Baltic Sea marine and coastal zones. Endangerment given as a percentage of species in each group (numbers in brackets) 104

3-1 Inspection efforts of member states of the Paris Memorandum of Understanding on Port State Control 2001 and 2002 154

3-2 Number and percentage of single-hull oil tankers aged 20 or older 156

4-1 EU Commission proposed organisational arrangements for development of a European Marine Strategy 204

Page

List of Maps

3-1a	North Sea: German continental shelf/Exclusive Economic Zone (EEZ).	229
3-1b	Baltic Sea: German continental shelf/Exclusive Economic Zone (EEZ)	230
3-2a	Ecologically valuable marine areas in the German North Sea . . .	231
3-2b	Ecologically valuable marine areas in the German Baltic Sea . . .	232
3-3a	Proposed Natura 2002 protected areas under the Habitats Directive	233
3-3b	Proposed Natura 2002 protected areas under the Habitats Directive	234
3-4a	Distribution of seabird species determining the extent of the proposed Easterly German Bight SPA in the German North Sea EEZ	235
3-4b	Distribution of seabird species determining the extent of the proposed Pomeranian Bay SPA in the German Baltic EEZ	236
3-5a	North Sea: All uses	237
3-5b	Baltic Sea: All uses	238
3-6a	North Sea: Wind park applications and environmental protected areas	239
3-6b	Baltic Sea: Wind park applications and environmental protected areas	240
3-7a	North Sea: Cables, pipelines and sediment extraction and dumping areas	241
3-7b	Baltic Sea: Cables, pipelines and sediment extraction and dumping areas	242
3-8a	North Sea: Maritime traffic and military training areas	243
3-8b	Baltic Sea: Maritime traffic and military training areas	244

Summary Report

1 Marine Environment of North and Baltic Seas Still at Risk

1.* The North and Baltic seas have long been subjected to significant pollution from the industrialised countries of Northern Europe. Despite the remarkable reductions achieved so far, the situation remains problematical. Recent reports compiled by marine protection organisations and scientific research institutes impressively illustrate the various ways in which marine ecosystems are both endangered and harmed by Europe's fishing industry, nutrient and pollution inputs, shipping, and diverse local encroachments such as raw materials extraction, tourism, coastal protection and, more recently, the use of wind energy. These reports include:

– Quality Status Reports published by the OSPAR Commission for the Protection of the Marine Environment of the North East Atlantic.

– The reports of the Baltic Marine Environment Protection Commission (Helsinki Commission).

– The Progress Reports of the International Conference on Protection of the North Sea.

– The Status Reports of the International Council for the Exploration of the Sea (ICES).

In the two decades since the German Advisory Council on the Environment published its 1980 Special Report on the Environmental Problems of the North Sea, significant improvements have been achieved in some of the more serious issues. The greatest reductions can be accredited to land-based activities involving pollution control, greatly improved wastewater treatment, a range of substance and discharge bans, and measures to combat oil discharges from shipping.

Although significant reductions in pollution and nutrient inputs have been achieved in some areas, there is still a long way to go before sounding the environmental 'all clear'. Both the North and the Baltic seas remain under considerable – in some areas increasing – pressure of use. For example, no sufficient improvements have been achieved as regards the impact of fishing and nutrient inputs from agriculture. Further growth is forecast for other industrial sectors that have either direct or indirect impacts on marine resources (examples include tourism, mariculture and shipping). If we are to achieve sustainable, environmentally sound management of the North and Baltic seas over time, then there is still need for greater efforts and, in some cases, for more fundamental structural changes – particularly in dealing with intensive fishing and agriculture. The following is a summary of the German Advisory Council on the Environment's position on the action needed and of the key policy recommendations contained in its report.

2 Paths to Sustainable Fishing

Existing Pressures and Risks

2.* Over-fishing of many commercial target stocks means that intensive fishing with its current surplus capacity has an increasing impact on marine ecosystems. This has lead to threatening stock reductions (both locally and globally) in many intensively fished species. Economically significant fish stocks in the North and Baltic seas are beyond 'safe biological limits', putting stock-replenishing reproduction within these populations at risk. Many target fish stocks continue to be managed in a non-sustainable way. A well-known example of greatly decimated stocks is the cod, whose North Sea stocks have for many years been fished well in excess of the safe biological limit. Recovery of stocks is thus dependent in the longer term on the complete closure of the cod fisheries. Some sensitive species – like the European eel and the shark species found in the North Sea – have not only suffered considerable decimation among natural stocks, but their habitats have also been affected to such an extent that their occurrence in the North Sea is now at risk (the eel is also at risk in the Baltic Sea).

3.* Intensive fishing does not only endanger target species. Many non-commercial, non-utility organisms end as by-catch in fishing nets. These usually die and are thrown overboard as discards. The use of bottom nets harms benthic communities: a pattern can be observed in areas where bottom nets are used in that significant reductions in sensitive benthic species go hand in hand with an increase in the number of opportunists.

Action Needed and Recommendations

4.* Environmentally sound fishing that is sustainable over time can only be achieved if the necessary measures are taken in order to:

– Manage commercial target fish stocks well above safe biological limits or to restore that level where required.

– Significantly reduce by-catches and discards.

– Better protect valuable benthic populations from harmful fishing practices.

5.* In implementing these targets, the EU carries a key responsibility given its extensive powers as regards the fishing industry and the great extent to which the Common Fisheries Policy (CFP) shapes the fishing sector. But despite better insight on the part of the EU Commission, the EU has not succeeded in aligning Europe's fishing industry with basic sustainability requirements. The German Advisory Council on the Environment thus

welcomes the fact that in the EU Council of Fisheries Ministers, the German government has called for sustainable management of resources. The Council recommends that the German government remains expressly committed to ensuring that the Community fulfils the basic requirements for sustainable fisheries. This change in approach must be guided by the following maxims:

– *A strict resources-focused approach*: conservation of stocks must at least take clear priority over short-term economic considerations. The conservation or recovery of stocks at a productive, sustainable biomass level is of utmost importance for all targets laid down in the Basic Regulation for the CFP. This also applies to socio-political objectives aiming to secure an acceptable standard of living for people employed in the fisheries sector. Any over-shooting of long-term sustainable yields will by default lead to disproportionately high yield losses and subsequently to a reduction in living standards. There is no sensible reason for – and the CFP contains no legal basis on which to place – short-term economic considerations aimed at keeping this vastly over-sized sector on its feet from one month to the next.

– *Efficient catch quotas in line with scientific recommendations made by the ICES*: instead of negotiating annual total allowable catches (TACs), multi-annual catch limits should be fixed under the management and recovery plans for the stocks involved. The ICES's best available scientific prognosis on fish stock capacities must serve as the sole criterion. The EU Commission's proposal of June 2003 for a Regulation establishing measures for the recovery of cod stocks could effect significant advancements by basing minimum stock levels on fixed total allowable catch (TAC) limits and by proposing TAC-based restrictions on fishing-effort. This is dependent on the EU Council of Fisheries Ministers both agreeing to and enforcing a management system of this nature.

– *Protection of indirectly affected marine ecosystems*: the CFP must also take full account of the species conservation requirements under Article 6 EC and Article 174 EC, which also recognise indirectly affected marine ecosystems as being worthy of protection. The objectives of the new Basic Regulation, which have been expanded to include protection of marine ecosystems as a whole, must be put into practice without delay. The FAO Code of Conduct for Responsible Fisheries ought to play a decisive role in practical implementation of the precautionary principle.

– *Restricting by-catch intensive industrial fishing*: as a path to sustainable fisheries, the German Advisory Council on the Environment in its 2002 Environmental Report recommended restricting fishing for industrial use in particular, as the benefits of this type of fishing are, to some extent, questionable (SRU 2002, Paragraph No. 749). This remains valid if tight-meshed nets continue to be used in commercial fishing, resulting in especially harmful by-catches. Experts see the large cod by-catch involved in Norway pout fishing as an area for particular concern. To restrict fishing of this type, specific catch bans and protected areas must be set out in the integrated management plans.

– *Codes of practice to reduce by-catches and discards:* by-catches should be reduced (where practicable) by prescribing the use of larger-mesh nets, deterrent systems and escape windows, and by developing guidelines that require fishermen to avoid by-catch intensive areas. The protected area network must be designated with particular regard to reducing by-catches. A general ban on discards should be implemented with effective sanctions.

– *Comprehensive, integrated, long-term management and recovery plans*: the instruments for a long-term planning approach to fisheries are welcomed in principle and must now be put into practice without further delay. Long-term management planning must not however be allowed to stop at fixing TACs for specific species. Instead, management plans must properly coordinate quotas (in terms of species, numbers, and spatial applicability) with the protected areas strategies and catch method regulations. Such plans should also connect with other claims to use of the seas: in essence, they need to be integrated into a future marine management plan.

– *Protected area network*: for the North and Baltic seas, a holistic protected area concept must be developed to set out in an adequate way specific long-term or temporary restrictions on fisheries while taking account of the level of regional importance attached to stock conservation, other marine ecosystems and other demands on the sea.

– *Monitoring and enforcement*: the more stringent provisions set out in the new Basic Regulation will only help reduce the occurrence of infringements if their implementation is effective in practice. Given that control by Member States is often lacking and that the competent authorities in Member States – especially in regions dependent on the fishing industry – have a tendency to 'make allowances', monitoring should be performed, or at least overseen, to a greater extent by the more centralised and more European organisations of the EU Commission. The new Basic Regulation takes the right approach on this issue but its proposed common inspection system remains toothless without staff and funding. It is not only for this reason that the council welcomes the EU Commission's initiative towards a new Community Fisheries Control Agency to achieve centralised, independent organisation of monitoring backed by funding from the Member States. The council also attaches great importance to tighter sanctions under harmonised criminal law across the Member States.

– *Research and development*: significantly more funding must be invested into researching the impact of fishing and into developing environmentally sound

technologies and practices. As the 'culprits', the fisheries should, first and foremost, be forced to support research and development projects. This applies both to financing and – more particularly – to cooperation needed in on-site investigations, say in documenting and monitoring of by-catch. The internationally applicable precautionary principle in itself places an obligation on the fisheries sector.

– *Withdrawal of subsidies*: the construction of new fishing vessels should no longer be promoted by the Community or the Member States. And subsidies that even indirectly contribute to maintaining overcapacities must be withdrawn. Funds should be used solely for the purposes of socio-economic activities directed at shrinking the sector and, where appropriate, of supporting those fisheries and producer cooperatives which already meet sustainable resources management requirements.

– *Regulatory powers for the EU Commission*: the Council sees as positive that both the EU Commission and the Member States (within their 12-mile zones) will be authorised to implement emergency measures if stock conservation or the marine ecosystem is seriously at risk from fishing activities and immediate action is needed. In most cases, the period of either six or three months allowed for measures implemented by the EU Commission or the Member States would probably be too short to allow lasting prevention of a serious threat to a resource or stocks. The EU Commission should, therefore, be granted significantly broader powers of enforcement.

6.* As regards national responsibilities, the German Advisory Council on the Environment recommends the following:

– Set out stringent management rules and designate specific protected areas for the 12-mile zone to exclude beam trawling in sensitive areas and also to safeguard spawning areas and breeding grounds from potentially harmful fishing activities. The Council nevertheless recognises the wide-ranging and welcome measures already implemented by the responsible *Länder* (states), especially in the Wadden Sea mudflats.

– Report to the EU Commission and designate under the EC Habitats and Birds directives suitable protected areas in the Exclusive Economic Zone (EEZ), indicating the importance of the areas for reproduction of fish stocks.

– Integrate a protected and closed area plan into a future coastal waters and EEZ plan to achieve differentiated, area-specific spatial regulation of fisheries that is coordinated with the many other demands involved.

– Develop action plans and guidelines for environmentally sound, acceptable regional fishing practices and integrate fishermen into the process.

– Significantly increase controls to ensure compliance with requirements for compatible fishing activities in German waters.

7.* To make TACs and stock management more efficient, consideration must be given to making TACs more flexible as regards fishermen's rights of access to fish stocks. By introducing a flexible quota management system to strengthen individual rights of access to fish stocks, EU Member States and their Common Fisheries Policy could make a significant contribution to conserving fish stocks, to reducing overcapacities and to enhancing the profitability of the fishing industry. Europe-wide harmonisation of quota management system implementation and flexible transfer of individual catch rights within the EU could considerably enhance efficiency in national fisheries management. As regards a system comprising tradable catch quotas, the German Advisory Council on the Environment believes that for coastal areas preference should be given to group-based management founded on spatial access rights.

3 Protecting the North and Baltic Seas from Hazardous Substances and Radionuclides

Existing Pressures and Risks

8.* The oceans are pollution sinks. Almost all anthropogenic pollutants eventually find their way into the sea. Some of these pose an environmental risk due either to high input levels, persistence and accumulation, or even direct toxic impact. Risks of this type are posed in particular by heavy metals, some persistent organic compounds and oil inputs. Endocrine disruptors and polar pollutants also give cause for increasing concern.

The days of huge *heavy metal* inputs are over. Since the mid 1980s, most North and Baltic Sea states have managed to significantly reduce inputs of many substances, and thereby achieved a proven reduction in the concentrations of those substances in the water. Because heavy metals are non-biodegradable and are not extracted from the biogeochemical cycle, they can be found in sediment and biota (sometimes in high concentrations), especially in heavily polluted areas of the German Bight and other large river estuaries. In some areas, cadmium, mercury and lead are still found in concentrations that can have a negative impact on biota.

The risks posed by *organic pollutants* have only been researched for a limited number of substances or substance groups, making risk assessment difficult. Nevertheless, some of these substances – like polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), lindane, dioxins, nonylphenol and tributyl tin (TBT) – have been identified as particularly harmful. Their approval and use has been regulated, bringing about significant reductions in their inputs. In some areas, however, concentrations of these substances in the marine ecosystem still reach or even exceed toxicological impact thresholds. At particular risk are river input areas and coastal zones near industrial settlements, in which the concentrations of many pollutants exceed background values or even ecotoxicological assessment criteria. This is why, for example, fish-eating seabirds and marine mammals in the

Baltic Sea are still contaminated with high levels of PCBs, dioxins and DDT. The fact that high concentrations are sometimes measured for substances whose use has been restricted for many years or is even banned (PCBs, DDT, lindane) emphasises the particular risk from persistent substances and justifies the use of stringent prevention standards.

Oils and their components can damage marine ecosystems and their organisms in a variety of ways. Apart from external oiling, petroleum-derived substances and their oxidation products have a range of toxic effects. The main sources are rivers, coastal wastewater, drilling platforms, discharges from shipping and marine accidents.

Action Needed and Recommendations

9.* Protection of the North and Baltic seas from inputs of hazardous substances calls for a broader approach to environmental and, particularly, chemicals policy that takes in marine environment protection requirements. Installation-specific emission restrictions are not enough. On the one hand, diffuse inputs are not covered, while on the other, technical clean-up measures do not cover the entire substance spectrum. Alongside strict emission thresholds, total bans and restrictions on the use of substances that cannot be sufficiently contained at source provide key instruments for effective marine environment protection. Against this backdrop, the German Advisory Council on the Environment makes the following recommendations:

– The International Conference on the Protection of the North Sea's so called 'one generation' target (ongoing reduction of inputs of harmful substances to achieve their complete cessation in 2020, the goal being to reduce concentrations of those substances in marine ecosystems to 'close to zero' or 'near background values for naturally occurring substances') should be anchored in all relevant EC law and consequently in national legislation. The goal therefore should be to achieve by no later than 2010 the cessation of discharges, emissions and losses of hazardous substances in the marine environment. Therefore it is particularly important to further develop and implement the Water Framework Directive and all hazardous substance-specific EU policy to implement both the substance and timing of the one generation target. This is one aim the German government should pursue in developing a European marine protection strategy as well as during negotiations on the new EU chemicals policy (REACH – Registration, Evaluation and Authorisation of Chemicals) and in the current review of the Plant Protection Products Directive.

– The German Advisory Council on the Environment sees a need to harmonise the evaluation systems used in European water protection and chemicals policy with the OSPAR and HELCOM evaluation systems, especially for PBT substance properties. The evaluation systems currently in place at Community level do not give sufficient consideration to protecting the marine environment. In this regard, there is also a need – under both the OSPAR and the Helsinki agreements – to actually implement as planned Community-wide monitoring of hazardous substances for their biological impacts.

– The designation of priority substances and the subsequent selection of priority hazardous substances under the Water Framework Directive must reflect marine environment protection requirements. Priority hazardous substances should at least take in those substances listed by OSPAR and the Helsinki Commission as requiring priority treatment. The current EU list is deficient, particularly in terms of marine environment protection. This is all the more puzzling because the Water Framework Directive makes explicit reference, among others, to the OSPAR and Helsinki agreements.

– Of utmost importance in this regard is that, at Community level, Member States agree emission threshold values as quickly as possible – at least for the 33 substances already identified as priority – and, at national level, emission threshold values for other pollutants listed in the Annex to the Water Framework Directive. The German government should commit itself to ensuring that implementation of the Water Framework Directive does not suffer a similar fate to that of the Water Pollution Directive (76/474/EEC), in which hexachlorobenzenes are the only persistent organic pollutants for which the EU has so far laid down emission limits.

– The German Advisory Council on the Environment believes that granting emission permits under the Water Framework Directive should also take into account the emissions impact on the marine environment. Moreover, significant consideration should be given to the oceans' special sink function and associated concentration trends not only as regards the 12-mile zone covered by the Water Framework Directive, but also beyond that zone.

– In accordance with the EU Commission's proposal, the provisions on long-range transboundary air pollution with regard to persistent organic pollutants set out in the Stockholm Agreement and in the UN/ECE Protocol as regards production, distribution and use of specific persistent organic pollutants should be implemented without delay in binding Community and national legislation.

– Additionally, all substances that are not listed in either international POP agreements but which have PBT and vPvB properties, as well as endocrine disrupters, should be subject both to REACH authorisation procedures and to the licensing procedures for plant protection products and biocides. The German Advisory Council on the Environment recommends that the German government take an appropriate stance in further REACH negotiations and in the review of the Plant Protection Product Directive, pushing for continued efforts towards the integration of PBT and vPvB substances into REACH authorisation pro-

cedures as proposed in the EU Commission's draft regulation.

– The German Advisory Council on the Environment also believes that licensing of plant protection products, biocides and chemicals containing persistent, bioaccumulating and toxic or very persistent and very bioaccumulating properties should only occur in exceptional cases where there is significant public interest and non-availability of suitable alternatives can be proven. This applies irrespective of whether substances are produced for intra-Community trade or for extra-Community export.

– Substitution of hazardous substances should be anchored in EU chemicals policy and implemented and enforced in a determined way. The availability of less-hazardous alternative substances should thus be established as independent grounds on which to deny authorisation of a substance under the REACH system and under plant protection product law.

– Greater attention should be paid to potential inputs, especially of PCBs and DDT, from contaminated soil resulting from rehabilitation activities and to polar pollutants and pharmaceuticals.

– The scope afforded to individual Member States under the Common Agricultural Policy should be used to promote extensive crop growing practices that use lower levels of plant protection products.

– Further efforts are needed if we are to achieve the one generation target with heavy metal concentrations. There is potential for realistic reductions in cadmium and mercury. The phase-out of cadmium-containing batteries should be anchored in law and environmentally sound disposal of used nickel-cadmium batteries implemented. In the case of mercury pollution, the German Advisory Council on the Environment calls for the discontinuation of chlorine-alkaline electrolysis. Mercury-free membrane processes could be used instead.

– Radioactive discharges into the marine environment must be stopped altogether. Given that the dumping of radioactive waste in the oceans is no longer permitted, the German Advisory Council on the Environment believes it sensible to ban discharges of radioactive wastewater from nuclear reprocessing plants. 'Controlled' discharge is by no means synonymous with lower impacts on the marine environment.

4 Reducing Nutrient Inputs in the North and Baltic Seas

Existing Pressures and Risks

10.* Eutrophication caused by high inputs of nutrients, particularly phosphates and nitrogen, remains one of the most serious threats to marine ecosystems. An excess of nutrients leads to an unnatural accumulation of algae or phytoplankton in the water. The most visible effects of increased algae build-up are cloudy waters and greater numbers of algae blooms which can sometimes be toxic. Other negative ecological impacts are caused by the short-lived algae dying off and sinking to the sea bed, where their decomposition involves oxygen-depleting processes. The resulting oxygen deficiency and high concentrations of hydrogen sulphide cause widespread death of animals, plants and other organisms that live on the sea bed, and ultimately lead to far-reaching changes in the aquatic communities affected. In the North Sea, these impacts are largely to be observed in the flatter coastal regions and especially in the Wadden Sea mudflats. The Baltic Sea area is affected in its entirety by the outcomes of eutrophication.

Despite considerable efforts in the prevention of phosphate inputs, eutrophication remains a huge problem. This is largely due to continued high inputs of nitrogen. The reductions in phosphate and nitrogen inputs by 50% each by 1995, agreed under the OSPAR and Helsinki agreements and by the International Conference on the Protection of the North Sea in the late 1980s, have only been achieved to any great extent for phosphate inputs – and that largely as a result of extremely cost-intensive modernisation of industrial and municipal wastewater treatment systems and the removal of phosphates from household laundry detergents. In contrast, the nitrogen reduction target remains largely unachieved; this is due for the most part to high nitrogen inputs from the use of fertilisers in agriculture. The latter thus pose a key challenge in marine environment protection policy. Rapid measures to reduce inputs are particularly important because it can be expected that concentrations will take some considerable time to react to reductions in nutrient sources. A great proportion of today's inputs do not stem directly from anthropogenic sources, but rather from 'stores' that have built up on the sea bed and in groundwater. Nor should we ignore the atmospheric nitrogen stores that contribute about one third of nitrogen inputs in the Baltic Sea and more than one fifth in the North Sea, the key source being agriculture followed by transport.

Activities and Action Needed

11.* The German Advisory Council on the Environment welcomes the demanding objectives laid down by regional marine protection organisations, particularly the target set for reducing nutrient inputs and, moreover, the ideal target set by the OSPAR Commission and the 5th International Conference on the Protection of the North Sea to achieve a marine environment devoid of anthropogenic eutrophication by 2010. At the same time, the Council must point out that the reductions in agricultural fertilising that are so vital to achieving this ideal are simply not happening. If agriculture is to be adapted towards (marine) water protection, then there is another vital issue – one which goes beyond the agricultural compromise agreed in June 2003 on reform of the Common Agricultural Policy (CAP) and involves the following:

– The targets contained in Article 33 (1) EC which focus on increased production should be replaced by more environment-focused wording.

– The marine environment protection targets should actually be integrated into agricultural policy structure (see Article 6 EC).

– Payment of agricultural subsidies should be decoupled from production quantities and without any significant exemptions.

– Reallocation of funding from the first to the second pillar of the CAP ('modulation') should be effected to a significantly greater extent than is intended.

The German government must take action to enable appropriate further reform of the CAP. But it should also fully exploit existing national scope for action provided under the CAP, make agricultural funding available for environmental protection activities and, more specifically, structure the national agro-environment programme to take a more determined approach to environment and nature protection objectives as required by EC Regulation 1267/1999.

12.* Significant reductions in nutrient pollution could also be achieved if the Nitrate Directive was finally applied in practice (as is actually required) to coastal and marine waters. Under existing law, eutrophied coastal and ocean areas, or those at risk of eutrophication, must be identified and treated as areas at risk. The action plans to rehabilitate or conserve these areas must thus contain appropriate measures. For example, nitrogen thresholds that are significantly lower than 170 kg N (arable land) and 210 kg N (grassland) per hectare and year must be complied with if the respective local conditions and those in the North and Baltic seas so demand.

13.* The special protection requirements for both seas must be integrated into the action plans which will be developed in the implementation of the Water Framework Directive. The competent authorities can and must determine the action needed in river basins, including agricultural activities as appropriate.

14.* Given that monitoring of agriculture can be difficult, the German Advisory Council on the Environment calls for the next action plans, and later the activities programmes, to focus on fewer but easily verifiable provisions that also make for effective water protection. The Council identifies the following 'enforcement-friendly' and effective instruments:

– Area-specific restrictions on animal numbers.

– Perennial vegetation cover, with intercropping and winter cover.

– Comprehensive records on the areas available for use of farm manure.

– At least for farms with large animal stocks, the systematic implementation of storage systems for farm manure storage during the winter, based on retrospective orders imposed under Articles 17 (1) and 5 (1) 3 of the Federal Imission Control Act (BImSchG) to enable correct waste management.

– A broad ban on ploughing grassland.

15.* Farmers will only cooperate better in environmental protection activities if the activities are sufficiently well funded. Consultation, training and cooperation play a key role. There is also a need for Community-wide harmonisation of nutrient budgeting models to obtain clarity as to the situation on individual farms.

16.* In small municipalities, wastewater is often heavily polluted with phosphates and nitrogen. In the interests of prevention, improved nutrient-reducing wastewater treatment under the Urban Wastewater Treatment Directive should thus become the norm. The option of designating so-called less-sensitive areas should be abandoned. The German government should call for the directive to be amended accordingly. At national level, the German Advisory Council on the Environment attaches great importance to nation-wide compliance at large wastewater treatment plants with the concentration values for nitrogen of 13 mg/l now stipulated in the German wastewater ordinance.

17.* There is a great need for regulation of emissions from shipping. Standards at sea should no longer be allowed to blatantly lag behind those on land. Under the NEC Directive, land-based NO_x emissions are to be cut Community-wide to 6,519 thousand Mg per year by 2010 (compared with 13,389 thousand Mg in 1990). In contrast, it is expected that by 2010 shipping-related inputs will rise by between 4,015 thousand Mg (1.5% growth) and 4,649 thousand Mg (3% growth) compared with 2,808 thousand Mg in 1990.

5 Combating Pressures and Risks from Shipping

Existing Pressures and Risks

18.* Commercial sea traffic has increased considerably along the major North Sea and Baltic shipping lanes. Shipping poses a range of significant environmental pressures and risks:

– Illegal discharges of heavy oil residues and tank-wash water are the main sources of concentrated oily residues on the surface of the water in the North and Baltic seas. There is evidence of a reduction in such discharges since the introduction of severe restrictions on the disposal of oil-containing residues from fuel processing. Pollution levels measured along the main shipping routes, however, still show considerable quantities of illegally discharged oil.

– The sinking of the Prestige has focused attention on the grave consequences of oil tanker accidents, which cause serious localised damage to the marine environment and – as with the Prestige – to entire coastal regions and ocean-dependent industries. The risk of shipping accidents in the North and Baltic seas is con-

siderable and is likely to increase rather than decrease with the growing number of structures being built in the oceans, especially with the erection of offshore wind farms.

– Atmospheric emissions from shipping are also considerable and are largely due to the use of heavy, highly sulphurous bunker oils and heavy oils. SO_2 emissions from shipping match almost one third of all land-based emissions in the EU. The same applies to NO_x emissions.

– Finally, shipping is seen as the key causal factor in the introduction of non-native species. In an ecosystem that is already under pressure from other environmental factors, exotic species transported by ballast water can further upset the natural balance and cause undesired homogenisation of habitats.

Action Needed and Recommendations

19.* The German Advisory Council on the Environment believes that a lot more must be done to place shipping on a sound ecological footing. Given the pollution and risks that remain, shipping is nowhere near the level of environmental compatibility that could reasonably be achieved using modern technologies and practices. As in landbased environmental protection, the precautionary and polluter-pays principles should be systematically applied to shipping to minimise the risks to the North and Baltic seas. Accordingly, the freedom of the oceans must be subordinated. This assumes significant tightening and refinement of prevailing environmental protection and safety requirements combined with far better enforcement of existing provisions. The German Advisory Council on the Environment sees the following as particularly important:

EU's Special Strategic Responsibility

20.* With the Law of the Sea Treaty and the International Maritime Organisation (IMO), the international community has agreed to allow shipping largely free access to the oceans and in consequence has considerably limited individual states' abilities to enact restrictions. This means that the call for more stringent environmental and safety measures must be directed above all at the IMO and its international law regime, the IMO being the competent international body. The IMO, however, shows little willingness to implement more stringent rules. At best, long and drawn-out decisionmaking processes result in a tightening of existing provisions. Although EU legislation – especially that enacted in response to the sinking of the Erika and the Prestige – has clearly influenced the further development of the relevant international law, uncertainty remains as regards the extent to which the EU can enact regional protection measures without IMO approval. Only recently have the IMO and the EU begun to clarify the division of responsibilities between their organisations. In any event, the EU – along with those nations who take their responsibilities seriously – should become active within the IMO. EU regional protection standards could provide considerable stimulus at international level: over 10% of world tonnage can be apportioned to the fifteen EU member states and a further 10% to the ten EU accession states – particularly Malta with 5% and Cyprus with 4% (EU Commission, 2002b, p. 13). EU-coordinated lobbying in the IMO by these 25 countries could spur further action at international level. The German Advisory Council on the Environment thus welcomes the EU Commission's intention to have the EU join the IMO and recommends that the German government actively supports this undertaking.

The EU could and should play a more significant role through better enforcement of applicable international law and EU environment protection and safety provisions. There are still considerable qualitative and quantitative deficiencies in supervision of shipping by Member States (as either flag or port states). This is impressively illustrated by the infringement proceedings concerning the directive on port state controls initiated immediately the deadlines expired. An EU controlling body with both coordinating and monitoring powers and appropriate staff and equipment would thus be an important step towards improved and consistent enforcement.

Shipping Safety

21.* Measures towards improved shipping safety must achieve the following:

– *Constructional requirements*: The phasing out agreed at EU level of single hull tankers – according to ship category between 2005 and 2010 – and the ban on the transportation of heavy oil in such tankers must now be put into practice. The German Advisory Council on the Environment believes that a European port entry ban for all single hull tankers from 2010 is compatible with international law provisions. However, banning single hull tankers will not guarantee total safety. The risk of shipping accidents caused by engine damage should therefore, regardless of construction type, be minimised by the installation of back-up engines that can keep ships manoeuvrable. Additionally, double hull tankers must be subject to regular quality controls. And finally, EU and international law should prohibit use of the space between both hulls as additional capacity for transporting oils, other hazardous substances or liquids.

– *Adequate training of ships' crews*: greater attention must be given to the training of ships' crews. Immediate action should be taken to ensure that in future, 'older' crew members – those trained prior to 2002 – fulfil requirements under the 1995 International Convention on Standards of Trading, Certification and Watchkeeping (STCW) or the corresponding EU Directive 2001/25/EC.

– *Adequate port state controls*: it must be ensured that all Member States make available an adequate number of inspectors at all ports and berthing places and fulfil the 25% minimum control rate. Individual ports must

not be allowed to become 'convenience' ports. Pressure must be applied first and foremost, though not solely, to the accession states Cyprus and Malta.

– *Modern monitoring and information systems*: new monitoring and information systems will enhance sea traffic safety. The German government should nevertheless continue to push for the introduction of mandatory piloting services (at least in certain sea areas like the Baltic Sea entrances and the Kadet Trench), for additional protection measures in the designation of the Wadden Sea as a Particularly Sensitive Sea Area (PSSA), and for recognition of the Baltic Sea as a PSSA.

– *Consolidation of national enforcement responsibilities*: the differing responsibilities of the German Federal and *Länder* (state) governments within and beyond the 12-mile zone, various agencies' authorities, the use of *Länder* organisations to enforce federal requirements, and so on, mean that shipping-related responsibilities are performed in a non-uniform and haphazard manner. The German Advisory Council on the Environment sees an urgent need to consolidate these multifaceted decisionmaking responsibilities, not least for reasons of efficiency. The Joint Accident Task Force is a welcome initial step in this direction. Additionally, Germany's sovereign maritime forces (vessels belonging either to the Federal Ministry of Transport, Building and Housing or the Coast Guard or Customs and Excise or Fisheries Inspectorate) would be better consolidated into a German Coast Guard as an agency of a federal ministry.

Reducing Operational (Illegal) Discharges

22.* The German Advisory Council on the Environment calls for greater attention to be paid to pollution from discharges of operational and loading residues and tipping of ships' waste into the oceans. Abuse of the North and Baltic seas as waste dumps is no longer acceptable; likewise the fact that nowhere near the same monitoring standards are applied at sea as on land. While the annexes to the 1973/1978 International Convention for the Protection from Pollution from Ships (MARPOL) lay down relatively strict provisions as a basis for protecting the marine environment, frequent illegal discharges are still a cause for concern. Illegal discharges are caused by the lack of waste reception facilities in ports, non-uniform application of MARPOL rules and inadequate monitoring and pursuit of infringements. Although in need of enhancement, the EU's efforts on port reception facilities, port state controls and sea traffic monitoring are key steps towards combating this intolerable situation.

Reducing Air Pollution from Shipping

23.* In the case of shipping-related air pollution, the current lack of international, and the inadequate EU, exhaust regulations for sea traffic essentially results in highly environmentally harmful bunker oil being used as shipping fuel in place of marine diesel oil. The German Advisory Council on the Environment thus sees a need for binding restrictions on the sulphur content in shipping fuel, at least for EU waters and ports in the interim. There is an equally urgent need for similar binding restrictions on NO_x emissions. Wherever possible, compliance with more stringent emission standards should be backed by financial incentives: for example, more attractive berthing fees and lower control fees.

Liability Law Incentives to Comply with Environment and Safety Provisions

24.* In principle, criminal law sanctions and financial liability can provide a tremendous incentive to comply with existing environment protection and safety provisions and also to implement precautionary measures. A prerequisite for this, however, is that liability provisions are made stringent enough at international level and are reliably enforced. This does not appear to be the case at present; in particular, it is evident that inadequate civil liability provisions do not prevent the use of outdated ships and safety systems. Along with a tightening of compensation obligations in the form of liability limits under civil law, the German Advisory Council on the Environment sees an urgent need for stricter sanctions under criminal law that apply to anyone who pollutes the seas wilfully or through gross negligence or is an accessory to such an offence. Thus, the threat of sanctions should not only affect the ship's captain and the ship's owner, but also the responsible individual within the classification society or the company that owns the cargo. It is therefore regrettable that a directive to this effect proposed by the EU Commission has not received Council of Ministers' support as regards sanctions under criminal law.

6 Protecting Regional Habitats and Species

25.* It is some time since the North and Baltic seas were natural areas untouched by construction. They remain and are increasingly influenced by activities like marine mining, the dumping of dredged materials, pipelines, cable channels and planned offshore wind farms. Alongside and in conjunction with the ubiquitous pressures posed by shipping, fisheries and chemical inputs, these regional impacts can, to a significant and increasing extent, contribute to the endangerment, degradation and destruction of marine communities and their habitats. The number and size of relatively untouched and undisturbed habitats that could serve both as breeding and recovery areas is dwindling rapidly.

Against this backdrop, there is an urgent need for more effective measures than those already implemented: firstly, to protect ecologically valuable areas from disturbance (especially breeding, resting and recovery areas) and, secondly, to achieve a minimum of protection from excessive encroachments.

26.* To ensure region-specific protection of particularly valuable and/or sensitive habitats and species, the Ger-

man Advisory Council on the Environment recommends that the German government implement as soon as possible the integrated protected area network aimed for under the Habitats Directive and the Birds Directive and also under the HELCOM System of Coastal and Marine Baltic Seas Protection Areas (BSPA) and the OSPAR Marine Protected Area Programme:

– In the short-term, place under effective protection all sea areas which – according to available knowledge and under the Federal Agency for Nature Conservation's (BfN) nature protection assessments – are deemed important to the marine environment and migratory birds.

– Intensify research on marine ecosystems in the North and Baltic seas and use the results to identify additional protection needs and, where applicable, new protected areas.

– Push for systematic and transparent integration, harmonisation and simplification of the various protection programmes, protected area categories and criteria, including the integration of species-specific protection provisions from the prevailing species protection agreements.

– In close cooperation with OSPAR and the Helsinki Commission, lay down in either primary or secondary legislation a uniform framework for marine protection areas. This framework should contain uniform criteria providing for the exclusion of incompatible uses, the approval of acceptable uses, area management and monitoring.

– As part of a joint Federal and *Länder* (state) national marine protection strategy, develop a national protected area plan for the North and Baltic seas.

– Implement marine spatial planning alongside land-based spatial planning to ensure that diverse uses are formally and bindingly coordinated – both in terms of the uses themselves and of marine environment protection requirements – particularly to avoid locating industry in valuable or sensitive habitats.

27.* To ensure adequate and broad minimum protection, the German Advisory Council on the Environment sees a need for uniform and harmonised marine licensing law, especially concerning sea-based construction projects.

– Give the competent authorities the discretionary power to grant planning permission analogous to their discretionary power to grant exploitation licenses under water management law.

– Ensure responsible management of marine habitats within the licensing process by means of specific administrative standards for marine environment impact assessments and sea-based application of impact provisions.

– Identify the specific marine compensation potentialities so that the compensation requirements under nature protection law can be applied to encroachments on the marine environment.

28.* Different types of use entail different environmental risks and hence different levels of regulation and monitoring. In many cases, there are no binding regulations or specific requirements to ensure minimisation of impacts and risks using the best available technologies. In many cases, implementation of existing decisions and recommendations made by OSPAR and the Helsinki Commission is still pending. The German Advisory Council on the Environment thus sees the following action as a priority for specific types of uses:

Offshore facilities: in general, the 'raw materials security' provision (Section 48 (1), 2nd sentence, Federal Mining Act (BBergG)) should be abolished to allow designation of protected areas to prohibit mining activities where conservation and protection objectives so demand. As regards the environmental risks of rapidly spreading wind farms, the provisions on areas of suitability in Section 3a of Germany's Marine Facilities Ordinance (Seeanlagenverordnung) should be amended so that wind farms may only be erected in suitable areas. In light of the results expected from current environmental impact research, the licensing of offshore facilities under the Marine Facilities Ordinance should be made discretionary to allow the Federal Maritime and Hydrographic Agency (BSH) to take a planning-focused and phased approach to wind farm licensing.

Cables and pipelines: Alongside thorough environmental impact and alternative assessments, priority should be given to the bundling of cables or pipes wherever possible. There is thus an urgent need for comprehensive planning of requirements and networks in the North and Baltic seas. Where applicable, this must include infrastructures like marine transformer stations which must be made compatible with other uses under a compulsory marine management plan.

Sediment extraction: the obligation to conduct an environmental impact assessment should be broadened to include extraction projects involving less than 10 ha or 3,000 Mg per day, and sediment extraction in all nature protection areas should be prohibited.

Relocation and dumping of dredged materials: compliance provisions for dumping and relocating dredged materials, including special assessment criteria for environmental impact assessment, maximum allowable pollutant content, applicable technical processes, and monitoring, should be placed on a uniform federal, or preferably EU, legislative level in line with the Disposal Guidelines for Dredged Material in Coastal Waters (Handlungsanweisungen Baggergut Küste) and the Disposal Guidelines for Dredged Material in Inland Waters (Handlungsanweisungen Baggergut Binnengewässer).

Mariculture: as soon as possible, HELCOM recommendation 20/1 of 23 March 1999 on environmentally sound mariculture should be fully implemented into European and national law, taking account of applicable provisions

contained in the FAO Code of Conduct for Responsible Fisheries. This should include an environmental impact assessment and should link location selection to spatial planning suitability criteria. It should limit discharges of phosphates and nitrates and the use of pharmaceuticals, prescribe measures against the release of breeding fish and set out rules for the regular monitoring of breeding farms.

Tourism: environmentally sound planning and management of tourism activities pose a great challenge. This is shaped by local and regional conditions and must largely be met by the respective districts and municipalities. Regional specificities aside, establishing protected areas and full enforcement of protected area provisions play a key role. Assessment and evaluation of local and regional tourism using meaningful, uniform criteria is important and should be further developed. The concept of environmental impact assessment under the Viabono eco-label along with proactive marketing of environmentally sound tourism services is an approach that is both right and worthy of promotion.

7 Strategies for Effective Marine Environment Protection Policy

Strategic and Institutional Principles

29.* A look at the various fields of activity in marine environment protection reveals numerous sector-specific problems, deficits in action already taken and opportunities available for further action. There are also fundamental cross-sectoral goal-setting issues, obstacles to success and management deficiencies. Much of this is due to the fact that there is still no plausible strategic, institutional and instrumental basis for integrated marine environment protection policy. There are neither clear, coordinated quality assurance goals, nor is there a cross-sectoral, coordinated plan of action. Both at EU and at national level, marine environment protection is instead largely dealt with on an incremental basis and, where at all possible, lumped in with existing sectoral policies (fisheries, agriculture, chemicals, water protection policy and so on). A significant contributor to the segmentation of marine protection policy is the distribution of decisionmaking responsibilities and initiatives among global and regional international bodies, the EU, national governments and their regional entities. Given the cross-border, multi-sectoral nature of the problem, the involvement of all these stakeholders is vital. Initiatives must thus be transparent, both in their coordination and in the division of responsibilities. Much remains to be done in this regard.

30.* Another overarching management issue involves the deficiencies often apparent in implementation of the relatively 'soft' target and action decisions made by the regional protection organisations INC, OSPAR and HELCOM. This is no doubt partly a result of the more political, appellatory nature of those decisions. Supplemental policy instruments would thus appear called for to aid better implementation. Any efforts made in this direction must, however, be sensitive to the fact that the soft nature of INC, OSPAR and HELCOM decisions is a significant factor in compromise building between the large number of responsible states, and that more specific obligations, greater degrees of bindingness and a stricter sanctioning regime might well make individual states less willing to sign up to international agreements in the first place. For this reason, when it comes to the North and Baltic seas, the German Advisory Council on the Environment recommends a continuation of the division of responsibilities between international cooperations and the EU in such a way that the Community, with its special legislative and enforcement powers, should drive implementation of INC, OSPAR and HELCOM decisions.

Rapid Development of Integrated Quality Assurance Goals

31.* The level of prevention and protection aimed for in the marine environment is of fundamental importance. The 'ecosystem approach' internationally established by the Biodiversity Convention rightly focuses on finding a balance between differentiated quality targets, taking account, among other things, of regional protection needs and conflicting claims to use of the sea. Given the great socio-economic importance of the North and Baltic seas, eliminating all anthropogenic impacts cannot be the principle aim of any realistic prevention model. Based on the principle of proportionality, balanced environmental quality targets must be agreed, reconciling anthropogenic demands as far as possible with ecosystem conservation and regeneration.

32.* In terms of proportionality it appears principally acceptable to take into account economic and social stakes within the ecosystem approach and to link the derivation of quality objectives under this approach to the broad postulate of sustainability. However, the German Advisory Council on the Environment sees a grave risk that special emphasis of an integrated approach and particular consideration of economic and social claims could – not least in the context of the general sustainability debate – water down the ecosystem approach's ecological strategy and weaken the thrust of the precautionary model in environmental policy.

33.* What remains uncontested is the ecosystem approach's requirement to expand protection and prevention targets and measures to take in differing ecosystem functions and, as far as possible, to take account of interactions and remote influences. This is a sound and sensible prerequisite for problem-driven and effective environmental protection which, in many cases, can not yet be satisfactorily met in terms of the marine environment because of gaps in knowledge and available data. It cannot be denied that further research in this area should place greater weight on marine ecosystems and anthropogenic impacts. The German Advisory Council on the Environment nevertheless sees a danger, especially in policy-making, that the postulate of full ecosystem protection

could be abused by being made 'subject to further research' to allow questioning and postponement of preventive measures that could be implemented on the basis of available knowledge.

34.* The marine environment protection policies drawn up by INC, OSPAR and the Helsinki Convention follow the Biodiversity Convention by focusing on the underlying principles that pollutant emissions should not be allowed to exceed the ecosystem's capacity to absorb them and that emissions of hazardous substances must be minimised with the aim of achieving zero emissions. This is in line with the one generation target of zero emissions of hazardous substances by 2020. The phosphate and nitrate target aimed at cessation of anthropogenic eutrophication by 2010 is stricter than the capacity principle and is unrealistic, as are the emission reductions it involves. The German Advisory Council on the Environment recommends softening the target and tightening measures to achieve it.

35.* While setting basic targets for pollution and hence emission reductions is indispensable in designing successful policy, they cannot have the desired controlling effect unless global targets and an associated timeframe are agreed for both sector-specific and consolidated activities. The German Advisory Council on the Environment thus greatly welcomes the Bergen Declaration of the Fifth North Sea Conference and its important contribution in setting out the ecological quality elements and the ecological quality objectives that we should aim for.

Solving Conflicts of Responsibility that Weaken Effectiveness

36.* Clarification and redistribution of responsibilities within key problematic areas of marine environment protection must be pushed for if we are to solve responsibility conflicts that weaken effectiveness. This applies to:

– The relationship between regional legal initiatives (by OSPAR, HELCOM and EU) and the International Maritime Organisation (IMO) as regards the possibility of obligating shipping at regional level to greater protection, emission and safety standards.

– The relationship between the EU and international regimes under the OSPAR and Helsinki agreements whereby the responsibilities of OSPAR and the Helsinki Commission should be upheld and their initiator and pioneer roles in marine environment protection supported, while the EU should put to greater use its legislative authority and enforcement powers to ensure more effective implementation of international protection objectives.

– The relationship between the EU and its Member States concerning the lack of uniform monitoring and of an enforcement agency with broad sovereign powers for fisheries and shipping. A European inspectorate that uses international control teams to coordinate and manage enforcement could significantly reduce implementation and enforcement problems.

– The inappropriate division of federal and *Länder* administrative responsibilities at the edge of the 12-mile zone, where greater federal powers are needed. To achieve uniform and efficient enforcement on either side of the 12-mile zone, responsibility for marine environment protection, shipping safety and fisheries, and also for coastal sea waters, should be transferred in its entirety to a federal agency or at least to an agency commissioned at federal level. As with the example of the need for uniform marine spatial planning law, there is also much to be said for giving the federal government comprehensive legislative powers over the marine issues outlined above as part of its sovereign authority over the coastal sea waters and exclusive economic zone in its jurisdiction.

Creating an Integrated Management Regime

37.* The German Advisory Council on the Environment sees an integrated strategy and action plan together with spatial coordination as vital to marine environment protection, which is essentially a multilateral, cross-sectoral responsibility. It appears that national programmes of this kind do not yet exist. The EU should thus require national management plans to ensure that such plans are uniform and can be integrated both horizontally and vertically. With reference to the Water Framework Directive, the EU should place its Member States under obligation to:

– Develop and regularly update national management plans for coastal sea waters and the exclusive economic zone.

– Use the management plans to achieve and provide evidence of the implementation of international and EU law requirements.

– Issue supplemental action plans if enforcement deficits occur.

– Establish a marine spatial plan in line with their national management plans.

All overarching management problems outlined above illustrate the need for a strategic, transparent and planned approach. The German Advisory Council on the Environment believes that a Europe-wide obligation for Member States to draw up marine management plans would not only promote integrated, transparent and effective marine environment protection, but would also make a significant contribution to Europe-wide coordination at and between the various stakeholder levels and to enhancing implementation of European protection goals. National action plans are the only means of assessing whether and to what extent individual states are willing to fulfil their international and Community obligations to protect the marine environment.

The ecosystem approach's holistic management requirements can only be met with an overarching, transparent action plan, long-term objectives and activities that are coordinated over space and time.

Other than with long-term goal-setting and transparent activity planning, it is impossible to provide the most efficient, sustainable level of marine environment protection while taking account both of ecosystem functional relationships and of economic and social demands. This type of holistic, long-term optimisation strategy requires long-term goal-setting and coordinated planning of consolidated measures.

Coordinated coastal area management, as largely initiated and coordinated by the EU Commission, takes the right approach for marine protection planning of this type. While it cannot replace marine protection planning due to its restriction to coastal sea waters and lack of a spatial planning structure, it constitutes a key marine management component.

Irrespective of future European requirements, the German Advisory Council on the Environment appeals to the German government, and especially to Germany's coastal *Länder*, to develop marine protection plans without delay and to review and update them with regular public consultation.

1 Introduction and Background

1.1 North and Baltic Seas Still at Risk

1. The Joint Ministerial Meeting of the OSPAR and Helsinki Commissions on the Protection and Conservation of the Baltic Sea and the North East Atlantic in June 2003 again drew public attention to the fact that marine environmental protection in the North and Baltic seas remains a key challenge, and not least for European environment policy. Marine environments in the North and Baltic seas have long been exposed to significant pressures from the industrialised countries of Northern and Central Europe.

With its Special Report on the Environmental Problems of the North Sea (SRU, 1980) the German Advisory Council on the Environment conducted the first comprehensive analysis and evaluation of pollution levels in the North Sea. The report signalled an alarming situation that called for major clean-up efforts in many areas of the North Sea affected by high inputs and concentrations of particularly harmful substances, including some which are today either completely banned or restricted. The main causes of pollution were high levels of pollutants distributed by rivers which at the time were subject to extreme pollution discharges, grossly negligent pollution of the oceans through the dumping of waste, high nutrient inputs from municipal wastewater and washing detergents, and significant oil discharges from shipping and offshore oil industry. Added to this were overfishing, extreme encroachments on nature through coastal protection and tourism, and a severe reduction in the numbers of species and stock levels in marine environments in general.

2. Since publishing its Special Report, the German Advisory Council on the Environment has identified some significant improvements regarding the main sources of pollution, and this despite the ongoing and in some cases increasing pressures – particularly from fisheries (SRU, 2002, Para. 751 et seq.; below, Para. 35 et seq., 148 et seq). Important advancements have been achieved for pollution control activities and greatly improved wastewater treatment processes (SRU, 1994, Para. 478 et seq.; 1996a, Para. 311 et seq.; 2000, Para. 613 et seq.; below, Para. 100), a range of substance and discharge bans (SRU, 1994, Para. 478 et seq.; 2000, Para. 703) and effective measures to halt oil discharges from shipping (see Para. 378). But despite the considerable reductions achieved, the high levels of harmful pollutants still found in the North and Baltic seas remain a cause of considerable concern. Recent status reports compiled by marine protection organisations and scientific research institutes (Para. 24 et seq.) impressively illustrate the various ways in which marine ecosystems are both endangered and harmed by fisheries, nutrient and pollution inputs, shipping, and diverse local encroachments such as raw materials extraction, tourism, coastal protection and, more recently, the use of wind energy.

There is also increasing evidence of the changes and harm that projected climate change could mean for marine environments. Changes in water temperatures, sea levels and currents could have significant impacts on marine ecosystems in the near future. Efforts to reduce the anthropogenic greenhouse effect, which have also proven to be an urgent requirement in marine environment protection policy, comprise an independent, far-reaching policy area that the German Advisory Council on the Environment will not address in this paper (SRU, 2002a, Para. 410 et seq.)

3. As with pollution, considerable developments have taken place since 1980 in terms of the policy and legal frameworks for marine environment protection (SRU, 2000, Para. 673 et seq). Compared with earlier times, the diverse, cross-sectoral and largely cross-border issue of marine environment protection today comprises a considerably more detailed and complex mesh of scientific institutions, political actors and legal protection regimes. Understanding this complex subject requires an insight both into the key pollution factors and the principles on which the institutional structure rests (Section 1). These thus come before a detailed description of the status (Section 2) and an outline of policies and actions (Section 3). Sectoral and cross-cutting issues of effectiveness and implementation are then followed by a critical assessment of more general institutional and methodological issues in marine environmental protection (Section 4).

1.2 Main Pollution Sources: An Overview

Intensive Fisheries

4. Over-fishing of many commercial target stocks has an increasing impact on marine ecosystems in the North and Baltic seas. Intensive fishing has led to threatening stock reductions (both locally and globally) in many intensively fished species. Most commercially significant fish stocks in the North and Baltic seas are beyond ‘safe biological limits’, putting stock-replenishing reproduction within these populations at risk. Intensive fishing endangers not only target species, but also numerous indirectly affected species and habitats due to the large quantities of by-catches and the sometimes harmful effects of bottom nets and beam trawling.

Hazardous Substances

5. The oceans are pollution sinks: almost all anthropogenic pollutants eventually find their way into the sea. Some of these pose an environmental risk due either to

high input levels, persistence and accumulation, or even direct toxic impact. Risks of this type are posed in particular by heavy metals, some persistent organic compounds and oil inputs.

The days of huge heavy metal inputs are over. Since the mid-1980s, most North and Baltic Sea states have managed to significantly reduce inputs of many substances, and have thereby achieved a proven reduction in the concentrations of those substances in the water. High concentrations can still be found, however, in sediment and biota – especially in heavily polluted areas of the German Bight and other large river estuaries.

The risks posed by organic pollutants have only been researched for a limited number of substances or substance groups. Nevertheless, some of these substances – like polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), lindane, dioxins, nonylphenol and tributyl tin (TBT) – have been identified as particularly harmful. The authorisation and use of most of the substances has been regulated, bringing about significant reductions in their inputs. In some areas, however, concentrations of these substances in the North and Baltic seas still reach or even exceed toxicological impact thresholds. This also applies for substances whose use has been restricted for many years or is even banned (PCBs, DDT, lindane).

Oils and their components can damage marine ecosystems and their organisms in a variety of ways. Apart from external oiling, petroleum-derived substances and their oxidation products have a range of toxic effects. The main sources are rivers, coastal wastewater, drilling platforms, discharges from shipping and marine accidents.

Nutrients and Eutrophication

6. Eutrophication caused by high inputs of nutrients, particularly phosphates and nitrogen, remains one of the most serious threats to marine ecosystems. An excess of nutrients leads to an unnatural accumulation of algae or phytoplankton in the water. The most visible effects of increased algae build-up are cloudy waters and greater numbers of algae blooms which can sometimes be toxic. Other negative ecological impacts are caused by the short-lived algae dying off and sinking to the sea bed, where their decomposition involves oxygen-depleting processes. The resulting oxygen deficiency and high concentrations of hydrogen sulphide cause widespread death of the creatures, plants and other organisms that live on the sea bed, and ultimately lead to far-reaching changes in the aquatic communities affected.

Despite considerable efforts in the prevention of phosphate inputs, eutrophication remains a huge problem. This is largely due to continued high inputs of nitrogen. Reductions in phosphate and nitrogen inputs by 50% each by 1995, agreed under the OSPAR and Helsinki agreements and by the International Conference on the Protection of the North Sea in the late 1980s, have only been achieved to any great extent for phosphate inputs – and that largely as a result of extremely cost-intensive modernisation of industrial and municipal wastewater treatment systems and the removal of phosphates from household laundry detergents. In contrast, the nitrogen reduction target remains largely unachieved; this is due for the most part to high nitrogen inputs from the use of fertilisers in agriculture. The latter thus pose a key challenge in marine environment protection policy.

Environmental Risks and Pressures from Shipping

7. Illegal discharges of heavy oil residues and tank-wash water are the main sources of concentrated oily residues on the surface of the water in the North and Baltic seas. The most visible impact of such concentrated oil pollution involves seabirds living on the ocean surface who suffer external oiling of their feathers and fatal poisoning from oily waters and oil-coated food. While a strong reduction in such discharges has been achieved with the introduction of severe restrictions on the disposal of oil-containing residues from fuel processing, pollution levels measured along the main shipping routes still show considerable quantities of illegally discharged oil out at sea.

The sinking of the ‘Prestige’ in November 2002 off the Iberian peninsula again focused attention on the grave consequences of oil tanker accidents, the serious localised damage they cause to the marine environment and – as the ‘Prestige’ also showed – to entire coastal regions and ocean-dependent industries.

Atmospheric emissions from shipping are also considerable and are largely due to the use of heavy, highly sulphurous bunker oils and heavy oils. SO_2 emissions from shipping match almost one third of all land-based emissions in the EU. The same applies to NO_x emissions.

Shipping poses a further risk to the marine environment through the transportation and introduction of non-native species in ballast water.

Local Encroachments

8. It is some time since the North and Baltic seas were natural areas untouched by construction. They remain and are increasingly influenced by activities like marine mining, the dumping of dredged materials, pipelines, cable channels and planned offshore wind farms. The lack of holistic planning instruments allows almost arbitrary spatial distribution of such encroachments – often without any consideration being given to special protection needs, which sometimes results in serious, visible impacts on the marine environment. In many coastal regions, coastal protection activities have caused significant changes in morphology and the interrelations between currents and tides, and thus the natural habitats of many marine mammals and seabirds. The problem is about to crystallise with the German Government’s plans to expand the use of offshore wind energy.

1.3 Regimes and Actors in Marine Environment Protection: An Overview

9. Marine environment protection involves a range of polluter groups, sectors and policies. Given the causal links at global level and cross-border exploitation of the oceans by almost all sectors involved, it is an international issue of particular magnitude. Since World War II, the need for multilateral cooperation has been met by a well-established network of international agreements, cooperations and institutions (for more on the historical developments see HEINTSCHEL von HEINEGG, 2002). Apart from globally applicable agreements like the 1982 UN Law of the Sea Treaty (United Nations Convention on the Law of the Sea of 10 December 1982, 21 ILM 1982, p. 1261, entry into force 16 November 1984; Federal Gazette 1994 II, p. 1798), the most prominent special regional cooperations are the OSPAR Commission on the North East Atlantic (Convention on the Protection of the Marine Environment in the North East Atlantic of 22 September 1992, 32 ILM 1993, p. 1069; Federal Gazette 1994 II, p. 1360; international entry into force 25 March 1998; Para. 13) and the Helsinki Commission (Baltic Marine Environment Protection Convention of 9 April 1992, Federal Gazette 1994 II, p. 1397, international entry into force 17 January 2000; Para. 15). With its broad powers of authority, the European Union – now a member of both OSPAR and the Helsinki Commission – carries key responsibility for the protection of the North and Baltic seas. Finally, the various nation states have significant scope for activity: not just in terms of their choice of instruments, but also as regards reinforcing protection targets. Table 1-1 provides an overview of the key institutions and regimes in marine environmental protection at international, European and national level.

Global Marine Environment Protection

10. The Law of the Sea Treaty lies at the core of international marine environment protection at global level. It governs the responsibilities and authorities of nation states at sea, and its Section 12 lays down general obligations for marine environment protection. These obligations are an expression of customary international law and in some instances largely shaped the contents of regional marine environment protection agreements prior to the Law of the Sea Treaty entering into force (BIRNIE and BOYLE, 2002, p. 351 et seq.; BEYERLIN, Para. 224). On the one hand, states are under a general obligation to protect and preserve the marine environment (Article 192). On the other, they have a sovereign right to exploit their natural resources in line with certain environmental protection requirements (Article 193). Additionally, Part XII of the Law of the Sea Treaty lays down, among others, obligations to prevent, reduce and control pollution of the marine environment (Article 194), for global and regional cooperation in drawing up marine environment protection law (Articles 197 to 201) and for ongoing monitoring and environmental assessment of the marine environment (Articles 204 to 206).

Under international law, shipping is afforded special status as a traditional use of the sea. But shipping has also long been recognised as a key source of environmental pollution. International policy on pollution from shipping is thus extremely comprehensive and detailed (Section 3.4.2, Para. 359 et seq.). Apart from the legislative and enforcement powers for coastal states that are set out in Articles 211 and 220, the Treaty also places states under obligation to ensure that ships flying their flag comply with international rules on pollution prevention, reduction and control (Article 217). It also grants harbour states powers of enforcement to prevent illegal discharges from ships at sea. From a marine environment perspective, one particularly interesting aspect is the option for coastal states under Article 211 (6) a) and c) to apply to the International Maritime Organization (IMO) – the Treaty's key organisation – for authority to adopt special area-specific protection measures to prevent pollution from shipping or for the designation of Particularly Sensitive Sea Areas.

11. The 1973/1978 International Convention for the Protection from Pollution from Ships (Convention of 2 November 1973, 12 ILM 1973, p. 1319, in the version of the London Protocol of 17 February 1978, 17 ILM 1978, p. 246 – MARPOL) also comes under the aegis of the IMO. MARPOL regulates the discharge of harmful substances into the oceans for all sea-going vessels, including floating platforms. Through its institutional anchoring in the IMO, MARPOL remains a key forum and driver in shipping-related marine environmental protection.

12. The 1996 Protocol to the Convention on the Prevention of Marine Pollution by the Dumping of Waste and other Matter of 29 December 1972 (London Convention – Text in UNTS 932, p. 3) remains available for signature by prospective party states. While the London Convention of 1972 provides for discharge bans for specific wastes (known as the black list), the new convention contains a general dumping ban with exceptions for specific waste categories (these include dredged materials, sewage sludge, fisheries waste, ships and marine constructions). The Convention also contains a general, worldwide ban on the burning of waste at sea – a practice that was stopped in Germany back in 1989.

Regional Agreements and Cooperation on Protecting the North and Baltic Seas

13. The 1992 Convention for the Protection of the Marine Environment of the North East Atlantic (known as the OSPAR Convention) entered into force on 25 March 1998 and replaced both the 1972 Oslo Convention for the North East Atlantic and the 1974 Paris Convention on Pollution of the North Sea and Adjacent Areas from Land-Based Sources. The OSPAR Convention aims to protect the marine environment in the North East Atlantic from the risks posed by all types and sources of anthropogenic pollution (LAGONI, 1996). It requires application of the precautionary and polluter-pays principles, not least by placing (potential) polluters under obligation to use the best available emissions reduction technology. Party states are required to introduce a licensing process for pollution sources and, as part of that process, to implement the binding decisions of the OSPAR Commission.

Synoptic Overview of the Key Institutions (bold) and Legal Regimes in Marine Environment Protection

Area of Activity Level of Activity	Marine Environment Protection in General	Fisheries	Substance Inputs	Shipping	Marine Nature Protection
International Global	– United Nations Convention on the Law of the Sea (UNCLOS) (Para. 10)	– United Nations Convention on the Law of the Sea (UNCLOS) (Para. 240) – Straddling Stocks Agreement 4 August 1995 (Para. 242). – **Food and Agriculture Organization – FAO** (Para. 243)	– United Nations Convention on the Law of the Sea (UNCLOS) – Stockholm Convention on Persistent Organic Pollutants (Para. 308) – UN-ECE Protocol on Nitrogen Oxides	– United Nations Convention on the Law of the Sea (UNCLOS) (Para. 360) – **IMO** (Para. 11, 360) – MARPOL (Para. 11, 360)	– United Nations Convention on the Law of the Sea (UNCLOS) (Para. 403) – Ramsar Convention (Para. 406) – Biodiversity Convention (Rio) (Para. 494) – Bonn Convention on Conservation of Migratory Species of Wild Animals (Para. 406)
International Regional	North Sea: – OSPAR Convention – **OSPAR Commission** (Para. 13) – **NSC** (Para. 18) – Trilateral Wadden Sea Conference (Para. 20) Baltic Sea: – Helsinki-Convention – **HELCOM** (Para. 15) – Baltic Agenda 21	North Sea: – North East Atlantic Fisheries Commission – NEAFC Baltic Sea: – International Baltic Sea Fisheries Commission – IBSFC	North Sea: – **NSC Targets** (Para. 2291, 342) – **OSPAR Commission Decisions** (Para. 292, 326) Baltic Sea: – **HELCOM** Recommendations (Para. 293, 327)		– **OSPAR Commission** Protected Areas Programme (Para. 408) – **HELCOM Recommendations on** Baltic Sea Protected Areas (Para. 407) – Small-Type Whaling Convention (Para. 406) – African-Eurasian Waterbird Agreement (Para. 406) – Agreement on the Conservation of Seals in the Wadden Sea (Para. 406)
EU	– EU Concept for a Common Marine Environment Protection Strategy (Para. 22)	– Common Fisheries Policy (CFP, Para. 246 et seq.) – CFP-Basic Regulation (Para. 246 et seq.)	– EU Chemicals Policy/ Law (Para. 299 et seq.) – Framework Water Directive (Para. 296) – Nitrates Directive (Para. 336) – Urban Wastewater Treatment Directive (Para. 342)	– European Maritime Safety Agency – Safe Harbour Directive (Para. 364) – Regulation on Phased Ban on Single-Hull Tankers (Para. 371)	– Habitats Directive (Para. 409 et seq.) – Birds Directive (Para. 409 et seq.)
National			Chemicals, Water and Fertiliser Law (Para. 340 et seq., 345 et seq.)		– Implementation of Habitats and Birds Directives (Para. 414 et seq.) – National Protected Areas (Para. 411)

SRU/SR 2004/Table 1-1

14. In implementing and further developing the OSPAR Convention, the OSPAR Commission for the Protection of the North East Atlantic (hereafter OSPAR) was established as the successor to the Oslo and Paris commissions. With its Secretariat in London, the Commission comprises a management board, two committees and nine working groups. It has far-reaching powers compared with other international bodies: It can, for example, make decisions for implementation under the Convention. Those decisions are binding for all contracting parties who do not raise an official objection within a specific period. The Commission also monitors implementation of the Convention. It does not, however, have effective sanctions in response to non-implementation. The OSPAR Commission has since developed, agreed and drawn up its Action Plan 1998 to 2003, with five key strategies covering biodiversity, eutrophication, hazardous substances, radioactive substances and the offshore oil and gas industry.

15. The Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention) was agreed in 1992 and established as a counterpart to the OSPAR Convention. Under the Convention, Baltic Sea states came together for the first time in 1994 in a joint effort to protect the Baltic Sea. Like the OSPAR Convention, the Helsinki Convention covers all pollution activities. It applies both the precautionary and polluter-pays principles, and also the principle that discharges that contribute to polluting the Baltic Sea must be restricted through the use of the best available emissions reduction technology. Its annexes contain measures to reduce the most significant pollution inputs (Annex III on Prevention of Pollution from Land-Based Sources, Annex IV on Prevention of Pollution from Ships, Annex VI on Prevention of Pollution from Offshore Activities, Annex VII on Response to Pollution Incidents). Since 1992, the Convention has also included species and habitat protection as an independent area of responsibility in its Action Programme.

16. As the permanent representative of the Helsinki Convention, the Helsinki Commission (hereafter HELCOM), with its secretariat in Helsinki, has a similar function to that of the OSPAR Commission although with less far-reaching powers. The Commission's decisions, which require unanimous vote, have no international law character. They do, however, constitute political statements of intent which at the same time may pose a strong collective call for action and could well shape the standards for the best available technologies and practices. Special mention is made of its recommendations on protection from encroachments on the marine environment through offshore activities (Recommendations 9/5 and 18/2) and from marine mining (19/1), hazardous substances (19/5 and especially 9/10 and 20/4 on antifouling paints), from substances used in agriculture (19/6) and from airborne pollutants (16/11), and the protection of marine ecosystems through a system of marine protection areas (15/5, 21/3, 21/4). Current recommendations especially involve the reduction of marine environment-related pollution from specific industries (23/6 to 23/12).

17. The first Joint Ministerial Meeting of the OSPAR and Helsinki Commissions on the Protection and Conservation of the Baltic Sea and the North East Atlantic was held in June 2003. The meeting paved the way for promising new perspectives on cooperation, greater coherence and the 'unification' of the two conventions.

18. The *International Conference on the Protection of the North Sea* (NSC) has met on a non-regular basis since 1984 and involves the responsible ministers of the North Sea states, with EU representatives acting as permanent observers. The NSC is not an internationally recognised body and has no individual responsibilities or legislative powers. But as the most powerful political forum for North Sea protection, the NSC is a key driver of objectives, action programmes and related decisions of the OSPAR Commission. The NSC's main goals are:

– A 50% reduction in inputs of nutrients and all toxic substances and substances with bioaccumulating properties between 1985 and 1995.

– A 70% reduction in inputs of dioxins, mercury, cadmium and lead.

– A ban on the use of polychlorinated biphenyls (PCBs) and harmful substitutes by 1999.

– What is known as the 'generation target' to reduce the input of harmful substances (Para. 291 et seq.).

The NSC's current goals, strategies and action requirements are contained in the *Bergen Declaration* which was ratified by the ministers at the last NSC in March 2002.

19. The Baltic Sea area has no counterpart to the International Conference on the Protection of the North Sea. Given that the Baltic Sea is covered by the Helsinki Convention, no specific need or occasion is seen to further regionalise international cooperation as has happened with the specific problems in the North Sea which are covered by the OSPAR Convention on the North East Atlantic. Thus, *BALTIC Agenda 21* embodies a parallel cooperation for marine environment protection in the entire Baltic Sea region. Agreed by the Prime Ministers of the Baltic Sea states in May 1996 in Visby (Sweden), the Agenda has as its goal sustainable development of the Baltic Sea region and thus integration of environment protection needs into other policy areas through participation of all significant social actors. Appropriate sectoral goals and programmes are set out in the recent Baltic 21 Report 2000 to 2002 (Baltic 21, 2003).

20. In their regular *Trilateral Governmental Conferences on the Protection of the Wadden Sea,* which take place at ministerial level, Denmark, Germany and the Netherlands take up the environmental problems in the Wadden Sea in a cross-sectoral and comprehensive way – including in the form of status reports – and, in compliance with OSPAR and NSC decisions, decide policy measures to improve the situation in the Wadden Sea. As with the International Conference on the Protection of the North Sea, the trilateral governmental conference has no

independent mandate under international law. While the ministers cannot make binding decisions, the conferences bring about significant improvements in marine environment protection in the Wadden Sea. Great importance is placed on what is largely institutionalised cooperation between policymakers and scientists in the Wadden Sea states. This involves such things as agreeing joint principles and protection targets (quality targets).

21. The various international commissions for the protection of the rivers that flow into North and Baltic seas all play a role in regional cooperation that is so vital to marine environment protection. These have achieved considerable success in improving river ecosystems and have thus contributed to reducing the pressures on the North and Baltic seas.

European Union

22. The European Union is the most powerful and most important actor in protecting the North and Baltic seas. With its Member States, the EU comprises the large majority of nations responsible for pollution in the seas and has far-reaching regulatory powers in both water protection policy and key polluting sectors – particularly fisheries, agriculture (the main cause of eutrophication), and chemicals policy important to pollution control. With its regulatory powers in these policy areas, the EU essentially holds the key to protecting the North and Baltic seas. Nevertheless, the EU has given little attention to protecting its 'domestic seas' as a central aspect of management and as an independent policy area, either in legislation or in its decisionmaking committees and institutions. Only through the EU's participation in the OSPAR and Helsinki Commissions does marine environment protection appear as an independent policy area at Community level – more or less from the outside in. Thus, rather than acting on the basis and as a promoter of an integrated protection model, the EU acts as administrator of the various interests affected by marine protection.

It is recognised that with its incremental treatment of marine environment protection, the European Union does not take account of the causal relationships and their particular role. The EU Sixth Environmental Action Programme thus gave the EU Commission the task of developing a targeted strategy for the protection and conservation of the marine environment (Decision 1600/2002 of 22 July 2002, EU Official Journal L 242 of 10 September 2002, p. 1). Presented by the Commission in October 2002, the proposed Strategy Towards Protecting and Conserving the Marine Environment (EU Commission, 2002a) can be seen as an advancement because, for the first time, marine environment protection is treated as an independent policy area and as an integral component of Community environment protection requirements. However, key problem areas – like nutrient inputs from agriculture – have received inadequate attention. Additionally, the scope of the policy area and its intended anchoring in sectoral policy are nowhere near being adequately mirrored in the Commission's organisation and distribution of its human resources (SRU, 2003b).

National Level

23. The individual states are required to implement binding decisions and recommendations made by OSPAR and HELCOM. In many cases, this involves regulatory areas largely shaped by EU law and policy requirements binding for Member States – especially agricultural policy, fisheries policy and chemicals policy. While the international regimes of OSPAR and HELCOM regularly present minimum protection requirements and thus leave the Member States free to choose what action they take, the respective rules of the EU are usually based on Articles 94 and 95 EC as requirements for complete harmonisation and implementation of the Single Market, which means that the Member States are only entitled to adopt more far-reaching protection measures under the strict provisions of Article 95 (4) and (5) EC. Nevertheless, the Member States have at their disposal a range of options with which to achieve marine environment protection, especially in terms of funding. It is thus all the more disillusioning that Germany has no strategic model for marine environment protection, either at federal or *Länder* (state) level.

1.4 Key Scientific Institutions and Basic Data

ICES Status Reports

24. The International Council for the Exploration of the Sea (ICES) is the largest and most recognised research institute for marine research and marine environment research in the North Atlantic region, including the North and Baltic seas. The ICES coordinates and promotes marine research involving over 1,600 marine scientists from 19 countries. It regularly produces environmental status reports through a range of working groups, symposia and conferences. In many instances, these comprehensive reports, and particularly the recent Special Report on the Environmental Status of the European Seas 2003, serve as the basis for the statements contained in this report. The ICES combines its scientific assessments with recommendations on conservation policy targets and activities. Special importance is placed on recommendations for the conservation of fish stocks and the associated need to restrict fishing activities (Para. 36 et seq.).

OSPAR Quality Status Report

25. The Status Reports published by the OSPAR Commission provide additional sources of key data for marine environment protection. The Commission is not only a key policymaking authority in the North Sea region, it also performs collation and evaluation of status data provided by OSPAR member states. Produced in cooperation with ICES and the NSC Secretariat, its Quality Status

Report (QRS) represents the broadest available source of data on the status of the North East Atlantic and, to a greater extent than the ICES reports, assesses the need for action and prioritisation.

NSC Progress Reports

26. Alongside OSPAR, the North Sea Conference (NSC), in line with its political goals and decisions for action, performs comprehensive monitoring of developments in the marine environment of the North Sea. The results are published in its Progress Reports which contain not only key information on action already agreed, implemented or planned, but also data on trends in the state of the environment. Given the special focus of the Progress Reports, they thus contain detailed information on pollution sources and paths.

HELCOM Reports on the Status of the Baltic Sea

27. The Helsinki Convention requires its contracting parties to report to the Helsinki Commission (HELCOM) on any action taken, its impact and any problems experienced in its implementation. This involves the provision of emissions and environmental quality data in particular. Based on these national reports, HELCOM's monitoring activities take the form of a comprehensive survey of available environmental data on the status of the Baltic Sea. The findings of the survey are summarised and evaluated in regular status reports. Without doubt, the HELCOM reports (particularly HELCOM, 2001a, 2003a) provide the broadest-based and most comprehensive assessment on pollution in the Baltic Sea. The reports thus serve as the main source of data for the assessment on the status of the Baltic Sea contained in Section 2.2 of this report.

2 Protected Resources, Pollution Status and Pollution Pathways

2.1 The North Sea

2.1.1 Habitat and Economic Area

28. The North Sea is an aquatic ecosystem whose specific geological, physical and chemical traits are subject to constant change. It houses a range of marine organisms. The North Sea also faces huge pressures of use due to its importance as a habitat and economic area for millions of people. The German Advisory Council on the Environment described the North Sea in detail some twenty years ago in its Special Report on the Environmental Problems of the North Sea (SRU, 1980). The sea's basic situation has not changed since then. What have changed, however, are the claims to use on this marginal sea. A general outline of the key characteristics of the natural and economic regions comprising the North Sea is thus given for purposes of general orientation.

Geography and Oceanography

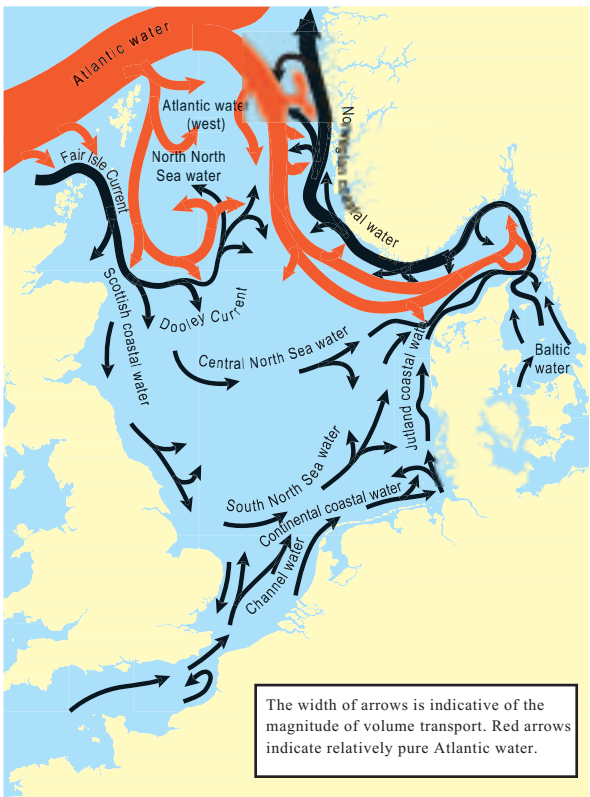
29. The North Sea is a flat marginal sea on the continental shelf in the North East Atlantic. It has an average depth of 70 metres and becomes deeper from South to North. Exceptions are Dogger Bank in the central North Sea, with a depth of between 20 and 30 metres, and the Norwegian Trench along the southwest coast of Norway, where the sea bed reaches depths of 710 metres. The North Sea has a water volume of 43,000 km^3 (Becker, 1990) and covers an area of some 570,000 km^2, making a 0.002% share of the world's oceans (LOZÁN et al., 2003; Crisp, 1975). The small size of this sea shelf detracts from its actual importance. The North Sea is one of the most productive ocean areas – something that is highlighted, for example, by the North Sea fisheries' 4% share of global ocean fisheries. Additionally, flat ocean areas and coasts provide important breeding grounds for fish and provide food for numerous marine and terrestrial organisms.

30. The North Sea is closely linked with the Atlantic through manifold interactions. The main exchange of water masses takes place where the seas connect in the north and also in the Channel. Thus, the oceans cause the tides in the North Sea and its high salinity, which can reach up to 35 psu in the North (psu = practical salinity unit; equivalent to 35 g salt/1 kg seawater).

Distribution and mixing of water masses is largely subject to meteorological conditions, run-off from rivers and the Baltic Sea, and tidal currents (BECKER, 1990). Westerly winds prevail over the North Sea. While evaporation and precipitation are balanced, coastal areas in particular are affected by strong run-off of fresh water from rivers. Tidal flows determine both the horizontal and vertical mix and the exchange of water masses. These are driven by 'co-oscillating tides' (tidal currents) which are not produced in the North Sea itself, but by the tides in the North Atlantic in a 12 hours and 25 minutes cycle. The tidal wave flows into the North Sea between the Shetland Islands and then flows anti-clockwise along the North Sea coast. Water circulation and thus exchange with the North Atlantic is driven by wind-induced currents as well as by tides. Further inflow into the North Sea occurs via the Channel. Run-off into the Atlantic occurs parallel to the western coast of Norway (Figure 2-1).

Figure 2-1

Main circulatory systems in the North Sea



Source: OSPAR, 2000a

The retention time of water in the North Sea, calculated by the inflows and outflows, is about seven months. The exchange time, as a measure of water renewal, in differing areas of the North Sea can vary between one month and 21 years. The prevailing tidal conditions cause polluted coastal waters to have especially high retention times and be transferred along the coastline (LOZÁN et al., 1990). This aspect is of key importance because, lying

between land and sea, coastal habitats are subject to a range of influences and are particularly sensitive to anthropogenic pressures.

Habitats

31. A variety of geological, hydrographical and ecological processes shape a range of habitats in the North Sea (SRU, 1980: Paras. 64 to 131). Their differentiation is particularly visible in coastal regions:

– The coasts are largely characterised by soft-bottom habitats. Because the sediment is easily transferred by water movement, only few living organisms and an abundance of infauna are found there (see below).

– The occurrence of coastal cliffs is limited to Norway and to some areas of Great Britain. In Germany, such hard substrate occurs solely around the island of Heligoland. The littoral zone is characterised by a wealth of sessile species or others that attach to the hard substrate.

– Sand dunes occur in Jutland, on the Frisian islands, in Belgium, England and south of Den Helder.

– Estuaries and fjords (see below) take up relatively little space. Estuaries are the wider, funnel-like downstreams of rivers that flow into the sea, such as those found in Germany's Elbe and Weser rivers. Estuaries are typified as the point where fresh water meets the sea. Their different salinity zones move upstream and downstream with the tides. Constant fluctuation in salinity allows formation of highly typical communities relative to the salt content in the water. These communities are species poor when compared with purely limnic or marine habitats.

– Fjords are V-shaped valleys formed during the ice age and flooded with seawater. They are characterised by their steep valley walls, a precipitous drop to the sea and in places extreme depth. The input of nutrient-rich freshwater means that fjords are often highly productive and, at the same time, also extremely sensitive to anthropogenic input of pollutants and nutrients due to limited exchange of water mass. In the North Sea region, fjords only occur along the Norwegian coast. The bays along Denmark's coast which are usually described as fjords are lagoon-like areas that are separated by spits. Being separated from the sea, these shallow lagoons have specific ecological characteristics and serve, among others, as important production sites for fish and mussels.

As a whole, the North Sea, and particularly the German coast, is dominated by marshland habitats of which the Wadden Sea in the German Bight and on the west coast of Denmark make up the largest unbroken expanse (SRU, 1980, Para. 102). The uniqueness and spatial distribution of this habitat warrant a more detailed presentation.

32. Stretching along the coasts of the Netherlands, Germany and Denmark, the Wadden Sea is a unique and sensitive habitat (LOZÁN et al., 1994; SRU, 1980, Paras. 103 to 121). It is influenced by water mass exchanges in the North Sea, by river estuaries and by the mainland. The Wadden Sea comprises sand dunes, salt marshes and typical mudflats and tidal channels. It houses some 4,800 marine and semi-terrestrial species, which make up around 5% of all animal and plant species in Central Europe (UBA, 2002).

The Wadden Sea ecosystem is characterised by a considerable and significant dynamic flux driven by the tides and thus subject to strong currents and to fluctuations in salinity and temperature – conditions that together provide an extreme habitat for the species native to the area. Aperiodic ice sheets can form in extreme winters and can cause considerable changes in stock levels. The result is a comparably low level of biodiversity. At the same time, the Wadden Sea is a highly productive marine environment. Its high levels of biomass productivity make it an indispensable source of food for fish and birds. It serves as a 'nursery' for plaice, sprats, herrings and other fish species. Each year, more than 10 million birds use the Wadden Sea as a resting, moulting and/or wintering ground. This is why the Wadden Sea is often described as the 'East Atlantic Flyway' (EXO et al., 2003). The Wadden Sea is thus part of an ecological structure and of functional relationships that stretch all the way from South Africa to the Arctic (UBA, 2000).

The entire Wadden Sea region is also important to some 400,000 breeding pairs among 31 coastal bird species. The German Wadden Sea alone is of international importance to 32 out of 39 aquatic and mudflat bird species of international importance, which means that in terms of the Ramsar Convention (the Convention on Wetlands of International Importance which entered into force in 1975) the area houses more than 1% of the flyway population. The dry sandbanks in the Wadden Sea provide an important habitat for harbour seals (*Phoca vitulina*), especially during birthing, rearing and the moulting phase. Not least does the Wadden Sea act as a filter for the North Sea in its entirety: suspended sediment is collected in the watershed zone (SRU, 180, Para. 105) and the water is filtered by colonies of blue mussels.

Many of the habitats along the North Sea coast are protected as Habitats of Community Interest under Annex V to the Habitats Directive (Fauna-Flora-Habitat Directive: the directive issued by the European Commission in 1992 aims to conserve biodiversity in Europe). The main habitats are Posidonia eelgrass beds, estuaries, non-vegetated shingle or stony beaches, sandflats, mixed sediment shores and sandbanks.

33. In non-coastal areas of the North Sea, the sea bed type and structure and the sediment are indicative of the diverse types of habitats that exist there. Sandbanks are formed from the sandy areas in German waters off the Frisian Islands (RACHOR and GÜNTHER, 2001). The Elbe glacial valley extends northwest from the Elbe estuary. With a depth of between 30 and 60 metres, the estuary area comprises extremely fine, muddy sediment while in other areas the substrate comprises clay, silt and fine sand. Around the island of Heligoland, the substrates are made up of comparably larger-grain

material comprising sand, fine gravel, stones and rocks. There are also the sandbanks, reefs and gulley structures typical of the area. The northwest section of the German Bight is characterised by a soft morphology with fine sediments. The various substrates often house flora and fauna unique to their type which have often undergone great adaptation to prevailing conditions.

Two particularly notable habitats in the open areas of the North Sea are sandbanks and reefs. The first are sandy ridges that remain slightly submerged (BfN, 2003a). These flat-like sands are either sparsely vegetated or non-vegetated. They provide a habitat for a highly typical sandbed communities and serve as a food source and resting place for birds, seals and fish. Reefs comprise minerals (cliffs, drift boulders, stones) or biogenic hard substrates (coral reefs) that rise up from the sea bed and are constantly flooded by water. They also provide a habitat for a variety of sessile organisms, among which a highly diverse community of non-sessile species usually forms. Apart from off the coast of Heligoland, reefs are found in larger flat-like expansions near the Borkum reef and on the eastern side of the Elbe glacial valley.

The North Sea as an Economic Area

34. The catchment area of the North Sea (841,500 km^2) is the most populated of the five OSPAR regions. It houses some 184 million people from 12 nations (LOZÁN, 2003). The seven riparian states (Belgium, Denmark, France, Germany, Norway, the Netherlands and Great Britain) are characterised by high populations and high industrialisation.

The coastal zones are of particular importance as this is where direct interaction occurs between human activity and the North Sea. An unequal distribution of the population is particularly evident along the North Sea coast. On the one hand, there are some extremely sparsely populated rural areas such as those on the west coast of Denmark, while on the other, there are the large conurbations like Amsterdam, Leiden, Den Haag, Rotterdam, and the large belts around the cities of London and Hamburg. Apart from the Dutch cities already mentioned, most conurbations lie around river estuaries or fjords and are traditional harbour towns.

As with the use of the North Sea as a transportation route, there has been an increase in other claims to use of the sea (STERR, 2003). The following uses have a direct impact on marine resources:

- Extraction of North Sea oil and natural gas.
- Sand and shingle extraction for construction and coastal protection.
- Coastal and offshore fisheries.
- Mariculture (production of fish, mussels, algae, etc.).

The economic benefit to these sectors is relatively easy to estimate. Other economic sectors involve North Sea potential, like wind and space, whose value is difficult to monetarise. These include:

- Wind energy generation.
- Coastal land reclamation and use.
- Tourism (accommodation, relaxation, sports facilities on land and at sea).
- Shipping (shipping routes, cable and pipeline channels on the sea bed).
- Waste disposal, residues, wastewaters and dredged materials.

A consequence of the last type of use is the exploitation of natural habitats. Numerous conflicts exist both between and within the differing claims to use. Multilayered conflicts of interest of this kind are well illustrated by the contest between the tourism sector and nature protection needs. Tourism has become the most important economic and employment sector in the coastal region of the North Sea (LOZÁN et al., 2003) – the reason being the increasing attractiveness of the coastal areas for people seeking relaxation, and growing leisure time and mobility. On the one hand, there is the special attraction of the coasts in what is (apparently) a natural area largely untouched by human activity, a quality that can only be achieved by nature protection activities and thus by restricting people's access to those areas. On the other, growing tourism demands improved infrastructures which in turn are only achieved by encroachments on coastal habitats that lessen near-nature conditions.

2.1.2 Pressures from Intensive Fisheries

35. The North Sea provides habitats for around 230 fish species and is one of the most productive fishing areas in the world. The annual catch of approximately 2.5 million Mg makes up almost 4% of the global fish catch. Only about 5% of the species are actually fished commercially. These species make up the major proportion of all fish biomass. Some 95% of biomass involves only 2% of fish species, while these dominant species make up the largest share of fisheries (OSPAR, 2000a).

In the North Sea, some 13 fish species are fished in huge quantities for commercial gain. Of those 13 species, the sandeel (*Ammodytes lancea*), the herring (*Clupea harengus*) and the Norway pout (*Trisopterus esmarki*) are the three most important species relative to catch volume. Only the herring is caught for actual human consumption, while the others are used solely for the production of fish meal and fish oil.

2.1.2.1 Overexploitation of Fish Stocks

36. Since 1960, the North Sea, like most ocean areas in the European Union, has faced increasing pressures from the rapidly growing European fishing fleet. Public debate has since made it general knowledge that many commercially fished stocks are extremely overexploited and have suffered huge reductions in their numbers. According to OSPAR, two-thirds of fish stocks in the North East Atlantic are not being managed sustainably (OSPAR, 2000a).

And this although the conservation of stable stock levels is both an ecological conservation goal and vital to the continued existence of the European fisheries industry.

Having recognised the problem of overfishing several decades ago, Europe laid down Total Allowable Catches (TACs) to conserve fish stocks (Para. 254). TACs are based on scientific recommendations made by the ICES. To manage stocks in this way, safe biological thresholds were determined back in the 1980s. This involved setting 'safe biological limits', which at the time were based on a minimum biologically acceptable level (MBAL) of adult biomass. As long as the adult biomass remained above the MBAL, the stock was deemed within safe biological limits. Experience with trends in the development of demersal fish stocks has shown, however, that the MBAL threshold does not allow sustainable management because its supporting measures could only be implemented once stocks had fallen below the threshold, meaning they were no longer within safe biological limits. The precautionary principle had since been integrated into ICES recommendations on the management of fish stocks and the MBAL has been replaced by four new thresholds (see box) (HUBOLD, 2000).

ICES Reference Points for the Precautionary Approach

B_{lim} (limit biomass reference point) is the threshold for spawning stock biomass (biomass of reproductive individuals in a specific stock). Where spawning stock biomass exceeds the threshold, adequate reproduction is secured. As long as spawning stock biomass does not fall short of the threshold (limit biomass reference point), it can be expected that a stock can be sustained at a high level because it is able to adequately reproduce. If B_{lim} is not attained, a stock collapse is assumed. This leads in the first instance to commercial losses because high exploitation of the stock is no longer possible over time.

F_{lim} is the threshold for fishing mortality. If F_{lim} is exceeded, the stock sinks below B_{lim}. (F is the relative number of removals from a stock and is usually based on a period of one year).

To prevent the two values being exceeded or unattained due either to uncertainty regarding the data available or to unpredictable environmental fluctuations, a buffer has been added in the form of two additional thresholds B_{pa} and F_{pa}.

B_{pa} (precautionary reference point) is a threshold for spawning stock biomass which, if not exceeded, gives rise to the probability that B_{lim} can be reached.

F_{pa} is a threshold for fishing mortality which, if exceeded, gives rise to the probability that B_{lim} can be reached.

Only if spawning stock biomass remains above B_{pa} is the stock within safe biological limits. This also means that if F_{pa} is exceeded, the stock is being managed beyond safe biological limits. In this respect, the safe biological limit should not be seen as a limit at which the existence of the species is endangered (see Para. 38), but one at which sustainable stock management is no longer secured at the highest possible level. It involves a threshold which is based on fisheries and biological data and which serves the achievement of an economic target – in this case a high yield that can be sustained over time.

If B_{pa} is not attained or if F_{pa} is exceeded, the ICES requires implementation of a management plan to increase spawning stock biomass and to reduce fishing mortality.

37. As shown in Table 2-1, assessments conducted by the International Council for the Exploration of the Sea (ICES, 2002a) indicate that stock levels for five of the ten most important commercial fish species lie beyond 'safe biological limits'.

The situation regarding cod (*Gadus morhua*) is especially critical: Since 1989, spawning stock biomass has been below the 'safe biological limits' set out under the precautionary principle and is now below the limit biomass reference point (B_{lim}) at which it can no longer be guaranteed that stocks can fully recover (Figure 2-2). In response to these dramatic stock losses, the ICES has recommended complete closure of cod fisheries, including fishing of other species that involves large quantities of cod as by-catch (ICES, 2002a).

Other species like whiting (*Merlangius merlangus*), sole (*Solea solea*) and plaice (*Pleuronectes platessa*) have been so overfished that their estimated spawning stock biomass is already below the identified precautionary reference points (ICES, 2001, 2002a). As regards plaice, there was a steady rise in fishing mortality – with parallel biomass reduction – up to 1990. This peaked at a point where the stock dropped below B_{lim} (Figure 2-3). There has been a slight recovery in stocks in recent years, although B_{pa} has yet to be achieved.

38. In the case of the above-named commercially fished species, it can be expected that ongoing pressures from fishing will result in continued reduction in stocks and that commercial exploitation of these natural resources will no longer be lucrative. But these species are not seen as at risk from overfishing of stocks below the precautionary reference points because, given the high reproduction rates, there are still sufficient individuals available to secure genetic diversity and biological survival of the species (meeting with the Federal Research Centre for Fisheries (BFA) held 24 February 2003). It is also expected that access to the North Atlantic will secure stock replenishment due to the migratory behaviour and the drifting of pelagic fish spawn. Uncertainty remains, however, as to how quickly stocks would recover if fishing were to be stopped. Experience with fish stocks off the coast of Labrador and Newfoundland shows that reversibility of population decimation can be very limited. In these regions, Atlantic cod stocks collapsed completely in the early 1990s and have not recovered despite a near total closure of the fisheries (HUTCHINGS and MYERS, 1994; RICE, 2002). A direct comparison with North Sea

Table 2-1

Landings (2001), estimated spawning stock biomass (2001) and ICES assessment of stock endangerment for the main North Sea commercial fish species

Fish species	Landings (1 000 Mg)	Spawning stock biomass (1 000 Mg)	Stock outside safe biological limits
Sandeel	858	619	
Herring	372	1 400	
Mackerel	312	–	(X)
Sprat	170	–	
Haddock	167	211	
Saithe	98	247	
Plaice	82	230	X
Cod	50	30	XX
Whiting	46	209	XX
Sole	20	32	X

X = Stock below precautionary reference point (B_{pa})

XX = Stock below limit reference point (B_{lim})

(X) According to ICES, mackerel stocks are above B_{pa} but are not being managed sustainably.

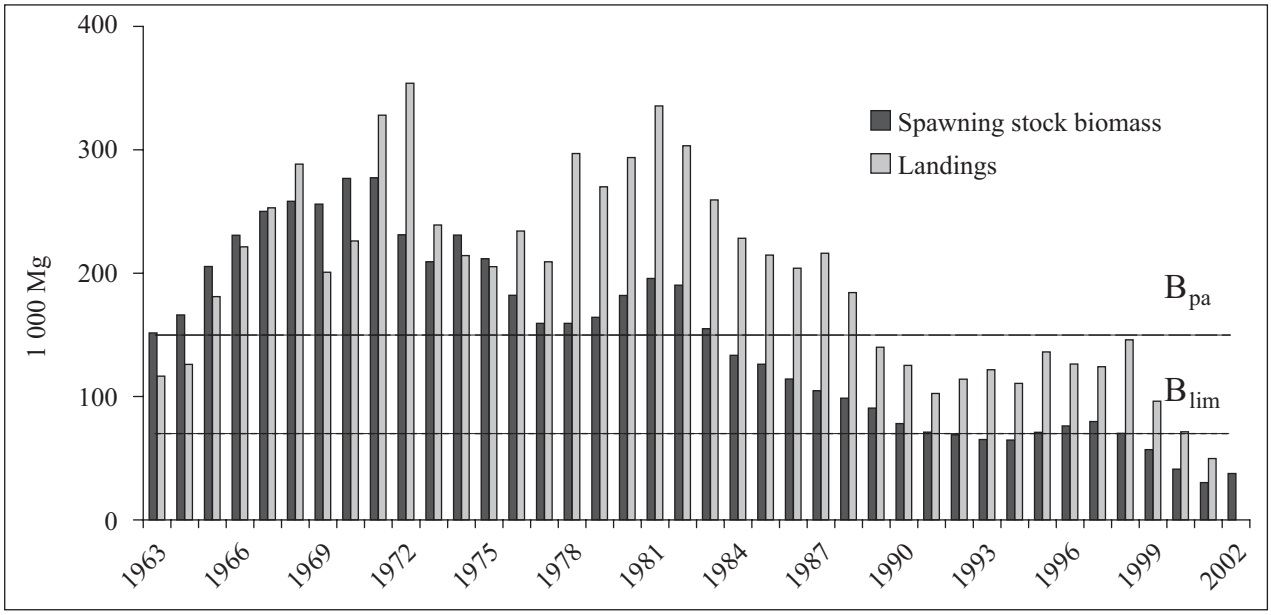
SRU/SR 2004/Tab. 2-1; data source: ICES, 2002a

cod proves difficult, however, because stocks off the coast of Newfoundland and Labrador demonstrate a significantly lower growth rate and thus later maturity due to considerably lower water temperatures (meeting with the Federal Research Centre for Fisheries held 24 February 2003). Experience with the demise of the North Sea herring in the late 1970s, whose stocks recovered following a four-year closure of the fisheries involved, can likewise only be partially transferred to cod because it is an entirely different species with different feeding and reproductive needs. Additionally, there are no available studies on the extent to which the reduction in commercial fish species in the North Sea ecosystem has already led to a redistribution between competing or co-dependent fish species that would more or less prevent a recovery in stocks. The ICES does not expect North Sea cod to recover over a short space of time, even if all measures to protect the stocks were to be implemented immediately (ICES, 2003a).

39. Even more threatening than the situation involving the commercial fish species mentioned above is that concerning anadromous (migrating from the sea to freshwater to spawn) and catadromous (migrating from freshwater to the sea to spawn) fish species like salmon (*Salmo salar*), sturgeon (*Acipenser sturio*) and eels (*Anguilla anguilla*), and K-strategy species (those with good survival capacity, often high adaptability, high longevity, but low reproductivity) found among marine fish (particularly sharks and large ray species) whose existence in the North Sea region is already seriously threatened in some cases. Sturgeon and salmon disappeared from the North Sea almost completely many years ago, spurdog are considered acutely at risk and the situation has continued to worsen as regards the European eel (WALKER, 2003; ICES, 2002a). In some areas, eel fishing has been stopped and the species has been placed on the Red List of endangered species. One cause is the extremely high pressures from fishing, with larvae being caught upon arrival in European waters from the Sargasso sea (LOZÁN et al., 1996a). Another cause is that construction activities in watercourses have had severe impacts on migratory routes and habitats. A further factor is the level of pollution, which is a particular problem for the eel on its long journey to its spawning ground, during which it takes in no food at all. Additionally, there is a high incidence of parasites in fish about to spawn and which can also have a negative impact on reproduction. Since 1998 the ICES has highlighted the fact that the entire European stock is outside safe biological limits and that immediate measures must be taken to protect the European eel to save it from extinction. This calls for an international management programme in

Figure 2-2

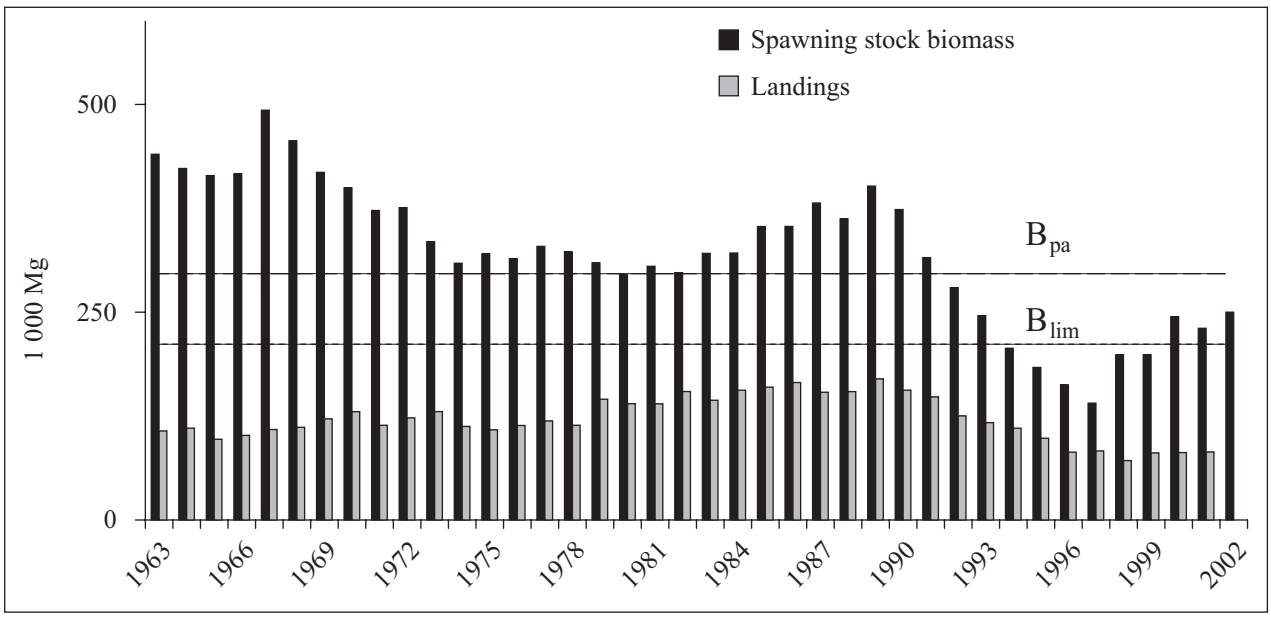
Cod fisheries and cod biomass in the North Sea, the Eastern Channel and the Skagerrak (1963–2002)



SRU/SR 2004/Fig. 2-2; data source: ICES, 2002a

Figure 2-3

Plaice fisheries and plaice biomass in the North Sea (1963–2002)



B_{pa} = Precautionary reference point; B_{lim} = Limit reference point

SRU/SR 2004/Fig. 2-3; data source: ICES, 2002a

which, wherever possible, human-caused mortality is completely reduced, and also for measures to renaturalise the migratory routes and habitats (ICES, 2002a).

40. A further cause of the reduction in fish stocks and of poor compliance with catch quotas is not only highly excessive catch capacities, but also high quantities of juvenile fish by-catch (fish caught unintentionally). Small fish caught as by-catch are either used industrially or are thrown back into the sea as discards (animals or parts of animals that accrue in fisheries and are returned to the sea for economic or legal reasons or out of personal preference, Para. 42). Only a very small number survive. In industrial fishery, whose share of the total fisheries volume in the North Sea amounts to 50% and which is primarily responsible for the production of fish food for aquaculture, large quantities of juvenile fish are often caught in the closely-meshed nets used and are thus lost to stocks before reproduction occurs.

41. One impact of the severe pressures on target fish stocks posed by fisheries, and which was described as early as in the 1960s, is the reduction of the average length of fish caught (BEVERTON and HOLT, 1957). Because most fish are caught either before or directly after their first spawning, only very few get to spawn more than once and attain a certain size. Larger females are becoming rare. These have the advantage of higher fertility compared with first spawners. They produce larger eggs and larvae, and they are more likely to pass on traits that are beneficial to fish health because longevity is an indicator of fitness (FROESE and PAULY, 2003). A natural age structure is thus an important basis for healthy fish stocks. This is no longer available to highly exploited fish stocks with current fisheries practice.

2.1.2.2 Negative Impacts on Non-Target Species

42. Apart from target species and by-catch species that are also landed and marketed, each catch contains a significant quantity of non-utility marine organisms that are thrown back overboard due to poor demand or low market value. The volume of discards can actually be higher than that of the fish landed. For example: In beamtrawling for sole, for every 1 kg of fish some 9 kg of discards are caught, most of which are smaller plaice and dab (*Limanda limanda*) and – making up some 60% of the total catch – non-vertebrates (common whelk, hermit crab, brittle stars, etc.) (LOZÁN, 2003). The discarded fish are often so badly injured that almost all of them die. Overall, the discard share of North Sea fisheries is estimated at between 20 and 30% (WEBER, 1995).

Discarded organisms now provide a key source of food for many benthic organisms and seabirds (VAUK and PRÜTER, 1990; GROENEWOLD and BERGMAN, 2003). One result was the occurrence at the beginning of the 1960s of massive shifts in seabird populations. Species like the herring gull (*Larus argentatus*) and the lesser black-backed gull (*Larus fuscus*) benefited from the new source of food and stocks grew exponentially. The case is similar for the 'opportunists' among benthic communities who also benefit from the new food source. It is thus highly probable that the fisheries are responsible for long-term change in seabird populations and bottom communities.

43. The fisheries are also responsible for the severe damage to habitats and organisms caused by tickler chains used in beam trawling and by steel boards affixed to bottom trawls (GROENEWOLD and BERGMAN, 2003). The tickler chains can dig several centimetres into the sea bed, disturbing sole for example, and plough through the sediment. Such activities have a severe effect on sessile bottom inhabitants in particular. In many areas of the southern North Sea, beam trawlers plough the sea bed between three and five times a year with the result that sensitive organisms like ocean quahogs, sea urchins, lobsters and sharks disappear, while other robust species and 'opportunists' (e. g. starfish, hermit crabs and swimcrabs) increase (for more on the impacts from fisheries see SRU, 2002a, Para. 744 et seq.).

44. Other indirect impacts can be apportioned to encroachments in the food chain brought about by intensive fishing. The resulting changes in the ecosystems can only be proven in a few instances (meeting with the Federal Research Centre for Fisheries held 24 February 2003). In the 1980s, for example, there was a clear drop in breeding success in seabirds on the Shetland Islands because coastal sandeel stocks, a key food source, had been significantly reduced due to fisheries-related pressures (ICES, 2003a). Another example of the changes in the food chain is the increase in lobster and shrimp stocks off the coast of Norway relative to the reduction in cod as their main predator. Overall, more intensive research is needed on the effects that fishing has on the ecosystem through the food chain.

2.1.2.3 Summary

45. The fisheries are responsible for considerable pressures of use on the ecosystems in the North Sea. Target fish stocks have not been sustainably managed for many years, with many stocks having been decimated to such an extent that they now lie outside biologically safe limits. In recent years, the cod and the eel have been particularly affected by such activities. Apart from the eduction in population size in commercially fished species, stocks are becoming younger and there is evidence of changes having occurred in the food web.

Non-target species are also directly affected by fishing activities. Large quantities of non-utility organisms are still caught as by-catch and thrown overboard as discards. The large share of discarded round fish, and also many other vertebrates, are so badly damaged when caught that they subsequently die and serve seabirds and/or opportunists within benthic communities as a new source of food. Additionally, bottom fauna are damaged by the use of bottom trawl nets – especially in beam trawling – which, in highly fished areas has led to a reduction, or in extreme cases the displacement, of sensitive species.

2.1.3 Pressures from Pollution

46. Numerous pollutants find their way into the sea through the atmosphere and through the water cycle. Despite the vast size of the waterbody, which has a strong dilution effect, the sea's pollution intake capacity is limited. This is particular the case with marginal seas on flat continental shelves like the North Sea.

Attention was drawn to the growing concentrations of pollutants in the North Sea as early as the 1960s and 1970s. A reduction in seabird populations in the southern North Sea was attributed to the high concentrations of biocides in their organisms (BECKER and BRUHN, 2003). In 1980, the German Advisory Council on the Environment reported serious pollution from chlorohydrocarbons (especially PCBs) and heavy metals in coastal areas of the North Sea (SRU, 1980). Even then, emphasis was already being placed on the particular risk potential from these substances due to their accumulation in organisms, and a causal relationship was suspected with the increased occurrence of fish disease. Ten years later, LOZÁN et al. (1990) talk of a worsening of the situation in the North Sea compared with that described by the Environment Council in its 1980 report. They justify their assessment with evidence of pollution-related damage in non-coastal regions.

Based on available data, the following is a detailed description of the pollution levels in the North Sea caused by heavy metals and arsenic (Section 2.1.3.1), organic compounds (Section 2.1.3.2), petroleum-derived substances that find their way into the marine environment through oil discharges (Section 2.1.3.3) and radioactive substances (Section 2.1.3.4). The key criteria used in evaluating the discharged substances are their toxicity, persistence and accumulation in organisms.

Input paths, distribution in environmental compartments and comparison with background reference concentrations (BRCs) and ecotoxicological evaluation criteria (EACs)

47. Pollutants enter the sea through the atmosphere and the water cycle. Input of pollutants from the atmosphere involves airborne substances being deposited on the surface of the sea by rain (wet deposition) and through sedimentation (dry deposition). Extremely high levels of atmospheric deposition occur in the southern North Sea due to its proximity to industrial centres (OSPAR, 2000b, p. 53). Sources of atmospheric deposition are often difficult to identify, however, because – depending on their volatility and stability – pollutants can be transported over great distances so that, for example, an organic pollutant in the North Sea may have originated far from Europe. Data on atmospheric depositions are largely extrapolated from concentration levels measured at individual coastal stations in conjunction with dispersion modelling (OSPAR, 2000b, p. 54).

48. Inputs through the water cycle include direct discharges into the sea (from sewage treatment plants and industrial wastewater systems on the coast, discharges from offshore facilities, from ships and from mariculture), and also inputs from rivers. The latter collect atmospheric pollutant depositions on the surface of the sea's entire catchment area and also pollutants from discharges from sewage treatment systems, industry, agriculture, etc. River inputs are identified from concentrations in river water and flow rates. Pollutant inputs are thus directly related to changes in waterflow in the rivers involved. Additionally, a high waterflow can result in higher pollutant inputs due to water erosion (OSPAR, 2000b, p. 54).

49. Inorganic and organic pollutants that are discharged into the sea occur in dissolved form or bound to particles. Distribution of a pollutant between the dissolved and bound phase depends on the physical and chemical characteristics of the substance. The dissolved portion follows the path of the water masses (Para. 30), while the bound portion quickly sedimentises and remains in areas where sedimentation is promoted: for example, in estuaries, in the Wadden Sea, in deep areas of the Kattegat and Skagerrak, and in the Norwegian Trench (OSPAR, 2000b, p. 53). Lipophilic compounds – those not easily dissolved in water – are mostly bound to suspended particles and to sediment and thus tend to disperse in the sediment rather than the water phase. Because most organic compounds are lipophilic, sediment is of key importance in assessing pollution of the sea from organic pollutants. In contrast, measuring the concentration of non-water-soluble pollutants in seawater is often difficult because the concentrations often lie near to or below the detection limit for each substance.

Concentrations in sediment depend not only on the quantity of pollutant input and the affinity of the pollutant to the sediment, or conversely its ability to dissolve in water. The sediment itself can be highly active, both chemically and biologically; and it can also be influenced by the hydrochemistry of the deeper water layers. For these reasons, decreasing and increasing concentrations in sediment should not be automatically construed as a sign of decreasing or increasing pollutant inputs. Under changed conditions, sediments to which pollutants are bound can become a source of pollution (OSPAR, 2000b, p. 53).

50. Persistent and lipophilic compounds also accumulate in marine organisms (bioaccumulation). Through the consumption of polluted food, these compounds accumulate in the food chain so that concentrations of toxic pollutants may reach particularly high levels in the organisms at the end of the food chain (birds, marine mammals and humans). A range of studies have shown that consumption of seafood is a key source of human exposure to pollution, especially from heavy metals (DOUGHERTY et al., 2000).

51. The OSPAR Commission has developed background/reference concentrations (BRC) and ecotoxicological assessment criteria (EAC) that can be compared to measured pollutant concentrations in seawater, sediments and biota in the North Sea (OSPAR, 2000b, p. 55 et seq.). While a reduction in pollution to the level of the natural BRC values is the medium-term goal (Section 3.2.1.1 on the internationally agreed generation target), the EAC values serve the purposes of fast identification of potential problem areas. They provide a threshold for pollutant concentrations in seawater, sediment and biota below

which harmful impacts on the environment or on biota cannot be expected based on available knowledge. They do not, however, include long term effects like carcinogenicity, mutagenicity or damage to the endocrine system. In many cases, rather than one single EAC value, a concentration range is given, i.e. an upper and a lower EAC value (OSPAR 2000b, p. 55 et seq.).

2.1.3.1 Heavy Metals and Arsenic

2.1.3.1.1 Heavy Metals

52. As natural components of the Earth's crust, traces of heavy metals occur throughout the environment. Heavy metals are among the top aquatic problem substances (Brügmann, 1996), because:

- A large proportion of metals released by industrial and natural processes reach the oceans.
- Their compounds are potentially poisonous and can have acute or chronic toxic effects.
- Detoxification by means of decomposition, as in the case of organic pollutants, or of decay as with radioactive elements does not occur.
- Apart from acute damage to aquatic ecosystems, accumulation can occur by way of the food chain, up to and including humans.
- They can be remobilised following deposition on the sea bed.

Heavy metals and their compounds thus show persistent, bioaccumulating and toxic characteristics. Of importance in the pollution of the North Sea are the highly toxic heavy metals cadmium, lead and mercury. Also of importance is copper: an essential trace element in low concentrations, it can damage organisms in high concentrations.

Pollution Status

53. Concentrations of lead in North Sea waters were reduced by 38% between 1982 and 1990. Cadmium concentrations were reduced by 50% during the same period. No data is available on trends in mercury and copper concentrations in the North Sea (Table 2-2). Concentrations of lead, cadmium, mercury and copper in North Sea sediments were reduced in the 1980s and the 1990s (Table 2-3). Nevertheless, in large river estuaries, in the German Bight and in some coastal waters of the North Sea, concentrations are regularly measured that far exceed the reference values for natural background concentrations. Additionally, ecotoxicological assessment criteria (EAC values) are also exceeded at numerous 'hot spots' of this type and especially with regard to concentrations of heavy metals in sediment (Tables 2-2 and 2-3) (OSPAR, 2000b, p. 57–66).

Table 2-2

Heavy metal concentrations in North Sea water

Heavy Metal	Trends in concentration in water	Regions where BRC or EAC exceeded in water	Factor by which BRC/EAC exceeded
Lead	Overall reduction of 38% for the entire North Sea (1982/85–1986/90) Decreases observed: Skagerrak, Dutch coast, Thames Estuary and Dogger Bank	South-east area off the English coast and the Channel North-east area off the English coast and in the Forth estuary Scheldt estuary: near the mouth Scheldt estuary: upstream	BRC: 1 BRC: 2 BRC: 2.5 BRC: 10
Cadmium	Overall reduction of 50% for the entire North Sea (1982–1990) Decreases observed especially in the Southern Bight and also in the Dutch coastal zone, the Thames estuary and the Dogger Bank area	Some estuaries Scheldt estuary	BRC: 2–10 EAC: > 1
Mercury	No information	Coastal zones and estuaries	BRC: 2–10
Copper	No information	South Tay estuary Forth estuary Scheldt estuary	BRC: > 1 BRC: 2–5 BRC: 3–7 BRC: 2–4
SRU/SR 2004/Tab. 2-2; data source: OSPAR, 2000b			

Table 2-3

Heavy metal concentrations in North Sea sediments

Heavy Metal	Trends in concentration in sediments	Regions where BRC or EAC exceeded in sediments	Factor by which BRC/EAC exceeded
Lead	Reduction of 53% in the Dutch coastal zone north of the mouth of the Rhine (1981–1996) No significant decrease outside of the Rhine plume 25% reduction in the Belgian coastal zone (1990–1995) 10% decrease in the Wadden Sea (1988–1993)	Belgian coast (including a former dredged spoil disposal site) Scheldt estuary	EAC: > 1 EAC: 1.4–24
Cadmium	71% decrease north of and 45% fall south of the mouth of the Rhine and Meuse rivers (1981–1996) No decrease 20–70 km offshore in the open sea Decrease by a factor of three in the Scheldt estuary (1990–1995) Decrease of 10–40% in the Wadden Sea (1988–1993)	Near the mouth of the Rhine, in the Dutch Wadden Sea and in the Scheldt estuary	EAC: > 1
Mercury	Decrease in the inner German Bight (former sewage sludge disposal sites) 5% annual decrease in the Belgian coastal area (former disposal sites, 1979–1995) No decrease noted for other coastal stations and the Scheldt estuary	Coastal and offshore sediments Contaminated estuarine stations Estuaries of the Scheldt, Elbe and Forth, at disposal sites for dredged spoil	BRC: 1–7 BRC: 10–50 EAC: > 1
Copper	40% decrease north and 30% fall south of the Rhine/Meuse mouth (1981–1996) 35% decrease in the offshore area of the Dutch coastal zone (1981–1996) 65% decrease along the Belgian coast, including in the dredged spoil dumping zone (1990–1996) Reduction of 20% in the Wadden Sea (1988–1993)	Belgian coastal zone (dredged spoil disposal site)	EAC: > 1
SRU/SR 2004/Tab. 2-3; data source: OSPAR, 2000b			

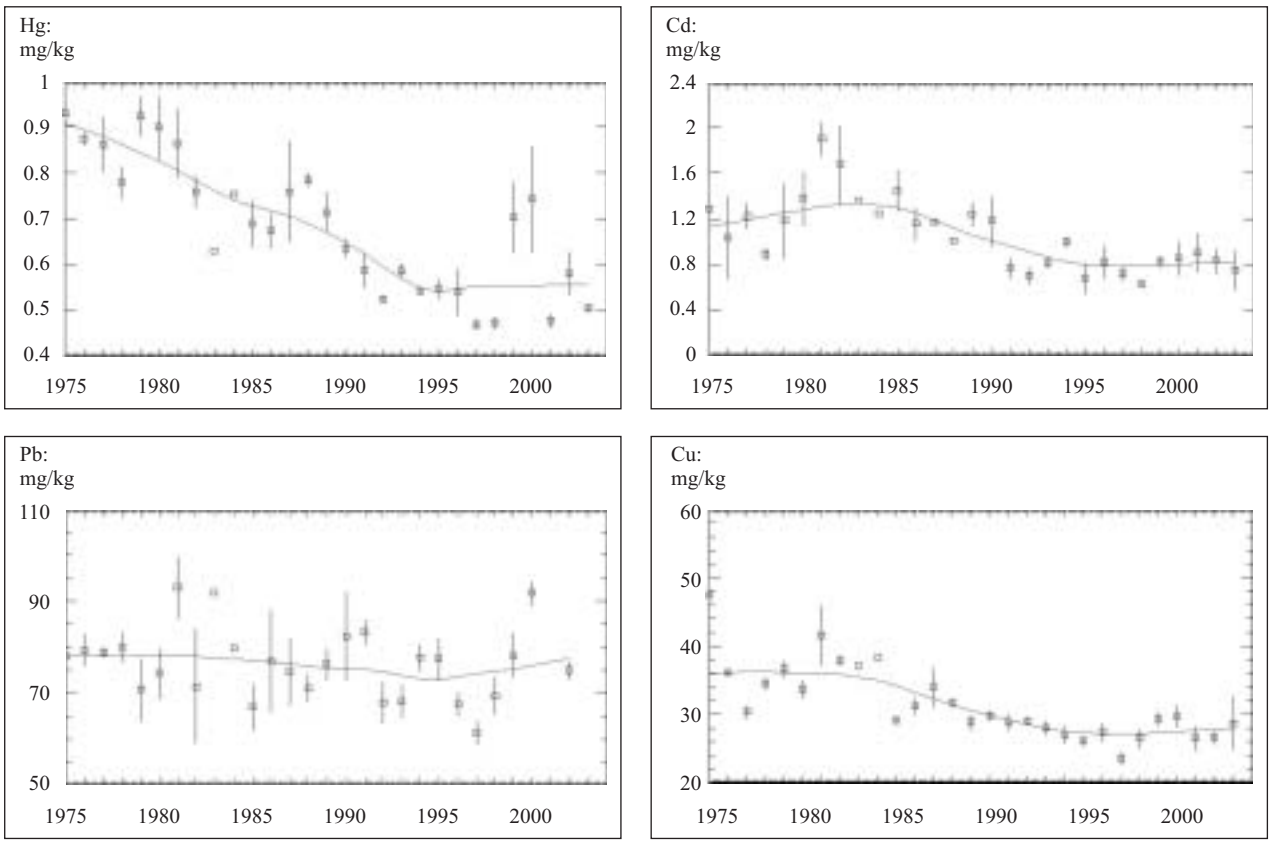
54. According to ALBRECHT and SCHMOLKE (2003), the broad range of concentrations measured in filtered water from the German Bight makes identification of a periodic trend in heavy metal concentrations difficult. At best, a trend in the direction of lower values can be shown for mercury and copper. At one station in the German Bight, cadmium, mercury and copper concentrations measured between 1990 and 2002 (1995 and 2002 for mercury) show neither a downward nor an upward trend (BSH, 2003a, p. 48 et seq.). It is possible that as inputs of heavy metals in the seawater are reduced, the relative importance of their remobilisation from the sediment is increased (ALBRECHT and SCHMOLKE, 2003).

55. The high levels of heavy metal concentrations found in sediments in the Wadden Sea and the German Bight are due to the fact that heavy metals accumulate in sediment. Accumulation factors, measured as a multiple of the background values, were 2 for lead, 3–5 for cadmium and 10–20 for mercury. Copper concentrations lay around the background values (BLMP, 2002). Overall, however, mercury, cadmium and copper concentrations in sediments in the German Bight have decreased in most areas. A trend cannot be identified for lead. Among the areas that show stagnating or increasing heavy metal concentrations in sediments is the eastern section of the mudflats south-east of Heligoland. Until 1980, the area was used to deposit sewage sludge from Hamburg. Figure 2-4 shows the trends for mercury, cadmium, lead and copper concentrations in the fine-grain fraction of sediments from this area. As the charts clearly show, a more or less strong reduction in concentrations up to about 1990 was followed by a levelling-out – and even an increase in the case of lead. The increase in lead concentrations is possibly due to remobilisation of this heavy metal from lower sediment layers (personal communication from the Federal Maritime and Hydrographic Agency (BSH) dated 15 October 2003).

56. In most data sets, no significant trend and thus no reduction is evident in concentrations of cadmium, lead, mercury and copper in biota (Table 2-4). Only a few tests show decreasing concentrations in mussels or fish. A comparison of heavy metal concentrations in biota with BRC and EAC values shows that in most studies, the BRC value for biota is exceeded. As with sediments,

Figure 2-4

Mercury (Hg), cadmium (Cd), lead (Pb) and copper (Cu) concentrations in the fine fraction of sediments in the Inner German Bight (eastern part of mud deposits south-east of Heligoland)



All values are annual averages with standard errors.

Source: BSH, written communication of 15 October 2003

contamination of biota shows that the highest concentrations of heavy metals are measured near industrial plants (e. g. cadmium and lead from smelting plants, mercury from chlorine-alkali plants) and in places where inputs from heavily populated areas occur. In Norway's Sørfjord, which houses a smelting plant, people are warned not to eat blue mussels (*Mytilus edulis*) due to the high levels of cadmium (95 times above the BRC value) and lead they contain.

57. Germany's *Bund-Länder* monitoring programme (BMLP) for the marine environment in the North and Baltic Seas shows that for the German region of the North Sea, levels of heavy metals in biota do not give cause for concern. While concentrations of cadmium and lead have remained at almost the same level since 1995, no conclusions could be drawn as to trends. There have been reductions in mercury concentrations in plaice (*Pleuronectes platessa*) and in eggs laid by oystercatchers (*Haematopus ostralegus*), the common tern (*Sterna hirundo*) and herring gulls (*Larus argentatus*) in the German Bight. Nevertheless, at regional level oystercatcher eggs still show mercury concentrations such that reduced breeding success due to heavy metal contamination cannot be ruled out (BLMP, 2002). At the end of the 1990s, oystercatcher eggs in the Elbe river showed mercury concentrations of between three and five times higher than eggs in other regions (BECKER and BRUHN, 2003).

Table 2-4

Heavy metal concentrations in North Sea biota

Metal	Concentration in biota	Regions where BRC or EAC exceeded in biota	Factor by which BRC/ EAC exceeded
Lead	Downward trends in blue mussels *(Mytilus edulis)* from Germany (Borkum), Norway (Sørfjord), the Belgian coast and Dogger Bank	In 27 of 31 time series for blue mussels, including:	BRC: > 1
		Sweden	BRC: > 1
	Decrease in benthic organisms found in dredged spoil disposal sites on the Belgian coast	German coast and German Bight	BRC: 1–4
		Seine area	BRC: 5
		Western Scheldt	BRC: 3
		Ems-Dollard	BRC: 4
		Norway, Hardangerfjord	BRC: 10
		Norway, Sørfjord	BRC: 40
Cadmium	Data from 65 time series (1985–1996):	In 46 of 58 data sets from mussel tissue, including:	BRC: > 1
	Four time series showed downward trends in blue mussels from the Netherlands (Western Scheldt and Ems-Dollard area) and Norway (Sørfjord and Hardangerfjord). No trends determined for the remaining time series.	G. B. (Tay and Forth estuaries)	BRC: 2–3
		Seine estuary	BRC: 5
		Norway, Hardangerfjord	BRC: 20
	50% decrease in mussels in the Seine estuary (after phospho-gypsum discharges prohibited in 1992)	Norway, Sørfjord	BRC: 95
	Downward trends in flounder *(Platichthys flesus)* from the Western Scheldt and inner Sørfjord		
	Downward trend in cod *(Gadus Morhua)* livers from Sweden.		

Table 2-4 continued

Metal	Concentration in biota	Regions where BRC or EAC exceeded in biota	Factor by which BRC/ EAC exceeded
Mercury	Data from 86 time series (1978–1996) of mercury in blue mussels and fish: 7 downward trends 1 upward trend (Sørfjord) No trends detected for the remaining time series Significant decrease in flounder (Belgian coast, the Ems-Dollard, the Wadden Sea, the Elbe) and plaice (Southern Bight of the North Sea)	In blue mussels: Swedish coast and North Frisian area Along the North Sea coast (from mouth of river Elbe to France) Oslofjord Sørfjord (industrial area) In fish muscle tissue: Along the Swedish and Danish coasts Germany Belgium and France Cod *(Gadus morhua)* (in the Sørfjord) Dab *(Limanda limanda)* (in Norway)	 BRC: 1–3 BRC: 2–7 BRC: 4.5 BRC: 11 BRC: < 2 BRC: < 3 BRC: < 4 BRC: 3 BRC: 5
Copper	Data from 71 time series of up to 15 years duration: 8 time series with downward trends in mussel and fish tissue (Denmark, Germany, Netherlands and Norway) 2 time series with upward trends (France and Norway)	In 53 of 61 time series with blue mussels	BRC: > 1
SRU/SR 2004/Tab. 2-4; data source: OSPAR, 2000b			

Heavy Metals: Sources and Input Pathways

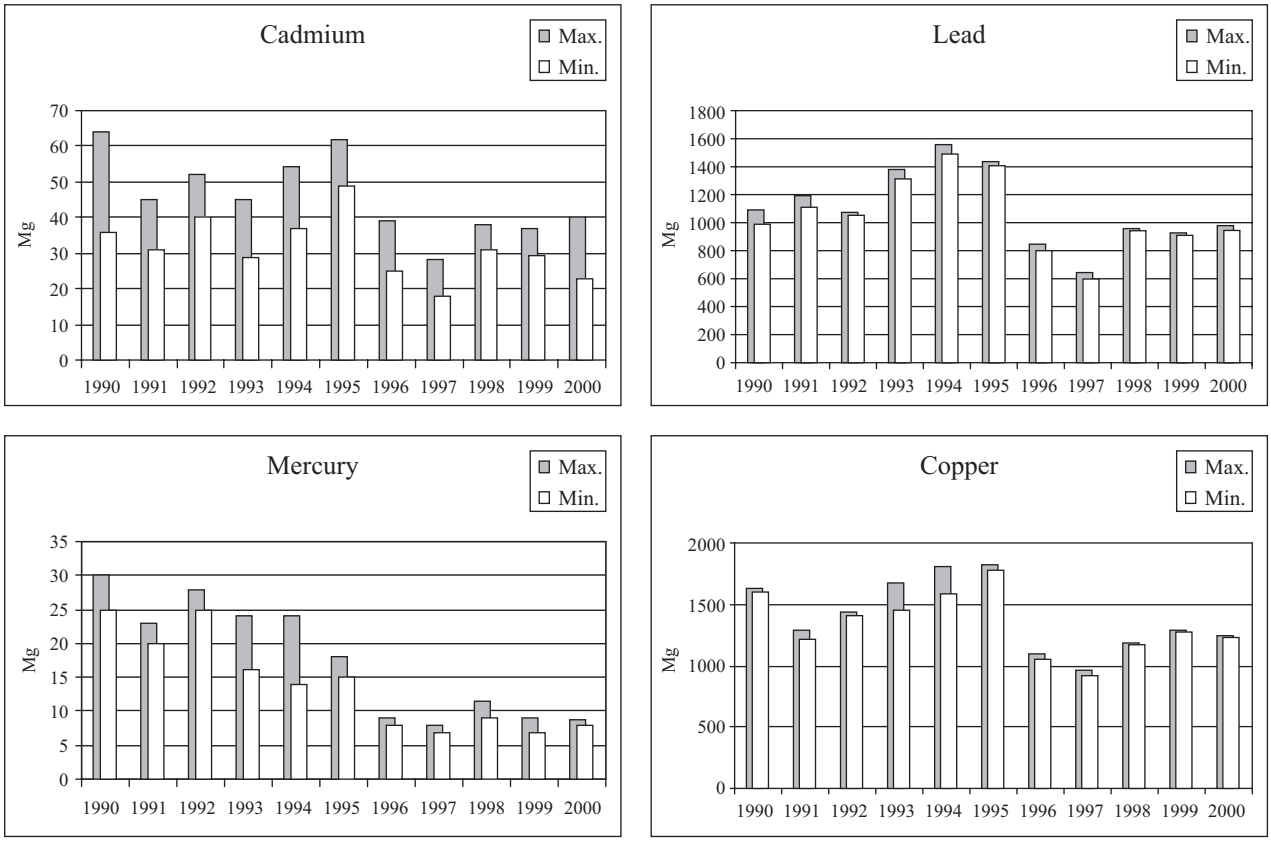
58. Heavy metals find their way into the sea through the atmosphere and through the water cycle. Inputs from direct discharges and from rivers dominate in coastal areas, and the greater the distance from the coast, the greater the role played by the atmosphere. The proportion of atmospheric depositions in overall inputs in the North Sea ranges between 19 and 29% for cadmium, and as much as between 58 and 61% for lead (OSPAR, 2000a, p. 43). In 1995, the proportion of atmospheric deposition in total inputs was approximately 25% for mercury and 31% for copper (OSPAR; 2000b, p. 62, 65; OSPAR, 1997). Between 1985 and 1995 overall reductions in cadmium and mercury emissions from North Sea states amounted to 44%, with 82% for lead and 22% for copper (OSPAR, 2000b, p. 59).

59. No similar significant reductions are evident for inputs into the North Sea through the water cycle. The measured total inputs of cadmium, mercury, lead and copper from rivers and from direct discharges during the period 1990 to 2000 (Figure 2-5) fluctuate due to the annual changes in river flows, with no overall reduction for lead and only a marginal reduction of around 16% for copper. There is evidence of a reduction in cadmium inputs of approximately 22% between 1995 and 1996, and a significant reduction of around 60% for mercury between 1992 and 1996. Inputs of both heavy metals stagnated from 1996 onwards.

60. Of the North Sea states, Germany, along with France, Great Britain and the Netherlands, discharges the greatest amounts of heavy metals into the North Sea. In 1996, Germany's share of total inputs via the water cycle was 16% for lead, 22% for cadmium, 38% for mercury and 14% for copper. Figures 2-6 and 2-7 show the shares of individual North Sea states in total inputs of lead and cadmium in the North Sea.

Figure 2-5

Total waterborne inputs of cadmium, lead, mercury and copper to the North Sea (Mg/a)



Note: Where maximum values are below the detection limit, the true concentration is assumed to be the detection limit. Minimum values below the detection limit are assumed to be zero.

SRU/SR 2004/Fig. 2-5; data sources: OSPAR, 1998a, 2001a, 2001b, 2002a

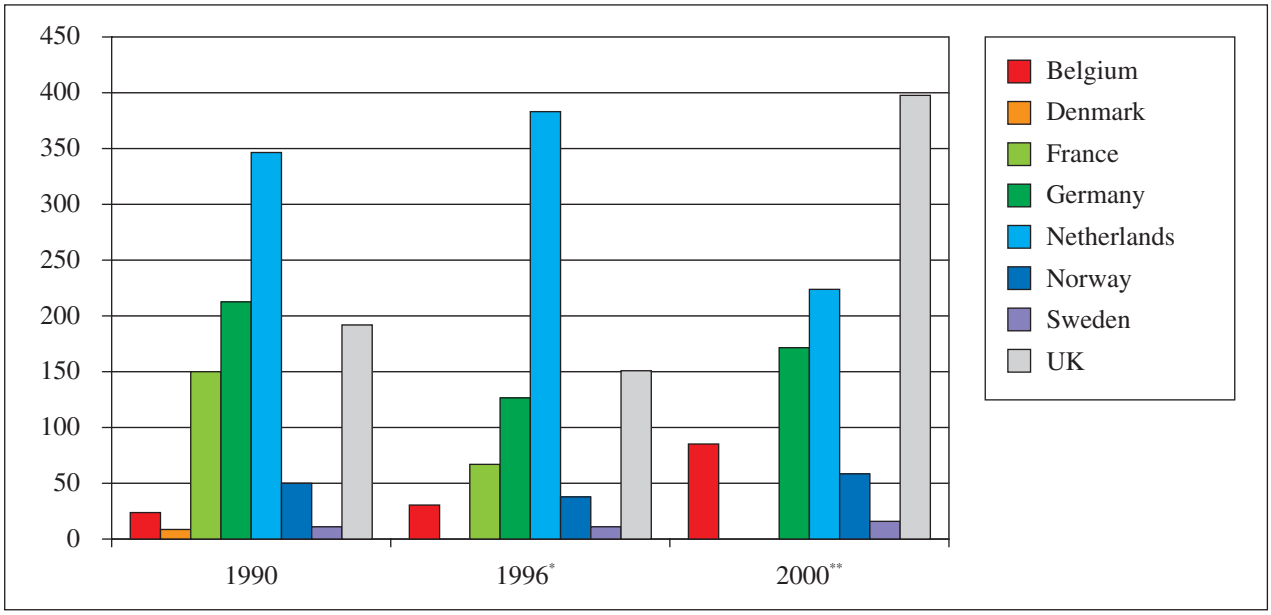
61. The main sources of lead, cadmium, mercury and copper emissions comprise the iron and steel industry, the non-ferrous metals industry, the glass industry, chlorine-alkaline electrolysis, fossil-fuelled power stations and waste incineration plants. Use of products containing heavy metals and use of products that are contaminated with heavy metals can result in direct emissions into the environment during use (e. g. cadmium-containing fertilisers, lead shot, lead weights) or to later emissions via the waste management path (meaning through waste combustion and landfill). Table 2-5 shows the main sources and respective input paths for lead, cadmium, mercury and copper. Inputs of lead from the use of leaded fuel have steadily declined and are no longer included in the table. Inputs from offshore activities can cause localised high levels of heavy metal pollution. However, these sources are thought to make up less than 1% of total lead input into the North Sea via the water cycle (OSPAR, 2002b).

62. In recent years, emission reduction activities carried out in industrial facilities and power plants have resulted in significant reductions in emissions from point sources (Para. 58). The introduction of unleaded fuel brought about dramatic reductions in lead emissions from traffic. Thus the North Sea states – in line with the obligations set out by the International Conference on the Protection of the North Sea (NSC) – reduced their atmospheric and water-cycle inputs of cadmium, mercury and lead by 70% between 1985 and 1995. Many states also reduced their atmospheric and water-cycle inputs of copper by 50% (NSC, 2002a).

In addition to emission reduction activities in industrial facilities, another cause of emission reductions in Germany since the 1990s was the decline in industrial activities in former eastern Germany (Elbe catchment area). In 2000, direct inputs into water from industry played only a subordinate role. While the role of inputs from municipal sewage treatment plants remained significant, the main source of water pollution in 2000 came from diffuse sources. The key input paths were thus sewage systems, dwellings not connected to sewage treatment plants, erosion and groundwater inflow (UBA, 2003a).

Figure 2-6

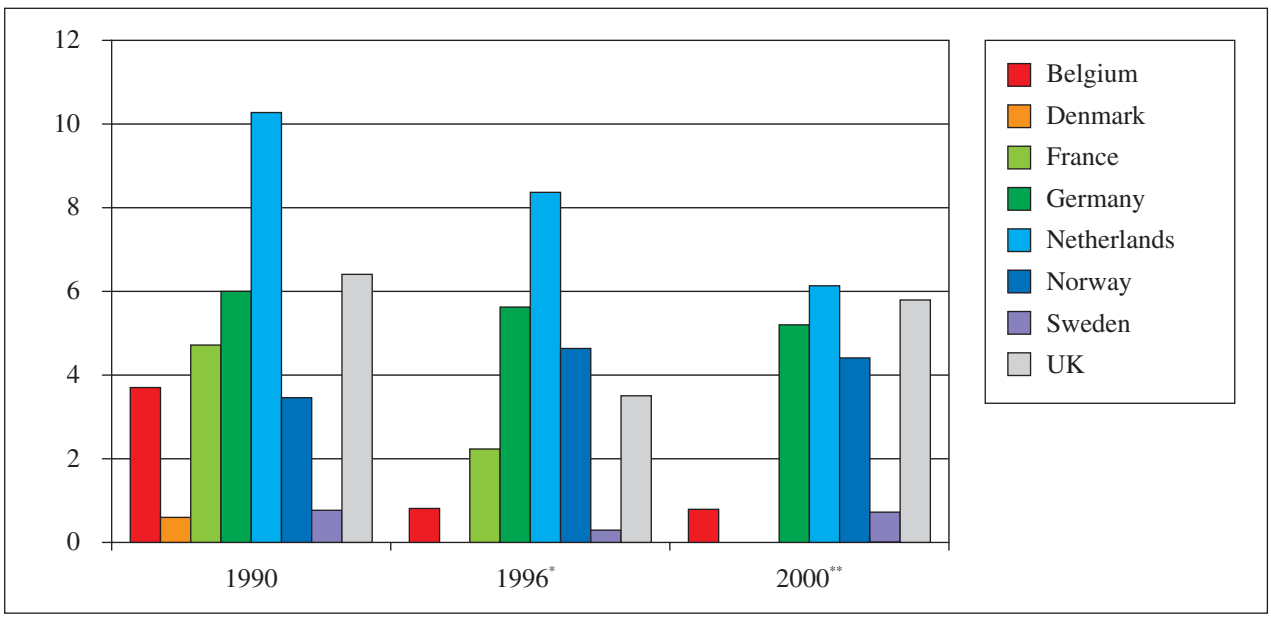
Waterborne lead inputs from individual North Sea coastal states for 1990, 1996 and 2000 (Mg/a)



* No information from Denmark.
** No information from Denmark or France.
The data are minimum waterborne inputs; that is, all concentrations below the detection limit are assumed to be zero.
SRU/SR 2004/Fig. 2-6; data sources: OSPAR,2000b, 2002a

Figure 2-7

Waterborne cadmium inputs from individual North Sea coastal states for 1990, 1996 and 2000 (Mg/a)



* No information from Denmark.
** No information from Denmark or France.
The data are minimum waterborne inputs; that is, all concentrations below the detection limit are assumed to be zero.
SRU/SR 2004/Fig. 2-7; data sources: OSPAR, 2000b, 2002a

Table 2-5

Emission sources, uses and possible input pathways into the North Sea for lead, cadmium, mercury and copper

	Sources and use	Input pathways
Lead:		
Point sources	Iron and steel industry, non-ferrous metals industry, stone/earth industry, waste incinerators, fossil fuel burning	Air/water
	Offshore platforms (drilling fluids)	Direct inputs
Diffuse sources	Batteries, stabilisers in PVC, pigments in paints	Solid waste
	Lead weights and lead shot	Water
Cadmium:		
Point sources	Fossil fuel burning, waste incineration, iron and steel industry, non-ferrous metals industry	Mainly air, some wastewater
	Mining (dam breaches on flood control reservoirs)	Water
	Phosphate fertiliser and sewage sludge	Mainly water, some windborne
	Zinc roofs (contain cadmium as a contaminant)	Rainwater
Diffuse sources	Batteries (mostly Ni-Cd), pigments, metal coatings, plastics, some alloys; potential growth market: solar cells and photodetectors	Solid waste
Mercury:		
Point sources	Fossil fuel burning, waste incineration, non-ferrous metals industry, woodburning	Mainly air
	Chlorine-alkali electrolysis	Air/water
Diffuse sources	Dental fillings, meters, batteries, light sources	Wastewater and solid waste
	Biocides and crop protection products (old stocks)	Mainly water
Copper:		
Point sources	Non-ferrous metals industry	Air/water
Diffuse sources	Antifouling agent in ship paints, (substituting TBT)	Direct
	Copper roofs	Via rainwater
SRU/SR 2004/Tab. 2-5; data sources: OSPAR, 2000b, 2000c, 2002c, 2002b		

Summary

63. Since 1997, reductions achieved in heavy metal emissions from land-based sources have made no further contribution to reducing inputs of cadmium, lead, mercury and copper into the North Sea via the water cycle. This is possibly due not only to variations in river runoffs (Para. 59) but also to inadequate reductions in pollution from diffuse sources that are difficult to estimate (OSPAR, 2000b, p. 54).

Concentrations of lead, cadmium and mercury in sediments and marine organisms in estuaries and some coastal regions of the North Sea (especially near industrial sites) are still far in excess of BRC and, in some instances, of EAC values. Even if the precise causal linkage is unknown, remobilisation from sediments is thought to play a key role (OSPAR, 2000a).

In the main, we are still a long way from achieving the NSC and OSPAR goal of reducing inputs and emissions of priority heavy metals (cadmium, lead and mercury) from point sources as well as diffuse losses of these metals from products to such an extent that by 2020 the applicable background values will be achieved.

Although industrial facilities and power plants are still the main sources of heavy metal emissions, reductions in inputs from point sources have been achieved such that, relatively speaking, an increasing role is now attached to diffuse inputs from agriculture and from products (e. g. cadmium batteries, fertilisers containing cadmium, lead batteries, lead weights and antifouling products containing copper (as a substitute for TBT)). From a science and technology perspective, the following activities could serve in reducing heavy metal inputs:

– Substitution of lead in paints and as a stabiliser in PVC, replacing lead weights and lead shot with steel.
– Opt out from the use of cadmium batteries, environmentally compatible disposal of used Ni-Cd batteries, more stringent thresholds for cadmium in phosphate fertiliser, a ban on the use of cadmium in pigments and paints.
– Substitution of the amalgam process in chlorine-alkali electrolysis with the mercury-free membrane process, substitution of mercury in lamps, batteries and dental fillings.
– A ban on ships' paint containing copper (substitute with environmentally compatible processes).

2.1.3.1.2 Arsenic

64. Alongside heavy metals, concentrations in the North Sea of the semi-metal arsenic also play a significant role because the consumption of seafood is a key source of arsenic entering the human body through its ingestion with food (LLOBET et al., 2003).

Arsenic concentrations measured in blue mussels (*Mytilus edulis*) and eelpouts (*Zoarces viviparus*) in the Wadden Sea show neither an increase nor a decrease since monitoring began (1985 and 1994 respectively). Concentrations lie in the region of 9 to 20 mg/kg for common mussels and 5 to 17 mg/kg for eelpouts. The arsenic content in herring gull (*Larus argentatus*) eggs on the islands of Trischen and Mellum (Wadden Sea) dropped between 1988 and 1996 and has since fluctuated between 0.24 and 0.57 mg/kg. A trend is no longer evident (UBA, 2003b). Arsenic compounds with an average concentration of over 20 mg/kg were measured in a variety of fish species in the North Sea. The proportion of toxic arsenic compounds amounted to over 0.1 mg/kg. In a worst-case scenario (if the fish are smoked or dried), the content of toxic arsenic compounds increases to as much as 0.5 mg/kg and can thus reach levels that are harmful to human health (de GIETER et al., 2002).

Key sources of arsenic emissions are the burning of fossil fuels, the non-ferrous metal industry, the iron and steel industry, waste incineration plants and the mineral industry (including the glass industry) (DREYHAUPT, 1994). Arsenic is also used as an alloy component in the production of semiconductors.

2.1.3.2 Organic Compounds

65. Numerous synthetic organic substances are discharged into the North Sea. Of particular relevance to contamination of the marine environment are persistent, bioaccumulating and toxic compounds (PBT substances) and also organic compounds influencing the hormone system (endocrine disrupters). The latter have the potential to influence the hormone system of marine organisms even in extremely low concentrations. Many PBT substances have long atmospheric retention times and are thus transported over great distances. Organic compounds transported over long distances (persistent organic pollutants or POPs, Para. 308 et seq.) tend to be deposited in colder regions. Many POPs have, for example, been found in the fatty tissue of animals in both the Arctic and the Antarctic, far from their place of origin or use.

The most widely known and important PBT substances include chlorinated hydrocarbons (e. g. DDT, lindane (γ-HCH), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated dibenzodioxins and furans (PCDDs and PCDFs) and organo-tin compounds (like tributyl tin, TBT)). These compounds all have a toxic effect on organisms. Their effects range from acute to chronic toxicity (carcinogenicity, mutagenicity, reproductive toxicity) to disruption of the hormone system. Data on emissions, inputs and concentrations in the North Sea are available for only a few but nevertheless significant organic compounds. As a rule, organic compounds like PCBs, PAHs, dioxins/furans and γ-HCHs are relatively well studied due to their long-recognised impact on the environment. Under the OSPAR monitoring programme, measurement of organic compounds is only mandatory for γ-HCHs, while measurement of PCBs, PAHs and oil is recommended (OSPAR, 2002a). HCB, α-, β- and γ-HCHs, PAHs and PCBs are regularly monitored under the *Bund-Länder* monitoring programme (BLMP) for the marine environment in the North and Baltic seas (BLMP, 2002).

The following is an outline of pollution in the North Sea from organic compounds, as illustrated by PCBs, some plant protection products and biocides (including α-, β- and γ-HCHs, TBT), PAHs and dioxins/furans. Other substances that have come to light more recently will be addressed in a subsequent section.

Polychlorinated Biphenyls (PCBs)

66. PCBs are highly toxic, extremely persistent and bioaccumulating. PCB concentrations in seawater are very low and usually lie below 1 ng/l. Higher concentrations occur in the Elbe plume (30 ng/l). There is evidence of a slight reduction in concentrations in seawater (WEIGEL, 2003). Sediment concentrations in open seas are below 1 µg/kg, but they rise dramatically in river estuaries and in coastal areas, where they all exceed the ecotoxicological threshold (EAC) (Table 2-6). During the period 1986 to 1996, concentrations of PCBs dropped by 70% in the estuaries of the Rhine and Meuse and by 80% outside their plumes (OSPAR, 2000b, p. 67).

67. The highest concentrations of PCBs in biota were found in the western North Sea, in the Thames estuary (England) and in the Forth estuary (Scotland). Concentrations of ΣPCB_7 in the livers of dab (*Limanda limanda*) from those regions amounted to 0.19 µg/kg and 0.36 µg/kg. High PCB concentrations in the livers of cod (*Gadus morhua*) have resulted in recommendations warning against the consumption of fish liver for many areas of the Norwegian fjords (OSPAR, 2000b, p. 67). Background concentrations (BRCs) for PCBs in dab and blue mussels (*Mytilus edulis*) off the Belgian, German and Norwegian coasts are exceeded by a factor of between 2 and 20 (Table 2-7) (OSPAR, 2000b, p. 68). PCB concentrations in blue mussels in the Elbe estuary exceeded the EAC value by a factor of 3 (BECKER and BRUHN, 2003). From 1994 to 2000, high concentrations of PCBs were found in seabirds and marine mammals like common seals (*Phoca vituline*) and harbour porpoise (*Phocoena phocoena)*. A study of PCB concentrations in common terns (*Sterna hirundo*) in the Elbe estuary showed a reduction in concentrations between 1987 and 1992, with

Table 2-6

PCB concentrations in North Sea estuary and coastal sediments

	Region	Concentration in sediment
PCB	Provisional EAC set by OSPAR	1–10 µg/kg
PCB	Wadden Sea	10 µg/kg
ΣPCB_7	Forth Estuary	6.8–11.3 µg/kg
ΣPCB_7	Dutch coastal zone	> 20 µg/kg
ΣPCB_7	Ems, Elbe and Scheldt estuaries	382 µg/kg
PCB	Ems and Elbe estuaries	430 µg/kg
SRU/SR 2004/Tab. 2-6; data sources: OSPAR, 2000b and UBA, 2003a		

Table 2-7

PCB concentrations in North Sea biota

	Organism	Region	Factor by which BRC/EAC exceeded
CB 153	Blue mussel	Norwegian coast	BRC: 2*
CB 153 congener	Blue mussel	German and Belgian coasts	BRC: 12*
PCB	Dab	Haakonsvern	BRC: 20*
PCB	Blue mussel	Elbe estuary	EAC: 3**
SRU/SR 2004/Tab. 2-7; data sources: *OSPAR, 2000b, p. 68 and **BECKER and BRUHN, 2003			

no further reduction evident for the remaining study period up to 1998 (BECKER and BRUHN, 2003).

68. The greatest share of inputs of PCBs into the North Sea comes from the atmosphere. While for the period 1992 to 1994, PCB deposition was estimated at between 3 and 7 Mg per year, according to conservative estimates, input from rivers and from direct discharges for the period 1990 to 1996 was in the region of 130 to 2,400 kg per year (OSAPR, 2000a, p. 54). In 2000, four North Sea states reported inputs via the water pathway in the region of 180 to 1,126 kg (OSPAR, 2002a). Sources of PCB inputs today are largely thought to be waste and contaminated sites, especially non-regulated disposal of small capacitors that contain PCBs (NSC, 2002a). For the most part, earlier use of PCBs involved insulating fluids in capacitors, hydraulic oil, flame retardants in paint and lacquers, and softeners in plastics and sealing compounds. Restrictions on their use introduced in 1976 effected a stoppage of PCB production in all OSPAR countries by 1985 (OSPAR, 2001c).

Plant Protection Products and Biocides

69. Plant protection products and biocides are mostly used in agriculture, forestries and gardening to protect plants and to control pests and insects. Some 30 Mg of plant protection products used in agriculture find their way into the water each year. A large proportion enter the water through flooding, run-off from treated areas and incorrect disposal of left-over mixtures into farm drains and sewage systems (WWF, 2003). Apart from traditional lipophilic plant protection products (HCHs, for example), importance is attached to polar and thus less lipophilic plant protection products (including Atrazine, Simazine and Diuron, Paras. 72 and 73). Although the latter are more biologically degradable than lipophilic pollutants, concentrations are still found in seawater that far exceed those of traditional pollutants (BSH, 2003b, p. 71).

70. γ-HCH (lindane), a hexachlorocyclohexane isomer, is used as an insecticide in agriculture and forestries, as a wood and building preservative, and as a biocide to combat lice and scabies. The isomers α- and β-HCH occurred in the production of technical HCH, which was banned in 1980. The use of lindane is restricted. But despite restrictions and bans, α- and β-HCH are still widely found. There has, however, been a reduction in concentrations of both compounds in seawater – with those for α-HCH greater than for γ-HCH – since the maximum concentrations measured in the 1980s (WEIGEL, 2003).

γ-HCH inputs from current uses generally reach the North Sea from rivers, which is why high concentrations of these pollutants are found along the coasts (OSPAR, 2000b, p. 72). In 2000, five riparian states reported γ-HCH inputs from rivers and from direct discharges into the North Sea. These inputs amounted to 0.4 to 0.7 Mg (OSPAR, 2002a).

In 1992, high γ-HCH concentrations were found in sediment in the Scheldt estuary (0.004 mg/kg). While concentrations in biota found in samples taken from the contaminated areas decreased, there was evidence of an increase in concentrations in dab from Norway (Table 2-8). Since 1995, the *Bund-Länder* monitoring programme (BLMP) for the marine environment in the North and Baltic seas has measured slight increases in γ-HCH concentrations in eelpouts and dab. γ-HCH enrichment factors in the fish examined ranged from 1,000 (in muscle tissue) to 10,000 (in liver tissue) (BLMP, 2002, p. 57).

71. The biocide tributyl tin (TBT) is a highly toxic substance. TBT can cause serious harm to the hormone systems of non-vertebrate organisms, so that, for example, female snails develop male sexual organs (imposex) and their reproductive rates are significantly reduced (WEIGEL, 2003). TBT is largely used as an antifouling agent in ships' paints, but its use for that purpose has now been banned (Para. 310). It constantly leaches from treated surfaces and further inputs occur when old paint is removed. Sources of TBT inputs thus include harbours, dry docks and industrial wastewater containing TBT (WEIGEL, 2003). Annual TBT inputs into the North Sea were estimated at between 0.6 and 4.9 Mg (1997) for Denmark, 6 Mg (1997) for Great Britain and between 17.8 and 57.3 Mg per year (for the period 1985 to 1996) for Norway (OSPAR, 2000b, p. 66).

Although the use of TBT as an antifouling agent on small sports boats was banned over ten years ago, very high

Table 2-8

Observed γ-HCH concentrations in North Sea biota

Region	Biota	Observation	Year
East Frisian Wadden Sea Scheldt estuary	Blue mussel	EAC exceeded	n/a
Scheldt estuary	Fish liver, mussel tissue	Decreased concentration	1990–1995
Norway	Dab (muscle)	Increased concentration	1990–1995
SRU/SR 2004/Tab. 2-8; data source: OSPAR, 2000b, p. 71			

concentrations are still found in the waters of the North Sea, in harbour sediments, in rivers and other shipping routes. Thus, concentrations in the water in those areas exceeded the EAC value by up to 3,500 fold for harbours, by 1,200 fold for rivers and by 300 fold for shipping lanes. In harbour sediment, the EAC value was exceeded by as much as 30 million fold, in river sediments by 1,600 fold and in shipping route sediments by 30 fold. Concentrations of TBT in mussels from harbours were some 300 times higher than the EAC value. Concentrations in mussels from the coastal zone did not exceed the EAC value (OSPAR, 2000b, p. 67).

72. Triazines are mostly used as herbicides in plant protection and some derivatives are used in the biocide sector. Triazines include the herbicides Atrazine and Simazine. Although both substances are no longer approved in Germany, they still contaminate the waters and sediments of the Wadden Sea (WWF, 2003). In the early 1990s, a broad distribution of triazine herbicides was found in concentrations of up to 360 ng/l in the German Bight (WEIGEL, 2003). Certain triazines are used as an alternative to organo-tin compounds and are thus found in high concentrations in seawater (WWF, 2003).

73. Diuron is an agent from the phenyl urea group of substances and is contained as a herbicide in plant protection products and biocides. As a herbicide for total vegetation control, Diuron is largely used in municipal and private areas (railway tracks, green areas). Diuron concentrations of between 12 and 160 ng/l were measured in 1999 in the German Bight – the cause being Diuron inputs from the river Weser. Diuron is also used as a biocide in antifouling paints to protect ships' hulls. From a total of eight biocides analysed in various river estuaries and coastal zones of Great Britain, Diuron had the highest instance and the highest concentrations (up to 6.7 mg/l) (WWF, 2003).

Polycyclic Aromatic Hydrocarbons (PAHs)

74. PAHs include pyrene, benzo[a]pyrene, anthracene and fluoranthene. Some are acutely toxic, some carcinogenic. Among the main sources of diffuse inputs into the sea are wood preservatives, the burning of fossil fuels (especially in small or old facilities, e. g. domestic fuels) and traffic. Other sources include the Söderberg process in the primary aluminium industry, the coating of ships' exteriors, the offshore gas and oil industry, and shipping (Section 2.1.3.3; OSPAR, 2001d). PAHs are treated as priority carcinogens because of their high exposure probability and ubiquitous presence (BLMP, 2002, p. 68).

Total annual atmospheric PAH emissions from land-based sources in North Sea countries were estimated at 7,000 Mg for 1990. Reliable figures are lacking for PAH inputs via the water pathway. It is assumed that PAH distribution from direct discharges from all the drilling platforms in the North Sea are about 100 Mg per year. No data is available on atmospheric PAH emissions from these offshore facilities and from shipping (OSPAR, 2000b, p. 68 et seq.).

PAH concentrations in the water of the North Sea range from 0.001 ng/l to 0.3 ng/l. The highest concentrations (up to 8,500 ng/l) were measured on North Sea coasts and in the estuaries (OSPAR, 2002d). The concentrations in sediment vary between 0.2 and 6 mg/kg (OSPAR, 2002d). Results from a number of studies on PAH concentrations in sediments have been combined in Table 2-9. BRC and EAC values for PAHs are still under discussion. The preliminary EAC value for pyrene (0.1 mg/kg) is significantly exceeded in sediments in highly contaminated estuary regions. For other PAHs, increased concentrations are found in the vicinity of local sources, although EAC values are not significantly exceeded. No significant reductions were evident in PAH concentrations in sediments off the Dutch coast and in the Wadden Sea between 1986 and 1996. In fact, an increase in PAH concentrations was detected at some 40% of monitoring stations in the Wadden Sea (OSPAR, 2000b, p. 70).

Dioxins and Furans

75. Polychlorinated dibenzodioxins and furans are produced as undesired by-products in certain chemical and thermal processes (like chlorine bleaching in the pulp and paper industry, waste combustion, certain metallurgical processes, and the production of pentachlorophenole). Dioxins and furans are highly toxic.

Table 2-9

PAH concentrations in North Sea sediments

Compounds	Concentration in sediment	Region
21 PAHs	0.073–0.37 mg/kg	River Glomma (Norway)
Of which: carcinogenic congeners	0.032–0.11 mg/kg	
Sum of all PAHs	0.218 mg/kg	Wadden Sea
	6.08 mg/kg	Scheldt Estuary
SRU/SR 2004/Tab. 2-9; data source: OSPAR, 2000b, p. 69		

Very few studies are available on sediment and biota contamination from dioxins and furans (WEIGEL, 2003; OSPAR, 2000b, p. 70). In a Norwegian study conducted in 1989, extremely high sediment pollution was measured in Norway's Frierfjord (0.004 to 0.018 mg/kg toxicity equivalent (TEq)) and Kristiansandfjord (0.002 mg/kg TEq). In the Frierfjord, the sampling site was situated near a magnesium works. Even in open seas, some 20 km from the pollution source, BRC values were exceeded by between 5 and 100 fold. On the Dutch coast, the highest concentrations were measured in sediment in the Rhine and the Scheldt estuaries (OSPAR, 2000b, p. 70).

Due to the high sediment concentrations in Norway's fjords, high dioxin and furan concentrations are found in organisms in those regions (Table 2-10). The high levels of pollution have resulted in restrictions on the consumption of seafood in this area (OSPAR, 2000b, pp. 70–71).

'New' Organic Compounds

76. Other PBT substances have been found in the North Sea in recent years. These include short-chained chloroparaffins, nonylphenoles, phthalates, brominated flame retardants and musk xylenes. In the Wadden Sea, these 'new' organic compounds were found in much higher concentrations than, say, PCBs and HCHs (UBA, 2003a). The group of 'new' organic compounds includes pharmaceuticals, because many pharmaceutical agents pass through sewage treatment plants in almost unchanged form and can thus be identified in seawater (e. g. clofibric acid). Some of these new organic compounds are outlined as follows:

– Short-chained chloroparaffins are used as cooling and lubricating fluids in industrial metal processing, as leather grease, as flame retardants in rubber and textiles, and in paints and lacquers for film sets. They are persistent, non-biodegradable, adsorb onto sewage sludge and sediments and are carcinogenic (OSPAR, 2001e). Inputs of short-chained chloroparaffins in the North Sea can only be estimated due to the lack of a systematic monitoring programme for this substance group. High concentrations of short and long-chained chloroparaffins are found in fatty tissue in a variety of marine organisms and in marine mammals in the Arctic. Short-chained chloroparaffins have been found in breast milk in Inuit women in Northern Canada (HELCOM, 2002a).

– Nonylphenol mainly occurs as a by-product in the production of other chemicals (including nonylphenol ethoxylates). Nonylphenol is also a breakdown product of nonylphenol ethoxylates, which have many uses including as detergents in industrial cleaners, as solubilisers in the leather, textile and paper industries, and as additives in plant protection products. Nonylphenol is aquatoxic and accumulates in sewage sludge and sediment (OSPAR, 2001 et seq.). An oestrogenic effect of nonylphenol has been observed in trout at 20,000 ng/l. Other organisms are possibly more sensitive (WEIGEL, 2003). In the past 10 to 20 years, concentrations of nonylphenol have decreased significantly – at least in some areas (OSPAR, 2001 et seq.). However, extremely high concentrations are still found in sediments in the Elbe (107 µg/kg) and in the Scheldt rivers (300 µg/kg) (OSPAR, 2000b, p. 73).

– Brominated flame retardants (polybrominated diphenyl ethers, PBDEs) are added to plastics and textiles to make them highly flame-resistant. Each year, some 70,000 Mg of PBDEs are produced worldwide (UBA, 2003c). PBDEs are found in seawater, sediments and in fish. High PBDE concentrations have also been found in fatty tissue in marine mammals (OSPAR, 2000b, p. 71).

– Nitro-musk compounds like musk xylene and musk ketone, which were used most in earlier times, are now substituted by polycyclic musk compounds due to toxicological concerns (WEIGEL, 2003). They are used as aromatic substances in cosmetics and washing detergents. Samples kept in Germany's Environmental Specimen Bank were found to contain extremely high concentrations of polycyclic musk compounds in some instances (UBA, 2003b).

Table 2-10

Dioxin and Furan concentrations in Norway coastal biota

Year	Region	Biota	Concentration in organism
1993	Frierfjorden	Crab (hepatopancreas)	708 ng TEQ/kg ww
1993	Breviksfjord	Crab (hepatopancreas)	481 ng TEQ/kg ww
1993	Frierfjorden	Soft bottom fauna	312 ng TEQ/kg ww
1993	Breviksfjord	Soft bottom fauna	64 ng TEQ/kg ww
1994	Frierfjorden	Cod (stomach content)	208 ng TEQ/kg ww
ng TEQ/kg ww: nanogram toxicity equivalent per kilogram wet weight			
SRU/SR 2004/Tab. 2-10; data source: OSPAR, 2000b, p. 70–71			

Summary

77. Based on the historic pollutants PCBs, HCHs, TBTs, PAHs and dioxins/furans, it is evident that the marine environment is still contaminated with these persistent, bioaccumulating and toxic substances despite long-standing bans on their use or emissions reduction activities. Pollutant loads that have accumulated over decades and ongoing input of pollutants have resulted in increased concentrations in sediments and marine organisms. River input areas and coastal zones near industrial settlements are particularly affected. Measurements taken in areas at risk showed concentrations of the above cited compounds (with the exception of γ-HCH concentrations in sediments and PAH concentrations in biota) to be in excess of the background value (BRC), and even of the ecotoxicological assessment criteria (EAC) in sediments and biota. In certain areas of Norwegian coastal waters, seafood contains such high PCB and dioxin concentrations that it is no longer deemed fit for human consumption. Despite a ban on their use, polar, less lipophilic plant protection products (like Atrazine, Simazine and Diuron) are still found in relatively high concentrations in seawater. Although there was a significant reduction in concentrations of PCBs and HCHs in biota in the 1980s and the early 1990s, it is notable that since the mid-1990s no downward trend in PCB concentrations in bird eggs has occurred and there has even been a slight increase in HCH concentrations in fish. Inputs of pollutants transported over long distances (e. g. dioxins and other POPs) from regions in which organic pollutants originate or are used are of increased importance. Their remobilisation from sediment could continue for decades (WEIGEL, 2003).

78. The North Sea is also contaminated by inputs of new organic compounds (chloroparaffins, nonylphenol, PBDEs, phthalates, pharmaceuticals), some of which can affect the hormone systems in marine organisms. Up to now, no systematic studies have been conducted on the ecotoxicological effects of most of these substances. Nor is there a programme in place to monitor inputs (Para. 231).

79. To reduce inputs of organic pollutants in the marine environment, a range of recommendations exist on reduction activities for some well-known organic pollutants (Table 2-11).

Table 2-11

Strategies for reducing inputs of organic pollutants

Organic pollutants	Reduction strategies
Short-chain chlorinated paraffins (SCCPs)	Extend the restrictions under Directive 2002/45/EC (so far covering metalworking fluids and leather finishing products) in accordance with a PARCOM Decision requiring the phasing out of SCCPs in further applications
Polybrominated diphenyl ethers (PDEs)	Ban all PDEs (presently only marketing and use of pentabromodiphenyl ether and octabromodiphenyl ether restricted under Directive 2003/11/EC)
Pentachlorophenol (PCP)	Emission limit values for facilities still producing or using PCP, ban imports of products containing PCP to the EU, strategy for cleanup of contaminated sites etc.
Polycyclic aromatic hydrocarbons (PAHs)	Systematically implement existing emission reduction recommendations and monitoring
Dioxins and furans	Systematically implement existing emission reduction recommendations
HCHs (lindane etc.)	Monitoring for lindane plus control and monitoring for other HCH isomers
PCBs	Prevent releases from contaminated land Environmentally safe disposal of PCB capacitors
Musk xylene and other musks	Phase out musk xylene in washing and cleaning agents in the EU (currently only a voluntary industry commitment in Germany)
Tributyl tin (TBT)	Ratify the IMO Convention (banning use in ship paints from 2003)
DDT	Prevent releases from contaminated land
SRU/SR 2004/Tab. 2-11; data sources: OSPAR, 2000e, d; 2001c, d, e, g, h, j; 2002d; NSC, 2002a	

2.1.3.3 Oil Inputs

80. Oils and their components can damage marine ecosystems and their organisms in a variety of ways. Apart from external oiling of seabirds (particularly prevalent following oil tanker accidents), petroleum-derived substances and their oxidation products have a range of toxic effects. Oil comprises a range of substances (crude oil contains up to 10,000 different substances), the largest share of which comprises hydrocarbons. Then there are sulphur, heavy metals, phenols and organic acids. The effects of petroleum-derived components on organisms are equally as varied as the number of different components.

81. While estimates on oil inputs into the North Sea remain vague, it can be assumed that the main sources and pathways comprise rivers, wastewater discharge into coastal waters, drilling platforms, illegal discharges from shipping and shipping accidents.

Table 2-12

Main sources of oil released into the North Sea

Sources	Quantity [1 000 Mg/a]
Natural sources	1
Atmosphere	7–15
Rivers	16–46
Coastal waste water	3–15
Industrial discharges (coastal)	5–15
Drilling platforms	29
Refineries (coastal)	4
Oil ports	1
Shipping (operational)	1–2
Shipping (illegal discharges/accidents)	15–60
Sewage sludge	1–10
Dredging	2–10
Total	**86–210**

Sources: OSPAR, 1993, 2000a

82. The impact of oil extraction activities stems largely from drilling waste distributed over the sea bed in the immediate vicinity of oil drilling platforms, and from the release of oil components which can lead to the total destruction of organisms living on the sea bed (van BERNEM, 2003). A reduction in species numbers can be detected within a radius of 1,000 m and, at a distance of between 3 to 5 km, there is evidence of a growth in the number of opportunists parallel to a decline in the number of sensitive species (GRAY et al., 1999). The total area affected by drilling mud makes up approximately 1% of the sea bed in the North Sea.

83. Illegal discharges of inferior quality bunker oils and tank-wash water are the main sources of concentrated oily residues and slicks on the surface of the water in the North Sea (REINEKING and FLEET, 2003). In addition to concentrations of oil pollutants of this type, the most visible impact of such concentrated oil contamination involves seabirds living on the ocean surface who suffer external oiling of their feathers and fatal poisoning from swallowing oily water and oil-coated food. Since 1984, systematic swash zone studies have been conducted on the corpses of oil-covered seabirds. The occurrence of oiled seabirds serve as an indicator, especially as regards chronic oil pollution. Although a general reduction in the numbers of oiled birds was observed during the period 1984 to 2001, the number of oilings involving high-sea species (e. g. the common guillemot) and marine ducks remains extremely high (REINEKING and FLEET, 2003).

The entry into force of the designation of North West European waters (including the North Sea) as a Specially Protected Area under MARPOL 73/78 (Annex I), the introduction of a ban on oil tankers discharging oily mixtures from tank-wash waters, and restrictions on the disposal of oily residues from fuel processing have effected a strong reduction in the discharge of oily residues. Nevertheless, pollution levels measured along the main shipping routes still show considerable quantities of illegally discharged oil out at sea (Figure 2-8).

84. Oil tanker accidents, which result in the release of large quantities of oil, still occur at irregular intervals and often cause serious localised damage to the marine environment. Over the past decade, three such accidents (‘Braer’, 1993; ‘Sea Empress’, 1996; ‘Erika’, 1999) have resulted in some 170,000 Mg of oil being discharged into the North Sea and nearby marine areas (van BERNEM, 2003). The impact of such intermittent discharges on flora and fauna depends on the nature of the oil, the type of coast it drifts towards and the communities and organisms involved. Thus, the release of a mere 245 m^3 of fuel oil in the sinking of the Pallas, a timber freighter, caused the death of an estimated 16,000 individuals from 35 bird species (REINEKING and FLEET, 2003). This involved 11% and 18% respectively of the entire stocks of eider and black (common) scoter ducks in the North Sea.

85. The impacts from wide-ranging oil contamination in coastal regions vary greatly depending on the different communities of organisms (van BERNEM, 2003). Exposed rocky coasts appear less sensitive due to the low persistence of oils and the rapid repopulation of habitats. Only few larger macrobenthic organisms inhabit wave-exposed sandy beaches because of the constant shifting of sediment. These beaches are, however, home to a rich diversity of sensitive fauna with many types of tiny sediment-inhabiting organisms (meiofauna). Such coastal areas are usually seen as marginally sensitive to oil contamination. In contrast, the Wadden Sea coasts which are largely softbed and flats, are highly sensitive to such pollutant

Figure 2-8

Oil spillages observed in the North Sea and Baltic in 2001

Source: Bonn Agreement, 2001

inputs. The fine-grained sand and shingle sediments are characterised by a comparably low diversity and extremely high productivity (for more on the characteristics of the Wadden Sea see Section 2.2.1.1). Rapid repopulation is hindered by the long residence time of oil in fine sediments. Broad oil contamination of softbeds after a tanker accident can means long-term and serious damage to communities and could have significant impacts on nearby marine areas.

86. As the sinking of the 'Prestige' and its outcomes have shown, not only the marine environment but all affected coastal regions are endangered. It is impossible to fully estimate the economic impact from the partial collapse of coastal fisheries, the destruction of aquacultures and the negative impact on tourism in the regions affected by oil washed up onto the shore of the Spanish coast. There can be no doubt, however, that all available means must be used to prevent environmental disasters of this type (see Section 3.4.3).

87. In sum, it is evident that the North Sea will continue to be contaminated by inputs of oil and its components. It remains extremely difficult to obtain information on diffuse sources and especially on inputs from rivers. Nevertheless, despite increasing production, the application of new technologies has effected a reduction in the discharge of oil from oil extraction in recent years. Be that as it may, around 1% of the sea bed in the North Sea remains contaminated by drilling muds.

Although a reduction in oil pollution has been registered, chronic oil pollution from shipping is still a problem. Illegal discharges of oily residues from fuel preparation and tank-wash water continue to be the main source of such pollution.

The risk of large quantities of oil being released in a shipping accident is likely to increase with the growth in sea traffic. If large areas of the Wadden Sea were affected by an accident of this type, the outcomes would be disastrous.

2.1.3.4 Radioactive Substances

88. Anthropogenic radioactive substances have been detected throughout the North Sea region. These key sources of radionuclide emissions comprise:

- Fallout from atomic weapons testing, especially from tests conducted in the 1950s and 1960s.
- Leaching from nuclear reprocessing plants in La Hague (France, English Channel) and Sellafield (west coast of Britain, Irish Sea) (NIES, 2003). The prevailing ocean currents transport radionuclide inputs from the Irish Sea and the English Channel into the North Sea. It takes about one to two years before radionuclides from the Irish Sea can be detected off the Scottish coast in the North Sea, while inputs from La Hague reach the North Sea in a matter of months.
- Inputs from other nuclear facilities.
- Incident-related discharge of radioactivity (e. g. Chernobyl) and the loss of radiation sources from ships and platforms.

The first two sources are responsible for most pollution from anthropogenically discharged radionuclides in the North Sea (OSPAR, 2000a). In Germany, inputs from nuclear facilities like nuclear power plants are so low that they are no longer detectable in significant concentrations in the German Bight (NIES, 2003). Fallout from Chernobyl, which largely comprised short-lived radionuclides (those with a short halflife), is no longer detectable in the North Sea.

89. As Table 2-13 shows, there has been a steady reduction in inputs from nuclear facilities throughout the OSPAR region in recent years (OSPAR, 2003a). The decline is particularly evident as regards alpha sources. An increase in the radionuclides tritium and technetium (Tc-99) is evident from the mid-1990s, however, the reason being the increase in inputs of tritium from La Hague and of Tc-99 from Sellafield. The latter radionuclide is particularly worthy of note due to its extremely long halflife of approximately 200,000 years, its water solubility and accumulative characteristics. Tc-99 was measured in a range of different marine organisms on the Norwegian coast: A concentration factor of 8,000 was found in lobsters' claw muscles and of 486 in mussels (BROWN et al., 1999). By way of contrast, bioaccumulation in fish is significantly lower with a concentration factor of 30. However, despite the inherent characteristics of Tc-99 no notable exposure to radiation could be detected in marine organisms (BROWN et al., 1999; NIES et al., 2000; KARCHER, 2002).

90. In terms of dose, caesium 137 (Cs-137) is the most prominent artificial radionuclide in the marine environment (NIES et al., 2000). The dose factor for Cs-137 is some 300 times higher than for Tc-99. Inputs of this nuclide have significantly reduced in recent years. For example, close to 5,000 TBq/year were input from Sellafield in 1973, and only 9.6 TBq/year in 2001. While at the end of the 1970s, activity concentrations of Cs-137 measured on the east coast of Britain still exceeded 500 Bq/m³, concentrations now lie around a maximum 6 to 7 Bq/m³ (NIES, 2003). At 2 Bq/m³, concentrations in the waters off La Hague are only marginally above those measured in surface waters in the Atlantic after surface-to-air atomic weapons testing in 1960s. Concentrations of Cs-137 in the English Channel lie between 2 and 3 Bq/m³. Similar low concentrations were measured for Sr-90. The main source of Cs-137 in the North Sea today is remobilisation from sediments in the Irish Sea that are highly contaminated from earlier inputs.

The reduction in discharged activity concentrations is mirrored in concentrations measured in biota. Cs concentrations in cod from the central North Sea have dropped from over 15 Bq/kg (1982) to under 1 Bq/kg (1999) (KANISCH, 2000).

91. A limited accumulation of polonium 210 (Po-210) is contained in sea creatures in the vicinity of wastewater

Table 2-13

OSPAR statistics on liquid discharges of radioactive substances from nuclear installations

Year	Total alpha (TBq/a)*	Total beta (excluding tritium) (TBq/a)*	Tritium (TBq/a)*
1993	2.88	354	10 806
1994	1.36	321	12 931
1995	0.68	365	15 040
1996	0.57	332	16 779
1997	0.38	315	17 991
1998	0.43	265	16 240
1999	0.42	256	18 871
2000	0.33	171	16 548
2001	0.41	231	15 759

* TBq/a = 10^{12} Bq/a

Source: After OSPAR, 2003a

discharges from the phosphoric acid and fertiliser industries in the Scheldt delta (OSPAR, 2000b), where the wastewater and waste is contaminated with uranium, radium and polonium. In recent years, however, emissions have significantly reduced due to the ongoing decline in phosphate production in Europe and the relocation of residue disposal to landfills.

92. Overall, there has been a reduction in pollution from artificial radionuclides in the North Sea. The reason is the decline in inputs from nuclear reprocessing plants in La Hague and Sellafield. Nevertheless, the two facilities remain the most dominant source of artificial radionuclides in the North Sea (apart from above-ground atomic weapons testing). These facilities have also discharged high levels of tritium and Tc-99 into the marine environment in recent years. Concentrations of radionuclides in marine organisms can significantly exceed natural background contamination in the vicinity of both these input sources. The potential for additional radiation exposure for people who eat seafood is usually well below the threshold of 1 mSv/a recommended by the International Commission on Radiological Protection (OSPAR, 2000b). Thus, consumption of seafood from the North Sea does not pose a significant risk of radiation exposure for humans. Similarly, no serious risk of radiation exposure from artificial radionuclides can be identified for marine organisms.

2.1.4 Nutrient Inputs and Eutrophication

93. The high levels of pollution in the North Sea caused by anthropogenic nutrient inputs and resulting 'eutrophication effects' pose a serious problem. Of particular importance are the inputs of nitrogen and phosphorus compounds (especially nitrates, ammonium and phosphates). The high availability of these nutrients can have a negative impact on the status of the aquatic ecosystem. A significant effect of eutrophication is the change in growth conditions for phytoplankton. The development of phytoplankton in the German Bight is largely influenced by sunlight and the availability of nutrients. Great quantities of nutrients result both in increased phytoplankton growth and changes in species composition.

The latter effect can stem from the differing competitive abilities of the various species when confronted with an increased availability of nutrients, and it can also be caused by changing ratios of the limiting nutrients nitrogen and phosphorus. Since the 1980s, the proportion of diatoms in phytoplankton has reduced while the proportion of flagellates has increased (ICES; 2003, p. 18; see also CARSTENS et al., 2003, p. 343 et seq.). While the mass occurrence of microalgae (algal blooms) is part of the natural processes that take place in the North Sea, excessive algal blooms can have a harmful impact. The part of the phytoplankton that are not eaten by zooplankton sink to the sea bed, where their decomposition involves oxygen-depleting processes. Large quantities of biomass on the sea bed can thus lead to oxygen deficiency at that depth. Regularly observed in the German Bight since the 1980s, this phenomenon is still fostered by the occurring stratification of algae carpets and the relatively long residence times of the water masses. Both reduce the supply of oxygen to the sea bed. This can cause the death of benthic organisms and fish (BEUSEKOM et al., 2003,

p. 185 et seq.). Additionally, anoxic conditions on the sea bed can also influence the presence of nutrients. Oxygen deficiency on the sea bed results in the release of phosphate contained in the sediment and contributes to further eutrophication.

Toxic algal blooms can cause problems for the marine environment and for economic activities like fisheries, mariculture and tourism. To date, no widespread presence of toxic algae has occurred in the areas around the German Bight and the Wadden Sea (BEUSEKOM et al., 2003, p. 182).

94. To secure a functional ecosystem for species stocks over time, the nutrients in the North Sea must be kept at a level that precludes excessive bacteria and algae growth and guarantees sufficient oxygen levels in the water. OSPAR signatory states agreed quality targets for the North Sea in 1998 (Para. 325). It is expected that the aimed-for 50% reduction in nutrient inputs in the North Sea is insufficient to achieve the quality targets. However, further studies are needed in order to assess the impact of reduction activities (NSC, 2002a, p. 121 et seq.). Based on ecosystem modelling, it is currently thought that a 50% reduction of riverine inputs into the North Sea will effect a maximum reduction in nutrient concentrations of nitrogen and phosphorus in the sea of between 25 and 30%. For the parameter chlorophyll, the reduction impact would be between 25 and 30%, and around 30% for annual primary production (CARSTENS et al., 2003, p. 345 et seq.).

To combat eutrophication in the North Sea, average concentrations of 0.15 mg/l for total phosphorus and between 0.6 and 1.8 mg/l for total nitrogen must be aimed for in the waters that enter the North Sea via Germany's largest rivers (CARSTENS et al., 2003, p. 343; thresholds taken from Heinis et al., extrapolated for the Rhine). These thresholds cannot be achieved despite the reductions already attained. Since the mid-1990s, average total phosphorus concentrations in the Elbe have been reduced from 0.31 mg/l per year in 1988 to 0.23 mg/l. Average nitrogen concentrations in the Elbe in the mid-1990s were approximately 5 mg/l (CARSTENS et al., 2003, p. 342 et seq.), between three and eight times higher than the set threshold. In the case of the Wadden Sea, a reduction in riverine inputs alone is not thought sufficient. Rather, atmospheric nitrogen depositions must be reduced to natural background values as well (BEUSEKOM et al., 2001).

2.1.4.1 Eutrophication in the Wadden Sea

95. The impacts of eutrophication in the Wadden Sea are far more serious than in the open North Sea. Some impacts, like 'black water' and 'red tides', are readily visible (see below). While large quantities of nutrients enter the Wadden Sea via rivers, sluices, direct discharges and the atmosphere, high concentrations of suspended particles limit the growth of phytoplankton in the Wadden Sea region. The mass growth occurs to a large extent in the open North Sea. Large amounts of phytoplankton are carried back to the Wadden Sea on the tides, something that previously led to an increase in eutrophication by a factor of 2 to 3. For this reason, the OSPAR Commission has classified the inner German Bight, including the Wadden Sea, as a problem area with regard to eutrophication under the 'Common Procedure' (Para. 326). The following eutrophication effects result from an excessive presence of organic matter (BEUSEKOM et al., 2003, p. 188 et seq.):

– Highly visible mass accumulation of microplankton organisms are the foam formation in coastal regions which are results of (extended) blooms in foam algae (*Phaeocystis globosa*) and the red tides caused by *Noctiluca scintillans*, a large bioluminescent dinoflagellate (HANSLIK, 1999, p. 44).

– In the case of macroalgae, the observation can be made that green algae rapidly spread at the expense of brown and red algae. This caused a broad algal carpet in the Wadden Sea off the coast of Lower Saxony in the summer months between 1989 and 1992 (KOLBE, 1999, p. 48; REISE, 2003, p. 197 et seq.).

– Black waters – reduced and black-tainted areas of the sediment surface – occur when high nutrient and biomass inputs lead to a build-up of organic matter for which the oxygen supply is insufficient for decomposition (BÖTTCHER, 2003, p. 193 et seq.; SRU, 2000, Para. 629).

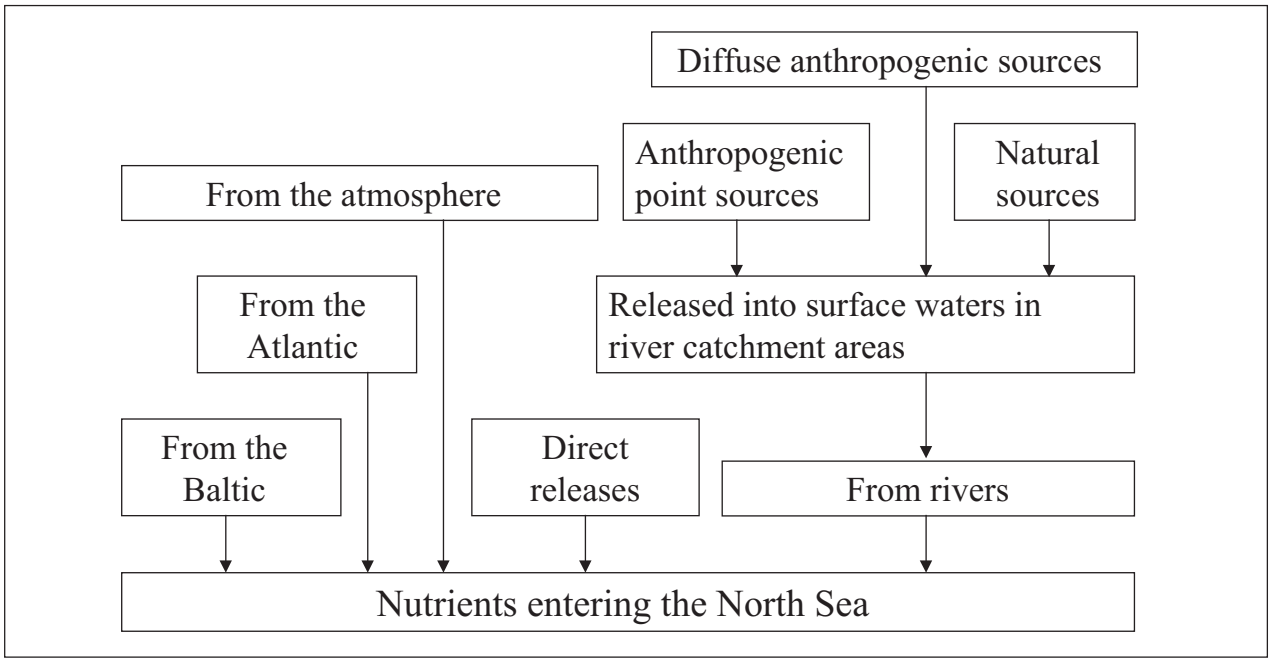
– The significant reduction of eelgrass meadows off the coast of Lower Saxony: from the early 1970s up to the mid-1990s, the area of unbroken eelgrass meadow decreased from 35.5 km² to one of 8.2 km². A reduction in eelgrasses, the only flowering plants in the Wadden Sea outside the intertidal zone, means the loss of a unique habitat and feeding ground for a number of bird species like the brant (*Branta bernicla*) (KASTLER, 1999, p. 50).

2.1.4.2 Nutrient Inputs: Sources and Trends

96. Nutrients find their way into the North Sea in a number of ways. The largest proportion are non-anthropogenic inputs from the Atlantic, although large quantities of nutrients from the northern North Sea are transported back into the Atlantic and do not reach the southern, flatter areas of the North Sea. The overall balance between inflow and outflow of nitrogen and phosphorus is about equal (BROCKMANN et al., 2003, p. 72 et seq.). All other nutrient inputs stem from sources that are heavily influenced by human activity. Of key importance are inputs from rivers in the catchment area of the North Sea, from the atmosphere and from direct discharges. Inputs from the Baltic Sea play only a marginal role. The fact that anthropogenic inputs make up only a small proportion of the total quantities in the North Sea should not, however, be taken as a sign to sound the 'all clear' because the conditions vary greatly from region to region. In coastal areas in particular, anthropogenic inputs result in high nutrient concentrations that have the eutrophication effect described above. Figure 2-9 shows the different paths along which nutrients are discharged into the North Sea. This is followed by a closer look at inputs from rivers, the atmosphere and direct discharges.

Figure 2-9

Main nutrient input pathways into the North Sea



SRU/SR 2004/Fig. 2-9

97. For some nutrient input paths, like direct discharges from coastal areas, the inputs are relatively easy to monitor and regulate. Huge problems occur, however, with nutrients that stem from what are known as diffuse sources and which are subject to a range of natural processes before they reach the North Sea. For example, the nutrients used in agriculture seep into groundwater, collect in surface waters, flow into rivers and then into the sea. This makes it extremely difficult to identify agriculture's contribution to the total nutrient load in river estuaries (BROCKMANN et al., 2003, p. 62 et seq.). Focusing on nutrient concentrations and loads in rivers would thus exacerbate assessment and the making of subsequent recommendations. Effective regulation of nutrient inputs must take account of their origins. Two approaches are taken in identifying anthropogenic nutrient inputs from rivers. The load-oriented approach serves to quantify nutrient concentrations in river estuaries and also takes account of direct discharges into the sea. The source-oriented approach is used to differentiate between diffuse sources and point sources, and to identify inputs from individual polluters. The second approach allows definitive conclusions to be drawn regarding the action needed to reduce nutrient inputs. The following is an outline of input paths and trends for nitrogen and phosphorus.

Nitrogen

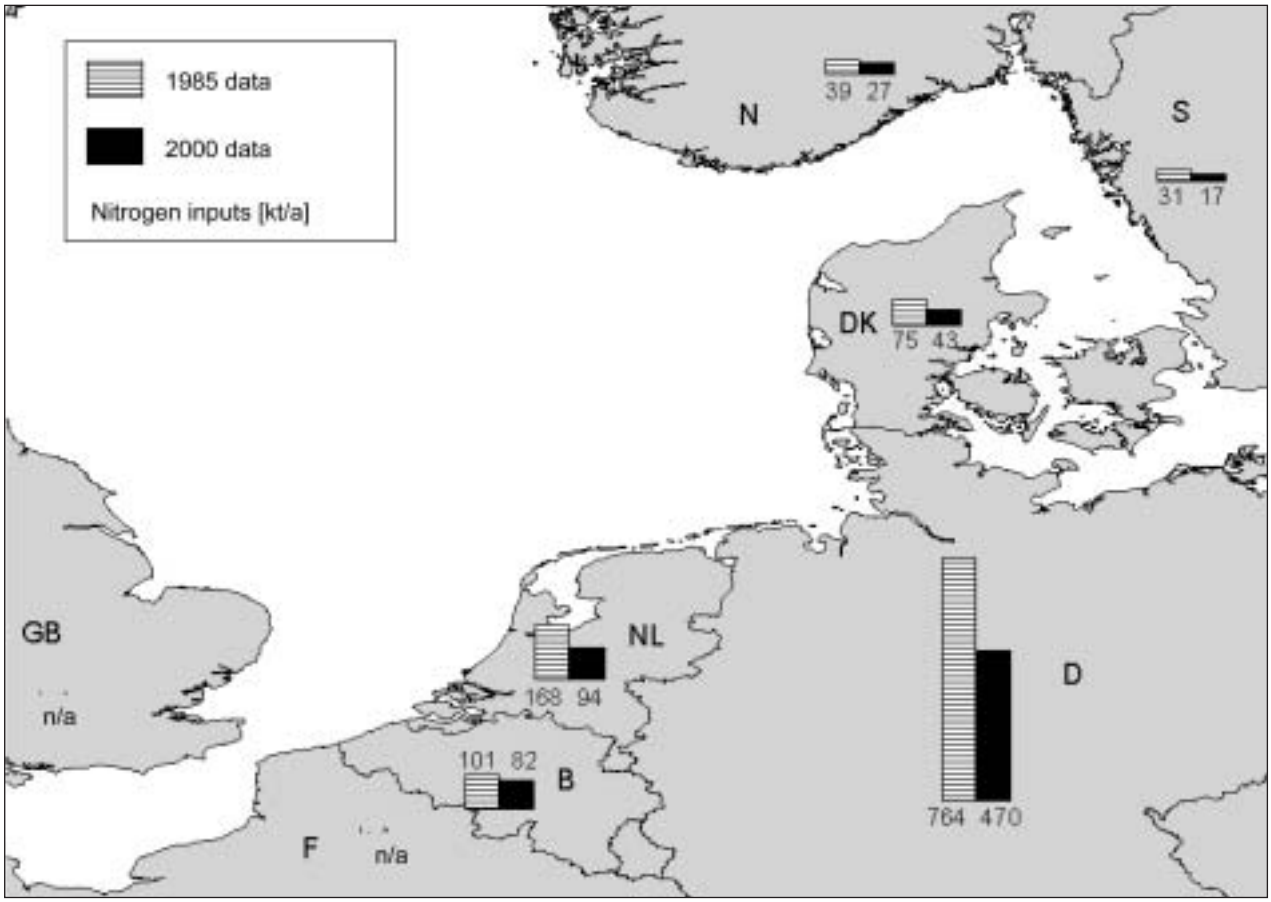
98. Inputs from rivers make up the greatest share of total nitrogen inputs followed by atmospheric inputs and direct discharges. The ratio between the inputs for the sources named is around 10 : 3 : 1 (OSPAR, 2000b, p. 81 et seq.). The high nitrogen loads in the rivers in the German catchment area of the North Sea stem largely from diffuse inputs from agriculture (underground and above-ground run-off from agricultural areas) and inputs from municipal wastewater treatment plants (Table 2-13). Atmospheric nitrogen inputs originate for the most part, and in about equal proportions, from traffic, from household and industrial incineration facilities, and from agriculture (animal husbandry and fertilisers) (BROCKMANN et al., 2003, p. 66).

99. A comparison of all the states in the North Sea catchment area highlights Germany's large share of nitrogen inputs (Figure 2.10). Although inputs in surface waters were reduced by all states between 1985 and 2000, reductions remained (sometimes significantly) below 50%. The lowest reductions occurred in Belgium and Switzerland (19% and 16% respectively), while the highest were achieved in Sweden and the Netherlands with 44% each. One reason for this relatively low overall reduction is that in many cases, only slight reductions have been achieved in inputs from agriculture (NSC, 2002a, p. 125).

100. As regards trends in anthropogenic nitrogen inputs in surface waters in the German catchment area of the North Sea, the various data sources all show the same, clear trend. According to data submitted in 1998 and published by the OSPAR Commission in 2001 (OSPAR,

Figure 2-10

Nitrogen inputs in surface waters draining into problem areas regarding eutrophication, for selected North Sea States (1985/2000)



SRU/SR 2004/Fig. 2-10; data source: NSC, 2002a, p. 125–129

2001, p. 17), nitrogen inputs were reduced by 26% between 1985 and 1995. Data published by the North Sea Conference showed that by 2000, inputs had reduced by a further 12%, making an overall reduction of 38%. While the quantitatively important diffuse inputs from agriculture declined by only 16% by 2000, significant reductions in municipal and industrial wastewater treatment were reported (51% and 79%) (Table 2-14). Great potential for further emissions reductions is seen for diffuse inputs from agriculture (see below). Further reductions could be achieved through the use of new technologies in wastewater treatment – especially in large facilities (Section 3.3.3.5).

A continuous downward trend is evident for nitrogen inputs entering the North Sea by direct discharge. While approximately 105,000 Mg of nitrogen had been discharged directly into the North Sea in 1990, the volume in 1996 was only 75,000 Mg – almost a 30% reduction. In contrast, no clear trend was evident for inputs from rivers (including natural nutrient loads) and atmospheric deposition in the same period. While inputs from rivers – in strong correlation with river water flow – fluctuated between 800,000 Mg and 1,400,000 Mg per year, inputs from atmospheric deposition remained relatively constant at 350,000 Mg per year (OSPAR, 2000, p. 81 et seq.).

101. When interpreting data on riverine inputs into the North Sea, consideration must be given to the fact that reductions achieved in diffuse nitrogen inputs will, to a certain extent, be delayed due to the sometimes considerable retention times in seepage and groundwater. According to BEHRENDT et al. (2000, p. 15 et seq.), average retention times can be expected of 10 years in the Rhine catchment area, 20 years in the Weser and Ems catchment area, and 30 years in the Elbe catchment area. It can thus be assumed that, even if new inputs of nitrogen fertiliser are reduced, considerable quantities of nitrogen will find their way into rivers because of the nitrogen excesses that built up in groundwater in the past.

Table 2-14

Anthropogenic nitrogen inputs in German surface waters draining into the North Sea, and reductions attained (1985/2000)

Emission source	1985		2000		
	Quantity (Mg)	**Share**	**Quantity (Mg)**	**Share**	**Reduction**
Diffuse losses (agriculture)	364 200	*48%*	304 300	*65%*	*16%*
Municipal sewage works	245 500	*32%*	119 700	*25%*	*51%*
Household direct discharges	31 800	*4%*	20 700	*4%*	*35%*
Industry direct discharges	122 200	*16%*	25 100	*5%*	*79%*
Total inputs	**763 700**	***100%***	**469 800**	***100%***	***38%***
SRU/SR 2004/Tab. 2-13; data source: NSC, 2002a, p. 125–129					

Phosphorus

102. The greatest pressures come from the input of phosphorus loads transported by rivers that flow into the North Sea. While these loads were reduced between 1985 and 2000, they still make up between 80% and 85% of the total anthropogenic phosphorus inputs in the North Sea. Figure 2-11 gives an overview of phosphorus inputs in surface waters in the various OSPAR states. The remaining 15 to 20% of inputs in the North Sea stem from direct discharges (OSPAR, 2000, p. 82). Atmospheric inputs of phosphorus are, by way of contrast, so low that they have not been included in NSC and OSPAR status assessments.

103. The quantities of phosphorus transported into the North Sea from Germany's rivers are mostly from agriculture and municipal wastewater (Table 2-15). During the period 1985 to 2000, a significant reduction was achieved in total inputs of 66%. This is largely the result of improvements in collection and treatment of municipal wastewater. Considerable reductions were also achieved in direct discharges of phosphorus from industry. Placement on the market of phosphate-free detergents also contributed to the reduction in inputs. Conversely, quantities of phosphorus discharged into rivers from diffuse sources remained almost steady between 1985 and 2000. Overuse of phosphorus fertiliser in many agricultural areas has caused the accumulation of large excesses of non-dissolving phosphorus compounds in top soil. It can be assumed that even a significant reduction in the use of phosphorus fertiliser will take a long time to produce notable reductions in inputs in surface water. In the meantime, erosion and drainage continue to transport large quantities of accumulated phosphorus compounds from the soil into surface waters. Erosion prevention measures would be needed to slow this process down (AUERSWALD, 1997). The creation of wider unfarmed strips beside waters would also contribute to reducing inputs of phosphorus and nitrogen.

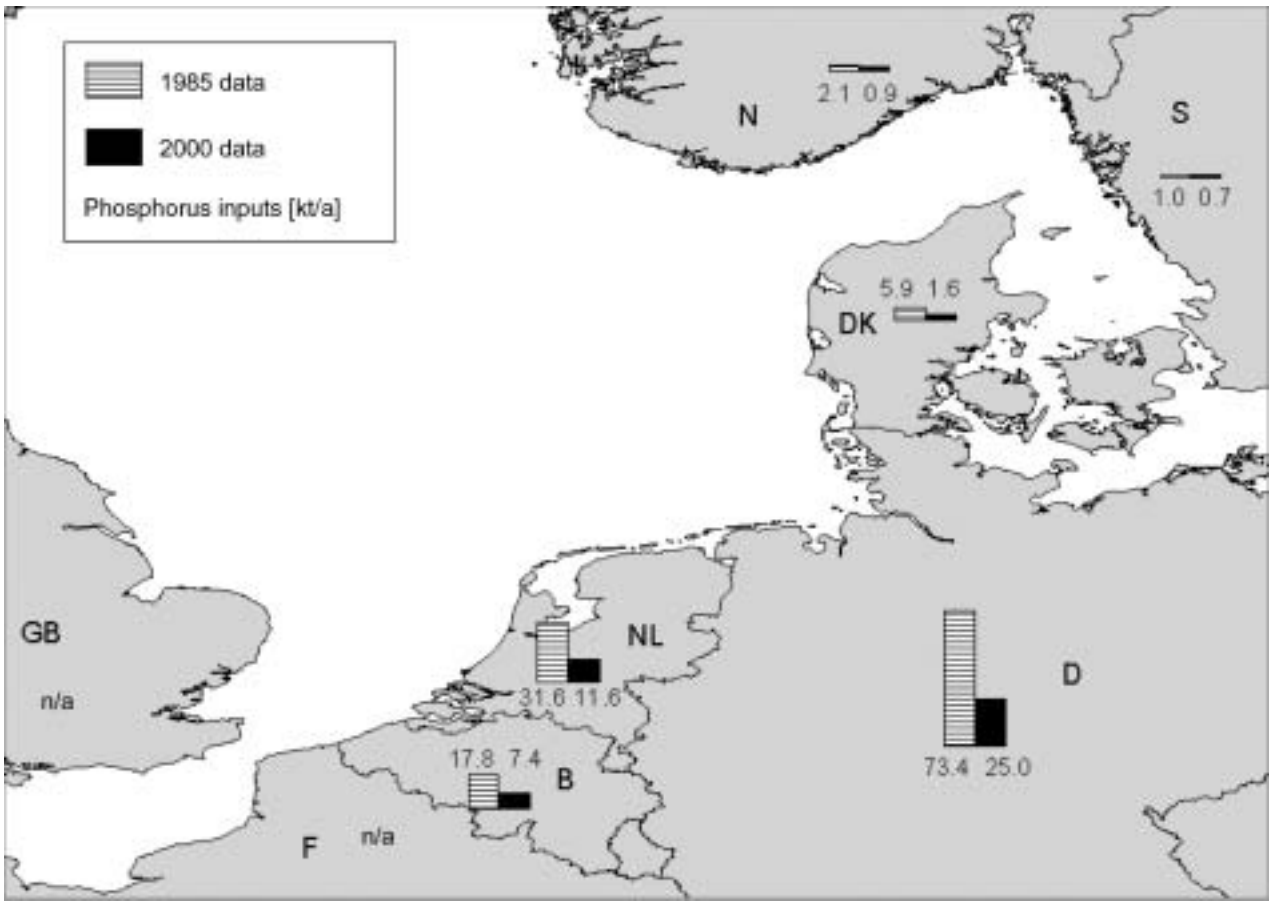
Table 2-15

Anthropogenic phosphorus inputs in German surface waters draining into the North Sea, and reductions attained (1985/2000)

Emission source	1985		2000		
	Quantity (Mg)	**Share**	**Quantity (Mg)**	**Share**	**Reduction**
Diffuse losses (agriculture)	13 507	*18%*	12 943	*52%*	*4%*
Municipal sewage works	46 858	*64%*	8 139	*33%*	*83%*
Household direct discharges	6 854	*9%*	2 832	*11%*	*59%*
Industry direct discharges	6 146	*8%*	1 104	*4%*	*82%*
Total inputs	**73 365**	***100%***	**25 018**	***100%***	***66%***
SRU/SR 2004/Tab. 2-14; data source: NSC, 2002a, p. 125–129					

Figure 2-11

Phosphorus inputs in surface waters draining into problem areas regarding eutrophication, for selected North Sea States (1985/2000)



SRU/SR 2004/Fig. 2-11; data source: NSC, 2002a, p. 125–129

Summary

104. The reductions achieved in nitrogen and phosphorus emissions have largely occurred in point inputs. Emissions from point sources involving direct discharges from industry and municipal wastewater management have dramatically reduced since the mid-1980s (approximately 80% for phosphorus and 60% for nitrogen between 1985 and 2000). In contrast, there was hardly any reduction in diffuse inputs during the same period. Pollution of the North Sea with nutrients is largely a result of the use of fertilisers in agriculture. Nitrogen compounds and phosphates from agriculture either flow through the rivers into the sea or are transported to the sea over great distances by the atmosphere. In addition to agriculture, transport is a key source of nitrogen inputs (see Section 3.3.3.7). Comparatively weak reductions are evident for inputs from diffuse sources in agriculture and traffic (16% for nitrogen and 4% for phosphorus from agriculture between 1985 and 2000).

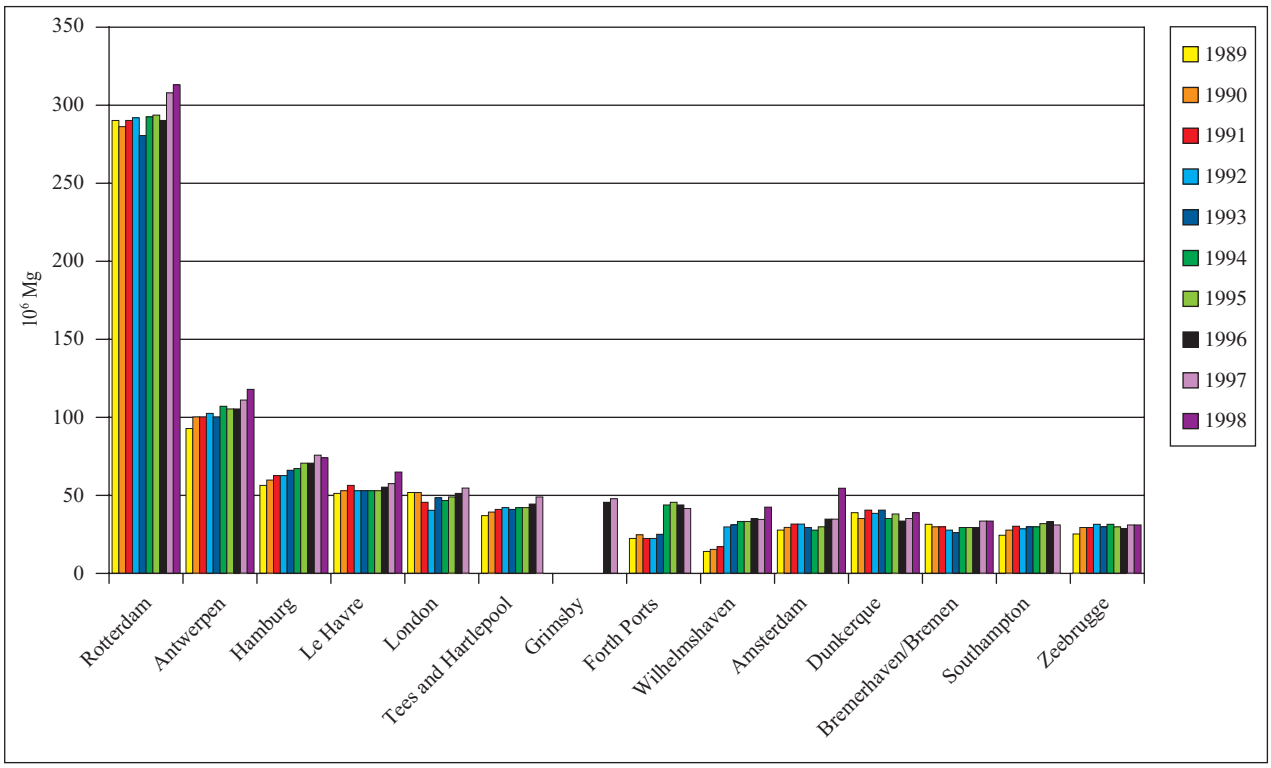
2.1.5 Environmental Risks and Pressures from Shipping

105. Shipping routes in the North Sea, particularly in the German Bight and the Straights of Dover, are some of the busiest in the world. Some 270,000 ships sailed into the key harbours in the North Sea and the English Channel in 1996 (OSPAR; 2000b). Note, however, that a steady increase in shipping traffic is evident and can be expected in the future. The world's total merchant fleet expanded during the period 1990 to 2000 from a gross tonnage of approximately 426 to 558 million – a growth of 31% (BSH, 2003c). Similarly, the oil tanker fleet increased from 232 million TDW (tons deadweight) at the beginning of 1989 to 305 million TDW in early 2003. Also worthy of note is the fact that the average age of the tanker fleet has increased – for example, from 17.5 years in early 1999 to 18.3 years in early 2003 (ISL, 2003; VSM, 2003).

The ongoing increase in shipping traffic is mirrored in the upward trends in cargo handling in North Sea harbours in recent years (Figure 2-12).

Figure 2-12

Shipments (10^6 Mg) in North Sea ports from 1989 to 1998



Source: After OSPAR, 2000b

106. The North Sea is subject to a wide range of risks and pressures from shipping and these are expected to grow with the increase in commercial shipping traffic. The problems of oil inputs from shipping operations, illegal discharges and shipping accidents were covered in Section 2.1.3.3 (Para. 80 et seq.), where it was shown that chronic oil contamination from shipping remains a problem despite reductions in illegal discharges of oil. An increase in shipping traffic means greater risk of large quantities of oil being released in shipping accidents. Other factors that add to this risk include the increasing age of the oil tanker fleet and the construction of offshore wind farms in the North Sea (Section 2.5.3).

Two particularly pressing problems – atmospheric emissions from ships and transportation of non-indigenous species in ballast water – are outlined below. Other pressures occur from (plastic) waste, the discharge of wastewaters from, for example, medical and kitchen facilities, and the input of pollutants like TBT from ships' paint (Para. 71). Plastic waste leads to contamination of beaches and threatens organisms if they become entangled in or swallow plastic. Wastewater from ships can, among other things, cause eutrophication.

2.1.5.1 Atmospheric Emissions

107. Airborne pollutants in the form of gases and particles that are released into the air by shipping have a harmful impact on the ecosystem, organisms and the atmosphere. Of key importance in marine environment protection are high sulphur dioxide (SO_2) and nitrogen oxide (NO_x) emissions that result in acidification and eutrophication of the oceans. While no data is available on actual quantities, it is thought that significant quantities of heavy metals are emitted by shipping (BARTNICKI et al., 2003).

A large proportion of these emissions are released near the coast. It has been calculated that in the North Sea, around 90% of SO_2 and NO_x emissions from shipping come from a zone no more than 90 km from the coastline.

108. Heavy oil or bunker oil (a waste product from oil refining processes) is used in ships' motors for economic reasons. These oils have a high sulphur content of around 3%, which means that the gases they give off contain high quantities of sulphur. In Europe, 2.6 million Mg SO_2 and 3.6 million Mg NO_x were emitted by shipping in 2000 (Table 2-16; EEB et al., 2003; there are no specific figures for the North Sea). Because more stringent requirements have led to a reduction in emissions from land-based sources, the proportion of airborne pollutants from shipping is steadily increasing. Around 30% of SO_2 emissions and around 27% of NO_x emissions in Europe stem from shipping. These proportions will increase further following implementation of further environment

policy regulations for land-based sources (e. g. NEC Directive, Section 3.4.3.2) and the further increase of ship-based emissions with the expected growth in commercial shipping traffic (Table 2-15).

109. A large proportion of pollutants are emitted over the sea and then re-emitted through deposition. As shown in Table 2-17, SO_2 and NO_x emissions from shipping now make a significant contribution to land-based acid deposition. In some European countries, shipping is now the dominant single source of pollution-related acidification on land.

Pollution from these sources is significantly higher in areas with a particularly high incidence of shipping traffic, like highly populated coastal zones and harbours. In Hamburg, for example, some 80% of SO_2 emissions come from shipping (Umweltbehörde Hamburg, 1999).

Through its inputs of sulphur dioxide and nitrogen compounds in the atmosphere, shipping has made a considerable contribution to acidification and eutrophication of the oceans. The most severely affected areas are the already heavily polluted coastal regions.

Table 2-16

Emissions of sulphur dioxide (SO_2) and nitrogen oxides (NO_x) from land-based sources and shipping in 1990, 2000 and 2010 (projected)

	SO_2 [1 000 Mg]		NO_x [1 000 Mg]	
	Land-based	**Shipping**	**Land-based**	**Shipping**
1990	16 363	2 001	13 389	2 808
2000	5 750	2 578	9 497	3 617
2010	3 850[a]	2 845[b]	6 519[a]	4 015[b]

[a] Projection according to the NEC directive
[b] Assuming 1.5 % per annum growth

Source: EEB et al., 2003

Table 2-17

Countries where shipping accounts for a significant share of total land deposition of sulphur dioxide (SO_2) and nitrogen oxides (NO_x)

SO_2		NO_x	
Malta	*16%*	Malta	*38%*
Denmark	*15%*	Cyprus	*24%*
Netherlands	*13%*	**Denmark**	*20%*
Sweden	*13%*	Estonia	*17%*
Cyprus	*10%*	**Sweden**	*16%*
Norway	*9%*	Greece	*15%*
Belgium	*9%*	Portugal	*14%*
Estonia	*9%*	**Netherlands**	*13%*
Portugal	*9%*	Finland	*13%*
France	*8%*	Eire	*12%*

Source: After JONSON et al., 2000

2.1.5.2 Introduction of Non-Indigenous Species

110. The North Sea is home to a specific species spectrum (Section 2.1.7). The species and stock composition of an open marine system is always subject to natural dynamics. This allows mass growth of a single species to occur and organisms to disappear on either a temporary or permanent basis. Humans intervene in these processes by transporting non-indigenous species beyond geographic borders, sometimes over great distances. As predators, competitors, parasites or pathogens, non-indigenous species can harm native species and can even displace them entirely. Overstepping the physical barriers that separate communities from one another carries the risk of homogenisation of species composition in habitats and also the loss of region-specific species in some habitats (REISE et al., 1999).

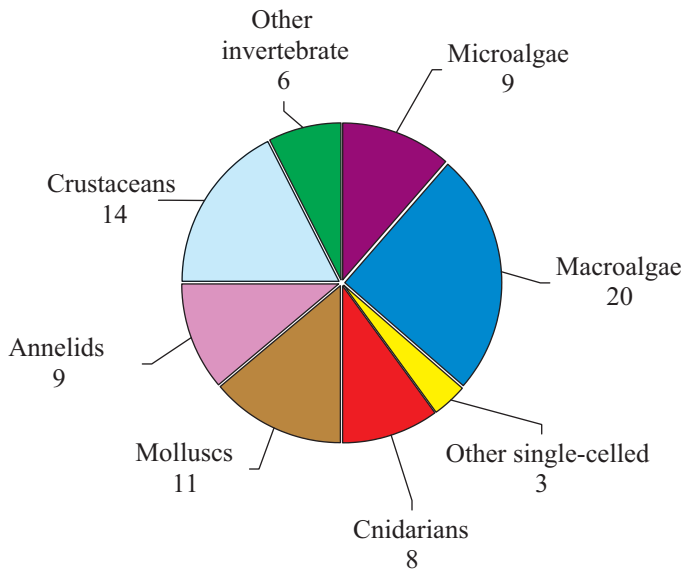
111. Apart from deliberate introduction of non-indigenous species for mariculture, as with the pacific oyster (*Crassostrea gigas*), organisms other than those used for commercial gain are introduced along with undesired parasites and other sessile species. The major proportion of long-distance transportations occurs incidentally with shipping traffic. The latter makes up around 30% of species introductions, compared with 17% from aquaculture and 37% from non-identifiable sources and pathways (WEIDEMA, 2000). Prior to the use of antifouling paint, growth on ships' hulls provided the key method of transport. Most non-indigenous species are now transported with ballast water. It is estimated that around 10 million Mg of ballast water containing more than 3,000 different species is transported around the world each year. The problem of transportation of non-indigenous species has steadily increased in recent decades. One reason being the ever-increasing incidence and speed of shipping traffic. More and more organisms are able to survive in ballast water, particularly due to the high speeds, and can thus cross geographical boundaries. The increase in toxic algae blooms is seen as an indicator (GOLLASCH and MECKE, 1996).

Some 80 introduced species have been found in the North Sea and have since become established (REISE et al., 1999). In the past ten years, 28 first finds of non-indigenous species were reported for the North Sea, of which 17 were introduced with ballast water, seven came from aquaculture and the origin of the remaining species is unknown (GOLLASCH, 2003). As shown in Figure 2-13, the species that have since become established stem from various taxonomical groups, with crabs and macroalgae the dominant species. Special attention should be paid to the microalgae group as they could spread with algal bloom.

112. Whether an introduced species can become established depends on a variety of factors. The temperature and salinity of the ecosystem from which the organism originates play a key role. The probability that a tropical or subtropical species can become established in the North Sea, for example, is extremely low. Other biotic factors like predators, competitors for food and the habitat itself also play a part in whether a non-indigenous or

Figure 2-13

Distribution of introduced species now established in the North Sea, by major taxonomic groups



SRU/SG 2004/Fig. 2-13, data source: REISE et al., 1999

introduced species can become established. If the habitat conditions are optimal for the introduced species and benefit that species more than native species, mass reproduction and distribution of the non-indigenous species can result. One example is the introduction of Japanese seaweed (*Sargassum muticum*), which was first reported in European waters in 1984 in Denmark's Limfjord. It is thought to have been imported from the Pacific along with the Pacific oyster. Its high growth rate, fecundity and longevity has allowed the Japanese seaweed to successfully take hold. The alga has since spread along the Swedish, Norwegian and British coasts – both to the north and the south. It is also found along France's Atlantic coast and near Heligoland. The problems that ensue from the spread of this alga include displacement of native species, changes in the compilation of flora and fauna, increased sedimentation, over-growth of shallow bays and small harbours, and impediment of coastal fisheries (WEIDEMA, 2000).

In terms of impact, the two best known introduced species are the Chinese mitten crab (*Eriocheir sinensis*) – which at times became a plague and hampered fishing – and the common shipworm (*Teredo navalis*). The most recent example is *Pfiesteria piscicida* – described as 'killer alga' – in the North Sea (GOLLASCH, 2003). This plankton alga originates from the Pacific and became well known through its introduction to the Atlantic coast of the USA where it caused large-scale fish loss. Apart from the non-poisonous form, there are other variants that produce a highly effective toxin, sometimes in such high concentrations that it has a lethal effect on fish. The algae develop especially well in highly eutrophic waters, where algal bloom forms. Up to now, only the non-toxic variety has been found in the North Sea. Whether or not it can become established remains to be seen.

113. In some cases, the introduction of non-indigenous species has resulted in economic damage to a number of sectors. For example, damage caused to timber harbour berths (in the Baltic) by shipworm is estimated to have cost around EUR 20 million in 1995. Assessing the outcomes for the habitats involved is extremely difficult due to the natural dynamics that exist in any aquatic system. There is also the problem that once a species has been introduced into an ecosystem, it cannot be removed. Even if species exchange cannot be completely prevented through anthropogenic vectors, species transfer should be kept to an absolute minimum to protect biodiversity.

114. The risk of transporting non-indigenous species with ballast water can be easily reduced (ICES; 2002b). The number of organisms taken on board can be greatly reduced if water is exchanged and taken on in open waters during the day (a large proportion of plankton organisms migrate into deeper waters during daylight). Also, plankton that originate in deep waters have only a marginal chance of survival in coastal waters. For some time, researchers having been exploring ways to develop simple processes that can kill organisms contained in ballast water. While mechanical treatment of ballast water – for example, with sieves or filters – is without risk, chemical treatment can have a harmful impact on the ecosystem. It is thus imperative that the ecological impact of an activity be studied alongside its effectiveness.

115. In sum, it is evident that shipping has become the main vector in introducing non-indigenous species into the North Sea. Their transportation usually occurs in ballast water. In the form of predators, competitors, parasites and pathogens, introduced species can harm native species and even displace them altogether. At the same time, the crossing of physical barriers that separate communities from one another carries the risk of homogenisation of species and loss of region-specific species in some habitats. An estimate of the long-term outcomes for the habitats affected is extremely difficult due to existing natural processes. Nevertheless, the additional pressure on the North Sea ecosystem from transportation of non-indigenous species should be reduced as much as possible.

2.1.6 Pressures from Local Encroachments

2.1.6.1 Raw Materials Extraction, Energy Generation, Dumping of Dredged Materials and Coastal Protection

116. Apart from use for fisheries and shipping, conditions in the North Sea are influenced by other economic activities in the marine sector like extraction of raw materials, removal of sediment for coastal protection activities, dumping of dredged materials and, more recently, the use of offshore wind energy.

117. *Natural gas and oil* have been extracted from the North Sea since the late 1960s. In the course of the 1990s, there was a substantial increase in the quantities extracted and the number of drilling platforms. The number of drilling platforms rose from 300 to 475 between 1990/1992 and 1996/1998. Oil deposits are mainly exploited in the northern part of the North Sea, in the British and Norwegian Exclusive Economic Zone (EEZ). Gas is exploited in shallower areas of the southern North Sea, in British and Dutch waters. The quantities of oil and gas extracted by Germany is comparatively low: 0.5 million Mg mineral oil and 300 million m^3 natural gas per year – somewhere between 0.1 and 0.2% of the total quantities of oil and gas extracted from the North Sea (OSPAR, 2000b, p. 41).

The environmental impact from activities involving the extraction of natural gas and oil is caused by oil and chemical inputs and pipeline construction (Para. 119). In the extraction of oil, inputs of contaminated drilling waste and oily production water can cause either the physical suffocation of sea bed organisms or chronic toxicological effects. This results in reduced species diversity and the spread of opportunistic species, both of which are reversible over time (EU Commission, 2002a, p. 38, see also Para. 82). The chemicals used for technical purposes in deep drilling can have differing levels of environmental importance. To reduce the impact on the marine environment from oil inputs (which rose by about one third during the period 1993 to 1998 due to the increasing quantities of oil being extracted) and from the chemicals

used in the process, the OSPAR member states, in the OSPAR Recommendation 2001/1 and OSPAR Decision 2002/2, agreed to reduce production water volume and to monitor the chemicals used (SÖNTGERATH, 2003, p. 151 et seq.).

118. *Sand and gravel* are extracted for coastal protection and for commercial purposes. In some countries, sand and gravel taken from marine deposits serve up to 15% of demand for these raw materials. Sand and gravel are usually extracted from shallower areas of the southern North Sea. The countries with the highest extraction activity are Denmark, Great Britain and the Netherlands (ICES, 2003a, p. 67). From 1992 to 1997, the quantities extracted from the North Sea rose from 34 million m^3 to 45.6 million m^3 (SÖNTGERATH et al., 2003, p. 153). This trend does not, however, apply to German sand and gravel extraction: between 1984 and 1992, the quantities extracted were in the region of 2 million Mg per year. For the period 1993 to 1997, total extraction per year was about 1 million Mg, with the exception of 1994 when more than 7 million Mg of sand was extracted for the landing of the 'Europipe' natural gas pipeline from Norwegian waters. In the other years during that period, the sediment extracted was used for coastal protection activities, e. g. for beach nourishment off the coast of Sylt, Langeoog, Norderney and Borkum (OSPAR, 2000b, p. 37; SÖNTGERATH, 1998).

Problems that ensue from sediment extraction include a negative impact on benthic communities, changes in sediment composition and in the hydrographic conditions in the water (flow rate, watermass exchange and sediment transport). The changes that occur in the natural marine environment can pose a risk to coastal protection and also encroach on conditions for benthic species. An 80% decline in benthic biomass has been observed as a result of sediment extraction. Regeneration of a habitat disturbed by sediment extraction can take between one month and more than ten years depending on the dynamics involved (OSPAR, 2000b, p. 38, 102).

119. Given the sometimes considerable sediment displacement, the laying of *pipelines and power cables* in coastal areas has had a similar impact to that of sediment extraction. While it can be assumed that no new oil pipelines will be built, it is possible that new gas drilling stations might be built along with pipelines to the mainland (WIRTZ and SCHUCHARDT, 2003). Additional electricity cables will need to be laid following liberalisation of the European electricity market and the planned use of offshore wind farms.

120. The *dumping of waste* no longer plays a significant role as regards the situation in the North Sea. Up to the 1980s and 1990s the dumping of a range of materials – like sewage sludge and industrial waste – was allowed. Now, only the *dumping of dredged material* collected in the clearing of shipping lanes is allowed – mainly near the coast. The quantities dumped in the North Sea remained constant throughout the 1990s. For Germany, the volume of dredged material in this period fluctuated between 20 and 30 million Mg per year, amounting to around one quarter of the total (LIEBEZEIT, 2003; see also OSPAR, 2000b, p. 38 et seq.). The largest quantities of dredged material come from channels in the Elbe, Weser and Ems rivers (RODIEK, 2003).

Apart from its effects on benthic organisms and the changes it brings to sediment communities near the dumping sites, dumping causes the release of pollutants stored in the dredged material. Concentrations of heavy metals are particularly high in dredged material taken from harbours, which is why, after appropriate treatment, this kind of highly contaminated dredged material is stored on land rather than being relocated in the oceans (LIEBEZEIT, 2003; see also Para. 454). Ever-changing natural conditions (e. g. tides) make it difficult to calculate the levels of pollution released during relocation of dredged material in rivers which actually reach the North Sea (BMU and Umweltbundesamt, 2003).

The direct impacts from the release of pollutants in areas near dumping sites appear to be relatively insignificant. This is shown in the results of a biological monitoring study conducted in Belgian sovereign waters, where dredged material dumped there has caused no significant damage to the marine environment (SFD, 2003). It is expected that the reductions achieved in the North Sea (Section 2.1.3) will result in a decline in the release of pollutants from the dumping of dredged material (LIEBEZEIT, 2003).

121. The feared outcomes of climate change – like a more rapid rise in sea levels and an increase in the frequency and intensity of storm floods – heighten demands as regards *coastal protection activities*. This especially applies to the islands and holms that are already subject to severe pressures. Apart from the need to protect inhabited and economic areas, nature protection objectives also play a role in the design of coastal protection measures. In the past, coastal protection has often caused considerable damage to coastal ecosystems. For example, the building of dikes has resulted in strong saltmarsh retreat, the construction of breakwaters has altered the dynamics of sedimentation and erosion, and land reclamation has caused the loss of areas where natural sedimentation occurs.

Under European and national regulations, salt marshes are designated as specially protected areas. They belong, for example, to the protected habitats covered by the Annex 1 of the Habitats Directive. Protecting the salt marshes calls for more extensive grazing, drainage prevention and, where compatible with human security, dismantling of dikes. Events in Lower Saxony and Schleswig-Holstein have shown that coastal protection and nature conservation interests are not incompatible (STOCK, 2003). In the Wadden Sea national park in Schleswig-Holstein, the area of intensively grazed salt marshes reduced from over 90 to 33% between 1989 and 1999. At certain intervals, dikes, or summer polders, are breached to allow the salt marshes to expand (STOCK, 2003, p. 368).

Criticism from nature protection circles, along with the high costs involved in existing coastal protection activ-

ities, has led to increased debate on alternatives that meet coastal protection needs in a cost-effective way while taking account of nature protection objectives. Worthy of note are activities in what is known as integrated coastal zone management, which involves things like the re-establishment of tidal marshes, the building of storm flood polders in estuaries, increased use of beach nourishments and determining the height and design of dikes based on risk assessments that take account of hydrological, social and economic conditions (von LIEBERMANN, 2003).

122. A new economic activity in the North Sea comes in the form of *wind energy* use. While the technology involved is not fully developed, Germany and other North Sea states are actively planning a range of large offshore wind farms. Germany's main focus is the establishment of wind energy facilities in the EEZ (BMU, 2002). The German government is planning an ambitious, phased expansion of offshore wind energy use that aims to meet nature protection requirements. Because the German Advisory Council on the Environment had a number of concerns regarding the implementability of this welcome objective in terms of existing planning and approval regulations, and thus saw an urgent need for action, it decided at the beginning of 2003 to issue a comprehensive position paper on offshore wind energy use in which it made recommendations for improving existing law (SRU, 2003a). The planned expansion of offshore wind energy use is further outlined in Section 3.5.3.3.

2.1.6.2 Tourism

123. The coastal regions of the German North Sea, including the habitats in the Wadden Sea, are highly popular with tourists. The North Sea coast of Germany, including its islands, received around 2.5 million visitors in 2002, with 16.5 million overnight stays in establishments with more than nine beds (Statistisches Bundesamt, 2003). Tourism is thus a key economic factor in many areas along the North Sea coast. It contributes around 20% of local income in Germany's Wadden Sea region (SCHMIED et al., 2002; BfN, 1997, p. 187).

Nature protection and tourism are closely interrelated. On the one hand, tourism encroaches on nature, while on the other, a natural (at least at first glance) environment is highly attractive to tourists. Tourism can thus foster nature and landscape protection, and it can also contribute to their destruction (REVERMANN and PETERMANN, 2002). A deciding factor in compatibility between nature protection and tourism, therefore, is the way tourism is managed (summarised for the Wadden Sea in GÄTJE, 2003). This includes regulating visitor numbers at peak times when the high spatial and temporal concentration of tourists further compounds the conflict of interests. In the Wadden Sea area, the problem is exacerbated by the fact that the biological functions in flora and fauna overlap with the tourism seasons (Figure 2-14). Animals and plants are particularly sensitive to disturbance during their development phases (BUCHWALD, 1998).

124. The direct and indirect environmental impacts from tourism encompass both claims on land through the expansion of infrastructure – with roads, paths, car parks and accommodation – and the sometimes considerable direct encroachments on animals and plants by recreational activities (SRU, 1998, Para. 996 et seq.; SCHMIED et al., 2002; BfN, 1997, p. 19 et seq.). Tourism can also be a driver of other activities that harm the environment. For example, NO_x emissions from holiday traffic (which makes up almost 8% of all private travel (KLOAS and KUHFELD, 2002)) can promote marine eutrophication (Para. 98) and, through its contribution to climate change, can also have an indirect impact on the marine environment. Localised accumulation of wastewater and waste in tourism hot spots can also be problematic. The following is, however, limited to the impacts of tourism on habitats.

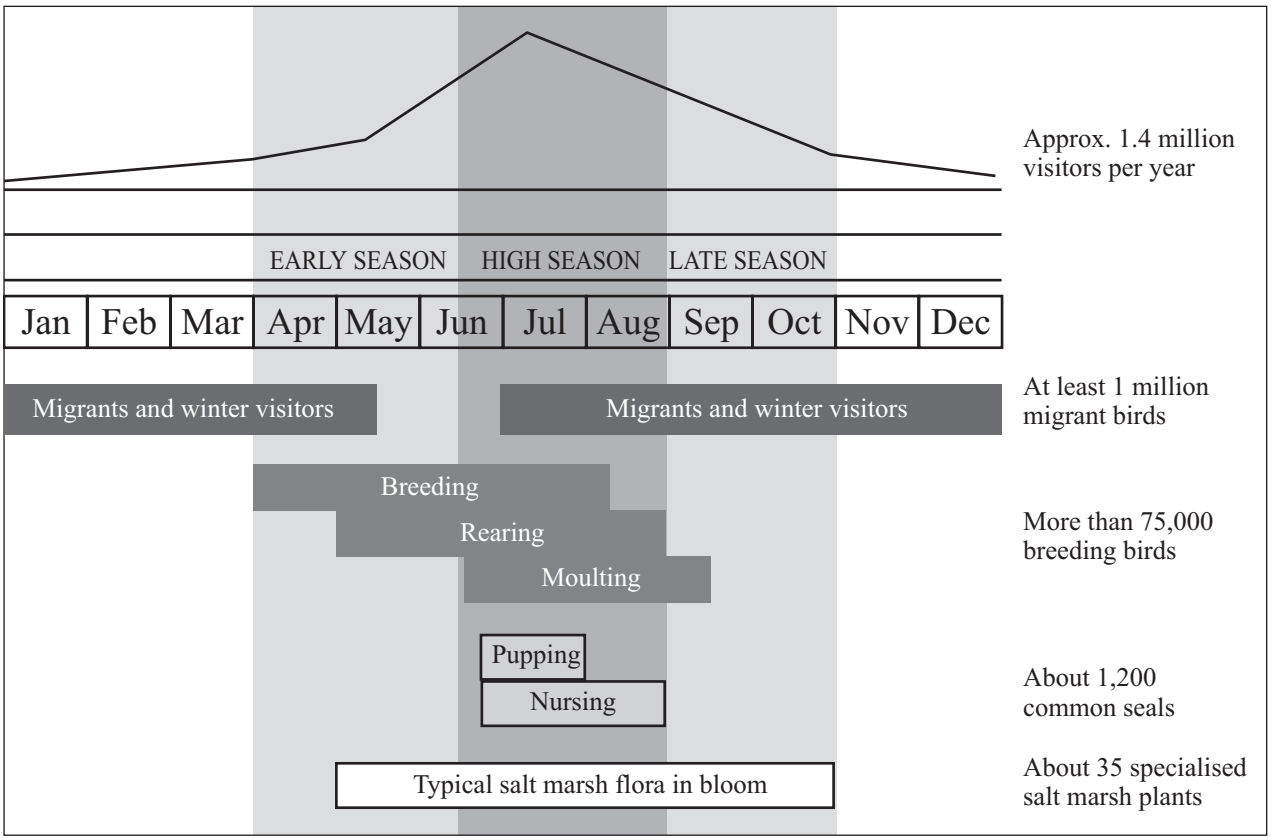
125. Specific environmental impacts from tourism in coastal areas and on offshore islands involve disturbance of vegetation, especially deflation and destruction of vegetation coverage that is trampled underfoot. This causes or exacerbates erosion and abrasion processes in the sand dunes, which can, among others, lead to changes in flora (KLUG and KLUG, 1998) and can influence the effectiveness of sand dunes in coastal protection. Between 1900 and 1990, around 15% to 20% of the sand dunes were lost from Germany's North Sea and Baltic coasts (Bundesregierung, 2002c). It is not possible to assess, however, whether this involves a continuous or discontinuous process.

Tourist activities on the North Sea coast of Germany can scare and displace birds who make their resting, feeding and breeding places in sand dunes, salt marshes and on beaches. This can disturb migrating birds during feeding, which means that they use up energy in fleeing the disturbance – vital energy that is then lacking in the onward flight and in breeding (EXO et al., 2003). In the case of breeding birds, limited breeding success is feared if they frequently leave their nests as a result of disturbance that causes them to become scared and fly off. It is feared that breeding will be limited if birds are frequently disturbed and leave their nests. Beach-breeding species usually avoid areas that are used by people. Prior to implementation of access rules in 1989, this had led to a significant decline in breeding among little terns (*Sterna albifrons*); the trend has continued in the case of the snowy plover (*Charadrius alexandrinus*) (POTEL and SÜDBECK, 1999). Tourism also affects aquatic birds. If, for example, pleasure boats and speed boats undercut the safety distances of the eider duck (*Somateria mollissima*) and the shelduck (*Tadorna tadorna*) during moulting, the birds are disturbed. Shelducks are unable to fly for three or four weeks during moulting and are extremely sensitive to disturbance. Their moulting places should thus be kept free from shipping traffic (NEHLS, 1999, 1998). Overall, the Red List cites tourism activities as a contributing factor in the endangerment of 11 of a total of 29 endangered breeding bird species in the German region of the North Sea, and as the sole cause of endangerment to another four other species.

Another localised environmental impact from tourism involves the overburdening of natural fresh water pools on

Figure 2-14

Seasonal overlap between natural cycles and tourism in the Lower Saxony Wadden Sea National Park



Source: BUCHWALD, 1998

some Frisian islands. An above-average volume of water is extracted in the summer, when precipitation is already low. This leads to a drop in groundwater levels and thus to damage of the wet sand dunes so valuable to species and biotope protection (GALL and BUNJE, 1999).

126. Tourism has long influenced the natural balance in coastal regions of the German section of the North Sea, and the conflicts of interest have increased with the growing number of visitors. The overall pressures on the ecosystem have, however, reduced with added scope for control following the establishment of the three German Wadden Sea national parks (see also BUCHWALD, 1998, p. 201). Clear conflicts of interest remain, however, between nature protection and tourism at local level, and there is a particular need for greater protection of beach-breeding bird species.

2.1.6.3 Environmental Risks from Mariculture

127. With stagnating fisheries, increasing overfishing of many fish stocks and the growing demand for fisheries products, the production of fish and mussels in aquacultures – known as mariculture in sea waters – is a promising growth sector. Mariculture is reported to have grown by 10% per year in North Sea states. Of the current total catch of 1.4 million Mg, salmon production makes up the largest share, followed by common mussels and trout. New species whose culture has become established include Atlantic halibut (*Hippoglossus hippoglossus*) and turbot (*Psetta maxima*). Given that coastal regions of the North Sea are little suited to conventional mariculture because of high exposure to wind, currents and waves, production is significantly higher on European coasts that lie beyond the North Sea region. With the planned use of offshore wind energy and the combination of offshore wind farms with mariculture facilities currently under discussion, new areas could be developed to exploit these resources (WALTER et al., 2003).

128. Depending on the location and production method, intensive farming of fish in underwater cages usually leads to localised environmental problems (WALTER et al., 2003). One problem is the release of large quantities of nutrients from these facilities through poor feed management. The use of optimised feed and modern feeding methods has significantly improved the relationship between added and released nutrients. Nevertheless, local accumulation still causes eutrophication effects.

Apart from discharging nutrients, this type of mariculture also carries a hygiene risk for the marine environment

because pathogens and parasites reproduce rapidly in the cages and are transferred to wild forms. This poses a significant risk to the environment because non-indigenous species used in the maricultures can introduce new pathogens and parasites. For example, bacterial furunculosis was transferred by cultured Scottish salmon to Norwegian cultured and wild forms and had catastrophic consequences for the latter (BLAZER and LAPATRA, 2002). It is also assumed that escaped fish from mariculture facilities cross with wild forms and thus contribute to genetic changes that reduce fitness (ICES, 2002c). In some Norwegian rivers with low salmon populations, 50% of the fish caught originate from fish farms (OSPAR; 2000b). A final problem is the use of pharmaceuticals, especially antibiotics, in fish farms. This leads to long term antibiotic resistance in soil bacteria in the immediate vicinity of fish farms. The use of antibiotics has reduced significantly in recent years due to better selection of farm locations, the development of vaccines against key infections, optimised management practices and improved hygiene (MARONI, 2000).

129. Mussel culture is largely an extensive form of mariculture. The problem here involves seed mussel fishing and the release of non-native mussel seed. Special dredges are used to fish mussel seed from natural mussel banks. The seed is then released in special culture areas. This can cause irreversible damage to mussel banks and even their complete loss due to their heightened exposure. An alternative to this method, which is used in the Wadden Sea in particular, is what is known as long line culture. Floating common mussel larvae are provided with artificial substrates attached to long ropes. Studies have shown that this method could be successfully introduced in the German Wadden Sea (WALTER and LIEBEZEIT, 2001). The best known example of the potential outcomes from introducing mussel seed into other regions is the introduction of the Pacific oyster (*Crassostrea gigas*) into the North Sea, with which two new parasite species were transported that caused high mortality in native oyster stocks (*Ostrea edulis*) (PILLAY, 1992).

130. The environmental risks from mariculture outlined above can be minimised through the use of modern, ecological production methods, especially in fish farming. Aligning stocking densities to the needs of the animals reduces the need for veterinary medication, while optimising feed according to the physiological needs of the animals reduces nitrate inputs.

To reduce both the risk of distribution and the introduction of non-indigenous species through mariculture, the ICES has developed a set of guidelines which contain a range of different approaches, including quarantine measures (ICES, 2002c) (see also Section 3.5.3.8).

131. Overall, the pressures on the North Sea from mariculture facilities have reduced in recent years. This is largely due to improved feeding methods and better feed ingredients. Use of pharmaceuticals – especially antibiotics – has also reduced. Nevertheless, eutrophication effects are still evident in areas near fish farms because of nutrient inputs. There also remains a risk from undesired interactions between wild and cultured forms. In mussel cultures, the primary problem is damage caused to benthic fauna from the use of dredges in seed mussel fishing.

2.1.7 Cumulative Pressures and Decline in Marine Habitats

132. The rich species spectrum in the North Sea ranges from mammals to reptiles, birds, fish, invertebrates, cnidarians, phytoplankton, bacteria and viruses. These species inhabit not only the water, but also the sea bed and coastal areas. Many animals and plants in the North Sea region are severely affected by anthropogenic influences, be it direct use (fisheries, Section 2.1.2), pollutant inputs (Section 2.1.3), eutrophication (Section 2.1.4), or shipping (Section 2.1.5), or because their habitats are damaged or even destroyed by marine structures, coastal protection activities and tourism (Section 2.1.6). Without doubt, the most serious risk is posed by intensive fishing.

2.1.7.1 Loss of Species Diversity

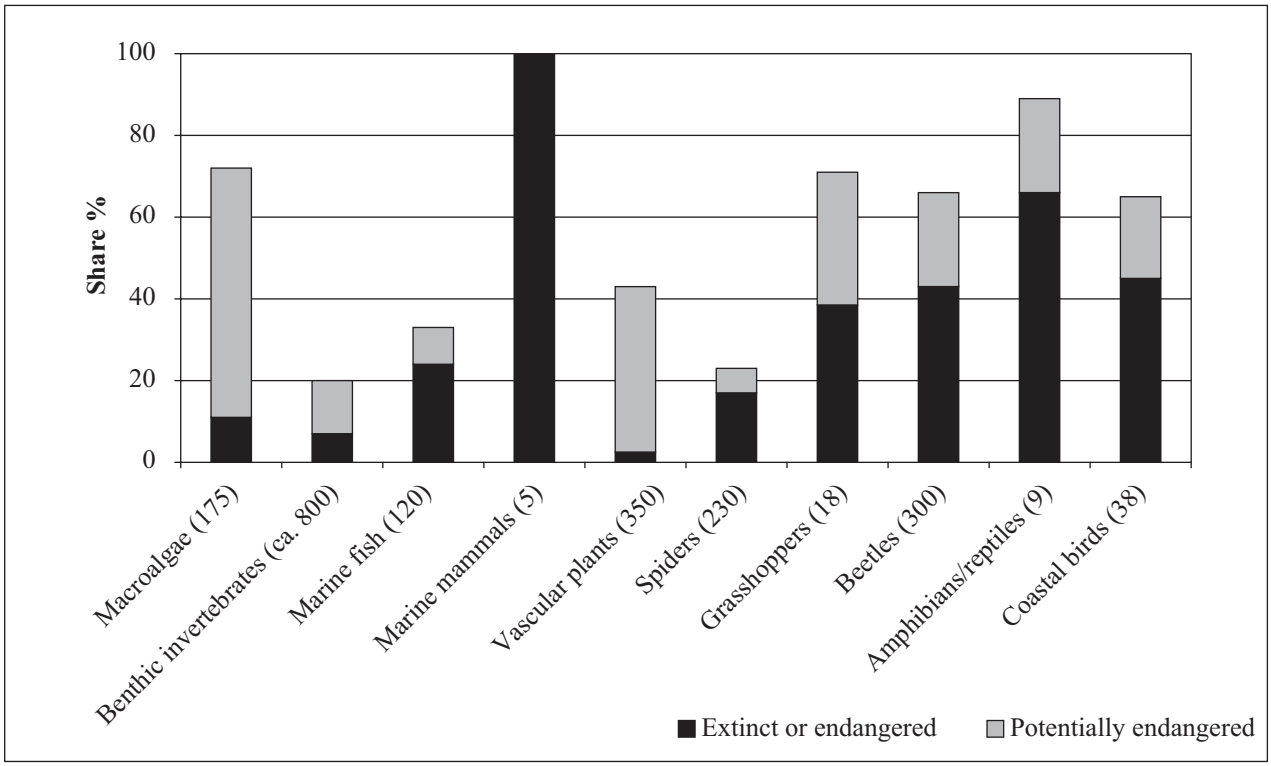
133. Ongoing studies on the trends in species diversity in the North Sea show that a decline in biodiversity is still evident and that the presence of numerous species is at risk (von NORDHEIM et al., 2003). The red lists issued by Germany's Federal Agency for Nature Conservation (BfN) illustrate this situation and highlight the need for action.

Figure 2-15 gives an overview of the results in the various red lists for the North Sea and the neighbouring coastal areas. Of the five native marine mammals, common seals (*Phoca vitulina*), grey seals (*Halichoreus grypus*), harbour porpoises (*Phocoena phocoena*), white-beaked dolphins (*Lagenorhynchus albirostris*) and bottlenose dolphins (*Tursiops truncatus*) are all considered endangered. The bottlenose dolphin has already disappeared from the North Sea completely (von NORDHEIM et al., 2003).

134. The harbour porpoise, the most abundant cetacean species in the North Sea, is especially at risk from fishing. Cetaceans get caught in bottom-set gillnets and eventually die. The volume of such by-catch is extremely difficult to estimate because reports from fishermen are unreliable for obvious reasons. An annual by-catch of around 7,500 harbour porpoises is estimated for the central and southern North Sea (VESPER, 2003). According to the stock study conducted in the North Sea in 1994 and estimated fisheries-related mortality, this amounts to around 4.3%. According to the International Whaling Commission (IWC) and the 1994 Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS), this is more than double the maximum threshold above which stocks are assumed at risk. In the long term, a high mortality of this type would lead to the extinction of this whale species in the North Sea. Furthermore, from an environmental ethics perspective, the tortuous death of 7,500 cognitively highly developed creatures must be taken into account (SRU, 2002a, Para. 31, 33, 38). The ICES has urged for a reduction in the use of gillnet fishing in the central and southern North

Figure 2-15

Summary of the Red Lists for the German North Sea marine and coastal zones*. Endangerment given as a percentage of species in each group (numbers in brackets).



* Only species that demonstrated a dependence on marine, coastal and near-nature biotopes and which were found to be regular and typical inhabitants of those areas were selected. The following two categories have been used for the purposes of simplification:
Extinct or endangered: matches the criteria of the Federal Agency for Nature Conservation (BfN) for Category 0 (extinct or disappeared), 1 (endangered), 2 (at serious risk) and 3 (at risk).
Potentially at risk: matches BfN criteria for Category P (potentially at risk: species that exist in small numbers in a specific area, and species that live in small populations on the edge of their habitat) (for more details see BfN, 1995).

Source: After von NORDHEIM et al., 2003

Sea. This appears to be the only way to successfully prevent extinction of the harbour porpoise in the North Sea. The use of gillnets must be stopped especially where fisheries are very difficult and by-catch is extremely high (e. g. turbot and lumpsucker fisheries). Additionally, areas that small cetaceans frequent and in which they rear their calves must be protected. Consideration is also being given to the use of acoustic signals (pingers) to keep harbour porpoises away from gillnets. At the moment, neither the scare factor of such signals nor their possible negative effects on small cetaceans (animals could be scared away from their preferred habitat) have been adequately studied to allow recommendation of pingers as an adequate instrument of protection. The establishment of protected areas such as those created in 2000 to the west of the islands of Sylt and Amrum is certainly the most effective way to secure nursery and breeding areas for these endangered species and for others. Thus, in terms of nature protection, the Schleswig-Holstein cetacean protection area should be expanded westwards.

135. Caused by the Phocine Distemper Virus (PDV), repeated outbreaks of a viral infection in spring/summer 2002 resulted in a significant drop in common seal populations in the North Sea, Skagerrak and Kattegat. As in 1988, one of the two suspected sources of the epidemic lay near Anholt in the Danish Kattegat (REINEKING, 2003). Some 22,500 dead common seals were registered throughout the area. According to preliminary estimates, it is expected that some of 53% of the total population in the Skagerrak and Kattegat and 40% in the Wadden Sea will be lost. Little is yet known about the causes of such epidemics or about the factors that contribute to their outbreak. It is thought that the outbreaks of PDV are of a cyclical nature and can recur from time to time, with disastrous outcomes for seal stocks. Suspicions that high pollution levels weaken the seals' immune systems and thus have a negative effect on illness rates and frequencies have not yet been confirmed. What is certain, however, is that anthropogenic disturbances have a negative impact on

the development of such epidemics and on the survival rates of the animals affected.

136. An extremely large number of highly endangered species are found among insects, amphibians and reptiles. Reports of the risk situation for these non-marine species groups, including vascular plants, relate solely to the Wadden Sea coasts (von NORDHEIM et al., 2003). The causes primarily lie in the loss of and changes in habitats. More intensive and expanding agriculture and the cessation of more traditional uses (e. g. extensive grazing of salt marshes), the expansion of tourist infrastructures and construction activities in coastal protection efforts are all responsible for these encroachments on habitats.

137. Macroalgae are a unique case in that they are limited to one location – the island of Heligoland. The island is the only area of the German North Sea where natural hard substrates are found. Elsewhere along Germany's North Sea coast, only sand and shingle are found to which, apart from a few green algae, only a small number of macrophytes are native. Changes on the island which might have a negative impact on local species could result in the loss of species for the entire German North Sea region. In the case of macroalgae that have been classified as extinct, and also of sessile invertebrates, this involves species that have only been identified on Heligoland and which are no longer found there.

138. The endangered birds include cliff-breeders who in the German North Sea are again native only to Heligoland. For example, wintering guillemots are particularly at risk from waste, from the remains of fishing nets in which they become entangled, and from oil residues in the water that cause oiling (Para. 83 et seq.).

139. Around one quarter of native fish species and lampreys (*cyclostomata,* or jawless fish) are considered endangered. For example, the Atlantic sturgeon (*Acipenser sturio*) has already disappeared completely from the North Sea (apart from a few individuals that migrate from other populations). Houting (*Coregonus oxyrhynchus*), salmon (*Salmo salar*) and the great weever (*Trachinus draco*) have almost become extinct in the North Sea. The causes are seen in construction activities in and along the routes to spawning grounds, and in pollution-related pressures. There are also reports of a strong decline in shark and ray stocks in the North Sea. Bottom trawling poses a particular threat to these chondrichthyes or cartilaginous fish: the nets catch and destroy a large proportion of eggs laid on the sea bed (Para. 43). Cartilaginous fish have almost been completely wiped out in areas that are intensively fished.

140. Among the seriously endangered group of invertebrates are the European oyster (*Ostrea edulis*), the yellow boring sponge (*Clione celata*), dead man's fingers (*Alcyonium digitatum*) (leather coral) and the netted dogwhelk (*Nassarius reticulatus*) (RACHOR et al., 1995, 1998). The European oyster was decimated in the first half of the 20th century through overfishing, disease that was probably introduced by non-native oyster species and harder winters with extreme iceflow. The decline in many other benthic fauna organisms, such as dead man's fingers, is apportioned to the use of bottom trawls. Demersal active gear disturbs and redistributes the substrates in which the organisms live. It also causes direct harm to some individuals (de GROOT and LINDEBOOM, 1994). In the case of the netted dogwhelk, it is thought the decline in stocks is largely caused by TBT-containing ships' paint which is now banned under EU law.

2.1.7.2 Destruction and Loss of Habitats

141. A significant reduction in eelgrass meadows has been observed in the Wadden Sea in the past 30 years (REISE, 2003). Eelgrass meadows provide a particularly species-rich biotope. Juvenile fish, pipefish, seahorses, different kinds of epiphytes (algae that grow on seagrass) and laver spire shell (*Hydrobia ulvae*) (mud snails) live on and between the eelgrass. Eelgrass is also a key food source for ducks and geese; they stabilise sediment and form significant nutrient sinks. Overall, eelgrass meadows must be appreciated for their far-reaching ecological value. The reduction in these vascular plants was connected with an ongoing and significant increase in green algae of the genus *Ulva*, *Enteromorpha* and *Chaetomorpha*. About 20% of the Wadden Sea was covered by these algae during the mass outbreaks in the summers of 1990 to 1993. The resulting lack of oxygen caused either the death or flight of benthic fauna living below the algae carpet (on so-called black patches). There are numerous causes for both the extreme spread of green algae and the parallel reduction in eelgrass meadows. Increased eutrophication is certainly a key factor in the redistribution between eelgrass stocks and algae growth in the Wadden Sea. It is also thought that an increase in westerly winds over the past 30 years, the associated stronger water swell and the increased turbidity in the water has had a negative impact on eelgrass beds. Although less than in the early 1990s, the presence of green algae carpets in recent summers indicates that eutrophication is still a problem for the North Sea and its coasts.

2.2 Baltic Sea

2.2.1 Habitat and Economic Area

142. The extent to which anthropogenic influences impact on a marine environment is dependent on the type and intensity of the encroachments and, to a large degree, on the natural conditions that prevail at the time. To assess the outcomes of such pressures on the natural environment, it is necessary to understand the characteristics and boundary conditions of the ecosystem. Factors like currents, tidal surge, water mass exchange and the occurrence of natural nutrients – to mention but a few key ones – are the main starting parameters that decide how a marine environment is influenced by human activity. It is important to remember, however, that these boundary conditions are often subject to temporal trends and fluctuations that are sometimes very difficult to forecast. Within this dynamic system, early recognition of anthropogenic changes is vital in assessing the need for preventive measures.

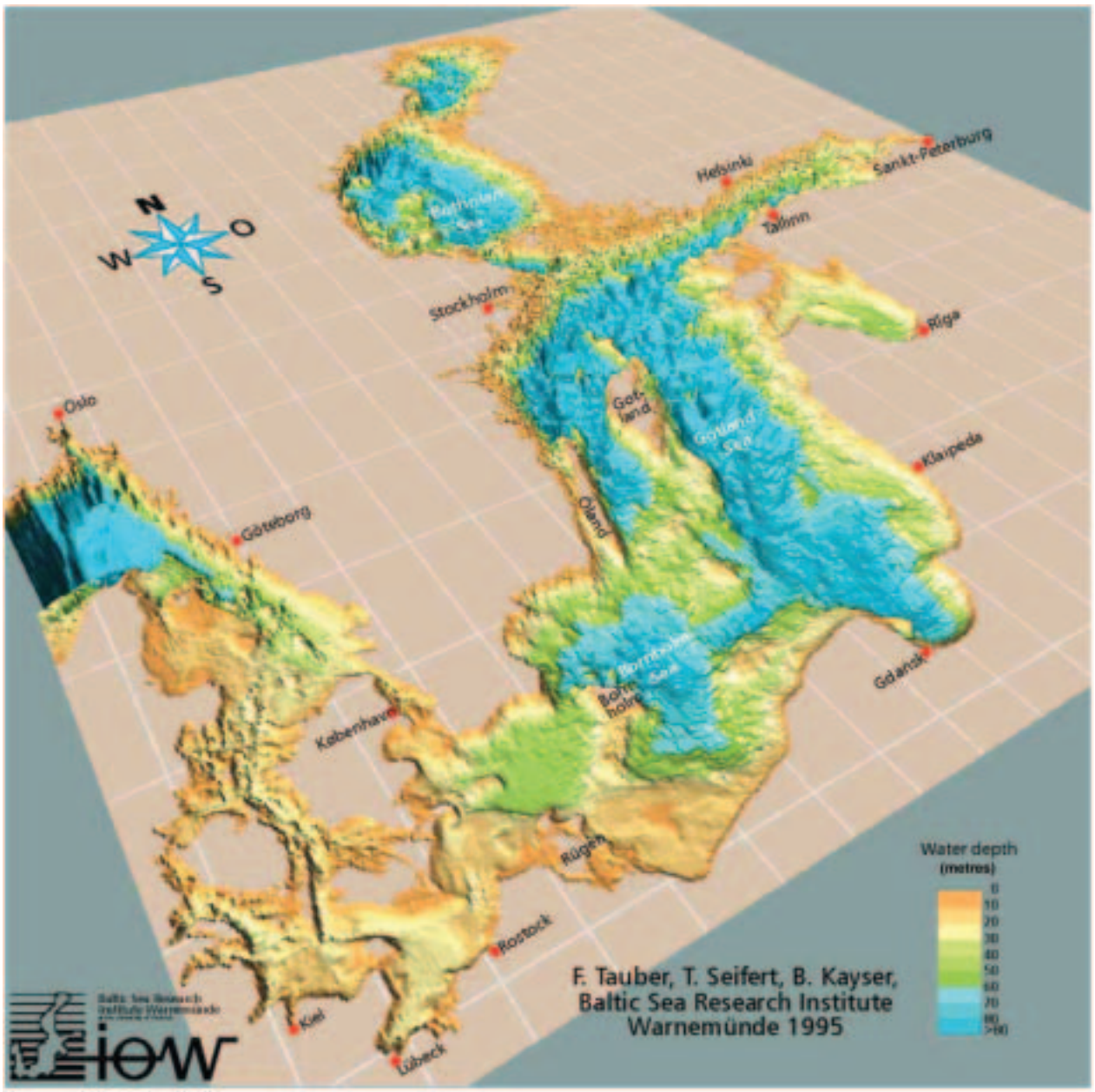
For general orientation purposes, the following outlines the key characteristics of the Baltic Sea as both a natural environment and an economic area to provide clarity as to the role played by the anthropogenic pressures presented later on.

Geography and Oceanography

143. The Baltic Sea is a shallow intracontinental sea formed by the Atlantic Ocean. It has an average depth of 52 m and is almost fully enclosed by the continent. As one of the world's biggest brackish seas (a mix of sea water and fresh water), the Baltic is fed by numerous rivers (inflow approx. 440 km³ per year). The specific geomorphological and hydromorphological characteristics of the Baltic Sea drive the watermass exchange processes that occur in this inland sea, while its topography shapes its hydrography. The cascade-like adjoining submarine sills and basin areas result in the sea's sub-division into what are largely separate sub-basins (NIEDERMEYER, 1996; Fig. 2-16).

Figure 2-16

Topography of the Baltic Sea



Source: IOW, 1999

The only connections to the North Sea through which saline, ocean water can flow into the Baltic are its shallow belts (Darsser Sill, 18 m deep) and the Sound (Drodgen Sill, 7 m deep), with a total cross section of 0.35 km^2. Large river inputs into the Baltic Sea make for a positive water balance and greater outflow than inflow. The difference in temperature between the more saline inflows from the North Sea and the water masses that flow out of the Baltic causes year-round thermohaline layering (MATTHÄUS, 1996). Submarine sills hinder distribution of denser ocean water that flows in on the sea bed. Normal inflow is thus insufficient to exchange the deep waters in the central Baltic – extreme inflows are needed such as those that occur in winter after prolonged westerly storms. These seawater inputs bring highly saline, oxygen-rich water, allowing exchange of oxygen-depleted deep waters, and significantly improve conditions in deep zones of the Baltic Sea. Long periods of stagnation cause depletion – and sometimes the complete disappearance – of oxygen along with a build up of toxic hydrogen sulphide. Up to the mid-1970s, inputs of saline water were relatively large, occurring an average 13 times over a period of ten years. The drop in the frequency and intensity of these occurrences was probably due to variations in atmospheric circulation in the European region of the Atlantic. There were no extreme saltwater inputs from the North Sea into the Baltic between 1983 and 1993. The last large saltwater input of any significance was recorded in the winter of 1993/1994. In January 2003, a lesser inflow supplied adequate quantities of oxygen to deep waters in most of the southern Baltic (IOW, 2003; ICES, 2003a).

144. The geographical and hydromorphological characteristics presented above shape the particular sensitivity of the Baltic Sea to anthropogenic pressures. Firstly, this shallow inland sea is fed by numerous rivers through which a range of pollutants and nutrients enter from the drainage area. Further pollutants enter via the distinct coastline and the atmosphere (in intercontinental locations) (LOZÁN et al., 1996b). Secondly, the basin's structure, a permanent layering and the prevailing currents hinder adequate water mix. Exchange processes – average water exchange takes between 25 and 35 years – are minor, highly irregular and dependent on meteorological conditions (EHLERS, 2001). This makes for high substance retention times. Changes in water quality must be seen as an early warning signal and taken seriously.

Biodiversity

145. The Baltic Sea has been in existence for some 8,000 years and so is a very young, brackish sea whose short life has not allowed development of genuine species (those for whom a habitat with a saline content of between 0.5 and 35 PSU is optimal) (ARNDT, 1996). The level of biodiversity is thus significantly lower than that in the adjoining North Sea, although marine species have been rather successful in inhabiting the Baltic's brackish waters. This can be linked to the very similar ion composition of sea and brackish water. The greatest species diversity is found in the more saline regions adjoining the North Sea and there is a significant decline in diversity towards the central Baltic.

The coastal formations of the Baltic inland sea are highly varied. Under the HELCOM protected area programme, 133 different marine and coastal habitats have been classified in the Baltic Sea. Examples include the bodden coast, sand bars, skerry coasts, cliff coasts, barrier dune coasts and fjord coasts. Figure 2-17 illustrates the distribution of the different coastal types.

Baltic Economic Area

146. The marine environment known as the Baltic Sea covers an area of 415,266 km^2. At 1,745,100 km^2, the water catchment area is around twice that of the North Sea (MATTHÄUS, 1996). About one sixth of Europe's surface drains into the Baltic. Its riparian states include Sweden, Finland, Russia, Estonia, Latvia, Lithuania, Poland, Germany and Denmark. Norway, Belarus, Ukraine, Slovakia and the Czech Republic also lie in the Baltic catchment area. The immediate coastal areas of the Baltic are populated by some 16 million people. Around 85 million live in the Baltic Sea catchment area, of which about one third live in 77 towns and cities with more than 100,000 inhabitants (JÄGE, 1988). About 200 large rivers drain the catchment area into the Baltic, the largest being the rivers Neva, Vistula, Daugava, Neman, Oder, Göta and Kemijoki. Land in the catchment area is dominated by almost 50% woodlands, which is largely concentrated in the North. The relatively high proportion of agricultural land (around 25%) is mostly in the south (Table 2-18), which also houses most of the area's industrial centres.

Table 2-18

Land use in the Baltic Sea catchment area

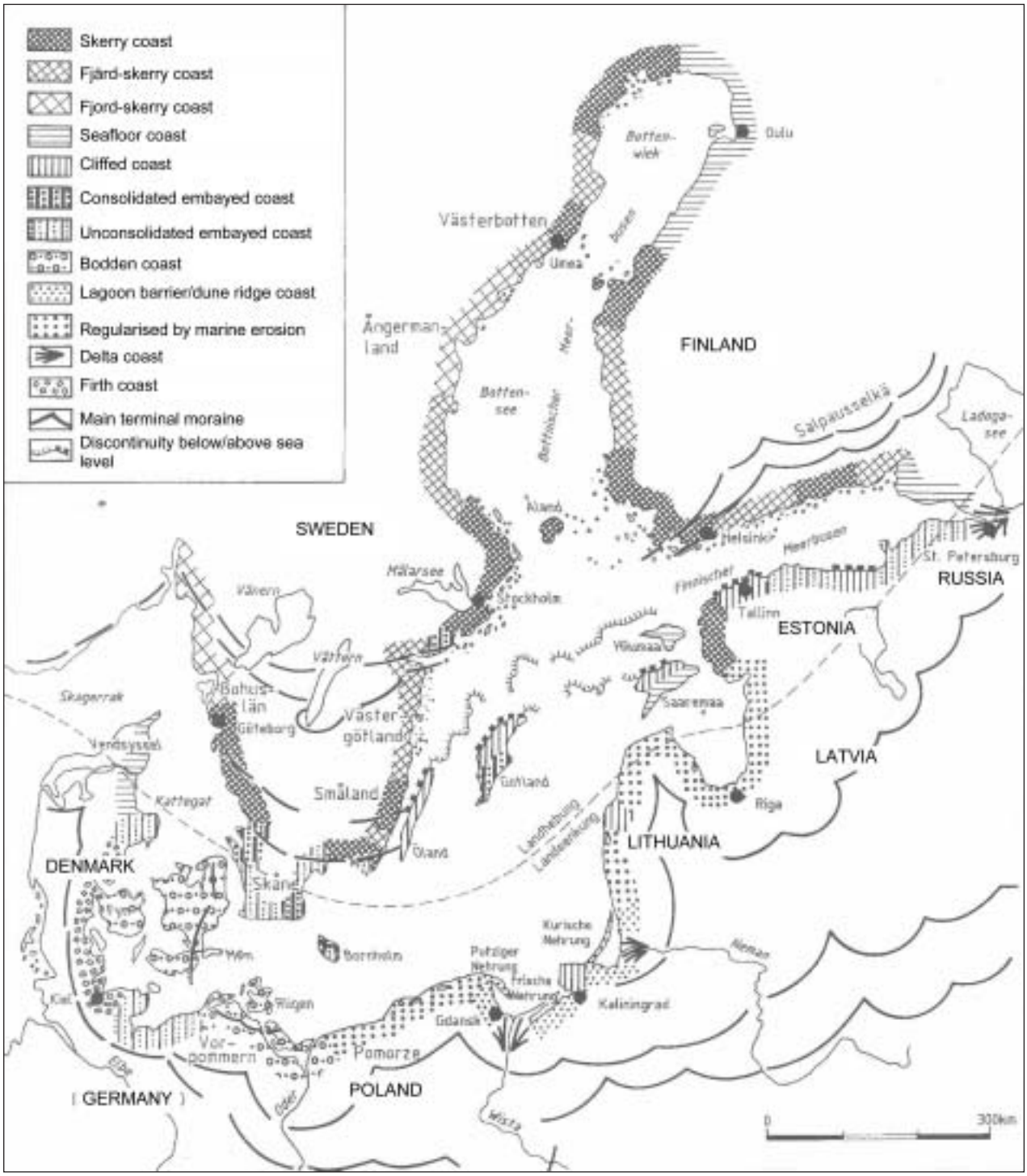
Land use	Percentage of drainage basin
Arable land	20.2
Pasture land	6
Forest	47.9
Inland water	9.1
Populated places	0.8
Unclassified	24.1

Source: SWEITZER et al., 1996

147. Claims to use of the Baltic Sea are as diverse as those identified in the North Sea. As an inland sea, with its central location and east-west reach, the Baltic plays a key and ever-increasing role in shipping. In this regard, special attention should be given to the increase in oil

Figure 2-17

Geographical distribution of coast types in the Baltic



Source: LAMPE, 1996

transfer in Baltic Sea harbours and with it the rise in the occurrence of tanker traffic (LAMPE et al., 1996) (see also Section 2.2.5). Apart from shipping, the marine environment is also used for cable-laying, pipelines and bridges.

Economic sectors that directly exploit marine resources include fisheries, extraction of oil, sand, shingle and other raw materials, and mariculture. Energy production and tourism in the Baltic involve more indirect impacts through use of the marine environment. There has been heavy investment in the tourism sector in particular, and further growth is expected (HELCOM, 2000b) (see also Section 2.2.6.2). The greatest indirect impact occurs, however, through the release or direct discharge of pollutants and nutrients from the many industries domiciled in the Baltic Sea catchment area (e. g. the metal, textile and chemicals industries) and by agriculture and transport of all kinds.

2.2.2 Pressures from Intensive Fishing

148. In the same way as the North Sea, the Baltic is subject to significant pressures from fishing. Key fish stocks are not managed sustainably and there is evidence of fishing activities having a negative impact on both non-target stocks and the entire ecosystem. The main problems with fishing were outlined in Section 2.1.2 above. For this reason, the following section will address only the conditions specific to the Baltic Sea.

With a total of 144 species, fish fauna in the Baltic Sea is less species-rich than in the North Sea. Of those 144 species, 97 are marine fish, seven are migrating fish and 40 are freshwater fish species. Marine species occur primarily in the western section of the Baltic due to its salinity levels, while the eastern section is dominated by freshwater species.

2.2.2.1 Overexploitation of Fish Stocks

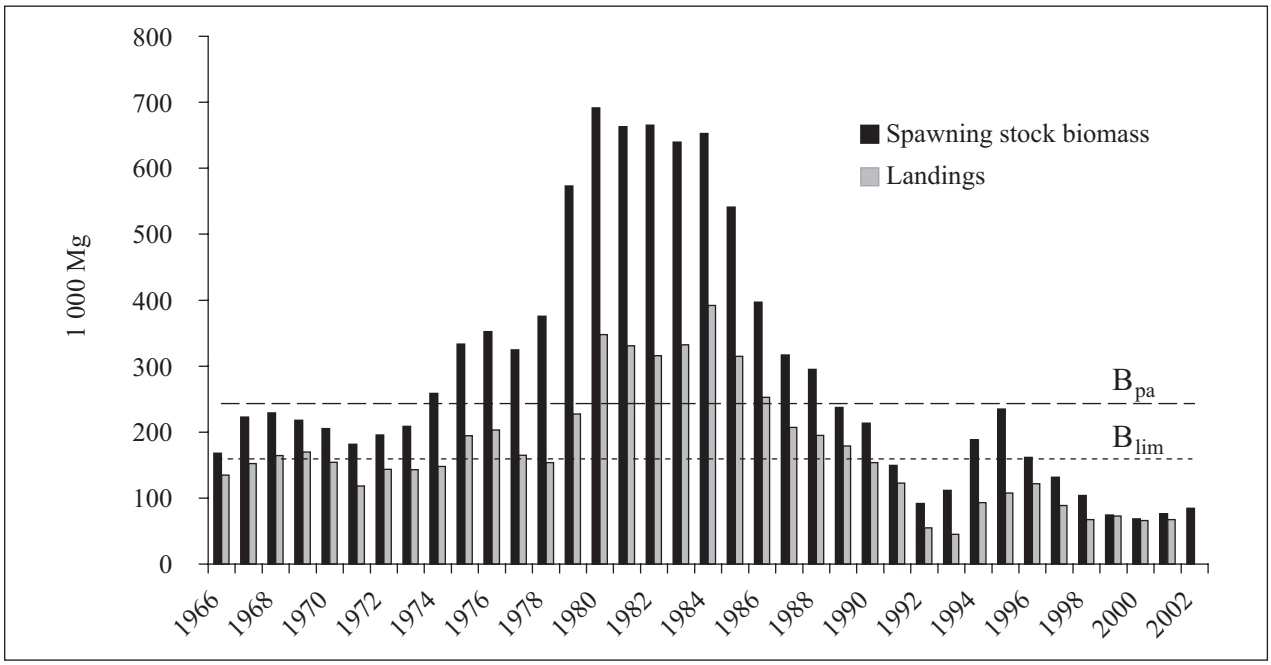
149. Around 30 fish species are fished in the Baltic Sea. However, the fisheries are dominated by the three species cod, herring and sprat whose proportion of the total catch is about 93% (ICES, 2003b). Although the total catch rates for commercially important fish species remain steady at between 0.9 and 1 million Mg of fish per year (about 1% of the global fish yield), fishing of cod, eel, salmon and plaice is not being managed in a sustainable way (HELCOM, 2002b). Figure 2-18 shows the trends in cod stocks in the eastern and central Baltic. There is evidence of an ongoing reduction in spawning stock biomass since the late 1980s. Stock levels now lie below the estimated biological reference values. Apart from overfishing, the decline in cod stocks can also be apportioned to the deteriorating conditions for fish spawn. Along with eutrophication, inadequate input of large quantities of highly saline and oxygen-rich water from the North Sea mean that in some areas and water layers of the central Baltic, oxygen levels are so low that sensitive cod spawn cannot survive. At the same time, cod stocks are now significantly lower than those of herring and sprat which feed, among other things, on cod spawn and thus exacerbate this negative trend due to the imbalance in the predator/prey relationship.

150. There is evidence of a recent increase in the exploitation of sprat and herring stocks in the Baltic Sea for use in fishmeal and fish oil production (ICES, 2002a; LOZÁN et al., 1996b). One of the main problems with industrial fisheries is that other fish species are caught as by-catch. Because of the tightly-meshed nets used, immature fish are caught before they can reproduce. This has, for example, resulted in additional pressures on cod stocks in the central Baltic Sea. In contrast to sprat, Baltic herring stocks have continually declined since the 1970s. For this reason, the ICES has called for an immediate reduction in catch quotas of around 50% to allow stocks to recover (ICES, 2002a). An additional problem is that in mixed fisheries, around one third of the herring catch is landed in the sprat catch. This factor must thus be taken into account when setting catch quotas for both fish species. An increase in industrial fishing would only exacerbate the problem.

151. Again as in the North Sea (Para. 39), the situation is particularly critical regarding migrating fish species like sturgeon, eel and salmon. The best-known example is the Baltic sturgeon which has been extinct since the 1970s. The causes are overfishing, blockage of migratory routes by dams and the destruction of spawning grounds through such activities as river straightening. Similar factors are also responsible for the decline in eel stocks and have affected sea trout and salmon in the same way. Salmon stocks have recovered slightly in recent years as a result of the Salmon Action Programme 1997 to 2010 initiated by HELCOM and the International Baltic Sea Fishery Commission (IBSFC). The programme aims to prevent Baltic wild salmon from becoming extinct. Losses which occur through the destruction of spawning grounds are compensated for by artificial incubation of salmon spawn which is released into existing or potential spawning waters. Stringent regulation of wild salmon fisheries through such activities as renaturalisation of spawning and migratory watercourses will assist in bringing stocks back to within ‘safe biological limits’.

Figure 2-18

Cod fisheries and cod biomass in the Baltic, from Bornholm Sea to Bothnian Bay and the Finnish coast (1966–2002)



B_{pa}: Precautionary reference point B_{lim}: Limit reference point

SRU/SR 2004/Fig. 2-18; data source: ICES, 2002e

2.2.2.2 Negative Impacts on Non-Target Species

152. Baltic Sea fisheries differ to those of the North Sea in terms of the preferred species and the dominant fishing methods. While beamtrawling is not used at all, numbers of static nets and fish traps are extremely high (HELCOM, 2002b; ICES, 2000). In the case of cod fishing, the share of the catch caught with gill nets was as much as 50% in the late 1990s. This catch method is preferred in coastal fisheries.

Differences are thus evident in the share of the Baltic catch with no assigned commercial utility which is thrown back overboard (see 'discards', Para. 40). The total landed catch for 1998 was estimated at 761,091 Mg; discards amounted to 11,003 Mg or 1.4% of the catch (ICES, 2000). Leaving industrial fishing out of the equation (because discards do not occur there), the share of discards amounts to 3.8%. When using this data, it must be remembered that for the most part it refers to the dominant fisheries for cod, sprat and herring. The smaller fisheries and especially coastal fisheries, which can sometimes involve extremely high quantities of by-catch, have not been included. In the Bothnian Bay, by-catch makes up some 92% of the total catch of vendace (*Coregonus albula*) (ICES, 2000). And in the largest Baltic fisheries, juvenile cod made up the main share of the identified discards (6,573 Mg). Given the trend in Baltic cod stocks in recent years, this factor must be given special consideration because – as mentioned earlier – these young fish are lost to already depleted stocks.

153. Towed nets used in the Baltic Sea cause less harm to bottom flora and fauna compared to those in the North Sea. One reason, as mentioned earlier, is the lack of beamtrawling. Also, in the Baltic, the benthos (plants and animals in and on the ocean floor) comprises small organisms that are somewhat less sensitive to fishery-related disturbances (ICES, 2000). Nevertheless, benthic organisms do come to harm. Larger bottom fauna are destroyed by trawl doors which dig into and plough up the sea bed to depths of between 5 and 23 cm. Those particularly affected are the ocean quahog (*Arctica islandica*) and the tellin (*Syndosmya alba*) (WEBBER and BAGGE, 1996). It is estimated that in the fishable area of the Baltic Sea, some 13% of the sea bed is affected by disturbances of this kind and it can be assumed that many of these areas undergo bottom net-related change more than once per year. In similar way to that already documented for the North Sea, this leads to a reduction in sensitive species and a parallel increase in short-lived opportunists.

154. Static net fishery has almost no impact on the benthic community, although seabirds, harbour porpoises and seals are often entangled in the nets. Consideration must however be given to the fact that by-catch levels are not equal in all areas. For the period 1987 to 1996, the proportion of harbour porpoises killed in static nets in the

south-western Baltic was estimated at between 0.5% and 0.8% of the total population, and at 1.2% of the population in the eastern Baltic (ICES, 2000). At just a few hundred individuals, the harbour porpoise population in the eastern Baltic Sea is so small that any loss is a loss too many. Also, many by-catches go unrecognised and so the reported numbers are lower than in reality. It can therefore be assumed that static net fisheries pose a risk to the harbour porpoise population in the Baltic (HELCOM, 2001a). The Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS) calls for urgent implementation of a recovery plan for the harbour porpoise population in the Baltic Sea where, in recent years, a huge decline has been observed in this small whale species. Although the causes are not completely known or categorised, a key role is apportioned to static net fisheries (ASCOBANS, 2000).

155. Section 3.1.6 – Principles of Sustainable Fisheries – presents the key measures for better protection of the marine environment from the impacts of fishing. The following is of importance as regards the Baltic Sea:

The harbour porpoise population in the Baltic Sea faces acute risk from static net fisheries. For this reason, immediate measures are necessary to secure harbour porpoise stocks there. Measures that could serve this goal include the establishment of no-fishing zones and the use of pingers or other scientifically tested equipment to keep harbour porpoises away from the nets (see also Section 2.1.7.1).

2.2.2.3 Summary

156. Like the North Sea, the Baltic Sea faces significant pressures of use from fisheries. Cod stocks in the Baltic have not been sustainably managed for some time. Along with other natural factors, this has led to an ongoing decline in biomass. At present, stocks are outside 'biologically safe limits'. The situation is even more acute as regards anadrome and catadrome migratory fish like eel, sturgeon, sea trout and salmon. Their clear decline is not solely caused by fishing, however. Other causes include encroachments on migratory routes and spawning grounds. Salmon stocks have recovered slightly in recent years due to replenishment activities.

The impacts of fisheries on non-target species are not so severe as in the North Sea. By-catch in larger-scale fisheries (cod, herring and sprat) is therefore lower than in the North Sea. This is not necessarily the case, however, with coastal static net fisheries, where large quantities of non-target species are often part of the catch. One of the main problems is that harbour porpoises frequently get entangled in static nets and meet their death. The presence of the only whale species that inhabits the eastern Baltic Sea is severely threatened. Robust bottom fauna and absence of particularly harmful beamtrawler fisheries in the Baltic means that the impact on benthnic communities from bottom net fishing is lower than in the North Sea. It nevertheless poses a problem for the ecosystem.

2.2.3 Pressures from Pollutants

157. As in the North Sea, a wide range of inorganic and organic pollutants are input into the Baltic Sea. The specific conditions in the Baltic, which compared to the North Sea include less frequent water mass exchange, lower temperatures and lower salinity levels (Para. 143), can lead to an increased delay in reduction of pollutants in sediments and thus to their increased accumulation (HELCOM, 2001a).

The following outlines the situation regarding pollution of the Baltic Sea by heavy metals and arsenic (Section 2.2.3.1), organic compounds (Section 2.2.3.2), petroleum-derived substances input into the marine environment by oil discharges (Section 2.2.3.3) and radioactive substances (Section 2.2.3.4). Section 2.2.3.5 takes up the potential problems involved in the legacies of military activities.

In each case, only pressures and emissions specific to the Baltic will be addressed. Reference will otherwise be made to the respective paragraphs in the section on the North Sea (Section 2.1.3) as regards general conclusions on the possible input pathways, distribution within environmental compartments, BRC and EAC values, emission sources and emission reduction activities.

2.2.3.1 Heavy Metals and Arsenic

2.2.3.1.1 Heavy Metals

158. Lead, cadmium and mercury all play a key role in the Baltic, as they do in the North Sea, and have thus been included in the HELCOM List of Priority Substances (Para. 293). Copper, another heavy metal, will also be addressed in the following presentation.

Pollution Status

159. Tests conducted during the period 1980 to 1993 showed an ongoing reduction of around 7% per year in cadmium concentrations in surface waters. The trend did not continue, however, between 1994 and 1998. Instead, levels stabilised at around 0.12 nmol per litre (~ 13 ng/kg). A similar trend can be observed for copper. In the case of lead, there is evidence of a significant reduction in concentrations of dissolved lead in surface waters of the Baltic for the period 1982 to 1993 and 1995. No earlier data is available for mercury, making it impossible to detect a trend (HELCOM, 2002b, p. 117–119).

The *Bund-Länder* monitoring programme for the marine environment in the North and Baltic Seas detected no significant trends for concentrations of cadmium, lead, mercury and copper in the waters of the German Baltic coast between 1994 to 1996 and 1997 to 1998; one exception being concentrations of lead and copper in coastal waters of Mecklenburg West Pomerania.

A new increase in concentrations of lead was measured during the periods 1994 to 1996 and 1997 to 1998. Copper concentrations dropped during the same periods (BLMP, 2003, p. 125).

Table 2-19

Concentrations of dissolved heavy metals (ng/kg) in the North Atlantic and the Baltic Sea

Metal	North Atlantic	Baltic Sea
Mercury	0.1–0.3	5–6
Cadmium	4±2	12–16
Lead	7±2	12–20
Copper	75±10	500–700

Source: HELCOM, 2003a, based on data sources from 1993, 1995 and 1999

Overall, heavy metal concentrations in the Baltic Sea are many times greater than those in the North Atlantic.

160. Low exchange of water mass with the North Sea causes, among other things, the build up of high concentrations of heavy metals in sediment in the Baltic. Tests conducted in deep, non-polluted sediment layers show that since 1900, concentrations of cadmium, lead and copper have increased by between two and four-fold due to anthropogenic causes. No accurate conclusions could be drawn for mercury due to the low number of available studies on the retention time and behaviour of this metal, which can be highly volatile in its oxidised state (HELCOM, 2002b, p. 119).

The highest concentrations of lead in sediment were measured in the Bay of Lübeck (198 mg/kg), the highest concentrations of cadmium in the Gotland Basin (7.2 mg/kg) and in the deep waters off the Faroe Islands (Faroe Deep) (6.2 mg/kg), the highest mercury concentrations in the Bothnian Bay (0, 42 mg/kg) and in the Gulf of Finland (0.35 mg/kg), and at 176 mg/kg, the highest copper concentrations were found in the Gotland Deep (HELCOM, 2002b, p. 122 et seq.). These concentrations of lead, cadmium and copper in sediment exceed the upper EAC values by a factor of 3 to 6 and are thus significantly higher than sediment concentrations in the North Sea (Table 2-20). Mercury concentrations in sediment in the Baltic Sea lie in the upper range of the EAC values and are lower than the highest sediment concentrations measured in the North sea.

161. High heavy metal concentrations are also found in marine organisms in the Baltic Sea, especially in herring (*Clupea harengus*). Figure 2-19 shows the trends for heavy metal concentrations of cadmium, lead and mercury in Baltic herring. While lead concentrations in herring have dropped almost across the board since 1980, and can largely be apportioned to the abandonment of leaded fuels, mercury concentrations in herring have stayed at the level for 1980 (HELCOM, 2003a). Following an interim reduction, mercury concentrations in herring in some regions have risen to match the relatively high levels of the early 1980s. Other mercury concentrations in Baltic fish exceed the reference values announced by the Swedish Environment Agency for noncontaminated fish (HELCOM, 2002c). Overall, the trend for mercury is not uniform and there is no significant evidence of any improvement in the contamination status.

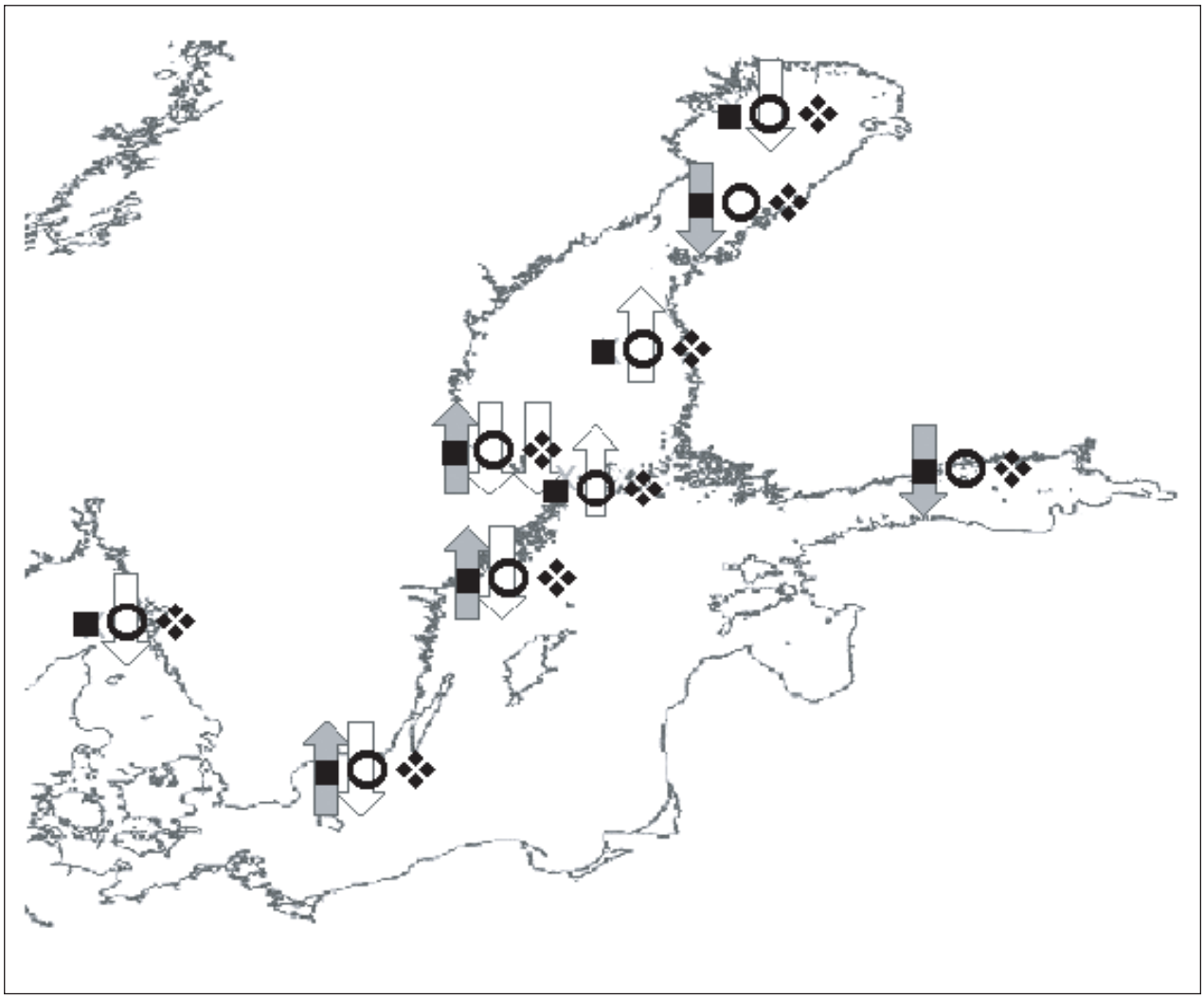
Table 2-20

Comparison of maximum recorded concentrations of heavy metals in Baltic and North Sea Sediments

Heavy metal	Concentration in Baltic sediment (mg/kg)	Concentration in North Sea sediment (mg/kg) (1993–1996)
Cadmium	7.2	< 5
Copper	176	< 60
Lead	198	< 100
Mercury	0.42	< 30
SRU/SR 2004/Tab. 2-20; data sources: HELCOM, 2002b, p. 122–128, OSPAR, 2000b, p. 61–66		

Figure 2-19

Trends in heavy metals in Baltic herring: cadmium (■), lead (O) and mercury (❖) during the period 1980 to 2001 in different parts of the Baltic Sea



Legend for cadmium (■), lead (O) and mercury (❖):
⇑: Significant upward trend; ⇓: significant downward trend; no arrow: no significant trend

Source: After HELCOM, 2003a, p. 31

162. A significant increase is evident in cadmium concentrations in Baltic herring (Figure 2-19). The situation is similar with other fish species and with mussels in specific regions. In flounder (*Pleuronectes flesus*) from the Öresund, cadmium concentrations rose by 5% per year between 1969 and 1999. Those in European perch (*Perca fluviatilis*) and blue mussel (*Mytilus edulis*) from the Swedish coast have risen by more than 10% per year within a period of four or five years and now exceed the background reference values set out by the OSPAR Commission. This trend is particularly evident with regard to the partly constant (above the halocline) and partly declining (below the halocline) cadmium concentrations in marine waters. Various explanations have been put forward as to the causes of this trend in cadmium concentrations in marine water and in biota (e. g. the impact of fluctuating salinity and pH levels in marine waters, or the effects of environmental hormones on marine creatures), but the reasons are not yet understood in detail (HELCOM, 2002d). No trend has been evident in cadmium levels in blue mussels on the German Baltic coast ('Darßer Ort') since 1992 (BLMP, 2002, p. 116).

163. The highest copper concentrations in herring livers were measured in the central Bothnian Sea near industrialised areas. Copper concentrations in herring and cod (*Gadus morhua*) have remained almost constant over a 15-year time series (HELCOM, 2002b, p. 130 et seq.).

Input Pathways and Sources of Heavy Metals

164. Lead, cadmium, mercury and copper find their way into the Baltic via rivers, direct discharges (industrial and

municipal wastewater) and the atmosphere. Regional inputs of lead, cadmium and mercury via the atmosphere remained more or less steady between 1996 and 2000 (BARTNICKI et al., 2003). The little data available on inputs via rivers give no real indication of any reduction in heavy metal inputs (HELCOM, 2002b, p. 33). The situation differs from region to region. During the period 1994 to 2000 an increase in cadmium and lead inputs was detected in some areas (although there were sometimes strong fluctuations in the levels measured), while in other areas, the opposite was the case (for further details see HELCOM, 2003, p. 26 et seq.). No data is available regarding copper inputs over a prolonged period (copper is not included in the HELCOM reports cited above). In 1995, total heavy metal inputs via the water course, that is river inputs and direct discharges, amounted to emissions of 337 Mg for lead, 24 Mg for cadmium, 13 Mg for mercury and 1,595 Mg for copper (Table 2-21)

165. Compared to the inputs via the water pathway, the atmospheric depositions in the Baltic Sea for 1996 were lower at 177 Mg for lead, 9.5 Mg for cadmium and 2.8 Mg for mercury (BARTNICKI et al., 2003). If the inputs from the water pathway for 1995 are added to atmospheric inputs for 1996, the proportion of emissions through the atmosphere compared with total emissions amounts to 34% for lead, 29% for cadmium and 18% for mercury.

166. Sources of inputs of heavy metals are similar to those for the North Sea (Table 2-5) and include the burning of fossil fuels, industrial activities, mining, waste incineration and the use of plant protection products and fertilisers that contain heavy metals. The main emitters of heavy metals into the atmosphere are Russia, Poland and Germany (Table 2-22).

Due to its very small catchment area, Germany's inputs of lead, cadmium, mercury and copper via the water pathway are extremely low at around 0.6% to 0.8%. In 1995, the main emitters of heavy metals via the water pathway (in order of inputs levels) were Russia, Finland, Sweden and

Table 2-21

Heavy metals load going into the Baltic Sea from rivers, municipalities and industrial plants in 1995

	Lead Mg/a*	**Cadmium Mg/a***	**Mercury Mg/a***	**Copper Mg/a***
Municipal direct discharges	32.9	6.6	1.1	75.9
Industrial direct discharges	4	0.6	0.6	49.6
Rivers**	300.5	16.4	11.6	1 469.2
Total**	**337.4**	**23.6**	**13.3**	**1 594.7**

* All Estonian figures are from 1994. All figures are missing for Denmark.
** Mercury figures are missing for rivers in Latvia. Mercury and cadmium figures are missing for rivers in Russia.

Source: After HELCOM, 1998a, p. 65

Table 2-22

Shares of the three main emitters in total atmospheric lead, cadmium and mercury emissions in the HELCOM region for 2000

	Lead		**Cadmium**		**Mercury**	
	Mg/a	**%**	**Mg/a**	**%**	**Mg/a**	**%**
Russia	2 352	*65*	51	*44*	10	*15*
Poland	648	*18*	50	*43*	26	*38*
Germany	519	*14*	11	*9*	29	*42*
Entire Baltic Sea Basin	3 632	*100*	117.6	*100*	69	*100*
SRU/SR 2004/Tab. 2-22; data source: BARTNICKI et al., 2003						

Poland for lead; Poland, Russia, Finland and Estonia for cadmium; Poland, Estonia, Finland and Russia for mercury; and Russia, Estonia, Sweden and Poland for copper (HELCOM, 1998a, p. 65 et seq.).

Summary

167. Concentrations of lead, cadmium and copper measured in the waters of the Baltic Sea have dropped since 1980, although for cadmium and copper, the trend has not continued since the mid-1990s. In some areas of the Baltic, concentrations of lead, cadmium and copper in sediments remain at between 3 and 6 times the respective EAC values. Concentrations of copper are in the range of the EAC value. The partial reduction in heavy metal concentrations in the water is not reflected in biota (excepting lead). Copper levels in herring and cod, and mercury concentrations in herring remain unchanged. Cadmium concentrations in mussels and fish have even increased. Inputs of cadmium, lead and mercury via both the atmosphere and the water pathway remained almost constant during the period 1996 to 2000.

Similar to the situation in the North Sea, the trend in recent years illustrates the need to further reduce emissions both from large point sources and diffuse sources. The options for reducing heavy metal inputs outlined in the section on the North Sea (Para. 63) also apply to the Baltic region.

2.2.3.1.2 Arsenic

168. Arsenic concentrations in biota in the Baltic Sea play an important role because consumption of seafood is one of the key sources of arsenic contamination in humans (Para. 64). High concentrations of arsenic (7.3 to 9.7 µg/l) were measured in coastal waters off Mecklenburg West Pomerania (Bay of Pomerania). The river Oder is thought to be the main input source. At between 4 and 22 mg/kg (BMLP, 2002, p. 124), arsenic concentrations in sediment in the coastal waters off Mecklenburg West Pomerania did not change over the period 1994 to 1998. These values significantly exceed the EAC value set out by OSPAR for arsenic in sediment (1 to 10 mg/kg).

Arsenic was found in eelpouts, blue mussels and in herring gull (*Larus argentatus*) eggs, in each at one sampling site on the German Baltic coast. Concentrations in blue mussels increased during the period 1992 to 1996 to as much as 9.5 mg/kg and have since dropped to 5.5 mg/kg (2002). The levels of arsenic found in eelpouts and herring gull eggs have showed no significant trends since testing began (1994 and 1991), and fluctuate between 1.4 and 2.5 mg/kg in eelpouts and between 0.2 and 0.32 mg/kg in herring gull eggs (UBA, 2003b). All concentrations measured on the Baltic coast are significantly lower than those in the Wadden Sea (Para. 64).

2.2.3.2 Organic Compounds

169. Despite their great role in polluting the Baltic Sea, no comprehensive studies are available on concentrations of many organic compounds in the water, sediments and marine organisms. At best, extended time series are available on long-recognised pollutants like PCBs, HCHs and DDT. While these tests allow trends to be detected, they are mainly restricted to a specific area of the Baltic (HELCOM, 2002, p. 119 et seq.).

In line with the findings on the North Sea (Section 2.1.3.2), the following is an outline of the pollution status in the Baltic Sea based on a number of existing chemicals (PCBs, γ-HCH, TBT, DDT, PAHs and dioxins/furanes). With the exception of PBDEs (polybrominated diphenyl ethers), the HELCOM reports contain no data on inputs or pollution of the Baltic by 'newer' organic compounds (e. g. PBDEs, nonylphenol, nitro-musk compounds, pharmaceuticals; see also Para. 76).

Polychlorinated Biphenyls (PCBs)

170. PCB concentrations in the Baltic waters are extremely low (< 0.2 to 3 ng/l; UBA, 2003a), in many cases lower than the detection limit. No trend can be seen for the period 1994 to 1998 due to the high variability of the values. In general, concentrations tend to rise towards the coast. PCBs accumulate in sediments due to their high lipophility. High sediment concentrations (2 to 33 µg/kg) were found along the Swedish coast in the Baltic proper, with very high concentrations (up to 100 µg/kg) near Stockholm (HELCOM, 2002b, p. 126). On the coast of Schleswig-Holstein, the main concentration points lay in the inner Kiel Fjord (sediment concentration up to 185 µg/kg) and in Mecklenburg near the Warnemünde shipyard area (80 to 100 µg/kg) (BMLP, 2002, p. 135). PCB concentrations in biota (e. g. in herring and the guillemot (*Uria aalge*)) have dropped since the 1960s, although this trend is no longer observed in the Baltic proper (HELCOM, 2002b, p. 136).

Preliminary estimates show atmospheric inputs of PCBs into the Baltic of 715 kg (HELCOM, 2002b, p. 36).

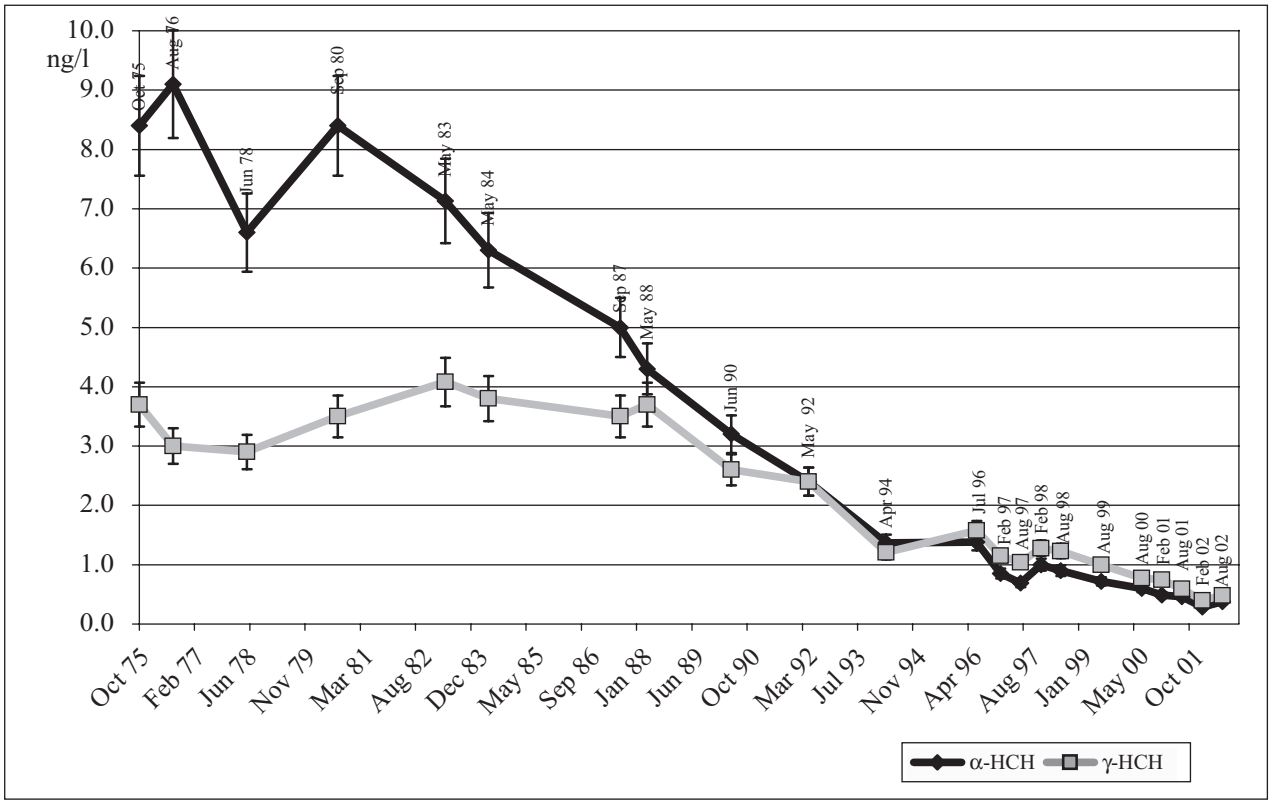
Plant Protection Products and Biocides

171. Concentrations of the hexachlorocyclohexane isomers α-HCH and γ-HCH (lindane) reduced significantly during the period 1975 to 1999 (measured in the Arkona Basin, Figure 2-20). Until 1993, there was evidence of a significant reduction in contamination of the surface waters with HCH isomers. This downward trend was less evident from 1994. A significant reduction in HCH concentrations was again measured after 1999, resulting in a further reduction of over 30% by 2001 (HELCOM, 2003a, p. 31). This also led to a reduction in concentrations of γ-HCHs in biota from the mid-1980s (HELCOM, 2002b, p. 137; BLMP, 2002, p. 131 et seq.). Concentrations did however decline at a lower rate in the western Baltic, probably due to continued extensive use of lindane in South-West Europe (HELCOM, 2002b, p. 137).

In 1997, atmospheric deposition of γ-HCH in the Baltic Sea was estimated at around 3.4 Mg (HELCOM, 2002b, p. 36). While concentrations of γ-HCH in the Baltic are similar to those in the North Sea, contamination with α-HCH is greater in the Baltic. In 1997 and 1998, α-HCH

Figure 2-20

Trend in surface water (3–5 m) α-HCH and γ-HCH concentrations in the Arkona Basin



Source: BSH, 2003, written communication of 21 October 2003

concentrations ranged from 0.43 ng/l in the bays of Kiel and Flensburg, and 1.1 ng/l in the Baltic Proper. The relatively low concentrations in the western Baltic can be apportioned to inflow of water from the North Sea with lower levels of α-HCH. The higher concentrations in the eastern Baltic can be explained by legacies of the past (HELCOM, 2002b, p. 120 et seq.).

172. As in the North Sea, the highest concentrations of tributyl tin (TBT) in Baltic sediment are typically found in harbours and along shipping lanes. Sediments in the Baltic contain higher concentrations of organic tin compounds (up to 33 mg/kg) than those in the North Sea (sediment in Denmark: 16.9 mg/kg). TBT was detected in new-born harbour porpoises (*Phocoena phocoena*), in mussels and in Baltic seabirds. No trend was evident, however (HELCOM, 2002b, p. 140). At four stations on the coast of Mecklenburg West Pomerania (including the Warnemünde shipyard), concentrations of TBT in sediment were five times higher than the effects threshold for prosobranch snails (BMLP, 2002, p. 143).

173. Use of the insecticide DDT has been banned in the EU since the 1970s. Over the last ten years (in some cases since 1980), a significant drop in concentrations of DDT and its persistent breakdown products DDE and DDD was measured in most biota examined (HELCOM, 2002b, p. 133 et seq.). Levels of DDT in Baltic seals declined in the early 1970s, and again in the course of the 1980s and 1990s. In 1999, however, particularly high concentrations of DDT were reported in European perch (*Perca fluviatilis*) from the Gulf of Riga. This probably resulted from either illegal use or incorrect storage of DDT in CIS states (ALLSOPP et al., 2001, p. 30).

Polycyclic Aromatic Hydrocarbons (PAHs)

174. PAH concentrations in the water are likewise subject to strong fluctuations. No change was detected in concentrations in marine waters between 1989 and 1998. The highest PAH concentrations (35.2 mg/kg) in sediment were measured in the southern Baltic (Bay of Gdansk, Bay of Lübeck) (HELCOM, 2002b, p. 126). PAHs continue to play a key role because they are created in the burning of fossil fuels and are ubiquitously distributed via the atmosphere (BLMP, 2002, p. 141).

Dioxins and Furanes

175. Little information is available on contamination of sediments in the Baltic Sea by dioxins and furanes. The reduction in concentrations in biota is lower than for

PCBs and has stagnated in the last decade (HELCOM, 2002b, p. 139). For example, by 1990, concentrations of dioxins in the eggs of the guillemot had dropped to one third of those for 1970 and have since remained almost constant.

In some Baltic fish, the new EU maximum threshold for dioxins in food is exceeded. Finland and Sweden have thus been granted an exception allowing the sale and consumption of Baltic fish to continue until 2006 (HELCOM, 2003a, p. 32).

Brominated Flame Retardants

176. Brominated flame retardants (PBDEs) have been found in fish and in the eggs of the guillemot. The concentrations in eggs have been on the rise since the 1980s, although they did fall in the 1990s. By way of contrast, concentrations of PBDEs in human breast milk have shown an ongoing increase since the early 1970s (HELCOM, 2002b, p. 139).

Impacts from Pollution

177. One effect of pollutants often observed in vertebrates is a disturbance of the reproductive system. The decline in a range of fish predators, ringed seals (*Pusa hispida*), grey seals (*Halichoerus gryphus*), harbour seals (*Phoca vitulina*), otters (*Lutra lutra*) and white-tailed eagles (*Haliaeetus albicilla*) in the Baltic region between the 1950s and the 1970s is apportioned to the then increasing input of chloro-organic compounds (including PCBs, DDT) into the Baltic Sea. A reduction in pollutant inputs since the 1970s allowed species recovery. The size of the hatch in the white-tailed eagle and the numbers of pairs that breed successfully has increased. However, the size of the hatch appears to be stabilising below the figures for 1950. It is possible to identify a relationship between stagnating concentrations of PCBs and dioxins in Baltic fish (see Paras. 170 and 175). The shells of guillemot eggs have become thicker since the 1970s, and have regained the thickness measured prior to 1940. Nevertheless, other findings indicate that we are still a long way off from sounding the 'all clear' as regards pollution of the Baltic. In young grey seals, an increase in the occurrence of intestinal ulcers – from 10% to over 50% – was detected during the periods 1977 to 1986 and 1987 to 1996. The Helsinki Commission sees a causal relationship between the fact that otter populations on the Baltic coast have not yet recovered and concentrations of PCBs and dioxins in fish still being too high (HELCOM, 2002b, p. 40 et seq.).

178. A study published in 1995 on babies born to Swedish fishermens' families who eat large quantities of Baltic fish indicated a relationship between the consumption of contaminated fish and an increased risk of lower birthweight. Given that concentrations of dioxins and PCBs in herring and salmon are still extremely high, the Swedish government has recommended that women of childbearing age should refrain from eating fish of this kind (HELCOM, 2002b, p. 141). Increased dioxin, PCB and DDT contamination was detected in those groups whose diet consists of medium to large quantities of fatty fish from the Baltic (ALLSOPP et al., 2001, p. 75 et seq).

179. Increased concentrations of pollutants are also cited as a cause of fish disease. Significant increases in concentrations of hepatic detoxification enzymes – measured as EROD activity (EROD: ethoxyresorufin O-deethylase) – were detected in Baltic fish during the period 1988 to 1998. At the end of that period, EROD activity was between two and three times higher than at the beginning, indicating that the fish were exposed to substances that triggered increased production of these detoxification enzymes. Given that concentrations of pollutants which are known to induce heightened EROD activity have declined, unknown pollutants must be the cause of these effects (HELCOM, 2002b, p. 140).

Summary

180. The Baltic Sea continues to be contaminated by historic chemicals like PCBs, γ-HCH, TBT, DDT, PAHs and dioxins/furanes despite long-standing bans or restrictions on their use or production. These organic pollutants have accumulated in fish, birds and mammals through the food chain. Baltic fish caught for human consumption is often contaminated to a far greater extent than fish from other regions. Effects like increased occurrence of fish disease and disturbance of the reproductive system in more highly developed species can be observed in the Baltic Sea. Consumption of contaminated fish leads to an increase in concentrations of organic pollutants in humans.

It can be assumed that – similar to the situation in the North Sea – 'newer' organic pollutants are finding their way into the Baltic Sea. Pollution monitoring activities in the Baltic must thus be further expanded to obtain more accurate indications as to input levels and the impacts of such substances.

Reduction measures for reducing inputs of organic pollutants are recommended in the section on pollution of the North Sea (Para.79). In the main, prevention of inputs of priority organic pollutants into the Baltic Sea requires a comprehensive approach that aims to substitute persistent and bio-accumulating substances with more environmentally sound substances (see also Section 3.2.3).

2.2.3.3 Oil Inputs

181. Inputs of petrochemical substances are an additional source of contamination in the Baltic Sea. HELCOM (2002b) estimates annual oil inputs at between 20,000 and 70,000 Mg. Offshore oil extraction has played only a subordinate role in the Baltic to date (GROMOLL, 1996). However, Lukoil, a Russian oil concern, intends to construct an oil drilling platform only 22 km from the Courland Spit national park. From 2004, some 700,000 Mg oil per year will be produced (newspaper article dated 18 july 2004). GROMOLL (1996) has estimated that in 2000, between 25 and 100 Mg will find their way into the Baltic as a result of prospecting, exploration and production of hydrocarbons. The proportion

of the total input of oil hydrocarbons from illegal oil discharges from ships is about 10%. Despite existing prosecution procedures and simplified disposal through the expansion of waste reception facilities in harbours, only a marginal reduction is evident in pollution caused by these substances (Section 3.4.3.1). According to the Helsinki Commission, between 500 and 700 illegal discharges of oil occurred each year over the past twelve (HELCOM, 2003a; Figure 2-21). An intensification of illegal releases of oily components could result from the projected increase in shipping traffic.

Accident-related oil discharges pose an additional problem. During the period 1969 to 1998, some 40 large ship collisions occurred in the Baltic region causing over 100 Mg of oil to be spilled in each case (HELCOM, 2002b). The last big accident was the collision of the MS Baltic Carrier with the MS Tern in 2001, involving the spill of 2,700 Mg of oil. Apart from the acute effects of such oil spills, which include contaminated beaches and the death of seabirds, long-term effects can also be observed, for example, in increased concentrations of oil hydrocarbons in sediment (HELCOM, 2003a).

2.2.3.4 Radioactive Substances

182. The very slow exchange of water in the Baltic Sea makes for extremely long pollutant retention times, including for man-made radionuclides. This is why activity concentrations for caesium and strontium are higher than in other marine environments (HELCOM, 2002b). The following are the key sources of 'artificial' radionuclides in the Baltic, in order of importance:

- The Chernobyl nuclear reactor incident in 1986.
- Above-ground nuclear tests, especially those conducted in the 1960s and 1970s.
- Discharges from the nuclear processing plants at La Hague and Sellafield. These reach the Baltic via the North Sea and can be readily detected.
- Sea-based nuclear facilities (release of radioactivity from nuclear-powered naval vessels).

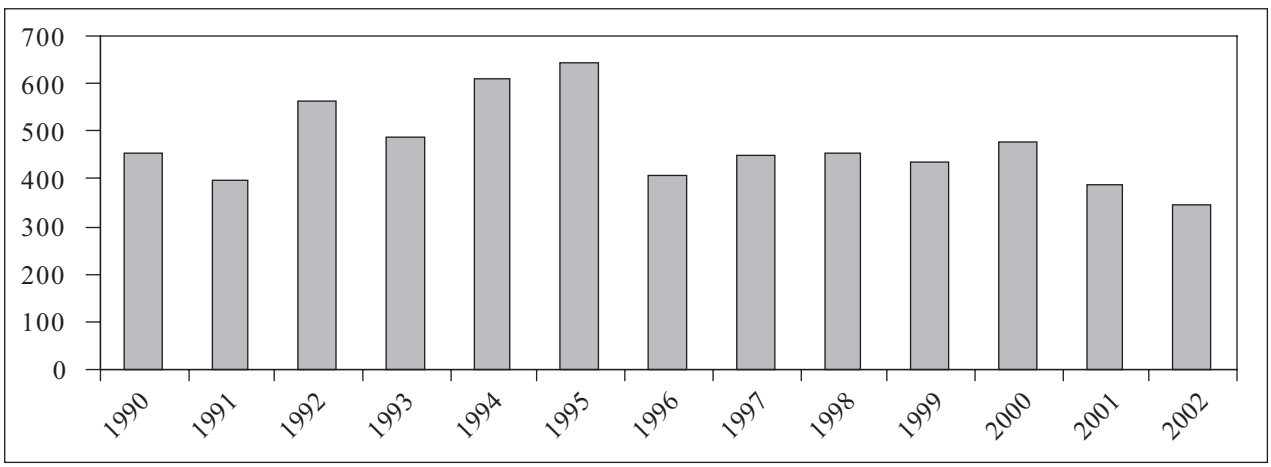
183. Chernobyl affected the Baltic Sea to a far greater extent than the North Sea. In the short-term, the accident led to a significant increase in radioactive contamination of the waters. As shown in Table 2-23, Chernobyl was responsible for the main share of caesium 137 inputs during the period 1950 to 1996 – the majority being from the atmosphere.

In contrast to the water in the North Sea, in which pollution by Cs-137 quickly returned to levels measured before Chernobyl, concentrations of Cs-137 measured in the Baltic are still higher than before the accident. Higher concentrations can thus be found in sediments serving as important sinks for radionuclides. A significant increase in Cs-137 activity concentrations was detected in sediments in the Bothnian Bay (HELCOM, 2002b).

184. The higher activity concentrations found in the Baltic compared with the North Sea are mirrored in contamination of marine creatures. In Baltic fish, the average Cs-137 activity is 6.1 Bq/kg wet mass (BfS, 2003). But in absolute terms, the activity concentrations measured are very low and pose no threat to aquatic organisms. Also, the levels of artificial radionuclides found in fish are so low that consumption of Baltic fish poses no additional risk to humans – average fish consumption leads to an additional radiation dose of between 1 and 2 µSv/a, which is only 1% to 2% of the threshold set out by the International Commission on Radiological Protection (HELCOM, 2002b; TEUCHER, 1996).

Figure 2-21

Number of detected illegal oil discharges in the Baltic Sea, 1990–2002



Source: After HELCOM, 2003a

Table 2-23

Total input of ^{137}Cs to the Baltic marine area during the period 1950–1996

Source	Input mode	^{137}Cs input (TBq)
Atmospheric nuclear weapons test	Atmospheric deposition Riverine runoff	1 800 100
Chernobyl accident	Atmospheric deposition Riverine runoff	4 400 300
Reprocessing (Sellafield and La Hague)	Hydrodynamic transport from the North Sea	400
Nuclear facilities	Coastal discharge	2

Source: HELCOM, 2002b

2.2.3.5 Military Legacies

185. Both during and after World War II, conventional and chemical weapons were dumped in the Baltic and the Skagerrak, and to a far greater extent than in the North Sea (which is why this problem is addressed in this section only). A relatively good overview has since been obtained as to the location and quantities of the chemical weapons that were dumped. The situation is rather more vague as regards conventional weapons.

The main dumping grounds for chemical weapons were the Skagerrak (150,000 Mg), the Bornholm Basin (around 32,000 Mg), the southern exit of the Small Belt (5,000 Mg) and the Gotland Basin (about 2,000 Mg) (HELCOM, 1994). Most of the weapons and ammunition lie in water depths ranging from 70 to 120 m; in the Skagerrak in depths of between 200 and 700 m. At these depths, water mass layers are mostly stable and the seabed current is weak, keeping vertical transportation of substances very low. Little is known about the condition of the weapons and ammunition because they are covered with sediment, and hardly any on-site studies have been conducted in recent years (THEOBALD et al., 1996). There is thus little to go on as regards the extent to which the substances have leeched into the water. The condition of the weapons and ammunition found to date has ranged from intact to completely corroded empty cartridge shells.

The dumped weapons and ammunition comprise a range of different materials such as Clark I (diphenylchloroarsine, a nose and throat irritant), phosgene ($COCl_2$, a lung irritant) and tabun (ethyl N,N-dimethylphosphoramidocyanidate, a nerve gas) (HELCOM, 1994.) It is assumed that in sea water, most of the substances break down relatively easily into non-toxic products (THEOBALD et al., 1996). Chemical agents containing arsenic – Clark I and II, and adamsite (10-chloro-5-hydrophenarsazin(10)) – give greater cause for concern because they are difficult to break down. High concentrations of arsenic are not expected in sediment or in sea water, however, due to the low quantities and solubility of dumped chemical weapons containing arsenic. Also, once released, the large proportion of arsenic will be of anorganic form and thus less toxic than organic compounds (HELCOM, 2002b). Given that corrosion has not occurred uniformly, the chemical agents are probably leeched in low doses over time.

The prime risk is faced by fisheries, because if the chemical weapons were to become entangled in nets they could contaminate crews and catches. Such accidents are recorded in Denmark because of its reporting requirements and award of compensation for contaminated catches. A downward trend is evident in this type of incident (HELCOM, 2002b).

Overall, there is no scientific evidence to support the need for immediate action (meeting at the Schleswig-Holstein Environment Ministry on 7 May 2003; HELCOM, 1994, 2002b; THEOBALD et al., 1996). Salvaging the chemical weapons – which is the only possible solution – would pose an extremely high risk to the ecosystem because the mechanical damage caused would result in the release of even larger quantities of the chemical agents.

186. At present, the German Advisory Council for the Environment sees no need to contest this assessment and thus makes no additional recommendations. The Council would like to point out, however, that the situation cannot really be adequately assessed due to the lack of information on the current status of the chemical weapons and thus on the release of pollutants. While it cannot be assumed that the risk, however assessed, will be eliminated, any existing or potential release of pollutants from the chemical weapons dumps should at minimum be appropriately monitored.

2.2.4 Nutrient Inputs and Eutrophication

2.2.4.1 Eutrophication in the Baltic Sea

187. Since the beginning of the 20th Century, the Baltic Sea has developed from an oligotrophic sea with clear waters to a highly eutrophied waterbody that has become consistently more turbid in the course of the past 50 years. Eutrophication has caused significant changes in species composition in the Baltic, with severe reductions in stocks of eelgrass (*Zostera spp.*) and bladder wrack (*Fucus vesiculosus*). All sub-areas of the Baltic are

subject to eutrophication and its effects. Nutrient inputs are seen as a causal factor of aglal bloom, which regularly occurs up to three times a year in most Baltic regions – in spring, summer and autumn. Concentrations of nutrients in Baltic waters did not significantly decline during the 1990s, but remained at a high level (HELCOM, 2002b, p. 180 et seq.). Concentrations of nitrogen and phosphorus in deep waters have actually risen due to the depletion of oxygen on the sea bed.

Compared with the North Sea (Para. 93 et seq.), one particular feature of the Baltic is the mass presence of blue-green algae (*cyanobacteria*) in summer. While phytoplankton production is limited relative to nitrogen levels in the water, cyanobacteria can fix nitrogen from the air, making phosphorus a limiting factor. The more phosphorus is available, the more additional nitrogen can be fixed by the cyanobacteria and thus absorbed into the nutrient cycle (IOW, 1999). Apart from a high availability of phosphorus and a lack of anorganic nitrogen, cyanobacteria require high water temperatures and a relatively calm sea for optimum development. The frequency and intensity of blue-green algal bloom in the summer appears to have increased since the 1960s. Since the summer of 1997, 'record' blooms of toxic blue algae have occurred at ever-shorter intervals (EU Commission, 2002a, p. 42). Species composition in blue algae bloom has thus changed since 1992: while in earlier times, the non-toxic species *Aphanizomenon flos-aquae* was more frequent than the potentially toxic species *Nodularia spumigena*, the relationship has now reversed (HELCOM, 2003a, p. 22 et seq.).

2.2.4.2 Nutrient Imputs: Sources and Trends

Nitrogen

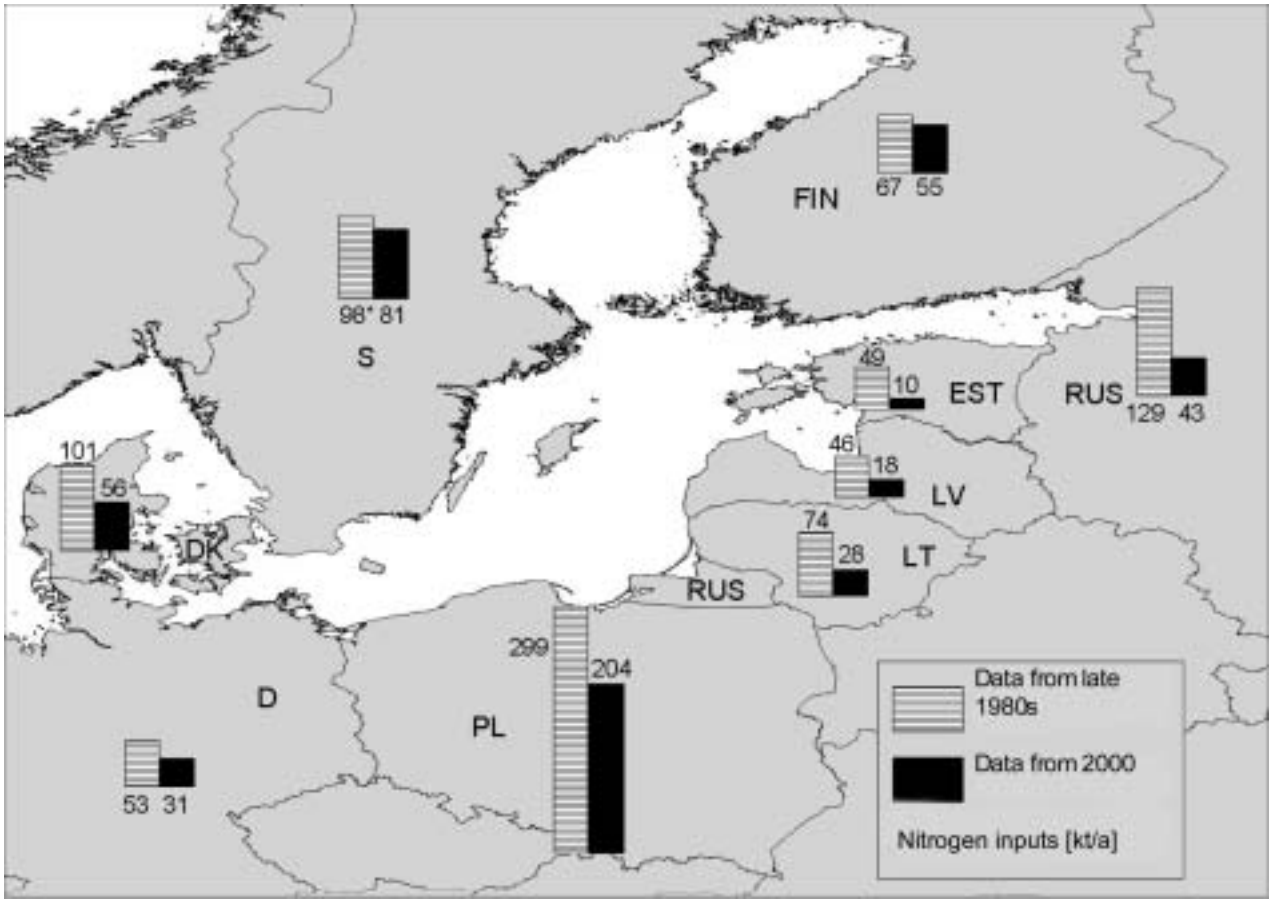
188. The water pathway (rivers and direct discharges) is the key input path for nutrients. A load-focused assessment shows that about double the amount of nitrogen and about ten times that of phosphorus reaches the Baltic via the water pathway than via the atmosphere (HELCOM, 2003a; HELCOM, 2001b, p. 4). While atmospheric inputs of nitrogen were reduced by 25% to 248,000 Mg per year during the period 1986 to 1995 (HELCOM, 1997, p. 25), by 2000 they had risen again to about 300,000 Mg per year. An upward trend was evident in riverine inputs of nitrogen compounds up to the mid-1990s. In 1995, inputs via this pathway had already reached 760,000 Mg (HELCOM, 1998a, p. 53). No specific trend was evident for nitrogen inputs via the water pathway during the period 1994 to 2000. Rather, they followed the freshwater run-off of the rivers that flow into the Baltic. Nitrogen inputs were significantly greater in years with high precipitation than in drier years. Nitrogen inputs amounted to almost 700,000 Mg in 2000 (HELCOM, 2003c, p. 8). More than 50% of the total nitrogen input stems from four rivers: the Neva, Vistula, Oder and Nemunas (HELCOM, 2003a, p. 12).

189. A source-focused assessment of nitrogen inputs showed the shares of total inputs by individual Baltic riparian states (Figure 2-22). Poland, which reduced its annual inputs into surface waters by around 100,000 Mg during the period 1985 to 2000, still has by far the greatest share with 37%. Inputs by the Baltic states are relatively low (with 14% of total inputs), as are those by Germany (6% of total inputs). While from the late 1980s up to 2000, all states were able to reduce both their point sources and their diffuse inputs from agriculture into the surface waters of the Baltic catchment area, the reductions that were achieved varied. Most countries missed the target to reduce inputs of nitrogens by 50% set out in a Ministerial Declaration of the HELCOM States in 1988 (Para. 327). Because of the delays which occur through natural processes, it can be assumed that the full effects of the measures implemented in agriculture will not be visible by 2005 (LÄÄNE et al., 2002, p. 23). Inconsistencies in the data must also be taken into account. In particular, the figures for emissions from agriculture in East European countries in the 1980s can only be interpreted as estimates. The highest percentual reduction between the late 1980s and 2000 occurred in Estonia (by about 80% compared to the figures for USSR times), while the lowest reduction occurred in Sweden with just under 20%. Poland and Russia achieved the highest absolute reductions (by around 100,000 and 85,000 Mg of nitrogen per year). On the whole, reductions in Eastern European states were greater than those in EU Member States. One of the main reasons is thought to be the economic transitions in industry and agriculture that have taken place since the early 1990s. It can thus be assumed that no further reductions will be achieved without appropriate political measures. The Baltic states will no doubt strive to keep emissions at current levels (LÄÄNE et al., 2002, p. 23). There is even a danger that, in the course of EU expansion, accession states will adopt intensified farming methods and increase their nutrient inputs.

190. Nitrogen inputs from the German catchment area of the Baltic Sea are shown in Table 2-24. It is evident that the reduction in inputs from agriculture is significantly lower than from direct discharges from municipal and industrial facilities. The 50% reduction target for agricultural inputs was clearly missed. Inputs from agriculture made up almost three quarters of the total nitrogen inputs in 1995. Germany's report on nitrogen inputs (LÄÄNE et al., 2002, p. 118) cites an almost 50% reduction in the use of nitrogen fertiliser on agricultural land between the late 1980s and 1995, and a 26% reduction in agricultural inputs into surface waters. The main cause of this clear reduction in nitrogen inputs is the socio-economic changes that have taken place in former East Germany since 1989. A comparison of the use of nitrogen fertilisers with nitrogen inputs in surface waters clearly shows the great role played by the transportation of nitrogen compounds in groundwater, which hardly dropped at all. It is assumed that with the long nutrient retention times in soil and groundwater, reductions in the use of nitrogen fertilisers in agriculture will only be mirrored by reductions in inputs into surface waters after a delay of between twenty and thirty years (LÄÄNE et al., 2002, p. 123). What must be considered is that the frequency and duration of washouts is strongly linked to agricultural management

Figure 2-22

Nitrogen inputs in surface waters in the Baltic Sea catchment area (late 1980s and 2000)



* Computed by a different method to the figure for 2000. The stated figure is probably too low.

SRU/SR 2004/Fig. 2-22; data source: HELCOM, 2003b, p. 7; LÄÄNE et al., 2002, p. 14–22

Table 2-24

Anthropogenic nitrogen inputs in German surface waters draining into the Baltic Sea, and reductions attained (late 1980s and 1995)

	Late 1980s		1995		Reduction
	Quantity (Mg/a)	**Share**	**Quantity (Mg/a)**	**Share**	
Diffuse losses (agriculture)	35 200	*66%*	26 100	*73%*	*26%*
Municipal discharges	16 100	*30%*	8 600	*24%*	*47%*
Industrial discharges	1 900	*4%*	1 100	*3%*	*42%*
Fish farming	160	*0.3%*	110	*0.3%*	*31%*
Total inputs	**53 360**	***100%***	**35 910**	***100%***	***33%***

SRU/SR 2004/Tab. 2-24; data source: LÄÄNE et al., 2002, p. 17

practices and soil properties. The reductions still needed to achieve the 50% reduction target for direct inputs are likely to be achieved in the near future (LÄÄNE et al., 2002, p. 123).

Phosphorus

191. Inputs of phosphorus into the Baltic have declined since the late 1980s. While some 46,000 Mg of phosphorus was input into the Baltic in 1990, inputs in 2000 were just under 31,000 Mg (HELCOM, 2003c, p. 10; HELCOM, 1993, p. 144). Improved wastewater treatment and the use of phosphate-free detergents are cited as the main causes. This downward trend has, however, slowed in recent times. No clear reduction in phosphorus inputs could be identified for the period 1994 to 2000. Rather, inputs varied strongly correlated with river water flow (HELCOM, 2003c, p. 10). Compared with riverine inputs, atmospheric inputs of phosphorus into the Baltic Sea are so low that they can be completely ignored (HELCOM, 1997, p. 8).

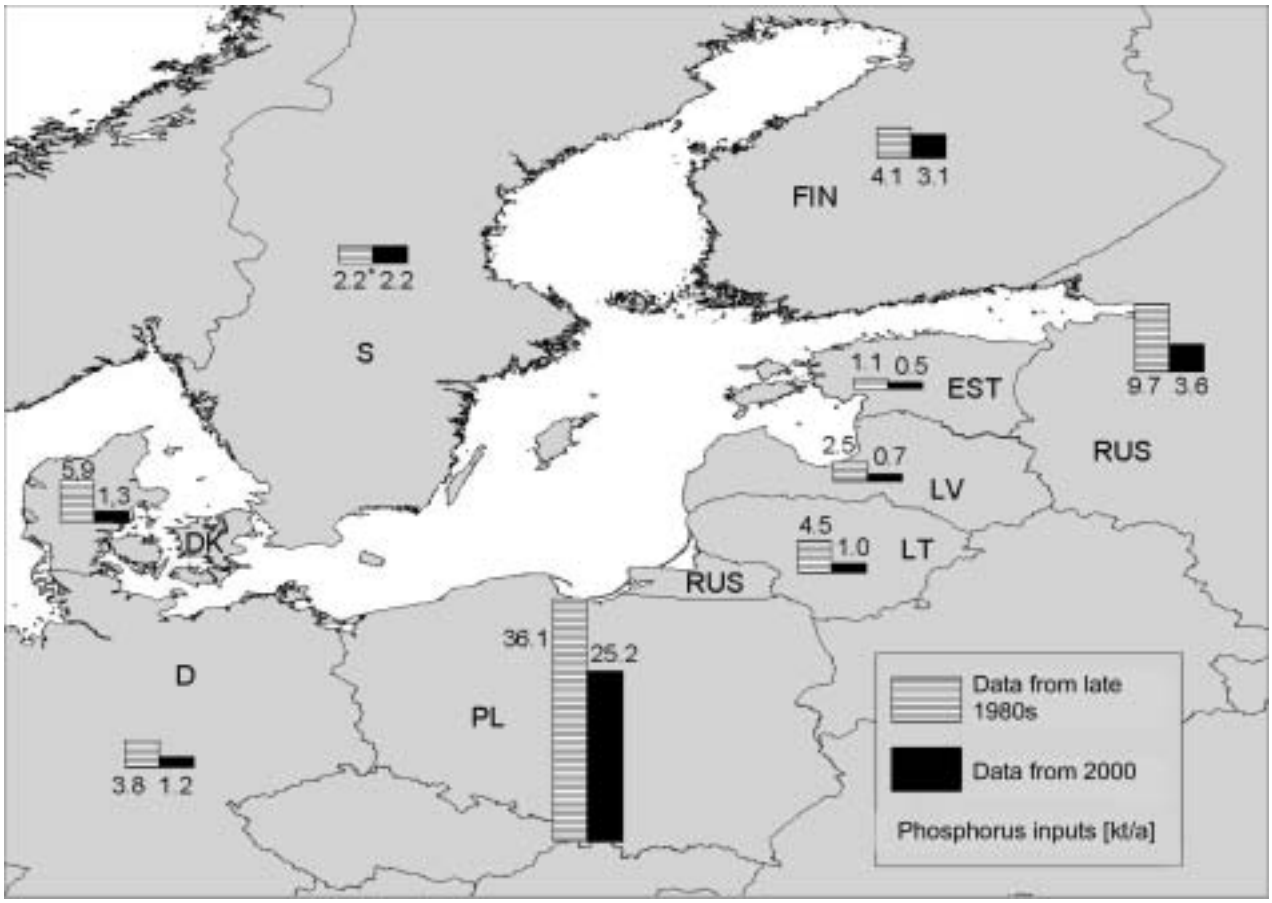
Under certain hydrographic conditions, phosphorus is released from ocean sediment and reenters the water. The release is promoted by changes in the water layers and lack of oxygen. Thus, in the Bay of Finland, releases of phosphorus from sediments in the period 1994 to 1998 matched those from land-based emissions (HELCOM, 2002b, p. 177).

The largest share of phosphorus inputs, some two thirds of all inputs into surface waters in the Baltic catchment area, come from Poland. Inputs from the Baltic states, and from Denmark and Germany, are relatively low – those from Germany making up only 3% of total inputs (Figure 2-23).

Most HELCOM member states achieved the 50% reduction target for inputs of phosphorus back in 1995 and those who didn't only missed it by a narrow margin (Section 3.3.1.2). Sweden, Finland and Poland achieved remarkably low reductions. EU Member States at least achieved significant reductions in point source inputs,

Figure 2-23

Phosphorus inputs in surface waters in the Baltic Sea catchment area (late 1980s and 2000)



* Computed by a different method to the figure for 2000. The stated figure is probably too low.

SRU/SR 2004/Fig. 2-23; data source: HELCOM, 2003b, p. 7 and LÄÄNE et al., 2002, p. 14–22

while their inputs from agriculture hardly changed at all. Given that phosphorus nutrients in soil are non-dissolving and thus have long retention times, it will be some time until the measures taken to reduce pollution from phosphorus will visibly impact inputs into surface waters.

192. Germany achieved HELCOM's reduction target of 50% for phosphorus inputs back in 1991 and exceeded it by 2000 with a reduction of 70% (Table 2-25). This significant reduction in Germany's phosphorus inputs was largely achieved in municipal and industrial inputs. The main reasons cited are improved wastewater treatment in former East Germany and the closure or modernisation of eastern German industrial facilities (LÄÄNE et al., 2002, p. 17). By way of contrast, there has been a slight increase in inputs from agriculture. At 640 Mg per year, they made up around 50% of total phosphorus inputs in 1995. Conversely, a more than 70% reduction in phosphorus excesses in agricultural fertilisers occurred from the late 1980s up to 1995. This discrepancy can be explained by the long retention times, the fact that phosphorus compounds are barely soluble and their accumulation in top soil over the last decade. Despite a significant reduction in the use of phosphate fertilisers, consistently high phosphorus washouts caused by erosion did not allow a reduction in total inputs.

Summary

193. With regard to phosphorus inputs, the 50% reduction target for nutrient inputs agreed for the period 1987 to 1995 by the Helsinki Commission was achieved in good time in the German Baltic catchment area. The reduction target for nitrogen was not achieved – inputs were only reduced by about 40%. Nutrients from agriculture play a dominant role in the remaining inputs. In general, inputs of phosphorus from agriculture have not been reduced to the same extent as inputs of nitrogen (LÄÄNE et al., 2002, p. 9). Atmospheric inputs of nitrogen into the Baltic Sea (ammoniac from animal husbandry, NO_x from household and industrial incineration processes, and from road and shipping traffic) should also be taken into account: combined, these make up around one third of total nitrogen inputs (HELCOM, 2003b, p. 18). Although it cannot be accurately predicted, the impacts of EU expansion on developments involving nutrient inputs in accession states will probably play an important role. The German Advisory Council on the Environment believes that diffuse inputs may well increase as a result of intensified agriculture and that implementation of EU directives on wastewater treatment will effect a reduction in discharges from municipal and industrial facilities.

Table 2-25

Anthropogenic phosphorus inputs in German surface waters draining into the Baltic Sea, and reductions attained (late 1980s and 1995)

	Late 1980s		1995		Reduction
	Quantity (Mg/a)	**Share**	**Quantity (Mg/a)**	**Share**	
Diffuse losses (agriculture)	600	*16%*	640	*49%*	*– 7%*
Municipal discharges	2 750	*72%*	590	*45%*	*79%*
Industrial discharges	440	*12%*	50	*4%*	*89%*
Fish farming	30	*1%*	20	*2%*	*33%*
Total inputs	**3 820**	***100%***	**1 300**	***100%***	***66%***
SRU/SR 2004/Tab. 2-25; data source: LÄÄNE et al., 2002, p. 17					

2.2.5 Environmental Risks and Pressures from Shipping

194. With some 56,000 ship journeys (based on ships with a gross tonnage of 500 and over: tankers, bulk carriers, containers, freight ships and passenger ferries), the Baltic is one of the busiest seas (BSH, 2003c). Given its narrow connection with the Atlantic, or rather to the North Sea, traffic can become particularly heavy in areas like the Kadet Trench. With depths of between 20 and 30 m in most places, the Kadet Trench is 15 nautical miles long and 3 nautical miles wide. It begins about 5 nautical miles south of Gedser Reef and runs north-northwest, almost one nautical mile off Gedser Reef. Waters in the trench proper reach depths of only 12 to 19 m. Around 50,000 ships pass through the Kadet Trench each year on their way to and from the eastern Baltic (BSH, 2000). One of the main problems is that the shipping lane is extremely narrow. Another is that near the half-way point, the Kadet Trench describes a curve of about 80° which ships must follow.

195. On average, some 8,200 tanker ships sail the Baltic each year. Almost 90% of EU oil trade occurs through shipping, with some 800 million Mg of oil being transferred at harbours in EU Member States (EU Commission, 2000a, p. 8). Economic growth in the Baltic region will result in additional risks regarding safety and pollution, especially following accession of the Baltic states and Poland to the EU (Table 2-26).

Once plans are implemented for new oil terminals in Russia, Estonia, Latvia, Lithuania and Poland, and also in eastern Germany, the annual volume of oil transported in the Baltic will rise from 80 million Mg (in 2000) to 130 million Mg (HELCOM, 2003). The amount of oil transported from the Russian port of Primorsk alone is expected to rise from current levels of between 13 and 20 million Mg to between 80 and 90 Million Mg in the coming years. This will result in an additional 1,000 tankers leaving Primorsk to navigate the Baltic.

Oil Inputs

196. At present, about 10% of oil hydrocarbon inputs in the Baltic stem from illegal oil discharges from shipping (for more details see Sections 2.1.3.3 and 2.2.3.3). There is also a risk from accident-related oil spills. With the projected increase in shipping, these pressures are more likely to increase rather than decrease.

Atmospheric Emissions

197. In the Baltic, the problem of emissions from shipping is comparable with that in the North Sea (Section 2.1.5.2). Thus, modelling of atmospheric inputs of pollutants in the Baltic for 1997 showed that shipping is now the second biggest single source of nitrogen oxide inputs through deposition (BARTNICKI et al., 2003). This is particularly problematical because, as already shown in Section 2.1.4, the Baltic is subject to high nutrient inputs.

Introduction of Non-indigenous Species

198. The introduction of non-indigenous species in the Baltic, as already described in Section 2.1.5.3, involves problems very similar to those in the North Sea. According to HELCOM, around 95 non-indigenous animal and plant species were recorded in the Baltic region in 1998, 66 of which have since become established (HELCOM, 2002b). As shown in Figure 2-24, introduction rates have steadily increased in recent decades. The causes are increased shipping, the rise in species introduced through mariculture, and immigration of non-indigenous species.

As in the North Sea, shipping traffic – and primarily transportation in ballast water – is now the main vector for introduction of non-indigenous species (HELCOM, 2002b, 2003a; GOLLASCH and MECKE, 1996). Additionally, inland waterways that connect the Baltic with the Caspian and the Black seas are responsible for increasing distribution of fresh and brackish water species. There have already been reports of introduced species in the Baltic that have either harmed or displaced native species. As in the North Sea, there is a risk of homogenisation of species composition in a range of habitats, with loss of regional specific biodiversity. Measures to minimise the risk of non-indigenous species introduction were addressed in Section 2.1.5.2.

Table 2-26

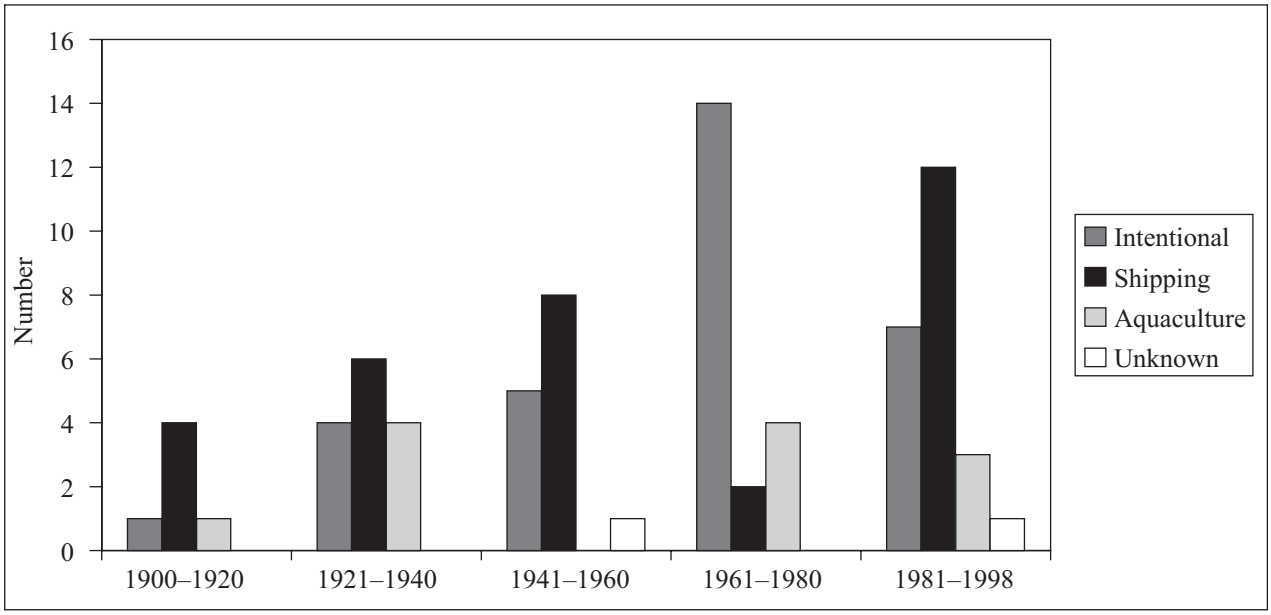
Ship movements in the Baltic, 2000 and 2010 (estimated)

	Tanker	Bulk carrier	Container	Unit Load	Passenger/ ro-ro	Ferry	Other	Total
2000	21 128	10 996	9 628	94 400	3 104	86 832	836	226 924
2010	24 254	12 146	15 683	110 639	3 263	91 273	923	258 181

Source: Schleswig-Holsteinischer Landtag, 2001

Figure 2-24

Numbers of alien species introduced into the Baltic Sea in the 20th Century



Source: After HELCOM, 2002b

2.2.6 Pressures from Local Encroachments

2.2.6.1 Raw Materials Extraction, Energy Generation, Dumping of Dredged Materials and Coastal Protection

199. For the most part, the encroachments made by marine facilities on the marine environment in the Baltic Sea by extraction of raw materials and by the dumping of dredged materials are similar to those in the North Sea (Section 2.1.6.1). This section will thus address only the role of those activities in the Baltic Sea and any peculiarities in comparison with the North Sea.

200. While there are a number of small and medium-sized *oil and gas* deposits in the Baltic Sea, only one Polish oil deposit is currently exploited. The quantities extracted between 1992 and 1998 amounted to around 700,000 Mg. A report by the Helsinki Commission believes it possible that oil and gas extraction activities may well rise significantly with the exploitation of further deposits in the southern Baltic (HELCOM, 2002b, p. 16).

201. In the 1990s, Denmark, Germany, Finland and Russia all expanded their activities in extracting *sand and gravel* from marine deposits in the Baltic Sea. In 1997, these countries extracted a combined total of some 8.5 million m^3 of sand and gravel. No activities of this type were recorded for Baltic states until the late 1990s, although the situation could change with their growing economic output (HELCOM, 2002b, p. 16 et seq.). A detailed overview of sediment extractions in the entire Baltic Sea region is contained in the HELCOM Status Report on Marine Sediment Extraction in the Baltic Sea (HELCOM, 1999). HELCOM member states approved recommendations for marine sediment extraction projects to minimise the impacts of sediment extraction on the marine environment (HELCOM, 1998b).

In Germany, the situation is that no sediment extraction occurs in Schleswig-Holstein, while in Mecklenburg West Pomerania, around 20 deposits are used for ad hoc extraction of materials needed for coastal protection. Sand and gravel are extracted from four deposits for use in construction (HELCOM, 1999, p. 16 et seq.).

202. The quantity of dredged materials dumped into the Baltic by Germany fluctuated between 1 and 3 million Mg during the period 1994 to 1998 (HELCOM, 2002b, p. 18). While this is significantly lower than the quantities dumped in the North Sea, the negative effects of dumping are of a similar nature (renewed release of pollutants, damage to benthic communities, changes in sediment characteristics) (Para. 120).

203. Although the Baltic coast is very different to that of the North Sea as regards natural conditions, similar conflicts arise between the needs of *coastal protection* and those of nature conservation. Coastal protection measures are necessary along the external coast and around the bays and lagoons. Flood protection, preventing sea defence breach and abating or averting land erosion usually involves dikes, flood protection dunes, beach nourishments and breakwaters (Umweltministerium Mecklenburg-Vorpommern, 2001).

The West Pomeranian Lagoon National Park and the Jasmund National Park are both managed on the principle that encroachments on natural coastal dynamics may only occur if human life is threatened. And in other areas,

nature protection aims to minimise encroachments on natural processes. From a nature conservation perspective, special consideration is given to protecting saltmarshes and, where appropriate, enclosing them with dikes. Saltmarshes provide both an invaluable habitat and – as natural flood plains – flood protection.

204. Plans to exploit *wind energy* in the Baltic are of a smaller scale compared with those for the North Sea. A range of large projects are planned in Germany, Denmark and Sweden. Germany currently has six applications for the construction of wind farms in its Exclusive Economic Zone (EEZ), and two for wind parks within the 12-mile zone. The wind farms are to be located at low-conflict sites to minimise the damage they are expected to cause to the marine environment. If this is to be ensured, the German Advisory Council for the Environment believes that planning law must be tightened for the EEZ (SRU, 2003a and Para. 450).

2.2.6.2 Tourism

205. Of all the coasts of the Baltic riparian states, the German Baltic coast is most affected by tourism. This involves land use by the hotel industry, the use of various beaches, infrastructures for water sports, and the construction of roads and car parks. Numerous conflicts of use ensue between recreational activities and nature conservation needs, especially in coastal areas (Para. 123 et seq.). The pine woods found in some coastal areas of the Baltic are particularly sensitive to damage from trampling and vehicles; their damage can lead to coastal erosion (BfN, 1997). Rare plants like sea holly (*Eryngium maritimum)* are already seriously at risk from trampling.

206. Tourism along the German Baltic coast has a negative impact on native, resting and breeding species because it encroaches on natural habitats. A variety of migratory bird species are harmed by the ongoing disturbances caused by tourism in that undisturbed feeding and resting phases are of great importance in average survival rates during migration (EXO et al., 2003). The effects of tourism on breeding birds are even more severe (Table 2-27). For many species, tourism is a key or perhaps the sole cause of their endangerment. Local leisure activities that take place on the water can harm marine creatures, noise caused by private boats being just one example.

207. On the German Baltic coast, it is important to differentiate between areas that have long been subject to heavy tourism and those that were developed following Germany's reunification. In the Bay of Lübeck, on the Schleswig-Holstein coast, there is hardly any need for intervention because most coastal areas have already been developed and have largely adapted to the needs of tourism. The situation is different in large areas of the coast in Mecklenburg West Pomerania, where tourism has increased dramatically in recent years. The number of overnight stays in this area (in hostelries with 9 beds or more) doubled from 9.9 million a year in 1995 to 21 million a year in 2002 (Federal Statistics Office, 1996, 2003). Second only to Bavaria, Mecklenburg West Pomerania has become the most visited area in Germany (F.U.R., 2003). The largest growth has occurred in the Rügen/ Hiddensee, Usedom and Darss regions. Tourism is one of the few economically successful sectors in Mecklenburg West Pomerania and puts huge pressures on coastal nature protection areas.

208. Numerous ecologically valuable areas are situated along the Baltic coast of Mecklenburg West Pomerania. These include the biosphere reserve on south-east Rügen, the West Pomeranian Lagoon National Park, the Jasmund National Park, the Usedom National Park, the Greifswalder Lagoon and the Bay of Wismar. With 2.5 million visitors in 2002, the West Pomeranian Lagoon National Park ranks first in the category of the most visited national and cultural landscapes in Germany (DTV, 2003). The huge growth in tourism, especially in largely natural, protected

Table 2-27

Significance of tourism in the endangerment of vascular plants, beetles and breeding birds off the German Baltic coast

Plant or animal family	Total endangered species	Species endangered by tourism	Percentage endangered by tourism	Percentage endangered by tourism alone
	Number	Number	%	%
Vascular plants	101	11	*11*	*7*
Beetles	191	43	*23*	*6*
Breeding birds	56	28	*50*	*21*

Source: After SCHMIED et al., 2002

areas carries great potential for conflict. This is evident in many cases where there are plans to expand tourism, one example being the plans to build holiday parks and golf courses in the direct vicinity of the Jasmund National Park. Expansion of marina facilities for sailing also conflicts with nature conservation goals. Rather than isolating these cases in terms of their impacts, they should be viewed in terms of their relationships: holistic planning is called for.

2.2.6.3 Mariculture: Environmental Risks

209. Mariculture activities in the Baltic are largely operated by Denmark, Finland and Sweden. The most commonly cultivated species are rainbow trout and salmon, followed by blue mussels and oysters. Around 22,250 Mg of fish were produced in mariculture in 1997, with Finland producing the largest quantities (ICES, 2000; Table 2-28). High growth potential is forecast for this sector, although conflicts with other coastal users could ensue (HELCOM, 2002b; ROSENTHAL et al., 1996).

Table 2-28

Fish and mussel production in the Baltic, 1997 (by producing country)

Country	Production [Mg]
Denmark	7 000
Estonia	150
Finland	13 000
Germany	> 100
Poland	–*
Sweden	2 000

* No data.

Source: After ICES, 2000

210. As regards the environmental impacts from commercial fish farming and mussel culture in the Baltic, many aspects have already been covered in the section on the North Sea (Section 2.1.6.3). At 0.5% for nitrogen and less than 2% for phosphorus, inputs of nutrients into the Baltic from fish farms are minimal in relation to the total input. Nevertheless, severe eutrophication effects can still occur in some areas (HELCOM, 2002b).

Neither HELCOM nor the ICES see inputs of pharmaceuticals from fish farms in the Baltic as a significant environmental threat (ICES, 2000; HELCOM, 2002b). The low salinity levels in this brackish sea mean there are no problems with parasites that would require the use of antiparasite chemicals. The use of antibiotics has also significantly reduced, similar to the situation in fish farms in the North Sea.

In contrast to the North Sea, efforts to protect dwindling fish stocks through breeding and release of juvenile fish have intensified. In 1998, a total of 6.4 million juvenile breeding salmon were introduced into the Baltic Sea – mainly in the Bothnian Bay. Reproduction among natural stocks increased the population by only 0.5 million during the same period.

2.2.7 Cumulative Pressures and Decline in Marine Habitats in the Baltic

211. As already outlined in Section 2.2.1, the fact that the Baltic Sea is so young means that it has significantly fewer species than the North Sea and certainly than an open ocean. In recent decades, species composition in this small inland sea has become increasingly subject to the influences of human activity. The biggest impact has been the secondary effects of eutrophication on communities. Increasing primary production resulting from higher levels of nutrients means greater availability of food. In shallower regions, for example, this has caused an increase in biomass among benthic communities along with changes in species composition (ARNDT, 1996; see also Section 2.2.4.1). At the same time, lack of oxygen harms benthic fauna in deeper water layers and they become displaced. Larger benthic organisms disappear completely from oxygen-depleted areas. As explained in detail in previous sections, other factors that have a negative impact on biodiversity include fisheries, pollution and tourism, particularly in coastal areas.

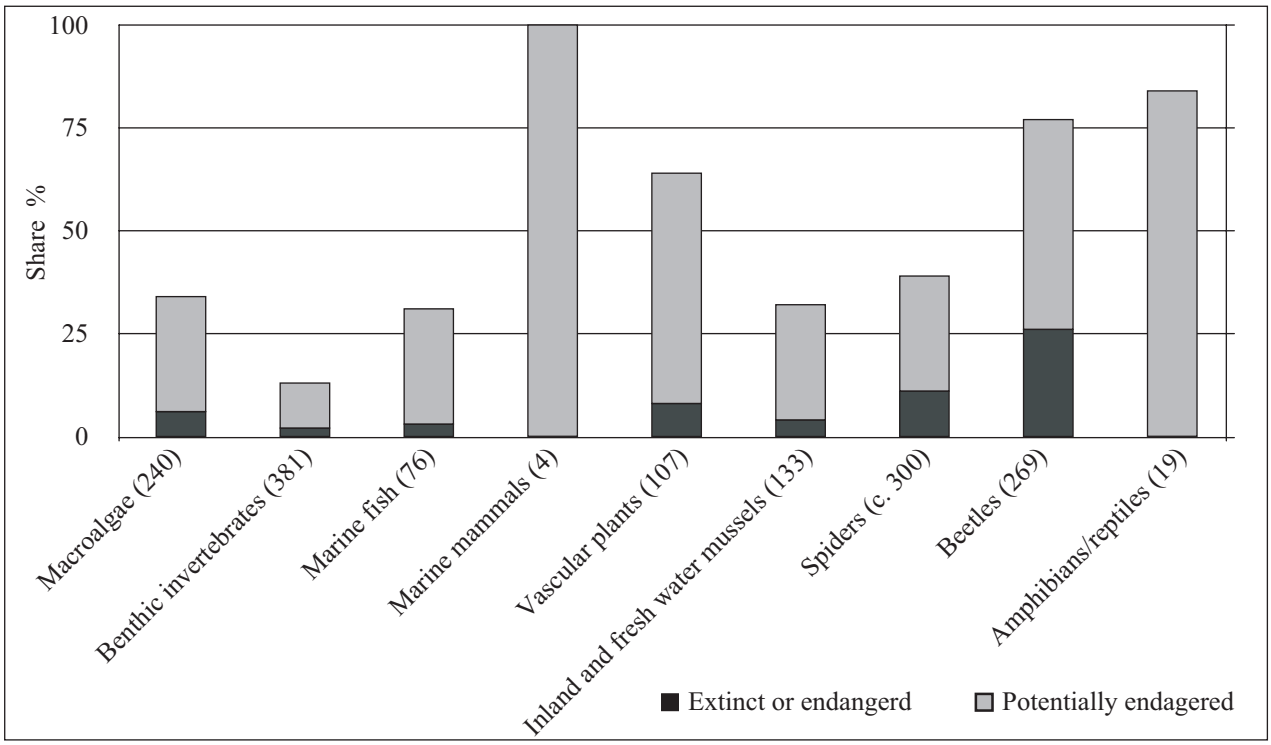
2.2.7.1 Loss of Species Diversity

212. The Red List for the Baltic Sea shows an obvious reduction in species and stocks (Section 2.25). It is thus clear that more than 60% of vascular plants are at risk or potentially at risk. Marine mammals are the only species group whose representatives are classed without exception as endangered or at risk. A slight upward trend is evident in seal stocks (common seals, grey seals and ringed seals), although their health and reproduction rates are poor in some regions. For example, an increase in the occurrence of chronic intestinal ulcers was detected in young grey seals and can probably be apportioned to a weakness of the immune system as a result of high contamination levels in the animals' systems (HELCOM, 2002b, p. 142). There were an estimated 200,000 ringed seals (*Phoca hispida botnica*) in the Baltic at the beginning of the 20th Century. Hunting activities have since decimated their stocks to about 6,000 individuals. At present, around 150 seals meet their death each year in fishing nets – too high mortality in a population of such small numbers (HARWOOD, 2002).

213. The harbour porpoise is the only cetacean species native to the Baltic Sea. While counts conducted in the Skagerrak and Kattegat in 1994 and 1995 showed around 36,000 individuals, current stocks in the eastern Baltic are now estimated at several hundred (SIEBERT et al., 1996). At present, fishing nets pose the greatest threat to this small whale species. They are also severely harmed by overfishing of their main source of food, pollution, and

Figure 2-25

Summary of the Red Lists for the German Baltic Sea marine and coastal zones*. Endangerment given as a percentage of species in each group (numbers in brackets).



* Only species that demonstrated a dependence on marine, coastal and near-nature biotopes and which were found to be regular and typical inhabitants of those areas were selected. The following two categories have been used for the purposes of simplification:
Extinct or endangered: matches the criteria of the Federal Agency for Nature Conservation (BfN) for Category 0 (extinct or disappeared), 1 (endangered), 2 (at serious risk) and 3 (at risk).
Potentially at risk: matches BfN criteria for Category P (potentially at risk: species that exist in small numbers in a specific area, and species that live in small populations on the edge of their habitat) (for more details see BfN, 1995).

Source: After MERCK and von NORDHEIM et al., 1996

disturbance by boats and shipping traffic (Section 2.2.6.2). Hardly any young whales were sighted in counts conducted from the air. This supports the assumption that no adequate retreats are available for birthing and successful rearing of calves.

214. In the case of amphibians and reptiles, which are only found in the coastal areas of the Baltic, more than 80% of the species are potentially at risk. The European pond turtle is already extinct in the German region of the Baltic. The causes lie particularly in loss of or damage to habitats as a result of increased use of coastal areas for tourism and coastal protection activities (MERCK and von NORDHEIM, 1996). Eutrophication is by far the greatest factor in the threat to aquatic groups like benthic invertebrates and macroalgae (Section 2.2.4). Changes in plant communities in the Baltic have been observed since as early as the 1960s. For example, stocks of bladder wrack (*Fucus vesiculosus*), which is found in the Bothnian Bay area, eelgrass (*Zostera marina, Z. noltii*) and pond weed (*Potamogeton spec.*) have all deteriorated. At the same time, an increase has been observed in fine epiphytic algae (algae that grow on other forms) and in green algae. While in the Bay of Kiel, bladder wrack was previously found in depths of around 10 m, it is now found only in depths of up to 2 m. Again, the main cause is seen in nutrient inputs. These foster growth of epiphytes, cause increased cloudiness in the water due to greater primary production of plankton algae, promote sedimentation and make for deteriorated light conditions for macrophytes at only minor depths. Particularly evident is a reduction in eelgrass, pond weed and red algae communities in the Greifswalder Bodden where, in the 1930s, around 50% of the boundary zone was covered by these algae at depths of up to 8 m. Coverage has since dropped to about 3%. Eutrophication effects are also seen as the primary cause of changes in species composition among benthic invertebrates (Section 2.2.4). The associated deterioration in oxygen supply is believed to be the cause of the increased shift from a long-lived mussel community to a short-lived polychaete (bristle worm) community. Further depletion of oxygen caused by organic inputs would kill all infauna on the sea bed.

215. Of marine fish, around one third are classified as endangered or potentially at risk (Figure 2-25). The main

causes are eutrophication and, in the case of anadrome and catadrome fish species and cyclostomata (sea lamprey and river lamprey) the blockage of water pathways.

216. Some 31 species of sea and coastal birds such as the guillemot (*Uria aalge*), the razorbill (*Alca torda*), the Eider duck (*Somateria mollissima*), the avocet (*Recurvirostra avosetta*) and the snowy plover (*Charadrius alexandrinus*) breed in the Baltic Sea region. Surveys conducted on the Baltic coast of Schleswig-Holstein show that around 90% of breeding birds breed in nature protection areas, and these make up only about 5% of the coast (HELBIG and KUBE, 1996). This confirms the clear encroachments on breeding areas for many bird species. Stocks that are heavily concentrated in a specific area are highly vulnerable to predation, disease and anthropogenic disturbance. Since the 1980s, a reduction has been evident in most breeding birds, with those who breed in saltmarshes most affected. Coastal protection activities now provide increasing protection against periodic flooding in these areas, many of which have been given over to intensive agriculture. In turn, the end of extensive grazing of saltmarshes allows higher vegetation to grow and causes marsh breeders to avoid these areas. Along with increased loss of habitats to agriculture, tourism and marine construction activities comes the rise in predation from feral cats, escaped mink and especially from foxes. The number of foxes has significantly increased due to rabies control and a decline in hunting activities in many areas.

Stocks of some endangered species have been stabilised through targeted protection activities. Examples include the cormorant, nearly extinct at the beginning of the 20th Century, and the white-tailed eagle.

2.2.7.2 Destruction and Loss of Habitats

217. Of the 133 marine and coastal biotope types described, all except the stony and rocky coasts are seen as endangered in terms of land loss and qualitative changes (MERCK and von NORDHEIM, 1996). The main causes are contamination with pollutants and nutrients from industry, municipalities and agriculture, mechanical encroachments on biotopes from fisheries, tourism and other activities, coastal protection and improvement of navigation channels, over-stocking and removal of plants and animals.

218. Along with its geomorphological situation, the conditions in the brackish waters of the Baltic make for unique coastal vegetation that is worthy of protection. The area comprises a broad belt of vegetation in the brackish water reed beds, typical dune vegetation and saltmarshes. While the first two are extremely sensitive to any type of use, the only way to conserve the saltmarshes is to use well-managed extensive grazing to halt the growth of reed species. With their characteristic flora and fauna, these types of vegetation are at risk from agriculture, coastal protection activities, tourism and leisure activities (HÄRDTLE and VESTERGAARD, 1996). For example, approximately 60% of the original saltmarshes on the coast of Fehmarn have been destroyed in the construction of sea walls and harbours. The sealing of surfaces and the fragmentation effects that result from improving infrastructure for tourism (roads, paths and car parks) are particularly harmful to sensitive sea wall and dune areas. Rare plants like sea kale (*Crambe maritima*), sea holly and the beach pea (*Lathyrus maritimus*), also destroyed by trampling, no longer exist in some areas (Section 2.2.6.2).

219. A further threat lies in the introduction or deliberate planting of neophytes which obliterate native species. The Japanese or 'potato' rose (*Rosa rugosa*) was planted to stabilise the dunes. Given its high wind and salinity tolerance, the rose continues to spread rapidly and completely obliterates the native dune vegetation (HÄRDTLE and VESTERGAARD, 1996).

2.3 Summary: Outlook for the North and Baltic Seas

220. As has been seen in most economic sectors that have either a direct or indirect impact on the two seas (e. g. tourism, mariculture, shipping), an ongoing increase can be expected in the pressures of use from human activities in both the North Sea and the Baltic. While the biggest direct impact is caused by the exploitation of marine resources (especially fisheries and the extraction of raw materials), the most dominant indirect impact stems from the use of the seas as sinks for the pollutants and nutrients that are released into the environment.

If long-term use of the seas is to be secured, it is vital that ecosystem functionality be kept at the highest possible level. It has long been recognised that this can only take place through sustainable management of resources. This requires that the current pollution status in the North and Baltic seas be identified and that common quality targets be agreed. The first problem that arises is setting a base line as the 'original' status for both seas: firstly, these systems are subject to ongoing change and secondly, anthropogenic influences have existed since the first settlements and use of the coasts and oceans. Rather than setting protection targets on the basis of the original natural status, it would make more sense to set out normative quality targets. This is the approach taken by the International Conference on the Protection of the North Sea (NSC) in reducing nutrient inputs by 50%, and also by the OSPAR and Helsinki commissions in setting out the generation target which aims to reduce inputs, emissions and losses of harmful substances to zero by the year 2020. The indispensable monitoring of pollutants such as metals must continue to be based on background values. This makes it impossible to completely do away with setting a base line because it is needed to assess the current status as a means to achieving the quality targets. Despite existing difficulties, there is a need for policymakers at EU level to agree where possible uniform and clearly defined quality targets for the North and Baltic seas in their entirety. The deficits in this area are evident in the likes of the EU Water Framework Directive (Para. 297).

221. Reliable scientific data is needed to perform an in-depth assessment of the situation and trends in the North

and Baltic seas in terms of how they are affected by human activity. While some data is readily available, there remain a number of glaring gaps in knowledge that must be closed (Para. 231 et seq.).

2.3.1 Human Impacts on the North and Baltic Seas

222. The main pressures in the North and Baltic seas come from the changes caused by fisheries, nutrient inputs and pollution. These all affect the seas to different degrees. It is, of course, difficult to rank the various anthropogenic influences because they mostly affect different areas of the system and their impacts are not altogether known. Nevertheless, the impact from fisheries is currently seen as the biggest problem in the North Sea, while in the Baltic the input of nutrients has the greatest impact due to the slow exchange of water masses (HELCOM, 2002b, 2003a; ICES, 2003a; OSPAR, 2001, 2002; NSC, 2002a; meeting with the Federal Maritime and Hydrographic Agency (BSH) on 4 October 2002 and with the Centre for Marine and Climate Research (ZMK)/ Institute of Oceanography on 13 November 2002).

While the three impacts on the ecosystem cited above largely affect the marine environment as a whole, there are some uses of the sea – oil extraction and mariculture – that primarily entail localised pressures.

223. Changes caused by the fisheries are particularly evident: most target fish stocks are not managed sustainably. This results either in the collapse of or dramatic reductions in vital commercial fish stocks, which in turn harms the fisheries and causes huge changes in marine communities. In recent years, North Sea cod has been managed outside biologically safe limits and stocks are not expected to recover in the near future. Nevertheless, no direct threat to species conservation is seen in the North Sea. There is, however, a real threat to the presence of some shark species, which mostly end as by-catch and have already disappeared in some parts of the North Sea. The European eel is already included in the Red List for some areas.

Apart from overfishing of commercial fish species, intensive fisheries impact on the marine environment because by-catch involves large quantities of non-commercial organisms which are thrown overboard as ‘discards’. The use of bottom nets harms the benthic community. These impacts manifest themselves in a significant decline in sensitive benthic species in parallel with an increase in the number of opportunists – especially in areas frequently used by fisheries. Harbour porpoise populations in the North and Baltic seas are also threatened by the use of static nets.

224. Both the North Sea and the Baltic Sea are greatly affected by eutrophication. Anthropogenic inputs of the nutrients nitrogen and phosphorus result in excessive algae growth and thus associated effects like turbidity in the waters, oxygen depletion on the sea bed, death of bottom species and changes in species composition. These effects are particularly evident in coastal areas of the North Sea, especially the Wadden Sea. Eutrophication affects the Baltic Sea in its entirety.

During the 1990s, nutrient inputs in surface waters in both the North Sea and Baltic catchment areas reduced significantly, with clear reductions being achieved in point sources (municipal and industrial discharges). Reductions in nutrients from diffuse sources were lower, especially those from the use of fertilisers in agriculture. More than half of all nutrient inputs now stem from diffuse sources.

Despite the reductions achieved in nutrient sources, the quantities of nutrients actually input into the seas has hardly changed since the 1990s. Apart from current excesses from the use of fertilisers in agriculture, the main causes are thought to be accumulated nitrogen and phosphorus reserves in groundwater and top soil. It will be some considerable time before reductions in nutrient sources are reflected in nutrient inputs into the oceans. A factor that must not be ignored is atmospheric deposition of nitrogen, which makes up around one third of nitrogen inputs into the Baltic, and around one fifth in the North Sea. Again, the main source is agriculture followed by transport.

225. As in the case of nutrient inputs, pollutant inputs from diffuse sources play an increasingly important role. Pollutants identified as particularly harmful to the marine environment include heavy metals and organic compounds.

Heavy metals are not degradable and cannot be removed from the biogeochemical cycle. Despite the in some cases considerable reductions in heavy metal inputs into the North Sea and the Baltic, concentrations of cadmium, mercury and lead in the water and in sediments in some coastal areas and estuaries still exceed thresholds above which negative effects on biota can be expected.

Pollution of the North and Baltic seas from organic compounds illustrates how long persistent, bioaccumulating and toxic substances can remain in the marine environment. This is particularly evident in the case of historic chemicals which are still found in disturbing quantities and continue to accumulate in the marine environment despite long-standing bans or severe restrictions on their production, use and emission. Along with current inputs, the quantities of pollutants that have accumulated over many decades result in increased concentrations of toxic compounds in sediments and in marine organisms in particular. River inflow areas and coastal zones near industrial facilities are particularly affected, where for many pollutants, concentrations in sediments and biota exceed not just background values but also concentrations above which a threat to the environment and the biota can no longer be ruled out. For example, fish-eating seabirds and marine mammals in the Baltic are still contaminated by large quantities of PCBs, dioxins and DDT.

Knowledge on the possible impacts of the ‘new’ organic pollutants which have recently come to light is still rather rudimentary, making assessment of the pollution status extremely difficult. Among these new organic pollutants

are brominated flame retardants, short-chained chloroparaffins, nonylphenoles and musk compounds. The fact that some of these extremely persistent substances or substance groups are detected and are able to accumulate throughout the marine environment gives cause for concern. Experience gathered with many persistent organic pollutants (POPs), whose toxicity was only detected at a very late stage, and the requirements of the precautionary principle show a need for action in this area.

226. The North and Baltic seas remain under pressure from inputs of oil hydrocarbons. While the larger proportion of these pollutants stems from river and atmospheric inputs, shipping is the dominant single source. Illegal discharges of oil components still occur from tank washing and the removal of oily residues in fuel preparation. The burning of low-grade fuels (heavy heating oil) in conjunction with a lack of adequate exhaust treatment poses an additional risk from emissions rich with nitrogen-oxide and sulphur-oxide. Coastal waters and regions with particularly high shipping traffic are worst affected.

Along with increased shipping comes a greater risk of accident-related spills of harmful substances, especially oil. Deficiencies in ships' safety and the often poor crews' training increases this risk to an unacceptable level. A tanker accident off the Wadden Sea coast involving the same quantities of oil that were spilled with the 'Prestige' would have grave long-term consequences both for habitats and for the economy in that area.

Shipping is also seen as the main vector in the introduction of non-indigenous species. Among other things, exotic creatures transported in ballast water can, usually through only a short-lived population boom, cause undesired changes in communities already affected by other environmental factors and homogenisation of species compilation in fragmented habitats.

227. Tourism is now the most important economic sector in coastal regions. Conflicts often ensue between the requirements of holidaymakers and the needs of environment protection, particularly nature protection. These can only be balanced at local level. Encroachments from tourism are still the biggest threat to birds that breed on the beaches and marshes on the German coast.

228. There has been an overall reduction in the pressures on both seas from mariculture. Inputs of nutrients from fish farms have improved through the use of better feeding methods and feed that is better suited to the needs of farmed fish. Similar reductions have been achieved in the use of pharmaceuticals like antibiotics. Fish farms can still cause eutrophication effects at local level, especially in bays and fjords. In the Baltic Sea, fears remain that the still extremely weak populations of wild salmon will be further pressured by the effects on reproduction and fitness from cross-breeding with escaped salmon from fish farms.

229. Overall, there is evidence that biodiversity levels in the North and Baltic seas are at risk. A decline in species and a threat to habitats in ocean and coastal areas can be observed. Anthropogenic influences are cited as the cause. Alongside traditional environmental problems like inputs of pollutants and nutrients, the impacts from fisheries as they are currently operated play a key role in the changes and reductions in stocks of coastal and marine species. This and a range of other factors can impact on the same and very different components of the ecosystem. Little is known about interactions with these pressure factors. Effective protection of the marine environment – as will be addressed in subsequent sections – thus requires not only that the cited pressures be reduced wherever possible, but that protected areas be established to conserve habitats and biotopes in their natural state and with their natural dynamics, while taking account of their special needs in the face of anthropogenic activities.

2.3.2 Research Programmes and Research Needed

230. Numerous study programmes for monitoring the status of the seas are in place at national and international level. Some of the most important programmes are outlined below. The *Bund-Länder* monitoring programme for the marine environment in the North and Baltic seas currently involves twelve specialist agencies and institutes:

- Federal Maritime and Hydrographic Agency (BSH)
- Federal Research Centre for Fisheries (BFA)
- Environmental Specimen Bank/Federal Environmental Agency (UBA)
- Federal Agency for Nature Conservation (BfN)
- Federal Institute of Hydrology (BfG)
- Lower Saxony State Agency for Ecology (NLÖ)
- Schleswig-Holstein State Office for Nature and the Environment (LANU)
- Mecklenburg West Pomeranian State Office for Environment, Nature Protection and Geology (LUNG)
- Mecklenburg West Pomeranian State Research Institute for Fisheries (LFA-MV), Rostock
- Working Group for the Protection of the Elbe (ARGE Elbe)
- Working Group for the Protection of the Weser (ARGE Weser)
- Baltic Sea Research Institute, Warnemünde (IOW)
- Alfred Wegener Institute for Polar and Marine Research (AWI)
- Institute for Ornithological Research (IfV), Wilhelmshaven.

The programme includes chemical and biological studies on the status of the water, sediments and organisms.

The research data are collated centrally in the Marine Environment Database (MUDAB) and published in biennial reports. The data also serve in fulfilling national reporting requirements for international conventions on marine environment protection (OSPAR and Helsinki Agreements)

and other European and international organisations (e. g. OECD, Eurostat). The *Bund-Länder* Monitoring Programme cooperates with the Trilateral Wadden Sea Monitoring and Assessment Programme (TMAP) which takes up issues of water quality, nature protection and management as part of the cooperation between Germany, Denmark and the Netherlands to protect the Wadden Sea.

The International Council for the Exploration of the Sea (ICES) is the largest organisation for coordinating and promoting marine research in the North East Atlantic. Its responsibilities include drawing up recommendations for European fisheries policy on the exploitation of target fish stocks in the respective marine regions. In recent years, there has been an increase in the number of studies and data collected on the impact from fisheries on non-target species and on the ecosystem. At national level, the Federal Research Centre for Fisheries along with specialist research institutes at key organisations that deal with fisheries research work closely with the ICES. Data on inputs into both the North and Baltic seas are collected by the Federal Environmental Agency (UBA) based on pollution monitoring conducted by the various *Länder* and other research programmes. At EU level, data on atmospheric inputs are collected and evaluated under the European Monitoring and Evaluation Programme (EMEP).

Apart from the main, ongoing monitoring and research programmes outlined in this report, a wide range of other, often subject-specific monitoring activities and projects are under way. Longer, multiyear test series like the extended study on the Heligoland Reed (conducted by the former Biological Institute on Heligoland, which has since become the Alfred Wegener Institute for Polar and Marine Research) are less common.

231. Despite the existing research and monitoring programmes, scientific and marine protection organisations continue to emphasise the need for large research programmes and particularly monitoring activities to determine and assess the situation in the seas, the impacts of anthropogenic influences and the effectiveness of protection measures. The German Advisory Council on the Environment thus believes it prudent to point out the need for further research on marine environment protection in the light of the wide range of problems and questions that remain unanswered. The following is an outline of the main gaps in knowledge that must be filled to allow future management of human activities in the marine environment.

Fisheries

- More accurate fish statistics would serve, among other things, reliable monitoring of by-catch and discards.
- Sustainable management of new commercial stocks and species could be assisted by better information on those species.
- There is a gap in knowledge as regards technical avoidability of by-catches and discards. It is desirable that the use of modified nets (e. g. windows and square netting) and new techniques be studied to effectively reduce the non-commercial share of the catch and by-catch of juvenile fish. The same applies for measures taken to reduce damage to benthic organisms (e. g. electric beam trawls).
- Further information is needed to assess the impacts of fishing activities on non-target species like shark, rays, seabirds, marine mammals and benthic communities, and in particular those of changes in the food chain resulting from reductions in specific fish stocks.

Eutrophication

- Harmonised methods for quantifying diffuse inputs are required to assess the reduction measures needed in diffuse sources (especially agriculture) as regards their effectiveness and impact on the degree of eutrophication in the seas. This is, for example, the aim of the EU's EUROHARP project. Also, models that describe the relationships between such diffuse inputs and the actual concentrations of nutrients found in the seas must be further developed.
- Knowledge on the natural variability of marine ecosystems and on the impact of nutrient inputs remains limited. Far more information is needed on the extent to which nutrient inputs influence plankton algae communities and their succession, and on how, for example, changes in the nitrogen-phosphorus ratio affect algae diversity.
- Long-terms trends in changes in the ecosystem that result from natural variability in nutrients in the seas provide an important basis for successful modelling of the ecosystem. In turn, knowledge gleaned from such models provides an important basis for early assessment of future anthropogenic nutrient inputs.
- Many questions remain unanswered regarding the presence of toxic algal bloom – how they are influenced by oceanographic conditions, for example.

Pollution Monitoring

- While knowledge on the behaviour and distribution of some long-known pollutants in coastal waters is relatively broad, fewer studies are being conducted on the presence and behaviour of 'new pollutants'. Up to now, OSPAR and HELCOM recommendations only call for monitoring of certain heavy metals (particularly cadmium, mercury and lead) and certain existing organic chemicals (PCBs, PAHs, HCHs and, in some instances, DDT). It is necessary to explore whether it would make sense to expand the existing monitoring programme to include other substances from the OSPAR and HELCOM lists of chemicals for priority action.
- Few studies have been conducted on synergistic effects of multiple pollutants found in the seas and particularly in sediments. Studies on contaminated sediments have provided the first indications of additive effects (BSH, 2003a). In determining the ecotoxicological assessment values for individual pollutants, the combined effects that result from the actual pollution

status are not given sufficient consideration. Balanced monitoring of biological effects that looks at different levels (from effects on metabolic processes to those on a population as a whole) can provide an indication of the combined effects of all pollutants present in highly contaminated areas.

– Germany has still not developed its own evaluation criteria for pollution of the seas because little data is available on the effects of pollutants on marine organisms.

– Little information is available on the concentrations of hormone-disrupting chemicals and pharmaceuticals (endocrine disrupters) in the marine environment and how they affect organisms.

– Harmonised monitoring of the long-term effects of drilling muds and production water that accumulate in oil production is needed for adequate ecotoxicological assessment of such effects.

Changes Over Time

– Extended time series, primarily encompassing physical, chemical and oceanographic parameters to document the status of the oceans and its fluctuations, are extremely important in detecting system changes. The few existing extended time series should thus be continued.

232. The German Advisory Council on the Environment believes that marine environment protection could be made far more transparent by collecting all the available data held throughout Europe on the status of the North and Baltic seas and making it accessible from one central agency. Timely updates would need to be ensured. This would allow institutions to obtain fast and accurate data on the status of the seas and the existing problem areas. A first step in this direction would be to combine monitoring activities in Germany in a central location (a Federal Agency for Marine Environment Protection).

3 Protecting the North and Baltic Seas: Action and Measures Needed

3.1 Paths to Sustainable Fisheries

233. As outlined in Sections 2.1.2 and 2.2.2, a sustainable fisheries industry that is compatible with the marine environment can only be achieved through a dramatic reduction in landings of endangered fish stocks. Moreover, by-catches must be significantly reduced (especially those of juvenile fish from endangered stocks) and encroachments on habitats must be kept to an absolute minimum through the use of environmentally sound fishing methods. As the sole authority for the management of live marine resources in its Member States' Exclusive Economic Zones (EEZs), and consequently for the North Sea in its entirety and for a large section of the Baltic, responsibility for promoting sustainable fisheries lies first and foremost with the EU.

234. In its 2002 Environmental Report, on the occasion of the reform of the EU Common Fisheries Policy (CFP), the German Advisory Council on the Environment had already cited the key conditions for sustainable management of marine resources and, bearing in mind fishing's historical, economic and political background, made some strategic recommendations as to the steps needed to achieve those conditions (SRU, 2002a, Para. 744 et seq.). The recommendations were made in recognition of the fact that fishing quotas based on Total Allowable Catch (TAC) criteria had not proved a successful management tool, with quotas always being set far in excess of the quantities recommended by ICES as maximum allowable withdrawal for stock conservation. Enforcement of TAC compliance had been lax and left many loopholes. One cause of this misguided catch quota policy is the EU's fisheries structural policy. It does not adequately structure the much-needed fleet reductions and almost forces approval of excessive catch quotas. Another cause is the high level of general subsidies afforded to fisheries, as this incentivises exploitation of fishing capacities.

The German Advisory Council on the Environment has emphasised the pressing need for substantial fleet reductions and economic restructuring of fisheries-dependent regions. The Council also pointed out the need to differentiate within the European Community as regards those states (like Germany) and fisheries (like small coastal fisheries) whose fisheries already go a long way towards operating in harmony with the marine environment. The Council also emphasised that structural policy measures should be supported by long-term management and reconstruction plans, and that the plans must combine in a practical way both temporal and spatial fishing bans and quantity restrictions. Finally, the Council recommended far-reaching requirements for selectivity in fishing methods and a general, visible strengthening of controls at sea (SRU, 2002a, Para. 756).

235. In December 2002, the Council of the European Union ratified the new Basic Regulation for Common Fisheries Policy (CFP) along with other legislation in a reform package supported by a range of EU Commission action plans, inter alia for:

- Integration of environment protection needs (EU Commission, 2002b)
- Management of the social and economic outcomes of restructuring (EU Commission, 2002c)
- Restricting discards in fishing (EU Commission, 2002d)
- Harmonised implementation and enforcement of fishing restrictions (EU Commission, 2003a).

These current developments and the broader focus of this section, which takes in marine environment protection as a whole, give cause to reassess European fisheries policy with regard to socio-economic conditions (Section 3.1.1) and international management requirements (Section 3.1.2).

3.1.1 Socio-Economic Conditions

236. Not least due to the significant subsidies provided by the EU and its Member States are the fisheries that operate in EU waters still an important economic sector within the European Union. The EU is one of the world's largest fisheries powers and the biggest market for fish processing and aquaculture products. Sales in the sector as a whole amounted to around EUR 20 billion in 1998 compared with EUR 18 billion in 1990. Around half of those sales occur in the processing sector (EUR 10.3 billion in 1998). Based on GDP in the EU, the size of the sector remains constant at about 0.28% (EU Commission, 2001a). The role of the fisheries varies between the Member States. Denmark leads with landings of 1.9 billion Mg (about 30% of total catches). Spain ranks the next highest with 999,603 Mg, followed by Great Britain, France and the Netherlands. The supply of fish and fish products in the EU falls increasingly short of demand, which is now being served by imports from third countries. In 1999, landings with a total value of EUR 8.6 billion were imported; imports thus exceeded EU domestic landings in monetary terms.

Despite high demand, the situation in the fisheries market is largely poor. Most fisheries manage to stay viable because of the extremely low wages they pay. In many cases, economic survival is only secured by subsidies that are co-financed by the EU and its Member States

(Para. 248 et seq.). This applies to small coastal fisheries in particular, as reported in the German Advisory Council on the Environment's 2002 Environmental Report (SRU, 2002a, Para. 754 et seq.).

One of the main reasons for the poor conditions are the ever-shrinking stocks of many traditional target fish species and thus the significant and ever-increasing overcapacities in the fleet. Based on sustainable and achievable landings, the EU estimates that fishing capacities in the EU fisheries fleet are around 40% too high. This figure is likely to have risen due to the further deterioration in fish stocks. The poor utilisation of an over-dimensioned fleet has a particularly grave economic impact because of the, on average, very high capital intensity of the fishing industry (up to 20 times that of the economy as a whole; EU Commission, 2001, p. 7). The higher the capital intensity, the more fleet profitability depends on capacity utilisation. For this reason, the fisheries industry faces more pressure than most to exploit its capacities to the full. It is thus all the more important to implement fast reductions in the fleet; not only as regards aligning them to the availability of natural resources, but also for economic reasons to ensure that remaining capacities can be used profitably (EU Commission, 2001a, p. 13).

As shown in Table 3.1, fishing capacities vary between the Member States. There is corresponding variation in dependence on the fisheries industry and the need for structural adjustment.

237. Over half a million people were directly employed in the various sectors of the EU fisheries industry in 1998 (EU Commission, 2001a, p. 23). The ongoing decline of the fisheries industry and the ever-increasing capital intensity of modern vessels have resulted in significant job losses in the sector. According to the findings of the EU Commission, 8,000 jobs per year have been lost in Europe's fishing sector in the past ten years. About half of those losses can be apportioned to reductions in capacity and to fishing vessels being taken out of operation (EU Commission, 2002c, 2.1.2, p. 3). However, if fishing effort is dramatically reduced within a four-year period, as recommended by the ICES, then according to the Member States and the EU Commission, the employment rate should not further decrease to any significant extent (EU Commission, 2002e, 2.3, p. 8). The Com-

Table 3-1

Ships, engine power and state aid:
Overall figures and EU member state shares

	Number of ships (1998)	**Tonnage (Mg) (1998)**	**Engine power (KW) (1998)**	**Catch (Mg) (1999)**	**State aid (euros) (1994–1999)**
Totals	**99 170**	**2 053 240**	**7 991 591**	**6 389 573**	**2 665 490 000**
	% shares	% shares	% shares	% shares	% shares
Greece	*20.4*	*5.5*	*18.4*	*2.1*	*4.0*
Spain	*18.1*	*28.7*	*18.4*	*18.7*	*50.0*
Italy	*16.5*	*12.7*	*18.9*	*4.6*	*10.4*
Portugal	*11.7*	*6.0*	*4.9*	*3.4*	*6.7*
France	*8.9*	*10.2*	*14.3*	*10.2*	*6.5*
United Kingdom	*8.7*	*12.3*	*13.1*	*13.7*	*5.1*
Denmark	*4.7*	*4.8*	*4.8*	*22*	*5.4*
Finland	*4.0*	*1.2*	*2.7*	*2.3*	*1.2*
Germany	*2.4*	*3.7*	*2.1*	*3.7*	*5.0*
Sweden	*2.1*	*2.4*	*3.2*	*5.5*	*1.8*
Ireland	*1.3*	*3.0*	*2.4*	*5.1*	*2.0*
Netherlands	*1.0*	*8.5*	*6.0*	*8.1*	*1.0*
Belgium	*0.1*	*1.1*	*0.8*	*0.5*	*0.8*
SRU/SR 2004/Tab. 3-1; data source: RITTERHOFF and BORCHERS, 2003					

mission believes that better use of a smaller fleet could go a long way towards compensating for the considerable job losses involved in fleet reduction. It is worthy of note, however, that despite these job losses, there is an excess of available jobs in the fishing sector – a situation that the EU Commission apportions to the comparably low wages, unattractive working conditions and the associated exodus from the fisheries, especially by younger people (EU Commission, 2002c, 2.1.2). The jobs market thus appears to have already anticipated the required shrinkage in the fisheries sector.

238. The decline of the European fisheries has an indirect impact on fish processing industries, the distribution sector and down-chain businesses in ship building, ships' interiors and maintenance. The impact is, however, less that that on fisheries themselves. In many cases, processing and distribution companies can switch to using imports from third countries (e. g. sardines and tuna) and the remaining affordable domestic species (e. g. mackerel and sprat) (EU Commission, 2002e, 2.3.2). This, of course, can make a significant contribution to causing similar problems for fisheries outside EU waters.

Many (coastal) regions in the EU remain heavily dependent on fishing. In its Report on the Economic and Social Conditions in Coastal Regions published in 2001, the EU Commission found that the degree of dependency had risen in over half of the regions among the top 100 fisheries-dependent in Europe, while only 35 regions had experienced reductions. This trend can, however, be partly apportioned to the switch to mariculture, which compared to the fishing sector has gained in economic importance and, to a certain extent, performs a safety-net function for the downward trends in fishing. In the regions most dependent on fisheries, their dependency is largely due to the lack of alternative employment opportunities. In an EU Commission study on the degree of regional dependency (EU Commission, 2000a), it was shown that dependency in coastal regions of the North and Baltic seas is less acute than in South-East European 'fishing nations', particularly Greece, Spain and Portugal.

239. Taken as a whole, the socio-economic dimension can be recapitulated as follows:

- The fisheries are largely in decline as a result of poorer yields and lower wages.
- Consolidation of the sector to a significantly lower level of activity appears appropriate, also for economic reasons, and especially due to the high levels of investment needed in modern fisheries.
- Economic dependence on the fisheries sector in the North Sea and Baltic regions is significantly lower than in some regions of the South-European Atlantic and the Mediterranean.
- The loss of jobs to a level that is compatible with the natural replenishment of fish stocks after consolidation will be less severe and more acceptable the faster fleet capacities are reduced, so that the remaining trawlers can be viably operated using their full capacities and thus provide additional, secure jobs.
- The decline of fisheries that fish endangered stocks will have a regionally concentrated rather than general impact on coastal regions that are traditionally dependent on these types of fisheries. This means that, from a socio-economic perspective, the structural changes needed to achieve sustainable fisheries pose a particular challenge to regional policymakers and to promotion of regional development, and are largely a matter of developing economic alternatives and perspectives for the affected regions.

The latter issue applies to small coastal fisheries in particular. These are not only threatened by the decline in their target stocks, but also by their relatively lower levels of efficiency and competitiveness compared with larger, modern fisheries. If coastal fisheries – with their low catches, regional nature and acceptable impacts on the marine environment – are considered worthy of maintaining, they should be systematically promoted (SRU, 2002a, Para. 755).

3.1.2 International Management Rules

Law of the Sea Treaty Provisions

240. The distribution of fishing rights in the North and Baltic seas reflects the fact that the Law of the Sea Treaty gives coastal states exclusive authority over live marine resources in coastal waters and in their Exclusive Economic Zones (EEZ). Common authority for all states applies solely in areas of open sea that are distant from the coast, where fishing yields are lower. Given that no such areas exist in the North and Baltic seas, the Law of the Sea Treaty prescribes a general requirement for care and consideration and points in other respects to the option of governing the distribution of resources by means of regional agreements between the riparian states.

The Law of the Sea Treaty links the exclusive authority of coastal states in their EEZ with the general obligation to adopt proper conservation and management measures to ensure sustainability of fish stocks. In particular, Article 61 (1) of the Treaty obligates coastal states to set catch quotas (Total Allowable Catch (TAC) quotas) for their EEZs. Under Paragraph 3 of this provision, the quotas must be set so as to take account of relevant environmental and economic factors, including the economic needs of coastal fishing communities, to maintain stocks at levels that can produce the maximum sustainable yield (MSY). The exclusive authority is only conditional on other states being given access to the surplus of the allowable catch (Article 62 (2) sentence 2, Law of the Sea Treaty).

Article 62 of the Treaty also includes other management measures, including regulation of fishing methods and the setting of spatial and/or temporal fishing bans or restrictions. Above all, Article 61 (2) sentence 2 requires the best available scientific evidence be taken into account. Finally, the Law of the Sea Treaty takes account, at least in part, of the possible impacts of fishing on indirectly affected species in that it requires prevention of a 'serious

threat' to species associated with or dependent on harvested species.

241. In principle, the Law of the Sea Treaty requirement for catch quota restrictions to be based on securing sustainable yields is a demanding environmental policy conservation goal that is to be welcomed. It is clear, however, that EU fisheries policy falls short of international sustainability requirements. Critics rightly point out that in the management of their fish stocks, the Law of the Sea Treaty provides states with an element of flexibility when setting their TACs by allowing them to take account of the economic needs of local fishing communities (WOLFF, 2002, p. 62), and thus that targets for maximum sustainable yield are not a suitable basis for managing fish stocks in a way that meets environmental requirements. But because sustainable conservation of stocks is also a fundamental requirement for further commercial exploitation, stocks are considered to be managed excessively when – as with cod in the EU – quotas are repeatedly set well above the limit laid down by the ICES and based on the best available scientific evidence at which stocks can just about be secured (WOLFF, 2003, p. 357 et seq.). That such severe overfishing cannot be justified for economic reasons has since been supported by the international community with the Straddling Fishstocks Agreement, although this agreement only applies directly to the open seas.

The Straddling Fish Stocks Agreement (SFSA)

242. The Agreement for the Implementation of the Provisions of the Law of the Sea Treaty relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks of 8 September 1995 contains specific provisions on the protection of migratory fish stocks in high seas. With the agreement, the signatory states place the management of deep-sea fisheries in the hands of regional fishing organisations (the organisation responsible for the North East Atlantic is the North-East Atlantic Fisheries Commission – NEAFC) and, by means of the organisations' management provisions, agree to comply with requirements on fishing methods and particularly catch quotas that allow maximal sustainable yields. Each member state allows one of the regional institutes to board fishing vessels and carry out checks for compliance with the management provisions.

While these provisions have only an indirect impact on the North and Baltic seas within the 200 mile zone, the SFSA's comparatively advanced prevention model will have a significant normative effect on the EEZs of the various coastal states (MARR, 2003, p. 141 et seq., WOLFF, 2003, p. 358, 2002, p. 71 et seq.). In protecting migratory fish stocks, the signatory states agree to:

– Apply the precautionary approach in that the absence of adequate scientific information on the possible impacts on the marine environment cannot be used as reason for postponing or failing to adopt conservation and management measures.
– Assess the impacts of fishing and other human activities on target stocks and the affected marine environment.
– Adopt, where necessary, conservation and management measures for species belonging to the same ecosystem or associated with or dependent upon the target stocks.
– Minimise pollution of the seas by harmful substances and waste.
– Minimise by-catches.
– Protect biodiversity in the marine environment.
– Perform effective monitoring and controls.

As mentioned earlier, these obligations only apply to the high seas. However, under Article 3 (1) of the SFSA, the precautionary approach is also to be applied in waters under the national jurisdiction of the coastal states in line with the provisions for conserving migratory fish stocks contained in Article 6 and Annex II. In some instances, these provisions go beyond the conservation and management provisions contained in the Law of the Sea Treaty. Coastal states' obligations include:

– Active advancement of knowledge and availability of data on the impact of fishing activities on stocks and associated species.
– Adoption of management plans that also include the conservation of associated or dependent species.
– The setting of precautionary reference points to maintain populations at levels at which they can produce the maximum sustainable yield.
– Take conservation and management action to prevent stocks falling below a limit reference point or to facilitate stock recovery in stocks that have already fallen below the reference point.

These provisions cover stocks of species that migrate beyond the limits of the EEZ and into high seas. This does not usually apply to commercially fished stocks in the North and Baltic seas. It should nevertheless be possible to refer to these provisions when interpreting the underlying precautionary approach even within the wider scope of the Law of the Sea Treaty, and it can also be taken as internationally recognised that state authority, including in the EEZ, only goes as far as achieving a 'properly managed' fishing industry for which constant yields remain secured (WOLFF, 2002, p. 71 et seq.).

FAO Code of Conduct for Responsible Fisheries

243. Taking up international management obligations, the UN Food and Agriculture Organisation (FAO) adopted detailed recommendations for sustainable, environmentally sound fisheries management in the form of a Code of Conduct for Responsible Fisheries in 1995. The Code has no legally binding status in international law. It does, however, contain a range of principles and provisions for appropriate and considerate management of fish stocks and conservation of the associated and de-

pendent marine environment. These could serve as internationally agreed standards when setting out international management obligations. It is thus appears important that the Code demand long-term stock conservation. Article 7.1.1 states:

'States and all those engaged in fisheries management should, through an appropriate policy, legal and institutional framework, adopt measures for the long-term conservation and sustainable use of fisheries resources. Conservation and management measures, whether at local, national, subregional or regional levels, should be based on the best scientific evidence available and be designed to ensure the long-term sustainability of fishery resources at levels which promote the objective of their optimum utilization and maintain their availability for present and future generations; short term considerations should not compromise these objectives.'

Article 7 requires that:

a) Excess fishing capacity is avoided and exploitation of the stocks remains economically viable.

b) The economic conditions under which fishing industries operate promote responsible fisheries.

c) The interests of fishers, including those engaged in subsistence, small-scale and artisanal fisheries, are taken into account.

d) Biodiversity of aquatic habitats and ecosystems is conserved and endangered species are protected.

e) Depleted stocks are allowed to recover or, where appropriate, are actively restored.

f) Adverse environmental impacts on resources from human activities are assessed and, where appropriate, corrected.

g) Pollution, waste, discards, catch by lost or abandoned gear, catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species are minimised, through measures including, to the extent practicable, the development and use of selective, environmentally safe and cost-effective fishing gear and techniques.

Under Article 7.2.3, states should assess the impacts of environmental factors on target stocks and species belonging to the same ecosystem or associated with or dependent upon the target stocks, and assess the relationship among the populations in the ecosystem.

In its other provisions, the FAO Code contains more detailed requirements for the implementation of these targets and measures, particularly for fishing methods and equipment, protection of marine habitats and communities, controls to be conducted by flag and harbour states, and correct management of the required fisheries research and data processing.

Overall, the Code can be seen as a progressive set of international guidelines for sustainable, environmentally sound fisheries that also take account of management requirements and environmental risks. The prescribed targets and measures for fisheries based on natural pressure limits are thus already available in detail and recognised at international level. For the most part, their implementation is still awaited.

OSPAR and HELCOM

244. One interesting aspect is that the regional protection organisations expressly exclude the fisheries from their area of responsibility, referring to specific international rules already in place. The above overview should, however, have made clear that this special international fisheries regime is highly dependent on implementation and further development by alliances of regional states. This applies even more so to the North and Baltic seas: these being separated from the high seas, the new and more stringent agreement on migratory fish stocks (SFSA) does not apply to them directly. The same applies as regards the North-East Atlantic Fisheries Commission (NEAFC), which also deals solely with deep-sea fisheries. Apart from the fact that the international regimes allow broad flexibility for regional cooperation regarding the fisheries in the North and Baltic seas, the need for integrating the needs of marine environment protection into state fisheries management, the dependence of fish stocks on external influences in the environment and the urgent need to balance ever-more conflicting uses (e. g. offshore wind farms) signal the necessity to integrate the fisheries officially into the jurisdiction and activities of OSPAR and HELCOM. In truth, the fact that integration of the fisheries has been ignored is probably less to do with existing international rules and more to do with the fact of the EU's desire to hold on to its autonomy in this area. The associated responsibility for structuring a sustainable North and Baltic sea fisheries that is compatible with international management targets, the needs of the marine environment and the many other uses have not been adequately taken up by the EU.

3.1.3 Paths to a Sustainable Common Fisheries Policy in the EU

245. The EU has sole regulatory authority over fishing activities in sovereign waters (within the 12-mile zone) and in common waters under national jurisdiction (EEZ) of its Member States (ECJ decision of 14.7.1976, (1976) ECR 1279; decision of 5.5.1981, (1981) ECR 1045). This authority serves as the basis on which the EU's Common Fisheries Policy (CFP) aims to structure and regulate the market to:

– Give all Member States equal access to common waters, excluding coastal waters in the 12-mile zone.

– Increase fisheries productivity by promoting technological advancement, production restructuring and the best-possible use of production factors, especially labour.

– Provide acceptable livelihoods for fishery-dependent populations.

– Stabilise the markets.

– Secure supply.

This will be achieved through:

- Common organisation of the market for fisheries products.
- A common structural policy.
- Common rules on the conservation and management of fisheries resources (referred to in the following as the code of practice).
- An extra-EU fisheries regime.

Fundamental changes are needed in all these areas if pressures on fish stocks and on associated and dependent species and habitats are to be reduced to a sustainable level. The greatest contribution will come from the reform of the CFP – particularly the new Basic Regulation – agreed by the EU Council in December 2002. As outlined below, the Council's reform decisions indicate significant progress in legislative principles but they fall far short of halting overfishing and environmentally damaging by-catch in the North and Baltic seas.

3.1.3.1 Common Organisation of the Market: A New Approach

246. Common organisation of the market involves quality and marketing standards, monitoring of those standards and – similar to agricultural policy – intervention mechanisms. A key element in all of this is the *Common Marketing Standards for Certain Fishery Products* (Council Regulation (EC) No. 2406/96 of 26. 11. 1996, Official Journal No. L 334, 30. 12. 1996, p. 1) under which fishers are guaranteed minimum prices for landings that cannot be sold at those prices. An annual reference price set by the Council of Ministers for each fish species provides the basis for calculating the lower EU withdrawal price. If the market price falls below the withdrawal price, producer organisations compensate their members for all quantities taken off the market. Compensation is co-funded by the EU (EU Commission, 2002e).

In 1999, the Council agreed a broad reform of the Common Marketing Standards for Certain Fishery Products (Council Regulation (EC) No. 104/2000 of 17. 12. 1999, Official Journal No. L 17, p. 22) which reduced compensation for final withdrawal from the market and increased the subsidies for conserving and storing products for later sale. The price setting mechanism provided for lower payments for smaller fish. Self-discipline was to be strengthened in the form of producer organisations. These are to become more active in regulating their members' landings and will take suitable action to avoid withdrawals. Finally, the reformed common organisation of the market brought in a new labelling obligation for retailers to improve product traceability and thus restrict opportunities for fraud as regards place of origin and fish species. The consumer must be informed as to the trade name, the type of production (aquaculture or wild catch) and the fishing area.

247. Overall, these measures have reduced subsidies and closed loopholes. However, the fact remains that minimum prices are guaranteed, including for fish that are not even marketable (undersize cod, for example), and other considerable grants are paid to producer cooperatives from EU and Member States funds, thus hindering the required alignment of the sector to the thresholds for sustainable management. This alone shows that structural policy aimed at fleet reduction and creation of economic alternatives does not go far enough.

3.1.3.2 Structural Policy: A Change in Course

248. First and foremost, structural policy covers fleets and fishing capacities. The expansion and modernisation of the European fleet has long been heavily subsidised through the Multiannual Guidance Programmes (MAPs) and without any consideration being given to the limited availability of natural resources. That structural policy of this type fails to take in all the relevant issues was only recognised by the EU once fishing effort had far exceeded the thresholds that target fish stocks can cope with over time.

In aligning the Common Fisheries Policy to natural stock limits, restructuring of subsidy policy takes top priority. Rather than investing in fleet expansion, investment should target fleet reduction linked to training those whose jobs are affected and establishing a social safety net to catch the fall-out from sector decline. With its Financial Instrument for Fisheries Guidance (FIFG), the Community has assisted such restructuring activities since the early 1990s. At the same time, construction and modernisation of fishing vessels received considerable subsidies under Council Regulation (EC) No. 2792/1999 laying down the detailed rules and amendments regarding Community structural assistance in the fisheries sector. Despite the urgent recommendations made by the EU Commission, the Council's reforms of December 2002 failed to go so far as to completely do away with these subsidies and concentrate EU funding entirely on fleet reduction and restructuring of the sector.

The Multiannual Guidance Programmes have been replaced by basic rules on limiting fishing capacities, with the main responsibility being assigned to the Member States. Under Article 13 of the new Basic Regulation, the Member States are obliged to take measures to restructure fleet capacities to establish a stable and sustainable balance between fishing capacities and fishing opportunities. For the first time, Member States are placed under obligation to keep national fishing fleet registers to allow monitoring of restructuring activities.

The conditions for reliable and reimbursable subsidies for modernisation and construction have been tightened and aid has been more strongly linked to reduction goals:

- During the period 2003 to 2004, Member States who provide public grants for fleet renewal must reduce their total capacity by 3% compared with the base for calculation.
- Under the amendment to the Regulation passed on 20 December 2002 (Regulation (EC) No. 2369/2002 of 20. 12. 2002) and the new Basic Regulation (Article 13), public grants may still be provided up to the

end of 2004 for construction of new trawlers with a gross tonnage below 400 t, but each addition to capacity up to a gross tonnage of 100 t must be matched by a reduction of at least the same volume, and each addition to capacity above 100 t gross tonnage by a reduction of 1.35 times the added capacity. The EU Commission had previously recommended requiring a 1.7-fold reduction.

– Aid for trawler modernisation is only granted for vessels that are at least five years old for the purposes of improving safety, product quality and working conditions, to promote selective fishing methods and for installation of satellite monitoring systems. These activities must not, however, result in increased fishing capacity.

– A Scrapping Fund comprising EUR 32 million was established from which premiums are paid for the scrapping of trawlers whose fishing effort must be reduced by at least 25% as part of a recovery plan.

– The conditions for socio-economic measures have been expanded to aid fishers and vessel owners affected by capacity restrictions. Aid is available, for example, for retraining and diversification measures to enable fishers either a complete change of employment or a part-time job outside the fisheries industry.

249. All the reform measures cited are to be welcomed in principle, even if they are long-awaited and are nowhere near adequate. This applies in particular to the withdrawal of subsidies for trawler construction, although the German Advisory Council on the Environment fails to see why they should only be withdrawn at the end of 2004. That the provision of aid is linked to a reduction of at least the same volume does not change the fact that the sector receives public funding and that this slows down the process of restructuring to match the limits of the markets and those of natural resources. The same applies to the continued promotion of fleet modernisation. Making aid capacity-neutral cannot alter the fact that the mere provision of financial aid (non-capacity-linked investment) frees up funds that can be used to increase capacities. Given the considerable overcapacities that already exist, it would thus be necessary to legally obligate Member States to visibly reduce their fleets, to constantly monitor the situation, and to invest EU funds solely in reducing excess capacities, restructuring fishery-dependent regional economies, and social cushioning and integration into other types of work for those whose jobs are affected. It is thus doubtful that restructuring will pick up pace and that fishing capacities will do anything other than remain at their current excessive levels (see EU Commission, 2002c, p.11 et seq., p. 14; EU Commission 2001b, p. 11 et seq.). A key issue in all of this is how to speed up, organise and fund restructuring in the affected regions. The EU's Action Plan to counter the social, economic and regional consequences of the restructuring (EU Commission, 2001e) contains some instructive and important recommendations. It makes clear that comparably low job losses (see Para. 237) are matched by large amounts of EU funds, not only from the fishery-specific FIFG but also from the European Regional Development Fund (ERDF). Some 80% of fishery-dependent regions belong to Target 1 and Target 2 regions that are eligible for aid, and the ERDF has funds allocated for the period 2000 to 2006 which amount to some EUR 19.2 billion. The European Social fund (ESF) co-finances a wide range of projects for training and diversification in the fisheries and aquaculture sectors. The ESF is making some EUR 5 billion available in the same period. Other funds to promote regional development in rural areas of fishery-dependent regions are provided by the European Agriculture Guidance and Guarantee Fund (EAGGF). The fund comprises some EUR 50.4 billion for the period 2000 to 2006.

250. How these richly available funds will be used to restructure the fisheries and fisheries-dependent regions lies largely in the hands of the Member States. As reported by the EU Commission (EU Commission, 2001e, p. 14), the Member States invest only a small portion of the funds in sustainable management of their fisheries and in their regional structures. Given their relatively low socio-economic clout, the fishery-dependent regions usually take a back seat when Member States develop their aid programmes. There appears, therefore, to be an urgent need for stronger central management of funding allocations.

The Commission rightly points out that the first priority should be strict quantity-related management of stocks and fishing capacities, which, if enforced with the required reductions, will indirectly affect subsidy policy in the Member States. Nevertheless, more direct and targeted aid should be provided to those regions wishing to forge ahead with restructuring at their own initiative. In this regard, the German Advisory Council on the Environment believes consideration should be given to requiring fishery-dependent regions and their producer communities to draw up specific, multiannual restructuring plans that are linked to the management plans.

251. Finally, future structural policy based on rapid reduction of overcapacities must also consider that not all fleets participate equally in the 'exploitation' of marine resources. This applies in particular to Germany's comparatively small fishing fleet, which does not regularly use its full quotas, and also to many of the small coastal fisheries throughout Europe (vessels less than 12 m long, see SRU, 2002a, Para. 755). Fisheries with relatively low fishing intensity are least able to cope with economic pressure. Management plans and restructuring activities must ensure, therefore, that these 'harmless' fisheries are not the first to lose their economic basis. The German Advisory Council on the Environment thus welcomes both the EU Commission's emphasis of the need to differentiate and its call for the Member States to implement, for example, more stringent protection measures, either assigning coastal waters to the small coastal fisheries or allocating them a fixed percentage of the fishing effort (EU Commission, 2002e, 5.2, p. 17).

3.1.3.3 Provisions for Environmentally Sound Management and Code of Practice

252. The old Basic Regulation (EEC) No. 3760/92 was a broad-based management instrument in that it contained legal provisions for quantity-related quotas, fishing effort restrictions and technical measures like protected areas (boxes) and recovery periods, and fishing equipment and methods. As shown by its recitals and its Article 2 (1), the old Basic Regulation aimed towards rational and responsible use of live marine resources and aquaculture that not only meets the needs of the fisheries as regards sustained development, their economic and social conditions, and consumer interests, but also takes account of marine environment conservation. The fisheries should, therefore, be managed in such a way as to achieve a balance between the available resources and the parameters that can influence fish mortality for each individual stock. In its goals and objectives, and in terms of the available instruments, the Regulation met the requirements for sustainable management of fish stocks. But as already described in some detail (Para. 36 et seq., 149 et seq.), the targets could not be even remotely realised.

253. The new Basic Regulation (EC) No. 2371/2002 contains an even clearer commitment to protecting resources. The aim now is sustainable use of live aquatic resources and environmentally sound aquaculture based on balanced consideration of environmental, economic and social factors. Long-term conservation of fish stocks and the survival of the fisheries sector are to be achieved by means of qualified scientific studies and the application of the precautionary approach. Also, management activities are to be expressly based on an ecosystem approach that should 'limit the impacts of fisheries on the marine environment' (Article 2 (1)). This places greater weight on protecting affected non-target species, especially by reducing by-catches. This enhanced protection requirement is not, however, expressed in more stringent quota restrictions (Section 3.1.3.3.1) or protected area provisions (Section 3.2.3.3.2). It is only expressed through additional requirements regarding fishing equipment and methods (Section 3.2.3.3.3). The reform also centres on monitoring provisions. Lax controls are seen as a key cause in the failure of the Common Fisheries Policy (Section 3.1.2.3.4).

3.1.3.3.1 Fishing Quotas and Fishing Effort Restrictions

254. The core management instrument is the regular (as yet annual) setting of total allowable catches (TACs, Para. 36) by means of individual regulations. Even under the old Basic Regulation, TACs were required to take account of resources protection. Under the past legislation, the quotas had to be based on the scientific recommendations of the International Council for the Exploration of the SEA (ICES). The scientific recommendations are drawn up by the Scientific, Technical and Economic Committee for Fisheries (STECF) for use by the Community (BOOß, 2003, Point 50). This, along with the annual negotiations of the EU Council of Fisheries Ministers (which are highly influenced by lobbying), regularly resulted in TAC quotas being set at levels that significantly exceed those recommended by the ICES. In late 2000, the ICES called for a multiannual recovery plan for cod and a severe reduction in fishing effort over a number of years; the ICES believes that cod fishing should be halted altogether unless a plan of this type was implemented (ICES, 2000). In actual fact, TAC quotas were only reduced by 40% and a protected area was created for a period of a mere 10 weeks. The situation thus became more acute and the ICES repeated its demand in 2002, with the result that TAC quotas in 2002 actually increased compared with those for 2001 (Commission Regulation (EC) No. 2000/2002, OJ EC 2002, No. L 308, p. 13). The Council was unable or did not wish to agree binding management targets based on a multiannual plan, as provided for in Article 8 (3) of Regulation (EEC) No. 3760/92. The focus on resources protection remained purely theoretical.

255. Under the new Basic Regulation, TAC quotas are to be set – other than previously – on the basis of longer term, multiannual management targets. As a fundamentally new approach, Article 5 of Regulation (EC) No. 2371/2002 provides for the adoption of multiannual 'recovery plans' for stocks that lie beyond safe biological limits. These could necessitate significant reductions in fishing effort. As regards fishing of stocks that are on the threshold or are within safe biological limits, Article 6 requires that multiannual management plans be adopted 'as far as necessary' to main stocks within safe biological limits. The term 'as far as necessary' is not defined. The multiannual plans must contain targets for sustainable use of the respective stocks along with provisions for calculating annual fishing and/or fishing effort restrictions and 'take account' of the limit reference points recommended by the relevant scientific bodies. Restrictions on fishing effort may include the time spent at sea and the number, size and capacity of vessels fishing in a specific area.

256. In principle, the introduction of multiannual recovery and management plans is to be welcomed: they will put a stop to annual quota 'haggling'. The conservation and recovery targets can be made binding for the long term and these binding requirements can no longer be countered by hopes for the 'catch of the century' (HUBOLD, 2003, p. 341). Against the background of existing experience and knowledge, the question remains as to whether and how these requirements can be put into practice. Although Article 8 (3) of the old Basic Regulation (EEC) No. 3670/92 provided the option for setting management targets on a multiannual basis, and despite the obvious threat to many stocks, the European Council decided to continue its practice of annual TAC setting. In the requirement for multiannual management plants, the new Basic Regulation contains stronger wording than its predecessor but the plans are still not mandatory: the rather vague 'where necessary' allows broad room for interpretation. In setting TAC quotas, the old Basic Regulation also relies on the recommendations of appropriate scientific committees – with the same result that the ICES

recommendations are regularly ignored. The situation does not appear to have changed: in October 2002, the ICES recommended the complete closure of the cod fisheries in the North Sea and the EU Commission wanted a 66% reduction in TACs (EU Commission, 2002f). The EU Council agreed to a mere 45% reduction (Council Regulation (EC) No. 2341/2002 of 20. 12. 2002; Table 3.2).

The quotas set by the EU Council patently contradict the sustainability requirements contained in Regulation (EC) No. 2371/2002. Against the backdrop of the totally inadequate fishing restrictions, the sustainability requirements cannot be met through supplementary, provisional fishing effort restrictions. To protect cod stocks, Annex XVII to Regulation No. 2341/2002 provides varying restrictions (relative to the type of fishing equipment used) on the number of days per month that fishing vessels with a length of 10 m and over may leave the harbour. These effort restrictions are not in themselves calculated to ensure recovery of stocks to a level within biologically safe limits. Thus, such effort restrictions are not suited to fixing fishing effort at precisely the level which ensures sustainable stock levels because they are based solely on the type of fishing equipment used and not on vessels' actual fishing capacity. The EU Council did, however, recognise this and called for the Commission to develop a parallel cod recovery plan to replace the measures implemented under the TAC Regulation (Council Regulation (EC) No. 2341/2002).

257. In response to the Council's request, the Commission presented its Proposal for a Council Regulation establishing measures for the recovery of cod stocks (EU Commission, 2003a). The proposal centres on target stock sizes, minimum stock sizes and maximum thresholds for mortality by fishing for four areas: the Kattegat, the North Sea including the Skagerrak and the Eastern Channel, to the west of Scotland and in the Irish Sea. The Commission proposes basic rules, linking them to these thresholds to serve both the setting of TAC quotas and restriction of fishing effort. The rules on the setting of TACs require that, until stock targets have been met, TACs be set so that, based on estimates from the STECF and taking account of the most recent ICES report, they allow stocks in the respective year to increase by 30% but – in an effort to prevent disruptions that cannot be planned for – do not deviate by more than 15% from the TAC quota for the previous year. The latter 15% limit should only apply, however, if it is not likely to result in the stock size falling below the minimum target. If the minimum stock sizes are not achieved, new TACs are to be set to allow their achievement by the end of the year.

According to the proposed system for fishing effort restriction, the existing total fishing effort of all vessels that fish cod is required to be calculated in 'kilowatt days' in order to quantify the reduction in fishing effort needed to comply with the agreed TAC. The reduction is then divided among the Member States according to their share of total landings of cod in the Community. The Member States can then distribute their allocated fishing effort among their fishing operations. The allocated 'kilowatt days' are to be transferable between the various fishing vessels but not from one fishing area to another.

The European Parliament Fisheries Committee has criticised these proposals in that they do not consider possible technical measures to protect cod, particularly when fishing for other bottom fish species. The Committee has proposed an amendment to allow, where appropriate, more flexible catch quotas and fishing effort restrictions once improved fishing practices have rendered existing quotas and restrictions obsolete (European Parliament, 2003). Other suggestions aim at monitoring the socio-economic impact of management activities and identification of the specific impacts on industrial fisheries, on the revision of fishing area restrictions and on improved enforcement through ubiquitous satellite monitoring.

Table 3-2

2003 quotas for cod and other North Sea demersal species: ICES moratorium, EU Commission recommended catch limitations, and the Total Allowable Catches ultimately set by the EU Council

	ICES	EU Commission	EU Council TAC
Cod	Moratorium	*– 66%*	*– 45%*
Haddock		*– 70%*	*– 50%*
Whiting		*– 76%*	*– 60%*
Plaice		*– 17%*	*– 5%*

SRU/SR 2004/Tab. 3-2

The German Advisory Council on the Environment believes that the Commission's proposal signals important progress. The basic principle on which the proposal is based – maintaining stocks at sustainable, biologically safe levels by restricting landings and fishing effort – is in line with the new Basic Regulation, if only in an abstract way. A key advancement in the Commission's proposal is the fixed minimum and target stock levels and the maximum levels for mortality by fishing. This provides a precise, transparent and plausible basis on which to calculate sustainability requirements, at least for cod stocks. The provision on calculating quotas also appears plausible. This does, however, place great responsibility with the STECF and, to a certain extent, assigns it a higher ranking than the ICES in terms of evaluation.

As regards the rules on fishing effort restrictions, it makes sense to link them – based on the agreed target and minimum stock sizes – to calculation of TAC quotas. Compared with the existing 'fishing day' formula, the 'kilowatt day' allows a more realistic calculation of fishing effort by incorporating engine size as a significant capacity factor.

On the whole, the Commission's proposal presents a far more consistent management system compared with the measures contained in the Basic Regulation. In contrast, the German Advisory Council on the Environment sees the integration of technical alternatives, as called for by the parliamentary committee, as unnecessary softening and over-complication – especially seeing that fishing practice options to protect stocks are anyway to be made binding, meaning that they could and should be taken into account *a priori* when using TACs to calculate fishing effort restrictions. Of key importance is that the Council finally approves and rigorously enforces a consistent management regime of this type. In principle, this applies to all stocks at risk from fishing. Also, delegation of responsibility for setting quotas and levels of effort (currently with the Council of Fisheries Ministers) to the less politics-dominated implementation arena of the Commission – beyond its current rapid action authority for short-term conservation measures – would certainly be helpful and desirable. If under the conditions contained in the Commission's proposal, the key management decisions were to be made according to hard and fast rules based on the most recent scientific data and forecasts from the STEFC and the ICES, then such delegation would appear both allowable and acceptable.

3.1.3.3.2 Area-Specific Fishing Restrictions and Bans

258. Given that fishing restrictions have failed, hopes are ever higher that the instrument of protected areas and area-specific fishing bans and restrictions (boxes) will work. Planned, area-specific fishing restrictions also appear particularly suited to protecting both the regions (spawning grounds) so important to stock replenishment and the marine environment as a whole from destructive forms of fishing (HUBOLD, 2003, p. 341 et seq.). As regards this approach to finely tuned spatial planning, the new Basic Regulation remains somewhat reserved. As already mentioned, the management instruments cited in the Basic Regulation provide for designation of protected areas and area-specific recovery periods (Article 4 (2) g, ii). The Basic Regulation does not, however, force anyone to monitor the need for such area-specific restrictions or to introduce appropriate rules where necessary. Rather, this instrument is solely mentioned as one of the many possible management measures that the European Council could take, as it did with the Shetland Box which is directly referred to in the Basic Regulation. Protected areas are only an optional instrument of the recovery and management plans. The EU Commission is neither responsible for nor authorised to either develop or set out a comprehensive model based on scientifically proven needs for protection and recovery periods. The EU Commission is only able to designate protected areas and recovery periods as part of its 'emergency powers' assigned under the old Basic Regulation (Article 7 of the new Basic Regulation) for a very limited period of between six and (at most) twelve months.

In the meantime, the EU Commission has convinced the Council to reduce fishing effort by limiting the number of fishing days. Under the respective provisions (see Council Regulation (EC) No. 671/2003), highly endangered stocks may only be fished on a certain number of days (e. g. nine fishing days per month for cod fishers in the North Sea). Given the considerable fleet overcapacities and in light of experience gathered in the USA, it is doubtful that restrictions of this type are suited to tangibly reducing pressures on the affected stocks. In the USA, the Pacific halibut fisheries managed to land the entire annual catch in the space of just a few days (HUBOLD, 2003, p. 341).

3.1.3.3.3 Measures to Reduce By-Catches and Protect the Sea Bed

259. The requirements for fishing equipment and practices centre on the reduction of by-catches and discards (see Para. 40 et seq., 152). Technical measures for the conservation of fishery resources are contained in Regulation (EC) No. 894/97 and cover nets and their uses, especially minimum mesh sizes and minimum sizes of fish landed. The regulation places severe restrictions on fishing with purse seines and towed nets, for example, and use of driftnets with a length of 2.5 km and over is prohibited.

Although these rules have meant significant improvements compared with previous practices, it is now apparent that they are nowhere near adequate to reduce particularly harmful by-catches to an acceptable level that complies with the sustainability target (see Para. 40 et seq., p. 152). The Communication from the Commission to the Council and the European Parliament on a Community Action Plan to Reduce Discards of Fish (EU Commission, 2002d) provides for a range of other

measures to achieve a visible reduction in by-catches and discards:

- The introduction of a regulation under which fishing grounds are to be voluntary vacated as soon as large quantities of juvenile by-catches are landed.
- Provisions to increase the market value of currently less popular species.
- Measures to restrict discards caused by TAC quotas, such as integrating by-catches into the quotas.
- Pilot projects to test new fishing practices involving fewer or no discards.
- Improved technical measures, including improved net design.
- Expansion of recovery areas and recovery periods.
- Monitoring of minimum landing sizes.
- The introduction of a discard ban from 2005 (subject to further appraisal).

The Commission's Communication also highlights the difficulties and negative side-effects involved with some of these measures. What appears to be sensible market promotion of by-catches is countered by the fact that while it prevents the destruction of useful resources, it also provides an incentive to harvest more by-catches. That by-catches are to be rewarded in some way constitutes a criticism of their inclusion in correspondingly increased quotas. This would, however, only make sense if – taking Norway's example – a total discard ban were to implemented. The Commission doubts, however, that a ban of this type could be enforced because it would be extremely easy to circumvent.

260. The EU Commission's deliberations make it clear that the time is right to prescribe even larger mesh sizes and, depending on the target species and fishing equipment used, scare systems and escape windows. Despite the doubts already raised, the German Advisory Council on the Environment also believes it prudent – considering the monitoring problems it would not do any harm – to implement a strict discard ban, to make landing of all by-catches mandatory and to make TACs more flexible. The assumption, based on existing law, that in response to the landing ban fishers will strive to reduce by-catches and avoid areas with high levels of juvenile fish has proven unrealistic given today's 40% overcapacity in the fleet. If by-catches are landed and used, these resources would not disappear completely, and research and management would have both a better idea as to by-catch quantities and composition and a basis for further development and regulation of their minimisation. Without doubt, given the options to circumvent an obligation to land by-catches, the requirement must be supported by effective controls and more stringent sanctions in response to non-compliance. Also, as regards fishing equipment and fishing methods, it must be remembered that they can only achieve the targets if compliance is ensured – an area that has been sorely lacking to date.

3.1.3.3.4 Monitoring and Enforcement

261. According to a recent report from the EU Commission, some 8,139 violations of CFP provisions were registered in the various Member States in 2001. This represents a 12% increase compared with 2000. The violations largely involved fishing without a license or fishing in a banned area, and obstructing the work of the fisheries inspectors (EU Commissions, Press Release IP/02/1805 of 5.12.2002).

Up to now, monitoring and control of all the above-cited code of practice has been governed by Regulation (EEC) No. 2847/93 establishing a control system applicable to the common fisheries policy, which assigns responsibility to the Member States for controlling ships flying their flag and for ships of other Member States or of third countries sailing in their waters. They are also required to cooperate with the EU Fisheries Inspectorate. The Commission currently has 25 fisheries inspectors – far too few in relation to the size of the fleet. Member States may apply sanctions for proven violations by reducing either the quota of the stock involved or that of another stock for the following year, or by confiscating fishing licenses from individual fishers.

The ever-increasing number of violations highlights the inadequacy of existing monitoring and control practices in enforcing implementation of the CFP (HUBOLD, 2003, p. 341). This was given special emphasis in the EU Commission's Communication on the reform of the Common Fisheries Policy ('Roadmap'), which also proposed new rules to improve enforcement (EU Commission, 2002g, p. 13 et seq.).

The European Council took this up in the new Basic Regulation, placing considerable weight on improving control systems and allowing Member States broad control authority in other Member States' EEZs. The use of satellite-guided location is to be progressively increased. Numerous provisions aim towards greater cooperation among the Member States themselves and with the Commission, which participates in the common control system with its own inspectors. Also, the Member States are placed under obligation to introduce and apply stringent penalties to serve as a deterrent against violation of the management rules. This has not yet happened. For example, fines for fishing without a license vary between EUR 84 and EUR 367 – if such violations are followed up in the first place (see EU Commission Press Release IP/02/1805 of 5.12.2002). Finally, the Commission is given greater controlling authority over the Member States. This includes the right to conduct its own inspections and audits to serve regular evaluation of enforcement activities within the Member States.

262. In March 2003, the EU Commission published its Action Plan 'towards uniform and effective implementation of the Common Fisheries Policy' (EU Commission, 2003b) in which it promised even broader steps for improved enforcement. As part of a joint inspection strategy,

the individual states are to make more effective use of existing means of inspection and surveillance by:

- Using the means available as a priority in selected fisheries or stocks.
- Developing specific monitoring programmes for such fisheries and stocks and making the results of inspection and surveillance activities transparent.
- Appointing special coordinators between the member states.
- Regularly monitoring the successes achieved in implementing specific inspection programmes.

In the medium term, the Action Plan requires the creation of a Community Fisheries Control Agency (CFCA) which combines the inspection and surveillance resources of the various Member States and coordinates them independently under one roof. The CFCS will manage operational inspection and surveillance planning and the creation of multinational inspection teams.

3.1.3.3.5 Deficits in the Effectiveness of CFP Management Provisions and Code of Practice

263. Experience with the setting of Total Allowable Catches (TACs), technical provisions on fishing equipment, area-specific fishing bans and restrictions (protected areas), the less than successful efforts to restrict fishing capacities and the considerable deficits in surveillance and control shows that these instruments are inadequate in ensuring environmentally sound and socio-economically sustainable management of the seas. Because these instruments largely focus on the symptoms of overfishing, they do not have the potential to provide long-term incentives for those in the fisheries to manage the seas sustainably.

In its current form, the policy of free market access provides a Europe-wide market for the sale of fishery products, but at the same time it induces ruinous competition for ever-scarcer fish stocks. Under these circumstances, a reduction in the fishing capacity of an individual fishing operation does not result in stock recovery but rather in increasing competitors' fishing activities. Protection of stocks does not provide an adequate future yield for individual fishers. In this market, fishing operations are often forced to maximise their share of the remaining fish stocks at short notice by intensifying fishing activities on an ongoing basis, expanding fishing capacity and improving their fishing equipment. On the other hand, there is no incentive to maximise the value of fish stocks for the long term by restricting catches to levels that ensure sustainable fish populations. The result is environmental damage and social losses, with harm to marine ecosystems, smaller landings, loss of income for fishers and inefficient use of resources through overcapitalisation of the fishing fleet and excessive use of labour. The CFP subsidy policies have long driven this process by promoting capacity expansion in the fisheries industry. Even if this assistance now largely focuses on reducing the economic impacts of decreasing landings, it still serves to exacerbate the situation in many cases (Para. 248 et seq.).

More intensive inspection and surveillance could prevent maximum catch quotas being exceeded and stop the use of fishing equipment that is harmful to stocks and by-catch-intensive. Nevertheless, the negative incentives of competition for fish as a 'common pool resource' remain. Temporary fishing bans and spatial fishing restrictions do not provide a long-term guarantee for sustainable stock maintenance because they rarely eliminate the incentive to maximise landings outside the restrictions and beyond the protected areas (SANCHIRICO, 2000, p. 8). Past efforts to restrict fishing effort by fixing the type and number of fishing vessels are often countered by improved fishing capacities. The incentive to do this remains, even with the efforts to reduce capacities under the current management provisions and code of practice which generally base fishing capacities purely on gross tonnage and engine power (kW). With the high economic pressures to land the maximum share of stocks before the fisheries are closed once national Total Allowable Catches (TACs) have been fully exploited, many fishers are left little scope for using less harmful fishing methods to reduce by-catch of lesser value individuals from target species and difficult-to-market non-target species.

The national fisheries inspectorates face a similar dilemma. Given the conditions of Europe-wide competition for fish stocks, strict national controls bring short-term disadvantages for national fishing industries. Protecting stocks when other EU Member States' controls are lax results in a loss in market share for domestic fishing operations. In protecting national fisheries, each Member State has an incentive to tolerate uncontrolled fishing activities at the cost of other EU States (JENSEN, 1999, p. 66).

The German Advisory Council on the Environment believes that European fisheries policy still lacks a clear strategy to resolve these fundamental deficits in its effectiveness. Combating these problems requires fundamental changes in the organisation of the fisheries market. Alternatives for an efficient fisheries industry with long-term stock protection incentives are addressed in detail in Section 3.1.5 of this report.

3.1.3.4 The Extra-Community Fisheries Regime

264. To open additional fishing grounds for its huge fleet, the Community is increasingly venturing into non-EU waters by entering into fishing agreements. Stock maintenance in EU waters must not, however, result in overfishing in non-EU waters. It is thus necessary, by means of EU law, for fishing agreements and enforcement of those agreements to take account of the requirements for sustainable, environmentally sound fishing activities. This is the approach taken in the EU Commission's green paper on the future of the common fisheries policy (EU Commission, 2001b, p. 39 et seq.) and in its Communication on reform of the CFP (EU Commission, 2002g, p. 15). It would, however, be difficult to require third countries to apply sustainable

fisheries policies as long as the Community fails to do so itself. The earnest intentions behind target setting remain questionable as long as ratification of the Straddling Stocks Agreement is further delayed. Once this enters into force, the EU's external fisheries activities – at least those on the edge of or in open seas – will be subject to its strict precautionary and management provisions (Para. 242).

3.1.3.5 Managing the Common Fisheries Policy

265. On balance, despite there still being some room for improvement, the prevailing provisions of the CFP have standardised demanding targets and certainly provide key instruments for sustainable fisheries. However, their application is in many cases left to the discretion of the EU Council, the EU Commission or the Member States. Key decisions on long-term management plans, protected areas and especially catch restrictions remain subject to the final implementation decisions of the Council. In reaching these implementation decisions, the Council has regularly given in to short-term economic considerations of the fishing nations and has thus fallen way behind the proclaimed protection and conservation targets. The broad flexibility the Council has retained with the new Basic Regulation and the TAC quotas – which again have been set far in excess of those recommended by the ICES – shows that the necessary paradigm shift away from publicly financed overfishing and towards a structural policy that adequately takes account of resources supply and demand still comes up against massive political opposition, not least from the fishing nations.

266. In the light of such opposition and the need to protect fish stocks and the marine environment as outlined above, the German Advisory Council on the Environment believes it prudent to intensify calls for:

– A strict resources-focused approach: conservation of stocks must at last take clear priority over short-term economic considerations. The conservation or replenishment of biologically safe stock levels is of utmost importance for all targets laid down in the Basic Regulation for the CFP. This also applies to socio-political objectives aiming to secure an acceptable standard of living for people employed in the fisheries sector. Any over-shooting of long-term sustainable yields will by default lead to disproportionately high yield losses and subsequently to a reduction in living standards. There is no sensible reason for – and the CFP contains no legal footing on which to base – short-term economic considerations aimed at keeping this vastly over-sized sector on its feet from one month to the next.

– Protection of indirectly affected marine ecosystems: in addition to conserving target species, the CFP must also unconditionally meet the requirements of Article 6 EC and Article 174 EC by recognising indirectly affected marine ecosystems as being worthy of protection. The objectives of the new Basic Regulation, which have been expanded to include protection of marine ecosystems as a whole, must be put into practice without delay. The FAO Code of Conduct for Responsible Fisheries ought to play a decisive role in practical implementation of the precautionary approach (see Para. 243).

– Withdrawal of subsidies: the construction of new boats should no longer be promoted by the Community or the Member States. Subsidies that indirectly contribute to maintaining overcapacities must also be withdrawn. Funds should be used solely for the purposes of socio-economic measures directed at shrinking the sector and, where appropriate, of supporting those fisheries and producer communities which already meet sustainable resources management requirements.

– Effective catch quotas in line with scientific recommendations made by the ICES: instead of negotiating annual total allowable catches (TACs), multi-annual catch limits *must* be fixed under the management and replenishment plans for the stocks involved. The ICES's best available scientific prognosis of fish stock resilience must serve as the sole criterion. Consideration should also be given to making quotas more flexible and, where appropriate, tradable between Member States.

– A protected area network: for the North and Baltic seas, a holistic protected area concept must be developed to set out in an adequate way specific long-term or temporary restrictions on fisheries taking into account the regional importance of stock conservation, other marine ecosystems and other demands on the sea.

– Codes of practice to reduce by-catches and discards: by-catches should be reduced (where practicable) by prescribing the use of larger-mesh nets, deterrent systems and escape windows, and by developing guidelines that require fishers to avoid by-catch intensive areas. The protected area network must be agreed – particularly with a view to by-catches – and a general ban on discards should be implemented with effective sanctions.

– Restricting by-catch intensive industrial fishing: as a path to sustainable fisheries, the German Advisory Council on the Environment in its 2002 Environmental Report recommended restricting industrial fishing in particular, as the benefits of this type of fishing are, to some extent, questionable (SRU 2002, Para. 749). This remains valid if tight-meshed nets continue to be used in commercial fishing, resulting in particularly harmful by-catches. Experts see the large cod by-catch in Norway pout fishing as an area for particular concern (meeting with the Federal Research Centre for Fisheries (BFA) on 24.2.2003). To restrict fishing of this type, specific fishing bans and protected areas must be set out in the integrated management plans.

– Comprehensive, integrated, long-term management and replenishment plans: in principle, the instruments for a long-term planning approach to fisheries are welcomed and must now be put into practice without

further delay. Long-term management planning must not however be allowed to stop at fixing TACs for specific species. Management plans must properly coordinate quotas (in terms of species, numbers, and spatial applicability) with the protected areas strategies and fishing method regulations. Such plans should also connect with other uses of the oceans and seas: in essence, they need to be integrated into a future marine management plan (see Section 3.5.2, Para. 422 et seq.).

– Regulatory powers for the EU Commission: it is viewed as positive that both the EU Commission and the Member States (within their 12-mile zones) will be authorised to implement emergency measures if stock conservation or the marine environment is seriously at risk from fishing activities and immediate action is needed. In most cases, the period of six or three months allowed for measures implemented by the EU Commission or the Member States respectively would probably be too short to allow lasting prevention of a serious threat to stocks. The EU Commission appears more open to more stringent management than the EU Council and should thus be granted significantly broader powers of enforcement.

– Monitoring and enforcement: the more stringent provisions set out in the new Basic Regulation will only help reduce infringements if their implementation is effective in practice. Given that the competent authorities in Member States – especially in fishery-dependent regions – have a tendency to 'make allowances', monitoring should be performed, or at least overseen, to a greater extent by the more centralised and more European organisations of the EU Commission. The new Basic Regulation takes the right approach on this issue but its proposed common inspection system remains toothless without staff and funding. It is not only for this reason that the German Advisory Council on the Environment welcomes the EU Commission's initiative towards a new Community Fisheries Control Agency to achieve centralised, independent organisation of monitoring backed by resources from the Member States. The EU Commission rightly calls for comprehensive monitoring of Member States' application of CFP provisions and prosecution of fishers who violate the rules. The applicable sanctions must be tightened and standardised without delay under criminal law in the Member States.

– Research and development: significantly more funding must be invested into researching the impact of fishing and into developing environmentally sound technologies and practices. As the 'culprits', the fisheries should, first and foremost, be forced to support research and development projects. This applies both to financing and – more particularly – to cooperation needed in on-site investigations, in documenting and systematically identifying by-catches. The internationally applicable precautionary principle in itself places an obligation on the fisheries sector to substantially support research. From a precautionary standpoint, fishing restrictions and bans appear justified unless the responsible fisheries themselves prove by substantial research that they cause no lasting harm to the marine environment.

267. The EU Commission has already proposed improvements for most of the issues outlined above and has urged that the CFP be aligned to the requirements for sustainable development. However, it has had only limited success in pushing its proposals through. It is thus disappointing, that with regard to fisheries policy, the Commission in its Communication 'towards a strategy to protect and conserve the marine environment' only refers to current reforms of the CFP and to the Commission's associated proposals (EU Commission, 2002f, p. 22, 26). This is perhaps understandable given the recent spate of documents issued by the Commission on integrating environmental policy into the CFP. The Commission cannot, however, take sufficient account of all the interrelated problems and the need for a strategic approach if key pressure factors like the fisheries and agriculture are excluded from the marine strategy. Strategy formation based on rational and effective protection measures must take in the many pressure factors and their interactions if it is to obtain a complete picture of the situation and an idea of the action needed.

268. In the end, a holistic view of all the pressure factors is needed when deciding where and to what extent consideration should be given to one or other harmful activity. When it comes to marine resources, the fishers are not only in competition with one another but with all other widespread uses of the seas. Management of the seas must take this into account. This makes it difficult to understand the EU Commission's reserved stance in its Communication on a marine strategy to protect and conserve the marine environment – a stance which under no circumstances should result in fisheries policy being treated merely as a side issue in further negotiations on marine environment protection. On the contrary, the fisheries sector – with its manifold impacts – must be made a key element of a truly integrated strategic concept for marine environment protection. The Commission must show where and to what extent it sees fisheries' use of common waters to be acceptable relative to the environmental impacts, cumulative effects and competing claims to use. By integrating the fisheries into an overall utility concept, as is a matter of course in the case of agriculture, the CFP would be given a new integrative perspective through its incorporation into spatial management (see Section 3.5.2 below).

3.1.4 National Policy and Scope for Action

269. Given that the EU has sole authority, national contributions to environmentally sound structuring of the fisheries industry are largely framed by the Common Fisheries Policy. The key aspects include:

– Reduction of fishing capacities to comply with the targets set out in the Basic Regulation. This involves withdrawing subsidies paid to the fishing industry and promoting shrinking of the sector.

– Agreeing demanding management and protected area provisions for the 12-mile zone.

– Conducting regional consultations and fostering cooperation on integrating fishers and fishery operations into the environmentally sound policy structure.

– Making distribution of national catch quotas flexible and implementing EU management provisions in an effective way.

270. Member States may place unilateral restrictions on fishing vessels that fly their flag. For example, when Sweden planned to place a unilateral national fishing ban on cod from March 2003 (TAZ of 23. 12. 2002, p. 3), the competent EU agriculture commissioner welcomed the move and stated that Sweden's quota would not be redistributed among the other fishing nations. The Member States are not, therefore, forced to pass on their allocated fishing quotas to their fisheries. Rather, they may do so in a limited way on grounds of marine environment protection. Falling below the maximum sustainable yield (MSY) is prohibited by the obligation under international law to pass on the remaining 'surplus' (Para. 240). The EU is nevertheless a long way from the MSY stocks aimed for and thus from the MSY-based surplus. Germany, too, can and should make use of the option to 'set aside' the generous TAC quotas set by the Fisheries Commission – although consideration must be given to the fact that Germany makes a relatively small contribution to overfishing. Its comparatively minute national fleet should not, however, lead to Germany passing its catch quotas on to other Member States. Rather, it should claim its maximum share relative to its EEZ as 'set aside'. This is all the more appropriate seeing that Spanish and Portuguese fishers have been allowed to fish in the North Sea since 2003.

3.1.5 Flexible Management of Fishing Rights and a Sustainable Fisheries Industry

Greater Efficiency and Stock Protection Incentives through Flexible Management of Fishing Rights

271. The German Advisory Council on the Environment believes that a sustainable EU fisheries policy has vast potential for success if it is able to implement the necessary stock protection measures in harmony with the economic and social interests of the fisheries industry. This requires fundamental rethinking as regards management of fish stocks, both on the part of the fisheries industry and of the responsible policymakers. Experience with the existing CFP has shown that it is extremely difficult and cost-intensive to implement environmental protection measures in a market environment in which there is insufficient individual economic interest in sustainable use of fish stocks due to the lack of exclusive access rights to those fish stocks. Also, these conditions significantly restrict the willingness of nation states to enter into mutually beneficial coordination of policy implementation. It is thus recommended that the fisheries market be restructured using a system of secure, individual fishing rights to incentivise market participants to protect fish stocks and the marine environment. This would also mean reform of the existing management provisions contained in EU fisheries policy to avoid any negative effects on the incentives provided by the new market structure.

272. Fisheries policy instruments that guarantee fishers exclusive, negotiable fishing rights have proven a successful approach (SANCHIRICO and WILEN, 2002, p. 8). While exclusive spatial access rights (Territorial User Rights in Fisheries or TURFs) are practicable in coastal areas with broad distribution of relatively static stocks, it is possible to implement Individual Transferable Quotas (ITQs) for more mobile species. In much the same way as owning a piece of land, exclusive spatial access rights guarantee an individual fisher or a group of fishers (Group Rights in Fisheries or GRF) exclusive access to regional stocks of commercially used marine life. Individual transferable quotas provide the owner a negotiable right to a predetermined share of a TAC for one or more target species based on scientific considerations and differentiated for a specific period and area. The transferability of these rights allows fishers flexibility in matching their share to their prevailing economic conditions, with temporary, paid assignment of ownership (quota leasing) being an option alongside sale or purchase.

273. Flexible management systems of this kind have several beneficial characteristics. They secure exclusive use of the designated areas or ensure that a fixed share of a pre-set catch quota is fished and marketed solely by the current owner. This does away with the need for fishers to compete for shares of the total catch quota, thus significantly reducing the incentive for some to exploit available stocks at the cost of others. And fishers no longer have to plan their capacities based on short-term catch maximisation. Fishers who operate on a cost-intensive, non-viable basis have a vested interest in reducing their fishing capacities and selling their available catch quotas to more viable businesses. This reduces existing overcapacities and lessens the associated environmental impacts. And there is more incentive to use less harmful fishing methods and to adapt fishing activities more flexibly to meet both the biological needs of fish populations and prevailing market demand. Because market prices for fishing rights mirror the value of the allocated fishing quotas (both current and future), long-term maintenance of fish stocks becomes a more attractive economic proposition. The larger the fish stocks and the more stable the ecosystem needed for stock conservation, the higher the market value of individual fishing rights. This incentive effect reduces the risk of overfishing and can potentially reduce the administrative effort of surveillance and control. Price trends in fishing rights provide key market information to the fisheries industry and the fisheries inspectorates. That information simplifies business investment decisions and provides a reliable indicator as to trends in fish stocks and the economic situation of the fisheries sector (NEWELL et al., 2002, p. 3).

The efficiency of this type of system largely depends on the quality of the rights of ownership attached to the fishing rights, which is determined by the degree of

exclusivity, duration, security and transferability. Restrictions on these criteria reduce the value of ownership rights and counter their economic incentives. Uncertainties, fishing rights of inadequate duration and restrictions on transferability not only impact on the long-term stock protection incentives. They also have a negative effect on the efficiency of fishing activities in the fisheries (SCOTT, 2000).

International Experience

274. In the past two decades, a range of countries and regions have implemented flexible management systems based on ITQs and TURFs. Long-term and scientifically evaluated experience has been gathered for the New Zealand and Icelandic fisheries in particular. The Netherlands have also had practical experience with an ITQ system for a number of fish stocks in the North Sea fisheries. Worthy of note is the experience gathered with quota management systems in some of the fisheries in Australia, Canada, Chile, Namibia and the USA. Relative stability in the value of fishing rights, a trend towards reducing fishing capacities and fishing effort, and advancements in the implementation of fishing surveillance and control all speak for successful implementation of these systems. In many cases, there is evidence of fish stock recovery and improved landing quality (HATCHER et al., 2002, p. 54; ARNASON, 2002). While transfer of the above experience to the EU fisheries industry is not altogether possible, it still provides some important information on the underlying potential and problems involved with management systems of this type.

Empirical studies on New Zealand's ITQ system show an increase in the market value of fishing rights since its implementation in 1986, especially with regard to fishing of previously overfished stocks by heavily overcapitalised fishing fleets. This is seen as a reliable indicator of the recovery of fish stocks and an increase in the viability of the fisheries industry (NEWELL et al., 2002, p. 27). Overall, population sizes have stabilised in many fish species and have even increased in some cases (SANCHIRICO and NEWELL, 2003, p. 10). A stable trend in the value of ITQs is also evident in the Netherlands (DAVIDSE, 2000). In Iceland, the annual total value of the catch quotas for 2000 was some twenty times higher than for 1984 (ARNASON, 2002, p. 32).

Progress in reducing overcapacities and increasing the profitability of the fisheries industry is now clearly evident. Between 1983 and 1998 the Netherlands ground fishery reduced the number of vessels by 32% and fishing effort by 7% (DAVIDSE, 2000). In Icelandic fisheries, the catch per unit fleet capacity rose dramatically. While the catch for coastal fisheries like herring has risen almost ten-fold since 1975, the number of fishing vessels in use has been halved. At the same time, marine biologists think that herring stocks are back above the level achieved in the 1950s. Despite sinking catch quotas, there was only a moderate reduction in the value of the catch from the Icelandic high-sea fisheries in the 1990s, although fishing effort reduced significantly (GISSURARSON, 2000, p. 46 et seq.).

The first steps towards individual distribution of national TACs have occurred under fisheries co-management systems in a number of EU Member States. A large proportion of Great Britain's national catch quotas are distributed and traded to individual fishers by producer organisations which comprise the biggest share of the fishing fleet (HATCHER et al., 2002, p.17 et seq.). Germany's practice of distributing a share of the catch quota among producer organisations (e. g. within producer cooperatives) allows a certain amount of fishing rights transfer between fishers. However, transferability of individual quotas is usually so severely restricted as regards duration and flexibility that the uncertainties and comparatively high transaction costs often hinder efficient trading. Flexible transfer of individual fishing rights between fishers in different EU Member States is also only a limited option. With their potential as regards collective coordination and control of fishing activities and better use of fishing capacities, co-management systems of this kind are a first step on the way to flexible management of fishing rights. The Netherlands' ITQ system, for example, gradually emerged from a co-management system between regional producer organisations (VALANTIN, 2000).

Criticism and Empirical Evidence

275. The introduction of flexible management of fishing rights in Europe is often met with considerable scepticism (NORDMANN, 2000). This is primarily due to problems with catch control, competition law issues and the trend towards industry concentration, and the fear of undesired outcomes for structural and distribution policy. Finally, there are concerns about the inadequate consideration given to the problem of by-catch and what is known as 'high-grading', where low-value components of target-species landings are discarded at sea – with complete disregard to stock conservation needs – in an attempt to increase the value of a catch based on size and quality.

276. Flexible fisheries management based on tradable access rights still requires effective monitoring. Use of a TURF system can effect a significant reduction in the problems of surveillance and control, and modern surveillance technologies allow reliable protection of territorial access rights (DE ALESSI, 2003, p. 30 et seq.). If a TURF system is managed by a group of fishers (GRF) within a specific marine region, the relatively small size of the group can limit the costs of monitoring and simplify the resolution of potential conflicts regarding stock use (CHRISTY, 2000). A significantly higher level of effort in surveillance and control is required by an ITQ system with a large number of market participants. Blanket on-site controls at sea involve prohibitively high costs, making effective controls of landings and fish processing by fisheries inspectorates necessary.

While none of the long-term market incentives under the existing TAC regime have countered the 'free rider'

dilemma of illegal overfishing, tradable catch quotas whose market price capitalises future profit expectations from long-term use of fish stocks puts considerably greater pressure on the fisheries industry to use less harmful fishing methods and forces self-monitoring within the sector (RUNOLFSSON, 1997, p. 59). This is evident in the New Zealand fisheries, where alongside state surveillance and control, the first private cooperations have been established in the form of voluntary monitoring institutions (KERR et al., 2003, p. 17). Fisheries control under the Netherlands ITQ system, which is largely based on self-discipline among the local producer organisations (management groups), is now regarded as a best-practice model by the European Union (VALANTIN, 2000). In existing quota systems, the fisheries industry shows a comparably high level of acceptance regarding to TACs that are focused on stock conservation (HATCHER et al., 2002, p. 62). There is thus no reason to assume that surveillance and control problems will worsen following implementation of tradable fishing rights.

277. The trend towards reducing overcapacities fostered by a flexible quota management system and the increase in variable fishing costs brought about by mandatory possession of fishing quotas could result in greater market concentration. Because the costs of acquiring fishing rights and the opportunity costs of using fishing rights solely affect the variable costs of fishing and not the fixed costs of production (fishing capacities) that are more important in ensuring market access, a reduction in the number of businesses does not necessarily mean a reduction in competition. Thus, a certain amount of market concentration should not be seen as an indicator of a potential increase in market power, but rather as an expression of enhanced efficiency in the use of fishing capacities.

This is closely linked to fears of negative regional structural effects which are in turn associated with a crowding out of small and medium-sized fisheries. To the extent that this sector of the fisheries industry cannot be operated cost-effectively under a sustainable fisheries regime, structural change is both necessary and unavoidable looking at the industry as a whole. With the right promotional measures, this process can be cushioned by a social safety net. What must also be considered is that businesses suffering under low economic viability can be compensated – at least in part – for their market exit through the sale of their fishing rights.

Experience at international level shows a comparatively low occurrence of this situation. The number of ITQ owners in New Zealand dropped relatively moderately in the 1990s from 1,800 to 1,400 (NEWELL et al., 2003, p. 3). Market concentration in Iceland increased only marginally. While in 1991, some 25% of catch quotas were owned by the top ten fishing companies, by 1999 the figure had risen to 38%. No one business has a dominant market position (GISSURARSON, 2000, p. 53). In the Netherlands, the concentration process has not led to a consolidation of a large share of the available fishing rights among just a few companies (DAVIDSE, 2000). Events in New Zealand have shown that there is no reason to fear an exodus from small and medium-sized fisheries (SANCHIRICO and NEWELL, 2003, p. 10). There is little empirical evidence to support the concerns expressed as regards the negative outcomes for the regional economies. There was hardly any change in regional distribution of Icelandic catch quotas during the period 1984 to 1999. The often feared concentration of quotas among companies located in the south-west of Iceland did not occur – the share for this region actually dropped by four percentage points. A similar trend occurred with the regional shares in landings and catch processing (GISSURARSON, 2000, p. 49 et seq.).

278. The risk to fish stocks posed by discards and the practice of 'high-grading' are seen as ongoing problems of fisheries management based on catch quotas. By-catch of non-target species with sufficient commercial utility can be reduced even under a quota system by integrating those species into the quotas and legalising their landing (ANDERSON, 2000). As long as the price of fishing rights for the respective by-catch does not exceed the actual market price, it makes sense to purchase fishing rights and make a profitable landing. There thus remains a need for specific provisions on the fishing methods used, regular onboard inspections and reliable harbour controls. Then again, temporal flexibilisation of TACs linked to safe biological limits or a limited reserve of fishing rights to ensure market liquidity could effect an additional reduction in the risk of lower value parts of the catch being discarded (HATCHER et al., 2002, p. 67).

If fishing rights are secured for a long enough period, then the associated incentive to protect stocks should counter the greater risk from 'high-grading' under an ITQ system. Protection of juvenile fish in a specific species fosters growth in stock and, in the medium term, increases the value of the negotiated fishing rights. This means not only increased profit from fishing itself, but greater income from the trade of catch quotas. Thanks to reduced competition for fish stocks, such flexibility over time allows fishers to plan fishing activities according to marine biological conditions and to use selective and less harmful fishing methods.

Iceland has less of a problem with by-catch because its quota system allows flexible catch quotas that can be transferred between the different species. No increase in 'high-grading' has been observed since the introduction of the flexible quota management system (GISSURARSON, 2000, p. 55 et seq.). Experience with existing ITQ systems shows that there is an overall increase in the willingness of fishers to use selective fishing methods in place of conventional management systems (HATCHER et al., 2002, p. 67). Taking a look at the key ITQ systems around the world, there is no evidence of an increase in the problem of discards. In some instances the situation has improved (ARNASON, 2002).

Recommendations for Flexible Quota Management within the EU

279. By strengthening individual rights to fish stocks as part of a flexible quota management system, EU Member States could make significant contributions under the CFP to fish stock conservation, to reducing overcapacities and to increasing the profitability of the fisheries industry. A system of this type is generally suited to integration into existing co-management systems or into fisheries designated by regional producer organisations. Individual distribution of the national TAC should take place under the auspices of existing or newly created producer communities and be followed by a loosening of the legal restrictions on the duration and transferability of individual fishing rights. Through self-organisation, the fisheries industry itself could use a phased approach to transfer important management and control functions in quota trading and fishing activities to this type of system.

If natural conditions allow, a more regionalised, group-based management (GRF) based on territorial user access rights (TURFs) is preferable to a system of individual transferable catch quotas (ITQs). The German Advisory Council on the Environment believes better control options and better conditions for economic cooperation and mutual exchange of information speak in favour of this type of fisheries management. Coastal fisheries have benefited in particular, as with a large proportion of the Baltic fisheries (DÖRING, 2001, p. 207 et seq.). In general, the final structuring of fishing rights management should occur in close cooperation with the fisheries interest groups, the fisheries inspectorates and the respective scientific experts. Key responsibilities could be assumed by a Regional Advisory Council for Fisheries Management (RAC), whose creation has been proposed by the EU.

280. A key prerequisite for flexible quota management having a positive impact on the environment is that quota-setting and allocation of species-specific TACs must be based less on daily policymaking and more on the requirements for ongoing stability of fish stocks. Another important aspect is that of securing broad monitoring coordinated throughout Europe and reliable protection of the rights of ownership attached to individual catch quotas. This requires not only protection of ITQs and TURFs through effective control measures and adequate prosecution of illegal fishing activities, but also that the responsible state actors guarantee the long-term stability, transparency and legal framework of the system. Where they are indispensable to marine environment protection, complementary measures (temporal and spatial fishing restrictions, provisions on fishing equipment and methods) should be designed in such a way as to have a minimal impact on the flexibility of quota trading and on group-based management of fishing rights. This is the only way that management systems of this kind can be expected to provide the fisheries industry with an ongoing incentive to engage in sustainable protection of the oceans and seas.

281. Due to its distribution effects, primary allocation of individual fishing rights is a key issue in gaining practical acceptance of a quota management system. From both an environmental and an economic efficiency perspective, the main issue is the size of quotas rather than their actual distribution. Given the asset-like nature of transferable fishing rights, the German Advisory Council on the Environment recommends an allocation process that everyone involved in the fisheries industry accepts as fair. A widely used approach is to base initial allocation on historical catch quotas from one or more years in the past. This process would allow TACs for the respective fish species to be allocated in accordance with fishers' historical market shares as a proportion of total landings. Trade would then be based on relative shares of the TAC rather than absolute landings, preferably with both TAC shares and the annual catch entitlement (ACE) for those shares separately tradable. Alternative procedures base initial allocation on existing fishing capacities or on past investment in fishing capacities, or they allocate fishing rights equally. To reduce allocation conflicts, the final decision should be made at the level of the producer communities. To fund the administrative costs of fisheries controls and quota management, and to ensure the availability of a structural adjustment fund for the fisheries industry, one option would be to auction a portion of the periodically adjusted TACs.

282. Europe-wide harmonisation in the implementation of quota management systems and flexible transfer of individual fishing rights within the EU should significantly increase effectiveness in national fisheries management. It would not only allow better use of Europe's fishing capacities, but also considerably reduce the observed incentive for national fisheries inspectorates to neglect fishing controls at the cost of other Member States.

The negative outcomes of the, in some instances, unavoidable regional structural change brought about by this type of fisheries management could be reduced through suitable implementation. Some of the options would be to give a certain degree of privilege to small commercial fisheries in the primary quota allocation, limited funding for quota acquisition for potentially uncreditworthy fishing businesses, and subsidised exit from the fisheries industry.

3.1.6 Summary and Recommendations for Sustainable Fisheries

Basic Conditions for Sustainable Fisheries

283. The environmental impacts from intensive fisheries parallel three fundamental conditions for a sustainable fisheries industry compatible with fish stocks and the marine environment:

- Sustainable management of fish stocks at the highest stable level. This target can only be achieved through fishing effort restrictions and the use of selective fishing methods.
- Marked reductions in by-catches and discards to an environmentally sound level over time.
- The creation of undisturbed areas or marine protected areas.

284. *Sustainable management of fish stocks*: fish stocks must be managed so that their fishery utility is secured over time. The recommendations made by the ICES on the use and conservation of fish stocks provide the best available scientific basis. The example of the North Sea herring shows that in implementing requirements based on scientific data and with effective management, stocks can be exploited at high levels while remaining within safe biological limits over time. A key requirement of sustainable fisheries is thus implementation of the ICES recommendations on conservation and recovery of fish stocks. This includes fishing bans in instances where stocks have already fallen below safe biological limits and where further fishing would be both harmful and unproductive in the longer term.

The EU Commission's proposed Regulation establishing measures for the recovery of cod stocks of June 2003 contains some important steps towards a sustainable management system. This applies especially to the proposal's more stringent approach to catch quota restrictions, basing them on fixed, quantified minimum stock numbers and fixed, quantified stock sizes, and to its supporting fishing effort restrictions which are strictly based on reaching TACs. The management rules developed by the Commission should not, however, be restricted to cod. They must be applied to all fish species whose stocks are at risk from fishing. In the case of cod, the proposed system – if it takes scientific stock trends analyses and forecasts seriously – should really result for a time in a complete closure of the fisheries in the North Sea.

In the case of endangered anadrome and catadrome fish species, a restriction of the fisheries would not suffice to bring stocks back up to a commercially usable level. There is thus an urgent need, in line with the ICES recommendations, for far-reaching measures for the protection and conservation of the European eel. The recommendations of the ICES require that alongside closure of the glass eel fisheries, an international recovery plan be developed which, among other things, includes rehabilitation of habitats for this species.

285. *Measures to reduce by-catches and discards*: the second key requirement for sustainable fisheries is that by-catches and discards be significantly reduced. To stop by-catch of low value utility fish, non-target species and benthos, a further increase in selectivity in fishing equipment and methods is needed. This can be achieved through:

- The use of larger-mesh nets that are designed strictly according to the size of the mature fish.
- The avoidance of areas with high numbers of juvenile fish.
- The creation of deterrent systems, escape windows and the use of square-meshed nets.

Other technical measures are needed to reduce damage to the benthos. One option would be to replace the chains used on beam trawlers with electrified deterrent cables.

Apart from application of these measures to prevent by-catch, urgent consideration should be given to implementing a general ban on discards. In the main, any discards landed could be supplied to industrial fish processing and save fishing effort elsewhere. Also, the volume of discards can only be controlled by inspecting complete landings and with the view to researching ways to improve fishing equipment.

286. *Designation of marine protected areas*: the third basic condition for sustainable fisheries is the designation of undisturbed areas. Norway pout and plaice 'boxes' have been established in the North Sea to protect young round fish and plaice. Fishing of these species within the designated boxes is banned all year round. Restricted areas already exist where, for example, beam trawlers may only be used south of the 55th parallel. There is a compelling need for additional protected areas. These no-fishing zones are urgently needed so that bottom fauna can develop undisturbed in areas where particularly sensitive benthic organisms find their habitats. The protected areas also serve to protect stocks of commercial fish species.

Paths to Sustainable EU Fisheries Policy

287. Given the extreme inadequacies of EU fisheries policy outlined above, the German Advisory Council on the Environment welcomes the German government's efforts in pushing for sustainable resources management in the Fisheries Council. The government is advised to continue and step up its efforts in calling for the Community to meet the basic conditions for sustainable fisheries. In terms of the foregoing evaluation and presentation of requirements for the Common Fisheries Policy, the following is of key importance:

- Sustainable stock management with catch quotas and fishing bans that are tightly based on the ICES recommendations.
- A broad protected area concept that considers all other uses of the seas and oceans.
- The withdrawal of all subsidies that foster high fishing capacities, and stronger support for sectoral capacity reductions.
- Other appropriate codes of practice to prevent by-catches and discards, including a ban or restriction on particularly by-catch intensive industrial fisheries.
- Better enforcement through an EU control body and increased pressure for more effective enforcement measures within the Member States.

Action Needed at National Level

288. As regards the need for action at national level, the German Advisory Council on the Environment recommends:

- Setting stringent management rules for the 12-mile zone, and especially differentiated protected areas, that exclude beamtrawling from sensitive areas and, wherever possible, keep the fisheries out of spawning and breeding grounds (without ignoring the fact that the responsible *Länder* (states) have already implemented many welcome measures – particularly in the Wadden Sea).
- Designation and reporting of appropriate protected areas for the EEZ under the Habitats Directive, bearing

in mind the importance of such areas in fish stock replenishment.

– Integration of long-term plans for protection and recovery areas into a yet-to-be developed management plan for coastal waters and the EEZ to achieve differentiated, area-specific fisheries management that also takes account of the various other claims to use.

– Development of action programmes and guidelines, with fishers' participation, for environmentally sound regional fishing practices.

– Effect much tighter controls to ensure that provisions for environmentally sound fishing practices are complied with in German waters.

Flexible Quota Management

289. In making catch quota management more effective, consideration should also be given to making catch quotas more flexible as regards fishers' individual access rights to fish stocks. By strengthening individual fishing rights under flexible quota management systems, the EU Member States could, within the Common Fisheries Policy, make a significant contribution to conservation of fish stocks, to the reduction of overcapacities and to raising the profitability of the fisheries industry. Europe-wide harmonisation of the implementation of quota management systems and flexible transfer of individual fishing rights within the EU should significantly increase the effectiveness of fisheries management at national level. The German Advisory Council on the Environment believes group-based management with territorial access rights to be more preferable than a system of transferable fishing quotas, especial for coastal waters.

3.2 Protecting the North and Baltic Seas: Harmful Substances and Radionuclides

3.2.1 Protection from Harmful Substances

290. In its 1980 Special Report on the Environmental Problems of the North Sea, the German Advisory Council on the Environment saw pollution of coastal waters in the North Sea by chlorohydrocarbons and heavy metals as particularly problematical and pointed to possible exacerbation of the potential risk from waterborne pollutants due to their propensity to accumulate in organisms (SRU, 1980, Para. 1435). Considering there is still a lot to learn about pollution and the environmental impacts of chlorohydrocarbons in particular, the report said that great care is needed when it comes to discharges of chemicals into the sea (SRU, 1980, Para. 476). The report cited the precautionary principle as a prerequisite for successful environmental policy, especially in respect of the North Sea ecosystem, stating that environmental policy must provide for prevention of ecologically negative developments without having to be based solely on identifiable and previously proven impacts on the marine environment. It suggested the North Sea as a perfect testing ground for implementation and enforcement of the precautionary approach (SRU, 1980, Par. 1439).

Twenty-three years on, the situation shows that reality did not stand up to the test. Despite the admirable achievements with certain substances (Para. 46 et seq., 157 et seq.), we are still a long way from sounding the 'all clear' for either the North Sea or the Baltic. This is especially the case with pollution of the seas by persistent organic pollutants (POPs), endocrine disrupters and some heavy metals. Another cause for concern is the evidence of what have come to be known as new (polar) pollutants in the marine environment.

In 1980 and again in 1996, the German Advisory Council on the Environment identified significant deficits in implementation of international targets by means of specific measures at national level (SRU, 1980, para. 1438; 1996a, Para. 357). There have been no significant improvements in the situation since that time.

3.2.1.1 Internationally Agreed Generation Target

291. The International Conference on the Protection of the North Sea (NSC) has concerned itself with prevention and reduction of pollution in the North Sea since 1984. The conferences have since agreed measures to reduce over 30 different pollutants. Ministers of the North Sea riparian states and representatives from the EU have also agreed restrictions and in some cases bans on certain plant protection products. These provisions were further developed in 1995 in the form of the 'generation target' contained in the Esbjerg Declaration of the 4th International Conference on the Protection of the North Sea (NSC, 1995). The generation target aims to cease by 2020 inputs, emissions and diffuse losses of harmful substances from products and their manufacturing processes. The harmful substances cited expressly include persistent, bioaccumulative and toxic substances (PBTs). The long term goal, beyond the generation target, is the maintenance or recovery of natural substance concentrations in the marine environment: near-zero concentrations of synthetic substances and close to natural background values for concentrations of naturally occurring substances.

292. The OSPAR contracting parties adopted the 4th NSC generation target for the entire North-East Atlantic at the 1998 Conference of Ministers in Sintra, Portugal. At the same time, they agreed the Hazardous Substances Strategy to serve achievement of zero-emissions by 2020 (OSPAR, 1998b). OSPAR also based its definition of harmful substances on substances with PBT properties and expressly cited endocrine disrupters. This paved the way for the development under the OSPAR strategy and the OSPAR Action Plan for 1998 to 2003 (OSPAR, 2000f) of a dynamic list of substances (currently 400) considered to be 'hazardous'. The list contains a set of criteria specially developed for the marine environment (WIANDT and POREMSKI, 2002; Para. 297, 301) to allow dynamic selection of substances for which priority reduction measures are required. In accordance with the OSPAR List of Substances for Priority Action (OSPAR 2003a, Annex 12), this now applies to the substances listed in Table 3.3. Several OSPAR recommendations also contain special measures to reduce inputs of plant protection products.

Table 3-3

OSPAR list of chemicals for priority action in the North Sea region

Aromatic hydrocarbon	
	4-tert-butyltoluene
Metallic compound	
	Cadmium
Metal/organometallic compounds	
	Lead and organic lead compounds
	Mercury and organic mercury compounds
Organometallic compounds	
	Organic tin compounds
Organic ester	
	Neodecanoic acid, ethenyl ester
Organohalogens	
	Perfluorooctanyl sulphonic acid and its salts (PFOS)
	Tetrabromobisphenol A (TBBP-A)
	Hexachlorocyclopentadiene (HCCP)
	1,2,3-trichlorobenzene
	1,2,4-trichlorobenzene
	1,3,5-trichlorobenzene
	Brominated flame retardants
	Polychlorinated biphenyls (PCBs)
	Polychlorinated dibenzodioxins (PCDDs), polychlorinated dibenzofurans (PCDFs)
	Short-chained chlorinated paraffins (SCCPs)
Organic nitrogen compound	
	4-(dimethylbutylamino)diphenylamin (6PPD)
Organophosphate	
	Triphenyl phosphine
Organosilicane	
	Hexamethyldisiloxane (HMDS)
Pesticides/biocides/organohalogens	
	Dicofol
	Endosulphan
	Hexachlorocyclohexane isomers (HCH)
	Methoxychlor
	Pentachlorophenol (PCP)
	Trifluralin
Pharmaceutical	
	Clotrimazole

Table 3-3 continued

Phenols	
	2,4,6-tri-tert-butylphenol
	Nonylphenol/ethoxylates (NP/NPEs) and related substances
	Octylphenol
Phthalate esters	
	Certain phthalates: dibutylphthalate, diethylhexylphthalate
Polycyclic aromatic compounds	
	Polyaromatic hydrocarbons (PAHs)
Synthetic musk	
	Musk xylene

Source: After OSPAR 2003a, Annex 12

293. HELCOM recommendation 19/5 of 1998 applied the generation target to harmful substances in the Baltic region (HELCOM, 1998c). The contracting parties to the Helsinki Agreement have agreed that discharges, emissions and diffuse losses of harmful substances into the Baltic Sea should cease by 2020. They also include PBTs in their list of harmful substances. The HELCOM recommendation contains a list of pollutants relevant to the marine environment and priority action is required for the substances and substance groups listed in Table 3.4.

Measures for reducing plant protection products were already contained in a recommendation made in 1995.

294. The German Advisory Council on the Environment expressly supports the agreed targets for the North and Baltic seas. They are a fitting and necessary outcome of the sustainability debate triggered in Rio in 1992 and continued in Johannesburg in 2002. Their implementation is unfortunately rather slow. Activities under the regional marine protection agreements are largely limited to producing background documents. In other respects, they fall back on EU instruments, particularly chemicals policy and the Water Framework Directive. The Council believes, however, that not enough is being done in the EU to realistically enable achievement of the zero emissions target in the remaining 16 years up to 2020. Even the Bergen Declaration of March 2002 (NSC, 2002b) signed by the environment ministers at the 5th International Conference on the Protection of the North Sea, and the Bremen Declaration of June 2003 (OSPAR, 2003b) signed by the OSPAR signatory states and representatives from the EU Commission Directorate General Environment, acknowledge the need for additional activities in order to meet the 2020 target. Further action must be initiated at Community level without delay.

The German Advisory Council on the Environment believes Member States' past reservations concerning EU measures to protect the marine environment and thus leading to the oceans and seas being 'taken over' by the Community (KRÄMER, 2003, p. 199 et seq., 1996, p. 169 et seq.; NOLLKAEMPER, 1997, p. 169; BOTHE, 1996, p. 329 et seq.) to be neither justified nor helpful. Member States who are also signatories to the OSPAR and Helsinki agreements are placed under individual as well as collective obligation by those agreements. If at Community level no (adequate) action is taken, then Germany and other signatory states are required to implement the action needed at national level, independently of the EU. For the most part, however, substance bans and restrictions on use fall within EU jurisdiction. The central aim of a common chemicals policy is harmonisation within the Single Market. This restricts the scope for action at national level when it comes to measures to regulate pollution – they are only allowable in environment protection policy under the provisions of Article 95 (4) and (5) and Article 176 of the EC Treaty. Even if, as the example of the Netherlands shows, unilateral measures are in no way ruled out, priority must still be given to EU arrangements for implementing internationally agreed targets. The Netherlands banned chlorinated paraffins in consistent implementation of a PARCOM decision agreed under the OSPAR regime. While the national ban was accepted by the EU Commission, its continued existence remains a perennial issue of debate. Uncertainty as regards the very existence of approval requirements for national substance bans prevent such national measures being a common and effective alternative to EU law.

Table 3-4

Selected substances for immediate priority action in the Baltic region

Alkanes	
	Chlorinated paraffins, short chained
	Chloroform
Phenols	
	Nonylphenolethoxylate and the degradation/transformation products
	Nonylphenol, 4-
Xylenes	
	Musk xylene
Organic oxygen compounds	
	Diethylhexylphthalate
	Dibutylphthalate
Metallic compounds	
	Cadmium and its compounds
	Lead and its compounds
	Mercury and its compounds
	Selenium and its compounds
Pesticides/biocides	
	1,2-Dibromoethane
	2,4,5-T
	Acrylonitrile
	Aldrin
	Aramite
	beta-HCH
	Chlordane
	Chlordecone (Kepone)
	Chlordimeform
	DDT
	Dieldrin
	Endrin
	Fluoroacetic acid and derivatives
	HCH
	Heptachlor
	Hexachlorobenzene
	Isobenzane

Table 3-4 continued

Pesticides/biocides continued	
	Isodrin
	Kelevan
	Kepon (Chlordecone)
	Lindane
	Mirex
	Morfamquat
	Nitrophen
	Pentachlorphenol
	Quintozene
	Toxaphene
	Organotin compounds
Polycyclic halogenated aromatic compounds	
	Hexabromobiphenyl
	PCBs
	PCT (mixtures)
	TCDDs, PCDDs, PCDFs
Polycyclic aromatic hydrocarbons	
	PAHs

Source: HELCOM, 1998c, Annex 3

3.2.1.2 Harmful Substances in the North and Baltic Seas: EU Measures and their Implementation at National Level

295. According to its Communication towards a strategy for protection and conservation of the marine environment, the EU Commission aims in the long term to reach concentrations of harmful substances in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances (EU Commission, 2002a, p. 22). It does not, however, adopt the generation target of zero emissions by 2020. The German Advisory Council on the Environment fears that without a deadline of this kind, and thus without a fixed interim target that can be monitored, what will remain is a mere declaration of intent as regards the final target defined in the Communication. Also, by way of planned action, the EU Commission only mentions actively promoting implementation of the aims contained in the Water Framework Directive and integration of those aims into relevant EU policies, particularly those on chemicals and plant production products (EU Commission, 2002a, p. 27). Integration of environmental policy aims into other policies and the Commission's responsibility to ensure implementation of common secondary legislation are already contained – and even elevated to the rank of basic requirements – in the horizontal provisions of Article 6 and Article 211 of the EC Treaty and thus merely repeat existing obligations under primary legislation. What actually needs to be done to achieve concentrations of harmful substances that are near natural background values or near-zero remains unanswered. The Community strategy contains no legislative proposals for dioxins, furans and polychlorinated biphenyls (EU Commission, 2001c). Rather it makes reference to proper implementation of existing Community regulations. Neither the final target defined by the EU Commission can be achieved nor can even less-ambitious marine environment protection be implemented solely on the basis of existing laws.

3.2.1.2.1 Water Framework Directive and Marine Environment Protection

296. Directive 2000/60/EEC of 23 October 2000 establishing a framework for Community action in the field of water (Water Framework Directive) will shape future EU water protection policy to a large degree: it combines much existing water protection legislation and does away with the sectoral approach that legislation takes (SRU, 2000, Para. 638 et seq., and for a more in-depth review

SRU, 2004, Section 5). The Water Framework Directive also has a direct impact on some marine waters. In the case of surface waters, a target of 2015 has been set for achieving 'good ecological status' up to one sea-mile from the coast and 'good chemical status' within the 12-mile zone.

The qualitative requirements of the Water Framework Directive have no direct application in the EEZ. In this respect, however, the German Advisory Council on the Environment wishes to point out that the actual reach of the Water Framework Directive goes beyond its formal scope. This is in line with the principle that is recognised for airborne pollution and indispensable in application of the precautionary approach (KOCH, 1996; KOCH and CASPAR, 1996, p. 116). There can be no other approach to waterborne dispersal of pollutants over long distances. For example, due to their low degradability, polychlorinated biphenyls and brominated flame retardants can be transported over long distances by air, rivers and by the oceans and seas. For this reason, the Water Framework Directive requires that management plans and action programmes contribute to protecting territorial waters and open seas (Recital 21, Article 1). The ultimate aim of the Directive is expressly defined, with no nautical mile limit, as being to eliminate priority hazardous substances and contribute to achieving concentrations that are close to background values for naturally occurring substances (Recital 27).

The above shows that implementation and application of the Water Framework Directive by the Member States must cover not only coastal waters up to one nautical mile and waters within the 12-mile zone (which bears no relation to natural conditions), but also the oceans and seas in their entirety and take these into account when issuing emissions permits for harmful substances.

297. When it comes to harmful substances, the requirement laid down in the Water Framework Directive is 'good chemical status'. Member States are left to formulate their own provisions on a range of harmful substances listed in the Annex to the Directive. The (water policy) relevance of these substances thus depends on whether their quantities are considered significant under the provisions laid down by the respective Member States. Concentrations in excess of national emissions and quality standards can be expected as a result (IRMER, 2003, p. 57).

Measures are to be developed Europe-wide by 2004 for the progressive reduction of inputs, emissions and diffuse losses of some 33 priority substances contained in a list agreed by the Council of Ministers and the European Parliament in 2001 (Decision No. 2455/2001/EEC). Measuring is mandatory where these priority substances are discharged from diffuse and point sources (IRMER, 2003, p. 57). Table 3.5 contains a list of the substances in question.

The list omits many harmful substances that pose a significant threat to the marine environment, including PCBs, several dioxin isomers and a number of brominated flame retardants, which both OSPAR and HELCOM have included in their own lists (Para. 292, 293 and SRU, 2003b). Although both use and placement on the market of PCBs is now banned in Germany and elsewhere in the EU, they are still found in the marine environment. PCBs exist in legacy manufactured products and in waste and can find their way into the environment and the oceans and seas in this form. Their production as such has not yet been banned.

The Germany Advisory Council on the Environment sees a need to match up and fill the gaps of the priority list, particularly as regards the eleven substances earmarked for classification as 'priority hazardous substances' (marked in the list with an asterisk). This shortlist does not include all of the substances selected by HELCOM as substances 'for immediate priority action' or those contained in the OSPAR List of Chemicals for Priority Action (Para. 292, 293). This is a significant shortcoming, due to the fact that the Water Framework Directive's obligations to entirely cease and not just reduce inputs, emissions and diffuse losses solely applies to the earmarked 'priority hazardous substances' (Article 16 (1)). Consequently, what will at best be achieved under the current regime of the Water Framework Directive is, in contrast to international requirements, cessation of inputs of only a fraction of the persistent, bioaccumulative and toxic substances actually present in the marine environment.

The lack of harmony with international provisions is partly to do with the fact that the restriction to 33 substances is not based on scientific evidence but on the limited administrative and legislative capacities of the EU Commission (LANZ and SCHEUER, 2001, p. 33; see also SRU, 2004, Section 5). Another reason is that the EU and the regional marine protection commissions have developed different methods of identification and different criteria for evaluating harmful chemical substances. A key aspect is the disparity in the ratings given to substances in terms of their specific harmfulness to the marine environment (SRU, 2003b, p. 3). Thus, the Combined Monitoring-based and Modelling-based Priority Setting (COMMPS) procedure used under the Water Framework Directive was adapted by an OSPAR working group to the specific conditions in the oceans and seas, for example by giving greater weight to the persistence and potential of a substance to bioaccumulate and less weight to its direct ecotoxicological effect (WIANDT and POREMSKI, 2002). The German Advisory Council on the Environment reiterates its call (SRU, 2003b, p. 3) for harmonisation of the evaluation processes, expansion of the EU list, and classification as priority hazardous substances under the Water Framework Directive of all substances listed by OSPAR and HELCOM as substances for priority action.

298. The provisions of the Water Framework Directive merely place the EU Commission under obligation to base its recommendations for progressive cessation of inputs of the (few) priority hazardous substances on a timeline of 20 years. Community law does not place the Commission under an obligation to meet the generation target by 2020.

Table 3-5

Priority substances in the Water Framework Directive

Organic chemicals	Metals	Plant protection products
Anthracene**	Cadmium and its compounds*	Alachlor
Benzene	Lead and its compounds**	Atrazine**
Brominated diphenylethers*	Mercury*	Chlorfenvinphos
C_{10-13}-chloroalkanes*	Nickel and its compounds	Chlorpyrifos[1,**]
1,2-Dichloroethane		Diuron[1,**]
Dichloromethane		Endosulfan**
Di(2-ethylhexyl)phthalate (DEHP)**		Hexachlorobenzene*
Fluoranthene		HCH (Lindane)*
Hexachlorobutadiene*		Isoproturon[1,**]
Naphthalene**		Pentachlorophenol**
Nonylphenols* (4-(para)-n.)		Simazine**
Octylphenols** (para-tert-o.)		Tributyltin compounds (TBT cation)*
Pentachlorobenzene*		Trifluralin[1,**]
PACs* (benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene)		
Trichlorobenzenes** (1,2,4-TB)		
Trichloromethane (Chloroform)		

[1] Approved pesticide
* Identified as a priority hazardous substance
** Subject to review for identification as possible priority hazardous substance
Source: IRMER, 2003

3.2.1.2.2 Chemicals Policy and Marine Environment Protection

299. The German Advisory Council on the Environment has on a number of occasions identified the need for broad reform of the current chemicals management system (SRU, 2002a, 2000, 1999, 1998). In doing so, it took to task the four fundamental sources of EU law, namely the Dangerous Substances Directive (67/548/EEC), the respective directives on dangerous preparations (88/379/EEC and 99/45/EEC), the Regulation on the evaluation and control of the risks of existing substances (Council Regulation (EEC) 793/93) and the Restrictions Directive (76/769/EEC). These directives and regulations place the burden of proof with the authority who wants to ban a harmful substance or at least restrict its use. Long-term effects, say of bioaccumulative substances, are usually extremely difficult to determine and clear causal relationships are more the exception than the rule. There is no after-the-fact approval process for most of what are referred to as existing substances, that is chemicals already on the market before 18 September 1981. While existing substances make up more than 99% of all substances on the market, only around 140 of them are subject to evaluation under the Existing Substances Regulation. In practice, restriction decisions made are often only proposed or agreed by the EU Commission if there is an identified danger or evidence of a high potential risk (CALLIESS, 2003, p. 41; GINZKY, 2000, p. 134). Options for preventive risk minimisation are not provided for. The European Court of Justice (ECJ) has in the meantime ruled that a comprehensive risk analysis need not necessarily be a prerequisite for substance restriction (Case C-473/98: *Kemikalieinspektion v Toolex Alpha AB).*

300. Like EU chemicals policy, German chemicals law also lacks an approval or licensing process. It contains no preventive ban with approved exceptions. Rather, it has a

registration procedure with monitoring options and options for after-the-fact intervention. The reasons given are the lack of administrative control capacities and the need to foster innovation in the chemicals industry (PACHE, 2002, p. 518). The former argument is difficult to accept given the fact that it is unconnected to the issue at hand. The latter is an argument addressed by the German Advisory Council on the Environment in a recent position paper (SRU, 2003c).

301. In terms of marine environment protection, the following must also be considered: risk assessment under EU chemicals policy takes place Community-wide on the basis of an evaluation system which is prescribed for new and existing substances and whose details are set out in Technical Guidance Documents issued by the EU Commission. Under this evaluation system, an effect threshold is ascertained in the laboratory on standard organisms such as fish and compared with the estimated concentration in the environment. A substance is deemed to give cause for concern if its predicted environmental concentration (PEC) is higher than the concentration that would probably have no impact on the environment (predicted no effect concentration (PNEC)). In the main, however, laboratory results can only be transferred in a limited way to complex ecosystems like the Baltic or the North Sea with its Wadden Sea. The PEC/PNEC approach does not take account of the special needs of marine environment protection. It assumes a specific dose-effect relationship and only 'kicks in' when doses reach a certain level: given the diluting effect of seawater, proving a direct effect would require approval of quite significant inputs for at least some pollutants. Because the oceans and seas act as sinks and pollutants can accumulate over long periods in sediments and marine organisms, the diluting effect does not necessarily make pollutants less harmful.

The German Advisory Council on the Environment believes that this sensitive situation can only be served by risk analysis based on actual effects (risk assessment) and supplemented by an evaluation of the inherent substance properties (hazard assessment) (POREMSKI and WIANDT, 2000, p. 63 et seq.; LELL, 2001, p. 144; see also HELCOM, 1998c, Annex 3.2). Specifically, this means bioaccumulative and persistent substances should be banned solely by virtue of their bioaccumulative and persistent nature and regardless of any response threshold that might be identified. Such substances would then only be permitted by way of exception. This would be an appropriate way of incorporating the generation target into chemicals policy. The application of use restrictions must be considered when approving any exceptions. Approval decisions must be preceded by a matching up of the common criteria for classification of substances as persistent, bioaccumulative, toxic, very persistent and very bioaccumulative (vPvB) with the respective marine environment protection standards developed by OSPAR and HELCOM (SRU, 2003b, p. 4). The special characteristics of the marine environment are now considered at EU level, in that a separate section on risk assessment for substance inputs into the oceans and seas has been included in the above cited Technical Guidance Document. Nevertheless, even using the most recent Technical Guidance Document on substances with PBT properties, assessment still lags behind that of the OSPAR and HELCOM provisions: for example, in the case of persistence the half-life times used are shorter than those applied by the two marine protection commissions.

The REACH System

302. In October 2003, the EU Commission proposed a regulation on which a major reform of the chemicals policy is to be based. It deals with the introduction of the REACH (Registration, Evaluation and Authorisation of Chemicals) system (for more in-depth coverage see SRU, 2003, 2002a and 2004, Section 11). The aim, among other things, is to introduce an authorisation system for existing and new substances whose properties give cause for high concern. Candidates for authorisation include all carcinogenic, mutagenic and reprotoxic (CMR) substances along with PBTs and vPvBs. Member States may also request that other, similarly worrying substances be included in the authorisation process. These include endocrine disrupters. Plant protection products and biocides are not covered by the authorisation system because they are already included in other directives and regulations (see Para. 305 et seq.).

303. Integration of PBTs and vPvBs into the REACH system effectively meant integration of key OSPAR and HELCOM provisions into EU chemicals policy. The German Advisory Council on the Environment regrets, however, that no provision is made in the proposed draft regulation for the PBT criteria prescribed in the EU's Technical Guidance Documents to be matched with the more stringent PBT criteria that OSPAR and HELCOM apply in substance selection: the draft REACH regulation matches the current Technical Guidance Documents issued in 2003. Because identification of substances with PBT properties provides the basis for subsequent decisions and is a requirement for inclusion in the authorisation process, approval of the draft regulation in its current form will omit an important step towards further integration of marine environment protection into chemicals policy.

304. The German Advisory Council on the Environment also sees a problem with the 'adequate controls' authorisation requirement. Producers are required to provide Chemical Safety Reports (CSR) in which they must show that the substance risk is adequately controlled. According to the definition contained in Annex I, adequate control of a risk – in line with risk analysis under existing substance controls – is deemed to exist when exposure lies below the predicted or extrapolated 'no effect' levels or when the probability and extent of the impact is 'negligible'. As outlined above, when it comes to marine environment protection, results achieved in laboratory tests give no adequate or reliable indication of a risk. Moreover, uncertainty remains as to whether the term 'negligible' gives sufficient consideration to the precautionary approach. The German Advisory Council on the Environment finds it particularly problematic to

consider the emission control requirements of the Water Framework Directive or the IPPC Directive as constituting 'adequate control'. This would pose a problem due to the flexibility allowed in setting facility-specific emission thresholds. To exclude the use of pollutants from the authorisation process, with reference being made to approval under either the Water Framework Directive or the IPPC Directive, would ignore the fact that chemicals policy and general substance bans and restrictions serve a wider purpose. Facility-specific emission approvals under German water law and permissions based on the Federal Immission Control Act (BImSchG) merely impose facility-specific emission thresholds and in some cases may restrict quantities and certain uses of harmful substances. Neither the Water Management Act nor the Immission Control Act provide for production bans that either prohibit a specific substance from being placed on the market or generally restrict its use. The 'hierarchy' of the various policy instruments must be respected: to be correct, the approval decision must precede the issuance of individual emissions permits and repressive monitoring. The latter must not make the approval decision indispensable. The German Advisory Council on the Environment thus sees an urgent need for clarification and improvement.

Plant Protection Products and Biocides

305. An EU-wide ban exists on the placement on the market and the use, but not production, of plant protection products containing mercury compounds, DDT, aldrin, dieldrin, endrine, chlordan, HCH, heptachlorine, hexachlorobenzene, camphechlor and captafol (Directive 79/111/EEC prohibiting the placing on the market and use of plant protection products containing certain active substances).

306. Approval of other plant protection products in the Member States has been harmonised by EU Directive 91/414/EEC concerning the placing of plant protection products on the market (SRU, 2002a, Para. 725; 2004, Section 4.4): only substances contained in a white list may be approved and used. By July 2003, producers must apply a new evaluation process to over 850 substances that were approved prior to 25 July 1993. In actual fact, only 29 substances had been subjected to the new evaluation process by July 2001, meaning that not even the 90 substances marked for priority evaluation had been retested (EU Commission, 2001d). This led the EU Commission in 2001 to extend the deadline to 2008. While the producers involved expressed scepticism regarding even the extended deadline, they finally decided in 2002 not to apply the new evaluation process to some 320 substances but to take them off the market by the end of 2003. The Commission also named a further 110 substances in July 2003 (http://europa.eu.int/comm/food/fs/ph_ps/pro/index_en.htm). Producers signalled their willingness to follow the recommendation and take the additional 110 substances off the market by the end of 2003. This same applies for another 20 substances which have not yet passed the new evaluation process (ENDS, 11. 07. 03, Issue 1482). The end result is that some 450 existing substances will no longer be available on the European market from 2004.

With a view to chemicals monitoring in general, the German Advisory Council on the Environment sees this trend as a key indication of the need and the justification for the planned inclusion of existing substances in the REACH system. It also illustrates the huge potential for reductions in the range of substances despite earlier counter-claims from producers.

The principles of substance evaluation are to be reviewed as part of a thematic strategy for sustainable use of pesticides (EU Commission, 2002h). The German Advisory Council on the Environment believes that the first step should be to harmonise the criteria for classifying substances as PBTs and vPvBs with those of OSPAR and HELCOM (Para. 297). This should be followed by generally prohibiting plant protection products with PBT properties. The Council believes this is necessary in meeting the targets contained in the OSPAR and Helsinki agreements, and thus in achieving effective marine environment protection. It would also ensure the necessary accordance with the definition of harmful substances under the Water Framework Directive (Article 2 [29]).

307. Mandatory approval and registration of biocide products was first introduced in 1998 with Directive 98/8/EC on the placing on the market of biocidal products (Biocides Directive). National implementation took place in Germany through amendments to the Chemicals Act (Chemikaliengesetz). Apart from non-agricultural pesticides, the Directive also covers wood preservatives, underwater paints, preservatives and disinfectants that kill harmful organisms and halt their reproduction. In contrast to the Plant Protection Products Directive, there are already plans to subject biocides to comparative risk assessment in which substances and products with high risk potential are to be substituted with less harmful alternatives. The Biocides Directive also differs from (existing) plant protection product law by requiring that consideration be given to maintaining concentration levels in sediments in surface waters and to possible accumulation in the marine environment.

All biocides placed on the market prior to May 2000 must be subjected to an evaluation programme by no later than 2010. There are already signs that some active components will not pass the evaluation process (GÄRTNER, 2000). The German Advisory Council on the Environment urges immediate evaluation of triazines and diuron. While Germany still allows these substances to be used in place of organo-tin compounds in antifouling paints, they are banned in other countries like Denmark, Great Britain, the Netherlands and Sweden (WWF, 2003, p. 29).

Special Focus on Persistent Organic Pollutants (POPs)

308. The EU and its Member States signed the Stockholm Convention on Persistent Organic Pollutants (POPs) in May 2001 and the Protocol to the UN/ECE Convention on long-range transboundary air pollution concerning persistent organic pollutants in June 1998. The aim of the

Convention is cessation of all inputs, emissions and losses of POPs, with initial provisions covering between twelve and sixteen substances (SRU, 2000, Para. 975 et seq.): under the Stockholm Convention, aldrin, chlordan, dieldrin, endrin, hexachlorobenzene (HCB), heptachlor, mirex, toxaphen and PCBs are all subject to a ban on production and use unless either a general or specific exception has been granted. There are also plans to restrict production and use of DDT. Releases of dioxins (polychlorinated dibenzo-p-dioxins (PCCDs)), furans (polychloride dibenzofurans, (PCDFs)), PCBs and HCB are to be gradually reduced, production stoppage being the long-term goal. The UN/ECE Protocol also provides for production bans and use restrictions on chlordecone and hexabromobiphenyl. In the case of heptachlor, HCB, PCBs and DDT, long-term cessation in production is the aim. Use of DDT, PCBs and HCHs is to be heavily restricted. Finally, the contracting parties to the UN/ECE Protocol have agreed to reduce emissions of dioxins, furans, PAHs and HCB to below the levels measured in 1990. Following up on the Stockholm Convention and the UN/ECE Protocol, the EU Commission presented two related proposals to the Council of Ministers in 2003 (EU Commission, 2003c, 2003d). The German Advisory Council on the Environment expressly welcomes the fact that the German government has already ratified both conventions.

All 16 POPs have been classified by HELCOM as substances for immediate priority action (Para. 293). The OSPAR Commission has done the same for PCDDs, PCDFs, HCB, HCHs, PAHs and PCBs (Para. 292). OSPAR has already earmarked the remaining POPs as candidates for priority action.

309. Apart from for mirex, chlordecon and hexabromide biphenyl, existing Community legislation contains all restrictions in the Stockholm Convention and the UN/ECE Protocol on the placement of POPs on the market and their use. Directive 79/177/EC merely bans the use of certain substances in plant protection products, however (Para. 305); it does not strictly prohibit their placement on the market and use in biocides, or their industrial use. What is most lacking are EU provisions that prohibit the production of the POPs currently listed in both international agreements and a legal framework for a ban on production of new POPs. As with the Plant Protection Products Directive and the Biocides Directive, the current chemicals management system contains no provisions for an actual ban on production. Community legislation shows further deficits compared with the international agreements in that, with the exception of PCBs, no restrictions exist regarding the use of waste containing POPs. In contrast, both international POPs conventions rightly cover the entire POP lifecycle from production to disposal. These international requirements are, however, implemented in the Waste Incineration Directive (2000/76/EC). The Directive standardises specific requirements of the incineration process and sets out a range of emission thresholds. This should lead to significant reductions in pollutant loads, particularly for dioxins and furans. The remaining gaps at EU level could conceivably be closed by the future REACH system. The EU Commission believes it will be some time before final enactment of the new legislation takes place. To serve speedy adoption of implementation measures, the Commission presented a proposal for a POPs regulation in June 2003 (EU Commission, 2003e). The proposed regulation provides for implementation of key provisions from the two international POPs conventions on production, use and placement on the market of specially produced existing and new POPs. The German Advisory Council on the Environment welcomes the plans not to adopt the exception options for some substances contained in the international agreements. In the medium term, the proposed measures should be successively integrated into the new chemicals policy.

Special Focus on Organo-tin Compounds

310. In January 2003, the EU effected a ban on the use of tin organic compounds, particularly tributyl tin (TBT), in antifouling paints for all types of ships – including commercial vessels (Directive 2002/62/EC in conjunction with Directive 76/769/EEC). Regulation (EC) No. 782/2003 of 14 April 2003 extends the ban on the use of tin organic compounds for ships flying EU Member State flags but treated with antifouling paint at shipyards outside the EU. The EU has also banned the sale of ships' paint containing TBT. This is in line with a resolution – not yet entered into force – of the International Maritime Organisation (IMO). Under that resolution, apart from a ban on organo-tin compounds in new ships' paints, from 01. 01. 2008 tin organic compounds may no longer be contained in antifouling paint used on ships' hulls or hulls must be coated with a sealer that prevents leaching of these compounds (SRU, 2000, Para. 973).

3.2.2 Protection From Radionuclides

311. While radioactive contamination in the Baltic is primarily a result of Chernobyl fallout and of fallout from aboveground nuclear weapons testing in the 1950s and 1960s (Para. 182 et seq.), the North Sea is still, and in some instances increasingly, subject to radioactive discharges from the nuclear reprocessing plants in Sellafield (Great Britain) and La Hague (France) (Para. 89 et seq.). The fact that, despite knowledge of the circumstances in Sellafield and La Hague, spent nuclear fuel from German nuclear power plants is still transported to both locations, makes Germany at least an indirect contributor to these discharges. The German Advisory Council on the Environment believes that prevailing national protection standards should also be applied to the reprocessing in another country of spent nuclear fuel from German nuclear power stations. The justification which underpins German protection standards, especially the requirement for 'safe recycling or recovery', does not stop at the border. If EU legislation lacks mandatory specific provisions (see Para. 312), then the application of more stringent environmental protection provisions should not be deemed discriminatory in terms of free trade in goods and services (for a more in-depth review see SCHEUING, 1991).

Radioactive discharges still occur despite the OSPAR contracting parties agreeing in 1998 not only the generation target for harmful substances, but also to bring radioactive inputs, emissions and losses to near-zero by 2020. There was a requirement to significantly reduce radioactive inputs by 2000. The problem was that no agreement could be reached on which emission threshold to use as a basis for calculating the required reductions. It was only at the OSPAR Ministerial Conference in Bremen in 2003 (OSPAR, 2003b) that agreement was reached on taking the average for the years 1995 to 2001. This is the level from which inputs must be reduced. Dumping of radioactive waste in the oceans and seas was banned under OSPAR Decision 92/2.

312. EU legislation contains no provisions on discharges of radioactive wastewater into the oceans and seas. The EU Commission has made no use of the option under the Euratom Treaty to make recommendations on radioactive content in the air, water and soil. Any future EU marine protection strategy should contain the target of reducing concentrations of radioactive substances in the marine environment to near background values for naturally occurring substances and to near-zero for synthetic radioactive substances. In contrast to the targets prescribed for harmful substances, the EU has even set a deadline of 2020 for the reduction of radioactive substances (EU Commission, 2002a, p. 23). As regards actually reaching the target, the Commission wants to restrict its activities to examining the relationship between the OSPAR strategy on radioactive substances and existing EU measures (EU Commission, 2002a, p. 28) – a rather bewildering notion given that there are no existing EU measures.

3.2.3 Summary and Recommendations for Protection From Harmful Substances

313. Protection of the North and Baltic seas from harmful substances requires a much broader approach to environmental and chemicals policy, and particularly the latter. Firstly, diffuse inputs are not covered, and secondly, treatment technologies do not take in the entire substance spectrum. Also, wastewater treatment involves considerable costs. The German Advisory Council on the Environment accordingly considers the key instruments of effective marine environment protection to be emission limits – among other things on the basis of the Water Framework Directive, the IPPC Directive and their national implementing legislation – plus systematic bans and restrictions on the use of those chemicals which cannot be adequately controlled at source. What must be rejected, however, is an end-of-pipe approach in which wastewater treatment is the mainstay: this would be in direct contradiction to the precautionary and preventive approaches. Against this background, the Council wishes to put forward the following recommendations:

314. The generation target should be enshrined in all relevant EU directives and regulations and consequently in national legislation. The aim should be the cessation by no later than 2020 of inputs, emissions and losses of harmful substances in the marine environment. Further development and implementation of the Water Framework Directive and of all harmful substance-related EU policies must take in both the substantive aims and the timeline contained in the generation target. The German government should lobby for this to happen in preparations for a European marine protection strategy, in negotiations on new EU chemicals policy (REACH) and in the current review of the Plant Protection Products Directive.

315. The German Advisory Council on the Environment also sees a need for harmonisation of the OSPAR and HELCOM evaluation systems, especially concerning substances with PBT properties, with the evaluation system used in European water protection and chemicals policy. The existing EU evaluation system fails to give adequate consideration to the needs of marine environment protection. In this regard, there is an additional need to implement – as provided for in both the OSPAR and the Helsinki agreement – the planned Community-wide monitoring of pollutants for their biological effects. In Germany, for example, monitoring of metals, TBTs and PAHs only covers substance concentrations in water and sediments, which is contrary to international requirements. Biological monitoring is however of particular importance in studying persistence and bioaccumulation of individual pollutants.

316. Designation of priority substances and the subsequent selection of priority hazardous substances under the Water Framework Directive must likewise be based on the needs of marine environment protection. Priority hazardous substances are at least those substances contained in the OSPAR and HELCOM lists of substances for priority action. The current EU list is particularly wanting when it comes to marine environment protection. This is all the more difficult to understand because the Water Framework Directive explicitly refers, among other things, to the OSPAR and Helsinki agreements.

Of key importance in this regard is that the Member States quickly agree at EU level emission ceilings for the 33 substances currently categorised as priority substances and set out at national level emission ceilings for other pollutants listed in the Annex to the Water Framework Directive. The German government must continue its efforts to ensure that implementation of the Water Framework Directive does not suffer a similar fate to the Water Protection Directive (76/464/EEC), in which HCBs are the only POPs for which the EU has laid down emission ceilings.

The German Advisory Council on the Environment believes that issuance of emissions permits under the Water Framework Directive must largely be based on the following: given the diluting effect of seawater, identifiable effects in the oceans and seas are in some cases only detectable with significant quantities of pollutants. For this very reason, the special protection needs of the marine environment, meaning its sink function and the resulting accumulation of pollution in sediments and organisms, must be accounted for in emission thresholds. In other words, it may be necessary to set emission values below the significance thresholds for flowing waters. This applies both inside and outside the 12-mile zone covered by the Water Framework Directive.

317. As proposed by the EU Commission, the provisions on the production, marketing and use of certain POPs agreed under the Stockholm Convention and the Protocol to the UN/ECE Convention on long-range transboundary air pollution concerning persistent organic pollutants must be adopted without delay in binding EU legislation and implemented at national level.

Along with endocrine disrupters, all substances not included in either of the international POP conventions but which have PBT and vPvB properties must be subject to the REACH authorisation process and the plant protection products and biocide approval process. The German Advisory Council on the Environment urges the German government to take an appropriate stance in the course of further REACH negotiations and the review of plant protection product law. Integration of PBTs and vPvBs into the REACH authorisation process, as proposed by the EU Commission, must be pursued further.

318. The German Advisory Council on the Environment is also of the opinion that approval of plant protection products, biocides and other chemicals with persistent, bioaccumulative and toxic or very persistent and very bioaccumulative properties should only occur in exceptional cases if their use is overwhelmingly in the public interest and it can be proven that no alternative is available. This applies independently of whether substances are produced for intra-Community trade or for extra-EU transportation.

Substitution of harmful substances must be enshrined in EU chemicals policy and be rigorously implemented. This means that the availability of less harmful alternative substances must be established as independent grounds for non-approval of a substance under the REACH system and in plant protection product law.

319. In the case of PCBs in particular, a CEN standard should be developed for analysis of PCBs in products. Recycling of products containing PCBs, say cable insulation, should be banned. Also, greater attention should be given to inputs of new (polar) pollutants and pharmaceuticals into the seas and oceans (Paras. 72, 73 and 76). This especially applies to potential inputs of PCBs and DDT from contaminated soil following clean-up activities.

Despite the unquestionable successes with inputs of heavy metals, there is still a potential risk from increased concentrations of cadmium, lead and mercury in sediments and biota (Para. 52 et seq., 158 et seq.). Further efforts are needed in order to achieve the generation target, which means reducing heavy metal concentrations in the marine environment to near natural background values by 2020. There is great practical and technical potential for reductions in cadmium and mercury (Para. 63). A phase-out of cadmium batteries should be enshrined in law, and environmentally sound disposal should be implemented for used Ni-Cd batteries. As regards pollution from mercury, the German Advisory Council on the Environment calls for a halt on the use of chlorine-alkali electrolysis, with mercury-free membrane processes being used as a substitute.

320. The scope for action afforded to individual states under the EU's Common Agricultural Policy (CAP) must be used to promote extensive farming methods that use fewer plant protection products. National agro-environment programmes should be implemented on the basis of Commission Regulation (EU) No. 1257/1999 and farmers should receive appropriate advice (SRU, 2004, Section 4).

321. Radioactive discharges into the marine environment must be stopped. Given that dumping of radioactive waste in the oceans and seas is no longer allowed, the German Advisory Council on the Environment believes it only prudent to ban discharges of radioactive wastewater. Controlled discharge from reprocessing plants is in no way synonymous with a lesser impact on the marine environment. It is thus recommended that the German government actually implement its plan to cease reprocessing by 2005. Any practice that – contrary to the requirement for 'safe recycling or recovery' under Germany's Atomic Energy Act (AtG) – produces significant volumes of radioactive waste must be stopped. Whether reprocessing actually takes place in Germany or another country is irrelevant.

3.3 Reducing Eutrophication in the North and Baltic Seas

322. Eutrophication is one of the most serious problems in the Baltic and in large sections of the North Sea, where many estuaries and coastal areas are either at risk from eutrophication or are already eutrophic (Para. 93 et seq., 187 et seq.). While past efforts to combat eutrophication at international level have certainly set ambitious targets, the signatory states have failed to take decisive action to reduce nutrient inputs. EU policy, which has adequate enforcement instruments at its disposal, has not had the desired effect despite the introduction of key directives: the Nitrates Directive (91/676/EEC), the Urban Waste Water Directive (91/271/EEC) and more recently the Water Framework Directive (2000/60/EC). The provisions contained in the Nitrates Directive in particular are not stringent enough (Para. 336; SRU, 1994, Para. 581). Some Member States have failed to properly implement both the Nitrates and the Urban Waste Water directives. In 2002, the European Court of Justice (Case C-161/00) ruled that Germany's regulation on fertiliser use (Düngeverordnung) did not fully comply with European requirements (Para. 340). The EU Commission sought to initiate violation proceedings against Germany for breach of the Urban Waste Water Directive because it had failed to standardise monitoring methods (Para. 345).

323. The EU's Common Agricultural Policy (CAP) is a deciding factor in falling short of the reduction targets and is in urgent need of reform. As the main cause of nutrient inputs in the North and Baltic seas, intensive agriculture promoted by the CAP has not been subject to any fundamental restructuring (for a more in-depth review see SRU, 2002a, 2002b, 1996b). In June 2003, the EU agricultural ministers did agree a reform of agricultural aid. Bonuses paid to farmers would no longer be coupled to production but be paid out in a lump sum and be more closely linked to compliance with environmental standards (see also Para. 335 and SRU, 2004, Section 4).

Not least in view of the many planned exceptions, the agreed agricultural reform is merely a long overdue first step towards actual integration of environmental policy requirements into agricultural policy.

Other key deficits are evident in the case of atmospheric deposition of NO_x inputs from transportation into the oceans and seas (SRU, 1996a, Para. 357 et seq.). NO_x emissions from shipping are almost completely ignored.

3.3.1 Tough Targets at International Level

3.3.1.1 International Conference on the Protection of the North Sea and the OSPAR Agreement

324. At the Second International Conference on the Protection of the North Sea in 1987 the riparian states agreed to a 50% reduction by 1995 (compared with 1985) in inputs of nitrogen and phosphorus in areas of the North Sea at risk from eutrophication (NSC, 1987). This target also served as the basis for PARCOM Recommendation 88/2 of 1988, which under the 1992 OSPAR Convention now applies to the entire North-East Atlantic. Additionally, PARCOM Recommendations 89/4 and 92/7 provide for the creation of national action plans and (yet to be finalised) measures for reduction of nutrient inputs specifically from agriculture. While phosphorus inputs in surface waters were significantly reduced up to 1995 (Para. 102 et seq.), none of the signatory states achieved anywhere near the 50% reduction target for nitrogen inputs (Para. 104). From the data contained in Table 3.6, it can be seen that, considering the efforts they made, the signatory states did not even really expect to achieve a 50% reduction in nitrogen inputs by 1995.

From the outset, the international agreement did not lead to the sort of action needed at national level in the agriculture sector: while nutrient inputs from industrial facilities and from municipal wastewater were reduced as a result of wastewater treatment and product regulations on phosphate content in detergents, a breakdown by origin shows at best only a slight reduction in (diffuse) nitrate inputs from agriculture (Para. 100; for a more detailed treatment see also DOHMANN, 2001).

325. Against this backdrop, the ministers at the Fourth International Conference on the Protection of the North Sea held in 1995 repeated the obligation contained in the 1985 Esbjerg Declaration for reductions in nitrate inputs of 50% compared with 1985 (NSC, 1995). What they omitted to do was to set a deadline, to further analyse the causes of the marked failure to meet the target previously or to stress the urgent need for further action in agriculture. In 1998, the OSPAR signatory states agreed the Strategy to Combat Eutrophication. The aim of the strategy, which the German Advisory Council on the Environment interprets at best as a remote goal, is to achieve a healthy marine environment devoid of anthropogenic eutrophication by 2010 (OSPAR, 1998c). Along with identification of '(potential) problem areas' (Para. 326), the 50% reduction in nutrient inputs postulated in PARCOM Recommendation 88/2 is intended to go a long way towards achieving the 2010 target. While the agricultural sector is seen as a key source of nutrient emissions, the OSPAR Convention likewise fails to draw any significant consequences from the non-achievement of the 1995 reduction target. In 2000, agriculture's share of nitrogen inputs in surface waters remained at 65% (OSPAR, 2001i).

Table 3-6

Anthropogenic nitrogen input into surface waters in North Sea states (1985 to 1995) and anticipated reductions

Country	Nitrogen input 1985 (Mg)	Nitrogen input 1995 (Mg)	Reduction 1985–1995 (%)	Anticipated reduction 1985–1995	Nitrogen input 1996 (Mg)
Belgium	101 936	83 424	*18*	> 19	NI
Denmark	75 151	57 300	*24*	25	32 800
Germany	873 070	642 120	*26*	24	NI
France	NI	NI	*NI*	19	NI
Netherlands	157 000	142 000	*10*	21	141 000
Norway	30 318	24 349	*20*	30	23 555
Sweden	26 500	22 000	*17*	32	NI
Switzerland	30 000	24 230	*19*	> 10	24 230
United Kingdom	319 000	357 000	*– 12*	– 10	306 000

NI: No information
Source: After OSPAR (2001i), p. 17

It was not until the Bergen Declaration of the Fifth International Conference on the Protection of the North Sea (NSC, 2002b), which adopts the OSPAR strategy target of achieving a healthy marine environment devoid of anthropogenic eutrophication by 2010, that the role of agriculture was placed in the spotlight. Apart from repeating the commitment to 50% reductions in anthropogenic nitrate inputs compared with the base year of 1985, the declaration contains an 'urgent call' for full implementation of the measures contained in the EU Agenda 2000 (SRU, 2002a, Para. 718 et seq.) and for greater application of environmental measures in future reforms of the Common Agricultural Policy. The participating ministers from the North Sea riparian states also issued a declaration of intent for greater integration of marine environment targets into future structuring of national agriculture policy. Against this background, the recently agreed changes to the CAP are rather disconcerting, as are the recommendations made by some Member States during negotiations on CAP reform to keep agricultural aid essentially dependent on production volume, thus more or less reinforcing the use of fertilisers in intensive agriculture. The recommendations made by Germany also contradict the relatively recent 2002 Bergen Declaration.

The German Advisory Council on the Environment thus finds it regrettable that the commitments contained in the Bergen Declaration regarding agricultural policy have not been taken up in the recent Bremen Declaration issued by the OSPAR Ministers (OSPAR, 2003b). The 50% reduction target is repeated, although no deadline has been set. While in the declaration of the Joint Ministerial Meeting of the OSPAR and Helsinki Commissions on the Protection and Conservation of the Baltic Sea and the North East Atlantic, also held in Bremen in June 2003, eutrophication is not even addressed as problem in its own right beyond making reference to the regional differences in this regard between the areas of application of the two conventions.

326. One positive aspect is that the identification of 'non problem areas', 'problem areas' and 'potential problem areas' in marine waters called for by the OSPAR Strategy to Combat Eutrophication has since been implemented by the signatory states and that the OSPAR Commission has recently published the results. This is the first instance in which an inventory and analysis has been conducted on eutrophication and the risk of eutrophication in the North-East Atlantic.

Germany has identified the following as problem areas:

– The estuaries of the Elbe, Weser and Ems rivers

– The Wadden Sea

– Coastal waters

German offshore waters, apart from the outer reaches, are classified as potential problem areas (OSPAR, 2003, p. 26 et seq., 46). Both actual and potential problem areas are to be identified as areas at risk under the Nitrates Directive, and the action programmes based on this Directive are to be structured accordingly (Para. 336).

The German Advisory Council on the Environment believes the usefulness of the OSPAR report is compromised by the fact that the Joint Process for area identification developed by the OSPAR Commission (SRU, 2000, Para. 676) has not been uniformly applied by the various states. This makes inventory and analysis comparison either difficult or impossible (OSPAR, 2003, p. 3 et seq.). In identifying (potential) eutrophic areas, relevance should be attached to whether at least some states are concerned about a precedence effect in terms of identifying endangered or sensitive areas under the EU Nitrates and Urban Waste Water directives and have thus taken a restrictive stance in reporting (potential) problem areas. Implementation of the Nitrates Directive is particularly deficient in coastal and marine waters (Para. 336). In any case, the OSPAR Commission sees a need to emphasise the fact that their report on eutrophication in the OSPAR region does not prejudge any disputes between EU Member States and the EU Commission (OSPAR, 2003c, p. 3). In contrast, the German Advisory Council on the Environment believes there is an urgent need to harmonise identification of problem areas under the different legal regimes because this is the only way to prevent duplication of effort and disputes on what are believed to be the 'right' criteria.

3.3.1.2 Provisions of the Helsinki Convention

327. The situation in the Baltic is similar to that in the North Sea or rather the North-East Atlantic: under the Helsinki Convention, the participating ministers agreed in 1998 to a 50% reduction in nutrient inputs by 1995, with 1985 as the base year. This was followed by a number of recommendations to be implemented in national legislation being agreed for, among other things, inputs from agriculture and reduction targets for nitrate content in municipal wastewater. In the Baltic, the 1995 reduction target of 50% was missed by a wide margin (Para. 193). The contracting parties to the Helsinki Convention thus agreed in 1998 to achieve the 1988 target of a 50% reduction in nutrient inputs in the Baltic by no later than 2005 (SRU, 2000, Para. 676). Additionally, HELCOM Recommendations 19/6 and 21/1 of 1998 entered into force in July 2000 (EHLERS, 2002a, p. 97) and contained provisions for (yet to be finalised) measures to reduce nutrient inputs specifically from agriculture.

328. Despite the agreements reached in 1998, nutrient concentrations in the Baltic have remained persistently high. Overall – and not accounting for regional differences – there was no reduction during the period 1994 to 1998 (Para. 189 et seq.). While there was a 50% reduction in phosphorus emissions from point sources in Baltic riparian states up to 2000, reduction in nitrogen inputs were still well below the 50% target in 2000 (Para. 193).

329. Reductions in agricultural losses of nitrogen in the Baltic states and in Russia – following the break-up of the Soviet Union – are estimated at around or even greater than 50%, livestock numbers have significantly

dwindled in eastern Germany and Poland during the reporting period, and the use of mineral fertilisers has declined. This trend is not, however, mirrored in nutrient loads in the Baltic. This is partly to do with washout of nutrient residues previously contained in the soil and delays in transportation of nutrients via the groundwater into rivers and subsequently into the Baltic (Para. 192). Another cause is the still excessive numbers of livestock across the Baltic riparian states and use of organic and synthetic fertilisers. The situation also shows that the in some instances dramatic reduction in agricultural production in former Eastern Bloc states has not yet effected any improvement as regards eutrophication in the Baltic Sea: it clearly illustrates the huge reductions in nutrient inputs needed in the Baltic catchment area if, at least in the medium term, eutrophication is to be kept at an acceptable level. The excesses of the Common Agricultural Policy must not be allowed to continue in the Baltic states and Poland following their accession to the EU.

The German Advisory Council on the Environment thus expressly welcomes the Bremen Declaration of the HELCOM Ministerial Meeting (HELCOM, 2003d), which explicitly cites the intensive agriculture currently practised in EU Member States as one of the main causes of nutrient inputs into the Baltic and expresses concern regarding even higher nitrogen and phosphorus inputs following expansion of the Common Agricultural Policy to include the new Member States. This was supplemented by HELCOM Recommendation 24/2003 providing for (again, yet to be finalised) measures to reduce inputs from agriculture.

3.3.2 The Need for Coherent Action

330. The situation can be summarised thus: tough international targets do not necessarily mean implementation of adequate measures at national and European level. The deficits in enacting implementing measures for harmful substances (Para. 290) are only worsened as regards eutrophication by the fact that since the late 1980s, there have been repeated calls to achieve a specific target but there has been no analysis of the similarly repeated failure to meet that target. With the exception of the Netherlands, the OSPAR contracting parties have not yet reported to the OSPAR Commission on when they plan to meet the 50% reduction target. The Netherlands have cited 2010, the year in which the Strategy to Combat Eutrophication aims to achieve a marine environment devoid of anthropogenic eutrophication. All other OSPAR contracting parties have either not reported at all or have submitted very vague reports. For example, Germany has merely announced intentions to achieve the agreed reduction target for nitrogen by implementing a range of measures in the respective sectors (OSPAR; 2001i, p. 23). Also, the aimed for 50% reduction in nutrient inputs is a policy requirement that is not adequately supported by scientific evidence. A 50% reduction in nutrient inputs in surface waters will not effect a 50% reduction in nutrient concentrations in the marine environment (OSPAR, 2001h; Para. 94). It is evident that the aimed for reduction in human-induced eutrophication cannot be achieved without far-reaching additional measures. Neither the OSPAR Commission nor the Helsinki Commission have the authority either to place individual contracting parties under greater obligation or to enforce legislation on and actual implementation of the measures agreed in the OSPAR and HELCOM recommendations and strategies.

331. Decisions are still made on a sectoral or departmental basis although both regional marine protection agreements emphasise the need for a cross-sector outlook and application of the ecosystem approach: almost at the same time as the OSPAR and HELCOM declarations and recommendations of June 2003, the EU agricultural ministers adopted a reform of the Common Agricultural Policy that not only falls short of the intentions announced by the EU Commission in summer 2002 (EU Commission, 2002i) but also of the EU Commission's proposals of January 2003 (EU Commission, 2003f). Thus the EU environment ministers responsible for the marine protection agreement formulate requirements that are all-but unattainable in light of the parallel agreements made by the EU agriculture ministers responsible for agricultural policy. Despite covering a broadly identical set of member states, the OSPAR and HELCOM requirements more or less float freely alongside the CAP. With the exception of Austria, Greece and Italy, all EU Member States are OSPAR contracting parties. Four current EU Member States, four accession states and the Russian Federation are contracting parties to the Helsinki Convention. The German Advisory Council on the Environment fears that without a fundamental change in thinking, no progress will be made beyond reiterating the targets postulated since the 1980s by OSPAR, HELCOM and the International Conference on the Protection of the North Sea.

332. The EU has a range of enforcement and implementation mechanisms at its disposal that it can use against the Member States. In its future marine protection strategy, the EU Commission intends to adopt the OSPAR target of achieving a marine environment devoid of anthropogenic eutrophication by 2010 (EU Commission, 2002a, p. 22 et seq.) but it does not follow that intention through to its logical conclusion as regards what is needed to seriously pursue and implement that target. The Common Agricultural Policy and its fundamental reform are explicitly excluded from the Communication towards a strategy on protection and conservation of the marine environment (EU Commission, 2002a, p. 51; critique SRU, 2003b). At purely EU level, marine environment protection and agricultural policy thus remain unconnected. By citing tougher action in implementation of the Nitrates and Urban Waste Water directives as a means to achieving the target, the EU Commission goes no further than the obligations already contained in the applicable EU legislation. Nevertheless, there is certainly an urgent need for stricter enforcement of the existing provisions. This is illustrated by the fact that almost all Member States face or have faced legal proceedings for infringement of the Treaty. Since 1994, the EU Commission has brought action in 56 cases involving implementation of

the Nitrates Directive, either exclusively or in conjunction with other directives (EU Commission, 2002j, p. 31).

333. HELCOM recommendations, NSC declarations and OSPAR strategies often have a binding effect in that they present minimum standards for legislation and guidance for the exercise of discretionary powers by the relevant authorities (LAGONI, 1996, p. 89 et seq., EHLERS, 2002a, p. 97, 100). Measures implemented by Germany and at EU level to combat eutrophication are aimed at achieving the internationally accepted target. What is needed is coherent action at international, EU and national level. Section 3.3.3 thus addresses both the deficits and the possible measures to be taken at European and national level.

3.3.3 EU Measures to Reduce Eutrophication and their Implementation at National Level

3.3.3.1 Common Agricultural Policy (CAP)

334. Despite having been tightened up in some areas, the Nitrates Directive will not bring about a fundamental shift away from intensive agriculture. Only broad reform of the CAP and the provisions of the Nitrates, Urban Wastewater and Water Framework directives can effect long-term elimination, or at least a significant reduction, of human-induced nutrient inputs in the North and Baltic Seas. This is certainly the case in light of the forthcoming EU enlargement and the associated expansion of EU agricultural policy, and also the in some instances long transition periods for implementation of directives like the Urban Waste Water Directive. The German Advisory Council on the Environment recently took an in-depth look at the CAP and the changes involved in Agenda 2000 and made appropriate recommendations (SRU, 2002a, Para. 718 et seq.; 2002b, Para. 234, 401 et seq.).

The options considered in Agenda 2000 take the right approach but they are by no means adequate. The main deficit in the existing structure of the CAP is the poor funding provision for the second pillar (promotion of rural development and environmentally sound production processes) compared with that for the first pillar (strengthening the market and price support). Guaranteed prices and direct coupling of agricultural subsidies to production volume have fostered huge overproduction. The German Advisory Council on the Environment thus reiterates its call for systematic transfer (modulation) of funding from the first pillar to the second (SRU, 2002a, Para. 723 et seq.). Overall, the amount of funding for agro-environmental activities should be raised to a level that allows most farms an alternative to intensive production. Production intensity in the EU must be significantly reduced and restricted according to a system of differentiated land use (SRU, 2002b, Para. 402). Subsidies should no longer be paid in the (exceptional) event that there is an obligation to implement agro-environmental measures: instead, such measures should be the rule and noncompliance subject to sanctions (SRU, 2004, Section 4).

335. The recently agreed reform of the CAP will satisfy the requirements only in part: in place of payments for grain crops and cattle rearing, farmers will receive a lump sum grant whose size will depend on the amount already paid by Brussels in bonuses for crop growing, set-aside, mother cows, slaughter and other factors. It does not, however, mean complete decoupling of agricultural subsidies from production volume. Only payments will no longer be exclusively based on volume. From 2005, Member States may still subsidise up to 25% of grain crops through the payment of production bonuses. In the beef sector, Member States may select from a range of subsidy models and longer take-up deadlines, and may decide whether the agreed reform should enter into force at national level in 2005, 2006 or even as late as 2007. Guaranteed prices for many products, including grain crops and milk products, will remain intact although they will be reduced, for example, by 15% for milk and 25% for butter.

More attention should be given to environmental needs. The environmental requirements have been significantly weakened in the course of negotiations. New cross-compliance provisions allow more effective implementation and control, and instil greater hope as regards good practice and maintenance of the current stock of permanent grasslands and meadows. However, provision is only made for marginal modulation of existing production subsidies for use in environmental and landscape protection and rural development programmes. Only about EUR 1.2 billion of the EUR 40 billion EU agriculture budget is to be used for environmental measures and for job security activities in structurally weak rural regions. It is primarily large farms that are affected by the binding control and sanction mechanisms involved in non-compliance with environmental requirements. This is only about 1% of farmers in Europe. The German Advisory Council on the Environment will address agricultural policy reform in more detail in its 2004 Environmental Report (SRU, 2004, Section 4).

3.3.3.2 The Nitrates Directive

336. Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources (Nitrates Directive) aims to restrict the use of fertilisers in agriculture to safeguard groundwater, freshwater and marine waters from nutrient pollution. Action programmes containing 'codes of good agricultural practice' are to be developed for areas at risk. The action programmes must contain measures that restrict the use of all types of fertiliser containing nitrogen and set out specific limits for the use of commercial fertilisers. Areas at risk are those other than catchment areas of surface waters used for drinking water and groundwater aquifers in which nitrate concentrations have reached 50 mg/l. These include the catchment areas of eutrophic surface waters and surface waters at risk of eutrophication. Annex I to the Nitrates Directive expressly lists coastal waters, estuaries and the oceans and seas as surface waters, and does not place any restrictions in terms of nautical miles from the coast (KRÄMER, 2003,

p. 191). Thus – up to December 1993 – the catchment areas of eutrophic marine areas (including estuaries) had to be classified as areas at risk.

Germany's regulation on fertiliser use (Düngeverordnung) makes use of the option under Article 3 (5) of the Nitrates Directive to waive identification of areas of risk and instead implement nation-wide action programmes under the same directive. Marine waters have not been included, however. Germany's implementation of measures for coastal waters under the Nitrate Directive has been lax and it has taken no action regarding measures for marine waters (EU Commission, 2002j, p. 10, 12). Discharge areas feeding eutrophic or near-eutrophic coastal and marine waters must be identified as areas at risk; these include the (potential) problem areas identified by the OSPAR contracting parties (Para. 326). Due to inconsistent application of the key criteria, identification of (potential) eutrophic coastal and marine waters cannot as yet be considered complete (Para. 326). The German Advisory Council on the Environment believes, however, that the identified (potential) problem areas must at least be classified as areas at risk under the Nitrates Directive. The Nitrates Directive correctly takes in not only eutrophic areas but also areas at risk of eutrophication. There is no evidence that classification under the Nitrates Directive is in any way inferior to evaluation under the OSPAR Convention.

337. Compared with 'mere' identification under the OSPAR Convention, under the Nitrates Directive designation of coastal and marine areas at risk involves mandatory direct requirements: national action programmes must be developed which not only focus on the situation on land, but also on the status of the coastal and marine waters in question. If a four-year programme fails to produce significant improvements in water quality, then under the Nitrates Directive, a follow-on programme must contain tougher requirements. A first action programme was required for the period 1996 to 1999 and a second for the period 2000 to 2003. In light of the fact that no change has occurred in the high nitrate concentrations in the North and Baltic seas, the third programme covering the period 2004 to 2007 should tighten the requirements and take account of the specific sensitivities of both marine environments.

338. The Nitrate Directive requires that action programmes contain an annual maximum ceiling (for Germany this means nation-wide) for farm fertilisers, including manure produced and distributed by animals: 170 kg N per hectare and year for cropland and 210 kg N per hectare and year for grassland. Given the variability in the soil and climate, 'acceptable' nitrogen concentrations can only be properly measured at local level and not for the whole of Europe (SCHÜLTKEN et al., 1997, p. 76). With light soil, for example, nitrogen fertiliser used in volumes of more than 125 kg N per hectare and year can make it difficult to keep nitrate concentrations below 50 mg/l in groundwater (VON URFF, 1988, p. 107; see also MÖKER, 1993, p. 76 et seq.). The ceiling of 170 kg N cited in the Nitrates Directive is thus incapable of ensuring compliance with the directive's own requirement of maintaining nitrate concentrations in groundwater at below 50 mg/l. The EU Commission itself has incidentally also found that setting a ceiling of 50 mg/l nitrate in groundwater as a basis for identifying areas at risk is much too high to allow effective reductions in eutrophication (EU Commission, 1997, p. 12). This lack of stringency is explained by the fact that the Commission's original proposal for a Nitrate Directive, which included restrictions on numbers of livestock, was not adopted because the Council of Ministers feared it would have significant impacts on agriculture. In the course of further negotiations on the directive, the requirements were repeatedly softened, with the allowable concentrations of nitrogen from farm fertiliser being set so high that they remain untouched by the systematic over-fertilisation and mass livestock husbandry promoted under the CAP. The German Advisory Council on the Environment believes that a review of the Nitrates Directive is urgently needed. The directive's quantitative limits on pure nitrogen should be supplemented, due both to local variation and in particular to the problems of enforcement monitoring, with restrictions on livestock numbers per unit area.

339. The trend in agriculture towards ever-greater intensification and increased productivity is linked to a significant increase in the use of mineral nitrogen fertilisers. In the EU, total nitrogen load from agriculture measured in soil amounts to almost 18 million Mg per year. Between 9 and 10 million Mg comes from nitrogen pollution from the use of anorganic nitrogen (EU Commission, 2002j, p. 4). Nevertheless, the Nitrates Directive contains no maximum threshold for the use of mineral fertilisers.

The Directive also lacks provisions on the phosphates and potassium also contained in farm fertiliser. In some areas of the EU, agriculture makes a huge contribution to phosphorus pollution of waters (Para. 103). Plans to draw up a phosphates directive containing area-related maximum thresholds were not followed up. The adoption of area-related restrictions on livestock numbers in the Nitrates Directive would, however, also effect reductions in phosphate pollution from agriculture.

Finally, the Nitrate Directive contains no provisions on atmospheric depositions of nitrogen from ammonium. The increase in livestock numbers and the storage and use of fertilisers have led to increased concentrations of airborne nitrogen being deposited in neighbouring soils and waters (Para. 100).

3.3.3.3 Deficits in Germany's Implementation of the Nitrates Directive

340. Implementation of the Nitrates Directive in Germany is largely effected by a regulation on the use of fertilisers (Düngervordnung). Articles 2 (1) and 4 (5) of the old version of the fertiliser regulation provided for deductions in nitrogen calculations which effectively allowed 170 kg of nitrogen per hectare in soil. Up to 20% of the total quantities of nitrogen was seen as 'normal' losses that occurred through nitrogen dispersal during spreading. The maximum annual quantities of

nitrogen from commercial fertiliser allowed in the soil are fixed in the Nitrates Directive without provision being made for deductions. In 2002, the European Court of Justice ruled against the Federal Republic of Germany (Case C-161/100) with the justification that EU law contained no basis on which to consider losses during the spreading process, the only allowable deductions being for losses during storage. The Nitrates Directive does not differentiate in its definition of the term spreading between the beginning and the end of the spreading process. It is not based on the quantities that actually find their way into the soil but on the quantities applied to the soil through spreading, injection into the soil, placement on the topsoil or mixing into the topsoil. The German Advisory Council on the Environment believes that this restrictive approach is in line with the meaning and purpose of the Nitrates Directive as regards preventing nitrate pollution of waters from agricultural sources.

341. The ruling of the European Court of Justice resulted in the regulation on the use of fertiliser being amended effective 20 February 2003. Losses which occur during spreading may no longer be taken into account when calculating total nitrogen quantities. The new national legislation will have a significant impact on livestock-intensive farms. The data contained in Table 3.7 shows the required minimum area (in hectares) for spreading 10,000 m³ of bovine slurry under the 'old' and 'new' laws on the use of fertilisers.

The comparison shows that proper implementation of the Nitrates Directive in Germany would have meant that at the start of the first action programme in 1996, farms with what had been deemed adequate land area would have either had to lease additional land or reduce the incidence of farm fertiliser overall by, for example, reducing the number of livestock kept.

3.3.3.4 Urban Waste Water Directive

342. Council Directive 91/271/EEC on urban waste-water treatment harmonises Community-wide the minimum requirements for wastewater treatment to reduce nutrient inputs from municipal wastewater and wastewater from certain industrial sectors. The Directive provides for preliminary treatment of municipal wastewater to be followed by secondary biological treatment. In the case of municipalities with a population equivalent of less than 2,000 inhabitants or of 10,000 where discharges into coastal waters occur, the requirement is merely for 'adequate treatment' of wastewater. The basic requirements of the Directive on collection, treatment, discharge and reuse of wastewater are either relaxed or tightened depending on whether an area is 'less sensitive' or 'sensitive'.

Table 3-7

Derivation of minimum area (ha) to spread 10 000 m³ of cattle slurry under Germany's 'old' and 'new' Fertiliser Ordinance (DüngeVO)

	Arable (≤ 170 kg N/ha)	**Pasture (≤ 210 kg N/ha)**
Formula I (old Fertiliser Ordinance)		
1. Total N collected: 10 000 m³ at 5.4 kg N/m³ = 54 000 kg N/a 2. 54 000 kg N – 10% storage loss = 48 600 kg N/a 3. 48 600 kg N – 20% spreading loss = 38 800 kg N/a 4. Area needed: 38 880/170 (arable) or 38 880/210 (pasture)	228.7	185.1
Formula II (new Fertiliser Ordinance)		
1. Total N collected: 10 000 m³ at 5.4 kg N/m³ = 54 000 kg N/a 2. 54 000 kg N – 10% storage loss = 48 600 kg N/a 3. Area needed: 48 600/170 (arable) or 48 600/210 (pasture)	285.9	231.4
Added area requirement		
ha	57.2	46.3
%	*25*	*25*

Source: After Landesanstalt für Landwirtschaft und Gartenbau Sachsen-Anhalt, 2003.

343. Sensitive areas include fresh waters and coastal waters that are already eutrophic or which will be at risk of eutrophication in the near future if protective measures are not taken. Under Article 5 (5) of the Urban Waste Water Directive, the additional provisions on sensitive areas must also be complied with in water catchment areas that contribute to their pollution. The Directive provides, at least in part, for catchment area-based management. This extension of the more stringent provisions of the Directive beyond sensitive areas themselves must be applied in practice and thus be integrated into the action programmes required under the Water Framework Directive (Para. 347).

344. Member States may designate as less sensitive areas 'marine waters in which the discharge of wastewater has no environmental impact due to morphological and hydrological conditions and specific currents'. Secondary treatment may be waived for discharges into coastal waters from municipalities with a population equivalent of between 10,000 and 15,000, and for discharges into estuaries from municipalities with a population equivalent of between 2,000 and 10,000. Discharges must merely 'minimise the adverse effects on the environment'. Given the imprecise wording and the difficulties regarding long-term predictions, this provision opens up significant scope for divergence from the basic requirements of the Urban Waste Water Directive. All wastewater discharges result in eutrophication of coastal waters and the oceans. The German Advisory Council on the Environment is thus of the opinion that 'less sensitive areas' do not actually exist.

3.3.3.5 Deficits in Germany's Implementation of the Urban Waste Water Directive

345. Germany was originally to apply the provisions of the Urban Waste Water Directive for sensitive areas on a nation-wide basis (TEUBER and PORT, 1991, p. 904). In practice, however, designation of sensitive areas was rather hesitantly effected at *Länder* (state) level. The result is that, in the meantime, the more stringent requirements of the Urban Waste Water Directive now apply to large areas of Germany (EU Commission, 1998). The German Advisory Council on the Environment also believes that the high nutrient concentrations would make it impossible to avoid at least large areas of Germany being designated as sensitive areas (SRU, 1996a, Para. 343).

346. Specific provisions on urban wastewater were contained in national legislation, particularly Article 7a of Germany's Water Management Act (WHG) in conjunction with the Wastewater Ordinance (AbwV) and general administrative regulations on wastewater management. Their implementation was deficient in that Germany's practice of sample taking when measuring nitrogen concentrations in wastewater outlets from sewage works with a population equivalent of over 100,000 did not provide comparable results. Also, studies showed that while Germany's requirements for wastewater treatment plants with a population equivalent of below 100,000 more or less complied with EU legislation, the Urban Waste Water Directive was tougher on plants with a population equivalent of more than 100,000 (NEITZEL and KLOPP, 1993, p. 956). The Wastewater Ordinance was amended immediately following the EU Commission's Treaty violation proceedings against Germany in May 2002. The remaining applicable general administrative regulations on wastewater management were abolished at the same time.

The monitoring threshold for total nitrogen concentrations has been reduced from 18 to 13 mg/l. The option to apply for a higher monitoring threshold of 25 mg/l N remains intact if the reduction in total nitrogen load is as least 70%. The German Advisory Council on the Environment nevertheless urges that use of the alternative of demonstrating a 70% reduction be made the exception and that priority be given instead to promoting the – technically attainable – observance of a maximum nitrogen concentration of 13 mg/l. What speaks for this approach is that up to now, no clear standards exist for demonstrating a 70% reduction as regards sample taking, measuring programme and calculation method. This means that the use of higher monitoring thresholds does not necessarily eliminate the existing deficit in Germany's implementation, at least not at present. The Wastewater Ordinance remains lacking in that the Council believes that the Urban Waste Water Directive sees the parameter 'nitrogen' as the sum of nitrate, nitrite, ammonium and organically compounded nitrogen. The latter is not covered by German law. In actual fact, concentrations of organic nitrogen in discharge from sewage plants are a significant 2 to 3 mg/l (SRU, 2004, Section 5).

3.3.3.6 Implications of the Water Framework Directive's Focus on Results

347. By taking in river catchment areas, the Water Framework Directive's broad management approach (SRU, 2004, Section 5) goes beyond the sectoral focus of the Nitrates and Urban Waste Water directives. It requires that nutrient inputs from all upstream and downstream tributaries be taken into account and governs all relevant uses. The provisions of the Nitrates and Urban Waste Water directives and their implementation at national level are required to be integrated into action programmes to be developed under the Water Framework Directive.

348. The Water Framework Directive's 'own' provisions on inputs from diffuse sources have marked shortcomings (SRU, 2002a, Para. 725; APPEL, 2001, p. 137). Measures towards a trend away from groundwater contamination are required under Article 4 (b) but have not – as yet – been finalised. The Water Framework Directive contains no actual strategy for nitrogen and phosphorus emissions from agriculture. This poses a challenge to those responsible for implementing the Water Framework Directive: in setting reductions for diffuse inputs by 2012 under Article 10, they must integrate agricultural activities as a key source of nutrient inputs while at the same time taking account of best environmental practice

(QUAST et al, 2002, p. 203 et seq.). If the directive's binding environmental quality targets cannot be met with stipulations based on other directives by 2015, timely action must be taken to decide on additional requirements. The action programmes may, for example, contain provisions on riverside buffer strips and other fertiliser bans that go beyond what is provided for in the action programmes developed under the Nitrates Directive and Germany's law on the use of fertiliser (SRU, 2004, Section 5).

This clear focus on results in the Water Framework Directive represents one key difference from existing EU and especially national law. Under future conditions, 'mere' reductions of nutrient inputs may not necessarily be enough – even if what the Nitrates Directive defines as available technology and good agricultural practice is observed.

The German Advisory Council on the Environment is aware that the fundamental problem in this regard is the lack of specific environmental quality targets for the different types of waterbodies. It is thus recommended that the criteria developed under the OSPAR Convention for identification of (potential) problem areas (Para. 326) be taken up and as negative assessment criteria quickly developed into a positive definition of good environmental and chemical status in coastal waters and estuaries.

349. As already outlined in the section on pollution of the marine environment (Para. 296), the German Advisory Council on the Environment also sees a need to point out the differences between the effective reach and the area of applicability of the Water Framework Directive, including for eutrophication: beyond the area of applicability of one nautical mile from the coastline seawards, the North and Baltic seas are indirectly protected by a reduction in land-based nutrient inputs under the Water Framework Directive. Management plans and action programmes are to contribute to protecting territorial and marine waters (21st Recital and Article 1 of the Water Framework Directive) so that in the case of nitrogen and phosphate – and parallel to pollutant inputs (Para. 297) – restrictions on nutrient inputs also focus on the sensitivity of the oceans and seas and not solely on the status of fresh waters and coastal waters. These are the only conditions under which the necessary coherence can be ensured with areas identified, irrespective of any nautical mile limit, as areas at risk under the Nitrates Directive and (potential) problem areas under OSPAR.

3.3.3.7 Nitrogen Inputs and Transportation

350. The causes of eutrophication in the North and Baltic seas include the large atmospheric depositions of nutrients, including those from transportation (Para. 107 et seq. and KOCH, 1996, p. 241 et seq.). Council Directive 70/220/EEC concerning the measures to be taken against air pollution by emissions from motor vehicles was enacted as early as in 1970 (see KOCH, 2003, Margin No. 69 et seq.). NO_x thresholds for heavy duty vehicles are contained in Directive 88/77/EEC. The emission thresholds contained in both directives have been tightened on a number of occasions. They were made binding in German legislation under Article 47 of the Road Traffic Act (StVZO) as part of vehicle approval. Emissions from land-based vehicles did reduce as a result, although the amount of the reduction has been partially 'compensated' for by the rise in the volume of traffic. A long term strategic and integrated policy on air pollution has been developed under the Clear Air for Europe (CAFE) programme (EU Commission, 2001e). The CAFE programme is due for completion by late 2004/early 2005. The EU Commission expects it to effect a 90% reduction in land-base NO_x emissions by 2010.

351. Council Directive (96/62/EU) of 27 September 1996 on ambient air quality assessment and management (Air Quality Directive), in conjunction with its daughter directive 1999/30/EU, lays down thresholds for sulphur dioxide, nitrogen dioxide, particulates and airborne lead. While input limits for nitrogen dioxide and nitrogen oxide in connection with human health will only become binding in 2010, an annual threshold of 30 $\mu g/m^3$ NO_x has been in effect since 2001 to protect vegetation. To ensure that area-specific limits are not exceeded, where appropriate the Member States must extend the 'necessary measures' (Article 4 of Directive 1999/30/EC) to road traffic (JARASS, 2003; SRU, 2004, Section 6).

352. Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (NEC Directive) sets out national emission ceilings (NECs) for certain atmospheric pollutants including NO_x. The NEC Directive also covers land-based transportation. The emission ceilings listed in Annex I to the Directive will become binding for the Member States by no later than 2010. A ceiling of 1,051 million Mg NO_x applies to Germany from 2010. Compared with original demands, the agreed ceilings remain considerable. The hot spot problems remain unsolved (SRU, 2004, Section 6).

353. The setting of binding emission ceilings for road traffic did not foster a similar trend as regards shipping. Shipping is without doubt a key contributor to emissions of sulphur dioxide and nitrogen oxides and concentrations and deposits of airborne pollutants in the EU. Necessary provisions on emission reductions have not been introduced (for a more in-depth review see Para. 381 et seq.). The EU Commission does, however, recognise the role of sea-based NO_x emissions. In its Communication towards a strategy to protect and conserve the marine environment (EU Commission, 2002a) it largely refers to the strategy for air pollution from shipping, which is in turn based for the most part on the planned marine protection strategy, the result being that the problem is not really addressed. The NEC Directive expressly excludes international shipping from its scope of application. Under the Air Quality Framework Directive, air quality is evaluated for the entire sovereign territory of the Member States. This means their emission ceilings for nitrogen dioxide and nitrogen oxides are also applicable at least to coastal areas.

3.3.4 Summary and Recommendations for Reducing Eutrophication

354. The political will expressed in ambitious provisions set out by the International Conference on the Protection of the North Sea and by OSPAR and HELCOM must be carried through to the adoption of practical measures both at EU and national level. The lack of coherence between the individual regulatory levels is no longer acceptable.

Reform of the Common Agricultural Policy (CAP) is needed that goes far beyond the compromise reached in June 2003. Above all, this means:

– The targets aimed at increased production contained in Article 33 (1) EC should be replaced with an environmentally focused wording.

– The marine environment protection targets must actually be integrated into agricultural policy (Article 6 EC).

– Payment of agricultural subsidies must be completely decoupled from production volume without broad exceptions.

– Modulation or reallocation of funding from the first to the second pillar of the CAP must take place in significantly greater scope than planned and in the longer term should replace the payments made under the first pillar.

The German Advisory Council on the Environment recommends that the German government actively pursue the above in further structuring of the CAP, particularly in light of the recently agreed changes. Also, the scope for national action currently allowed under the CAP must be exploited by making agricultural subsidies available where possible for environmental protection measures. National agro-environmental programmes developed under Regulation (EC) No. 1257/1999 must focus on environment and nature protection targets (for a more in-depth review see SRU, 2002b, Para. 401 et seq.; SRU, 2004, Section 4).

355. The Nitrates Directive and Germany's regulation on the use of fertiliser (Düngeverordnung) should be put into practice in coastal and marine waters. Eutrophic coastal and marine waters or those at risk of eutrophication must be identified and handled as areas at risk. Independent from any revision of the Nitrates Directive (which the German Advisory Council on the Environment deems necessary), Germany's action programmes should, for example, prescribe nitrogen concentrations that are significantly below 170 (cropland) and 210 (grassland) kg N per hectare and year if the respective local conditions and the conditions in the North and Baltic seas so demand. The provisions of the new regulation on the use of fertiliser must be strictly complied with.

The specific protection needs of both the North and Baltic seas should also be integrated into the action programmes to be developed under the Water Framework Directive. Where necessary, the competent authorities should agree targets in the action programmes that go beyond the actual requirements, especially as regards agricultural activities in river catchment areas.

Given that monitoring is often difficult in the agricultural sector, the German Advisory Council on the Environment calls for pending and future action programmes to be focused on fewer but more easily verifiable provisions that also serve water protection. Such 'enforcement friendly' and effective instruments include:

– Area-specific restrictions on livestock numbers.

– Year-round vegetation coverage with intermediate fruit crops and winter vegetation.

– Full reporting of the land available for use of farm fertiliser.

– At least on farms with large livestock numbers, systematic implementation of storage systems for storage of farm fertiliser during the winter, based on subsequent orders under Articles 17, 5 (1) Item 3 of the Federal Immission Control Act (BImSchG) to ensure proper disposal of waste.

– A widespread ban on ploughing of grassland.

356. Only adequate funding of environmental protection measures can prevent farmers' attitudes to this approach from becoming (further) cemented. Advice, training and cooperation play a key role. Great fluctuation is evident in the use of nutrients in conventional farming (HEGE, 2003) so that progress largely depend on individual farm managers and their expertise. There is thus a need for appropriate assessment of nutrients to gain clarity as to the situation on each individual farm. The German Advisory Council on the Environment expressly supports further development of EU-wide harmonisation of budgeting models (Para. 231).

357. Wastewater from smaller municipalities is often heavily contaminated with phosphates and nitrogen. Overall, for reasons of prevention, better wastewater treatment with nutrient reductions as called for under the Urban Waste Water Directive should become the norm. The option to identify less sensitive areas must be abolished. The German government should call for a corresponding change to the Urban Waste Water Directive. At national level, the Council lays great store in nationwide compliance with the 13 mg/l concentration limit for nitrogen contained in the Wastewater Ordinance.

358. Emissions from shipping are in urgent need of regulation. Standards at sea must no longer be allowed to lag so blatantly behind those for land-based emissions. While under the NEC Directive there are plans to reduce land-based NO_x emissions EU-wide to 6.5 million Mg by 2010 (compared with 13.4 million Mg in 1990), shipping-related inputs are expected to increase by 2010 by between 4.01 million Mg and 4.6 million Mg (based on growth of between 1.5% and 3% from to 2.8 million Mg in 1990) (Para. 108). The trend would thus run in the completely opposite direction. Reference is made to Para. 381 et seq. for solutions to the associated problems.

3.4 Protection from Shipping-Related Pressures and Risks

3.4.1 Current Status

359. The shipping lanes along the German coast are some of the busiest in the world. This is equally true of the German Bight, the entrance to the Port of Hamburg, both ends of the Kiel Canal and the Kadet trench in the Baltic south of the Gedser Reef. Transit shipping in the North Sea involves some 48,000 ship movements per year. For the Baltic, transit shipping is estimated at around 30,000 ship movements annually (BRENK, 2003a, p. 107). Shipping in the North and Baltic seas is expected to rise significantly in the coming years (Para. 105). HELCOM predicts a 25% increase in the risk of heavy oil spills in the Baltic (HELCOM, 2003e).

Apart from shipping accidents, ongoing pollution caused by discharges of operating and load residues from ships and the dumping of ships' waste continues to play a key role in the marine environment, as do atmospheric emissions of sulphur dioxide and nitrogen oxide from the burning of shipping fuel (Para. 107 et seq.). Finally, shipping is responsible for the introduction of non-native species into the North and Baltic seas (Para. 110 et seq.). While shipping-related risks from operational activities are perhaps less spectacular than those associated with shipping disasters, the extent of their impact exceeds any accident-related threat in either the North Sea or the Baltic. The German Advisory Council on the Environment thus believes it is time to heighten public awareness to the mounting pollution of the oceans and seas.

3.4.2 Multi-level Governance and Shipping

3.4.2.1 Flag State Principle and the Right to Innocent Passage

360. By their very nature, shipping and its regulation are of an international character. The enhancement of shipping safety and the fight against heavy pollution of the oceans and seas are dependent on international cooperation. Nevertheless, the key issue remains freedom of transit and the right to innocent passage. Solutions developed under the auspices of the International Maritime Organisation (IMO) involve long and drawn out decisionmaking processes, and the trend towards 'cheap flags' only exacerbates the situation. International responses to the sinking of the Torrey Canyon off the coast of the Scilly Isles in 1967 included:

– The 1972 London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (as amended by the Protocol of 7. 11. 1996)

– The 1973 International Convention for the Prevention of Marine Pollution from Ships, supplemented by a 1978 Protocol (MARPOL 73/78)

– The 1974 International Convention on the Safety of Life at Sea (SOLAS), also supplemented by a 1978 Protocol.

A framework for the management of shipping worldwide is provided by the 1982 Convention on the Law of the Seas (Law of the Sea Treaty) which only entered into force in 1994. The Law of the Sea Treaty is based on the principle that shipping standards are primarily a matter for the respective flag states (known as the flag state principle). Flag states are thus responsible for the safety of ships that either fly their flag or are entered in their register. If requested by another state, a flag state must investigate any and all violations committed by a ship flying its flag. Measures against ships flying foreign flags are only permissible under the Law of the Sea Treaty if they are restricted to the territorial waters of the respective coastal states. If a port state detects a violation of international rules and standards on seaworthiness by a vessel in one of its ports and that infringement threatens to damage the marine environment, the state must, as far as practicable, take administrative measures to prevent the vessel from sailing (Articles 219, 228 of the Law of the Sea Treaty). Coastal states also have authority to monitor compliance with, for example, MARPOL regulations within their exclusive economic zones (EEZs) (Article 211 (5) Law of the Sea Treaty). However, coastal states have so far made little use either of this authority or of the powers, conferred under Article 218, to prosecute pollution on the high seas, effectively on behalf of the international community (KÖNIG, 2003, p. 93 et seq.). The German Advisory Council on the Environment is aware that intensive monitoring is dependent on the availability of appropriate staffing and funding. The Council nevertheless sees – especially in a European context – quantitative and qualitative expansion of monitoring as a key tool to, at least partially, combat inadequate controls, particularly in 'cheap flag' countries. In practice, many flag states are either unable or do not want to exercise control over ships under their jurisdiction (KÖNIG, 2002, p. 39; 2003, p. 97; ERBGUTH et al., 2002, p. 240). What must not be overlooked, however, is that shipowners from EU states also sail their vessels under the flags of Liberia, Panama, the Bahamas and the EU accession countries Cyprus and Malta. A large number of vessels controlled by European shipping companies sail under third-country flags purely for tax reasons and thus make both a significant contribution to the problems involving those countries and to an increase in shipping-related risk.

3.4.2.2 EU Legislation and its Increasing Impact on International Provisions

361. Although international law has long allowed individual states and the EU the scope to adopt measures in their coastal waters and ports, it was quite some time before legal provisions on shipping came into effect at EU level proper. Following the Amoco Cadiz disaster off the coast of Brittany in 1978, the Member States called for the EU Commission to implement measures for monitoring and reducing oil spills at sea. While the initial response was to develop ambitious proposals, the end result was merely declarations and resolutions aimed at encouraging the Member States to ratify international agreements already in existence. It was only in 1993 that the

Council of Ministers agreed the development of a common policy on shipping safety. The resulting EU provisions largely involved:

– Minimum requirements for ships entering or departing EU sea ports carrying dangerous or polluting goods.

– Common regulations and standards on the organisation of shipping monitoring and ships' inspections, and appropriate measures by the marine authorities.

– Minimum requirements for the training of ships' crews.

In a similar way to the Directive on Port State Control (95/21/EC), these requirements are primarily to be seen as the implementation of international provisions and not as an EU initiative.

362. A large proportion of the EU fleet trades exclusively between third-country ports (EU Commission, 2000b, p. 6). Thus much consideration is given to how EU-level measures against shipping might negatively affect the EU fleet in the rest of the world. For this reason, Germany and the Netherlands have, for example, lobbied against a further tightening of the EU Directive on Port State Control, instead calling for an appropriate initiative from the International Maritime Organisation (KÖNIG, 2002, p. 52; NÖLL, 1999, p. 474). Overall, the EU Commission sees a tendency among its Member States to want to avoid mandatory provisions as soon as the incentive derived from an accident has petered out (EU Commission, 2000b, p. 4). The sinking of the Erika in 1999 and the Prestige in 2002 was obviously what drove the fundamental changes in shipping regulation at EU level, the result being the EU Commission's Erika I Package (EU Commission, 200b) which contained a number of proposals aimed at preventing the recurrence of such accidents. Those proposals were then supplemented by the Erika II Package (EU Commission, 2000c) and further tightened following the sinking of the Prestige (EU Commission, 2002k, 2003g), (Table 3.8).

These EU provisions, and especially those on phasing out single-hull tankers, have had a huge impact at international level (Para. 369). The introduction of a flag state code called for by the EU Commission and a mandatory (external) auditing process for flag states have now at least become a subject of IMO negotiations (ERBGUTH et al., 2002, p. 239 et seq.).

Table 3-8

Overview of EU action following the sinking of the Erika (1999) and the Prestige (2002)

Erika I package (March 2000)	Port State Control Directive (95/21/EC) reinforced by Directive 2001/106/EC	Entered into force 22 July 2003
	Classification Societies Directive (94/57/EC) reinforced by Directive 2001/105/EC	Entered into force 22 July 2003
	Regulation (EC) No 417/2002 phasing out single-hull tankers	Entered into force 27 March 2002
Erika II package (December 2000)	Vessel Traffic Monitoring and Information system Directive (2002/59/EG)	In force from 5 February 2004
	Establishment of a European compensation fund	Not taken up, but is providing impetus for additional international fund
	Establishment of the European Maritime Safety Agency	Entered into force 24 August 2002
Action following the sinking of the Prestige (December 2002 and March 2003)	Phasing-out further accelerated and transport ban imposed on fuel oil in single-hull tankers by amendment of Regulation (EC) No. 417/2002	Entered into force 21 October 2003
	Proposal for a directive on ship-source pollution and the introduction of sanctions, including criminal sanctions, for pollution offences	Currently being discussed.

SRU/SR 2004/Tab. 3-8

3.4.2.3 'Subordinated' National Level

363. In accordance with the provisions of the Law of the Sea Treaty, Germany extended its coastal waters in both the North Sea and the Baltic to 12 nautical miles in 1994. It also set up an Exclusive Economic Zone (EEZ) in both seas in early 1995. In international shipping, national regulations take a subordinate role because they only cover vessels flying the respective nation's flag and allow no jurisdiction over foreign vessels. Greater cooperation in EU activities also limits the scope for initiative at purely national level. Germany has, however, standardised the reporting requirements in its Ordinance on Vessels Entering German Territorial Waters (Anlaufbedingungsverordnung) for vessels carrying dangerous or polluting goods either in bulk or in packaged form that either enter or leave German ports. Provisions on the mandatory use of a pilot for routes into and out of ports in German territorial waters are based on Germany's Marine Pilot Act (Seelotsengesetz), and an agreement has been reached with the Netherlands on segregation of shipping traffic in the Terschelling-German Bight area of the North Sea. Germany has also recommended to the IMO that a transit route through the entire Baltic Sea be established for tanker ships (EHLERS, 2003).

3.4.3 Measures for Increased Shipping Safety

3.4.3.1 Port State Control and Classification

364. The Hague Memorandum of Understanding on Port State Control (Hague MOU) was agreed in 1978 in response to the sinking of the Amoco Cadiz earlier that year. It was replaced in 1982 by the Paris Memorandum of Understanding on Port State Control (Paris MOU). Germany is one of 20 signatory states to the Paris MOU, which requires shipping authorities to inspect 25% of the average number of vessels entering their ports and to forward the information to a database. Highest priority must be given to inspecting vessels registered under a flag on the Paris MOU's 'Black List' (Table 3.9).

Table 3-9

Paris Memorandum of Understanding on Port State Control
Black List

Flag state	Inspections 2000–2002	Detentions 2000–2002	Category
Albania	126	69	Very high risk
Bolivia	76	40	
Sao Tome and Principe	97	46	
Tonga	103	41	
Lebanon	237	77	
Algeria	200	61	
Korea, Democratic Republic	43	16	
Honduras	226	68	
Cambodia	911	230	
Georgia	212	56	
Turkey	2 440	545	
Syrian Arab Republic	394	89	
Libyan Arab Jamahiriya	57	16	
Romania	170	37	
Belize	358	71	
St Vincent & Grenadines	2 365	403	High risk
Morocco	201	39	
Ukraine	748	100	Medium to high risk
Egypt	209	30	Medium risk
Panama	5 213	541	
Malta	5 000	481	
India	209	24	
Bulgaria	293	32	
Tunisia	44	7	
Cyprus	3 991	347	

Source: After Paris MOU, 2002, p. 24: Black List

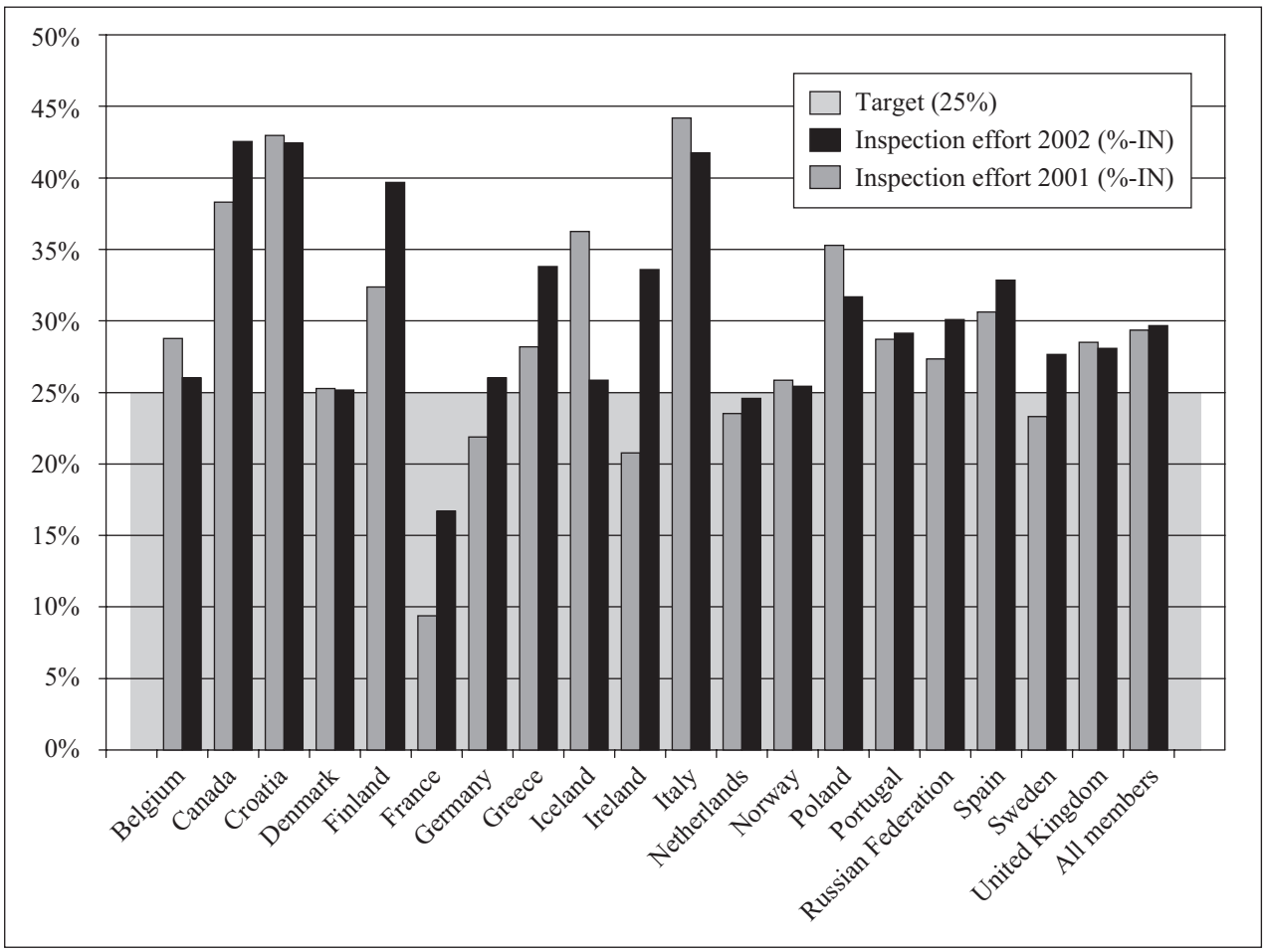
Some seven port state agreements have since been entered into around the world, all of which are based on the Paris MOU (HOPPE, 2000). Baltic riparian states are also required to carry out appropriate controls under the Helsinki Convention.

EU law goes beyond international requirements in that the EU Directive on Port State Control prescribes that at least 25% of the average number of ships entering Member State ports be inspected. Based on the Paris MOU, priority must be given to inspecting potentially sub-standard vessels. What actually appears to happen is that, in some ports, a concerted effort is made to inspect only younger ships in order to fulfil the 25% requirement while keeping inspection activities simple (KÖNIG, 2003, p. 95). In some instances control quotas have been and still remain well below the 25% minimum. Since 2002, both Ireland and France have been taken before the European Court of Justice for violations of the Directive. And while the 25% requirement was met in German ports in 2002, the situation was somewhat different in 2001 (Figure 3.1).

365. The provisions contained in the Directive on Port State Control were tightened on 22 July 2003 as a result of the Erika I Package. As soon as the implementation period had expired, the EU Commission immediately started violation proceedings against all Member States – except Denmark, France, Germany, Great Britain and Spain – for non-compliance with the implementation requirements (EU Commission, Press Release IP/03/1116). The new rules still provide for a minimum 25% control quota for vessels from EU ports, although they now clearly prescribe which vessels inspectors should give priority to and in which order of priority they are to be inspected. Another new aspect is closer scrutiny, regardless of any suspicion, of potential risk vessels in cases where more than 12 months have passed since the most recent thorough inspection. Under the new Article 7b, information on substandard vessels is to be gathered every six months. Vessels registered under a flag on the Paris MOU's Black List that have been refused entry to a Community port more than twice in the past two years are to be denied entry thereafter to EU waters. The same applies to vessels registered under a blacklisted flag and classified as 'very high risk' or 'high risk' that have repeatedly been detained in a port during the past three years.

Figure 3-1

Inspection efforts of member states of the Paris Memorandum of Understanding on Port State Control 2001 and 2002



Source: Paris MOU, 2002, p. 22

Compared with the original version of the 1995 Directive on Port State Control, which merely stated that entry 'should' be denied, mandatory denial of port entry signals a significant tightening of the provisions (RINGBOM, 2001, p. 271). It is similar to the US's 1990 Oil Pollution Act, which came in response to the sinking of the Exxon Valdez in 1989. The EU has since published a list of 112 vessels which, if inspected after 22 July 2003 and seen as a risk, would no longer be granted entry to a Community port (see Annex II for the list). These 'transparency' measures are aimed at encouraging shipowners, shipbuilders and flag states to immediately comply with the tighter shipping safety standards.

366. The German Advisory Council on the Environment welcomes these provisions. Their effectiveness is, however, reliant on the availability of an appropriate number of inspectors to allow inspection of 25% of vessels in a given port. The Member States must also guarantee an adequate number of inspections to ensure that individual ports or entire Member States do not become 'convenience ports'. The Council also wishes to point out that the 112 vessels named by the EU Commission make up only a fraction of the actual (potential) number of risk vessels. For example, more than 3,400 single hull tanker ships worldwide were built more than 20 years ago (Para. 369). The Commission's list must not be allowed to result in less attention being given to the risk potential of vessels it does not actually name.

367. Another consequence of the sinking of the Erika is that Directive 94/57/EC on classification societies now contains more stringent provisions. This includes the introduction of EU-wide recognition of (private) classification societies which inspect vessels on behalf of shipbuilders to obtain flag state classification. The system aims to combat the increasing commercial nature of classification societies and the resulting variation in their quality standards. A trend has been observed among shipowners in that they tend towards 'comfortable' inspection organisations (ERBGUTH et al., 2002, p. 241). This is of key importance in that port state control allows only limited options for inspection of cargo and ballast areas and it is almost impossible for public inspectors to inspect the parts of a ship that are below the water line. The work performed by the classification societies is indispensable. For example, in January 2003 alone, the grounds for detaining two ships in German ports lay solely within the scope of responsibility of the participating classification societies (BMVBW, Press Release 055/03).

368. Both the tightening of the Directive on Port State Control and the amendment to the Directive on Classification Societies have been transposed into German law under the Fourth Ordinance on the adjustment of technical and fiscal conditions in shipping to international standards (4. Schiffssicherheitsanpassungs-Verordnung).

3.4.3.2 Phasing Out Single Hull Tankers

369. The proportion of double hull tankers in the global tanker fleet is shown in Table 3.10. Figure 3.2 illustrates the number of single hull tankers built more than 20 years ago.

Table 3-10

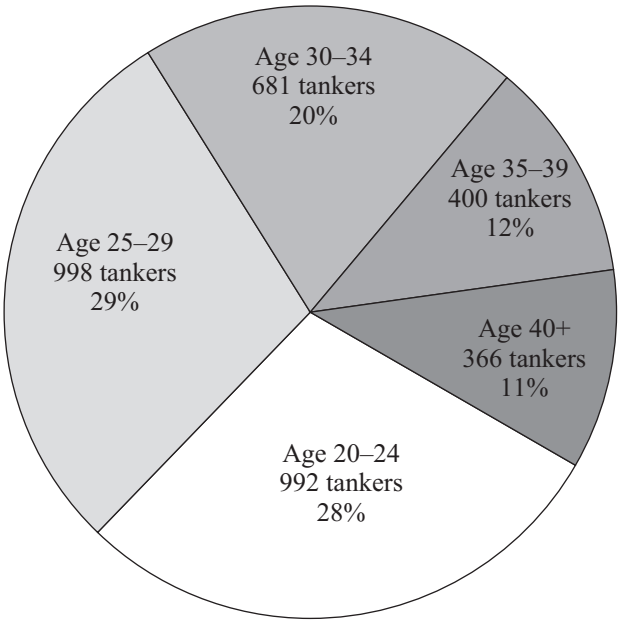
Oil tanker fleet as of 1/1/2000: Proportion of double-hull tankers

Size (t deadweight)	Number of tankers	Double-hulled tankers	
		Absolute figures	Percentage
< 5 000	2 249	32	*1.4*
5 000 – 20 000	1 155	296	*25.6*
20 000 – 80 000	1 538	424	*27.5*
80 000 – 200 000	975	417	*42.8*
> 200 000	493	164	*33.3*
Total	**6 410**	**1 333**	***20.8***

Source: After Intertanko, 2002

Figure 3-2

Number and percentage of single-hull oil tankers aged 20 or older



Source: Greenpeace, written communication, 2003

370. Arrangement to phase out single hull tankers illustrate the growing tendency for international standards to be influenced by regional requirements. The EU acts as a driver for global development of more stringent shipping safety provisions: at international level, the International Maritime Organisation only introduced legislation on the gradual phase-out of single hull tankers in 1992 as a response to requirements contained in the US's 1990 Oil Pollution Act. Annex I to the MARPOL Convention required that ships of this type be phased out by 2026. The IMO tightened the provisions in 2001 in response to a proposal contained in the EU Commission's Erika I Package. Single hull tankers classified under the MARPOL Convention into one of three categories according to age, capacity and availability of protective tanks for separated ballast are now to be phased out by no later than 2015 and not by 2026 as previously required. Under certain circumstances, the IMO decision provides for an exception and allows their use until 2017. However, the HELCOM contracting parties, among others, have declared that they do not intend to make use of the IMO excepted deadline for vessels registered under their flags. And from 2015, they will refuse both entry to their ports and anchorage for vessels flying the flags of non-HELCOM countries that make use of the softening provision up to 2017 (HELCOM, 2001c). On 4 December 2003, the contracting parties agreed to phase out Category 1 vessels by no later than the end of 2005. With the exception of single hull tankers with partial double hulls (which may be used until 2015), single hull tankers in Category I and II will be phased out by 2010 depending on their year of commission. Single hull tankers without partial double hulls may remain in operation up to 2015 if, after assessing the results of the internationally agreed status evaluation system, national administrations allow their use and the vessels will not reach the age of 25 before the deadline.

371. At EU level, Regulation (EC) No. 417/2002 on the accelerated phasing-in of double hull or equivalent design requirements for single hull oil tankers was approved in February 2002 with direct effect in all Member States. It was further tightened in October 2003 following the sinking of the Prestige. The regulation still covers all oil tanker ships of 5,000 Mg capacity and above that enter either a port or anchorage under Member State jurisdiction, irrespective of which flag they fly, and those flying a Member State flag. While single hull tankers in Category 1 were originally to be phased out from 2007, and from 2015 for Category 2 and 3 vessels, a decommissioning rule on Category 1 single hull tanker ships now requires their phase-out by no later than 2010 depending on their year of commission. This does not include Category I and II single hull oil tanker ships with partial double hulls – these may be kept in operation until 2015 on the condition they do not reach the age of 25 before the deadline. Vessels registered under third-country flags will be refused entry to Community ports after the deadlines mentioned. Compared with the international agreement, EU legislation is slightly tighter as regards Category II and III vessels. The German Advisory Council on the Environment believes that a ban from 2010 on entry to Community ports for single hull tanker ships in this category is compatible with international law. Under Article 211 (3) and Article 25 (2) of the Law of the Sea Treaty, states have the sovereign right to decide on the conditions under which a vessel may enter their ports. Both the Treaty and the Convention on the International Regime of Maritime Ports provide for no more than an entitlement to equal treatment. MARPOL provisions on control authority for coastal and port states could be construed as requiring that international standards be accepted as the rule, making any stricter European restrictions on entry unlawful. It is evident, however, that the international provisions are less than optimal and that international law should be interpreted so as to attain an optimum. More stringent standards at regional level could serve as the basis for such optimisation. Rather than being static, international law has a dynamic structure which allows further development. This is well illustrated in the interrelationships between the internationally enforced phasing-out of single hull tanker ships and the provisions of EU legislation. Also, US rules requiring phase-out by 2010 and 2015 respectively have long been accepted by EU Member States (EHLERS, 2003) and EU efforts at the Joint OSPAR/HELCOM Ministerial Meeting in June 2003 were expressly welcomed by environment ministers from some 21 countries, including several non-EU states.

372. Apart from a phasing-out provision, the amended Regulation No. 417/2000 requires that heavy oil be transported exclusively in double hull tanker ships. The transport ban on heavy oils applies to oil tanker ships with 600 Mg capacity and above.

3.4.3.3 Training of Ships' Crews

373. The technical opportunities available in making ships safer must not serve as a smoke screen for the human factor. On the one hand, human error plays a role in around 80% of shipping accidents (IMO, 2003b). On the other, a well-trained crew is the best means of ensuring early detection of technical difficulties and implementation of appropriate measures to prevent an accident. In 1995, the International Maritime Organisation tightened the provisions of the 1978 International Convention on Standards of Training, Certification and Watchkeeping (STCW). As of 2002, ships' crews must be trained in accordance with the Convention and carry proof of their qualifications. The less stringent standards of 1978 still apply for 'old' crews, meaning those trained before 2002. The requirements of the 1995 STCW Convention were transposed into EU law with Directive 2001/25/EC on the minimum level of training of seafarers.

374. The IMO published a 'white list' of states that met STCW training requirements. The white list is, however, merely based on the states providing information that records their full compliance with STCW requirements. In other words, the IMO does not actually carry out controls in individual countries or places of training.

The German Advisory Council on the Environment is aware that it is practically impossible to carry out controls on a global basis. Given the extremely comprehensive nature of the white list – it currently contains 109 of the 162 IMO contracting parties, including the Philippines (IMO, 2003c) – the Council believes that control mechanisms are needed in addition to mere provision of information. This especially applies to (European) societies who have re-flagged their vessels to sail under 'cheap flags': they must finally accept their responsibility and in each case ensure by thorough inspections of, say, certificates, that their ships actually comply with both EU and international minimum training requirements.

3.4.3.4 Safe Navigation

375. The IMO introduced a requirement in 2002 for ships to be fitted with 'black boxes' and automatic identification systems (AIS). Following an amendment to Annex V to the International Convention for the Safety of Life at Sea (SOLAS) in 2002 (Para. 360), all new vessels with a gross tonnage of over 300 must be equipped with AIS. All other vessels must be fitted with AIS by 2004. A general equipment obligation has been in effect for tanker ships since July 2003. AIS allows automatic exchange of information from ship to ship and from ship to shore. Compared with earlier radar-based control systems, AIS has the benefit that each ship is recognised by a unique identification code (EHLERS, 2002b, p. 93).

In response to the Erika II Package, Directive 2002/59/EC establishing a Community vessel traffic monitoring and information system (Vessel Traffic Monitoring and Reporting Directive) made the IMO provisions on AIS transponders and black boxes binding EU-wide. The Directive goes beyond international requirements in that it elevates black boxes to the required standard for a greater number of vessels and ship types (RINGBOM, 2001, p. 280). It also contains broader reporting obligations for vessels to use AIS and requires more comprehensive (electronic) exchange of shipping data between the Member States. Vessels that fail to comply with the Vessel Traffic Monitoring and Reporting Directive, those without a black box by the prescribed deadline for example, are refused entry to all EU ports. For the Baltic region, the contracting parties to the Helsinki Convention have agreed that traffic monitoring systems must be expanded to use AIS by July 2005. Germany plans to expand maritime traffic monitoring to cover its entire sovereign territory and its EEZ using AIS. Denmark and Germany have also agreed to use an AIS-based monitoring system for the Kadet trench (EHLERS, 2002b, p. 93).

376. As yet, there is no general obligation to use a marine pilot. An obligation of this type could only be implemented on the basis of an international agreement under the IMO, as is the case with the establishment of deepwater routes and traffic segregation areas outside territorial waters. The IMO has not even gone so far as to introduce mandatory use of a marine pilot for specific sea areas, probably because it would set a precedent for other sea areas. Two IMO resolutions from the 1980s do, however, contain recommendations for access routes to the Baltic. While around 96% of vessels comply with both IMO resolutions, the remaining 4% often pose a safety risk (EHLERS, 2002b, 2003). Against this backdrop, the German government should continue to push for mandatory use of a pilot in at least the difficult-to-navigate areas at the entrance to the Baltic and in the Kadet trench, as is already provided for in the Federal Transport Ministry's eight-point plan (BMVBW, 2003). Mandatory use of a marine pilot would allow coastal states powers of authority outside their territorial waters. Given that shipping accidents have disastrous consequences, the German Advisory Council on the Environment sees an urgent need to adopt measures as early and as widely as possible to protect coastal areas (EHLERS, 2003). Protection of this kind begins beyond coastal waters; the 'right to innocent passage' would not be disproportionately affected considering the significant risk potential, particularly from smaller vessels.

377. IMO guidelines allow designation of particularly sensitive sea areas (PSSAs). The Wadden Sea area of the North Sea was recognised as a PSSA in October 2002. The Wadden Sea is now one of five PSSAs worldwide. Designation as a PSSA serves the prevention of accidents, wanton pollution and encroachments on habitats. PSSAs are shown on maritime charts to illustrate where ships' crews are required to exercise particular care, although designation does not in itself have any direct legal implications for shipping traffic. Rather, the respective states must first apply to the IMO for permission to adopt additional safety measures and they must justify their grounds for the application (EHLERS, 2002b, 2003; LAGONI, 2002). Apart from restricted and traffic segregation areas, mandatory use of a marine pilot is

another protective option to be considered in a PSSA. In designating the Wadden Sea under the IMO, the Danish, German and Dutch transport ministers declared that no new preventive measures would be developed to deal with the risk from shipping because adequate protection measures were already in place (ERBGUTH et al., 2002, p. 232). This ruled out from the very start any opportunity to exploit the scope allowed under PSSA designation. The German Advisory Council on the Environment therefore urges the German government to revoke its stance on this issue and, at minimum, begin an evaluation process.

Opposition from Russia halted a joint application by the HELCOM contracting parties to designate the Baltic Sea as an IMO PSSA. The remaining HELCOM states have since applied to the IMO Marine Environment Protection Committee (MEPC) to have the Baltic designated as a PSSA to the exclusion of Russian territorial waters. The applicant states have reserved the right to apply measures associated with the designation within the prescribed two-year period.

3.4.4 Measures to Prevent Cumulative, Shipping-Related Pollution of the North and Baltic Seas

3.4.4.1 Preventing Discharges of Operating and Cargo Residues and the Dumping of Ship-Generated Waste

378. International law is of key importance when it comes to gradual or chronic, meaning non-accident related, pollution caused by shipping traffic. Annex 1 to the MARPOL Convention governs prevention of pollution in the marine environment by oil and oily mixtures. The Baltic region and North-East European waters, including the North Sea, have been classified and designated as special areas under Annex 1 (Oil) of MARPOL. Discharge of oil or oily mixtures from oil tanker ships and from other vessels with a gross registered tonnage (RT) of 400 or more is prohibited. Ships that are not tankers and have a gross registered tonnage of less than 400 may discharge oil in the North and Baltic seas if the oil content of the discharge before dilution does not exceed 15 ppm (LAGONI, 1998). Annex 2 of MARPOL covers monitoring of marine pollution by noxious liquid cargos. Depending on their degree of harmfulness, substances are classified into four groups (A-D) relative to the risk they pose, if discharged, to marine resources, human health and other legal uses of the oceans and seas. The Baltic is also a special area under Annex 2 and is thus subject to stricter regulation of noxious liquids than the North Sea. Annex 3 of MARPOL governs prevention of pollution by harmful substances transported in packaged form or in containers. Provisions on prevention of pollution by ships' ballast water are contained in Annex 4. Finally, Annex 5 governs prevention of pollution by ship generated waste. The North and Baltic seas are recognised as special areas under Annex 5 which prohibits the dumping of plastics and all other types of waste.

The MARPOL Convention places contracting parties under obligation to provide adequate reception facilities for the disposal of operational and cargo residues and ship generated waste.

379. Despite these comprehensive and detailed provisions, the current situation remains highly unsatisfactory. Infringements of MARPOL Annexes 1, 2, 3 and 5 increased by 18% over the period 1999 to 2001 (Paris MOU, 2002, p. 14). A slight reduction (6%) occurred in 2002 (Paris MOU, 2003). In many instances, operational discharges of oil by ships, including tank washing and disposal of used oil, remain standard practice in both the North and Baltic seas (see also LIERSCH, 1998). In 2002, aerial surveillance detected 389 oil spills in the Baltic and 596 in the North Sea (Para. 83; Bonn Agreement, 2001).

380. It was only in March 2003 that the EU Commission issued a proposed directive on binding implementation of Annexes 1 and 2 to MARPOL (EU Commission, 2003h). However, since 2002, Member States have been required by Directive 2000/59/EC on port reception facilities to ensure that reception facilities for ship generated waste and cargo residues are available in their ports. Ships entering EU ports are under obligation to make use of the facilities. Germany implemented the provisions, including the associated fee structure and port waste management plans, in January 2003 in the form, for example, of the Hamburg and Bremen regulations on port reception facilities for ship generated waste and cargo residues. It remains to be seen, however, to what extent mandatory requirements for the provision and use of reception facilities in EU ports will result in fewer infringements of MARPOL regulations. An element of doubt exists in that violation proceedings have commenced against eight Member States (Austria, Belgium, Finland, France, Great Britain, Italy, the Netherlands and Portugal) on the grounds of inadequate implementation measures. Without adequate reception facilities, the situation in the North and Baltic seas will hardly improve to any significant degree. Considerable problems exist in monitoring the seas and tracing a discharge to a specific vessel. Only a small number of vessels that make illegal discharges into the sea are identified and the number of those actually prosecuted is extremely low (EU Commission, 2003h, p. 2). Both in terms of deadlines and funds, waste disposal in ports must be structured so that it provides no incentive whatsoever to take a risk and thus chance being prosecuted. This naturally requires a much harder approach to investigation and prosecution of illegal discharges. Violations that can be traced to a specific vessel must be pursued in such a rigorous fashion that it acts as a deterrent to those who might be willing to take the risk. The Directive on Port State Control plays a supporting role in this regard. It aims to prevent the dumping of waste at sea by requiring that, during each and every inspection, logbooks and documents concerning oil be checked in addition to other papers and, in the case of irregularities or doubt, either further inspections be made or the vessel be detained. Port state controls must be structured accordingly.

3.4.4.2 Atmospheric Emissions from Shipping

381. Atmospheric emissions from shipping remain largely unregulated despite the release of large quantities of SO_2, NO_x, greenhouse gases and other substances that damage the ozone layer (Para. 107 et seq.). Germany does not even allow bunker oil (often used as shipping fuel) to be used in road coverings (BRENK, 2003a, 2003b). While the NEC Directive aims to achieve significant reductions in land-based SO_2 and NO_x emissions, the exact opposite effect is expected in shipping. Contrary to the trend on land, sea-based SO_2 and NO_x emissions are expected to rise considerably (Para. 108).

382. Issued in 1997, Annex 6 to the MARPOL Convention prescribes a general 4.5% limit on sulphur content in heavy oil used in shipping. The Baltic Sea is to be designated as a SO_x Emission Control Area (SO_x ECA), where fuel used by ships must be below 1.5% sulphur or equivalent abatement technologies used.

As regards NO_x emissions, Annex 6 stipulates a limit for diesel engines with an output in excess of 130 kW, according to the rated engine speed. The NO_x values are already seen as inadequate (EU Commission, 2002I, p. 13) because they do not fully exploit available technological opportunities. The German Advisory Council on the Environment wishes to point out that back in 1984, Germany's Federal Administrative Court found that the requirement for land-based oil burning facilities to burn only oil with less than 1% sulphur content was legal. The decision was based on precautionary grounds. The court justified its decision with the fact that prevention must combat the outcomes associated with broad distribution of emissions if they can be expected to result in a general increase in air pollution in areas at considerable distances from the emission source (BVerwGE Judgement 69, 37, 42 et seq.).

383. This loophole regarding atmospheric emissions from shipping has yet to be closed at EU level. There appear to be no immediate plans to introduce any provision on atmospheric NO_x emissions from shipping. The NEC Directive expressly excludes international shipping from its scope of application. Directive 1999/32/EC relating to a reduction in the sulphur content of certain liquid fuels prescribes that gas oil used by shipping in Member State territories may not exceed 0.2% sulphur from 2002 and 0.1% from 2008. The Directive is thus deficient in that it contains no provisions for sulphur content in the bunker oils that play such a key role in pollution. Thus, in November 2002, the EU Commission issued a proposal to amend Directive 1999/32/EC in which a sulphur limit of 1.5%, based on Annex 6 to MARPOL, would be introduced for shipping fuel used in the English Channel and in the North and Baltic seas. The limit would apply twelve months after the entry into force of Annex 6 to the MARPOL Convention or twelve months after the Directive's entry into force. Member States would also be required to ensure that no shipping diesel in excess of 1.5% sulphur content is sold within their sovereign territory.

3.4.5 Liability, Compensation and Sanctions

384. In cases of accident-related or 'operational' oil pollution involving oil tanker ships, liability and compensation is subject to the provisions of the International Convention on Civil Liability for Oil Pollution Damage (Oil Pollution Convention as amended in 1992) and the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (Fund Convention as amended in 1992). Both conventions started out as a response to the sinking of the Torrey Canyon in 1967. The liability system prescribed in the conventions provides for liability by registered shipowners and a fund, financed by contributions from the oil industry, to provide additional compensation to victims of oil pollution damage who are not fully compensated by shipowners. Shipowners are liable for damage, regardless of fault, caused by the leakage or release of oil from a vessel in territorial or coastal waters or the EEZ of a contracting state. However, the international liability system is characterised by the fact that it focuses on compensating victims and places the causer's personal liability in the background, and shipowners are able to limit their liability and appear to do so in all cases (EU Commission, 2003h, p. 6; RINGBOM, 2001, p. 275). The system also excludes claims against freighting companies, ship fitters and ship operators for compensation for pollution damage. Overall, the liability system outlined above provides little economic incentive. Fostered by an initiative contained in the EU Commission's Erika II Package, the International Maritime Organisation decided to set up an additional fund in 2003. Also financed by contributions from the oil industry, the fund raises the amount of available compensation from EUR 200 million to around EUR 900 million. Given that in the case of the Prestige, the damage currently stands at well over EUR 1 billion (the Spanish government actually puts the figure at EUR 12.5 billion), significant adjustments are needed.

385. The oil liability and funds conventions also only apply to oil pollution caused by tanker ships. They do not cover pollution caused by other types of ships that use bunker oil. This is the reason why the clean-up of 600 Mg of oil spilled from the Pallas was only partially covered by the shipbuilder's limited liability (ERBGUTH et al., 2002, p. 223). An international convention drawn up in 2001 provides for damage liability and mandatory insurance coverage for pollution caused by bunker oil. When it will enter into force remains unclear. Also not yet in force is the 1996 International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (HNS Convention), which is intended to govern the establishment of a compensation and liability system for cases of pollution caused by dangerous or noxious substances.

386. With its proposal for a directive on pollution of the marine environment by shipping and the introduction of sanction for acts of pollution (EU Commission, 2003h), the EU Commission aimed to achieve – in addition to civil liability – a more stringent prosecution system that is harmonised throughout the EU. The Council of Ministers has already signalled, however, that it will not support the section on criminal law sanctions contained in the proposed directive. Responsibility will thus remain with individual Member States for the time being. This is a regrettable state of affairs in that while national legislation most certainly covers relevant offences – Article 324 of the German Criminal Code (StGB), for example, contains the environmental offence of polluting a water body – there is a lack of monitoring capacity to allow forceful implementation in practice. There is an urgent need for greater cooperation throughout the Community. At the same time, pollution offences must be more rigorously pursued under the criminal law systems of the various Member States. Fines of a few thousand euros, or even a few hundred in some cases (BSH, 2003d) will hardly be a deterrent to large shipbuilders.

3.4.6 Preventing the Introduction of Non-Native Species

387. The introduction of non-native species is primarily caused by the transportation of organisms in ballast water (Para. 100 et seq.). Although the problem has long been recognised, regulatory measures have yet to be effected. An instrument of the International Council for the Exploration of the Sea (ICES) does, however, provide for (non-binding) practices such as quarantine activities. An IMO directive on management of ballast water requires only that ballast water be exchanged in high seas at depths of over 2,000 m, although no actual monitoring takes place. Additional measures are certainly required. Under the aegis of the IMO, there are plans to adopt a Convention on Control and Management of Ships' Ballast Water and Sediments, which aims to make processing systems mandatory equipment for ships in the medium term. It provides for standards on ballast water exchange, monitoring duties for crews (ballast water logbook) and the introduction of new treatment technologies. Also, states must ensure that their ports have adequate disposal facilities to allow treatment of organic sediments extracted from ballast water. A further IMO convention on installation of ballast water treatment systems in new vessels is planned.

388. The German Advisory Council on the Environment calls for the introduction of non-native species to be regulated relative to their importance to biodiversity. The IMO Ballast Water Convention can serve as the first step: it should be ratified quickly and without prolonged transitional arrangements. For more effective implementation, the Council suggests that these international requirements be adopted in binding EU legislation. Alongside the Vessel Traffic Monitoring and Reporting Directive and the Directive on the Phasing-out of Single Hull Tanker Ships, a deadline could be set after which entry to Community ports would be denied to vessels not fitted with ballast water treatment systems. This would in turn require appropriately structured port state controls.

3.4.7 Germany: Division of Shipping Regulation Responsibilities

3.4.7.1 Basic Principles

389. In Germany, the division of responsibilities for shipping safety and shipping-related pollution of the marine environment is characterised by a complex regulatory system involving the federal and *Länder* (state) governments. The starting point is the distinction made between inland and coastal waters on the one hand, and the Exclusive Economic Zone (EEZ) on the other. Based on the responsibilities designated in the Federal Waterways Act (WaStrG), the federal government is responsible for Germany's ports and for the development and maintenance of shipping routes in coastal waters. It is also responsible for transport control under the Federal Maritime Responsibilities Act (SeeAufG) and for prevention of shipping-related risk and harmful environmental impacts from shipping traffic. To fulfil these obligations, a federal administration was established in the form of the Federal Waterways and Shipping Administration (WSV). The line that divides coastal waters from the EEZ and which forms the border enclosing German sovereign territory is controlled by the German Border Police Coast Guard (BSG-See). Monitoring of compliance with customs and excise provisions is the responsibility of the Federal Customs Administration (Zollverwaltung) while coastal *Länder* are responsible for ensuring general risk prevention and pollution elimination. This results in the paradoxical situation that as long as pollutants are located aboard a vessel, they are the responsibility of the federal government. Should the pollutants find their way into the water, it becomes a matter of preventing a generally policeable risk and is then a *Länder* responsibility (KÖNIG, 2003, p. 92). The *Länder* are also responsible for fisheries control and for investigating minor and criminal offences such as pollution of a water body with oil or other harmful substances. Their monitoring and enforcement powers are exercised by the water police. In fulfilling its shipping control responsibilities – say traffic monitoring or prevention of shipping-related risk in coastal waters – the Federal Waterways and Shipping Administration also uses the services of the coastal *Länder* water police (KÖNIG, 2003, p. 92).

In the EEZ, shipping safety, marine environment protection, general risk prevention, investigation of minor and criminal offences, and fisheries control are the sole responsibility of the federal government and involve four federal ministries. Because the Federal Waterways and Shipping Administration (which is an arm of the Federal Ministry of Transport, Building and Housing) has only a small fleet of vessels at its disposal, both the German

Border Police Coast Guard (an arm of the Federal Ministry of the Interior) and the Customs Administration (an arm of the Federal Ministry of Finance) perform risk prevention and crime investigation within the EEZ. The Federal Ministry of Consumer Protection, Food and Agriculture (BMVEL) is involved in fisheries control. Cooperation is coordinated through a coast guard network. There is, however, no central authority and each station remains responsible for its own area (JENISCH, 2000). A cooperation agreement also exists between the Federal Ministry of Transport, Building and Housing and the Federal Ministry of Defence on aerial surveillance to combat oil pollution (JENISCH, 1999). Table 3.11 illustrates this mesh of regulatory responsibilities.

3.4.7.2 Joint Accident Task Force

390. The sinking of the Pallas off the coast of Amrum in 1998 highlighted a number of deficits in accident management, particularly in terms of cooperation between the federal and *Länder* governments. This led to an agreement by which the federal government and the five coastal *Länder* established a Joint Accident Task Force with a 'maritime operations centre'. The Task Force went into operation in early 2003. Everyday task force organisation involves, among other things, the development of alarm plans and action plans to be put in place in the event of a shipping accident. Officers of the various *Länder* water police and officers of the Federal Waterways and Shipping Administration (WSV) work side by side. The Joint Accident Task Force is headed by an officer of the WSV who takes command in the event of an accident. If the Task Force Commander issues instructions within the area under jurisdiction of the coastal *Länder* water police, he acts as an agent of the respective coastal *Land* and is effectively 'on loan' from the federal government. If he issues instructions within the EEZ to the *Länder* water police, they then act as federal agents 'on loan' to the federal government. This legal construct of 'agent loan' results from the haphazard distribution of shipping responsibilities outlined above.

3.4.8 Protection from Shipping-Related Pressures and Risks: Summary and Recommendations

391. The German Advisory Council on the Environment sees an urgent need for action to minimise as far as possible the risks posed by shipping in the marine environments of the North and Baltic seas. This requires systematic application of the precautionary and polluter-pays principles. Accordingly, the freedom of the oceans must be subordinated. In the Council's opinion, a right of innocent passage should only be assumed if passage takes place in accordance with the applicable international, regional and national rules. The Council recognises that the opportunities available to the German government are limited due to the international nature of shipping traffic. Action at purely national level is restricted to just a few measures in territorial waters. It is thus all the more important that the German government uses its influence before the International Maritime Organisation (IMO). The Council expressly welcomes the government's efforts to involve the Russian Federation in implementing tighter standards. If the government wishes to enhance and implement greater shipping safety, however, it must accept both the higher staffing levels and the higher costs involved in port state controls, shipping traffic surveillance and, as a coastal state, the maintenance of an efficient coastguard.

Table 3-11

Distribution of powers in Germany relating to ports, coastal waters and the EEZ

	Ports/coastal waters	EEZ
Shipping	Federal government: WSV (BMVBW), with assistance from *Länder* water police	Federal government: WSV
Border control	Federal government: BGS (BMI)	Federal government: WSV, with assistance from BGS
Customs control	Federal government: Customs Administration (BMF)	Federal government: WSV, with assistance from customs
General threat prevention and pollution cleanup	*Länder*	Federal government: WSV, with assistance from BGS and customs
Fisheries	*Länder*	Federal government (BMVEL)
Accident management	Joint accident task force with agents on loan between federal government and *Länder*	

SRU/SR 2004/Tab. 3-11

392. The German Advisory Council on the Environment also believes it is time to strengthen the EU's role in shipping. The EU Commission has proposed that the EU become a member of the IMO. The Council points out that this idea has been rejected by at least some Member States because they feared they would lose authority to the EU (ERBGUTH et al., 2002, p. 257; CRON, 1995; FREES, 1992). The following must not be overlooked, however: despite the number of shipping accidents that have had disastrous outcomes, not enough has been done at international level to effect adequate changes. There remain significant qualitative and quantitative deficits in shipping controls performed by both flag and port states. Substandard vessels are a regular occurrence. International shipping standards are only effective if they are subject to harmonised implementation whose measures aim to ensure their effectiveness. With its available powers of implementation and enforcement, the EU can make a key contribution. This is well illustrated by the violation proceedings started immediately after the deadlines expired for implementation of the Directive on Port State Control. While this cannot prevent vessels being registered under 'cheap flags' (outflagging), it at least allows the EU to take EU-wide action on port state controls, even against third countries. The Council thus believes that without the incentives sparked by Brussels, neither the worldwide accelerated phase-out of single hull tanker ships would have been implemented nor would an additional oil pollution compensation fund have been set up.

Over 10% of world tonnage can be apportioned to the fifteen established EU member states and a further 10% to the ten EU accession states – particularly Malta with 5% and Cyprus with 4% (EU Commission, 2002k). EU-coordinated lobbying in the IMO by these 25 countries could spur further action at international level. This would naturally depend on a high level of coordination within the EU. In the negotiations on their accession to the EU, the EU Commission unconditionally required that Malta and Cyprus apply Community law on shipping safety as soon as possible and no later than the date of their accession (e. g. EU Commission, 2000b, p. 7). The Treaty of Accession of 16 April 2003 thus provides neither Malta nor Cyprus any transitional period for implementation of the laws in question. The EU Commission and the EU Council of Ministers now face the challenge of monitoring adoption in both legislative and practical terms, and of supporting Malta and Cyprus in their implementation efforts.

393. Given the ongoing trend towards 'outflagging', the German Advisory Council also sees a need to strengthen public awareness of company responsibility. European companies who register their vessels under third-country flags purely for taxation reasons must no longer be allowed to foster inadequate controls, poor training and substandard ships. Rather, operators in these countries must once and for all be made to comply with prevailing law.

Shipping Safety

394. It must be ensured that Member States provide an adequate number of inspectors to cover all their ports and anchorage areas and thus comply with the 25% minimum control requirement. Individual ports must not become 'convenience ports'. Among others, pressure must be placed on accession states Cyprus and Malta.

395. Systematic implementation of the accelerated phasing-out of single hull tanker ships and the ban on the transportation of heavy oil in such ships signals a key step in protecting the marine environment. Despite its relatively low commercial value and the comparably low fire and explosion risk posed by its frequent transportation in older tanker ships, heavy oil causes severe environmental damage. From a marine environment protection perspective, this is unacceptable and must be stopped. What must not be overlooked, however, is that a ban on the transportation of heavy oil in single hull tanker ships and general decommissioning of such ships are not alone enough to ensure safety. While double hulls provide greater protection than single hulls in the event of a ship being stranded, they are little more effective in the event of a collision. The smaller tanks used in double hull vessels will, however, result in less oil being spilt in a collision. The risk of accidents following engine failure should be minimised by adding a spare engine to keep a ship manoeverable in the event of such failure.

Another important factor to be considered is that over time, double hull tanker ships can develop hairline fractures caused by a build-up of gas between the two hulls. This can lead to accidents at sea and while berthed in port. Regular quality controls must thus be ensured. Also, due to the thinness of the walls, the space between the hulls must not be used as additional transportation capacity for the carriage of oil or other dangerous substances or liquids. Both factors require standardisation at EU and international level.

396. Greater attention must be paid to the training of ships' crews. Efforts are needed to ensure that in future, 'older' crews (those trained prior to 2002) meet the requirements of the 1995 STCW Convention and the associated EU Directive 2001/25/EC. Despite the existence of the IMO White List, shipowners are called upon to improve their controls on ships' crews and training centre activities.

397. The establishment of new monitoring and information systems will increase shipping safety. All the same, the German government should continue its efforts regarding the introduction of mandatory use of a marine pilot, at least for specific sea areas like the entrance to the Baltic and the Kadet trench. Serious consideration should also be given to implementing additional protection measures associated with designation of the Wadden Sea as a Particularly Sensitive Sea Area (PSSA).

Discharges of Pollutants and Ship-Generated Waste

398. With regard to discharges of operational and cargo residues and the dumping of ship-generated waste

into the seas and oceans, the German Advisory Council on the Environment urges for greater attention to be given to this pollution pathway. The misuse of the North and Baltic seas as dumping grounds is no longer acceptable and monitoring standards at sea are nowhere near those practised on land. While the requirements contained in the Annexes to the MARPOL Convention provide a relatively strong basis for marine environment protection, the high number of illegal discharges remains an issue of concern. The causes of illegal discharges are the lack of port reception facilities, non-uniform application of the MARPOL rules already outlined, and inadequate monitoring and investigation of violations. EU measures on port reception facilities, port state controls and vessel traffic monitoring signal a step in the right direction to combat these unacceptable conditions.

Atmospheric Emissions

399. The lack of international and the inadequate EU provisions on shipping traffic emissions have effectively led to the legal use of environmentally extremely harmful bunker oil as shipping fuel in place of marine diesel. The German Advisory Council on the Environment believes it necessary, at least initially for Community waters and ports, to regulate the sulphur content of fuels used in shipping. Similar regulation of atmospheric NO_x emissions must take place without further delay. Sufficiently stringent standards are needed for diesel engines used in ships. Overall, shipping standards must no longer be allowed to lag behind the land-based environmental protection standards for industry and transportation. The Council is of the opinion that all the above-named measures must be accompanied by the promotion of high-standard ships in Community ports, for example through the use of lower berthing and control fees. The 'green shipping bonus' introduced in the Port of Hamburg in 2001 (initially limited to a five-year period) hails a first step in the right direction: any vessel that exclusively uses fuel with less than 1.5% sulphur pays 12% less in fees.

Liability, Compensation and Sanctions

400. The German Advisory Council on the Environment agrees with the EU Commission's view that prevailing international liability and compensation rules do not act as a deterrent to prevent the illicit practices associated with transportation of dangerous cargos at sea. In all probability, the required deterrent effect can only be achieved if, in addition to civil liability provisions, criminal law sanctions are implemented that apply to all individuals (meaning not only the captain or shipowner, but the responsible individuals within the classification society or the company that owns the cargo) who either wilfully or through negligence cause or contribute to marine pollution. It is thus regrettable that the criminal law sanctions contained in the EU Commission's proposed directive have not received Council of Ministers support.

Division of Responsibilities within Germany

401. The differing situations in the 12-mile zone and the EEZ, the division of authority among a range of agencies, and reliance on *Länder*-specific organisations to enforce federal responsibilities mean that shipping-related responsibilities are performed in a non-uniform and haphazard manner. This, along with the required level of cooperation and coordination, is a constant cause of friction which in turn has negative effects on the efficiency of individual measures taken at sea (KÖNIG, 2003, p. 92 et seq.). The German Advisory Council on the Environment thus sees an urgent need to consolidate the multifaceted decisionmaking responsibilities. Germany's sovereign maritime services (vessels belonging to the Federal Ministry of Transport, Building and Housing, the Coast Guard, Customs and Excise, and the Fisheries Inspectorate) would be better consolidated in a German Coast Guard that is an agency of a federal ministry and responsible to a single command for both routine operations and accident management. The respective *Länder* responsibilities would be transferred to the German Coast Guard in the medium term. Rather than cooperation and coordination, clear management structures are needed for effective accident management and effective pollution control. The Joint Accident Task Force is an important, if only initial, step towards consolidating maritime accident management activities (ERBGUTH et al., 2002, p. 216). The task force is the result of attempts under Germany's existing division of responsibilities to learn from and remedy deficits in accident management that became evident with the sinking of the Pallas. Prevailing law does not allow for a reduction in *Länder*-specific authority while increasing that of the federal government. This would require an amendment to the German Constitution (SCHNOOR, 2000, p. 221 et seq.). The latter should not, at least in the medium term, prove an obstacle because the constitution serves to protect the individual, society and the environment. Clearly, its purpose is not to hinder effective risk prevention.

3.5 Protection of Regional Habitats and Species

402. Fishing, shipping and the input of nutrients and pollutants each lead in their own way to severe pressures on the marine environments in the North and Baltic seas. These pressures are evident everywhere, albeit to differing degrees. From a global perspective, these are pressures that must be reduced as a matter of priority. In terms of the localised conditions in differing habitats, local pressures – such as marine facilities, coastal protection and tourism – often play a key role, especially as regards the combination and cumulation of global and regional impacts. In coastal regions in particular, the impacts of construction and tourism activities – whose effects are outlined in Sections 2.1.6 (Para. 116 et seq.) and 2.2.6 (Para. 199 et seq.) – only add to global pressures with the result that in many areas, valuable habitats are severely disturbed and species become displaced (Section 2.1.7, Para. 132 et seq. and Section 2.2.7, Para. 211 et seq.).

Protecting local habitats and species from excessive pressures essentially means applying the regulatory instruments used on land to the seas:

– A cohesive protected area network which focuses on the interrelations between the various ecological functions to ensure that valuable habitats and those in need of protection remain undisturbed (Section 3.5.1).
– A cross-sectoral regional management plan to ensure that sensitive and ecologically valuable marine areas, including those outside protected areas, be safeguarded from anthropogenic activities (Section 3.5.2).
– An adequate approval and control regime to ensure an area-wide minimum level of protection from individual encroachments (Section 3.5.3).

3.5.1 Protected Areas

403. That the role of protected areas in marine environment protection goes beyond that of traditional coastal activities is now recognised at international level (OSPAR, 2003d; HELCOM, 20003f; FARKE and RACHOR, 2003, p. 390 et seq.; CZYBULKA 2003, p. 330 et seq.; JANSSEN, 2002, p. 38 et seq.). It is now also acknowledged in legal terms that global maritime law and in particular the Law of the Sea Treaty do not stand in conflict with the creation of effective protection in the form of marine protected areas (MPAs) in coastal waters and exclusive economic zones (CZYBULKA, 1999, p. 563 et seq.; WOLFRUM, 2000, p. 72; JARASS, 2002, p. 29 et seq. with additional references). The Law of the Sea Treaty and the MARPOL Convention only provide for protected areas with regard to shipping (Section 2.3.4), under which regional restrictions are largely governed by decisions of the International Maritime Organisation (IMO). In all other cases, individual states are allowed considerable scope in complying with marine environment protection requirements through the implementation of area-specific restrictions or bans on uses of the oceans and seas (Article 192 Law of the Sea Treaty). Consideration must be given to the fact that with Article 6, 8a and 8e of the Biodiversity Convention (Rio Convention on Biological Diversity of June 1992), the international community has recognised the key role of protected areas and has committed itself to establishing a protected area network to ensure conservation of endangered species and habitats, including in the marine environment. Numerous other special provisions are contained in the international conventions protecting species and habitats (Section 3.5.1.1, Para. 406).

OSPAR and HELCOM have been lobbying for some considerable time for the establishment of protected area networks of this kind. At the Joint Ministerial Meeting in June 2003, the commissions again made this a high priority target and announced additional steps towards its implementation. Developments at OSPAR continue to lag behind those at HELCOM, however (Section 3.5.1.2, Para. 407).

404. In its proposal towards a strategy to protect and conserve the marine environment, the EU Commission underlines the key role of provisions on area-specific protection (EU Commission, 2002, Para. 80). This is to be served by fully implementing both the Habitats and the Birds directives at sea (Section 3.5.1.3, Para. 409). The EU is seen to pursue its own protected area model with these two directives. Apart from the long-discussed issues of implementation and enforcement (SRU, 2002b, Para. 298 et seq.), this gives rise to the question of alignment to and coherence with the HELCOM and OSPAR protected area programmes.

405. Germany's coastal *Länder* have already had considerable success in establishing protected areas in coastal waters, most notably the Wadden Sea National Park. Nevertheless, there remains a considerable need for further action in terms of the OSPAR and HELCOM programmes and of EU requirements, both inside the German EEZ and beyond. What is needed is constructive and timely cooperation in developing regional protected area networks and drafting appropriate binding and effective protection provisions for the affected areas in Germany's EEZ and its coastal waters (Section 3.5.1.4, Para. 411 et seq.).

3.5.1.1 Habitat Protection under International Conventions on Protecting Species and Habitats

406. At the forefront of the marine protection approach currently being developed are a number of specific international agreements that focus on endangered, valuable and sensitive species and habitats, and which prompt the contracting parties to place such habitats under special protection. These include:

– The Ramsar Convention (The Convention on Wetlands of International Importance, especially as Waterfowl Habitat, of 1971); contracting parties have agreed to designate the wetlands contained in the Ramsar List – known as Ramsar Sites and including the Wadden Sea – as protected areas and to ensure their conservation and wise use.
– The Bonn Convention on the Conservation of Migratory Wild Species of June 1979 with its marine-related regional implementation agreements, namely:
  – The 1990 Agreement on the Conservation of Seals in the Wadden Sea in which Denmark, the Netherlands and Germany agreed broad protection measures that also take in habitat protection. In implementing the Agreement, the three states designated protected areas for seals in which intrusive human activities are prohibited during whelping and rearing times.
  – The 1992 Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) which, among other things, commits signatories to protecting and preserving vital habitats of small cetaceans. In implementation of the Agreement, the German state of Schleswig-Holstein designated the North Sea breeding grounds off the coast of Amrum and Sylt as a small cetacean protected area and made the area part of the Schleswig-Holstein Wadden Sea National Park.

– The 1995 Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA). The Agreement provides for an action plan which includes hunting restrictions, species-specific protection plans and special measures to safeguard habitats and resting places.

3.5.1.2 HELCOM and OSPAR Protected Area Programmes

HELCOM Protected Area Network

407. With Recommendation 15/5 of 1994, HELCOM made the decision to establish a System of Coastal and Marine Baltic Sea Protected Areas (BSPA). At the same time, it identified a range of areas that were to be included in the BSPA network right from the outset. The core stock initially comprised coastal areas, but excluded offshore protected areas. A year later, with Recommendation 16/17 on Guidelines for Designation of Marine and Coastal Baltic Sea Protected Areas and Proposed Categories, HELCOM set out selection criteria for contracting states to apply in designating other suitable sites for the further development of the protected area network. The contracting states were required to draw up management plans for BSPA areas to ensure the conservation of particularly valuable resources, sustainable management of the protected areas and monitoring of the relevant biological and chemical parameters.

The decision as to which protection provisions are actually to be applied for specific (potentially) disturbing activities in a BPSA is mostly left to the contracting states. HELCOM, however, formally recommends the use of the long-established IUCN Categories I (Strict Nature Reserve/Wilderness Area), II (National Park), IV (Habitat and Species Management Area), V (Protected Landscape and Seascape) and IX (Biosphere Reserve). HELCOM also recommends area management which, based on a comprehensive environmental impact assessment, harmonises the various activities with conservation targets by means of area-specific restrictions and time limits, and where appropriate, total bans and measures to rehabilitate habitats and reintroduce species. The establishment of buffer zones is also recommended for each area category. It is worthy of note that HELCOM is evidently – if only within the BSPA network – striving towards a broad spatial planning concept that goes well beyond the protected area model contained in national nature protection law (JANSSEN, 2002, p. 62).

Germany has now notified HELCOM of the designation of eight BSPAs. Although notification took place back in 1994, six of those areas have not yet been delineated, established and reported. All eight are coastal areas. While proposals made by the Federal Nature Conservation Agency (BfN) for another seven offshore protected areas were drawn up a number of years ago (see Map 3.2b in Annex II), the German government has not yet submitted any associated proposals or notices to HELCOM. The areas, which in some instances the BfN also proposed as FFH areas (BfN, 2003b), have yet to be placed under German protection law. Like the Natura 2000 Network, the HELCOM Protected Areas Network also suffers inadequate implementation by the contracting states.

OSPAR Protected Area Network

408. The OSPAR Commission is taking a similarly delayed approach to a regional protected areas network based on international law for the North-East Atlantic. With its Annex V, the OSPAR Convention was expanded to include nature protection and conservation provisions in 1998. With express reference to the Biodiversity Convention, the contracting parties agreed 'to take the necessary measures to protect and conserve the ecosystems and the biological diversity of the maritime area … and, when practicable, restore marine areas which have been adversely affected.' This was also to involve the establishment of a Marine Protected Areas (MPA) programme (OSPAR, 1998d).

Seeing that this initiative has largely remained fruitless, in 2003 the OSPAR contracting parties agreed to establish the OSPAR Network of Marine Protected Areas by 2010 using protected area proposals from the contracting parties (OSPAR, 2003d). The network will apply to areas covered by the Convention. For this purpose, the contracting parties are required to use specific selection criteria contained in OSPAR Commission guidelines to draw up and submit by no later than the end of 2005 protected area designations for areas under their jurisdiction (OSPAR, 2003e). Also, management plans will be developed for both the specific protection needs in these areas and the associated protection and conservation measures. The OSPAR Commission has issued appropriate guidelines (OSPAR, 2003f). The OSPAR recommendation expressly takes account of the European Protected Areas Network which has yet to be designated under the Habitats and Birds directives and, if deemed suitable, will also serve as the OSPAR MPA programme (Section 3.5 of Recommendation 2003/3, OSPAR, 2003d).

3.5.1.3 Habitats and Birds Directives: Protected Areas

409. With the implementation of the Habitats Directive (92/43/EEC) of 21. 5. 1992 and the Birds Directive (79/409/EEC) of 2. 4. 1979, the EU seeks to contribute to international plans to establish protected area networks, including at sea.

Under the Birds Directive, Member States were required by April 1981 at the latest to designate as special protected areas (SPA) the most suitable habitats, in terms of numbers and size, for the birds listed in Annex I together with regular breeding, moulting, wintering and resting grounds of migratory bird species, and to ensure that birds are safeguarded from habitat deterioration and disturbance in those areas. Sea-based implementation of the Birds Directive is nowhere near completion and has yet to start in the large EEZ area, not just in Germany.

The Habitats Directive required Member States to submit proposals for their national list of protected areas by June 1995, from which the EU Commission intended to select

the areas for the EU list for the binding NATURA 2000 Network by June 1998. This applied without restriction to the marine and coastal habitats (see box) listed in Annex I to the Habitats Directive, both in coastal waters and in the EEZs. Without exception, all Member States have yet to submit their proposals for the EEZs (FARKE and RACHOR, 2003, p. 393).

Marine and Coastal Habitat Types under Annex I of the Habitats Directive

Inland waters and coastal waters:

- Sandbanks which are slightly covered by sea water all the time
- Estuaries
- Non-vegetated shingle, sand and mixed mudflats
- Coastal lagoons
- Large shallow inlets and bays
- Reefs
- Submarine structures made by leaking gases

Exclusive Economic Zone

- Sandbanks which are slightly covered by sea water all the time
- Reefs

The protection regime of the Habitats Directive is largely structured around requirements defined in its Article 6:

- Establish necessary conservation measures involving, if need be, appropriate management plans specifically designed for the sites or integrated into other development plans
- Avoid any deterioration and significant disturbance of Natura 2000 sites in order to rule out that the site will be adversely affected
- Subject any plan or project likely to have a significant effect on the site, either individually or in combination with other plans or projects, to appropriate assessment of its implications in view of the site's conservation objectives.
- Reject plans expected to have adverse effects unless they must be carried out for imperative reasons of overriding public interest and if the absence of an alternative solution forces their implementation.
- Take compensatory measures to minimise or cancel the negative impact of an approved plan or project to maintain the coherence of the network.

410. In principle, these measures in their abstract form are suited to implementing the HELCOM and OSPAR recommendations as to their respective BSPA and OSPAR MPA programmes. Both conventions thus recognise NATURA 2000 areas as adequate implementation of their protected area recommendations. There is, however, no guarantee that EU Member States will designate BSPAs and OSPAR MPAs as protected areas under the Habitats or Birds directives. The result will be two overlapping, interrelated protected area networks for the North and Baltic seas that are subject to different legal provisions. This gives rise to questions as to effectiveness, coherence of selection and structure, and transparency and uniformity of protection provisions and procedures. Considering the extremely slow implementation of the Habitats and Birds directives (see Section 3.5.1.4.2, Para. 414 et seq.), the initiatives of the regional marine protection organisations can, at least in the interim, help accelerate matters and prepare the way. Given the 'soft' nature of their recommendations and directives, OSPAR and HELCOM will no doubt find it easier than the EU to encourage riparian states to adopt area-specific proposals and thus to pave the way for additional areas to become FFH protected areas.

In its proposal towards a strategy for the protection and conservation of the marine environment, the EU Commission placed great weight on implementing the Habitats and Birds directives and developing by 2005 a programme aimed at improving protection of species and habitats in European waters. The Commission also intends to draft proposals for amendments to the annexes to the Habitats Directive, which list the habitats to be protected. However, poor implementation by the Member States remains the key obstacle to the EU protected areas regime, especially in the EEZ. If, to all intents and purposes, the first phase of protected area reporting has already been boycotted, there is little hope as regards ultimately structuring and implementing effective protection provisions. Germany is no exception in this regard.

3.5.1.4 National Marine Protected Areas

3.5.1.4.1 Existing Protected Areas

411. The coastal riparian *Länder* designated their nature protection areas quite some time ago. These are shown in Maps 3.2a and 3.2b in Annex II. Apart from some small areas which are partially marine areas, they encompass the protected areas listed in Table 3.12.

Table 3-12

National protected areas in coastal waters

North Sea	Baltic
– Schleswig-Holstein Wadden Sea National Park	– West Pomeranian Lagoon National Park
– Hamburg Wadden Sea National Park	– Jasmund National Park
– Lower Saxony Wadden Sea National Park	– South-East Rügen Biosphere Reserve

SRU/SR 2004/Tab. 3-12

The preferred National Park protected area category (SRU, 2002b, Para. 290 et seq., 2000, Para. 356), which is based on a mix of nature and human influences, appears to be a most realistic and fitting legal framework for coastal regions which are almost entirely characterised by their uses. Because these area categories (rightly) provide no guarantee of total protection, but instead are aimed at sustainable reconciliation of protection targets and other interests, their intensity and effectiveness depends to a large degree on the specific wording of protection provisions and their practical application. Taking account of area-specific sensitivities and myriad regional claims, the zonal divisions and detailed rules on uses of the Wadden Sea National Parks provide a relatively successful model for integrated protected area management. Nevertheless, significant encroachments on habitats are regularly allowed, with leniency being shown to 'powerful' regional and supra-regional activities likes fisheries and extraction of raw materials (SCHÜTTE, 2000, p. 185 et seq.).

412. One problem appears to be the special nature of marine environment protection, where ecology-based protected area management cannot be restricted to the setting of conservation targets and conservation measures but rather, due to the lack of marine spatial planning, must also combat the deficits in elementary responsibilities of overall planning without the aid of an appropriate – and positive – set of designation instruments (see Para. 421, 422 et seq.).

413. As regards the selection and number of protected areas already designated, a comparison of areas designated under the Habitats Directive with Important Bird Areas (IBAs) designated in accordance with international ornithological criteria shows that large sections of ecologically valuable areas do not yet enjoy protection status (see also Maps 3.2a, 3.3a, 3.2b and 3.3b in Annex II). This is especially the case in the EEZ, where no general marine protection area exists. It is largely as result of Germany's plans to expand offshore wind energy use that implementation of the Habitats and the Birds directives is now being pushed forward.

3.5.1.4.2 Implementing the Habitats and Birds Directives

The North Sea

414. The German coastal *Länder* responsible for the 12-mile zone have completed their FFH area proposals (see Map 3.2a in Annex II). The proposals submitted by Lower Saxony and Schleswig-Holstein are analogous with the Wadden Sea National Park. Schleswig-Holstein has also proposed two small marine areas as FFH areas: the 'Helgoländer Felssockel' Nature Reserve and the 'Steinriff' reef north-east of Heligoland.

The German government commissioned the Federal Nature Conservation Agency (BfN) with the development of proposals for areas to be designated as FFH protected areas. The BfN published its recommendations in June 2003 (BfN 2003b, Map 3.3a, Annex II). The Federal Environment Ministry (BMU) has announced that the BfN recommendations will be used to draw up final area designations by the end of 2003 in conjunction with other government departments and affected groups (BMU, Press Release 212/03 of 12 November 2003).

The Baltic

415. Map 3.2b in Annex II provides an overview of the ecologically valuable areas in the Baltic, including FFH areas proposed and SPAs designated by Germany. Map 3.3b illustrates the proposals drawn up for the EEZ by the Federal Nature Conservation Agency (BfN) in July 2003. As with the proposals for the North Sea, the Federal Environment Ministry intends to involve both the respective government departments and the affected social groups in finalising the proposals.

3.5.1.5 Evaluation

416. The high and rapidly increasing pressures of use on the North and Baltic seas underline the urgent need for marine protection areas to ensure species and habitat conservation, particularly breeding and resting places. Nevertheless, the protection area programmes developed by OSPAR and HELCOM, and the coherent protected areas network aimed for by the EU, are all still in their infancy. In the vital further development and implementation of international programmes, particularly the EU provisions contained in the Habitats and Birds directives, consideration should be given to the following issues:

Harmonising Regional Initiatives

417. The fact that the relevant provisions and programmes are characterised by a confusing number of differing – sometimes overlapping and sometimes strongly divergent – protected area categories and protection requirements is less than constructive. The German Advisory Council on the Environment thus welcomes the announcement by the Joint Ministerial Meeting of OSPAR and HELCOM in June 2003 of a programme for greater cooperation and harmonisation of their protected area programmes (OSPAR and HELCOM, 2003, Point 18).

Compliant Implementation of the Habitats Directive

418. Proposals for FFH areas designated under the Habitats Directive must be solely based on the nature protection criteria contained in Annex 1 to the Directive. If, during this phase, restrictions were permitted for either economic or social reasons, it would not be possible to develop a coherent protected area network that takes account of the interrelated functions within the region (see the habitat networks presented in Map 3.2b, Annex II). The German Advisory Council on the Environment thus expresses its concern regarding current practice (early agreement on area designations by the Cabinet and with the affected social groups), because it implies that area designations are by no means solely the result of an assessment based on nature protection criteria. Early consideration of conflicting interests and involvement of

the affected interest groups from the outset in preparing area designations does not serve identification of the actual protection needs that provide the basis for classification of a protected areas network by the EU Commission. Finally, the requirement for transparency involves both identification of actual protection needs (by designating protected areas) and of any restrictions made on economic grounds (as part of granting exceptions). The Council thus expects that the German government will provide conservationally well-founded, transparent and thus EU-compliant justification for any deviation from the BfN's proposals.

Full Implementation of the Birds Directive

419. Given the current status regarding identification and designation of protected areas, the German Advisory Council on the Environment doubts that the German government is implementing the Birds Directive in full. This applies both to *Länder* responsibilities within the 12-mile zone and to those of the federal government.

In implementing the Birds Directive in coastal waters, the state of Schleswig-Holstein has merely designated a generous bird protection area extending to the 12-mile limit to the west of the Dithmarsch mudflats and north of the North Frisian mudflats on the marine side of the Wadden Sea National Park. Lower Saxony's coastal waters contain an IBA area on the marine side of the National Park (SKOV et al., 2000, IBA Area No. 17 – East Frisian Islands) and a far more extensive 'important resting and feeding area for seabirds' (HEIBIGES and HÜPPOP, 2000). Neither are designated as SPAs. Despite the fact that, under Ramsar Convention criteria, these areas provide resting places for internationally significant numbers of Arctic and Red-Throated Divers, Common Scoters, Sandwich Terns and Common Gulls, Lower Saxony has not placed them under any other special protection provisions (BfN; 2001, statement, p. 4).

With regard to implementation in the EEZ, a comparison of the BfN proposals with the IBA List shows that even these take less than full account of nature protection requirements because the potential SPA they identify is even smaller than the IBA area west of Sylt. As with other areas in the EEZ, the data on the ornithological importance of this large area does not fully match the 'standard' required for SPA designation (see Maps 3.4a and 3.b in Annex II on the distribution of relevant bird species). At the very least, however, further research is needed along with a new assessment as to whether, in light of new knowledge, the existing SPA (still) complies with the protection requirements and designation criteria contained in the Birds Directive.

The BfN proposals for the Baltic region likewise do not match up with all IBA areas. Given the fact that the European Court of Justice has used the IBA publications as an expert opinion on demarcation and assessment of SPA designations (ECJ, Basses Corbières, case 7.12.2000, C-374/98), it is to be assumed that the EU Commission will view limited consideration of IBAs as a breach of EU law and initiate appropriate action.

High Level of Protection

420. Effective conservation can only be achieved if activities that impact on conservation objectives are largely prohibited in protected areas. With its obligation to avoid deterioration and disturbance, compatibility assessments and strict exception provisions (Para. 409), the Habitats Directive provides a suitable framework in this regards, albeit one which requires rigorous and systematic implementation. Like the HELCOM BSPA programme (Para. 407), the 'national park' protection category of which the coastal *Länder* are so fond falls short of such stringent protection requirements. This is partly due to the fact that the national park regimes have taken on a sort of spatial planning function for the vast nature protection and economic areas they cover.

Nevertheless, it would appear prudent to give greater weight to special conservation objectives by establishing a 'marine protected area' category which is flanked by specific legal restrictions (CYZBULKA, 2003, p. 333 et seq.; JANSSEN, 2002, p. 286 et seq.). Implementation of the Habitats Directive could have served as the leverage to establish marine-specific protected areas of this type. In contrast, Section 38 of the Germany's Nature Conservation Act (BNatSchG), added solely for the purposes of implementing the Habitats Directive in the EEZ, is restricted to the conventional area categories and even goes so far as to formulate general restrictions on the application of those categories, including in relation to shipping.

Marine Planning: Framework and Safeguard

421. The lack of broad marine planning becomes particularly evident as a key weakness in protected area management. At no level is an holistic view taken of all the potentially disturbing activities that could occur in the region, the total area needed for these activities estimated and, taking into account the conflicting needs of other users and of marine environment protection, the activities relocated to more suitable and less sensitive areas. From a local perspective focused on individual activities, the absence of this type of planning approach makes it very difficult to suggest more fitting locations with an eye to local claims and to define detailed activity restrictions and thresholds of importance for supra-regional resources. Without a broad management plan there is a danger that for certain projects, suitable alternative locations will go ignored and that valuable habitats and protected areas will gradually become smaller because the focus will be narrowed to individual projects only.

The approval process for the Butendiek offshore wind farm, which falls under the authority of the Federal Maritime and Hydrographic Agency (BSH), provides a fitting example (BSH, 2002). Input is required on the area of the gaviiform sea bird habitat affected by the project that could realistically be used without causing significant disturbance within the meaning of the Habitats and Birds directives, and on the extent to which mandatory relocation of the project away from the distribution area is feasible. With reference to the considerable size of the dis-

tribution area, the Federal Maritime and Hydrographic Agency came to the conclusion that the area needed for the Butendiek wind farm could not be seen as a significant encroachment on the (potential) protected area. In its report, the Agency also assumes that, rather than being an alternative measure, relocation of the project away from the distribution area would constitute a new project. These findings may well be acceptable based on prevailing legislation and the lack of holistic management planning. Nevertheless, the report highlights the absence of broad area allocation that takes account of the total protected area required, the total area needed to expand wind energy use and the availability of particularly suitable sites. Only an holistic approach would allow protected area designation that takes in the interests of both sides without too much need for making exceptions.

3.5.2 Marine Planning

422. Although systematic protection of nature reserves could safeguard a few particularly valuable habitats and species from the pressure of intensive use, it appears – as already outlined – neither adequate nor appropriate to restrict spatial planning of the myriad activities to a negatively-focused 'planning by exclusion' which involves setting up nature reserves rather than adopting a general approach that takes account of local conditions. Nor would it be appropriate to overburden conservation areas with general planning aims that ultimately overshadow the reason for designating them in the first place.

Given the many overlapping claims (see Maps 3.5 and 3.5b in Annex II), the urgent need for broad, legally binding and holistic planning in the North and Baltic seas is now rarely questioned in expert circles. What applies on land also applies to the oceans and seas: the conflicting claims cannot be properly assessed, coordinated and integrated into a systematic development strategy without a legally structured, binding spatial management plan that takes in the interests of all concerned (WIRTZ et al., 2003, p. 157 et seq.). The planned expansion of wind energy use has already exacerbated existing conflicting claims and has significantly heightened the need for a marine management plan (SRU, 2003a, p. 16). Thus, in its Bergen Declaration, the International Conference on the Protection of the North Sea expressly called for and challenged OSPAR to develop an internationally adaptable spatial management concept for the North Sea (NSC, 2002). The regional protection regimes of the OSPAR and HELCOM conventions will only provide broad standards and manage coordination of national plans. They will not, however, set out the necessary binding provisions on local uses. This responsibility will fall to the respective contracting states.

The German Advisory Council on the Environment welcomes the fact that the German government's October 2003 draft amendment to planning and building law (Draft Act Adapting German Legislation to EU Law, EAG-Bau, Bundesratsdrucksache 756/03 of 17. 10. 03; and Bundestagsdrucksache 15/2250 of 17. 12. 2003) provides for the Regional Planning Act (ROG) to allow regional planning principles and goals to be set out for the EEZ based on the standards contained in the Regional Planning Act. The Council believes that the provisions contained in Section 18a of the Draft provide a reliable legal basis for long over-due marine management planning. As regards timely, effective and coherent implementation, the Council particularly welcomes the fact that at national level, EEZ planning is to be assigned to the Federal Ministry of Transport, Building and Housing (BMVBW) and the Federal Office for Building and Regional Planning (BBR) (for more on these responsibilities see ERBGUTH, 2002).

423. Responsibility for the indispensable matter of cross-border coordination lies with the EU. The Community should thus issue a framework directive on marine management to allow adaptable and coordinated planning by the responsible Member States and adopt a spatial planning concept to guide coordination of marine issues. The particular need for marine management has long been acknowledged by both the EU Council and the Commission, at least for coastal regions. In view of the special economic, social and environmental challenges faced in the coastal zone, the Council in its Resolution No. 94/C 135/02 of 6 May 1994 on a Community strategy for integrated coastal zone management (ICZM), expressly referred to the urgent need for coastal states, regions and municipalities to cooperate on planning. Following on from this, as part of its strategy for 'integrated coastal zone management' (EU Commission, 2000d) and in its proposal for 'recommendations to the European Parliament and the Council on the implementation of integrated coastal zone management in Europe' (EU Commission, 2003), the EU Commission called for greater planning coordination both between the respective actors and of the many uses in coastal regions and coastal waters. These strategies and recommendations on ICZM do not, however, meet the urgent need for formal marine management because, firstly, they remain restricted to the narrow coastal zone and, secondly, they are based more on voluntary, proactive coordination than on a binding framework for regional management. Member States are required to develop national strategies to transpose the principles of integrated coastal zone management (see Recommendation IV, EU Commission, 2000e); this is undeniably an important step. However, the extent to which they comply with regional coordination requirements through their planning law instruments will remain at the express discretion of the Member States. This type of soft requirement does not serve the manifest need for marine regional planning.

424. ICZM at national level also emphasises the particular need for cooperation and agreement and aims to reach the best possible solution by involving all affected social groups. While there will be great differences in the areas of focus, the broad emphasis will be on economic development and coastal protection (see also Schleswig-Holstein's 2001 Generalplan Küstenschutz (Coastal Protection Plan), especially p. 15 et seq.).

On the whole, efforts towards integrated coastal zone management can in many ways be seen as an attempt to create an informal alternative to non-existent marine planning law and spatial management planning. However, ICZM focuses less on planning for long-term management and development of the marine environment and more on cooperative management of the problems and interests of the competing user groups. This means that, in some respects and depending on its regional form, ICZM goes far beyond the traditional scope of regional/spatial planning. Then again, with regard to its geographical reach, the levels of obligation, transparency and authority are well below those contained in regional planning law and do not provide an adequate alternative to formalised, legally binding regional planning.

3.5.3 Regulation, Approval and Monitoring of Local Activities

425. Apart from the protected area management instruments outlined above, approval law must ensure that at sea as well as on land, local uses be thoroughly assessed for their specific impacts and (only) approved on the basis of the strictest possible environmental compatibility standards. Environmental impact assessments, approval restrictions and adequate minimum environmental compatibility standards are the key requirements in ensuring broad minimum protection from local activities in the marine environment as a whole and not just in specially protected areas. As shown in the following outline of the various activity categories, prevailing law and current practice do not serve these requirements to the extent needed.

3.5.3.1 Cross-Sectoral Management Targets and Tools

3.5.3.1.1 Best Available Technology and Ecosystem Approach

426. According to the precautionary principles contained in the OSPAR and Helsinki conventions, regulation of localised activities should be structured on the best available technology and take an ecosystem approach.

The ecosystem approach, which was also given special emphasis at the Joint Ministerial Meeting in June 2003 (see the Bergen Declaration of the Fifth NSC; NSC, 2002b), is an integrated approach to marine ecosystems, including interactions and functional relationships (see also Para. 496 et seq.). Human activities should be structured so as to ensure that these functional relationships are maintained where possible. To achieve this, coherent and integrated quality standards (ecological quality objectives – EcoQOs) must be developed and complied with to safeguard marine ecosystems (OSPAR and HELCOM, 2003; NSC, 2002b).

With its dual best available technology and ecosystem approach, the OSPAR and HELCOM regional protection regimes take a combined and not necessarily coherent precautionary approach. While pollution reduction using the best available technology constitutes a source-related precautionary approach that is restricted to what is technically possible, the resources conservation-based ecosystem approach is founded by definition on acceptor-related quality standards. The relationship between the two approaches requires clarification, particularly as regards the planned operationalisation of the ecosystem approach using abstract and general quality standards. It remains to be seen whether these standards are to be formulated as policy targets which are (only) to be aimed for on the basis of additional implementation programmes and subject to what is technically feasible, or whether they will constitute binding minimum conservation targets which are to be complied with independently of available impact minimisation technologies and, where needed, by reducing or completely eliminating the respective activities. At present, the responsible policymakers appear to prefer the former approach – the development of general conservation targets which, rather than being a direct and binding requirement, are to be implemented by means of additional measures. Given the existing gaps in available knowledge on functional relationships in the marine ecosystem, these policy targets come across as more of an appeal to marine research than an immediately practicable precautionary measure.

Nevertheless, there can be no doubt that a precautionary requirement based on the best available technologies cannot and should not mean that every impact that is technically unavoidable is automatically made acceptable by the absence of a technical fix. Rather, protection of the marine environment must by default involve absolute pollution limits that may not be exceeded by activities in the oceans and seas. In light of the obvious risks, such pollution limits should be established without delay and it appears unwise to wait until ecosystem relationships have been adequately researched and environmental quality-related ecosystem protection standards developed.

Until such time as ecosystem-focused, integrated conservation standards have been developed, it thus remains necessary to combat excessive pressures on marine habitats using interim preventive targets or at least by applying suitable criteria to carefully assess, on a case-by-case basis, whether or not potential impacts on the marine environment appear acceptable and can be allowed. This does not necessarily mean dropping, temporarily or permanently, the idea of a common commitment to the broadest possible identification and protection of the functional relationships in an ecosystem. Until general quality standards have been developed, this commitment can and must be upheld by the competent agencies conducting a case-by-case environmental impact assessment of the impacts on affected species and habitats and taking account of their findings when appraising applications for approval. This requires appropriate structuring of the applicable approval law, the availability of systematic assessment and decision criteria, and the possibility of compensation for damage.

3.5.3.1.2 Further Research on Anthropogenic Impacts

427. The level of available knowledge on the impacts of human activities, and particularly of construction in coastal areas and offshore, is deemed relatively low in expert circles (SÜNDERMANN, 2003). In its 1998 Strategy on the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area (OSPAR, 1998d, see also Article 3 of the related Annex V to the Convention) and its Strategy for Environment Goals and Management Mechanisms for Offshore Activities, the OSPAR Commission consciously stressed the importance of further research on environmental impacts (OSPAR, 1999, 3.2). The latter of the two strategies also announced the development of systematic protection goals and programmes for the Joint Ministerial Meeting in June 2003. That deadline was not met. Up to now, none of the drafts available promise any significant advancement in this regard.

A number of new findings are expected from the research projects initiated by the German government in relation to its planned expansion of offshore wind energy (BMU, 2002a,b,c). These research projects focus on stocks of valuable resources and on potential impacts from wind energy facilities (SRU, 2003a). With its proposals for protected area designation under the Habitats and Birds directives, the Federal Agency for Nature Conservation (BfN) has made a significant contribution to detailed research of valuable resources (for information on the current research status, in German only, see the BfN web site on marine environment protection at http://www.habitatmarenatura2000.de/). There remains, however, a considerable need for further research, particularly as regards specific local influences on the respective projects and activities. Project-specific environmental impact assessment thus takes on a key role.

3.5.3.1.3 Environmental Impact Assessments

428. As regards environmental impact assessment, HELCOM has taken a more far-reaching and systematic approach than OSPAR by opting for comprehensive assessments and, in some instances, specific assessment programmes on all important stationary sources (HELCOM Recommendation 18/2, 12. 3. 1997 – Offshore Activities; Recommendation 19/1, 23. 3. 1998 – Marine Sediment Extraction; Recommendation 21/3, 20. 3. 2000 – Sustainable Tourism).

429. In terms of European law, the Environmental Impact Assessment (EIA) Directive 85/337/EEC in the version of Amending Directive 97/11/EC provides a respectable if improvable basis for marine environment impact assessment. With its purely project-related scope, the Directive is also to be applied and implemented at sea and in the EEZ (JARASS, 2002, p. 49). It does not, however, make EIAs mandatory for all marine-related projects. Submarine cables are not listed in the Annexes to the EIA Directive, for example. Nor does the EIA Directive require environmental impact assessments for offshore wind energy facilities. The situation is, however, made less critical in Germany by the fact that Germany's Environmental Impact Assessment Act (UPVG) for wind farms requires preliminary EIAs for facilities with upwards of six turbines and makes full-blown EIAs mandatory for wind farms with 20 or more turbines. The EIA Directive does not provide for mandatory EIAs for marine sand and silt extraction or for the dumping of materials (e. g. dredgings). The Directive leaves it to the Member States to decide, under Article 4 (2) in conjunction with Annex II, thresholds and criteria for dumping depths and locations. The EIA obligation for German marine waters stems from the Regulation on Environmental Impact Assessments for Mining Activities and the thresholds contained therein (UVP-V Bergbau of 13. 7. 1990, Federal Gazette I, p. 1420 amended by Article 5 of the Regulation of 10. 8. 1998, Federal Gazette, I, p. 2093).

430. Any advantages to be had from the use of EIAs in marine environment protection will largely depend on the detail level and on how the results are evaluated and classified in relation to project approval. In both cases, a fair and thorough EIA that takes account of the specific resources and risks can only be ensured through the application of detailed procedural rules and instructions. The basic features of such rules and assessment criteria for marine EIAs ought best to be developed at OSPAR and HELCOM level, and further developed in Germany's case by the Federal Agency for Nature Conservation (BfN) into national administrative regulations.

431. In the project approval process, project-specific EIAs are based on the assumption that the decisions of 'whether' and 'where' have, for the most part, already been made as part of a superordinate programme and planning process. It has long been recognised that, if it is to be done properly, environmental impact assessment must take place at planning level to identify the needs of the affected environment and integrate them into the decisionmaking process. This is why the SEA Directive (2001/42/EC of 27. 6. 2001 on the assessment of the effects of certain plans and programmes in the environment, Official Journal No. L197/30 of 21. 7. 2001, p. 390) requires Member States to conduct a Strategic Environmental Assessment (SEA). The core element of the SEAs prescribed by the Directive is the environmental impact assessment to be performed for environment-related programmes. This ensures that baseline environmental considerations are identified and taken into account at programme level – something that is certainly needed when it comes to large projects in the marine environment, especially as regards the German government's plans to expand wind energy use, coastal protection programmes and plans and programmes involving the fisheries. The SEA Directive rests on the premise that large-scale projects and activities are always founded on planning that takes place in the institutional arena and on which the SEA can build. As outlined above (Para. 422), no such institutional planning framework exists for the marine environment and certainly not for the area beyond the 12-mile zone.

3.5.3.1.4 Approval and Monitoring

Requirements at EU and International Level

432. Approval requirements and monitoring are the key instruments of project-related management. Only with preventive controls and adequate approval law can use of the best available technologies to prevent and reduce the negative impacts on the marine environment be guaranteed. The obligations under Article 9 of the OSPAR Convention and Articles 3 and 12 of the Helsinki Convention, which require contracting parties to adopt all possible measures to prevent pollution and degradation (by offshore facilities) of the marine environment, also encompasses the requirement to make marine environment-related projects subject to preventive state controls. However, neither the OSPAR nor the HELCOM conventions provide for a uniform approval process.

433. The EU also fails to prescribe a marine-specific project approval procedure. The requirements contained in the Annex to the IPPC Directive apply on land and at sea – including in the EEZ. The Annex lists no associated offshore activities, however. EU law conspicuously lacks a requirement to make drilling platforms, excavations, sea walls, wind farms and other activities subject to approval under environmental law. This is consistent in that these are not traditional industrial facilities. Nevertheless, making such activities subject to approval under environmental law would appear prudent given the specific environmental risks they entail. The EU is, or at least the riparian states are, thus called upon to (voluntarily) standardise and implement the necessary legal framework.

German National Legislation

434. Nationally applicable approval criteria and instruments vary significantly. According to the types of areas affected and the competent authorities responsible for project approval, projects are divided into three groups:

Projects involving German coastal waters (within the 12-mile zone) are subject to the same approval law as those on land. For example, under the Federal Immission Control Act (BImSchG), in conjunction with Item 1.6 of the Fourth Federal Immission Control Ordinance (4. BImSchV), wind farms with between three and five turbines are subject to a simplified approval procedure, while those with six or more turbines must undergo a comprehensive approval procedure under pollution control law. The approval process also requires that consideration be given to the applicable provisions contained in building and planning law along with the relevant provisions contained in other national and *Länder*-specific laws, particularly the rules on impacts of human activities in the German Federal Nature Protection Act (Para. 442).

Projects in the EEZ are distinguished according to whether they involve facilities for the exploration, extraction or processing of raw materials. Exploration activities, meaning mining and sand and silt extraction, and activities involving underwater cables, transit pipelines and research studies conducted on the German continental shelf – identical with the EEZ – are subject to federal mining law (BBergG) and its special two-step approval process consisting of an operator-level exploration and extraction license (Federal Mining Authority) plus facility-level licenses for specific exploration and extraction activities.

Projects planned for the EEZ which are not mining activities and which involve generation of energy from wind, water or currents or other commercial purposes (only wind energy facilities are of de facto relevance right now) are subject exclusively to the Marine Facilities Ordinance (SeeAnIV), whose Article 2 makes construction and operation of such facilities subject to approval by the Federal Maritime and Hydrographic Agency (BSH). Its Article 3 requires that a project be rejected if it poses a risk to traffic safety and flow or to the marine environment as a whole. Under Paragraph 2 of the Ordinance, a risk to the marine environment exists specifically when 'pollution of the marine environment can be expected or migratory birds are endangered'. If neither of these grounds for rejection exists, then the project must be approved. The approval process is thus designed as a binding decision which allows the Federal Maritime and Hydrographic Agency neither any degree of discretion nor any authority as regards planning; it is merely required to check whether one or other grounds for rejection exist.

Assessment: The Need for Marine Facilities Approval Law

435. The very heterogeneous nature of German approval law invites an initial positive assessment that it at least takes in almost all relevant activities and claims and, for the most part, subjects them to preventive state control. While the approval criteria often assume (to varying degrees) that consideration has been given to environmental needs, a number of significant deficits obstruct efficient implementation of marine protection requirements.

Overall, there is a lack of the necessary regional planning provisions needed to coordinate conflicting uses and needs. The very obvious need for a marine management plan has already been addressed elsewhere (Para. 422).

The licensing and regulation criteria enshrined in German environmental law that apply in principle to coastal waters are mostly designed for land-based facilities and are often unsuited to dealing with the conflicts surrounding offshore activities. This results in a lack of clarity as to the applicability and transferability of a wide range of requirements. In many cases, their applicability to marine areas is not explicitly set out.

436. Turning first to building and planning law, this undeniably provides an effective set of instruments for protecting and maintaining natural shorelines. A municipal planning approach often fails, however, because it only covers the municipal area which local administrative rules often deem as ending at the mid-tide line. The question remains as to whether at least Article 35 of the Federal Building Code (BauGB) finds application beyond that line (affirmed by ZIMMERMANN, 2003, p. 136 et

seq.). This is in turn of importance to wind energy facilities. Under Article 35 (1) No. 6 of the Federal Building Code, wind energy facilities receive special treatment in that they are generally allowed in undeveloped locations. The same article requires that the site be safe and neither detract from the 'natural landscape and its recreational value' nor disfigure the landscape. This situation will no doubt be a stumbling block to the erection of large wind farms in direct proximity to the coast. Their construction in narrow coastal strips is also largely prohibited by *Länder* nature protection provisions (Article 11 (1) sentence 1 Schleswig-Holstein Nature Protection Act (LNatSchG); Article 19 Mecklenburg West Pomerania Nature Protection Act (LNatSchG)).

437. With regard to wind energy facilities, it is particularly important in coastal areas that both *Länder*-specific and regional planning designate certain areas as being exclusively suitable, thus concentrating such facilities in coordination with other uses of the sea. Although regional planning laws (in contrast to building and planning law instruments) actually cover coastal waters, they are hardly ever applied. And this despite the fact that the need for a spatial planning approach to the management of conflicting uses, especially in intensively used coastal waters, is both evident and recognised in expert circles. Up to now, as far as can be ascertained, only Schleswig-Holstein has agreed a management plan for its coastal waters, albeit exclusively for wind energy. With its decision of 3 December 2001, the Ministerial Meeting on Regional Planning called for the coastal *Länder* to introduce spatial management plans for the 12-mile zone and asked the federal government to expand regional management to the EEZ in cooperation with the coastal *Länder*. While integrated coastal zone management forms an important part of marine management planning, as already outlined above (Section 3.5.2), it does not provide an adequate alternative to a legally binding, transparent and holistic planning approach.

438. Depending on the type and extent of a project, its technical regulation and approval is divided between building and planning law, mining law, water law, waterways law, pollution control law, nature protection law and *Länder*-specific coastal protection law. According to their subject matter, these instruments place more or less emphasis on environment protection and only a few contain the discretionary powers to allow planning and structuring to take account of other needs, including those of marine environment protection. Germany's Water Management Act (WHG) provides neither uniform approval criteria for significant construction activities in coastal waters nor approval requirements tailored specifically to marine environment protection. The construction of wind energy facilities in coastal waters is deemed neither use nor development of a water body and is thus not even subject to any approval requirement under the WHG. This fragmented, non-specific approval law for the regulation of activities in coastal waters appears highly inadequate given:

- The specific problems involved in marine environment protection.
- The specific conflicts involved in coastal waters.
- The increasing impact of the expansion of wind energy use.
- The efficiency and focus of approval procedures and decisions.
- The need for centralised approval and coordination of myriad protection requirements and claims.

There have rightly been calls for the establishment of specific approval criteria along with a requirements profile for coastal waters (ZIMMERMANN, 2003, p. 140). These must, however, be extended to take in the EEZ.

439. The mining law applicable to most offshore activities contains only very general provisions for marine environment protection. Article 49 No. 4 of the Federal Mining Act (BBergG) only allows exploration of raw materials if it 'does not significantly encroach on flora, fauna or waterbodies as components of the natural environment', while Article 55 (1) No. 13 requires that 'the adverse effects on marine waters be kept to an absolute minimum'. This provision allows for considerable administrative discretion as to whether and to what extent environmental impacts are 'acceptable' and to be tolerated (KÜHNE, 1996, p. 315). If the competent mining office requires that the assessment take account of the actual aim of mining law, specifically mining promotion and operational safety (KÜHNE, 1996, p. 316), then these rather vague provisions give cause for concern that marine environment protection needs are not especially safe in the hands of the mining administration. The absence of firm environmental approval criteria and of environmental protection guidelines is particularly worrying. Nor is this deficit eliminated by the environmental provisions contained in the Continental Shelf Mining Ordinance (Festlandsockel-Bergverordnung) because although they contain important duties of care (waste disposal requirements, accident prevention), they lack actual requirements as to the environmental compatibility of the facilities to be approved. That being the case, the German Advisory Council on the Environment considers it prudent to grant an environment agency at least the right of co-decision rather than allowing for mere participation in the approval procedure, as is the case with existing law and in current practice.

440. The key deficits of the Marine Facilities Act (SeeAnlV), which covers all facilities not covered by the mining administration, lie in the abstract nature of its environment-related approval requirements and the absence of the planning discretion and structural planning powers that would give the Federal Maritime and Hydrographic Agency (BSH) the ability to concentrate activities in non-sensitive areas (SRU, 2003a, p. 13 et seq. and later in the section on Expansion of Offshore Wind Energy, Para. 449 et seq.).

441. All in all, the German Advisory Council on the Environment considers that there is a need for specific

marine environment approval law that places responsibility for approval using appropriate approval criteria and guidance in the hands of a specialist environment administration. This kind of uniform approval law for marine projects in coastal waters and in the EEZ could, given the nature of the issue, be developed in a separate section of the Water Management Act (WHG). The approval criteria would need to encompass all activities that could have an adverse effect on the marine environment or on the biological or other functions and uses of coastal waters and the EEZ. The competent authorities should be given planning discretion to enable them – guided by specific substatutory standards – to strike an optimum balance between the various claims and protection requirements in marine areas. This means that the far-reaching interrelationships and interactions, and the complex task of integration, require similar management principles to those that apply to the use of water on the mainland. As addressed in the following sections, nature protection provisions call for an integrated marine-related approval process.

3.5.3.1.5 Human Impacts and Compensatory Measures

442. Stipulating a requirement to prevent significant impacts on nature and the landscape wherever possible or, if they cannot be prevented, to make good or compensate for them in some way or another, the rule on impacts of human activities in Article 19 of the Federal Nature Protection Act (BNatSchG) is not just a fundamental principle applied in identifying and considering environmental impacts. It also provides much-needed flexibility in the management of environmental conflicts. This applies both on land and to impacts on the marine environment. Because identification and due consideration of marine environment needs receives only marginal attention in the current largely land-based approval laws, it appears all the more important by way of compensation that the impacts rule be implemented at sea. What really matters, however, is what the German Advisory Council on the Environment criticised about land-based implementation in its Special Report Towards Strengthening and Reorienting Nature and Landscape Conservation: there is a need for clear administrative standards for identification, assessment and compensation of environmental impacts. And even more so than on land, standards are lacking to ensure effective and correct application of the impacts rule, using available knowledge (SRU, 2002a, Para. 335). Supporting research on the expansion of offshore wind energy will generate valuable insight. This knowledge should be used to reap the benefits of applying the impacts rule to marine waters.

443. Land-based experience with the impacts rule has shown that effective implementation of nature protection law requires a 'compensation strategy' that focuses on nature protection and takes a regional and holistic approach. The strategy should allow compensation obligations from a number of activities to be consolidated and coordinated in the form of specific compensation activities. The impacts rule thus depends both on holistic general regional planning and specific nature protection planning. While the Wadden Sea provides a number of suitable models, no area-wide planning obligation exists as such.

444. The impacts rule contained in Article 19 of the Federal Nature Protection Act (BNatSchG) and the more detailed *Länder*-specific nature protection laws all apply to coastal waters but not to the EEZ (KLINSKI, 2001, p. 21). Excepted and allowable impacts in FFH and bird protection areas (on grounds of overriding public interest) are subject to the compensation obligation contained in the Habitats and Birds directives which requires that significant impacts be prevented or at least by other activities (CZYBULKA, 2001). Making significant impacts in marine ecosystems, including in non-FFH areas, subject to a compensation provision appears at least desirable and OSPAR and HELCOM should consider appropriate initiatives. Implementation in the EEZ of the Habitats compensation provision would need to be supported by marine-related administrative standards.

3.5.3.1.6 Transparency in Activities and Environmental Impacts

445. As regards sea-based projects, the key requirements for their proper regulation and approval drawing upon available knowledge are transparency in existing and planned activities, intensive research on their impacts and the most effective possible level of cooperation between riparian states. OSPAR and HELCOM have done much in this area. Nevertheless, there are still some gaps in available data and knowledge. To date, there exists no centralised and comprehensive collection of all the available information on significant activities and facilities and on the assessments of their impacts in the marine environment. Although OSPAR announced their intention to issue documents of this type back in 1999 (OSPAR, 1999, No. 3.2) they have not been published. When it comes down to individual activities, decision-makers are thus faced with a rather diffuse image shaped by research results and publications put out by myriad private and public sources.

3.5.3.2 Offshore Facilities

446. Management of offshore activities involves exclusion of facilities from particularly valuable and sensitive marine (protection) areas and, more importantly, reduction of the environmental impacts from oil platform drilling residues (muds and cuttings) containing harmful substances – particularly oil and PCBs.

Both OSPAR and HELCOM have issued a number of resolutions and recommendations regarding inputs of oil and harmful substances from offshore extraction facilities and on non-substance related impacts on the marine environment (see Section 2.1.6 and 2.2.6) (Table 3.13).

Table 3-13

OSPAR and HELCOM action on offshore installations

OSPAR (Decision 2000/3 and Recommendations 2001/1 and 2003/5)	HELCOM (Recommendation 18/2)
– Environmental auditing system instituted for offshore installations – OSPAR states obligated to reduce oil discharges from produced water by 15% between 2000 and 2006. – Zero discharges target for new installations from 2002. – Discharges of produced water banned if the oil concentration exceeds 40 mg/l (30 mg/l from 2006). – Use of organic phase drilling fluids (OPFs) subject to authorisation. – Mandatory control system for the use and reduction of discharges of drilling fluids. – Diesel-oil-based drilling fluids prohibited. – Offshore discharge of cuttings contaminated with OBF prohibited at concentrations above 1% by weight on dry cuttings.	– Exploration or exploitation activities banned in HELCOM protected areas (see Para. 407). – In-depth environmental assessment for all new exploration and exploitation activities. Sea-bed, water column and benthos monitored while activities in progress. – Use of oil-based drilling muds to be avoided if possible. Any such muds used to be disposed of on land. – Drilling cuttings to be treated ashore. – Discharges of 'production water' and displacement water prohibited unless oil content less than 15 mg/l.
SRU/SR 2004/Tab. 3-13	

A comparison of the respective measures shows a need for further action on the part of OSPAR. Specifically, OSPAR lacks a resolution on rejecting applications for offshore activities in particularly valuable and sensitive areas. Also, there are no clear requirements on environmental impact assessments. By way of contrast, HELCOM Recommendation 18/2 goes so far as to set out very detailed assessment issues and criteria. OSPAR's strategy for an offshore environment management system comes as a welcome move, however. This approach should be taken up at national level, where it is likely to be important not so much as regards oil and gas extraction – which is less of an issue in German waters – than for wind energy facilities.

447. A positive aspect with regard to national implementation is that the Environmental Impact Assessments (Mining) Ordinance (UVP-V Bergbau) requires EIAs for most extraction facilities. The main OSPAR and HELCOM requirements on prevention of waste and oil inputs have been implemented under the Continental Shelf Ordinance (Festlandsockelverordnung), which allows inputs of production water with a maximum oil content of 30 mg/l on the condition that no reasonable measures can be taken to further reduce the oil content. Given the low level of importance this issue holds for German marine waters at present, the German Advisory Council on the Environment believes it acceptable despite the fact that it falls short of HELCOM's 15 mg/l recommendation.

An aspect in which German legislation is particularly lacking is that, as already outlined elsewhere (Para. 434 et seq.), it contains no specific approval requirements or environmental compatibility criteria for marine environment protection that could guide approval decisions by focusing on marine environment issues and make them appropriate and transparent. Current approval practice cannot guarantee compliance with the key approval requirement under Article 55 (1) No. 13 of the Federal Mining Act (BBergG) to keep impacts on marine waters to an absolute minimum.

Another weakness in national implementation legislation involves the HELCOM requirement to exclude offshore activities from protected areas. Under Article 48 (1) of the Federal Mining Act (BBergG), approval decisions should take account of requirements that – just like nature protection provisions on protected areas – prohibit mining activities on property that is protected for reasons of public interest. However, the raw materials security of supply provision contained in Article 48 (1) sentence 2 of the Federal Mining Act allows considerable scope for interpretation to allow mining activities and to ignore protected area provisions (HOPPE, 1987, p. 747). The provisions contained in German national implementation legislation essentially prevent the *Länder* from applying nature protection provisions to exclude mining activities. There are thus justified calls for a change to the raw materials security of supply provision, at least for marine protected areas (SCHÜTTE, 2000, p. 263). Given the

extremely low level of importance of raw materials extraction in German marine areas, there is no actual need to apply this provision to marine protected areas; on the contrary, highly sensitive marine areas must be safeguarded against undesirable activities.

448. There is also a significant need for action regarding the removal of offshore installations after decommissioning. Sparked by the broad public debate on the disposal of the Brent Spar oil platform, OSPAR Resolution 98/3 governs the disposal of offshore facilities in that it aims to prohibit the sinking or abandoning of any part of a facility. The resolution permits an exception to be made for very heavy facilities weighing more than 10,000 Mg which may be used on the proviso that all contracting parties to the Convention be consulted in advance.

Within the scope of German mining law (coastal waters and the EEZ, see Para. 434), Article 55 (1) of the Federal Mining Act (BBergG) requires that decommissioning plans contain the provision that operational facilities be removed in their entirety, right down to the sea bed. Sinking the facility to rest on the sea bed or mere partial disassembly are thus ruled out as disposal options (KÜHNE, 1996).

3.5.3.3 Special Focus: Expansion of Offshore Wind Energy

449. Looked at from almost any perspective, the German government's planned expansion of offshore wind energy serves as a fitting example of the political and legal challenges, and the existing deficits, in protecting marine habitats. The German Advisory Council on the Environment recently published its position paper on the environmental risks and management issues involved in implementing such a huge construction programme in the North Sea (SRU, 2003a). Its core findings still apply.

The Project and Its Environmental Risks

450. The use of offshore wind energy can make a significant contribution to obtaining a climate friendly, independent energy supply. The German government thus plans to develop large wind farms in its North Sea waters (the areas for which applications for projects have already been received are shown in Maps 3.6a and 3.6b in Annex II). In its Offshore Wind Energy Strategy, the government has committed to an ambitious phased expansion programme (Federal German Government 2002a, 2002b). The plan is to use offshore wind farms to supply a significant share of the country's electricity demand by 2025 or 2030 (between 70 and 85 TWh/a or about 15% of annual electricity consumption in 1998, Federal German Government 2002, p. 7 et seq). In the medium term, turbines with a minimum total output of 500 MW are to be installed in the North and Baltic seas by 2006, with output increasing to between 2000 and 3000 MW by 2010 (Coalition Agreement, 2002).

There are concerns that expansion on this scale could have a tremendous impact on natural resources in the area (see SRU, 2003a, p. 2 et seq.). The project primarily poses the following environmental risks:

– Disturbance, pollution and displacement during construction. It is feared that the considerable noise created by ramming foundations into the sea bed could disturb hearing and orientation in sensitive marine mammals like pig whales, seals and grey seals and cause their displacement from established territories. Disturbance of sediments and the cloudy waters that ensue from facility construction and the laying of connection pipes could, at least temporarily, harm benthos and fish.

– The potential impact of the facilities on bird migration. The North Sea provides a resting and transit area for numerous migratory bird species. These birds could be harmed by direct collisions with wind turbines and by the barrier effect of large-scale wind farms. Resting birds could be disturbed by the facilities themselves and by construction activities during the building phase.

– Lasting changes to marine morphology and geology. These can lead to changes in currents and sediment transportation, and particularly to changes in the species spectrum brought about by the introduction of hard substrates when laying foundations. Hard substrates are rarely a natural occurrence in shallower regions of the North Sea.

– Increased risk of accidents involving vessels carrying environmentally harmful cargos. As the sinking of the Prestige illustrated, the risk of collision plays a key role because of the huge damage potential (SRU, 2003a).

Given that many of the interrelationships in the marine environment have yet to be properly researched, a range of uncertainties exist regarding the impacts outlined above. The great variation in local conditions also allows only very general conclusions to be drawn. In fact, any environmental impact assessment must identify local sensitivities. Against this backdrop, it is necessary to take a careful and phased approach to expansion of offshore wind energy and to initially allow the erection of wind farms in such areas that, based on available knowledge, can be deemed particularly insensitive and of lesser ecological value. To identify areas of this type and enable better assessment of the potential environmental impacts, the German government has initiated a number of supporting research projects. Studies on stocks of regional resources serve future designation of marine protected areas under the Habitats and Birds directives (Section 3.5.1.3). As a parallel measure, research that has already been concluded (KNUST et al., 2003) is being used to develop the planning and technical capabilities to reduce (potential) impacts and risks. Examples involve construction phase measures to reduce noise and operational phase measures to reduce the risk of collision – for migratory birds and for shipping (SRU, 2003a, p. 7).

A final key factor – not least in environmental protection – is that in specific marine areas, wind energy

expansion plans come up against a complex mesh of claims from shipping, the military, fisheries, mining, tourism and research, making necessary both environmental impact assessments and coordination through regional planning (WIRTZ et al., 2003). This requirement cannot be met under prevailing law.

Regulatory and Planning Control

451. The German government plans to erect wind energy facilities almost exclusively in the EEZ, where their approval is subject to the provisions contained in the Marine Facilities Ordinance (SeeAnlV). Under Article 3, as already addressed elsewhere, the Federal Maritime and Hydrographic Agency (BSH) must approve a project if it has no impact on shipping safety and flow or poses no threat to the marine environment. The Federal Maritime and Hydrographic Agency is granted neither any degree of discretion nor any planning authority: it is simply required to assess whether one or other of the grounds for rejection exist. Determining whether grounds for rejection exist is, however, extremely difficult due to gaps in available knowledge on the impacts of large-scale wind farms.

A certain element of assistance is afforded to applicants in proving their compliance with approval requirements in that Article 3 of the Marine Facilities Ordinance allows designation of so-called 'suitable sites'. Once designated, these sites – selected by the Federal Ministry of Transport, Building and Housing in conjunction with the Federal Environment Ministry – are deemed to have a status 'equal to an expert report on the impact of a facility erected at the selected site'. The existence of suitable sites thus supports a refutable assumption that a location is generally suited as a wind farm site. With the incentive effect of simplified site assessment, the designated suitable sites also serve as the only legal instrument to provide for any degree of spatial planning.

452. In its position paper on offshore wind energy expansion, the German Advisory Council on the Environment set out in quite some detail why the legal system outlined above is poorly suited to management of the conflicts that ensue between wind energy operator claims, marine environment protection and other claims (SRU, 2003a, p. 9 et seq.). The Council thus wishes to emphasise its standpoint that:

– In place of the binding approval requirement, a degree of planning discretion must be granted to the Federal Maritime and Hydrographic Agency (BSH) to allow the expansion process to be phased in terms of area and timeframe so that expansion is initially restricted to non-sensitive areas and, in the course of this suitably phased expansion, the findings from supporting research are considered in subsequent projects. If, for this purpose, the Federal Maritime and Hydrographic Agency currently approves only facilities with less than 80 turbines, then it does so without adequate legal backing.

– The German government should issue administrative regulations reflecting the current status of impact research and laying down general, uniform and clear criteria to be used in environmental impact assessment. One example would be to apply the criteria to establish the level of impact at which an unacceptable 'impact on bird migration' can be expected.

– Without further delay, protected areas must be identified under the Habitats Directive and be reported to the EU Commission, selected by the Commission and set up by the Member States. The Birds Directive must be implemented in full by designating bird protection areas (see Para. 414 et seq.) in order to safeguard Natura 2000 sites against significant impacts from wind energy facilities and to foster expansion in less valuable areas. The German Advisory Council on the Environment thus welcomes the fact that with the current Draft Amendment to the Renewable Energy Sources Act, wind energy facilities approved after 1. 1. 2005 for construction in Natura 2000 protected areas are not subject to the price guarantees otherwise available for renewable power (Article 10 (7) Renewable Energy Sources Act – EEG-E). This should have the effect of keeping designated protected areas largely free of wind farms.

– As with the suitable sites designated under regional planning law (Article 7 (4) of the Federal Regional Planning Act (ROG)), appropriate marine sites should also be made exclusive, with facilities outside such areas being approved only in exceptional cases where there is a special need. This type of planning instrument is the only way to ensure that uses liable to cause conflict are concentrated at suitable sites. The German Advisory Council on the Environment believes that the incentive effect of designating suitable sites under Article 3 of the Marine Facilities Act (SeeAnlV) is not sufficient to achieve this. Nor does the exclusion of Natura 2000 sites from price guarantees under the Renewable Energy Sources Act provide for the necessary concentration of facilities at suitable sites.

– Wind energy use must be reconciled with nature protection and numerous other uses of the sea; this requires holistic regional planning that includes the EEZ (see Section 3.5.2). The German Advisory Council on the Environment expressly welcomes the fact that the German government's draft amendment to building and planning law (EAG-Bau, see Para. 422) provides for an addition to regional planning law to require that regional planning principles and objectives for the EEZ be drawn up by the Federal Ministry of Transport, Building and Housing (BMVBW) according to the provisions contained in the Federal Regional Planning Act (ROG). With regard to offshore wind energy, this initiative should be quickly followed through and wind energy expansion plans incorporated as far as still possible into the new marine management plan. However, the Council considers it an unnecessary self-imposed constraint on regional planning that the proposed new Section 18a (3) of the Regional Planning

Act requires designated suitable sites to be incorporated in the new marine management plan as priority sites only and not as exclusively suitable sites within the meaning of Section 7 (4) No. 3 of the Act.

These key policy requirements for sustainable use of the seas are not restricted to the planned expansion of wind energy. Planned management of marine areas and specific environmental approval criteria are equally necessary for the many other uses and impacts.

3.5.3.4 Cables and Pipelines

453. As shown by the highly contested Europipe, the specific problems involved with the laying of cables and pipelines lie in the considerable size of the areas they cover (see Maps 3.7a and 3.7b in Annex II). Oil pipelines also entail accident risks and the threat of leaks and oil spills. From a marine environment protection perspective, these negative impacts primarily require systematic cross-border pipeline management, where the main goal must be to lay pipelines together wherever possible. This calls for a comprehensive network plan for both the North Sea and the Baltic which should, where appropriate, provide for key infrastructures like marine transformer stations and – by means of a marine management plan (see para 422 et seq.) – be made legally binding (WIRTZ and SCHUCHARDT, 2003, p. 156).

3.5.3.5 Sediment Extraction

454. Due to the wide range of what can be considerable environmental impacts from the extraction of sea bed sediment (addressed in Paras. 118 and 201), the German Advisory Council on the Environment sees a need for strict application of the precautionary principle in this sector. It is thus to be welcomed that HELCOM Recommendation 19/1 has established important precautionary requirements for the entire Baltic region which:

- Make sediment extraction subject to approval criteria.
- Require that approval be based on an environmental impact assessment which takes account of the assessment criteria contained in the Annex to the Recommendation.
- Prohibit approval in particularly sensitive areas, including IUCN national parks and Natura 2000 sites, and make approval of certain partially sensitive areas a matter of exception.
- Require use of available technology to minimise environmental impacts and ensure speedy regeneration.
- Link approval to environmental monitoring or conservation of evidence relating to impacts.

German requirements on sediment extraction are largely confined to the general mining law provisions outlined above. Germany's Continental Shelf Mining Ordinance (Festlandsockel-Bergverordnung) contains the only environment-specific provision in that it requires companies both to ensure that the sea bed is able to regenerate ecologically and to avoid major surface irregularities (Article 34 FlsBergV).

455. With reference to HELCOM Recommendation 19/1 and considering the findings of a scientific workshop conducted by the *Bund-Länder* Committee on the North Sea and the Baltic (BLANO) on 18. 11. 1998 (von NORDHEIM and BOEDEKER, 2000; SORGE, 1998), the German Advisory Council on the Environment sees a need for further clarification and more detailed definition of statutory precautionary provisions on sand and silt extraction to include:

- A requirement for environmental impact assessments to go beyond the thresholds contained in the Environmental Impact Assessment in Mining Ordinance (UVP-V Berg) to include extraction activities in areas of less than 10 ha or where the daily extraction volume is below 3,000 Mg.
- An express ban on sediment extraction of any kind in nature protection areas.
- To prevent clouding, promotion of dry extraction using appropriate technologies (e. g. silt curtains) and approval of dumping at sea for coarse sediments only.
- Consideration of specific seasonal sensitivities (e. g. bird resting periods and fish migration) through appropriate restrictions on extraction activities.
- Specific precautionary requirements to ensure regeneration so that, for example, an adequate layer of the original sediment is left at the extraction site and that site expansion and configuration be designed to allow speedy settlement of organisms from the surrounding area.
- A requirement to enhance the knowledge base on environmental impacts and regeneration by means of parallel environment monitoring in line with ICES recommendations (ICES, 1995) or conservation of evidence.

3.5.3.6 Dredged Material

456. As regards the dumping of dredged material, current practices allow for far lower and shorter-lived pollution of the marine environment than those involved in other pollution sources (Para. 120). Nevertheless, the German Advisory Council on the Environment believes that clear and strict application of tough environmental soundness provisions is essential. The high concentrations of pollutants found in sediments in harbours and busy shipping lanes pose an ongoing threat in that large quantities of pollutants can be re-released when dredged spoil is dumped.

To combat the threat of significant impacts in the marine environment, rules on the management of dredged material were drawn up under the London Convention of 1972 (Para. 12) and by OSPAR and HELCOM (LC: DMAF/1995; OSPAR Guidelines for the Management of Dredged Material and HELCOM Recommendation 13/1 – guidelines for the disposal of dredged

spoil). To implement these recommendations, the Federal Institute of Hydrology (BfG), on behalf of the Federal Ministry of Transport, Building and Housing (BMVBW), developed Guidelines for Dredged Materials in Coastal Waters (Handlungsanweisung Baggergut Küstengewässer or HABAK) which since 1992 in the original and since 1999 in an amended version have provided binding administrative instructions to be applied by the federal waterways and shipping administrations to all dredging activities in federal waterways. As a parallel measure, the Guidelines for Dredged Materials in Inland Water (Handlungsanweisung Baggergut Binnengewässer or HABAB) provide assessment provisions, reference values and limits for inland waters; these naturally have an indirect impact on marine protection. Although the *Bund-Länder* Working Group on Management of Dredged Materials in Coastal Areas (BLABAK) has been working for some considerable time on joint recommendations for handling dredged material in coastal areas, it has not yet produced any conclusive results.

Both HABAK and HABAB guidelines require comprehensive environmental impact assessments for any introduction or relocation of dredged material and set out in detail the required assessment activities and assessment parameters. By applying thresholds for pollutants (e. g. for heavy metals, polychlorinated biphenyls and polycyclic aromatic hydrocarbons) and nutrient concentrations, and with classification based on ecotoxicological criteria, differentiated approval requirements are developed for approving the relocation and dumping of dredged material in coastal waters. The best available technologies listed in Annex 1 to HABAK must be applied. Also, monitoring activities are prescribed in line with international requirements to identify any changes caused by dumping. Dredged material with impermissible contaminants may not be dumped at sea; instead it must be properly recycled, reused or disposed of on land.

457. The HABAK and HABAB guidelines have, in the opinion of the German Advisory Council on the Environment, resulted in clear advancements in assessment and management of dredged material for which appropriate standards have long been lacking. The assessment, evaluation and approval criteria are both comprehensive and stringent.

Nevertheless, the guidelines do not provide an adequate legal basis for standardised and environmentally sound disposal of dredged material. Firstly, they do not apply beyond German federal waterways. Waters beyond these waterways come under the responsibility of the *Länder*, who lack a binding legal instrument on disposal of dredged waste similar to the federal guidelines. Secondly, the general legal standards are contested: in their area of jurisdiction (outside waterways), the *Länder* take a different approach to that of Federal Waterways Administration in that they require dredged materials to be treated as waste under waste management law and be recycled or reused without causing harm to the environment (Article 5 (2) of the Closed Substance Cycle Waste Management Act (KrW-/AbfG)). The *Länder* refuse to or only partially recognise relocation and dumping as reuse or recycling. In contrast, the Federal Waterways Administration assumes that relocation constitutes a direct use of dredged material if it is put back into the same waterbody (coastal waters) (STEINDER, 2003, p. 15; RODIEK, 2003).

Both the effectiveness and requirement to take account of the Water Framework Directive is questionable and contested (JANNING, 2003). It can hardly be denied that in management and action planning, the competent authorities must ensure that the introduction or relocation of dredged material neither degrades water quality nor threatens the achievement of the good water status target. This quality target primarily involves – at least indirectly – sediments and includes strict observation of the reduction requirements for priority harmful substances (Para. 297). However, with the complex web of federal and *Länder* responsibilities it remains both unclear and questionable as to what extent and with what material and legal means these targets can be enforced in the dredged material disposal and recycling sector.

458. On the whole, despite the German government's progressive administrative regulation of its waterways (HABAK/HABAB), current regulatory arrangements do not take account of the ecological, administrative and cross-sectoral dimension of the issue. Experts rightly call for national legislation (KÖTHE, 2003, p. 9; RODIEK, 2003) and, beyond this, for legislation at EU level (LABOYRIE, 2003). The German Advisory Council on the Environment expressly supports the calls for specific legislation and sees a sound basis for such legislation in the HABAK/HABAB guidelines. The Council also recommends that the introduction and relocation of dredged material in waterbodies be more tightly bound to the water management regime of the Water Framework Directive – although this requires expansion to take in the marine environment – to (1) ensure greater cooperation between the federal and *Länder* governments to effect joint management of dredged material, (2) tightly link the latter to the quality targets contained in the Water Framework Directive and to the associated thresholds, and as applicable (3) require harmless disposal on land. For land-based disposal, water law, soil protection law, waste management and construction materials law make up a comprehensive regulatory framework from which the Joint *Länder* Working Group on Waste, with its Resolution 20: Requirements for Recycling and Reuse of Substances from Mineral Wastes – Technical Instructions, provided specific provisions and guidelines for recycling and reuse as construction materials (BERTRAM, 2003).

The German Advisory Council on the Environment sees no pressing need to give priority to treatment and disposal on land. Nonetheless, in response to those who sound the 'all clear' by pointing out that ongoing improvements in freshwater quality reduce the risks from dumping dredged material, the Council again points to the high persistence of many pollutants in sediments (JANNING, 2003, p. 5). It is no doubt correct and of great importance that by reducing pollutant loads in waterbodies, the additional pressures from sediment extraction and the dumping of

dredged material will also be reduced. Nevertheless, there remains a significant long-term risk from the pollutants already present in sediment. This risk must be mitigated by means of clear and stringent requirements for environmental impact assessment, maximum allowable pollutant concentrations, technical implementation, and monitoring activities in line with HABAK and closely aligned to water law.

3.5.3.7 Coastal Protection

459. The conflicts between nature protection and coastal protection highlight the need for an integrated planning approach and for using and further developing the means and technologies for conservation of natural coastal habitats, and especially those in bird protection areas and foreshores. There is no question that protection of coastal populations must be the main priority. But this purely defensive protection priority does not, however, mean that other land reclamation should take precedence over the needs of nature protection. It is thus prudent to point to the stringent standards set out for bird protection areas and FFH protected areas by the European Court of Justice in the 'Leybucht' Dykes case (ECJ Ruling of 28. 2. 1991 – Case C-57/89, (1991) ECR I-883). With regard to plans to build sea walls in the Leybucht bay in the Lower Saxony Wadden Sea National park, the ECJ ruled that the Member States may only reduce the size of specially protected areas designated under the Birds Directive on exceptional grounds of public welfare. While the threat from flooding to public health and safety constitutes such a grave matter, land reclamation for economic or tourism reasons does not.

3.5.3.8 Mariculture

460. In many areas, the negative environmental impacts from aquaculture and mariculture (mariculture being marine aquaculture) have, as outlined in Para. 130, been reduced through the use of improved production technologies and methods. Nevertheless, sustained high growth rates give rise to an urgent need to place these marine activities in an appropriate environmental law framework which would ensure that operators of mariculture use the best available technologies and methods to prevent negative impacts on the environment and that mariculture be located at suitable, ecologically insensitive sites. With Article 9 of its Code of Conduct for Responsible Fisheries, the Food and Agriculture Organisation (FAO) has called upon the international community to create an appropriate administrative framework to promote environmentally sustainable development in mariculture. Also, with its Recommendation 20/1 of 23 March 1999, HELCOM agreed that the establishment and operation of fish farms must be subject to approval requirements and tied to best available technology provisions. These requirements include:

– Prior to operation, appropriate environmental impact assessments must be carried out to study the long-term effects on the affected marine region.
– Discharges of phosphates and nitrates from fish breeding must be limited in quantitative terms, either by applying emission thresholds or placing restrictions on input of fish feed; in general, discharges should not exceed 7 g phosphorus (tot-P) and 60 g nitrate (tot-N) per kilogram of fish produced, and in the longer term 6 g phosphorus (tot-P) and 50 g nitrate (tot-N).
– Other appropriate restrictions should be put in place to ensure that the limits of resilience identified in the environmental impact assessment or the pollution thresholds described in general quality standards are not exceeded in the affected habitats.
– Compliance with the ICES and EIFAC recommendations on preventing negative impacts from escaped cultured fish.
– Regular monitoring for compliance with available technology and, where appropriate, ensuring compliance by implementing additional measures.

HELCOM further recommends:

– Discharges and environmental impacts from mariculture be regularly monitored by the competent authorities or third-party experts, with particular focus being placed on the eutrophic condition of the waters and the state of the sediments in the affected area.
– Public control of drugs and chemicals and a ban on their prophylactic use (see PARCOM Recommendation 94/6 on Best Environmental Practice (BEP) for the Reduction of Inputs of Potentially Toxic Chemicals from Aquaculture).
– Regional planning should be employed as an instrument for directing fish farming activities to suitable areas and mitigating conflicts between fish farming and other uses of the area.
– Fish farms should not be placed in areas reserved for nature protection, if that might conflict with the aims of protection.

461. These fitting basic requirements for environmentally sound mariculture must be better enshrined in European and national law, including for the North Sea. In this regard, the German Advisory Council on the Environment expressly welcomes the EU Commission's announcement in its strategy for the sustainable development of European aquaculture (EU Commission, 2002, p. 23) of plans to integrate aquaculture and mariculture into the scope of IPPC Directive 96/61/EC and to monitor the development of reference documents on the best available environmental technology. Integration into the scope of the IPPC Directive would appear an appropriate regulatory approach at EU level given that the Directive also covers intensive livestock husbandry in agriculture. Of greater importance, however, are the approval requirements that will be chosen for the approval process – perhaps under the IPPC Directive. Apart from animal health provisions, some of which are quite detailed (Council Directives 91/67, 93/5 and 95/70), there are as yet no standards for implementation of the HELCOM

recommendations under EU law. For this reason, European efforts must place their main focus on the development of appropriately detailed provisions (including constitutional law guidelines where appropriate).

The EU Commission rightly emphasises, as does HELCOM, the great importance of carrying out comprehensive environmental impact assessments when planning mariculture activities and intends to develop appropriate criteria and guidelines. Also, the Commission has announced plans to assess whether the scope of the Nitrates Directive could be extended to take in aquaculture and mariculture. The German Advisory Council on the Environment also considers that the Water Framework Directive and its provisions on river and coastal water management constitutes a suitable management instrument to minimise the environmental impacts of aquaculture and mariculture activities. Effective application of this management instrument, however, requires the development of stringent standards for site selection and for the technologies and practices used in aquaculture and mariculture.

462. No specific requirements yet exist for aquaculture and mariculture at national level either. While intensive fish breeding and its impacts on the environment play a relatively insignificant role in Germany's coastal waters, the German Advisory Council on the Environment nevertheless sees a need, as a preventive measure at national level, to create an appropriate requirements profile for aquaculture and mariculture activities. One of the main tasks for the coastal *Länder* is to adopt the long-awaited marine management plan (Para. 422 et seq.) and to designate potential suitable areas for mariculture, thus preventing from the outset the uncontrolled spread of such activities in ecologically sensitive areas.

3.5.3.9 Tourism

463. Direct conflicts between marine environment protection and tourism activities are largely restricted to coastal waters and coastal regions (Section 2.1.6.2 and 2.2.6.2). In contrast to offshore activities in the EEZ, planning provisions for tourism activities along the German coast already exist in prevailing law. In the form of regional planning, landscape planning and building planning law, along with respective approval procedures, the various regional bodies have at their disposal a range of effective instruments with which to structure environmentally sound tourism (REVERMANN and PETERMANN, 2002, Table 15). Especially in protected areas along the coasts of the North Sea and the Baltic, nature protection is afforded a statutory role (Para. 411 et seq.).

In view of the relationship between unspoiled natural landscapes and tourism, the tourist industry shares the goal of making tourism environmentally compatible. As early as 1997, the German tourism industry issued its Environmental Declaration on Guidelines for Sustainable Tourism (German Tourism Industry, 1997). In June 1998, the Baltic riparian states agreed the Agenda 21 for the Baltic Region (Baltic 21), containing measures and targets for sustainable tourism (Baltic 21 Tourism Group, 1998) which HELCOM used to develop its official recommendations (HELCOM, 2000). OSPAR recently revisited the issue of tourism and issued recommendations for sustainable development in the tourism sector (OSPAR, 2003g). At national level, the German government issued its Environment and Tourism Report in April 2002 (Federal German Government, 2002c, p. 26) which included, among other things, the following goals:

- Promotion of environmentally compatible tourism in Germany.
- Increasing the share of environmentally compatible tourism services.
- Boosting the demand for eco-tourism.
- Boosting inland tourism.
- Maintenance of an intact environment as the basis for tourism.
- Assisting development of environmentally compatible tourism in foreign destinations favoured by tourists from Germany.

464. Thus at international, national and regional level, implementation tools already exist in the form of a comprehensive catalogue of objectives. The challenge now lies in structuring environmentally sound tourism by coordinating the various instruments within the available management options (SRU, 1998, para. 1016 et seq.). The German Advisory Council on the Environment assumes that 'sustainable' tourism is to be interpreted as tourism that is and remains environmentally sound. Emphasis is thus placed on the ability to quantify the environmental compatibility of tourism activities. This could be achieved by using a standard set of indicators such as those developed as part of a project commissioned by the Federal Environmental Agency (UBA) (DANIELLSON et al., 2001).

Managing Tourism and Related Activities

465. To minimise impacts on flora and fauna, a strategy for development of the infrastructure and areas used for tourism is essential. A strategy of this nature should ideally be developed in conjunction with other policy areas like agriculture, water and forestries (REVERMANN and PETERMANN, 2002). OSPAR thus emphasises the role of integrated planning in tourism development (OSPAR, 2003g). HELCOM recommends an approval and planning policy based on the HELCOM guidelines for sustainable tourism and integrated coastal zone management plans (HELCOM, 2000). In respect of regional planning for the expansion of tourism, the guidelines for sustainable and environmentally sound tourism in coastal areas of the Baltic Sea encompass the following:

- Involvement of all stakeholders.
- Consideration of cultural and social capacities.
- Consideration of ecological capacities in terms of the total impact of tourism, including leisure activities.

– Allowing tourism activities in protected areas only if they and any associated leisure activities pose no threat to conservation objectives.
– Giving preference to expanding tourism in existing tourism regions.
– Safeguarding untouched and near-natural landscapes and threatened marine and coastal ecosystems against tourism expansion.
– Leisure activities, especially those in protected zones, should be designed to ensure that they do not encroach on biological and landscape diversity, character and natural beauty, and soil functions; motorised activities must be made subject to clearly defined limits within protected areas.

466. Particularly with regard to large areas of the Baltic coast in Mecklenburg West Pomerania, the German Advisory Council on the Environment believes it especially important to give preference to expanding tourism activities in existing tourism regions and to improving the quality of existing capacities rather than to significantly expanding the infrastructure in less well-visited regions. Regional planners would be wise to take this into account considering that tourism is expected to level out rather than continue rising to any significant degree (DANIELLSON et al., 2001, p. 61; PETERMANN and WENNRICH, 1999), even though the state of Mecklenburg West Pomerania has played an increasingly important role as a tourist destination in the past ten years (Para 207; FUR, 2003).

At the periphery of officially designated protected areas, infrastructure development activities should give special consideration to nature protection requirements. Planning should take account of the fact that situating holiday parks immediately adjacent to national park borders goes against the very idea of a national park. Instead, the areas surrounding national parks and nature reservations should be seen as buffer zones and be kept largely free from construction activities. In the Baltic region, HELCOM recommends protecting the coast by declaring coastal strips of between 100 and 300 m wide outside built-up areas as protected zones in which activities that change the landscape (building, camping sites) are prohibited. At a distance of up to 3 km from the coast, large-scale construction activities are to be made subject, at least at regional level, to a specific decisionmaking process (HELCOM, 1994b).

467. Regional planning of tourist activities is necessary within protected areas whose natural landscapes are both attractive to many tourists and require special protection. The instrument of visitor management is a tried and tested approach. Segregative management or spatial separation of tourist activities and particularly valuable natural areas has been successfully implemented in national parks. Using direct provision of information in the form of information centres and signs, along with bans on particular activities and indirect incentives using attractive pathway design, visitors are kept out of endangered areas – sometimes just in particularly sensitive flora and fauna periods – without actually banning them from large-scale protected areas.

Clear access rules for pedestrians and vehicles are needed outside protected areas. This is especially the case as regards the increasingly intensive use of coastal waters for sporting activities, where motorised sports in particular cause noise and scare off marine inhabitants and birds. In the vicinity of protected areas, they pose a threat to natural habitats in coastal waters. The German Advisory Council on the Environment recommends expanding existing restrictions on sporting activities.

One well-known problem is that infringements are hardly ever prosecuted. There is thus a deficit when it comes to enforcement because many infringements are 'tolerated' by the public eye. For the sake of 'keeping the peace', the authorities prefer not to take action against even very obvious violations.

468. From an environmental protection perspective, there is a need not only for regional management of tourism activities but for better distribution of visitor flow over the year (UBA, 2002, p. 267 et seq.). At present, the infrastructures created for tourism are mainly used during the peak season which collides with the biological functions of fauna and flora (Para. 123). Huge overcapacities exist in the quiet season. Distribution of tourism activities through, for example, staggered school holidays could both reduce the pressures on flora and fauna and improve the jobs situation in the tourism sector. For Mecklenburg West Pomerania, it would make sense to relocate some tourism activities inland where many attractive options exist.

Environmentally Sound Tourism

469. Apart from regional planning, a further decisive factor in reconciling the needs of tourism and environmental protection is the integration of tourism into nature and landscape protection processes. This can be served by taking an integrated approach which focuses on boosting the demand for environmentally sound tourism services and incentivising an increase in the availability of such services. One approach to tourism management, focusing on increasing quality rather than quantity, plays an ever-increasing role in the criteria for sustainable development in tourism. Rather than being a matter of promoting a new eco-tourism segment in the dominant mass tourism sector, mass tourism per se must be viewed as a problem in its own right. According to a study conducted by the Federal Environmental Agency (UBA), the tourism sector should aim for somewhere in the region of a 50% market share for environmentally sound tourism services (UBA, 2002, p. 277).

To implement this integrative approach there must be sufficient demand for environmentally sound tourism services. A key factor lies in heightening awareness of environmental issues among holidaymakers through the use of suitable education centres and information services like those already established in many locations – national park information centres, for example. Another option is

to label environmentally sound tourism services that comply with specific criteria. According to recommendations by HELCOM, the construction of new buildings or the rehabilitation of existing buildings should use water and energy-saving technologies, and priority should be given to re-use of existing infrastructures over new construction (HELCOM, 2000).

To support the implementation of these criteria, promotion of the tourism sector should take place through SME promotion and regional development activities (SRU, 1998, Para. 1023; SCHMIED et al., 2002). After a range of environmental seals of quality failed to have any significant impact, a group of 20 organisations joined forces to establish the umbrella Viabono eco-label (VIABONO GmbH, 2003; KRUG, 2003). The Viabono group checks potential licensees for compliance with environmental criteria on waste, energy, water, noise, mobility, nature and landscape, architecture and housing, information, visitor welfare, the regional economy and environmental management. In contrast to simple quality seals, it also engages in intensive public relations activities to heighten awareness of the notion of environmentally sound tourism services, make them more attractive and provide such services to the public. The idea is to link environmentally sound holidays to personal added value, for example in the form of relaxation, quality and adventure. The Viabono eco-label has helped establish a more local association with the natural environment in Schleswig-Holstein's Wadden Sea National Park. Award of the National Park Certificate involves a commitment by the tourism sector to adopt the national park's goals and principles and to support the work of the national park authority. Support can take the form of informing visitors about current national park events (Landesamt für den Nationalpark Schleswig-Holsteinisches Wattenmeer, 2003).

470. The German Advisory Council on the Environment sees a need to strengthen the link between tourism needs and those of environmental protection. This calls for the integration of all relevant actors and a comprehensive regional tourism concept that prescribes spatial division of the various claims. The Council sees the Viabono eco-label concept – using pro-active marketing to make environmentally sound tourism attractive – as a welcome approach.

Consideration must, however, be given to the fact that what are in themselves desirable improvements in water, waste and energy use in tourism infrastructures (environmental soundness) need not necessarily lead to a reduction in the environmental impacts of tourism itself. Thus, when it comes to tourism, emphasis must be placed on the difference between environmental soundness and compatibility with nature. Environmentally sound tourism that is not enduringly nature-compatible cannot, in the Council's view, be interpreted as sustainable. The Council thus believes that segregative or 'channelling' models remain an indispensable approach for particularly sensitive areas.

3.5.4 Protecting Regional Habitats and Species: Summary and Recommendations

471. Local activities involving offshore facilities, pipelines, sand and shingle extraction, the dumping of dredged material, coastal protection and tourism can – in conjunction with the ubiquitous pressures from shipping, fisheries and substance inputs – pose a significant and ever-increasing threat to or cause the damage and destruction of marine communities and their habitats. The number and size of comparatively untouched and undisturbed habitats that also serve as breeding and recovery grounds continues to dwindle apace. New forms of mass use, like the expansion of offshore wind energy, threaten an acceleration of this trend. Against this backdrop, far more effective measures are needed than those already in place if we are to safeguard ecologically valuable areas against the impacts of disruptive activities, keep an adequate number of breeding, resting, recovery and relaxation areas free from disturbance, and achieve broad minimum protection from excessive encroachments.

472. To ensure region-specific protection of particularly valuable and/or sensitive habitats and species, the German Advisory Council on the Environment recommends that the German government implement as soon as possible the integrated protected area network aimed for under the Habitats and Birds directives and under the HELCOM System of Coastal and Marine Baltic Seas Protection Areas (BSPA) and the OSPAR Marine Protected Area Programme:

– In the short-term, place under effective protection all sea areas which – according to available knowledge and under the Federal Agency for Nature Conservation's (BfN) nature protection assessments – are deemed important to the marine environment and migratory birds.

– Intensify research on marine ecosystems in the North and Baltic seas and use the results to identify additional protection needs and, where applicable, new protected areas.

– Push for systematic and transparent integration, harmonisation and simplification of the various protection programmes, protected area categories and criteria, including the integration of species-specific protection provisions from the prevailing species protection agreements.

– In close cooperation with OSPAR and HELCOM, lay down in either primary or secondary legislation a uniform framework for marine protection areas. This framework should contain uniform criteria providing for the exclusion of incompatible uses, the approval of acceptable uses, area management and monitoring.

– As part of a joint Federal and *Länder* (state) national marine protection strategy, develop a national protected area plan for the North and Baltic seas.

– As a matter of urgency, implement marine spatial planning alongside land-based spatial planning to

ensure that diverse uses are formally and bindingly coordinated – both in terms of the uses themselves and of marine environment protection requirements – particularly to avoid locating industry in valuable or sensitive habitats.

– In light of the threatened spread of wind farms, amend the regulation on suitable areas under Article 3a of the Marine Facilities Ordinance (SeeAnlV) to allow erection of wind farms solely in suitable areas (SRU, 2003).

473. To ensure adequate and broad minimum protection, the German Advisory Council on the Environment sees a need to:

– Make offshore construction activities subject to uniform, harmonised marine licensing law.

– Give the competent authorities the discretionary power to grant planning permission analogous to the discretionary power granted under Water Management Act (WHG) with regard to land-based water management.

– Amend the approval criteria in the Marine Facilities Ordinance (SeeAnlV) to make licensing discretionary, allowing the Federal Maritime and Hydrographic Agency (BSH) to take a planning-focused and phased approach to wind farm licensing in light of the results expected from current environmental impact research.

– Ensure responsible management of marine habitats within the licensing process, by means of specific administrative standards for marine environment impact assessments and sea-based application of the provisions of nature protection law on impacts of human activities.

– Identify specific means of compensating human impacts on the marine environment in order to exploit the potentialities of compensation requirements under nature protection law.

Different types of use entail different environmental risks and hence different levels of regulation and monitoring. In many cases, there are no binding regulations or specific requirements to ensure minimisation of impacts and risks using the best available technologies. The German Advisory Council on the Environment thus recommends that legislative and administrative steps be taken as regards the regulatory needs outlined in Sections 3.5.3.2 and 3.5.3.9.

3.6 Protecting the North and Baltic Seas: Conclusions and Recommendations

3.6.1 Paths to Sustainable Fisheries

474. Sustainable, environmentally sound fisheries can only be achieved through implementation of the necessary measures:

– Maintain commercial target fish stocks at a biologically safe level or bring stocks back up to this level.

– Significantly reduce by-catches and discards and thus:

– Better protect valuable benthic communities from harmful fishing methods.

475. In implementing these targets, the EU carries a key responsibility given its extensive powers as regards the fishing industry and the great extent to which the Common Fisheries Policy (CFP) shapes the fishing sector. But despite better insight on the part of the EU Commission, the EU has not succeeded in aligning Europe's fishing industry with basic sustainability requirements. The German Advisory Council on the Environment thus welcomes the fact that the German government has called for sustainable management of resources in the EU Council of Fisheries Ministers. The Advisory Council recommends that the German government remains expressly committed to ensuring that the Community fulfils the basic requirements for sustainable fisheries. This change in approach must be guided by the following maxims:

– A strict resources-focused approach: conservation of stocks must at last take clear priority over short-term economic considerations. The conservation or replenishment of biologically safe stock levels is of utmost importance for all targets laid down in the Basic Regulation for the CFP. This also applies to socio-political objectives aiming to secure an acceptable standard of living for people employed in the fisheries sector. Any over-shooting of long-term sustainable yields will by default lead to disproportionately high yield losses and subsequently to a reduction in living standards. There is no sensible reason for – and the CFP contains no legal footing on which to base – short-term economic considerations aimed at keeping this vastly over-sized sector on its feet from one month to the next.

– Protection of indirectly affected marine ecosystems: in addition to conserving target species, the CFP must also unconditionally meet the requirements of Article 6 EC and Article 174 EC by recognising indirectly affected marine ecosystems as being worthy of protection. The objectives of the new Basic Regulation, which have been expanded to include protection of marine ecosystems as a whole, must be put into practice without delay. The FAO Code of Conduct for Responsible Fisheries ought to play a decisive role in practical implementation of the precautionary approach (see Para. 243).

– Withdrawal of subsidies: the construction of new boats should no longer be promoted by the Community or the Member States. Subsidies that indirectly contribute to maintaining overcapacities must also be withdrawn. Funds should be used solely for the purposes of socio-economic measures directed at shrinking the sector and, where appropriate, of supporting those fisheries and producer communities which already meet sustainable resources management requirements.

– Effective catch quotas in line with scientific recommendations made by the ICES: instead of negotiating annual total allowable catches (TACs), multi-annual catch limits *must* be fixed under the management and replenishment plans for the stocks involved. The ICES's best available scientific prognosis of fish stock resilience must serve as the sole criterion. Consideration should also be given to making quotas more flexible and, where appropriate, tradable between Member States.

– Protected area network: for the North and Baltic seas, a holistic protected area concept must be developed to set out in an adequate way specific long-term or temporary restrictions on fisheries taking into account the regional importance of stock conservation, other marine ecosystems and other demands on the sea.

– Codes of practice to reduce by-catches and discards: by-catches should be reduced (where practicable) by prescribing the use of larger-mesh nets, deterrent systems and escape windows, and by developing guidelines that require fishers to avoid by-catch intensive areas. The protected area network must be agreed – particularly with a view to by-catches – and a general ban on discards should be implemented with effective sanctions.

– Restricting by-catch intensive industrial fishing: as a path to sustainable fisheries, the German Advisory Council on the Environment in its 2002 Environmental Report recommended restricting industrial fishing in particular, as the benefits of this type of fishing are, to some extent, questionable (SRU 2002, Para. 749). This remains valid if tight-meshed nets continue to be used in commercial fishing, resulting in particularly harmful by-catches. Experts see the large cod by-catch in Norway pout fishing as an area for particular concern (meeting with the Federal Research Centre for Fisheries (BFA) on 24. 2. 2003). To restrict fishing of this type, specific fishing bans and protected areas must be set out in the integrated management plans.

– Comprehensive, integrated, long-term management and replenishment plans: in principle, the instruments for a long-term planning approach to fisheries are welcomed and must now be put into practice without further delay. Long-term management planning must not however be allowed to stop at fixing TACs for specific species. Management plans must properly coordinate quotas (in terms of species, numbers, and spatial applicability) with the protected areas strategies and fishing method regulations. Such plans should also connect with other uses of the oceans and seas: in essence, they need to be integrated into a future marine management plan (see Section 3.5.2, Para. 422 et seq.).

– Regulatory powers for the EU Commission: it is viewed as positive that both the EU Commission and the Member States (within their 12-mile zones) will be authorised to implement emergency measures if stock conservation or the marine environment is seriously at risk from fishing activities and immediate action is needed. In most cases, the period of six or three months allowed for measures implemented by the EU Commission or the Member States respectively would probably be too short to allow lasting prevention of a serious threat to stocks. The EU Commission appears more open to more stringent management than the EU Council and should thus be granted significantly broader powers of enforcement.

– Monitoring and enforcement: the more stringent provisions set out in the new Basic Regulation will only help reduce infringements if their implementation is effective in practice. Given that the competent authorities in Member States – especially in fishery-dependent regions – have a tendency to 'make allowances', monitoring should be performed, or at least overseen, to a greater extent by the more centralised and more European organisations of the EU Commission. The new Basic Regulation takes the right approach on this issue but its proposed common inspection system remains toothless without staff and funding. It is not only for this reason that the German Advisory Council on the Environment welcomes the EU Commission's initiative towards a new Community Fisheries Control Agency to achieve centralised, independent organisation of monitoring backed by resources from the Member States. The EU Commission rightly calls for comprehensive monitoring of Member States' application of CFP provisions and prosecution of fishers who violate the rules. The applicable sanctions must be tightened and standardised without delay under criminal law in the Member States.

– Research and development: significantly more funding must be invested into researching the impact of fishing and into developing environmentally sound technologies and practices. As the 'culprits', the fisheries should, first and foremost, be forced to support research and development projects. This applies both to financing and – more particularly – to cooperation needed in on-site investigations, in documenting and systematically identifying by-catches. The internationally applicable precautionary principle in itself places an obligation on the fisheries sector to substantially support research. From a precautionary standpoint, fishing restrictions and bans appear justified unless the responsible fisheries themselves prove by substantial research that they cause no lasting harm to the marine environment.

476. As regards national responsibilities the German Advisory Council on the Environment recommends the following:

– Setting stringent management rules for the 12-mile zone, and especially differentiated protected areas, that exclude beamtrawling from sensitive areas and, wherever possible, keep the fisheries out of spawning and breeding grounds (without ignoring the fact that

the responsible *Länder* (states) have already implemented many welcome measures – particularly in the Wadden Sea).

– Designation and reporting of appropriate protected areas for the EEZ under the Habitats Directive, bearing in mind the importance of such areas in fish stock replenishment.

– Integration of long-term plans for protection and recovery areas into a yet-to-be developed management plan for coastal waters and the EEZ to achieve differentiated, area-specific fisheries management that also takes account of the various other claims to use.

– Development of action programmes and guidelines, with fishers' participation, for environmentally sound regional fishing practices.

– Effect much tighter controls to ensure that provisions for environmentally sound fishing practices are complied with in German waters.

To make TACs and stock management more efficient, consideration must be given to making TACs more flexible as regards fishermen's rights of access to fish stocks. By introducing a flexible quota management system to strengthen individual rights of access to fish stocks, EU Member States and their Common Fisheries Policy could make a significant contribution to conserving fish stocks, to reducing overcapacities and to enhancing the profitability of the fishing industry. Europe-wide harmonisation of quota management system implementation and flexible transfer of individual catch rights within the EU could considerably enhance efficiency in national fisheries management. As regards a system comprising tradable catch quotas, the German Advisory Council on the Environment believes that for coastal areas preference should be given to group-based management founded on territorial access rights.

3.6.2 Reducing Pollution by Hazardous Substances

477. Protection of the North and Baltic seas from inputs of hazardous substances calls for a broader approach to environmental and, particularly, chemicals policy that takes in marine environment protection requirements. Installation-specific emission restrictions are not enough. On the one hand, diffuse inputs are not covered, while on the other, technical clean-up measures do not cover the entire substance spectrum. Alongside strict emission thresholds, total bans and restrictions on the use of substances that cannot be sufficiently contained at source provide key instruments for effective marine environment protection. Against this backdrop, the German Advisory Council on the Environment makes the following recommendations:

– The International Conference on the Protection of the North Sea's so called 'one generation' target (ongoing reduction of inputs of harmful substances to achieve their complete cessation in 2020, the goal being to reduce concentrations of those substances in marine ecosystems to 'close to zero' or 'near background values for naturally occurring substances') should be anchored in all relevant EC law and consequently in national legislation. The goal therefore should be to achieve by no later than 2010 the cessation of discharges, emissions and losses of hazardous substances in the marine environment. It is particularly important, therefore, to further develop and implement the Water Framework Directive and all hazardous-substance-specific EU policies to implement both the substance and timing of the one generation target. This is one aim the German government should pursue in developing a European marine protection strategy as well as during negotiations on the new EU chemicals policy (REACH – Registration, Evaluation and Authorisation of Chemicals) and in the current review of the Plant Protection Products Directive.

– The German Advisory Council on the Environment sees a need to harmonise the evaluation systems used in European water protection and chemicals policy with the OSPAR and HELCOM evaluation systems, especially for PBT substance properties. The evaluation systems currently in place at Community level do not give sufficient consideration to protecting the marine environment. In this regard, there is also a need – under both the OSPAR and the Helsinki agreement – to actually implement as planned Community-wide monitoring of hazardous substances for their biological impacts.

– The designation of priority substances and the subsequent selection of priority hazardous substances under the Water Framework Directive must reflect marine environment protection requirements. Priority hazardous substances should at least take in those substances listed by OSPAR and HELCOM as requiring priority treatment. The current EU list is deficient, particularly in terms of marine environment protection. This is all the more puzzling because the Water Framework Directive makes explicit reference, among others, to the OSPAR and Helsinki conventions.

– Of utmost importance in this regard is that, at Community level, Member States agree emission threshold values as quickly as possible – at least for the 33 substances already identified as priority – and, at national level, emission threshold values for other pollutants listed in the Annex to the Water Framework Directive. The German government should commit itself to ensuring that implementation of the Water Framework Directive does not suffer a similar fate to that of the Water Pollution Directive (76/474/EEC), in which hexachlorobenzenes are the only persistent organic pollutants for which the EU has so far laid down emission limits.

– The German Advisory Council on the Environment believes that granting emission permits under the Water Framework Directive should also take into account the emissions impact on the marine environment. Moreover, significant consideration should be

given to the oceans' special sink function and associated concentration trends not only as regards the 12-mile zone covered by the Water Framework Directive, but also beyond that zone.

– In accordance with the EU Commission's proposal, the provisions on long-range transboundary air pollution with regard to persistent organic pollutants set out in the Stockholm Agreement and in the UN/ECE Protocol as regards production, distribution and use of specific persistent organic pollutants should be implemented without delay in binding Community and national legislation.

– Additionally, all substances that are not listed in either international POP agreements but which have PBT and vPvB properties, as well as endocrine disrupters, should be subject both to REACH authorisation procedures and to the licensing procedures for plant protection products and biocides. The German Advisory Council on the Environment recommends that the German government take an appropriate stance in further REACH negotiations and in the review of the Plant Protection Product Directive, pushing for continued efforts towards the integration of PBT and vPvB substances into REACH authorisation procedures as proposed in the EU Commission's draft regulation.

– The German Advisory Council on the Environment also believes that licensing of plant protection products, biocides and chemicals containing persistent, bioaccumulating and toxic or very persistent and very bioaccumulating properties should only occur in exceptional cases where there is significant public interest and non-availability of suitable alternatives can be proven. This applies irrespective of whether substances are produced for intra-Community trade or for extra-Community export.

– Substitution of hazardous substances should be anchored in EU chemicals policy and implemented and enforced in a determined way. The availability of less-hazardous alternative substances should thus be established as independent grounds on which to deny authorisation of a substance under the REACH system and under plant protection product law.

– Greater attention should be paid to potential inputs, especially of PCBs and DDT, from contaminated soil resulting from rehabilitation activities and to polar pollutants and pharmaceuticals.

– The scope afforded to individual Member States under the Common Agricultural Policy should be used to promote extensive crop growing practices that use lower levels of plant protection products.

– Further efforts are needed if we are to achieve the one generation target with heavy metal concentrations. There is potential for realistic reductions in cadmium and mercury. The phase-out of cadmium-containing batteries should be enshrined in law and environmentally sound disposal of used nickel-cadmium batteries implemented. In the case of mercury pollution, the German Advisory Council on the Environment calls for the discontinuation of chlorine-alkaline electrolysis. Mercury-free membrane processes could be used instead.

– Radioactive discharges into the marine environment must be stopped altogether. Given that the dumping of radioactive waste in the oceans is no longer permitted, the German Advisory Council on the Environment believes it sensible to ban discharges of radioactive wastewater from nuclear reprocessing plants. 'Controlled' discharge is by no means synonymous with lower impacts on the marine environment.

3.6.3 Reducing Nutrient Inputs

478. The German Advisory Council on the Environment welcomes the demanding objectives laid down by regional marine protection organisations, particularly the target set for reducing nutrient inputs and, moreover, the ideal target set by the OSPAR Commission and the 5th International Conference on the Protection of the North Sea to achieve a marine environment devoid of anthropogenic eutrophication by 2010. At the same time, the Council must point out that the reductions in agricultural fertilising that are so vital to achieving this ideal are simply not happening. If agriculture is to be adapted towards (marine) water protection, further amendments to the CAP that go beyond the agricultural compromise agreed in June 2003 on reform of the Common Agricultural Policy (CAP) remain essential and involve the following:

– The targets contained in Article 33 (1) EC which focus on increased production should be replaced by more environment-focused wording.

– The marine environment protection targets should actually be integrated into agricultural policy structure (see Article 6 EC).

– Payment of agricultural subsidies should be decoupled from production quantities and without any significant exemptions.

– Reallocation of funding from the first to the second pillar of the CAP ('modulation') should be effected to a significantly greater extent than is intended.

The German government must take action to enable appropriate further reform of the CAP. But it should also fully exploit existing national scope for action provided under the CAP, make agricultural funding available for environmental protection activities and, more specifically, structure the national agro-environment programme to take a more determined approach to environment and nature protection objectives as required by EC Regulation 1267/1999.

479. Significant reductions in nutrient pollution could also be achieved if the Nitrate Directive and the Fertiliser Regulation were finally applied in practice (as is actually required) to coastal and marine waters. Under existing law, eutrophied coastal and ocean areas, or those at risk of eutrophication, must be identified and treated as areas at

risk. The action plans to rehabilitate or conserve these areas must thus contain appropriate measures. For example, nitrogen thresholds that are significantly lower than 170 kg N (arable land) and 210 kg N (grassland) per hectare and year must be complied with if the respective local conditions and those in the North and Baltic seas so demand.

480. The special protection requirements for both seas must be integrated into the action plans which will be developed in the implementation of the Water Framework Directive. The competent authorities can and must determine the action needed in river basins, including agricultural activities as appropriate.

481. Given that monitoring of agriculture can be difficult, the German Advisory Council on the Environment calls for the next action plans, and later the activities programmes, to focus on fewer but easily verifiable provisions that also make for effective water protection. The Council identifies the following 'enforcement-friendly' and effective instruments:

– Area-specific restrictions on animal numbers.

– Perennial vegetation cover, with intercropping and winter cover.

– Comprehensive records on the areas available for use of farm manure.

– At least for farms with large animal stocks, the systematic implementation of storage systems for farm manure storage during the winter, based on retrospective orders imposed under Articles 17 (1) and 5 (1) 3 of the Federal Immission Control Act (BImSchG) to enable correct waste management.

– A broad ban on ploughing grassland.

482. Farmers will only cooperate better in environmental protection activities if the activities are sufficiently well funded. Consultation, training and cooperation play a key role. There is also a need for Community-wide harmonisation of nutrient budgeting models to obtain clarity as to the situation on individual farms.

483. In small municipalities, wastewater is often heavily polluted with phosphates and nitrogen. In the interests of prevention, improved nutrient-reducing wastewater treatment under the Urban Wastewater Treatment Directive should thus become the norm. The option of designating so-called less-sensitive areas should be abandoned. The German government should call for the Directive to be amended accordingly. At national level, the German Advisory Council on the Environment attaches great importance to nation-wide compliance at large wastewater treatment plants with the concentration values for nitrogen of 13 mg/l now stipulated in the German wastewater ordinance.

484. There is a great need for regulation of emissions from shipping. Standards at sea should no longer be allowed to blatantly lag behind those on land. Under the NEC Directive, land-based NO_x emissions are to be cut Community-wide to 6.5 million Mg per year by 2010 (compared with 13.4 million Mg in 1990). In contrast, it is expected that by 2010 shipping-related inputs will rise by between 4,01 million Mg (1.5% growth) and 4.6 million Mg (3% growth) compared with 2.8 million Mg in 1990.

3.6.4 Combating Pressures and Risks from Shipping

485. The German Advisory Council on the Environment believes that a lot more must be done to place shipping on a sound ecological footing. Given the pollution and risks that remain, shipping is nowhere near the level of environmental compatibility that could reasonably be achieved using modern technologies and practices. As in land-based environmental protection, the precautionary and polluter-pays principles should be systematically applied to shipping to minimise the risks to the North and Baltic seas. Accordingly, the freedom of the oceans must be subordinated. This assumes significant tightening and refinement of prevailing environmental protection and safety requirements combined with far better enforcement of existing provisions. The Council sees the following as particularly important:

EU's Strategic Responsibility

486. With the Law of the Sea Treaty and the International Maritime Organisation (IMO), the international community has agreed to allow shipping largely free access to the oceans and in consequence has considerably limited individual states' abilities to enact restrictions. This means that the call for more stringent environmental and safety measures must be directed above all at the IMO and its international law regime, the IMO being the competent international body. The IMO, however, shows little willingness to implement more stringent rules. At best, long and drawn-out decisionmaking processes result in a tightening of existing provisions. Although EU legislation – especially that enacted in response to the sinking of the Erika and the Prestige – has clearly influenced the further development of the relevant international law, uncertainty remains as regards the extent to which the EU can enact regional protection measures without IMO approval. Only recently have the IMO and the EU begun to clarify the division of responsibilities between their organisations. In any event, the EU – along with those nations who take their responsibilities seriously – should become active within the IMO. EU regional protection standards could provide considerable stimulus at international level: over 10% of world tonnage can be apportioned to the fifteen former EU member states and a further 10% to the ten new EU states – particularly Malta with 5% and Cyprus with 4% (EU Commission, 2002b, p. 13). EU-coordinated lobbying in the IMO by these 25 countries could spur further action at international level. The German Advisory Council on the Environment thus welcomes the EU Commission's intention to have the EU join the IMO and recommends that the German government actively supports this undertaking.

The EU could and should play a more significant role through better enforcement of applicable international law and EU environment protection and safety provisions. There are still considerable qualitative and quantitative deficiencies in supervision of shipping by Member States (as either flag or port states). This is impressively illustrated by the infringement proceedings concerning the directive on port state controls initiated immediately the deadlines expired. An EU controlling body with both coordinating and monitoring powers and appropriate staff and equipment would thus be an important step towards improved and consistent enforcement.

Shipping Safety

487. Measures towards improved shipping safety must achieve the following:

– *Constructional requirements*: The phasing out agreed at EU level of single hull tankers – according to ship category between 2005 and 2010 – and the ban on the transportation of heavy oil in such tankers must now be put into practice. The German Advisory Council on the Environment believes that a European port entry ban for all single hull tankers from 2010 is compatible with international law provisions. However, banning single hull tankers will not guarantee total safety. The risk of shipping accidents caused by engine damage should therefore, regardless of construction type, be minimised by the installation of back-up engines that can keep ships manoeuvrable. Additionally, double hull tankers must be subject to regular quality controls. And finally, EU and international law should prohibit use of the space between both hulls as additional capacity for transporting oils, other hazardous substances or liquids.

– *Adequate training of ships' crews*: greater attention must be given to the training of ships' crews. Immediate action should be taken to ensure that in future, 'older' crew members – those trained prior to 2002 – fulfil requirements under the 1995 International Convention on Standards of Trading, Certification and Watchkeeping (STCW) or the corresponding EU Directive 2001/25/EC.

– *Adequate port state controls:* it must be ensured that all Member States make available an adequate number of inspectors at all ports and berthing places and fulfil the 25% minimum control rate. Individual ports must not be allowed to become 'convenience' ports. Pressure must be applied first and foremost, though not solely, to the new Member States Cyprus and Malta.

– *Modern monitoring and information systems:* new monitoring and information systems will enhance sea traffic safety. The German government should nevertheless continue to push for the introduction of mandatory piloting services (at least in certain sea areas like the Baltic Sea entrances and the Kadet Trench), for additional protection measures in the designation of the Wadden Sea as a Particularly Sensitive Sea Area (PSSA), and for recognition of the Baltic Sea as a PSSA.

– *Consolidation of national enforcement responsibilities*: the differing responsibilities of the German Federal and *Länder* (state) governments within and beyond the 12-mile zone, various agencies' authorities, the use of *Länder* organisations to enforce federal requirements, and so on, mean that shipping-related responsibilities are performed in a non-uniform and haphazard manner. The German Advisory Council on the Environment sees an urgent need to consolidate these multifaceted decisionmaking responsibilities, not least for reasons of efficiency. The Joint Accident Task Force is a welcome initial step in this direction. Additionally, Germany's sovereign maritime forces (vessels belonging either to the Federal Ministry of Transport, Building and Housing or the Coast Guard or Customs and Excise or Fisheries Inspectorate) would be better consolidated into a German Coast Guard as an agency of a federal ministry.

Reducing Operational (Illegal) Discharges

488. The German Advisory Council on the Environment calls for greater attention to be paid to pollution from discharges of operational and loading residues and tipping of ships' waste into the oceans. Abuse of the North and Baltic seas as waste dumps is no longer acceptable; likewise the fact that nowhere near the same monitoring standards are applied at sea as on land. While the annexes to the 1973/1978 International Convention for the Protection from Pollution from Ships (MARPOL) lay down relatively strict provisions as a basis for protecting the marine environment, frequent illegal discharges are still a cause for concern. Illegal discharges are caused by the lack of waste reception facilities in ports, non-uniform application of MARPOL rules and inadequate monitoring and pursuit of infringements. Although in need of enhancement, the EU's efforts on port reception facilities, port state controls and sea traffic monitoring are key steps towards combating this intolerable situation.

Reducing Air Pollution from Shipping

489. In the case of shipping-related air pollution, the current lack of international, and the inadequate EU, exhaust regulations for sea traffic essentially results in highly environmentally harmful bunker oil being used as shipping fuel in place of marine diesel oil. The German Advisory Council on the Environment thus sees a need for binding restrictions on the sulphur content in shipping fuel, at least for EU waters and ports in the interim. There is an equally urgent need for similar binding restrictions on NO_x emissions. Wherever possible, compliance with more stringent emission standards should be backed by financial incentives: for example, more attractive berthing fees and lower control fees.

Liability Law Incentives to Comply with Environment and Safety Provisions

490. In principle, criminal law sanctions and financial liability can provide a tremendous incentive to comply with existing environment protection and safety provisions and also to implement precautionary measures. A prerequisite for this, however, is that liability provisions are made stringent enough at international level and are reliably enforced. This does not appear to be the case at present; in particular, it is evident that inadequate civil liability provisions do not prevent the use of outdated ships and safety systems. Along with a tightening of compensation obligations in the form of liability limits under civil law, the German Advisory Council on the Environment sees an urgent need for stricter sanctions under criminal law that apply to anyone who pollutes the seas wilfully or through gross negligence or is an accessory to such an offence. Thus, the threat of sanctions should not only affect the ship's captain and the ship's owner, but also the responsible individual within the classification society or the company that owns the cargo. It is therefore regrettable that a directive to this effect proposed by the EU Commission has not received Council of Ministers' support as regards sanctions under criminal law.

3.6.5 Protecting Regional Habitats

491. It is some time since the North and Baltic seas were natural areas untouched by construction. They remain and are increasingly influenced by activities like marine mining, the dumping of dredged material, pipelines, cable channels and planned offshore wind farms. Alongside and in conjunction with the ubiquitous pressures posed by shipping, fisheries and chemical inputs, these regional impacts can, to a significant and increasing extent, contribute to the endangerment, degradation and destruction of marine communities and their habitats. The number and size of relatively untouched and undisturbed habitats that could serve both as breeding and recovery areas is dwindling rapidly.

Against this backdrop, there is an urgent need for more effective measures than those already implemented: firstly, to protect ecologically valuable areas from disturbance (especially breeding, resting and recovery areas) and, secondly, to achieve a minimum of protection from excessive encroachments.

492. To ensure region-specific protection of particularly valuable and/or sensitive habitats and species, the German Advisory Council on the Environment recommends that the German government implement as soon as possible the integrated protected area network aimed for under the Habitats Directive and the Birds Directive and also under the HELCOM System of Coastal and Marine Baltic Seas Protection Areas (BSPA) and the OSPAR Marine Protected Area Programme:

– In the short-term, place under effective protection all sea areas which – according to available knowledge and under the Federal Agency for Nature Conservation's (BfN) nature protection assessments – are deemed important to the marine environment and migratory birds.

– Intensify research on marine ecosystems in the North and Baltic seas and use the results to identify additional protection needs and, where applicable, new protected areas.

– Push for systematic and transparent integration, harmonisation and simplification of the various protection programmes, protected area categories and criteria, including the integration of species-specific protection provisions from the prevailing species protection agreements.

– In close cooperation with OSPAR and the Helsinki Commission, lay down in either primary or secondary legislation a uniform framework for marine protection areas. This framework should contain uniform criteria providing for the exclusion of incompatible uses, the approval of acceptable uses, area management and monitoring.

– As part of a joint federal and *Länder* (state) national marine protection strategy, develop a national protected area plan for the North and Baltic seas.

– Implement marine spatial planning alongside land-based spatial planning to ensure that diverse uses are formally and bindingly coordinated – both in terms of the uses themselves and of marine environment protection requirements – particularly to avoid locating industry in valuable or sensitive habitats.

493. To ensure adequate and broad minimum protection, the German Advisory Council on the Environment sees a need for uniform and harmonised marine licensing law, especially concerning sea-based construction projects. This marine licensing law should:

– Give the competent authorities the discretionary power to grant planning permission analogous to the discretionary power granted under the Water Management Act in respect of inland waterways.

– Ensure responsible management of marine habitats within the licensing process, by means of specific administrative standards for marine environment impact assessments and sea-based application of impact provisions.

– Identify the specific marine compensation potentialities so that the compensation requirements under nature protection law can be applied to encroachments on the marine environment.

494. Different types of use entail different environmental risks and hence different levels of regulation and monitoring. In many cases, there are no binding regulations or specific requirements to ensure minimisation of impacts and risks using the best available technologies, and implementation of existing decisions and recommen-

dations made by OSPAR and the HELCOM is still pending. The German Advisory Council on the Environment thus sees the following action as a priority for specific types of uses:

- *Offshore facilities*: in general, the 'raw materials security' provision (Section 48 (1), 2nd sentence, Federal Mining Act (BBergG)) should be abolished to allow designation of protected areas to prohibit mining activities where conservation and protection objectives so demand. As regards the environmental risks of rapidly spreading wind farms, the provisions on areas of suitability in Section 3a of Germany's Marine Facilities Ordinance (Seeanlagenverordnung) should be amended so that wind farms may only be erected in suitable areas. In light of the results expected from current environmental impact research, the licensing of offshore facilities under the Marine Facilities Ordinance should be made discretionary to allow the Federal Maritime and Hydrographic Agency (BSH) to take a planning-focused and phased approach to wind farm licensing.
- *Cables and pipelines*: alongside thorough environmental impact and alternative assessments, priority should be given to the bundling of cables or pipes wherever possible. There is thus an urgent need for comprehensive planning of requirements and networks in the North and Baltic seas. Where applicable, this must include infrastructures like marine transformer stations which must be made compatible with other uses under a binding marine management plan.
- *Sediment extraction*: the obligation to conduct an environmental impact assessment should be broadened to include extraction projects involving less than 10 ha or 3,000 Mg per day, and sediment extraction in all nature protection areas should be prohibited.
- *Relocation and dumping of dredged materials*: compliance provisions for dumping and relocating dredged materials, including special assessment criteria for environmental impact assessment, maximum allowable pollutant content, applicable technical processes, and monitoring, should be placed on a uniform federal, or preferably EU, legislative level in line with the Disposal Guidelines for Dredged Material in Coastal Waters (HABAK) and the Disposal Guidelines for Dredged Material in Inland Waters (HABAB).
- *Mariculture*: as soon as possible, HELCOM recommendation 20/1 of 23 March 1999 on environmentally sound mariculture should be fully implemented into European and national law, taking account of applicable provisions contained in the FAO Code of Conduct for Responsible Fisheries. This should include an environmental impact assessment and should link location selection to spatial planning suitability criteria. It should limit discharges of phosphates and nitrates and the use of pharmaceuticals, prescribe measures against the release of breeding fish and set out rules for regular monitoring of breeding farms.
- *Tourism*: environmentally sound planning and management of tourism activities pose a great challenge. This is shaped by local and regional conditions and must largely be met by the respective districts and municipalities. Regional specificities aside, establishing protected areas and full enforcement of protected area provisions play a key role. Assessment and evaluation of local and regional tourism using meaningful, uniform criteria is important and should be further developed. The concept of environmental impact assessment under the Viabono eco-label along with proactive marketing of environmentally sound tourism services is an approach that is both right and worthy of promotion.

4 Strategies for Effective Marine Environment Protection Policy

495. While the previous chapter has focused on sector-specific problems, implementation deficits and opportunities available for further action in the various fields of activity in marine environment protection, this chapter focuses on more fundamental and cross-sectoral issues of effective marine protection policy.

First of all, the level of prevention and protection aimed for in the marine environment is of fundamental importance (Section 4.1). This relates to the reference points (protection targets) used and the way in which environmental goals are set. While the increasingly favoured ecosystem approach combines a number of elementary strategic rules to this end (some of which require clarification and better definition), it fails to derive material targets from them. There is thus a need for clear protection and conservation targets.

Second, a range of general institutional and policy management issues play a key role in achieving the desired level of environmental protection. These include:

- The division of responsibilities and powers between international, European and national levels (Section 4.2).
- The implementation and enforcement of internationally agreed goals, decisions and recommendations on marine environment protection (Section 4.3).
- The integrated treatment of all relevant factors exerting pressure on the marine environment.
- The integration of marine environment protection requirements into other sectoral policies (Section 4.4).

4.1 Setting Conservation Targets and Goals

4.1.1 The Ecosystem Approach

496. When it comes to setting targets and goals, the international protection regimes and the European Union refer back in almost all instances to what is known as the 'ecosystem approach' (CBD, Decision V/6). As outlined elsewhere, this approach, which has its roots in the Convention on Biological Diversity (CBD), combines a number of strategic rules for formulation and implementation of environmental conservation goals. Goal-setting is based on two principles that are largely inherent in the general precautionary principle:

- An holistic approach to protecting not only individual species and other manifestations of the marine environment, but also the ecosystems as functional units in their own right.
- Conservation goals must take account of the Convention's three objectives: conservation, sustainable use and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.

Taking the above principles into account, the 'man agement of land, water and living resources' should be a matter of societal choice as prescribed by the first of twelve CBD guiding principles on the ecosystem approach (CBD, Decision V/6, see box below).

The Twelve Principles of the CBD Ecosystem Approach

1. The objectives of management of land, water and living resources are a matter of societal choice.
2. Management should be decentralised to the lowest appropriate level.
3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
4. Recognising potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:
   - Reduce those market distortions that adversely affect biological diversity;
   - Align incentives to promote biodiversity conservation and sustainable use;
   - Internalise costs and benefits in the given ecosystem to the extent feasible.
5. Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.
6. Ecosystems must be managed within the limits of their functioning.
7. The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.
8. Recognising the varying temporal scales and lag effects that characterise ecosystem processes, objectives for ecosystem management should be set for the long term.
9. Management must recognise that change is inevitable.
10. The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
11. The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
12. The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

497. The German Advisory Council on the Environment regards the ecosystem principles as an important commitment to the precautionary principle and as an appropriate precautionary strategy towards marine environment protection. Thus, for two reasons, the Council believes it prudent to point to the specific risks involved should the ecosystem approach's protection strategy be misinterpreted:

Protection of ecosystem structures and functions as postulated in the ecosystem approach, along with consideration of the direct and indirect impacts of anthropogenic activities in the marine environment, are principally to be welcomed as maxims for problem-driven environmental protection. Ultimately, however, these postulates presuppose a lot in terms of the underlying science and their practical implementation. Given that many interactions in the marine environment have still to be properly researched, there is still a danger that the postulates in question could be misinterpreted as making everything 'subject to further research' and so become an obstacle to rapid implementation of necessary protection measures. The ecosystem approach has thus begun to be invoked to support calls for further research on the functional relationships and interactions of marine species and ecosystems prior to adopting further action. Demands of this kind must not, however, be allowed to result in the neglect or postponement of preventive action to protect the marine environment.

In circumstances where knowledge is limited, the precautionary principle essentially entails the following: whenever it can be assumed that, based on available knowledge, specific anthropogenic activities pose a serious threat to species and habitats, available knowledge must be used to implement the most appropriate and practicable preventive measures. Waiting for more effective measures to present themselves in the hope that they might take in the full set of interactions within the ecosystem or even constitute an integrated ecosystem management programme is only compatible with the precautionary approach if the more effective measures are likely to transpire and a delay appears acceptable relative to the degree of the expected impact. The latter is not the case, however, with most of the anthropogenic pressures outlined earlier – especially as regards the ongoing risks posed by fishing, nutrient inputs and various localised activities. The need for a wide range of direct measures is indisputable: taking timely action does not preclude the further development of a protection regime based on newly acquired knowledge about ecosystem functional relationships and interactions.

498. A further risk of misinterpreting and watering down the ecosystem approach when used as an ecology-based preventive strategy lies in its close links with the notion of sustainability. In proportionality terms, it would not be entirely wrong for the Biodiversity Convention to link the ecosystem approach to the sustainability postulate so that, along with ecology, ecosystem management and quality target-setting, it takes in the other two pillars of sustainable development, namely economy and society. That marine environment protection objectives should focus on the notion of sustainable development is beyond question. However, the German Advisory Council on the Environment sees a risk that – not least in the context of the general sustainability debate – special emphasis of the sustainability principle could water down and thus weaken the environmental thrust of the ecosystem approach. The Council points to its 2002 Environmental Report, in which it sets out the detailed reasoning behind its call for an ecology-focused sustainability model (SRU, 2002a, Para. 1 et seq., 30 et seq.), and to the associated management rules derived from the priority goal of preserving natural capital contained in the Council's preferred 'strong sustainability' concept (SRU, 2002a, Section 1 and particularly the 'management rules' in Para. 29). By its very nature, the ecosystem approach's integral conservation goal requires at least that economic and social stakes be considered only as far as ecosystem capacities allow. If this ceiling is lifted to take in broader considerations, it would not just weaken the ecological thrust of the precautionary approach but would constitute its complete abandonment.

4.1.2 Adequate Conservation Goals for the North and Baltic Seas

Fundamental Precautionary Principles in the OSPAR/HELCOM Process: Institutional Legitimation

499. In its special report, Towards Strengthening and Reorienting Nature and Landscape Conservation, the German Advisory Council on the Environment gave a detailed account of the difficulties involved in setting conservation objectives. The same conclusions apply for marine environment protection strategies (SRU, 2002b, Para. 66 et seq.). There are fundamental reasons why quantified targets and pollution limits for complex ecosystems can hardly ever be specified on a purely scientific basis.

As outlined elsewhere, the principles of the ecosystem approach set out in the Biodiversity Convention do not allow derivation of clear objectives for marine environment protection. In emphasising that 'objectives … are a matter of societal choice', Principle 1 expressly acknowledges that strict scientific derivation of targets is neither possible nor necessary. The principles of the ecosystem approach do, however, require long-term objectives for ecosystem management (Principle 8) and make conservation of ecosystem structure and functioning (Principle 5) a priority objective.

500. In terms of pollution, marine environment protection policy as structured by the NSC, OSPAR and HELCOM focuses on two basic principles:

– Pollutant emissions should not exceed the ecosystem's intake capacity.

– Inputs of non-biodegradable substances should be minimised.

In conjunction with the precautionary approach, these principles serve as a standard by which the plausibility of individual proposals can be judged in specific goal-setting debates to which the first principle of the ecosystem approach refers.

While the first of the principles allows emission levels that are to be specified based on the intake or assimilation capacity of the affected ecosystem, the second relies on a minimisation target that ideally will result in zero emissions of non-biodegradable substances. The difference in their substance makes clear definition of the different types of goals vital in order to specify the normative status of each goal.

A situation devoid of anthropogenic pollution inputs (zero emissions) is an *ideal* that can be aimed for over time without actually being achievable in the foreseeable future. This does not, however, rule out declaring this general ideal as a set of specific individual goals for certain undesirable substances in an effort to reduce concentrations of those substances to 'near zero' (harmful synthetic substances) or 'near natural background values' (naturally occurring harmful substances). With regard to other substance groups like copper, nutrients and certain organic pollutants, it would make little sense to view the general ideal as an actual goal because, for example, it would require the cessation of certain types of land use. Instead, stringent targets are needed that focus on the intake capacity rule (e. g. 50% reduction of eutrophying substances).

One objective that is occasionally applied is reinstatement of the seas' original status before they were affected by human influences. This is a regulatory notion for which there is no corresponding empirical standpoint. It thus involves a hypothetical situation that can be neither observed nor monitored. A notion of this type does not provide the necessary conditions for practical marine protection and is of little help or perhaps even entirely useless in policy terms.

501. In past decades, targets have been established under the OSPAR and HELCOM conventions and the International Conference on the Protection of the North Sea that do not necessarily meet the adequacy requirements:

– The generation target aims for cessation of discharges, inputs and diffuse losses of pollutants by 2020. This means achieving, in the longer term, concentrations of naturally occurring substances that are close to natural background values and 'close to zero' concentrations of other substances. These targets are in line with the underlying minimisation principle.

– In the case of phosphorus and nitrogen, the OSPAR contracting parties agreed a target to prevent anthropogenic eutrophication by 2010. This is stricter than the capacity principle and thus unrealistic. Likewise, the aimed for quality levels cannot be reached with the agreed 50% emissions reduction (Para. 330).

The German Advisory Council on the Environment calls for a more realistic target based on the carrying capacity of the ecosystem. At the same time, however, the measures adopted to achieve this target need to be stepped up.

502. While setting basic targets for pollution and hence emission reductions is an indispensable part of designing successful policy, the global targets cannot have the desired controlling effect unless they are broken down into sectoral action targets and packages of implementing measures with an associated timeline. The objectives set out in the Bergen Declaration of the Fifth International Conference on the Protection of the North Sea (NSC, 2002b) have made an important contribution in this regard.

From Precautionary Principles to Prescribed Quality Targets

503. With its Bergen Declaration, the Fifth NSC rightly gave the initiative to operationalise the abstract precautionary maxims outlined above through the use of verifiable quality targets and criteria for the chemical, biological and hydromorphological status of marine waters (NSC, 2002b, I and Annexes 2 and 3). The Fifth NSC has thus performed valuable groundwork by developing, among other things, the key 'quality elements' for which quality targets are to be agreed (see Table 4.1 and 4.2).

504. The German Advisory Council on the Environment welcomes the NSC's approach to target-setting and recommends that the German government push for rapid further development and implementation of the quality targets, while taking care to ensure that target-setting responsibilities are fairly distributed between global and regional levels. With its requirement for the respective ecosystem, economic and social functional relationships to be taken into account wherever possible, the ecosystem approach tends to produce finely and locally differentiated quality targets.

Given the competition between the participating states and regions, and in light of the often dominant socio-economic interests at regional level, the aspirations to global environmental policy management clearly correspond with an actual need for global governance. For this reason, the German Advisory Council on the Environment believes that quality targets should be set on the basis of a global typology, with regional actors being allowed to set local targets only in cases where it is relatively certain that global quality targets would be less effective due to their lack of regional specificity. Existing preponderances in chemical and biological profiles (as in river estuaries) can be taken into account by means of differentiated typologies of quality targets, as is the case concerning inland waters and significantly altered waterbodies under the Water Framework Directive. The policy instrument of protected areas can also give consideration to specific local conservation needs without having to limit quality target-setting *a priori* to local constraints and local decisionmakers.

Table 4-1

Quality elements for measuring attainment of ecological quality objectives for the North Sea marine environment as set out in the Bergen Declaration of the Fifth International Conference on the Protection of the North Sea, Annex 3, Table A

Issue	Ecological quality element
1. Commercial fish species	a) Spawning stock biomass of commercial fish species
2. Threatened and declining species	b) Presence and extent of threatened and declining species in the North Sea
3. Sea mammals	c) Seal population trends in the North Sea d) Utilization of seal breeding sites in the North Sea e) By-catch of harbour porpoises
4. Seabirds	f) Proportion of oiled Common Guillemots among those found dead or dying on beaches g) Mercury concentrations in seabird eggs and feathers h) Organochlorine concentrations in seabird eggs i) Plastic particles in stomachs of seabirds j) Local sandeel availability to black-legged Kittiwakes k) Seabird populations trends as an index of seabird community health
5. Fish communities	l) Changes in the proportion of large fish and hence the average weight and average maximum length of the fish community
6. Benthic communities	m) Changes/kills in zoobenthos in relation to eutrophication n) Imposex in dog whelk (*Nucella lapillus*) o) Density of sensitive (*e. g.* fragile) species p) Density of opportunistic species
7. Plankton communities	q) Phytoplankton chlorophyll *a* r) Phytoplankton indicator species for eutrophication
8. Habitats	s) Restore and/or maintain habitat quality
9. Nutrient budgets and production	t) Winter nutrient (DIN and DIP) concentrations
10. Oxygen consumption	u) Oxygen

Source: NSC, 2002b, Annex 3

Table 4-2

Examples of quality objectives for selected quality elements as set out in the Bergen Declaration of the 5th NSC, Annex 3 (Table B)

Ecological quality element	Ecological quality objective
(a) Spawning stock biomass of commercial fish species	Above precautionary reference points for commercial fish species where these have been agreed by the competent authority for fisheries management
(c) Seal population trends in the North Sea	No decline in population size or pup production of ≥ 10% over a period of up to 10 years
(e) By-catch of harbour porpoises	Annual by-catch levels should be reduced to levels below 1.7% of the best population estimate
(f) Proportion of oiled Common Guillemots among those found dead or dying on beaches	The proportion of such birds should be 10% or less of the total found dead or dying, in all areas of the North Sea
(m) Changes/kills in zoobenthos in relation to eutrophication	There should be no kills in benthic animal species as a result of oxygen deficiency and/or toxic phytoplankton species
(n) Imposex in dog whelks (*Nucella lapillus*)	A low (< 2) level of imposex in female dog whelks, as measured by the *Vas Deferens* Sequence Index
(q) Phytoplankton chlorophyll *a*	Maximum and mean chlorophyll *a* concentrations during the growing season should remain below elevated levels, defined as concentrations > 50% above the spatial (offshore) and/or historical background concentration
(r) Phytoplankton indicator species for eutrophication	Region/area-specific phytoplankton eutrophication indicator species should remain below respective nuisance and/or toxic elevated levels (and increased duration)
(t) Winter nutrient concentrations	Winter DIN and/or DIP should remain below elevated levels, defined as concentrations > 50% above salinity related and/or region-specific natural background concentrations
(u) Oxygen	Oxygen concentration, decreased indirect effect of nutrient enrichment, should remain above region-specific oxygen deficiency levels, ranging 4–6 mg oxygen per liter

Source: NSC, 2002b, Annex 3

4.2 Division of Responsibilities and Powers in the Multi-Actor Setting

505. The division of responsibilities between international, European and national levels, and in Germany between the federal and *Länder* governments, has proven to be a major obstacle in advancing marine environment protection. The following areas of conflict exist:

– As regards regulation of shipping, there are conflicts of responsibility in relationships between the EU and regional treaty initiatives and between the International Maritime Organisation (IMO) and the Law of the Sea Treaty. Regional environmental policy activities to combat shipping-related risk largely require IMO approval and their success is often stymied by a lack of global consensus (as with the phasing out of single hull tanker ships).

– There is a conflict of responsibilities and interests between regional treaty initiatives and the EU. Difficulties arise in this relationship due to the dual role played by the participating states in their parallel capacities as EU Member States and contracting states to conservation conventions and commissions.

– The relationship between the EU and its Member States involves conflicts of responsibility on two counts. Firstly, the EU hinders its Member States in implementing OSPAR and HELCOM resolutions, and uncertainties remain as to the legal scope for action afforded to them. Secondly, the lack of EU administrative enforcement powers – particularly for marine protection – is a clear implementational weakness.

– Finally, the distribution of responsibilities between Germany's federal and *Länder* governments, whereby the *Länder* are largely responsible for inland waters and coastal waters and the federal government for federal waterways and the Exclusive Economic Zone (EEZ), poses a considerable barrier to effective management of marine waters (for a review of the same issue in the USA see CICIN-SAIN, 2002).

4.2.1 Implementing Regional Protection Provisions Versus International Requirements under the Law of the Sea Treaty and the International Maritime Organisation

506. The global nature of shipping calls for regulation at international level. The IMO shows little willingness to implement more stringent rules, however. At best, long and drawn-out decisionmaking processes result in a tightening of existing provisions. The fact that the IMO is dominated by the interests of the shipping industry, the vested interests of cheap-flag states and the priority given to the flag state principle under the Law of the Sea Treaty, has for the most part stopped regional decisionmaking bodies from setting regional protection standards. This applies both to the EU and to the OSPAR and HELCOM conventions. Nevertheless, there are signs of increasing activity within the EU, if only in response to the serious shipping accidents that have occurred in EU waters in recent years. While the regional marine protection organisations play a pioneer role compared to the EU in dealing with harmful substances, eutrophication and marine protected areas (Section 4.2.2), it is the EU rather than the IMO which plays the initiator and pioneer role (as do OSPAR and HELCOM) when it comes to shipping safety.

Although EU legislation has clearly influenced the further development of relevant international law and continues to do so, uncertainty remains as to the extent to which the EU can enact protection measures without IMO approval. Only recently have the IMO and the EU begun to clarify the division of responsibilities between their organisations. There is as yet no clear division of responsibilities capable of effectively taking account of environmental policy needs. This deficit is likely to be one of the causes of the EU failing to muster the same level of effort as regards chronic pollution caused by normal shipping operations as it does in dealing with shipping safety issues, where public pressure following shipping accidents (particularly the sinking of the Erika and the Prestige) acted as a driver and forced the EU to take a positive stance within the complex mesh of responsibilities (DESOMBRE, 2000).

4.2.2 Cooperation with the European Union

Regional Marine Protection Organisations and their Pioneer Role

507. Regional initiatives under the OSPAR and HELCOM conventions and the International Conference on the Protection of the North Sea play a pioneer role in protecting the North and Baltic seas (SKJAERSETH, 2003a; HAAS, 1993). Their strategies, resolutions and recommendations have set high standards – particularly on target-setting. Their main objectives include:

– A common commitment to using the best available technologies to prevent harmful activities and inputs in the marine environment (Section 3.5.1.1).

– The so-called generation target for inputs of harmful substances (reduction to 'near zero' or near natural background concentrations by 2020 (Section 2.3.2)).

– A 50% reduction in nutrient inputs (Section 2.3.3).

– The cessation of overfishing (Bergen Declaration).

– The creation of coherent protected area networks (Section 2.3.5).

With the exception of the fisheries, these and a range of other objectives have been further developed and refined at regular meetings of the convention commissions with detailed resolutions and recommendations on appropriate measures and policies. Compared with the EU, the commissions demonstrate greater willingness in policy-making to give higher priority to marine environment protection needs. This is largely due to the fact that the NSC, OSPAR and HELCOM focus solely on marine environment protection, while for the EU, protection of the marine environment is only one of many issues to be considered in managing marine-related activities (HAAS, 1993). The NSC, OSPAR and HELCOM, as monothematic expert forums, serve to identify the necessary policies and measures for marine environment protection and, where possible, foster and achieve political agreement on joint implementation of those measures. Their 'agenda-setting' function plays a key role in dealings with the EU (SKJAERSETH, 2003b, p. 9–14).

The Role of the EU: Binding Implementation and Integration into Multisectoral Community Programmes and Policies

508. With its legislative powers in almost all significant problem areas of marine environment protection, the EU holds a key position of responsibility when it comes to protecting the North and Baltic seas. A great opportunity lies in the fact that EU law will, in the near future, com-

mit the vast majority of North Sea and Baltic riparian states to supranational cooperation and legislation. The binding nature of EU law on Member States and the special sanctions available for dealing with non-implementation ensure a relatively high level of effectiveness for EU law and for implementation of international marine protection goals by the Community. EU law also ensures that Member States are less likely to operate on the freerider principle (relying on other Member States to act) or to point the finger at other states' failure to achieve set targets. These power relations enable the EU and its various bodies to make a significant contribution to implementing and enforcing marine protection goals. The EU does not, however, have any direct enforcement powers in relation to individual citizens and must rely on enforcement bodies in the various Member States. These need to be centrally coordinated due to the crossborder nature of marine environment protection (Para. 266, 365).

When it comes to formulating provisions for marine environment protection, the fact that EU implementation laws are legally binding and allow sanctions leads to EU legislation being considerably less stringent than provisions agreed upon by contracting state representatives in the regional marine protection organisations. Along with the binding application of EU law, the EU's reserve towards pollution sectors is largely due to it not focusing solely on issues of marine environment protection – as do the marine protection organisations – and its being primarily concerned with the economic aspects of the Single Market. Another factor is that at EU level, environment protection needs come up against conflicting policies from the outset and to a far greater extent than at OSPAR and HELCOM level. A further obstacle at EU level comes in the form of Member States that are neither North Sea nor Baltic coastal states.

The Relationship between the EU and the Regional Marine Protection Organisations

509. The EU's role as outlined above means that in dealings with the regional marine protection organisations, the two sides take on key and unique functions. The main role of the marine protection organisations lies in their monothematic approach and the need to present marine environment protection needs to the EU as a single package. The fact that the NSC, OSPAR and HELCOM do not have at their disposal the same hard implementation tools as the EU is by no means a disadvantage. Rather, their 'soft' resolutions and recommendations, which are more programmatic than legislative, are largely responsible for the fact that most states are willing to agree to stringent targets and measures in the first place. The regional organisations thus fulfil a key initiator and integration function and, to a certain extent, form a policy 'funnel' on the way to the EU and individual Member States adopting more binding protection provisions. This is particularly the case as regards the International Conference on the Protection of the North Sea (NSC), which has regularly given new impetus to marine environment protection and is responsible for the strict nutrient and pollution reduction targets (the generation target). Its initiator role is largely due to the 'high-noon effect' of conferences held at regular multiyear intervals (SKJAERSETH, 2003b, p. 9–11; HAAS, 1993). The intensive groundwork done by the OSPAR Commission makes a significant contribution to the conferences being presented with a clear outline of the problems involved and ways to solve them.

Conflicts of Responsibility

510. The increasing pioneer role and integrational function assumed by the marine protection organisations tends to be threatened by their relationship with the EU when it blocks their decisions from being made or implemented. Because the EU – as already emphasised in a number of places – enjoys legislative powers that take in most areas of marine environment protection and has made use of its powers on numerous occasions, it acquires more or less by default an external responsibility for the implementation of international agreements. In areas like fisheries, agriculture, chemicals policy and water protection law, the Member States can only commit to such protection measures without EU approval as are allowed under respective sector-specific EU law. Member States' legal commitment to the EU when participating in OSPAR and HELCOM committees raises the concern that the EU will increasingly exercise its powers at the level of the two conventions in a way which reflects the conflicting interests of the non-coastal states, thus severely bridling or completely derailing the dynamic regional cooperation process (LELL, 2001, p. 144 et seq.; and on the EU's influence in international agreements, JUPILLE, 1999). These fears would appear justified in that, compared with the EU, OSPAR and HELCOM perform a leadership and initiator role and any further occupation of this arena by the EU would lessen their effectiveness. Greater assumption of power on the part of the EU following its expansion cannot go ignored. Finally, the EU initiative towards a marine protection strategy signals the EU's intentions to reinforce its presence in this arena (Section 4.5, Para. 524).

However, even with the EU in the dominant role, the scope for decisionmaking and the unique functions of the regional protection organisations will most likely remain considerable and largely intact. Firstly, along with the areas of responsibility covered by the Community, the individual states are still afforded a range of options both in regional management and in the standardisation of conservation-focused environmental provisions on issues liked marine facilities and use of waterbodies. Secondly, in those areas where regulation of marine protection is no longer possible at national level following its full harmonisation under EU law, the EU's responsibility

remains unaffected by non-binding policy recommendations and 'soft law' guidelines. OSPAR, HELCOM and the NSC thus retain key policy mandates.

511. In an effort to foster the initiator function of these organisations in the shadow of EU influence, the German Advisory Council on the Environment believes the German government should take action to ensure that OSPAR and HELCOM suffer no significant loss of power or influence in relation to the EU. The Joint Ministerial Conference has sent out an important signal with its call for consolidation of the two organisations. The German government should thus push for additional regular conferences.

4.2.3 The Relationship between the EU and its Member States

512. In the relationship between the EU and its Member States, conflicts of responsibility arise from the dual role played by Member States as members of the EU and as contracting states to the marine protection organisations. As outlined above, the situation largely depends on balancing the marine protection organisations' initiator and integration function with the EU's areas of responsibility.

Another problem regarding the relationship between the EU and its Member States involves the administrative enforcement of common marine protection provisions. One of the main reasons for the current state of affairs in the fisheries is that Member States rarely monitor compliance with what are already excessively high catch quotas. This has led the EU Commission (as addressed in Para. 262) to consider establishing an EU Fisheries Inspectorate that would at least coordinate and supervise enforcement in Member States. The Commission's idea of managing Member State enforcement through a central EU agency would appear a suitable approach to improving the poor enforcement situation.

To an even greater extent than with the fisheries, monitoring of shipping activities requires coordinated implementation and enforcement because of the flag state principle and the many cross-border issues involved. It is thus to be welcomed that the EU intends to assume a greater leadership role in enforcement and is already taking action on the in some cases still woefully inadequate port state controls and the past wide variance in prosecution and sanction practices at national level.

4.2.4 The Relationship between Germany's Federal and *Länder* Governments

513. Along with the other contracting states to the OSPAR and HELCOM conventions, and like its fellow EU Member States, Germany must implement and enforce national legislation to comply with international and Community marine environment protection requirements. Additional scope is afforded to the individual states to allow adoption of further measures in areas like nature conservation and protected area designation, planning management, regulation and restriction of localised activities, and investment to reduce pollutant and nutrient inputs.

Cooperation between the federal and *Länder* governments and between the coastal *Länder* is of particular importance not only because, in addition to the enforcement responsibilities of the *Länder,* the federal government is responsible for marine environment protection beyond the 12-mile zone, but more importantly because of the cross-border issues involved. Particularly regarding enforcement, the division of responsibilities between the federal and *Länder* governments at the 12-mile limit poses considerable difficulties – as illustrated, for example, by the efforts to establish a joint accident task force (Section 3.4.7.2). An amendment of the German Constitution appears necessary to establish uniform administration at federal level. Consideration should also be given to a constitutional reallocation of responsibilities in management of coastal waters. As in implementation of the Water Framework Directive, there is something to be said for giving the federal government constitutional powers to standardise specific requirements for coastal water management and planning and for approving facilities in coastal waters. Also, there is an obvious need for institutionalised coordination of planning between the federal and *Länder* governments – particularly in protecting marine waters.

4.3 Implementation Deficits and Instruments for Better Enforcement

4.3.1 Stringent Targets and Implementation Deficits

514. The responsible states have recognised the need for action regarding the problems involved in marine environment protection, and OSPAR, HELCOM and the NSC have adopted stringent protection and precautionary targets. Nevertheless, the individual pressures and prevention policies described earlier highlight many deficits in implementation, some of them very pronounced. In some cases, individual states or even the EU as a whole fail to take the action needed to achieve the targets. Key examples from among the cases outlined earlier include:

– The continued setting of catch quotas under the Common Fisheries Policy that are far in excess of those which the ICES believes should not be exceeded to ensure sustainable stock management and which are thus repeatedly adopted as targets by both the NSC and the EU itself.

– Incomplete implementation of OSPAR and HELCOM decisions (the generation target, Para. 291 et seq.) to reduce inputs of harmful substances under EU chemicals policy and especially the Water Framework Directive, along with the associated lists of priority hazardous substances.

– Non-achievement of agreed reductions in nitrogen inputs (Para. 325, 328), particularly as a result of inadequate restriction of nitrate run-offs.

– The continued lack of a coherent, integrated protected area network such as that long aimed for by the Helsinki Commission and set down as a binding requirement under the Habitats and Birds directives (Para. 414 et seq.).

515. Given the above 'assignment' of roles between the regional marine protection organisations as initiators and drivers of marine environment protection and the EU as a consolidator and catalyst, an element of laxness in enforcement and a certain degree of lagging behind OSPAR and HELCOM objectives would appear both natural and acceptable. As already outlined, there is a distinct benefit in the fact that soft law from the likes of OSPAR and HELCOM does not usually prescribe immediate compliance in that the allowed flexibility actually increases states' willingness to agree to the respective targets and recommendations. This benefit is, however, outweighed by the disadvantages of the lack of binding force and enforcement deadlines if states still fail to implement agreed targets and measures in the medium or the longer term and ignore clearly set cut-off dates like those for the 50% nutrient reduction and generation targets (Para. 291 et seq., 325, 328).

Because goal-setting, at least at OSPAR and HELCOM level, is well advanced and decisions and recommendations on prevention measures to tackle specific pressures have consolidated into a respectable action programme, the main task now is to implement specific measures and enforce compliance. Naturally, this also applies to the yet-to-be implemented policy and legal requirements set by the EU for the Natura 2000 protected area network and the Common Fisheries Policy. While the right goals are in place, they have yet to be implemented.

4.3.2 Reasons and Approaches for Improved Implementation

516. The political science and legal debate surrounding implementation of international rules, measures and agreements has cited a number of reasons for deficient enforcement and has proposed a range of instruments to improve the situation (BÖRZEL, 2002; BROWN WEISS and JACOBSON, 2000). The following addresses the main barriers to enforcing marine environment protection.

Conflicting Power Relations

517. In many cases, the abstract objectives contained in international agreements are interpreted less as immediate legal obligations for action and more as impetus for a political problem-solving process. Governments who sign international agreements are often unable to achieve the political majority needed at national level to transpose the agreements into national law. Where agreements merely formulate abstract environment protection goals and allow Member States broad scope as to the measures to be taken, ratification by national parliaments does not necessarily mean those measures can or will be implemented (BÖRZEL and RISSE, 2001). Examples include the internationally agreed target for sustainable management of fish stocks, adopted on repeated occasions by the NSC, and the OSPAR and HELCOM commitments to establishing a coherent protected area network. Despite being linked to specific deadlines, there has been tough political opposition to national implementation of the generation target for priority hazardous substances and the reduction target for nutrient inputs. In all these areas, the task now is to push enforcement of agreed targets and binding requirements and to break through the political barriers. As will be addressed later, this involves making (inadequate) goal attainment more transparent and, more importantly, requiring implementation plans with realistic enforcement measures.

Inadequate Binding Force of International Agreements and Lack of Sanctions for Non-Compliance

518. The absence of a superordinate power means that there are few options for hard sanctions under international environment law. It appears in many cases that no immediate negative outcome can be expected if a state fails to fulfil its obligations. Only recently have greater efforts been taken to provide international law regimes with more effective means of ensuring implementation, albeit with the main focus more on implementation aids and measures to encourage implementation than on actual sanctions. What must be considered is the fact that hard sanction mechanisms could well prevent states from signing up to environment policy agreements and commitments in the first place. The goal of greater binding force and enforcement powers conflicts with the equally fundamental integrating and impetus-giving function of the international marine protection conventions. To improve implementation at this level, preference must thus be given to instruments that provide positive incentives to comply with implementation requirements and, wherever possible, maintain sufficient flexibility (CHAYES and CHAYES, 1993). Two basic requirements for effective implementation remain of key importance: firstly, implementation of international agreements must be regularly monitored and deficiencies in compliance must be identified as clearly and as transparently as possible (MITCHELL, 1998, 2000). Secondly, non-compliant states must be required to explain how deficits will be remedied. Greater effectiveness is thus promised by a regime that from the outset links agreed targets with a mutual commitment to present transparent implementation plans illustrating how targets are to be reached in each individual state.

Lack of Derived Targets

519. In many cases, international agreements are restricted to common targets and do not actually describe the means to be used in achieving them. In some instances, the wording of the targets themselves is rather vague so that uncertainties remain as to what is being aimed for (CHAYES et al., 2000; CHAYES and CHAYES, 1993, p. 188–192). Then again, the reasons for 'weakly' worded agreements lie in efforts to reach a compromise reconciling myriad conflicting interests. Their vague objectives and lack of derived targets are a precondition for the integrational capacity of international agreements and for the desired action being acceptable to as many states as possible. An element of implementational weakness must thus be accepted as the price to be paid for the greater integrational and initiator function that international agreements perform. It would appear, therefore, that an obligation for transparent reporting and implementation planning is not only a suitable but an indispensable instrument for detecting implementation deficits and holding states to compliance without running the risk of them shying away from participating in agreements and actively engaging in their further development.

Uncertainties in Collective Action

520. Uncertainties in collective action are largely due to the lack of binding force and the absence of enforcement measures and could result in the responsible states either relying on others to act (freerider approach) or tacitly agreeing to fall short of the targets in implementation. These effects, which certainly play a role as regards non-compliance with the reduction target for nutrient inputs and in EU fisheries policy, can only be overcome with greater transparency and more effective enforcement. However, to maintain flexibility alongside the integrational capacity and the initiator function of international agreements, it would appear appropriate to couple the soft instrument of transparent reporting with mandatory submission of implementation plans.

Inadequate Financial, Technical and Administrative Capacities

521. The capacity deficits that are often a major problem in developing countries should not hinder protection of the North and Baltic seas. However, administrative representation of marine environment protection interests appears extremely underdeveloped compared with other sector-specific environment policies (protecting inland waters, for example). While the new waterways administrations being formed under the Water Framework Directive serve as a reference point for integration of marine environment protection, there are no plans for separate management of marine waters (nevertheless, see the EU Commission's plans as regards a draft proposal for a common marine protection strategy).

4.3.3 Outcomes

522. The deficits in implementing international agreements and recommendations for action on marine environment protection are largely due, albeit to varying degrees, to the conventions' lack of 'hard' implementation instruments and sanctions that would allow greater pressure to be put on non-compliant states. For this reason, international initiatives must take efforts to ensure that their binding decisions be heeded and implemented. What must not be overlooked, however, is that the soft (flexible) and often medium or even long-term nature of these agreements is a key prerequisite for environmental protection initiatives finding support in the international arena.

The German Advisory Council on the Environment believes that, like the individual decisions adopted under them, the international marine protection regime's enforcement powers could be significantly increased – without causing too much damage to its integrational capacity – by amending protection conventions to require contracting states to submit meaningful national implementation plans to both OSPAR and HELCOM. Both of these conventions provide for ongoing reporting by the contracting states, in the form of implementation status reports and, based on those reports, subsequent implementation reports. A minimum level of transparency in implementation is thus guaranteed. What is missing, however, is an obligation on the part of the contracting states to draw up action programmes for implementation of international targets and to supplement the programmes with revised plans to remedy any deficiencies that may be identified.

The Council views the absence of strategies and action programmes as a serious management deficit, not only as regards the key role that could accrue to national implementation programmes in implementing international protection targets and recommendations for action. The main reason action programmes of this kind are needed is that the required level of integration of the various policy areas can only be guaranteed and a holistic and optimised action programme can only be developed on the basis of detailed plans linking targets with clear deadlines (see also Section 4.4).

4.4 Integrated Management Instruments

523. The complex nature of marine environment protection calls for cross-sectoral strategy building and action planning. Only with an integrative approach can conflicting and counter-productive courses of action be avoided (on the importance of strategic planning in environmental policy see SRU, 2000, Section 1). The need for an integrated protection and prevention approach is particularly well illustrated by the frequently mentioned lack of cooperation in planning efforts, which still shapes activities in marine areas in the absence of marine spatial planning. Marine spatial planning is thus of fundamental importance in integrated marine protection policy. Spatial planning does not, however, provide for all necessary or potential action. Alongside marine spatial planning,

there is thus a need for comprehensive marine protection action plans to allow development of the best possible, transparent protection strategy taking in all available options and considering all interests. In terms of marine planning, this poses something of a challenge – one similar to that experienced in managing river catchment areas under the Water Framework Directive. The EU should thus implement appropriate and consistently quality-focused management of marine waters as is already the case with inland waters. In many aspects, this could be directly based on the instruments, institutions and standards of the Water Framework Directive.

As outlined elsewhere (Para. 522), taking an integrated strategy and management approach as part of action planning plays a key role in dealing with marine environment protection in conflicting sectoral policies. Institutionalised cross-sectoral coordination as is always required by integrated management planning better ensures inclusion of the appropriate policy areas. It also ensures integration of marine environment protection into the decisionmaking process, both in terms of individual protection needs and as an integral policy field, thus lending it greater weight overall. One thing which must not be underestimated in this regard is the greater value that would be accorded to the marine environment through the additional staffing, administrative and organisational efforts required by its integration. This is demonstrated not only in the ongoing implementation process regarding management of inland waters under the Water Framework Directive, but more recently in the EU Commission's work plan and organisational arrangements for the development of an EU Marine Strategy (EU Commission, 2003i), which will be addressed in more detail in the next section.

4.5 Special Focus: Structuring a European Marine Protection Strategy

524. The EU Commission recognised the urgent need for a cross-sectoral marine protection strategy and laid the foundations for this type of integrated action plan in a proposal published in October 2002. Although the initial proposal contained some fundamental deficits (SRU, 2003b), the aim of achieving an integrated protection policy – both in terms of subject matter and organisation – is to be welcomed without reservation. The proposed work plan and organisational arrangements are a step in the right direction (EU Commission, 2003i).

In its proposal, the Commission reiterates and further defines the objectives of the draft strategy. The strategy to be developed by May 2005 is to encompass the following:

– An integrated approach with qualitative and quantitative targets and deadlines.
– Implementation measures.
– A common, harmonised monitoring and environmental impact assessment system.
– Broad participation by affected groups and industry associations.

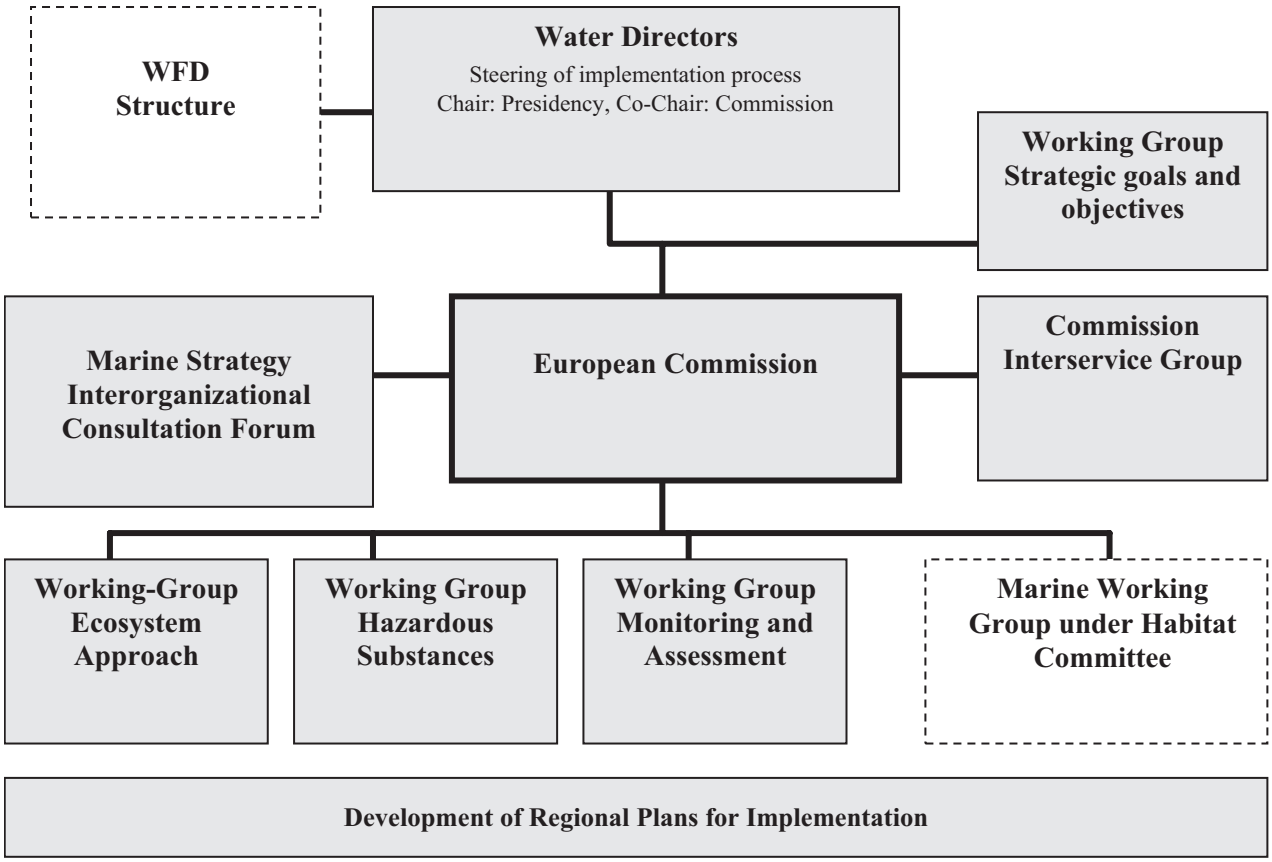
The Commission places particular weight on greater cooperation and coordination between actors at international, regional and national level, and on effective cooperation and approval mechanisms within the EU, between the EU and its Member States, and with OSPAR, HELCOM and other organisations. In all issues involving marine environment protection, agreement at EU level is to be organised and managed by an Inter-service Group which has now been officially established. Agreement with, between and within the Member States is to be tightly linked to the Water Framework Directive implementation strategy and, as part of that strategy, managed by Member States' designated coordinators – known as water managers – in a specially formed working group (Figure 4.1). The Commission also hopes to achieve better integration of marine environment protection into the organisational and administrative structures established under the Water Framework Directive. Finally, the Commission lays great store in the development of regional implementation plans similar to the management and action plans under the Water Framework Directive.

This organisational arrangement would appear a suitable approach towards integrative marine environment policy at EU level and, given their close relationship in terms of subject matter, it seems particularly fitting to base it on the Water Framework Directive implementation programmes. This model nevertheless fails to meet two key challenges:

– It does not provide for working groups to cover the main problem sectors of agriculture, fisheries and shipping. Working groups are restricted to DG Environment's traditional areas of responsibility. This seamlessly transfers the deficits contained in the Commission's draft strategy of October 2002 to its proposals on institutional arrangements.
– Links to national and regional implementation are largely neglected. While the link to regional implementation programmes takes the right approach, the Member States must be involved in the operationalisation of the EU strategy by means of national marine protection programmes and action plans in order to take into account the concerns addressed earlier regarding policy requirements, transparent implementation controls, better enforcement and integrated action planning (Section 4.6).

Figure 4-1

EU Commission proposed organisational arrangements for development of a European Marine Strategy



Source: EU Commission, 2003

4.6 Conclusions and Recommendations

Pragmatic Interpretation and Management of the Ecosystem Approach

525. The ecosystem approach carries with it the objective of protecting functional relationships and interactions among marine species and habitats along with the species and habitats themselves, and of coordinating the management of marine areas with those functional relationships and interactions. The German Advisory Council on the Environment considers this to be a binding rule. This applies especially to the fisheries sector with its severe impact on species composition, where no adequate research has been conducted on its effects, let alone their being considered by decisionmakers or managers. Then again, the ecosystem approach must not be interpreted as making everything 'subject to further research', with functional relationships and interactions having to be further investigated before action can be taken to prevent anthropogenic impacts. If it is to help improve marine environment protection, the ecosystem approach should put the precautionary principle into practice rather than water it down.

Resolving Conflicts of Responsibility that Weaken Effectiveness

526. Clarification and redistribution of responsibilities within key problem areas of marine environment protection must be pushed for if responsibility conflicts that weaken effectiveness are to be resolved. This applies to:

- The relationship between regional protection organisations, the EU and the international shipping regimes (the Law of the Sea Treaty and the International Maritime Organisation (IMO)) as regards the possibility of obligating shipping at regional level to greater protection, emission and safety standards. Efforts must be made to afford regional communities with sovereign waters greater scope for action at their regional level.
- The relationship between the EU and the regional initiatives under the OSPAR and Helsinki agreements, where the responsibilities of OSPAR and HELCOM should be upheld and their initiator and pioneer roles in marine environment protection supported.
- The relationship between the EU and its Member States concerning the establishment of a European

Inspectorate that uses international control teams to coordinate and manage enforcement, to remedy the current lack of a uniform monitoring and enforcement agency with broad sovereign powers.

– The relationship between the federal and *Länder* governments, where greater enforcement powers ought to be given to the federal government as regards shipping monitoring (to include coastal waters) and concurrent legislative powers ought to be introduced in the field of water protection.

– Supplementing the EU Commission's recommendations for organisation of a Common Marine Policy at EU level with additional institutions and permanent committees to ensure integration of agriculture, fisheries and shipping.

Creating a Hierarchically Structured and Integrated Management Regime

527. The German Advisory Council on the Environment sees an integrated strategy and action plan together with spatial coordination as vital to marine environment protection, which is essentially a multilateral, cross-sectoral responsibility. Given the differences in the scope for action allowed in implementing OSPAR, HELCOM and EU requirements, there is an obvious need for an holistic strategy at national level – a national marine environment protection programme – to provide transparent targets and measures. It appears that national programmes of this kind do not yet exist. The EU should thus require the drafting of national management plans. These could in turn provide the basis for more effective implementation and enforcement of international and European initiatives. In line with the Water Framework Directive, the EU should thus place its Member States under obligation to:

– Develop and regularly update national action plans for marine waters.

– Use the action plans to effect and document the implementation of international and EU requirements.

– Issue supplementary action plans to remedy any enforcement deficits.

– Establish marine spatial plans in line with their national management plans and in compliance with uniform planning standards and processes to be laid down in EU law.

Irrespective of any future European requirements, the German Advisory Council on the Environment appeals to the German government, and particularly to Germany's coastal *Länder,* to develop marine protection plans without delay and to review and update them regularly with public consultation.

Annex I

Charter Establishing the Advisory Council on the Environment in the Ministry of the Environment, Nature Conservation and Nuclear Safety

Issued on 10 August 1990

Article 1

The Advisory Council on the Environment has been established to periodically assess the environmental situation and environmental conditions in the Federal Republic of Germany and to facilitate opinion formation in all government ministries, departments and offices that have jurisdiction over the environment, and in the general public.

Article 2

(1) The Advisory Council on the Environment shall comprise seven members who have special scientific knowledge and experience with respect to environmental protection.

(2) The members of the Advisory Council on the Environment shall not be members of the government, a legislative body of the government or the civil service of the federal government, state governments or of any another public entity, universities and scientific institutes excepted. Further, they shall not represent any trade associations, or employers' or employees' associations, nor shall they be in their permanent employ or party to any non-gratuitous contract or agreement with said associations, nor shall they have done so in the 12 months previous to their appointment to the Advisory Council on the Environment.

Article 3

The task with which the Advisory Council on the Environment is charged shall be to describe the current environmental situation and environmental trends, as well as to point out environmentally related problems and suggest possible ways and means of preventing or correcting them.

Article 4

The Advisory Council on the Environment is charged exclusively with the mission stated in this charter and may determine its activities independently.

Article 5

The Advisory Council on the Environment shall provide the federal ministries whose area of competence is involved, or their representatives, with the opportunity to comment on important issues that emerge as a result of the Council's performing its task, and to do so before the Council publishes its reports on these issues.

Article 6

The Advisory Council on the Environment may arrange hearings for federal offices and *Länder* offices concerning particular issues, as well as invite the opinions of non-governmentally affiliated experts, particularly those who represent business and environmental associations.

Article 7

(1) The Advisory Council on the Environment shall make a report every two years which is to be submitted to the federal government by February 1 of the particular year in question. The report is to be published by the Council.

(2) The Advisory Council on the Environment may make additional reports or statements on particular issues. The Federal Ministry of the Environment, Nature Conservation and Nuclear Safety may commission the Council to make further reports and statements. The Council is to submit the reports and statements mentioned in clauses (1) and (2) of this article to the Federal Ministry of the Environment, Nature Conservation and Nuclear Safety.

Article 8

(1) Upon approval by the Federal Cabinet, the members of the Advisory Council on the Environment shall be appointed by the Federal Minister of the Environment, Nature Conservation and Nuclear Safety for the period of four years. Reappointment shall be possible.

(2) The members of the Council may give written notice to resign from the Council to the Federal Minister of the Environment, Nature Conservation and Nuclear Safety at any time.

(3) Should a member of the Council resign before serving the full four-year period, a new member shall be appointed for the remaining period. Reappointment shall be possible.

Article 9

(1) The Advisory Council on the Environment shall elect, by secret ballot, a chairperson who shall serve for a period of four years. Re-election shall be possible.

(2) The Advisory Council on the Environment shall set its own agenda, which shall be subject to approval by the Federal Minister of the Environment, Nature Conservation and Nuclear Safety.

(3) Should a minority of the members of the Council be of a different opinion from the majority of the members when preparing a report, they are to be given an opportunity to express this opinion in the report.

Article 10

The Advisory Council on the Environment shall be provided with a secretariat to assist it in the performance of its work.

Article 11

The members of the Advisory Council on the Environment and its secretariat are sworn to secrecy as concerns the Council's advisory activities and any advisory documents that it has classified as confidential, and as concerns any information given to the Council that has been classified as confidential.

Article 12

(1) The members of the Advisory Council on the Environment are to be paid a lump-sum compensation as well as to be reimbursed for their travel expenses. The amount of compensation and reimbursement shall be determined by the Federal Minister of the Environment, Nature Conservation and Nuclear Safety, with the consent of the Federal Minister of the Interior and the Federal Minister of Finances.

(2) The financial funding for the Advisory Council on the Environment shall be provided by the federal government.

Article 13

The Charter Establishing an Advisory Council on the Environment in the Federal Ministry of the Interior (GMBl. 1972, no. 2, p. 27), issued on 28 December 1971, is superseded by this charter.

Bonn, 10 August 1990

The Federal Minister of the Environment, Nature Conservation and Nuclear Safety

Dr. Klaus Töpfer

References

ALBRECHT, H., SCHMOLKE, S. R. (2003): Belastung der Nordsee mit anorganischen Schadstoffen. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 77–82.

ALESSI, M. de (2003): Technology, Marine Conservation, and Fisheries Management. In FOLDVARY, F. E., KLEIN, D. B. (eds.): The Half-Life of Policy Rationales: How New Technology Affects Old Policy Issues. New York: New York University Press, p. 21–37.

ALLSOPP, M., ERRY, B., SANTILLO, D., JOHNSTON, P. (2001): POPs in the Baltic. A review of persistent organic pollutants (POPs) in the Baltic Sea. Amsterdam: Greenpeace International. Online at http://archive.greenpeace.org/~toxics/reports/popsbaltic.pdf.

ANDERSON, L. G. (2000): Selection of a Property Rights Management System. In SHOTTON, R. (ed.): Use of Property Rights in Fisheries Management. FAO Fisheries Technical Paper 404/1. Online at http://www.fao.org/docrep/003/x7579e/x7579e00.htm.

APPEL, I. (2001): Das Gewässerschutzrecht auf dem Weg zu einem qualitätsorientierten Bewirtschaftungsregime: Zum finalen Regelungsansatz der EG-Wasserrahmenrichtlinie. Zeitschrift für Umweltrecht 12, Sonderheft, p. 129–137.

ARNASON, R. (2002): A Review of International Experiences with ITQs: Annex to Future Options for UK Fish Quota Management. University of Portsmouth. CEMARE Report No. 58.

ARNDT, E.-A. (1996): Lebensgemeinschaften. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee: Wissenschaftliche Fakten. Berlin: Parey, p. 47–54.

ASCOBANS (Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas) (2000): Draft recovery plan for Baltic harbour porpoises. Document AC9/Ddoc. Bonn: ASCOBANS.

AUERSWALD, K. (1997): Emissionen von N und P aus der Pflanzen- und Tierproduktion in die Gewässer. In Bayerische Akademie der Wissenschaften (eds.): Landwirtschaft im Konfliktfeld Ökologie – Ökonomie. Rundgespräch am 8. und 9. Juli 1996 in München. Munich: Pfeil, p. 127–135.

Baltic 21 (2003): Baltic 21 Report 2000–2002: Towards Sustainable Development in the Baltic Sea Region. Baltic 21 Series No. 1/2003. Stockholm: Baltic 21 Secretariat. Online at http://www.baltic21.org/.

Baltic 21 Tourism Group (1998): Agenda 21 – Baltic Sea Region Tourism. Baltic 21 Series No. 7/98.

BARTNICKI, J., GUSEV, A., BARRETT, K., SIMPSON, D. (2003): Atmospheric Supply of Nitrogen, Lead, Cadmium, Mercury and Lindane to the Baltic Sea in the Period 1996–2000 (Updated: 15. July 2003). Online at http://www.emep.int/helcom2002.

BECKER, G. A. (1990): Physikalische und chemische Randbedingungen: Die Nordsee als physikalisches System. In LOZÁN, J. L., LENZ, W., RACHOR, E., WATERMANN, B., WESTERNHAGEN, H. von (1990) Warnsignale aus der Nordsee: Wissenschaftliche Fakten. Berlin: Parey, p. 11–27.

BECKER, P. H., BRUHN, R. (2003): Schadstoffbelastung der Organismen im Küstenbereich. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 204–210.

BEHRENDT, H., HUBER, P., KORNMILCH, M., OPITZ, D., SCHMOLL, O., SCHOLZ, G. (2000): Nährstoffemissionen und -frachten in den Flussgebieten Deutschlands und ihre Veränderung. In Umweltbundesamt (eds.): Nährstoffemissionen in die Oberflächengewässer. Workshop des Umweltbundesamtes. Berlin: Umweltbundesamt. UBA-Texte, 29/00, p. 6–28.

BERNEM, K.-H. van (2003): Einfluss von Ölen auf marine Organismen und Lebensräumen. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 229–233.

BERTRAM, H.-U. (2003): Anforderungen an die Verwertung von Baggergut aus Sicht der Abfallwirtschaft. Paper prepared for presentation at an HTG/PIANC meeting held in Bremen by HTG-Fachausschuss Baggergut on 20 May 2003. Online at http://www.htg-baggergut.de/sites/texte.html.

BEUSEKOM, J. van, FOCK, H., JONG, F. de, DIEL-CHRISTIANSEN, S., CHRISTIANSEN, B. (2001): Wadden Sea Specific Eutrophication Criteria. Wilhelmshaven: Common Wadden Sea Secretariat. Wadden Sea Ecosystem No. 14. Online at http://www.wadden-sea-secretariat.org/news/documents/eut/Eut-report.pdf [viewed 09/10/2003].

BEUSEKOM, J. van, BROCKMANN, U., ELBRÄCHTER, M., PÄTSCH, J., WILTSHIRE, K. (2003): Die Bedeutung und die Gefahr von Algenblüten

in Wattenmeer und Nordsee. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 182–192.

BEVERTON, R. J. H., HOLT, S. J. (1957): On the dynamics of exploited fish populations. London: HMSO. Fishery investigations, Series 2, Vol. 19.

BfN (Bundesamt für Naturschutz/German Federal Agency for Nature Conservation) (1995): Rote Listen der Biotoptypen, Tier- und Pflanzenarten des deutschen Wattenmeer- und Nordseebereichs. Bonn-Bad Godesberg: BfN. Schriftenreihe für Landschaftspflege und Naturschutz, 44.

BfN (1997): Biodiversität und Tourismus. Berlin: Springer.

BfN (2001): BfN-Karte und Erläuterungen: Ökologisch besonders wertvolle marine Gebiete im deutschen Nordseebereich. 2nd, revised ed., January 2001. Online at http://www.bfn.de/.

BfN (2003a): Lebensraumtypen. Online at http://www.habitatmarenatura2000.de/.

BfN (2003b): Schutzgebietsvorschläge nach der FFH-Richtlinie. Online at http://www.habitatmarenatura 2000.de/.

BfN (2003c): HABITAT MARE NATURA 2000. Current maps. Online at http://www.habitatmarenatura2000.de/.

BfS (Bundesamt für Strahlenschutz/German Federal Office for Radiation Protection) (2003): Umweltradioaktivität in der Bundesrepublik Deutschland 1998 bis 2001: Daten und Bewertung. Bericht der Leitstellen des Bundes und des Bundesamtes für Strahlenschutz. Bremerhaven: Wirtschaftsverlag NW. BfS-Schriften, 27.

BLAZER, V. S., LAPATRA, S. E. (2002): Pathogens of cultured fishes: Potential risks to wild fish populations. In TOMASSO, J. R. (ed.): Aquaculture and the environment in the United States. Baton Rouge: U. S. Aquaculture Society, p. 197–224.

BLMP (Bund/Länder-Messprogramm für die Meeresumwelt von Nord- und Ostsee) (2002): Meeresumwelt 1997–1998. Hamburg: Bundesamt für Seeschifffahrt und Hydrographie.

BMU (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit/German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety) (2002): Internationale Aktivitäten und Erfahrungen im Bereich der Offshore-Windenergienutzung. Berlin: BMU.

BMU and UBA (2003): Umwelt Deutschland: Eine multimediale Reise durch das Gestern, Heute und Morgen unserer Umwelt. Online at http://www.umwelt-deutschland.de/ [viewed 12/09/2003].

BMVBW (Bundesministerium für Verkehr, Bau- und Wohnungswesen/German Federal Ministry of Transport, Building and Housing) (2003): Acht-Punkte-Programm für mehr Sicherheit auf See vom 23. Dezember 2003. Online at: http://www.bmvbw.de/.

BÖRZEL, T. A. (2002): Why Do States Not Obey the Law? Paper prepared for presentation at ARENA, University of Oslo, June 6, 2002. Berlin: Humboldt Universität zu Berlin.

BÖRZEL, T. A., RISSE, T. (2001): Die Wirkung internationaler Institutionen: Von der Normanerkennung zur Normeinhaltung. Bonn: MPPRdG. Preprints aus der Max-Planck-Projektgruppe Recht der Gemeinschaftsgüter 2001/15.

BÖTTCHER, M. E. (2003): Schwarze Flecken und Flächen im Wattenmeer. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 193–195.

Bonn Agreement (2001): HELCOM/Bonn Agreement: Location of oil spillages observed by Aerial Surveillance within the Baltic and North Sea Areas in 2001. Online at http://www.bonnagreement.org/grfx/commonmap2001.gif [viewed 17/09/2003].

BOOß, D. (2003): Umweltschutz und Fischerei. In RENGELING, H.-W. (ed.): Handbuch zum europäischen und deutschen Umweltrecht. 2nd ed. Cologne: Heymann, Vol. 2, § 86.

BOTHE, M. (1996): Versuch einer Bilanz. Ratifizierungs-, Durchsetzungs-, Ausfüllungs- und Überwachungsdefizite. In KOCH, H.-J., LAGONI, R. (eds.): Meeresumweltschutz für Nord- und Ostsee. Baden-Baden: Nomos, p. 329–338.

BRENK, V. (2003a): Verschmutzung der Nord- und Ostsee durch die Seeschifffahrt. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 107–113.

BRENK, V. (2003b): Presentation to the symposium ‘Warnsignale aus dem Meer’, Hamburg 31 March–2 April 2003.

BROCKMANN, U., LENHART, H., SCHLÜNZEN, H., TOPCU, D. (2003): Nährstoffe und Eutrophierung. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 61–76.

BROWN, J. E., KOLSTAD, A. K., BRUNGOT, A. L., LIND, B., RUDJORD, A. L., STRAND, P., FOYN, L. (1999): Levels of Tc-99 in seawater and biota samples from Norwegian coastal waters and adjacent seas. Marine Pollution Bulletin 38 (7), p. 560–571.

BROWN WEISS, E., JACOBSON, H. K. (eds.) (2000): Engaging Countries. Strengthening Compliance with International Environmental Accords. Cambridge, Massachusetts: MIT Press.

BRÜGMANN, L. (1996): Quellen und regionale Verteilung von Schwermetallen im Wasser und Sediment. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee: Wissenschaftliche Fakten. Berlin: Parey, p. 74–79.

BSH (Bundesamt für Seeschifffahrt und Hydrographie/ German Federal Maritime and Hydrographic Agency) (2000): Safe navigation in the Kadetrenden (Kadetrinne). Online at http://www.bsh.de/de/Schifffahrt/Sportschifffahrt/Berichtigungsservice%20Karten/NfS/Hefte2000/nfs-beilage2_36.2000.pdf [viewed 13/01/2004].

BSH (2002): Genehmigung Offshore-Windenergiepark „Offshore-Bürger-Windpark Butendiek“, Case 8086.01/ Butendiek/Z1.

BSH (2003a): Die Auswirkungen des Elbehochwassers vom August 2002 auf die Deutsche Bucht. Abschlussbericht Juni 2003. Hamburg. Berichte des BSH, 32.

BSH (2003b): Jahresbericht 2002 der Bundesanstalt für Seeschifffahrt und Hydrographie (BSH). Hamburg.

BSH (2003c): Transport Routes. Online at http://www.bsh.de/en/Marine%20uses/Industry/Transport%20routes/.

BSH (2003d): Statistik 2001. Online at http://www.bsh.de/de/Meeresdaten/Umweltschutz/MARPOL%20Umweltuebereinkommen/Jahresstatistik.jsp.

BSH (2003e): Continental Shelf Research Information System. Online at http://www.bsh.de/en/Marine%20uses/Industry/CONTIS%20maps/index.jsp.

BUCHWALD, K. (1998): Naturschutz und Tourismus im Nationalpark „Niedersächsisches Wattenmeer“ – Problematik, Konfliktlösungen, Zukunftsgefährdung. In BUCHWALD, K., ENGELHARDT, W. (eds.): Freizeit, Tourismus und Umwelt. Bonn: Economica. Umweltschutz – Grundlagen und Praxis, 11, p. 194–222.

CALLIESS, C. (2003): Einordnung des Weißbuches zur Chemikalienpolitik in die bisherige europäische Chemie- und Umweltpolitik. In HENDLER, R., MARBURGER, P., REINHARDT, M., SCHRÖDER, M. (eds.): Das Europäische Weißbuch zur Chemikalienpolitik. Berlin: E. Schmidt, p. 11–62.

CARSTENS, M., CLAUSSEN, U., HERATA, H., SCHWARZBACH, W. (2003): Der Zustand der Nordsee – Ergebnisse der Qualitätszustandsberichte. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 340–349.

CHAYES, A., CHAYES, A. H. (1993): On Compliance. International Organization 47 (2), p. 175–205.

CHAYES, A., HANDLER CHAYES, A., MITCHELL, R. B. (2000): Managing Compliance: A Comparative Perspective. In BROWN WEISS, E., JACOBSON, H. K. (eds.): Engaging Countries. Strengthening Compliance with International Environmental Accords. Cambridge, Massachusetts: MIT Press, p. 39–62.

CHRISTY, F. T. (2000): Common Property Rights: An Alternative to ITQs. In SHOTTON, R. (ed.): Use of Property Rights in Fisheries Management. FAO Fisheries Technical Paper 404/1. Online at http://www.fao.org/docrep/003/x7579e/x7579e03.htm.

CICIN-SAIN, B. (2002): An Overview of Policy Issues and Options for Improved Regional Ocean Governance. In CICIN-SAIN, B., EHLER, C. (eds.): Improving Regional Ocean Governance in the United States. Workshop Proceedings. Newark, Delaware: Center for the Study of Marine Policy, p. 1–22.

CRISP, D. J. (1975): Secondary Productivity in the Sea. In Productivity of World Ecosystems. Washington D. C.: National Academy of Sciences, p. 71–89.

CRON, T. O. (1995): Das Umweltregime der Nordsee – völker- und europarechtliche Aspekte. Baden-Baden: Nomos.

CZYBULKA, D. (1999): Naturschutzrecht im Küstenmeer und in der Ausschließlichen Wirtschaftszone. Natur und Recht 21 (10), p. 562–569.

CZYBULKA, D. (2001): Geltung der FFH-Richtlinie in der Ausschließlichen Wirtschaftszone. Natur und Recht 23 (1), p. 19–27.

CZYBULKA, D. (2003): Meeresschutzgebiete in der Ausschließlichen Wirtschaftszone (AWZ). Zeitschrift für Umweltrecht 14 (5), p. 329–337.

DANIELSSON, J., GÜNTHER, W., KOCH, A., LOHMANN, M., SCHUMACHER, M., SONNTAG, U., VOLMERT, E., ZIESEMER, K. (2001): Indikatoren für die Entwicklung von nachhaltigem Tourismus im Ostseeraum. Berlin: Umweltbundesamt. UBA-Texte, 67/01.

DAVIDSE, W. P. (2000): The Effects of Transferable Property Rights on the Fleet Capacity and Ownership of Harvesting Rights in the Dutch Demersal North Sea Fisheries. In SHOTTON, R. (ed.): Use of Property Rights in Fisheries Management. FAO Fisheries Technical Paper 404/2. Online at http://www.fao.org/docrep/003/x8985e/x8985e08.htm.

DESOMBRE, E. (2000): Flags of Convenience and the Enforcement of Environmental, Safety, and Labor Regulations at Sea. International Politics 37 (2), p. 213–232.

DÖRING, R. (2000): Die Zukunft der Fischerei im Biosphärenreservat Südost-Rügen. Frankfurt am Main: Lang.

DOHMANN, M. (2001): Stickstoffelimination aus Abwasser – eine unendliche Geschichte? In HIT 2000, 7. Hannoversche Industrieabwasser-Tagung: Neue Wege der Stickstoffelimination in hoch konzentrierten Teilströmen. Hannover: Institut für Siedlungswasserwirtschaft und Abfalltechnik. Veröffentlichungen des Instituts für Siedlungswasserwirtschaft und Abfalltechnik der Universität Hannover, H. 117, p. 1–11.

DOUGHERTY, C. P., HENRICKS HOLTZ, S., REINERT, J. C., PANYACOSIT, L., AXELRAD, D. A., WOODRUFF, T. J. (2000): Dietary Exposures to Food Contaminants across the United States. Environmental Research 84 (2), p. 170–185.

DREYHAUPT, F. J. (ed.) (1994): VDI-Lexikon Umwelttechnik. Düsseldorf: VDI-Verlag.

DTV (Deutscher Tourismusverband) (2003): Deutschlands Touristenhits im Jahr 2002. Press release of 14 May 2003. Online at http://www.deutschertourismusverband.de/source/aktuelles/index.html.

EEB (European Environmental Bureau), T&E (European Federation for Transport and Environment), SAR (Seas At Risk), Swedish NGO Secretariat on Acid Rain (2003): Air pollution from ships. Online at http://www.eeb.org/activities/air/Air-Pollution-from-Ships-Feb2003.pdf [viewed 24/11/2003].

EHLERS, P. (2001): Der Schutz der Ostsee – Ein Beitrag zur regionalen Zusammenarbeit. Natur und Recht 23 (12), p. 661–666.

EHLERS, P. (2002a): Marine Environment Protection – The Baltic Sea Example. In EHLERS, P., MANN-BORGESE, E., WOLFRUM, R. (eds.): Marine Issues. From a Scientific, Political and Legal Perspective. The Hague: Kluwer Law International, p. 94–104.

EHLERS, P. (2002b): Schiffssicherheit auf der Ostsee – Strategien der Helsinki-Kommission. Zeitschrift für öffentliches Recht in Norddeutschland H. 3, p. 89–95.

EHLERS, P. (2003): Schiffssicherheit nach der „Prestige“. Zeitschrift für Umweltrecht 14 (5), p. 342–349.

ERBGUTH, W. (2002): Wahrung möglicher Belange der Bundesraumordnung in der Ausschließlichen Wirtschaftszone der Bundesrepublik Deutschland – Raumordnung im Küstenmeer. Rechtsgutachten im Auftrag des Bundesministeriums für Verkehr, Bau- und Wohnungswesen. Rostock.

ERBGUTH, W., JENISCH. U., HERMA, M., KELLER, M. (2002): Maritime Sicherheit im Ostseeraum 2002. Endbericht. In Landtag Mecklenburg-Vorpommern: Maritime Sicherheit im Ostseeraum. Vol. 2. Schwerin: Landtag, p. 204–330.

EU Commission (1997): The implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources. COM (1997) 473 final.

EU Commission (1998): Implementation of Council Directive 91/271/EEC of 21 May 1991 concerning urban waste water treatment, as amended by Commission Directive 98/15/EC of 27 February 1998 – Summary of the measures implemented by the Member States and assessment of the information received pursuant to Articles 17 and 13 of the Directive. COM (1998) 775 final.

EU Commission (2000a): Regional Socio-economic Studies on Employment and the Level of Dependency on Fishing. Lot No. 23: Coordination and Consolidation Study.

EU Commission (2000b): Communication from the Commission to the European Parliament and the Council on the safety of the seaborne oil trade. COM (2000) 142 final.

EU Commission (2000c): Communication from the Commission to the European Parliament and the Council on a second set of Community measures on maritime safety following the sinking of the oil tanker Erika. COM (2000) 802 final.

EU Commission (2000d): Communication from the Commission to the Council and the European Parliament on integrated coastal zone management: a strategy for Europe. COM (2000) 547 final.

EU Commission (2000e): Proposal for a European Parliament and Council recommendation concerning the implementation of integrated coastal zone management in Europe. COM (2000) 545 final.

EU Commission (2001a): Report on the economic and social situation of coastal regions. In EU Commission: Green Paper: The future of the common fisheries policy. Volume II. Luxembourg: Office for Official Publications of the European Communities.

EU Commission (2001b): Green Paper on the future of the common fisheries policy. COM (2001) 135 final.

EU Commission (2001c): Communication from the Commission to the Council, the European Parliament and the Economic and Social Committee Community – Strategy for Dioxins, Furans and Polychlorinated Biphenyls. COM (2001) 593 final.

EU Commission (2001d): Report from the Commission to the European Parliament and the Council: Evaluation of the Active Substances of Plant Protection Products. Brussels. SANCO 822/2001 rev. 3. Online at http://europa.eu.int/comm/food/fs/ph_ps/pro/ppp01_en.pdf.

EU Commission (2001e): The Clean Air for Europe (CAFE) Programme: Towards a Thematic Strategy for Air Quality. COM (2001) 245 final.

EU Commission (2002a): Communication from the Commission to the Council and the European Parliament – Towards a strategy to protect and conserve the marine environment. COM (2002) 539 final.

EU Commission (2002b): Communication from the Commission setting out a Community Action Plan to integrate environmental protection requirements into the Common Fisheries Policy. COM (2002) 186 final.

EU Commission (2002c): Communication from the Commission to the European Parliament and the Council – Action plan to counter the social, economic and regional consequences of the restructuring of the EU fishing industry. COM (2002) 600 final.

EU Commission (2002d): Communication from the Commission to the Council and the European Parliament On a Community Action Plan to reduce discards of fish. COM (2002) 656 final.

EU Commission (2002e): Common organisation of the market in fishery and aquaculture products. Luxembourg: Office for Official Publications of the European Communities.

EU Commission (2002f): Proposal for a Council Regulation on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy. COM (2002) 185 final.

EU Commission (2002g): Communication from the Commission on the reform of the Common Fisheries Policy ('Roadmap'). COM (2002) 181 final.

EU Commission (2002h): Communication from the Commission to the Council, the European Parliament and the Economic and Social Committee – Towards a Thematic Strategy on the Sustainable Use of Pesticides. COM (2002) 349 final.

EU Commission (2002i): Communication from the Commission to the Council and the European Parliament – Mid-Term Review of the Common Agricultural Policy. COM (2002) 394 final.

EU Commission (2002j): Report from the Commission – Implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources – Synthesis from year 2000 Member States reports. COM (2002) 407 final.

EU Commission (2002k): Communication from the Commission to the European Parliament and to the Council on improving safety at sea in response to the Prestige accident. COM (2002) 681 final.

EU Commission (2002l): Communication from the Commission to the European Parliament and the Council – A European Union strategy to reduce atmospheric emissions from seagoing ships. COM (2002) 595 final., Vol. 1.

EU Commission (2002m): Communication from the Commission to the Council and the European Parliament – A strategy for the sustainable development of European aquaculture. COM (2002) 511 final.

EU Commission (2003a): Proposal for a Council Regulation establishing measures for the recovery of cod stocks. COM (2003) 237 final.

EU Commission (2003b): Communication from the Commission to the Council and the European Parliament – Towards uniform and effective implementation of the Common Fisheries Policy. COM (2003) 130 final.

EU Commission (2003c): Proposal for a Council Decision concerning the conclusion, on behalf of the European Community, of the 1998 Protocol to the 1979 Convention on Long Range Transboundary Air Pollution on Persistent Organic Pollutants. COM (2003) 332 final.

EU Commission (2003d): Proposal for a Council Decision concerning the conclusion, on behalf of the European Community, of the Stockholm Convention on Persistent Organic Pollutants. COM (2003) 331 final.

EU Commission (2003e): Proposal for a Regulation of the European Parliament and of the Council on persistent organic pollutants and amending Directives 79/117/EEC and 96/59/EC. COM (2003) 333 final.

EU Commission (2003f): Proposal for a Council Regulation establishing common rules for direct support schemes under the common agricultural policy and support schemes for producers of certain crops. COM (2003) 23 final.

EU Commission (2003g): Communication from the Commission – Report to the European Council on action to deal with the effects of the Prestige disaster. COM (2003) 105 final.

EU Commission (2003h): Proposal for a Directive of the European Parliament and of the Council on ship-source pollution and on the introduction of sanctions, including criminal sanctions, for pollution offences. COM (2003) 92 final.

EU Commission (2003i): Work plan and organisational arrangements for the development of an EU Marine Strategy. Brussels.

EU Parlament (2003): Draft report on the proposal for a Council regulation establishing measures for the recovery of cod stocks, 24 July 2003. Doc. no. 2003/0090 (CNS).

EXO, K.-M., HÄLTERLEIN, B., BLEW, J., GARTHE, S., HÜPPOP, O., SÜDBECK, P., SCHEIFFARTH, G. (2003): Küsten und Seevögel. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 317–329.

FARKE, H., RACHOR, E. (2003): Naturschutz für die Nordsee – Was ist erforderlich? In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 390–394.

Federal German Government (2002a): Strategie der Bundesregierung zur Windenergienutzung auf See. Online at http://www.bmu.de/files/windenergie_strategie_br_020100.pdf.

Federal German Government (2002b): Perspektiven für Deutschland: Unsere Strategie für eine nachhaltige Entwicklung. Berlin.

Federal German Government (2002c): Bericht der Bundesregierung: Konzeption der Bundesregierung für den Bereich Umweltschutz und Tourismus. Online at http://www.bmu.de/files/tourismusbericht.pdf [viewed 09/09/2003].

FREES, C.-P. (1992): Maßnahmen und rechtliche Möglichkeiten der Europäischen Gemeinschaft zur Bekämpfung und Verhütung von Öltankerunfällen vor ihren Küsten. Natur und Recht 14 (1), p. 16–21.

FROESE, R., PAULY, D. (2003): Dynamik der Überfischung. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 288–295.

F.U.R. (Forschungsgemeinschaft Urlaub und Reisen) (2003): Die 33. Reiseanalyse RA 2003. Hamburg: F.U.R.

GÄRNTER, S. (2000): Biozidprodukte werden sicherer. Nachrichten aus der Chemie 48, p. 1491–1492.

GÄTJE, C. (2003): Tourismus und Erholung im Wattenmeer. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 117–121.

GALL, U., BUNJE, J. (1999): Grundwassergewinnung aus den Süßwasserlinsen der Ostfriesischen Inseln. In Nationalparkverwaltung Niedersächsisches Wattenmeer, Umweltbundesamt (eds.): Umweltatlas Wattenmeer. Vol. 2. Stuttgart: Ulmer, p. 134–135.

German Tourism Industry (1997): Umwelterklärung der Deutschen Tourismuswirtschaft – Presseerklärung (1997). Online at http://www.eco-tour.org/info/w_10197_de.html [viewed 14/01/2004].

GIETER, M. de, LEERMAKERS, M., RYSSEN, R. van, NOYEN, J., GOEJENS, L., BAEYENS, W. (2002): Total and toxic arsenic levels in North Sea fish. Archives of Environmental Contamination and Toxicology 43 (4), p. 406–417.

GINZKY, H. (2000): Vermarktungs- und Verwendungsbeschränkungen von Chemikalien – Verfahren, materielle Anforderungen und Reformüberlegungen. Zeitschrift für Umweltrecht 11 (2), p. 129–137.

GISSURARSON, H. H. (2000): Overfishing: The Islandic Solution. London: The Institute of Economic Affairs. Studies on the Environment No. 17.

GOLLASCH, S. (2003): Einschleppung exotischer Arten mit Schiffen. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 309–312.

GOLLASCH, S., MECKE, R. (1996): Eingeschleppte Organismen. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey, p. 146–150.

GRAY, J. S., BAKKE, T., BECK, H. J., NIELSSEN, I. (1999): Managing the environmental effects of the Norwegian oil and gas industry. From conflict to consensus. Marine Pollution Bulletin Vol. 38, p. 525–530.

GROENEWALD, S., BERGMAN, M. (2003): Auswirkungen der Fischerei auf das Bodenökosystem der Nordsee und Ansätze zur Verringerung von Schadwirkungen. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 280–287.

GROMOLL, L. (1996): Gewinnung von Bodenschätzen: Öl, Gas, Kies und andere Rohstoffe. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey, p. 113–117.

GROOT, S. J. DE, LINDEBOOM, H. J. (eds.) (1994): Environmental impact of bottom gears on benthic fauna in relation to natural resources management and protection of the North Sea. Ijmuiden: Netherlands Institute for Fisheries Research. NIOZ rapport, 1994-11.

HAAS, P. M. (1993): Protecting the Baltic and North Seas. In HAAS, P. M., KEOHANE, R. O., LEVY, M. A. (eds.): Institutions for the Earth: Sources of Effective International Environmental Protection. Cambridge, Massachusetts: MIT Press, p. 133–181.

HÄRDTLE, W., VESTERGAARD, P. (1996): Veränderungen der Ufervegetation, Salzwiesen und Dünen. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey, p. 157–161.

HANSLIK, M. (1999): Massenauftreten von Mikroplankton. In Nationalparkverwaltung Niedersächsisches Wattenmeer, Umweltbundesamt (eds.) (1999): Umweltatlas Wattenmeer. Vol. 2. Stuttgart: Ulmer, p. 44–45.

HARWOOD, J. (2002): Wechselbeziehungen zwischen Seehunden und der kommerziellen Fischerei im Nordostatlantik. Zusammenfassung. Provisional Version. Luxembourg: European Parliament. Online at http://www.europarl.eu.int/meetdocs/committees/pech/20020326/pt10_de.pdf.

HATCHER, A., PASCOE, S., BANKS, R., ARNASON, R. (2002): Future Options for UK Fish Quota Management. University of Portsmouth. CEMARE Report No. 58.

HEGE, U. (2003): Untersuchungen zu Nitratgehalten in Sickerwasser. Paper prepared for presentation at a congress organised by the Bayerische Akademie für Naturschutz und Landschaftspflege, 'Die Umsetzung der EU-Wasserrahmenrichtlinie – Mitwirkung von Landwirtschaft und Naturschutz'. Berching, 27–28 May 2003.

HEIBGES, A.-K., HÜPPOP, O. (2000): Ökologische Bedeutung der seewärtigen Bereiche des niedersächsischen Wattenmeeres. Frankfurt am Main: WWF Germany. Nationalparke, Vol. 9.

HEINTSCHEL VON HEINEGG, W. (2002): The Development of Environmental Standards for the North-East Atlantic, including the North Sea. In EHLERS, P., MANN-BORGESE, E., WOLFRUM, R. (eds.): Marine Issues from a Scientific, Political and Legal Perspective. The Hague: Kluwer Law International, p. 135–152.

HELBIG, A. J., KUBE, J. (1996): Die Ostsee als Brut- und Überwinterungsgebiet für Meeres- und Küstenvögel. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey, p. 222–231.

HELCOM (Helsinki Commission, Baltic Marine Environment Protection Commission) (1993): Second Baltic Sea Pollution Load Compilation (PLC 2). Baltic Sea Environment Proceedings No. 45. Helsinki: HELCOM. Online at http://www.helcom.fi/proceedings/bsep45.pdf [viewed 19/03/2003].

HELCOM (1994): Report on Chemical Munitions Dumped in the Baltic Sea. Online at http://www.helcom.fi/sea/Reportonchemicalmunitions.pdf [viewed 11/08/2003].

HELCOM (1997): Airborne Pollution Load to the Baltic Sea 1991–1995. Baltic Sea Environment Proceedings No. 69. Helsinki: HELCOM. Online at http://www.helcom.fi/proceedings/bsep69.pdf [viewed 19/03/2003].

HELCOM (1998a): The Third Baltic Sea Pollution Load Compilation (PLC 3). Baltic Sea Environment Proceedings No. 70. Helsinki: HELCOM. Online at http://www.helcom.fi/a/plc/Bsep-70.pdf [viewed 19/03/2003].

HELCOM (1998b): HELCOM Recommendation 19/1. Marine Sediment Extraction in the Baltic Sea Area. Online at http://www.helcom.fi/recommendations/rec 19_1. html [viewed 18/03/2003].

HELCOM (1998c): HELCOM Recommendation 19/5. HELCOM objective with regard to hazardous substances. Online at http://www.helcom.fi/recommendations/rec 19_5.html.

HELCOM (1999): Marine Sediment Extraction in the Baltic Sea – Status Report. Baltic Sea Environment Proceedings No. 76. Helsinki: HELCOM.

HELCOM (2000): HELCOM Recommendation 21/3. Sustainable and environmentally friendly tourism in the coastal zones of the Baltic Sea Area. Online at http://www.helcom.fi/recommendations/rec21_3.html.

HELCOM (2001a): The specific conditions in the Baltic Sea Region to be taken into account when selecting and prioritising hazardous substances for priority action. Online at http://www.helcom.fi/pollution/hazardous.html [viewed 09/10/2003].

HELCOM (2001b): Environment of the Baltic Sea area 1994–1998. Executive Summary. Baltic Sea Environment Proceedings No. 82A. Helsinki: HELCOM. Online at http://www.helcom.fi/a/proceedings/bsep82a.pdf [viewed 19/03/2003].

HELCOM (2001c): Declaration on the Safety of Navigation and Emergency Capacity in the Baltic Sea Area (HELCOM Copenhagen Declaration). Online at http://www.helcom.fi/helcom/declarations.html.

HELCOM (2002a): Guidance Document on Short Chained Chlorinated Paraffins (SCCP). Presented by Sweden, June 2002. Online at http://www.helcom.fi/pollution/hazardous.html [viewed 09/11/2003].

HELCOM (2002b): Environment of the Baltic Sea area 1994–1998. Baltic Sea Environment Proceedings No. 82B. Helsinki: HELCOM. Online at http://www.helcom.fi/Monas/BSEP82B.pdf [viewed 22/07/2003].

HELCOM (2002c): Guidance Document on Mercury and Mercury Compounds. Presented by Poland, October 2002. Online at http://www.helcom.fi/pollution/hazardous.html [viewed 09/10/2003].

HELCOM (2002d): Guidance Document on Cadmium and its Compounds. Presented by Denmark, June 2002. Online at http://www.helcom.fi/pollution/hazardous.html [viewed 09/10/2003].

HELCOM (2003a): The Baltic Marine Environment 1999–2002. Baltic Sea Environment Proceedings No. 87. Helsinki: HELCOM.

HELCOM (2003b): The review of more specific targets to reach the goal set up in the 1988/1998 Ministerial Declarations regarding nutrients. Baltic Sea Environment Proceedings No. 89. Helsinki: HELCOM. Online at http://www.helcom.fi/proceedings/bsep89.pdf [viewed 22/07/2003].

HELCOM (2003c): Executive Summary of the Fourth Baltic Sea Pollution Load Compilation. PLC-4. Online at http://www.helcom.fi/monas/PLC4/PLC4.pdf [viewed 22/07/ 2003].

HELCOM (2003d): HELCOM Ministerial Declaration (HELCOM Bremen Declaration). Online at http://www.helcom.fi/helcom/declarations.html.

HELCOM (2003e): Newsletter 1/2003, p. 4.

HELCOM (2003f): HELCOM Recommendation 15/5. System of Coastal and Marine Baltic Sea Protected Areas (BSPA). Updated 11/2003. Online at www.helcom.fi/recommendations/rec15_5.html.

HEYDEMANN, B. (1998): Biologie des Wattenmeeres. Landesamt für den Nationalpark Schleswig-Holsteinisches Wattenmeer, Umweltbundesamt (eds.): Umweltatlas Wattenmeer. Vol. 1. Stuttgart: Ulmer, p. 76–79.

HOPPE, H. (2000): Port State Control – an update on IMO's work. IMO News No. 1, p. 9.

HOPPE, W. (1987): Die Einschränkung bergbaulicher Berechtigungen durch eine Nationalparkverordnung – am Beispiel des Niedersächsisches Wattenmeers. Deutsches Verwaltungsblatt 102, p. 757.

HUBOLD, G. (2000): Fortschritte bei der Umsetzung des Vorsorgeansatzes im Fischereimanagement. Deutsche hydrographische Zeitschrift, Supplement, 12, p. 93–100.

HUBOLD, G. (2003): Wege zu einer nachhaltigen Fischerei. Zeitschrift für Umweltrecht 14 (5), p. 338–342.

HUTCHINGS, J. A., MYERS, R. A. (1994): What can be learned from the collapse of a renewable resource? Atlantic cod, Gadus morhua, of Newfoundland and Labrador. Canadian Journal of Fisheries and Aquatic Sciences 51, p. 2126–2146.

ICES (International Council for the Exploration of the Sea) (2000): Report of the ICES Advisory Committee on the Marine Environment, 2000. Copenhagen: ICES. ICES Cooperative Research Report, 241.

ICES (2001): Report of the ICES Advisory Committee on Fishery Management, 2001. Copenhagen: ICES. ICES Cooperative Research Report, 246.

ICES (2002a): Report of the ICES Advisory Committee on Fishery Management, 2002. Copenhagen: ICES. ICES Cooperative Research Report, 255.

ICES, Advisory Committee on the Marine Environment (2002b): Report of the Working Group on Introductions and Transfers of Marine Organisms. Gothenburg, Sweden, 20–22 March 2002. Copenhagen: ICES. Online at http://www.ices.dk/reports/ACME/2002/WGITMO02.pdf.

ICES, Mariculture Committee (2002c): Report of the Working Group on Environmental Interactions of Mariculture.

ICES Headquarters, 8–12 April 2002. Copenhagen: ICES. Online at http://www.ices.dk/reports/MCC/2002/WGEIM02.pdf.

ICES (2003a): Environmental Status of the European Seas. Online at http://www.ices.dk/reports/germanqsr/23222_ICES_Report_samme.pdf [viewed 09/10/2003].

ICES (2003b): ACFM Report. Stocks in the Baltic. Online at http://www.ices.dk/committe/acfm/comwork/report/2003shy/may/o-3-14-1.pdf [viewed 8/10/2003].

IMO (International Maritime Organization) (2003a): December 2003 meeting to consider proposals for an accelerated single-hull tanker phase-out. Online at http://www.imo.org, Newsroom, Press Briefings [viewed 22/07/2003].

IMO (2003b): STCW White List. Online at http://www.imo.org/InfoResource/mainframe.asp?topic_id=70.

IMO (2003c): International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978, as Amended. Online at http://www.imo.org/includes/blastDataOnly.asp/data_id%3D7513/1092. pdf.

Intertanko (International Association of Independent Tanker Owners) (2002): Oil tanker fleet by hull type. Online at http://www.intertanko.com/communications/issue.asp?topic_id=326.

IOW (Institut für Ostseeforschung Warnemünde/Baltic Sea Research Institute Warnemünde) (1999): BASYS – Baltic Sea System Study. Final Report. Online at http://www.io-warnemuende.de/Projects/Basys/reports/en_home.htm [viewed 21/07/2003].

IOW (2003): Ostsee wird durch Nordseewasser „aufgefrischt": Seit 10 Jahren erstmals wieder massiver Salzwassereinbruch in der Ostsee. Online at http://www.io-warnemuende.de/documents/salzeinbruch2.pdf [viewed 12/01/2004].

IRMER, U. (2003): Umsetzung wasserrechtlicher Qualitätsziele. In Erbguth, W. (ed.): Änderungsbedarf im Wasserrecht – zur Umsetzung europarechtlicher Vorgaben. Baden-Baden: Nomos, p. 55–63.

ISL (Institut für Seeverkehrswirtschaft und Logistik) (2003): Executive Summary – SSMR Market Analysis No 1/2. World merchant fleet, OECD Shipping and Shipbuilding. Online at http://www.isl.org/products_services/publications/pdf/Fleet_short.pdf [viewed 12/01/2004].

JÄGE, B. (1988): Die Flächennutzungsverhältnisse im Ostseeeinzugsgebiet (Ostseeanliegerstaaten). *Diplom* thesis, University of Greifswald.

JANNING, J. (2003): Auswirkungen der EU-Wasserrahmenrichtlinie auf den Umgang mit Baggergut – Perspektiven und Chancen. Paper prepared for presentation at an HTG/PIANC meeting held in Bremen by HTG-Fachausschuss Baggergut on 20 May 2003. Online at http://www.htg-baggergut.de/sites/texte.html.

JANSSEN, G. (2002): Die rechtlichen Möglichkeiten der Einrichtung von Meeresschutzgebieten in der Ostsee. Baden-Baden: Nomos. Rostocker Schriften zum Seerecht und Umweltrecht, Vol. 19.

JARASS, H. D. (2002): Naturschutz in der Ausschließlichen Wirtschaftszone – Völkerrechtliche, EG-rechtliche und verfassungsrechtliche Probleme der Ausweisung von Meeresschutzgebieten. Baden-Baden: Nomos. Rostocker Schriften zum Seerecht und Umweltrecht, Vol. 17.

JARASS, H. D. (2003): Luftqualitätsrichtlinien der EU und die Novellierung des Immissionsschutzrechts. Neue Zeitschrift für Verwaltungsrecht 22 (3), p. 257–266.

JENISCH, U. (1999): Rechtsfragen zur Schiffssicherheit – Das Sicherheitskonzept für die deutschen Küsten. Zeitschrift für öffentliches Recht in Norddeutschland 2, p. 170–175.

JENISCH, U. (2000): Sicherheitskonzept für die deutschen Küsten. Bausteine für eine einheitliche Küstenwache. In EHLERS, P., ERBGUTH, W. (eds.): Aktuelle Entwicklungen im Seerecht. Dokumentation der Rostocker Gespräche zum Seerecht 1996–1999. Baden-Baden: Nomos. Rostocker Schriften zum Seerecht und Umweltrecht, 13, p. 155–170.

JENSEN, C. L. (1999): A Critical Review of the Common Fisheries Policy. Esbjerk: University of Southern Denmark, Department of Environmental and Business Economics. IME Working Paper 6/99.

JONSON, J. E., TARRASON, L., BARTNICKI, J. (2000): Effects of international shipping on European pollution levels. Oslo: The Norwegian Meteorological Institute. Research Report, No. 41. EMEP/MSC-W Note 5/2000.

JUPILLE, J. (1999): The European Union and International Outcomes. International Organization 53 (2), p. 409–425.

KANISCH, G. (2000): Radioaktivität in der Nordsee. Welcher Strahlung ist die Bevölkerung durch den Verzehr von Meerestieren ausgesetzt? Forschungsreport H. 2, p. 28–31.

KARCHER, M. (2002): The dispersion of 99Tc in the Nordic Seas and the Artic Ocean in the 1990s according to model results and observations. In STRAND, P., BOERRETZEN, P., JOLLE, T. (eds.): Proceedings from the International Conference on Radioactivity in the Environment. Extended Abstracts. 1–5 September 2002, Monaco, p. 511–515.

KASTLER, T. (1999): Die Seegrasbestände im Niedersächsischen Wattenmeer. In Nationalparkverwaltung Niedersächsisches Wattenmeer, Umweltbundesamt (eds.) (1999): Umweltatlas Wattenmeer. Vol. 2. Stuttgart: Ulmer, p. 50–51.

KERR, S., NEWELL, R., SANCHIRICO, J. (2003): Evaluating the New Zealand Individual Transferable Quota Market for Fisheries Management. Wellington: Motu Economic and Public Policy Research Trust. Working Paper 2003-02.

KLINSKI, S. (2001): Rechtliche Probleme der Zulassung von Windkraftanlagen in der ausschließlichen Wirtschaftszone (AWZ). Berlin: UBA. UBA-Texte 62/01.

KLOAS, J., KUHFELD, H. (2002): Stagnation des Personenverkehrs in Deutschland. DIW-Wochenbericht 69 (42), p. 685–693.

KLUG, A., KLUG, H. (1998): Naturraumbelastung durch den Fremdenverkehr im Norden Sylts. In Landesamt für den Nationalpark Schleswig-Holsteinisches Wattenmeer, Umweltbundesamt (eds.): Umweltatlas Wattenmeer. Vol. 1. Stuttgart: Ulmer, p. 184–185.

KNUST, R., DALJOFF, P., GABRIEL, J., HEUERS, J., HÜPPOP, O., WENDELN, H. (2003): Untersuchungen zur Vermeidung und Verminderung von Belastungen der Meeresumwelt durch Offshore-Windenergieanlagen im küstenfernen Bereich der Nord- und Ostsee – Offshore-WEA. Berlin. UBA-Texte 62/03.

KOCH, H.-J. (1996): Der Schutz von Nord- und Ostsee vor Schadstoffeinträgen aus der Luft. In KOCH, H.-J., LAGONI, R. (eds.): Meeresumweltschutz für Nord- und Ostsee. Baden-Baden: Nomos, p. 241–258.

KOCH, H.-J. (2003): Grundlagen, Schutz der Wälder. In Rengeling, H.-W. (ed.): Handbuch zum europäischen und deutschen Umweltrecht. 2nd ed. Cologne: Heymann, Vol. 2, § 47.

KOCH, H.-J., Caspar, J. (1996): Das nationale Umweltrecht und die landseitige Meeresverschmutzung. Zeitschrift für Umweltrecht 7 (3), p. 113–126.

KÖHTE, H. (2002): Baggergut im Kontext nationaler und europäischer Regelungen. Online at http://www.htg-baggergut.de/Downloads/Koethe_HROBG_2002.pdf.

KÖNIG, D. (2002): Port State Control: An Assessment of European Practice. In EHLERS, P., MANN-BORGESE, E., WOLFRUM, R. (eds.): Marine Issues from a Scientific, Political and Legal Perspective. The Hague: Kluwer Law International, p. 37–55.

KÖNIG, D. (2003): Schiffssicherheit und Umweltschutz vor Deutschlands Küsten. Zeitschrift für öffentliches Recht in Norddeutschland 6, p. 89–98.

KOLBE, K. (1999): Makroalgen. In Nationalparkverwaltung Niedersächsisches Wattenmeer, Umweltbundesamt (eds.) (1999): Umweltatlas Wattenmeer. Vol. 2. Stuttgart: Ulmer, p. 48–49.

KRÄMER, L. (1996): Meeresumweltschutz im Recht der Europäischen Gemeinschaften. In KOCH, H.-J., LAGONI, R. (eds.): Meeresumweltschutz für Nord- und Ostsee. Zum Zusammenspiel von Völkerrecht und nationalem Umweltrecht. Baden-Baden: Nomos, p. 129–179.

KRÄMER, L. (2003): E. C. Environmental Law. 5th ed. London: Sweet & Maxwell.

KRUG, S. (2003): Viabona – die Umweltdachmarke im Tourismus: Qualität und Genuss statt moralischer Zeigefinger. Natur und Landschaft 78 (7), p. 303–306.

KÜHNE, G. (1996): Regulierung der Rohstoffgewinnung im Seegebiet. In KOCH, H.-J., LAGONI, R. (eds.): Meeresumweltschutz für Nord- und Ostsee. Zum Zusammenspiel von Völkerrecht und nationalem Umweltrecht. Baden-Baden: Nomos, p. 309–328.

LÄÄNE, A., PITKÄNEN, H., ARHEIMER, B., BEHRENDT, H., JAROSINSKI, W., LUCANE, S., PACHEL, K., RÄIKE, A., SHEKHOVTSOV, A., SVENDSEN, L. M., VALATKA, S. (2002): Evaluation

of the implementation of the 1988 Ministerial Declaration regarding nutrient load reductions in the Baltic Sea catchment area. Helsinki: Finnish Environment Institute. Online at http://www.vyh.fi/eng/orginfo/publica/electro/fe524/fe524.htm [viewed 10/03/2003].

LABOYRIE, H. P. (2003): Handling of Dredged Material in the Netherlands. Paper prepared for presentation at an HTG/PIANC meeting held in Bremen by HTG-Fachausschuss Baggergut on 20 May 2003. Online at http://www.htg-baggergut.de/sites/texte.html.

LAGONI, R. (1996): Das OSPAR-Übereinkommen von 1992 und der Schutz der Nordsee. In KOCH, H.-J., LAGONI, R. (eds.): Meeresumweltschutz für Nord- und Ostsee. Zum Zusammenspiel von Völkerrecht und nationalem Umweltrecht. Baden-Baden: Nomos, p. 79–101.

LAGONI, R. (1998): The Disposal of Oily Waste from Ships in Community Ports. In KOCH, H.-J., LAGONI, R. (eds.): The Reception of Oily Waste from Ships in European Ports. Baden-Baden: Nomos, p. 15–66.

LAGONI, R. (2002): Die Errichtung von Schutzgebieten in der ausschließlichen Wirtschaftszone aus völkerrechtlicher Sicht. Natur und Recht 24 (3), p. 121–133.

LAMPE, R. (1996): Die Küsten der Ostsee und ihre Dynamik. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey, p. 41–47.

Landesamt für den Nationalpark Schleswig-Holsteinisches Wattenmeer (2003): Wir Nationalpark-Partner. Online at http://www.nationalpark-partner.de/ [viewed 05/11/2003].

Landesanstalt für Landwirtschaft und Gartenbau Sachsen-Anhalt (2003): Neufassung der Düngeverordnung beachten! Online at http://lsast23.sachsen-anhalt.de/llg/acker_pflanzenbau/duengung/zur_neufassung_der_duengeverordnung.pdf.

LANZ, K., Scheuer, S. (2001): Handbuch zur EU Wasserpolitik im Zeichen der Wasserrahmenrichtlinie. Brussels.

LELL, O. (2001): Der Schutz der Meere vor Schadstoffbelastungen – EG-Recht und Völkerrecht als konkurrierende Regelungsmodelle. Zeitschrift für Umweltrecht 12, Sonderheft, p. 138–146.

LIEBERMANN, N. von (2003): Küstenschutz: Bisherige und zukünftige Maßnahmen. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 360–363.

LIEBEZEIT, G. (2003): Einträge in die Nordsee durch Verklappung. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 114–116.

LIERSCH, K.-M. (1998): Marine Pollution by Oily Discharge. In KOCH, H.-J., LAGONI, R. (eds.): The Reception of Oily Waste from Ships in European Ports. Baden-Baden: Nomos, p. 85–94.

LLOBET, J. M., FALCO, G., CASAS, C., TEIXIDO, A., DOMINGO, J. L. (2003): Concentrations of arsenic, cadmium, mercury, and lead in common foods and estimated daily intake by children, adolescents, adults, and seniors of Catalonia, Spain. Journal of Agricultural and Food Chemistry 51 (3), p. 838–842.

LOZÁN, J. L., LENZ, W., RACHOR, E., WATERMANN, B., WESTERNHAGEN, H. von (eds.) (1990) Warnsignale aus der Nordsee: Wissenschaftliche Fakten. Berlin: Parey.

LOZÁN, J. L., RACHOR, E., REISE, K., WESTERNHAGEN, H. VON, LENZ, W. (eds.) (1994): Warnsignale aus dem Wattenmeer. Wissenschaftliche Fakten. Berlin: Blackwell.

LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.) (1996a): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey.

LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (1996b): Über die Gefährdungen und Veränderungen der Ostsee. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey, p. 315–321.

LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.) (2003): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen.

MARONI, K. (2000): Monitoring and regulation of marine aquaculture in Norway. Journal of Applied Ichthyology 16 (4–5), p. 192–195.

MARR, S. (2003): The Precautionary Principle in the Law of the Sea. The Hague: Nijhoff.

MATTHÄUS, W. (1996): Ozeanographische Besonderheiten. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey, p. 17–24.

MERCK, T., Nordheim, H. von (1996): Rote Listen: ein Instrument im Meeresnaturschutz. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey, p. 311–314.

MITCHELL, R. B. (1998): Sources of Transparency: Information Systems in International Regimes. International Studies Quarterly 42 (1), p. 109–130.

MITCHELL, R. B. (2000): Transparency's Three Paths of Influence. Columbia International Affairs Online. Online at http://www.ciaonet.org/isa/mir01/.

MÖKER, U.-H. (1993): Gewässerbelastungen durch Agrarstoffe. Rechtliche Standards beim Einsatz von Düngern und Pflanzenschutzmitteln. Baden-Baden: Nomos. Forum Umweltrecht, 8.

NEHLS, G. (1998): Schiffsverkehr und mausernde Enten. In Landesamt für den Nationalpark Schleswig-Holsteinisches Wattenmeer, Umweltbundesamt (eds.): Umweltatlas Wattenmeer. Vol. 1. Stuttgart: Ulmer, p. 190–191.

NEHLS, G. (1999): Brandentenmauser im Wattenmeer. In Nationalparkverwaltung Niedersächsisches Wattenmeer, Umweltbundesamt (eds.): Umweltatlas Wattenmeer. Vol. 2. Stuttgart: Ulmer, p. 86–87.

NEITZEL, V., KLOPP, R. (1993): Statistischer Vergleich der Anforderungen der EG-Richtlinie über die Behandlung kommunaler Abwässer und des Anhanges 1 zur Rahmenabwasser-VwV für Stickstoff. Korrespondenz Abwasser 40 (6), p. 948–957.

NEWELL, R. G., SANCHIRICO, J. N., KERR, S. (2002): Fishing Quota Markets. Washington, D C: Resources for the Future. Discussion Paper 02-20.

NIEDERMEYER, R.-O. (1996): Geologische Entwicklung, Meeresboden-Relief und Sedimente. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey, p. 11–17.

NIES, H. (2003): Gefahren durch radioaktive Substanzen. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 137–141.

NIES, H., OBRIKAT, D., HERRMANN, J. (2000): Recent radionucleotide concentrations in the North Sea as a result of discharges from nuclear installations. Kerntechnik 65, 195–200.

NÖLL, H.-H. (1999): Europäisches Recht in der Seeschifffahrt. Die Rechtsetzung der Gemeinschaft und ihre Grenzen. In Lagoni, R., Paschke, M. (eds.): Seehandelsrecht und Seerecht. Festschrift für Rolf Herber zum 70. Geburtstag. Hamburg: LIT, p. 463–483.

NOLLKAEMPER, A. (1997): The External Competences of the European Community with Regard to Marine Pollution from Maritime Transport: the Frail Legal Support for Grand Ambitions. In RINGBOM, E. (ed.): Competing Norms in the Law of Marine Environmental Protection. London: Kluwer Law International, p. 165–186.

NORDHEIM, H. von, BOEDEKER, D. (2000): Umweltvorsorge bei der marinen Sand- und Kiesgewinnung. Tagungsband BLANO-Workshop, INA Insel Vilm, 18. November 1998. Bonn-Bad Godesberg: BfN. BfN-Skripten, 23.

NORDHEIM, H. VON, RITTERHOFF, J., MERCK, T. (2003): Biodiversität in der Nordsee – „Rote Listen“ als Warnsignal. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 300–305.

NORDMANN, C. (2000): The Common Fisheries Policy of the European Union and Fishing Rights. In SHOTTON, R. (ed.): Use of Property Rights in Fisheries Management. FAO Fisheries Technical Paper 404/2. Online at http://www.fao.org/DOCREP/003/X8985E/X8985 E00.HTM.

NSC (North Sea Commission) (1987): Ministerial Declaration. Second International Conference on the Protection of the North Sea, London, 24–25 November 1987. Online at http://www.dep.no/md/nsc/declaration/022001-990245/indexdok000-b-n-a.html.

NSC (1995): Esbjerg Declaration. Fourth International Conference on the Protection of the North Sea. Esbjerg, Denmark, 8–9 June 1995. Online at http://www.dep.no/md/nsc/declaration/022001-990243/index-dok000-b-n-a.html.

NSC (2002a): Progress Report. Fifth International Conference on the Protection of the North Sea. Bergen, Norway, 20–21 March 2002. Online at http://www.dep.no/md/html/nsc/progressreport2002/Progress_Report.pdf [viewed 18/03/2003].

NSC (2002b): Bergen Declaration. Fifth International Conference on the Protection of the North Sea. Bergen, Norway, 20–21 March 2002. Online at http://www.dep.no/archive/mdvedlegg/01/19/Berge037.pdf.

OESCHGER, R. (2000): Der Ökosystemansatz der Biodiversitätskonvention. Deutsche Fallstudie: Ökosystemforschung Wattenmeer. Berlin: UBA.

OSPAR (OSPAR Commission for the Protection of the Marine Environment of the North Sea) (1993): Quality Status Report of the North Sea. Report on Sub-Region 7a: Organic Contaminants in Fish. London: OSPAR Commission.

OSPAR (1997): Data Report on the Results of Measurements made at Coastal Stations in 1995. Comprehensive Atmospheric Monitoring Programme (CAMP) (1995). London: OSPAR Commission.

OSPAR (1998a): Summary Report of the Comprehensive Study on Riverine Inputs and Direct Discharges (RID) from 1990 to 1995. London: OSPAR Commission.

OSPAR (1998b): OSPAR Strategy with regard to Hazardous Substances. Online at http://www.ospar.org/eng/html/sap/Strategy_hazardous_substances.htm.

OSPAR (1998c): OSPAR Strategy to Combat Eutrophication. Online at http://www.ospar.org/eng/html/sap/eutstrat.htm.

OSPAR (1998d): Strategy on the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area. Reference Number 1998-19.

OSPAR (1999): OSPAR Strategy on Environmental Goals and Management Mechanisms for Offshore Activities. Online at http://www.ospar.org/eng/html/sap/offshore_strat.htm.

OSPAR (2000a): Quality Status Report 2000. London: OSPAR Commission.

OSPAR (2000b): Quality Status Report. Region 2: Greater North Sea. London: OSPAR Commission.

OSPAR (2000c): OSPAR Background Document on Mercury and Organic Mercury Compounds. London: OSPAR Commission.

OSPAR (2000d): OSPAR Background Document on Organic Tin Compounds. London: OSPAR Commission.

OSPAR (2000e): OSPAR Background Document on Musk Xylene and other Musks. London: OSPAR Commission.

OSPAR (2000f): Action plan 1998-2003, update 2000. London: OSPAR Commission.

OSPAR (2001a): Overview of the Results of the Comprehensive Study on Riverine Inputs and Direct Discharges (RID) from 1996 to 1998. London: OSPAR Commission.

OSPAR (2001b): Data Report on the Comprehensive Study on Riverine Inputs and Direct Discharges (RID) in 1999. London: OSPAR Commission.

OSPAR (2001c): Polychlorinated Biphenyls (PCBs). London: OSPAR Commission. OSPAR Priority Substances Series.

OSPAR (2001d): Polycyclic Aromatic Hydrocarbons (PAHs). London: OSPAR Commission. OSPAR Priority Substances Series.

OSPAR (2001e): Short Chain Chlorinated Paraffins. London: OSPAR Commission.

OSPAR (2001f): Nonylphenol/Nonylphenolethoxylates. London: OSPAR Commission. OSPAR Priority Substances Series.

OSPAR (2001g): Certain Brominated Flame Retardants – Polybrominated Diphenylethers, Polybrominated Biphenyls, Hexabromo Cyclododecane. London: OSPAR Commission. OSPAR Priority Substances Series.

OSPAR (2001h): Evaluation of the expected situation of the eutrophication status in the Maritime Area following the 50% reduction target for nutrient inputs. London: OSPAR Commission.

OSPAR (2001i): Nutrients in the Convention Area – Overview of the Implementation of PARCOM 88/2 and National Action Plans cf. PARCOM Recommendation 89/4. London: Unpublished manuscript.

OSPAR (2001j): Pentachlorophenol. London: OSPAR Commission. OSPAR Priority Substances Series.

OSPAR (2002a): Data Report on the Comprehensive Study of Riverine Inputs and Direct Discharges (RID) in 2000. London: OSPAR Commission.

OSPAR (2002b): OSPAR Background Document on Lead. London: OSPAR Commission.

OSPAR (2002c): OSPAR Background Document on Cadmium. London: OSPAR Commission.

OSPAR (2002d): Lindane. London: OSPAR Commission. Hazardous Substances Series.

OSPAR (2003a): Summary record OSPAR 2003. Meeting of the OSPAR Commission Bremen.

OSPAR (2003b): Ministerial Meeting of the OSPAR Commission. Bremen 25 June 2003. Bremen Statement. Online at http://www.ospar.org/eng/html/md/Bremen_statement_2003.htm.

OSPAR (2003c): Integrated Report 2003 on the Eutrophication Status of the OSPAR Maritime Area. London: OSPAR Commission.

OSPAR (2003d): OSPAR Recommendation 2003/3 on a Network of Marine Protected Areas. Ref. § A-4.44a. Online at http://www.ospar.org/.

OSPAR (2003e): Guidelines for the Identification and Selection of Marine Protected Areas in the OSPAR Maritime Area. Agreement 2003-17. Online at http://www.ospar.org/.

OSPAR (2003f): Guidelines for the Management of Marine Protected Areas in the OSPAR Maritime Area. Agreement 2003-18. Online at http:// www.ospar.org/.

OSPAR (2003g): OSPAR Background Document on Tourism. Chapter 5 – Possible Actions for the Development of Sustainable Tourism in Coastal Zones of the OSPAR Maritime Area. OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic. Meeting of the Biodiversity Committee. Dublin: 20–24 January 2003.

OSPAR und HELCOM (2003): Declaration of the Joint Ministerial Meeting of the Helsinki and OSPAR Commissions. Online at http://www.ospar.org/.

PACHE, E. (2002): Gefahrstoffrecht. In KOCH, H.-J. (ed.): Umweltrecht. Neuwied: Luchterhand, p. 491–527.

Paris MOU (Paris Memorandum of Understanding on Port State Control) (2002): Annual Report 2001. The Hague: Paris MOU. Online at http://www.parismou.org/.

Paris MOU (2003): Annual Report 2002. The Hague: Paris MOU. Online at http://www.parismou.org/.

PETERMANN, T., WENNRICH, C. (1999): Entwicklung und Folgen des Tourismus. Endbericht. Bonn: TAB. TAB-Arbeitsbericht, No. 59.

PILLAY, T. V. R. (1992): Aquaculture and the environment. Oxford: Fishing News Books.

POREMSKI, H.-J., Wiandt, S. (2000): OSPAR-Programme zu Gefahrstoffen – Verfahren zur dynamischen Auswahl und Prioritätensetzung. In BEHRET, H., NAGEL, R. (eds.): Chemikalienbewertung – Konzepte für Sedimente und marine Ökosysteme. Frankfurt am Main: GDCh. GDCh-Monographien, Vol. 17, p. 55–70.

POTEL, P., SÜDBECK, P. (1999): Am Strand: Nur Raum für Sonnenbadende? Nationalparkverwaltung Niedersächsisches Wattenmeer, Umweltbundesamt (eds.): Umweltatlas Wattenmeer. Vol. 2. Stuttgart: Ulmer, p. 146–147.

QUAST, J., STEIDL, J., MÜLLER, K., WIGGERING, H. (2002): Minderung diffuser Stoffeinträge. In KEITZ, S. V., SCHMALHOLZ, M. (eds.): Handbuch der EUWasserrahmenrichtlinie. Berlin: E. Schmidt, p. 177–219.

RACHOR, E., HARMS, J., HEIBER, W., KRÖNCKE, I., MICHAELIS, H., REISE, K., BERNEM, K.-H. van (1995): Rote Liste der bodenlebenden Wirbellosen des deutschen Wattenmeer- und Nordseebereichs. In NORDHEIM, H. von, MERCK, T. (Bearb.): Rote Listen der Biotoptypen, Tier- und Pflanzenarten des deutschen Wattenmeer- und Nordseebereichs. Bonn-Bad Godesberg: BfN. Schriftenreihe für Landschaftspflege und Naturschutz, H. 44, p. 63–74.

RACHOR, E., ARLTT, G., BICK, A., GOSSELCK, F., HARMS, J., HEIBER, W., KUBE, J., MICHAELIS, H., REISE, K., SCHROEREN, V., VOSS, J., BÖNSCH, R., KRÖNCKE, I., BERNEM, K.-H. von (1998): Rote Liste der bodenlebenden wirbellosen Meerestiere. In Bundesamt für Naturschutz (eds.): Rote Liste gefährdeter Tiere Deutschlands. Bonn: BfN. Schriftenreihe für Landschaftspflege und Naturschutz, H. 55, p. 290–300.

RACHOR, E., GÜNTHER, C.-P. (2001): Concepts for Offshore Nature Reserves in the Southeastern North Sea. Senckenbergiana maritima 31 (2), p. 353–361.

REINEKING, B. (2003): Das Seehundsterben 2002 – Ausmaß, Ursachen und Folgen. Meeresumwelt-Symposium 2003. Bundesamt für Seeschifffahrt und Hydrographie. Online at http://www.bsh.de [viewed 13/08/2003].

REINEKING, B., FLEET, D. M. (2003): Einfluss von Öl auf Seevögel und Meeressäuger. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 235–238.

REISE, K. (2003): Grüner Wechsel im Wattenmeer: Weniger Seegraswiesen und das Aufkommen der Grünalgenmatten. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 196–200.

REISE, K., GOLLASCH, S., WOLFF, W. J. (1999): Introduced marine species of the North Sea coasts. Helgoländer Meeresuntersuchungen 52 (3/4), p. 219–234.

REVERMANN, C., PETERMANN, T. (2002): Tourismus in Großschutzgebieten – Wechselwirkungen und Kooperationsmöglichkeiten zwischen Naturschutz und regionalem Tourismus. Bonn: TAB. TAB-Arbeitsbericht, No. 77.

RICE, J. (2002): Changes to the Large Marine Ecosystem of the Newfoundland-Labrador Shelf. In SHERMAN, K., SKJOLDAL, H. R. (eds.): Large Marine Ecosystems of the North Atlantic. Changing States and Sustainability. Amsterdam: Elsevier, p. 51–104.

RINGBOM, H. (2001): The ERIKA Accident and its Effects on EU Maritime Regulation. In NORDQUIST, M., MOORE, J. (eds.): Current Marine Environmental Issues and the International Tribunal for the Law of the Sea. The Hague: Nijhoff, p. 265–290.

RITTERHOFF, J., BORCHERS, T. (2003): EU-Fischereipolitik. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 401–405.

RODIEK, W. (2003): Wirtschaftlicher und umweltverträglicher Umgang mit Baggergut aus Bundeswasserstraßen im Küstenbereich. Paper prepared for presentation at an HTG/PIANC meeting held in Bremen by HTG-Fachausschuss Baggergut on 20 May 2003. Online at http://www.htg-baggergut.de/sites/texte.html.

ROSENTHAL, H., JANSEN, W., LAUTERBACH, R. (1996): Aquakultur: Ein Eutrophierungsfaktor im Ostseeraum? In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey, p. 83–88.

RUNOLFSSON, B. (1997): Fencing the Oceans: A Right-Based Approach to Privatizing Fisheries. Regulation 20 (3), p. 57–62.

SANCHIRICO, J. (2000): Marine Protected Areas: Can They Revitalize Our Nation's Fisheries? Resources No. 140, p. 6–9.

SANCHIRICO, J., WILEN, J. E. (2002): Global Fisheries Resources: Status and Prospects. Washington, DC: Resources for the Future. Issue Brief 02-17.

SANCHIRICO, J., NEWELL, R. (2003): Catching Market Efficiencies: Quota Based Fisheries Management. Resources No. 150, p. 8–11.

SCHEUING, D. H. (1991): Grenzüberschreitende atomare Wiederaufarbeitung im Lichte des europäischen Gemeinschaftsrechts. Baden-Baden: Nomos.

Schleswig-Holsteinischer Landtag (2001): Bericht der Landesregierung. Sicherheit des Schiffsverkehrs in der westlichen Ostsee. Drucksachen 15/718 und 15/909. Online at http://www.lvn.parlanet.de/infothek/wahl15/drucks/1000/drucksache-15-1067.pdf [viewed 16/09/2003].

SCHMIED, M., BUCHERT, M., HOCHFELD, C., SCHMITT, B., SIMON, A., KLÜTING, R., WOLLNY, V. (2002): Umwelt und Tourismus: Daten, Fakten, Perspektiven. Berlin: E. Schmidt.

SCHNOOR, H. (2000): Verfassungsrechtliche Bedingungen einer Küstenwache zur Bewältigung maritimer Schadensfälle. Zeitschrift für öffentliches Recht in Norddeutschland 3, p. 221–226.

SCHÜLTKEN, H., MÜLLER, U., FLEIGE, H. (1997): Einfluss der Standortfaktoren Boden und Klima auf die Nitratauswaschung. Wasserwirtschaft 87 (2), p. 76–78.

SCHÜTTE, P. (2001): Der Schutz des Wattenmeeres. Völkerrecht, Europarecht, Nationales Umweltrecht. Baden-Baden: Nomos.

SCOTT, A. (2000): Introducing Property in Fishery Management. In SHOTTON, R. (ed.): Use of Property Rights in Fisheries Management. FAO Fisheries Technical Paper 404/1. Online at http://www.fao.org/docrep/003/X7579E/x7579e03.htm.

SFD (Sea Fisheries Department) (2003): Biological monitoring of dumping of dredged material off the Belgian coast (1997–1999). Online at http://www.dvz.be/obw.htm [viewed 18/08/2003].

SIEBERT, U., BENKE, H., SCHULZE, G., SONNTAG, R. P. (1996): Über den Zustand der Kleinwale. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey, p. 242–249.

SKJAERSETH, J. B. (2003a): Managing North Sea Pollution Effectively: Linking International and Domestic Institutions. International Environmental Agreements: Politics, Law and Economics 3 (2), p. 167–190.

SKJAERSETH, J. B. (2003b): Protecting the North-East Atlantic: Enhancing Synergies by Institutional Design. Paper presented at the 44th Annual ISA Convention, Portland, Oregon, February 26 to March 1, 2003.

SKOV, H., VAITKUS, G., FLENSTED, K. N., GRISHANOV, G., KALAMEES, A., KONDRATYEV, A., LEIVO, M., LUIGUJOE, L., MAYR, C., RASMUSSEN, J. F., RAUDONIKIS, L., SCHELLER, W., SIDLO, P. O., STIPNIECE, A., STRUWE-JUHL, B., WELANDER, B. (2000): Inventory of coastal and marine Important Bird Areas in the Baltic Sea. Cambridge: Birdlife International.

SÖNTGERATH, K. (1998): Sand- und Kiesentnahme im Nordseebereich – ihre Bedeutung und die Berücksichtigung des Umweltvorsorgeprinzips in der Genehmigungspraxis. In NORDHEIM, H. von, BOEDEKER, D. (eds.): Umweltvorsorge bei der marinen Sand- und Kiesgewinnung. BfN-Skripten 23. Bonn-Bad Godesberg: BfN, p. 4–11.

SÖNTGERATH, K. (2003): Gewinnung von Rohstoffen. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 149–153.

SRU (Rat von Sachverständigen für Umweltfragen/German Advisory Council on the Environment) (1980): Umweltprobleme der Nordsee (Environmental Problems of the North Sea). Special Report, June 1980. Stuttgart: Kolhammer.

SRU (1994): Environmental Report 1994: Für eine dauerhaft umweltgerechte Entwicklung (In Pursuit of Sustainable Environmentally Sound Development). Stuttgart: Metzler-Poeschel.

SRU (1996a): Environmental Report 1996: Zur Umsetzung einer dauerhaft-umweltgerechten Entwicklung (On Implementing Sustainable Development). Stuttgart: Metzler-Poeschel.

SRU (1996b): Konzepte einer dauerhaft-umweltgerechten Nutzung ländlicher Räume (Environmental Concepts of Sustainable Use of Rural Areas). Special Report. Stuttgart: Metzler-Poeschel.

SRU (1998): Environmental Report 1998. Umweltschutz: Erreichtes sichern – Neue Wege gehen (Environmental Protection: Securing Achievements – Breaking New Ground). Stuttgart: Metzler-Poeschel.

SRU (1999): Umwelt und Gesundheit – Risiken richtig einschätzen (The Environment and Health: Towards Improved Risk Assessment). Special Report. Stuttgart: Metzler-Poeschel.

SRU (2000): Environmental Report 2000. Schritte ins nächste Jahrtausend (Beginning the Next Millennium). Stuttgart: Metzler-Poeschel.

SRU (2002a): Environmental Report 2002. Für eine neue Vorreiterrolle (Towards a New Leading Role). Stuttgart: Metzler-Poeschel.

SRU (2002b): Für eine Stärkung und Neuorientierung des Naturschutzes (Towards Strengthening and Reorienting Nature and Landscape Conservation). Special Report. Stuttgart: Metzler-Poeschel.

SRU (2003a): Windenergienutzung auf See (Wind Energy Use in Coastal Waters). Statement, April 2003. Online at http://www.umweltrat.de/.

SRU (2003b): On the European Commission's Concept for a European Strategy for the Protection and Conservation of the Marine Environment. Statement, February 2003. Online at http://www.umweltrat.de/.

SRU (2003c): On the Economic Impact of the Planned Reform of European Chemicals Policy. Statement, July 2003, No. 4. Online at http://www.umweltrat.de/.

Statistisches Bundesamt (Federal Statistical Office) (1996): Statistisches Jahrbuch 1996 für die Bundesrepublik Deutschland. Stuttgart: Metzler-Poeschel.

Statistisches Bundesamt (2003): Statistisches Jahrbuch 2003 für die Bundesrepublik Deutschland. Stuttgart: Metzler-Poeschel.

STEINER, P. (2003): Baggergutkonzept der Landesregierung Schleswig-Hostein. Paper prepared for presentation at an HTG/PIANC meeting held in Bremen by HTG-Fachausschuss Baggergut on 20 May 2003. Online at http://www.htg-baggergut.de/sites/texte.html.

STERR, H. (2003): Geographische Charakterisierung der Nordseeregion. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 40–46.

STOCK, M. (2003): Salzwiesenschutz im Wattenmeer. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 364–368.

SÜNDERMANN, J. (2003): Forschungsbedarf. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 408–412.

SWEITZER, J., LANGAAS, S., FOLKE, C. (1996): Land use and population density in the Baltic Sea drainage basin: a GIS database. Ambio 25, p. 191–198.

TEUBER, W., PORT, E. (1991): Anforderungen an kommunale Abwasseranlagen: EG-Richtlinie verabschiedet. Korrespondenz Abwasser 1991, p. 900–904.

TEUCHER, M. W. (1996): Radioaktivität. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey, p. 104–106.

THEOBALD, N., RÜHL, N.-P., JORGENSEN, K. F. (1996): Belastungen durch militärische Altlasten. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey, p. 107–112.

TIEDEMANN, A. (2003): Windenergieparke im Meer – Perspektiven für den umweltverträglichen Einstieg in eine neue Großtechnologie. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 142–148.

UBA (Umweltbundesamt/Federal Environmental Agency) (2002): Nachhaltige Entwicklung in Deutschland. Die Zukunft dauerhaft umweltgerecht gestalten. Berlin: E. Schmidt.

UBA (2003a): Schadstoffe im Meerwasser und in Sedimenten der Nordsee. In Umweltdaten Deutschland Online. Online at http://www.env-it.de/umweltdaten/ [viewed 20/10/2003].

UBA (2003b): Umweltprobenbank des Bundes (Federal Environmental Specimen Bank). Online at http://www.umweltprobenbank.de/ [viewed 11/09/2003].

UBA (2003c): Jahresbericht 2002. Berlin: UBA.

Umweltbehörde Hamburg (Hamburg Environment Agency) (1999): Verkehrsbedingte Emissionen in Hamburg 1995. Online at http://www.hamburg.de/Behoerden/Umweltbehoerde [viewed 27/10/2003].

Umweltministerium Mecklenburg-Vorpommern (Mecklenburg Vorpommern Environment Ministry) (2001): Küstenschutz in Mecklenburg-Vorpommern. Online at http://www.um.mv-regierung.de/kuestenschutz/bschutz [viewed 12/09/2003].

URFF, W. von (1988): Umweltschutz und europäische Agrarpolitik. In Rengeling, H.-W. (ed.): Europäisches Umweltrecht und europäische Umweltpolitik. Cologne: Heymann, p. 103–123.

VALANTIN, G. (2000): Development of Property Rights-based Fisheries Management in the United Kingdom and the Netherlands: A Comparision. In SHOTTON, R. (ed.): Use of Property Rights in Fisheries Management. FAO Fisheries Technical Paper 404/2. Online at http://www.fao.org/docrep/003/x8985e/x8985e00.htm.

VAUK, G., VAUK-HENTZELT, E., PRÜTER, J. (1990) Bestandveränderungen fischfressender Seevögel an den Küsten der südlichen Nordsee und mögliche Ursachen. In LOZÁN, J. L., LENZ, W., RACHOR, E., WATERMANN, B., WESTERNHAGEN, H. von (1990); Warnsignale aus der Nordsee: Wissenschaftliche Fakten. Berlin: Parey, p. 314–319.

VESPER, H. (2003): Gefährdung der Wale durch die Fischerei und andere Störfaktoren. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 296–299.

VIABONO GmbH (2003): Das Reiseportal für Naturgenießer. Online at http://www.viabono.de/.

VSM (Verband für Schiffbau und Meerestechnik) (2003): Entwicklung der Weltschifffahrt und des Weltschiffbaus 1998. Online at http://www.vsm.de/ftp/JB98ii.pdf [viewed 06/08/2003].

WALKER, P. (2003): Langzeitveränderungen der Rochen- und Haibestände in der Nordsee. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 256–265.

WALTER, U., BUCK, B. H., ROSENTHAL, H. (2003): Marikultur im Nordseeraum: Status quo, Probleme und Tendenzen. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 122–131.

WALTER, U., LIEBEZEIT, G. (2001): Nachhaltige Miesmuschel-Anzucht im niedersächsischen Wattenmeer durch die Besiedlung natürlicher und künstlicher Substrate. Abschlussbericht der ersten Projektphase. Wilhelmshaven: Forschungszentrum Terramare.

WEBER, W. (1995): Discard Problematik aus fischbestandskundlicher Sicht. Deutsche Hydrographische Zeitung, Supplement 2, p. 101–108.

WEBER, W., BAGGE, O. (1996): Belastungen durch die Fischerei. In LOZÁN, J. L., LAMPE, R., MATTHÄUS, W., RACHOR, E., RUMOHR, H., WESTERNHAGEN, H. von (eds.): Warnsignale aus der Ostsee. Wissenschaftliche Fakten. Berlin: Parey, p. 88–92.

WEIDEMA, I. R. (ed.) (2000): Introduced species in the Nordic countries. Copenhagen: Nordic Council of Ministers. Nord, 2000:13.

WEIGEL, S. (2003): Belastung der Nordsee mit organischen Schadstoffen. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 83–90.

WIANDT, S., POREMSKI, H.-J. (2002): Selection and prioritisation procedure of hazardous substances for the marine environment within OSPAR/DYNAMEC. Ecotoxicology 11 (5), p. 393–399.

WIRTZ, K. W., SCHUCHARDT, B. (2003): Auswirkungen von Rohrleitungen und Stromkabeln. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 154–156.

WIRTZ, K. W., TOL, R. S. J., HOOSS, K. G. (2003): Mythos “Offene See”: Nutzungskonflikte im Meeresraum. In LOZÁN, J. L., RACHOR, E., REISE, K., SÜNDERMANN, J., WESTERNHAGEN, H. von (eds.): Warnsignale aus Nordsee und Wattenmeer: Eine aktuelle Umweltbilanz. Hamburg: Wissenschaftliche Auswertungen, p. 157–160.

WOLFF, N. (2002): Fisheries and the Environment – Public International and European Community Law Aspects. Baden-Baden: Nomos.

WOLFF, N. (2003): Erhaltung lebender Meeresressourcen im Lichte des Nachhaltigkeitsgrundsatzes: Völker- und gemeinschaftsrechtliche Voraussetzungen. Zeitschrift für Umweltrecht 14 (5), p. 356–362.

WOLFRUM, R. (2000): Die Entwicklung des Seerechts zum Recht der marinen Umwelt. In EHLERS, P., ERBGUTH, W. (eds.): Aktuelle Entwicklungen im Seerecht. Dokumentation der Rostocker Gespräche zum Seerecht 1996–1999. Baden-Baden: Nomos, p. 69–81.

WWF (World Wide Fund for Nature) (2003): Schadstoffe gefährden die Meeresumwelt. Anforderungen an eine neue EU-Chemikalienpolitik zum Schutz des Wattenmeeres. Frankfurt am Main: WWF Deutschland.

ZIMMERMANN, A. (2003): Rechtliche Probleme bei der Errichtung seegestützter Windenergieanlagen. Die öffentliche Verwaltung 56 (4), p. 133–140.

Abbreviations

a	Year
AIS	Automatic Identification System
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas
BauGB	Federal Building Code (Baugesetzbuch)
BBergG	Federal Mining Act (Bundesberggesetz)
BfN	Federal Agency for Nature Conservation (Bundesamt für Naturschutz)
BGBl.	Federal Gazette (Bundesgesetzblatt)
BGS	German Border Police (Bundesgrenzschutz)
BImSchG	Federal Immission Control Act (Bundes-Immissionsschutz-gesetz)
BLABAK	Bund-Länder Working Group on Management of Dredged Materials in Coastal Areas (Bund-Länder-Arbeitskreis für den Umgang mit Baggergut an der Küste)
BLANO	Bund-Länder Committee on the North Sea and the Baltic (Bund-Länder-Ausschuss Nordsee/Ostsee)
B_{lim}	Limit biomass reference point
BMF	Federal Ministry of Finance (Bundesministerium der Finanzen)
BMI	Federal Ministry of the Interior (Bundesministerium des Inneren)
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit)
BMVBW	Federal Ministry of Transport, Building and Housing (Bundesministerium für Verkehr, Bau- und Wohnungswesen)
BMVEL	Federal Ministry of Consumer Protection, Food and Agriculture (Bundesministerium für Verbraucherschutz, Ernährung und Landwirtschaft)
BNatSchG	Nature Conservation Act (Bundesnaturschutzgesetz)
B_{pa}	Precautionary reference point
Bq	Becquerel
BRC	Background/reference concentration
BSH	Federal Maritime and Hydrographic Agency (Bundesamt für Seeschifffahrt und Hydrographie)
BSPA	Baltic Sea Protected Area
CAFE	Clean Air for Europe (Programme)
CAP	Common Agricultural Policy of the European Community
CBD	Convention on Biological Biodiversity
Cd	Cadmium
CFP	Common Fisheries Policy of the European Community
Cs	Caesium
Cu	Copper
DDT	Dichlorodiphenyl trichloroethane
DG	Directorate General
DWT	Dead weight
EAC	Ecotoxilogical Assessment Criteria
EAGGF	European Agricultural Guidance and Guarantee Fund

EC	European Communities (in conjunction with article no.: EC Treaty)
ECJ	European Court of Justice
EcoQOs	Ecological Quality Objectives
EEC	European Economic Community
EEZ	Exclusive Economic Area
EIA	Environmental Impact Assessment
EIFAC	European Inland Fisheries Advisory Commission
ERDF	European Regional Development Fund
EU	European Union
FAO	Food and Agriculture Organization
FFH Directive	Flora, Fauna and Habitats Directive
FIAF	Financial Instrument for Fisheries Guidance
FlsBergV	Continental Shelf Mining Ordinance (Festlandsockel-Bergverordnung)
g	Gram
GDP	Gross domestic product
GRF	Group Rights in Fisheries
HABAB	Guidelines on Dredged Material in Inland Waters (Handlungsanweisung Baggergut Binnengewässer)
HABAK	Guidelines on Dredged Material in Coastal Waters (Handlungsanweisung Baggergut Küstengewässer)
Hague MOU	Hague Memorandum of Understanding on Port State Control
HCB	Hexachloride benzene
HCH	Hexachlorocyclohexane
HELCOM	Helsinki Commission (governing body of the 1992 Convention on the Protection of the Marine Environment of the Baltic Sea Area)
Hg	Mercury
HNS Convention	International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea
IBA	Important Bird Area
IBSFC	International Baltic Sea Fisheries Commission
ICES	International Council for the Exploration of the Sea
ICZM	Integrated Coastal Zone Management
ILM	International Legal Materials (a periodical issued by the ILM Office containing major international treaties and agreements)
IMO	International Maritime Organization
IPPC Directive	Directive 96/61/EC concerning integrated pollution prevention and control
ITQ	Individual Transferable Quota
IUCN	International Union for Nature Conservation
kg	Kilogram
km	Kilometre
KW	Kilowatt
l	Litre
LNatSchG	Nature Protection Act of any of the German Länder (Landesnaturschutzgesetz)

m	Metre
MAP	Multiannual Programme
MARPOL	International Convention of 1973/78 for the Protection from Pollution from Ships
MBAL	Minimum Biologically Acceptable Level
µg	Microgram
mg	Milligram
Mg	Megagram
MPA	Marine Protected Area
N	Nitrogen
NEAFC	North East Atlantic Fisheries Commission
NEC	National Emission Ceilings
ng	Nanogram
Ni	Nickel
NO_x	Nitrogen oxides
NSC	International Conference on the Protection of the North Sea
OSPAR (Commission)	Commission of the Oslo and Paris Conventions (Commission pursuant to Article 10 of the Convention for the Protection of the Marine Environment of the North-East Atlantic)
PA	Precautionary Approach
PAHs	Polycyclic aromatic hydrocarbons
Para.	Paragraph number
PARCOM	Paris Convention of 1974 for the Prevention of Pollution of the Sea from Land-based Sources
Paris MOU	Paris Memorandum of Understanding on Port State Control
Pb	Lead
PBDE	Brominated flame retardants (polybrominated diphenyl ethers, PBDEs)
PBTs	Persistent, bioaccumulating and toxic substances
PCBs	Polychlorinated biphenyls
PCDDs	Polychlorinated dibenzo-p-dioxins
PCDFs	Polychlorinated dibenzofurans
PDV	Phocine Distemper Virus
PEC	Predicted Environmental Concentration
PNEC	Predicted No Effect Concentration
Po	Pollonium
POP	Persistent Organic Pollutant
psu	Practical salinity unit
RAC	Regional Advisory Council for Fisheries Management
REACH	Registration, Evaluation and Authorization of Chemicals
ROG	Regional Planning Act (Raumordnungsgesetz)
RT	Registered tonnage
SEA	Strategic Environmental Assessment (under Directive 2001/42/EC on the assessment of the effects of certain plans and programmes in the environment)
SeeAnlV	Marine Facilities Ordinance (Seeanlagenverordnung)
SFSA	Straddling Fishstocks Agreement
SO_2	Sulphur dioxide
SPA	Special Protected Area

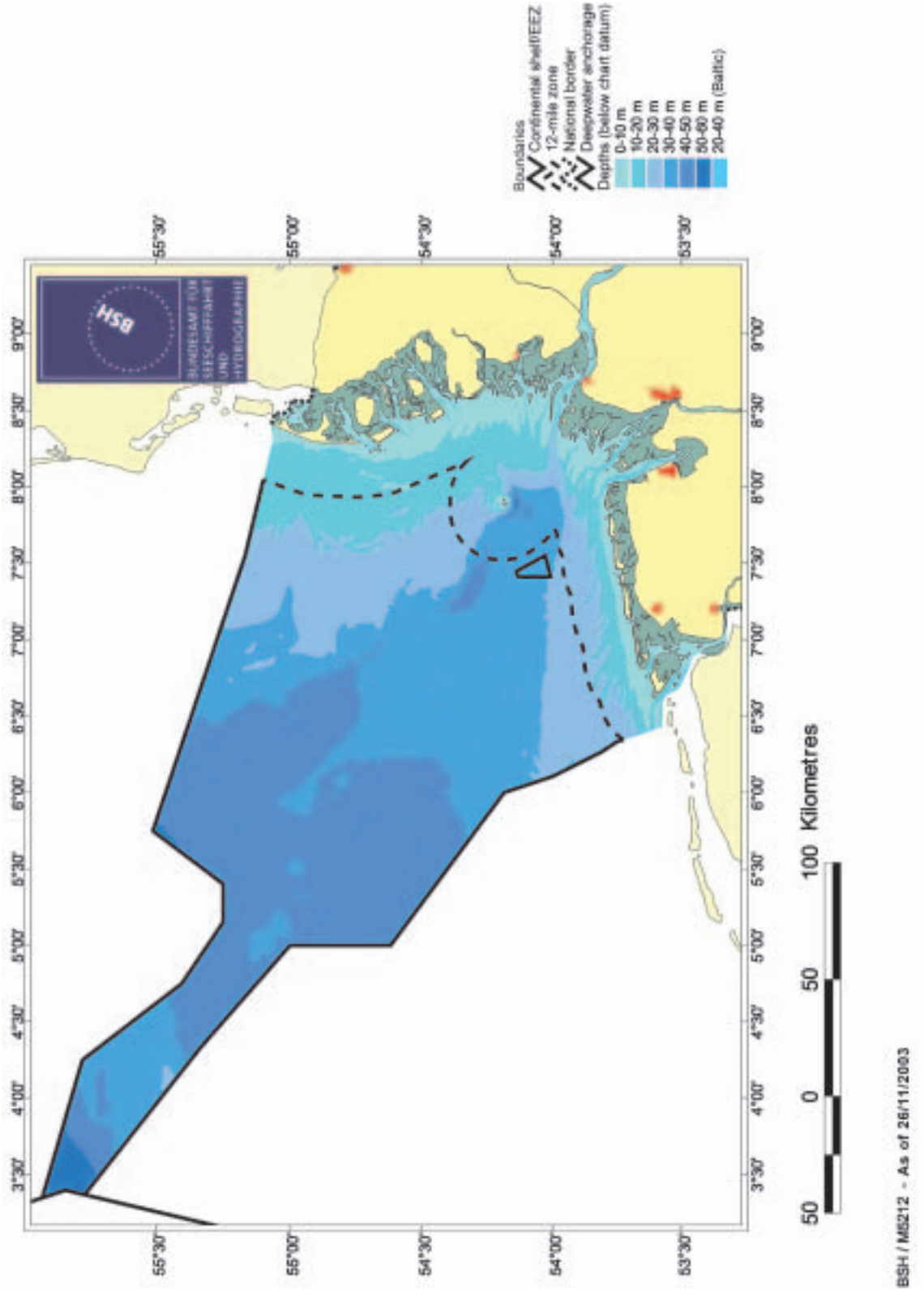
Sr	Strontium
SRU	German Advisory Council on the Environment (Rat von Sachverständigen für Umweltfragen)
STCW	International Convention on Standards of Trading, Certification and Watchkeeping
STECF	ICES Scientific, Technical and Economic Committee for Fisheries
StGB	German Penal Code (Strafgesetzbuch)
Sv	Sievert
TAC	Total Allowable Catches
TBT	Tributyl tin
Tc	Technetium
TEq	Toxicity equivalent
TURF	Territorial User Rights in Fisheries
TWH	Terawatt hour
UNCLOS	United Nations Convention on the Law of the Sea
UNECE	United Nations Economic Commission for Europe
UNTS	United Nations Treaty Series
UVP-V Bergbau	Regulation on Environmental Impact Assessments for Mining Activities (Verordnung zur Umweltverträglichkeitsprüfung im Bergbau)
VO	Ordinance (Verordnung)
vPvB	Very persistent and very bioaccumulative
WHG	Water Management Act (Wasserhaushaltsgesetz)
WSV	Federal Waterways and Shipping Administration (Wasser- und Schifffahrtsverwaltung)
ww	Wet weight

Annex II

Seamaps

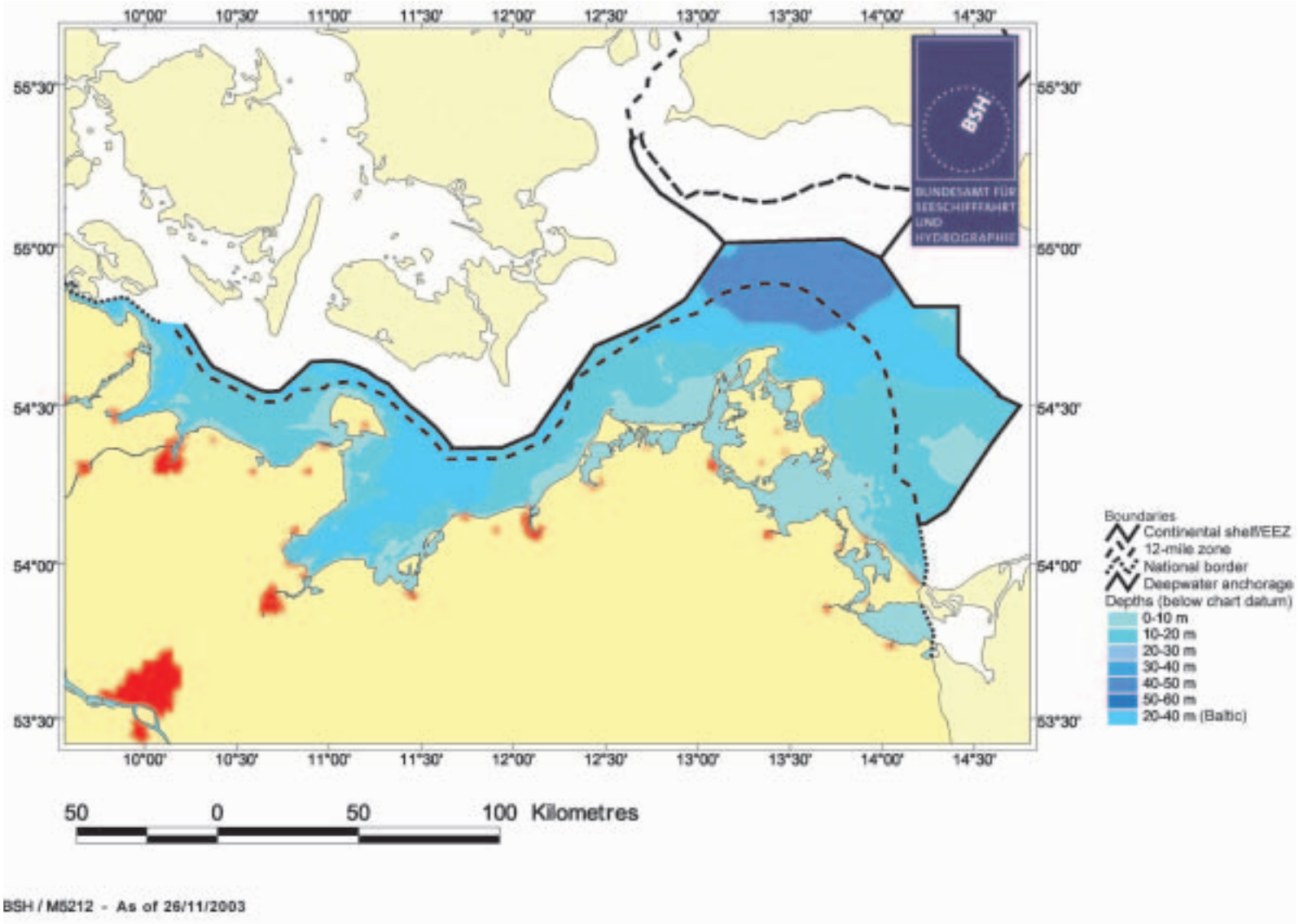
Map 3-1a

North Sea: German continental shelf/Exclusive Economic Zone (EEZ)



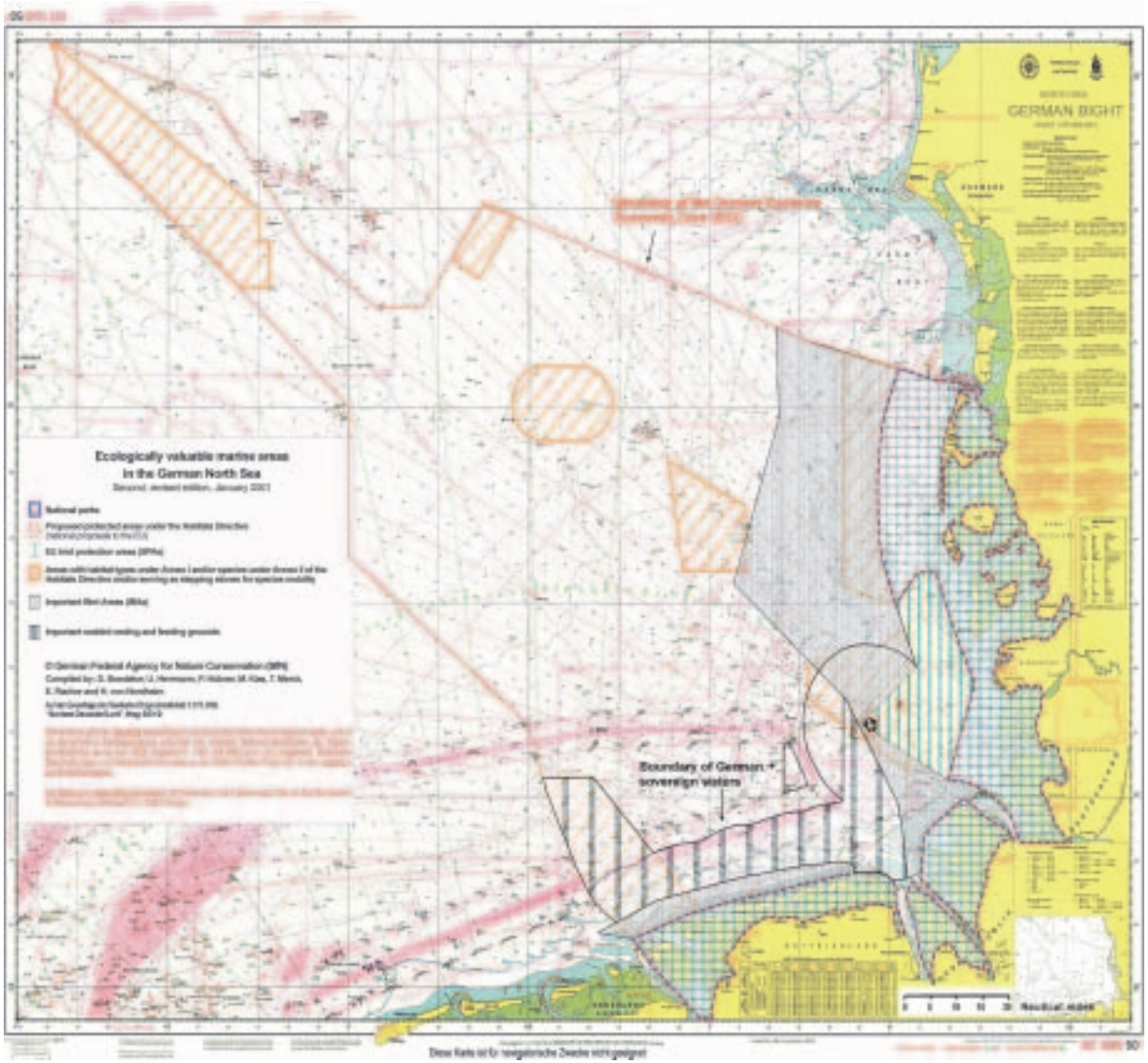
Source: BSH
[As of 2003-12-09]

Baltic Sea: German continental shelf/Exclusive Economic Zone (EEZ)



Source: BSH
[As of 2003-12-09]

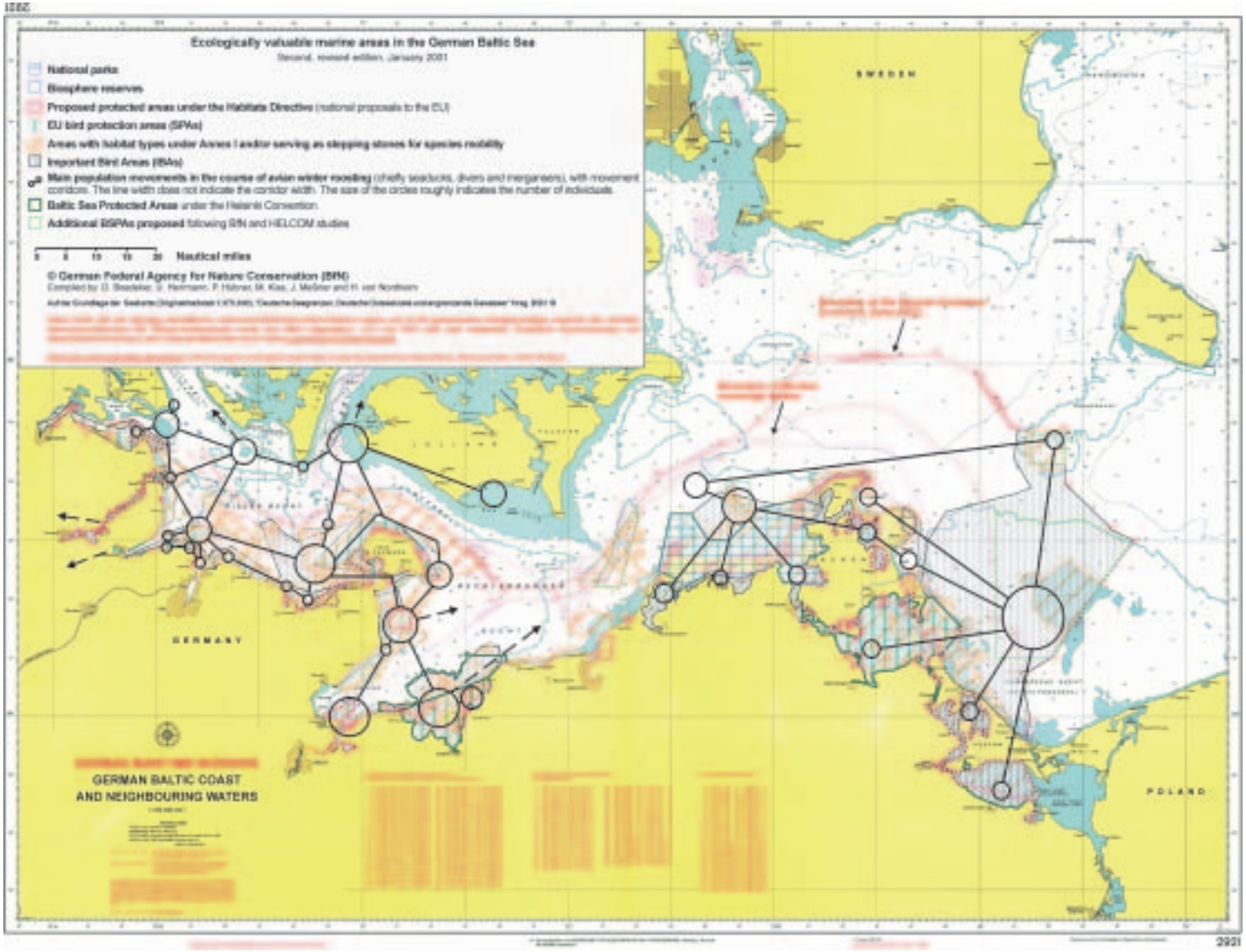
Ecologically valuable marine areas in the German North Sea



Source: BfN
[As of 2003-12-09]

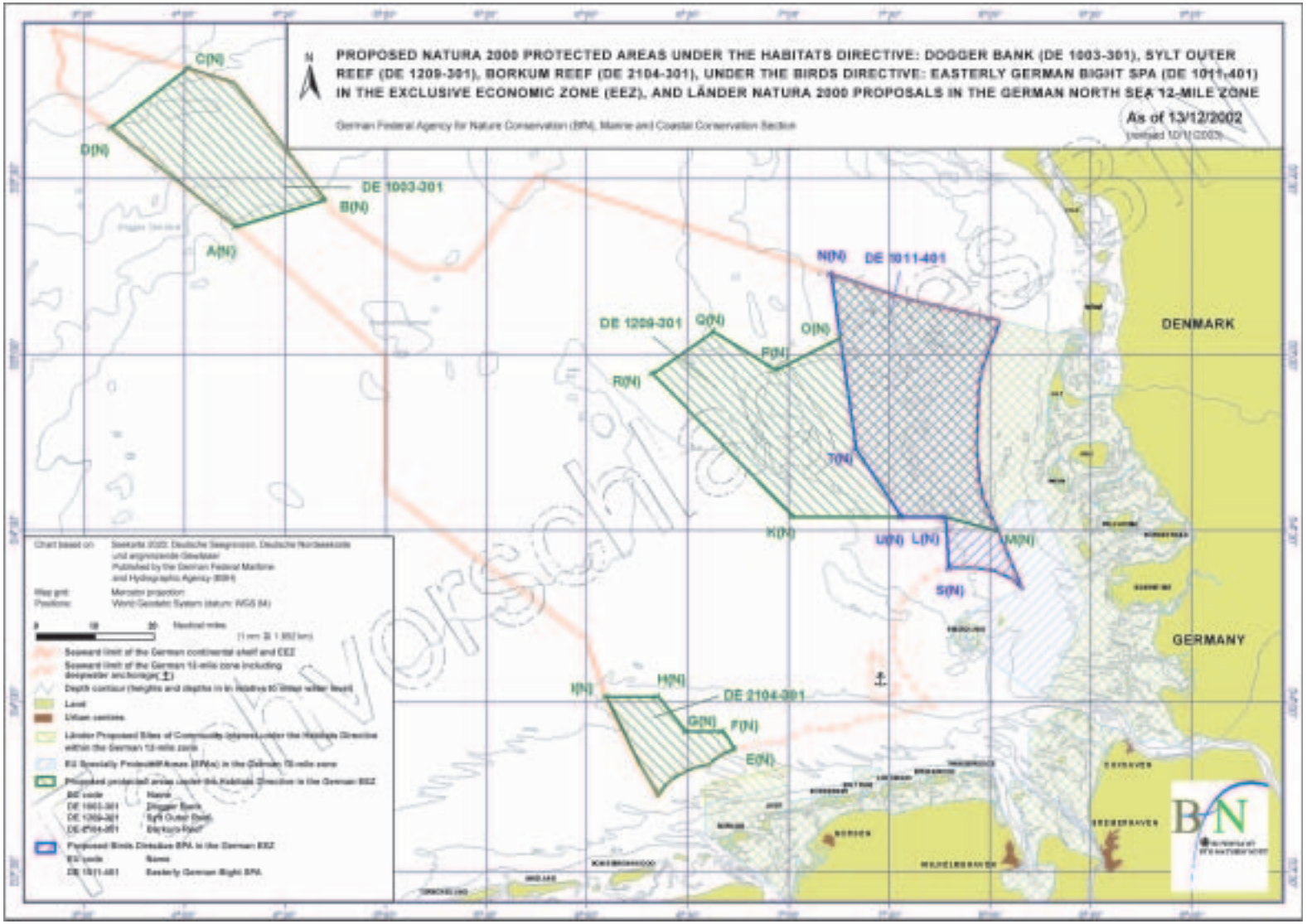
Map 3-2a

Ecologically valuable marine areas in the German Baltic Sea



Source: BfN
[As of 2003-12-09]

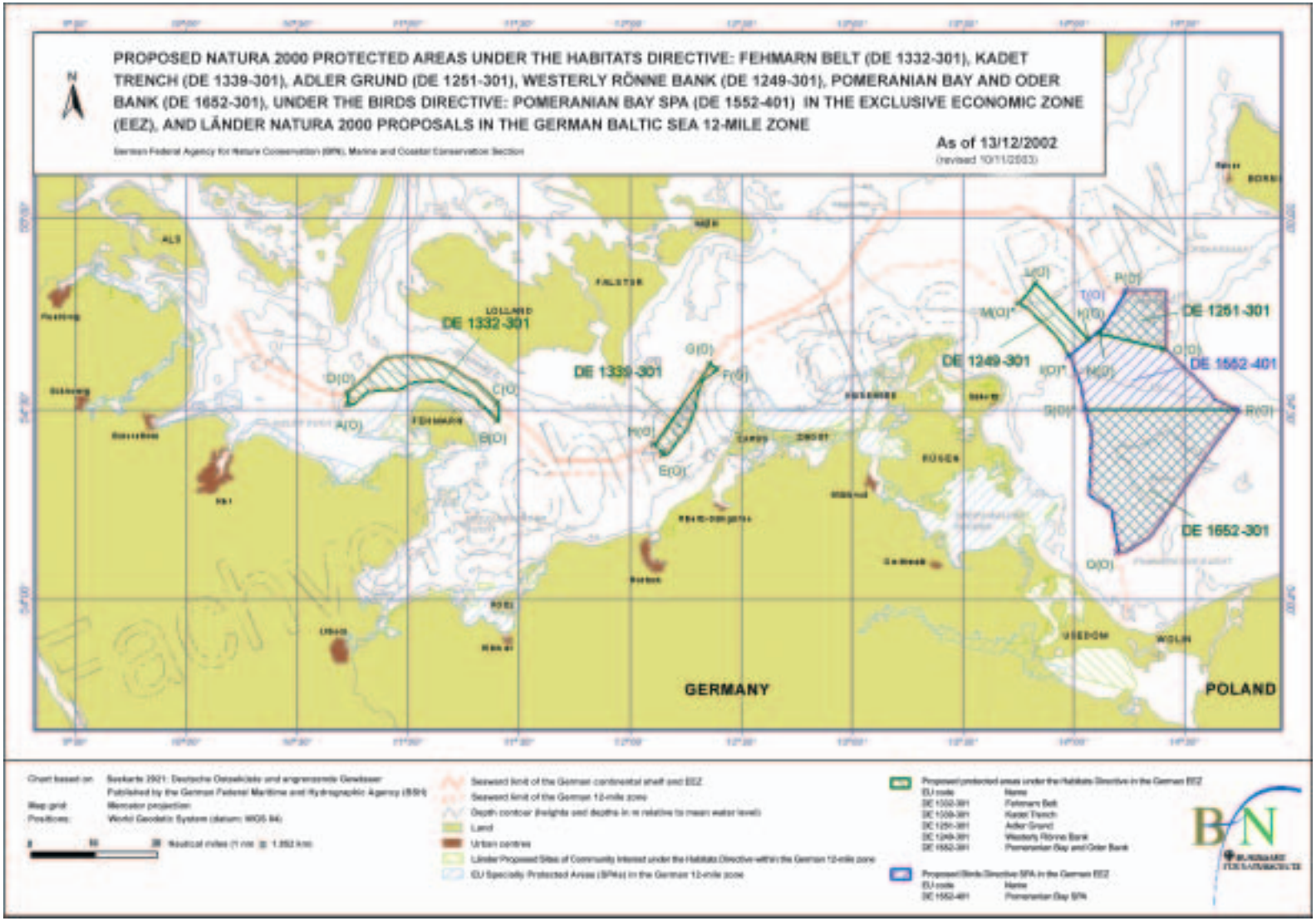
Proposed Natura 2002 protected areas under the Habitats Directive



Source: BfN
[As of 2003-12-09]

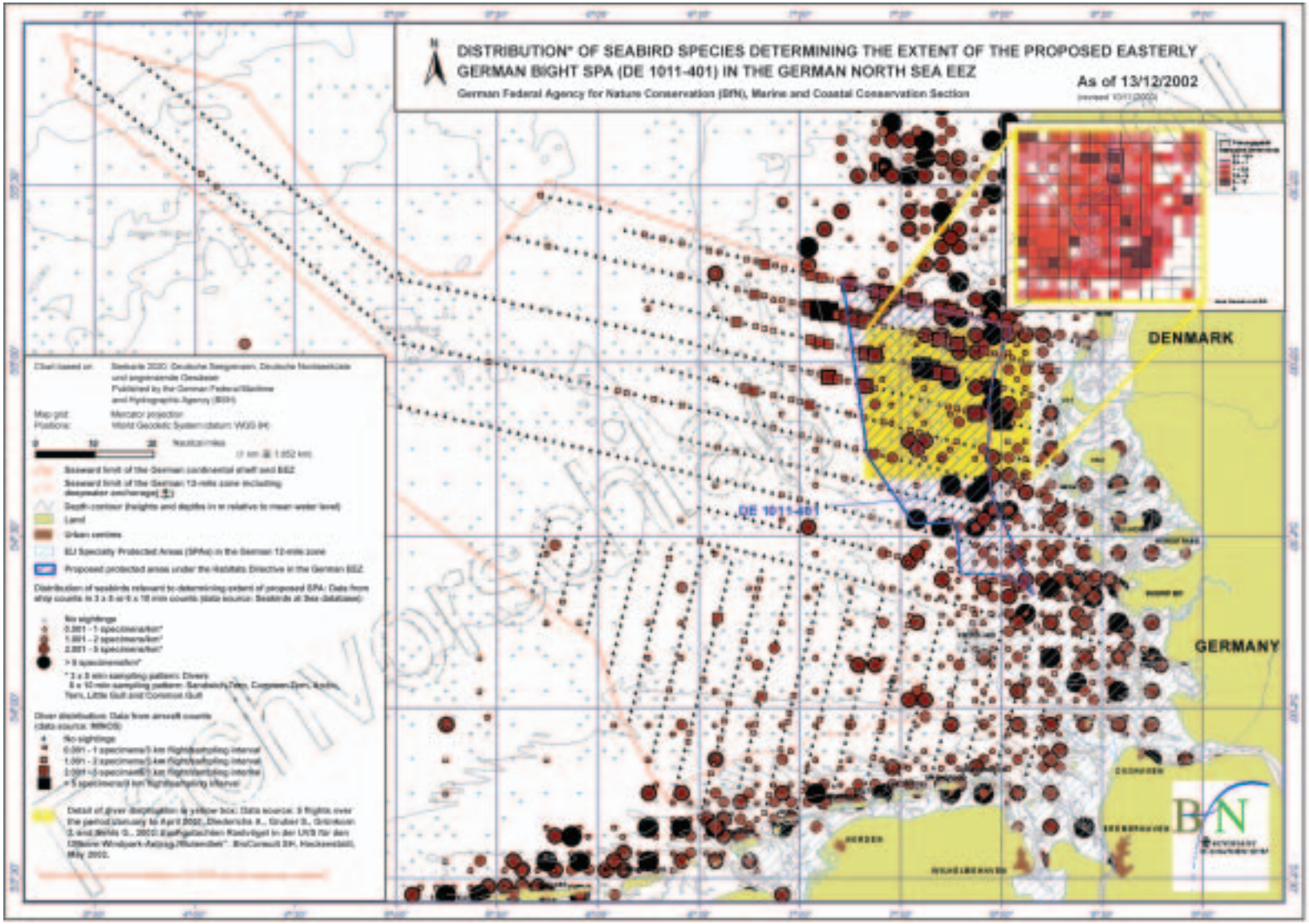
Map 3-3a

Proposed Natura 2002 protected areas under the Habitats Directive



Source: BfN
[As of 2003-12-09]

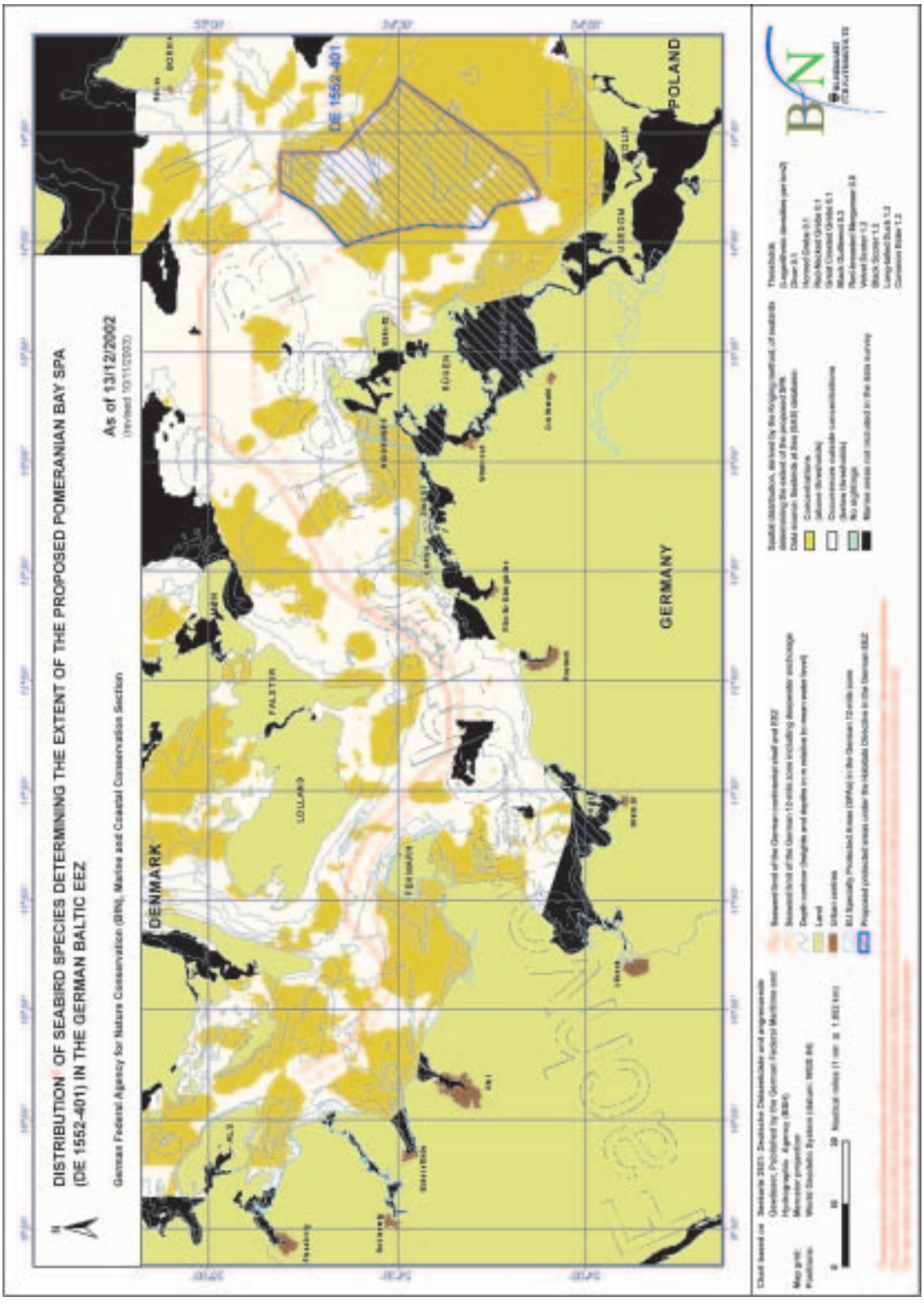
Distribution of seabird species determining the extent of the proposed Easterly German Bight SPA in the German North Sea EEZ



Source: BfN
(As of 2003-12-09)

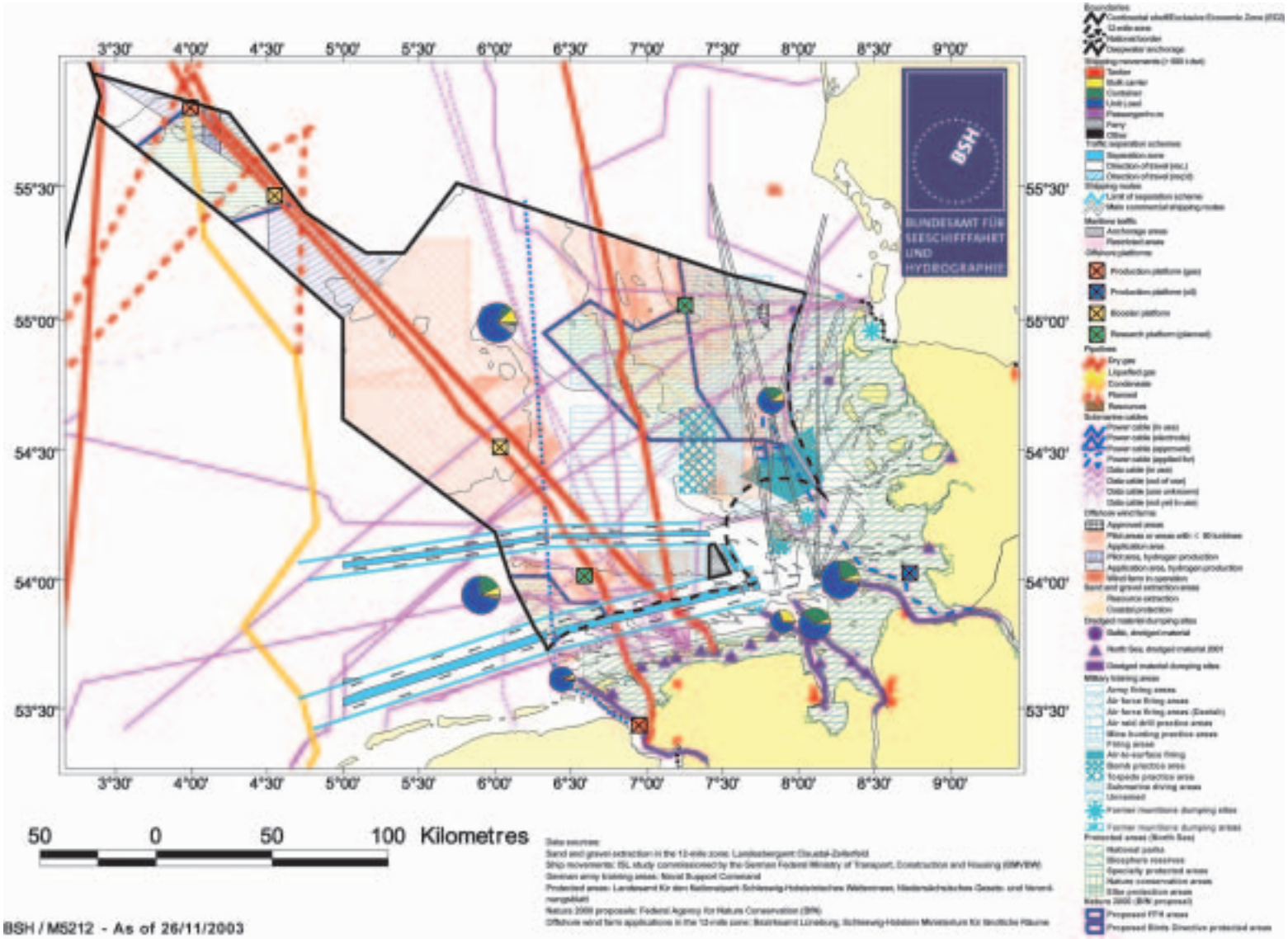
Map 3-4a

Distribution of seabird species determining the extent of the proposed Pomeranian Bay SPA in the German Baltic EEZ



Source: BfN
(As of 2003-12-09)

North Sea: All uses

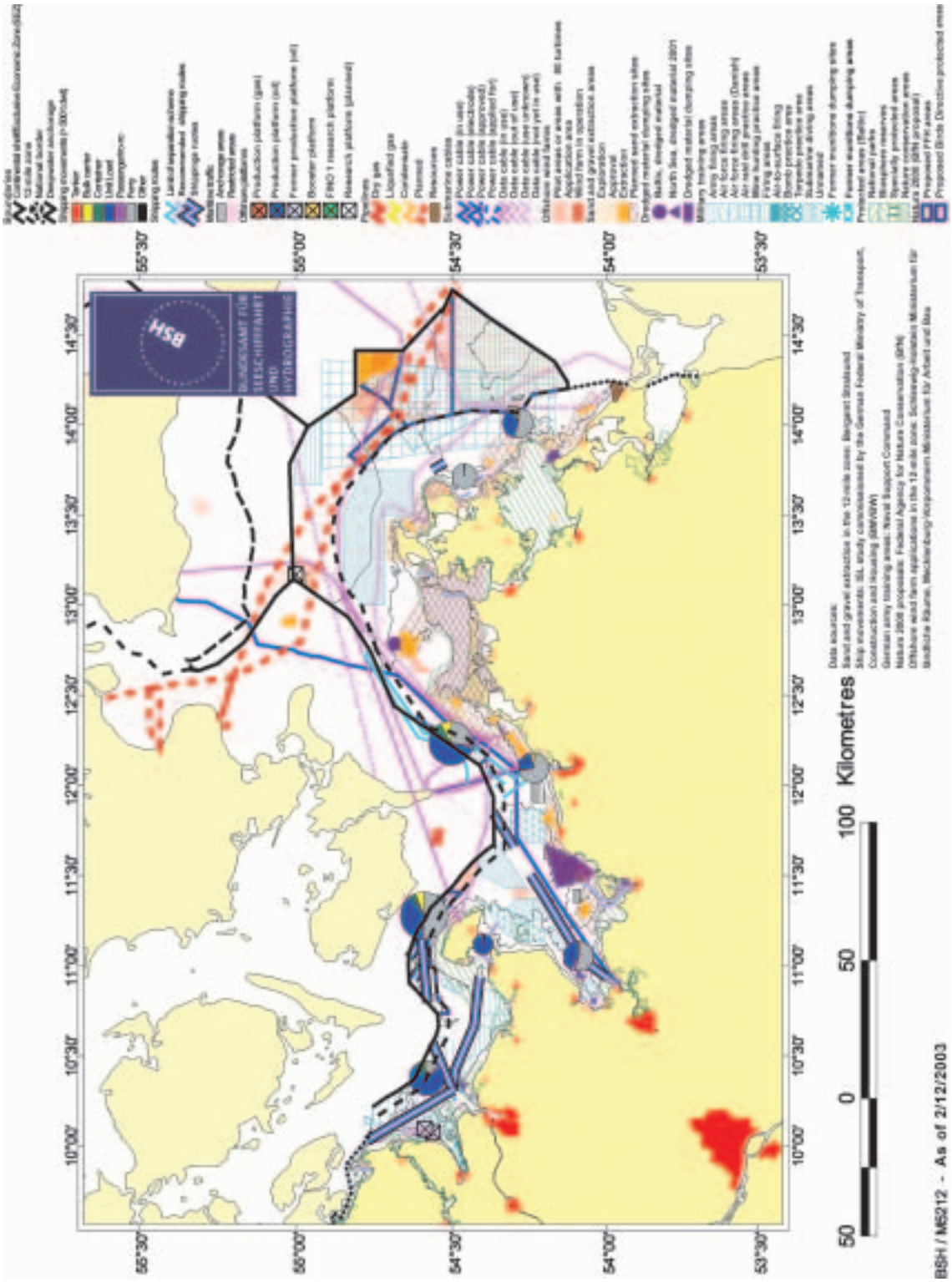


Source: BSH
[As of 2003-12-09]

Map 3-5a

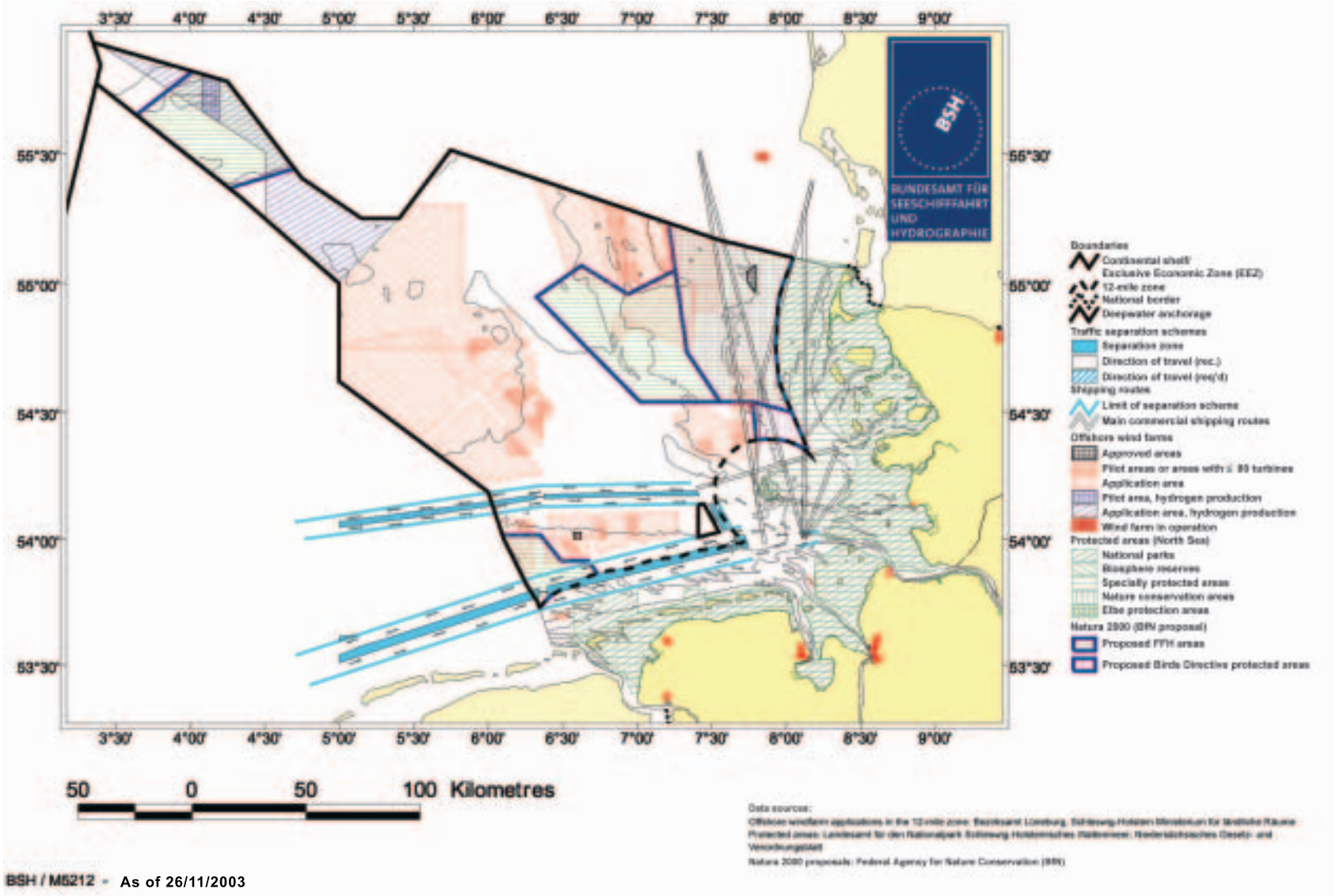
Map 3-5b

Baltic Sea: All uses



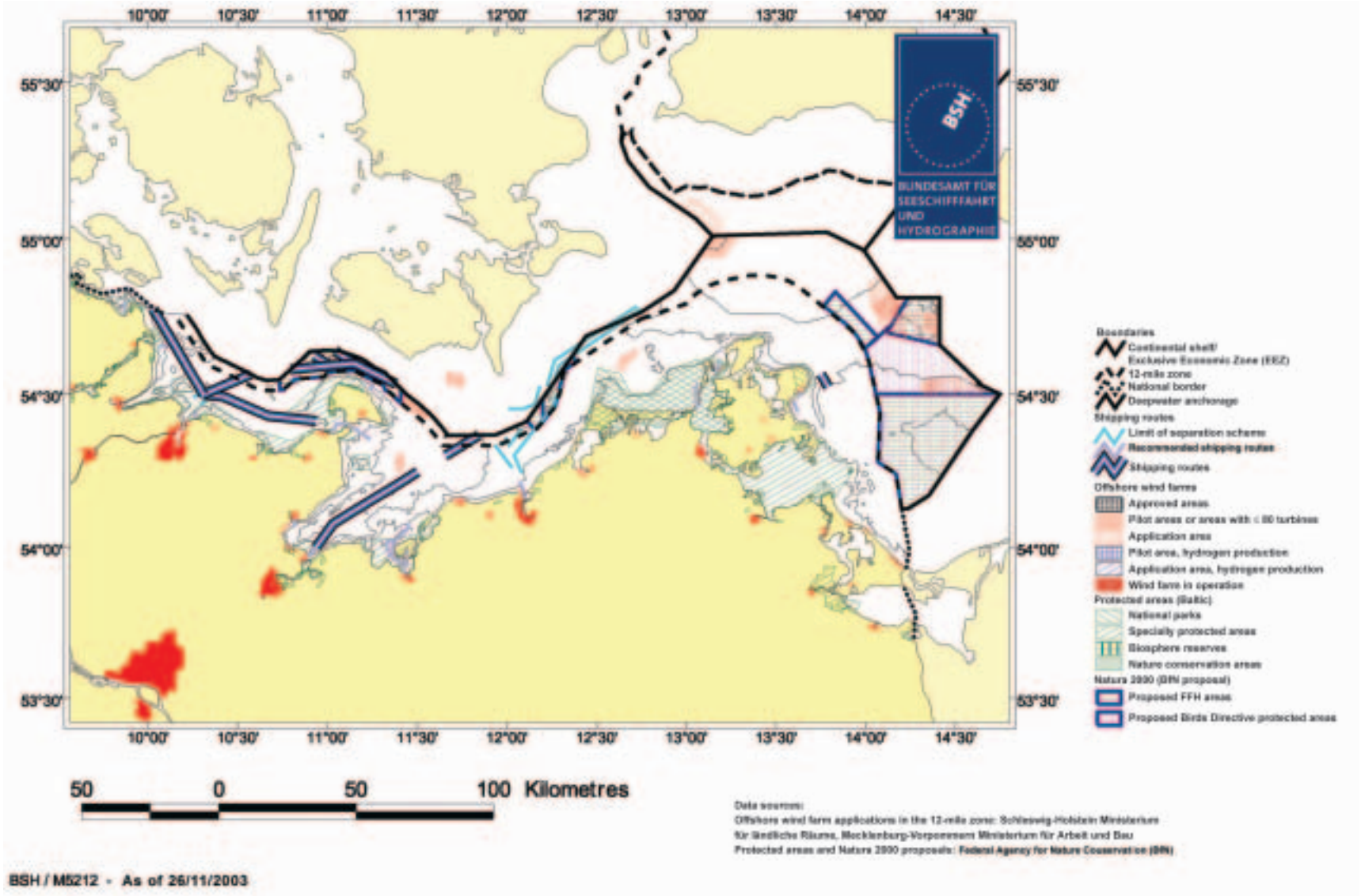
Source: BSH
[As of 2003-12-09]

North Sea: Wind park applications and environmental protected areas



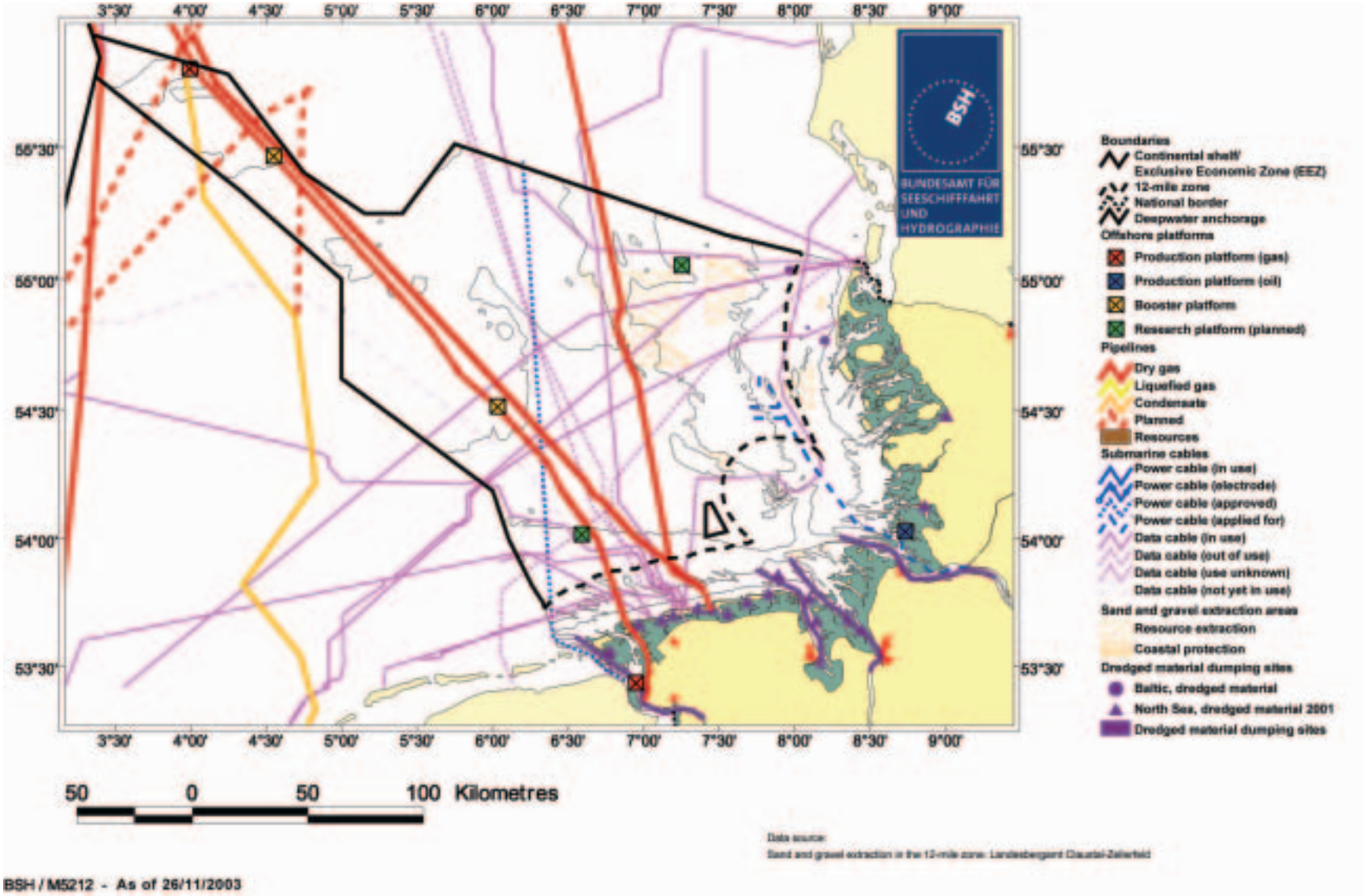
Source: BSH
[As of 2003-12-09]

Baltic Sea: Wind park applications and environmental protected areas



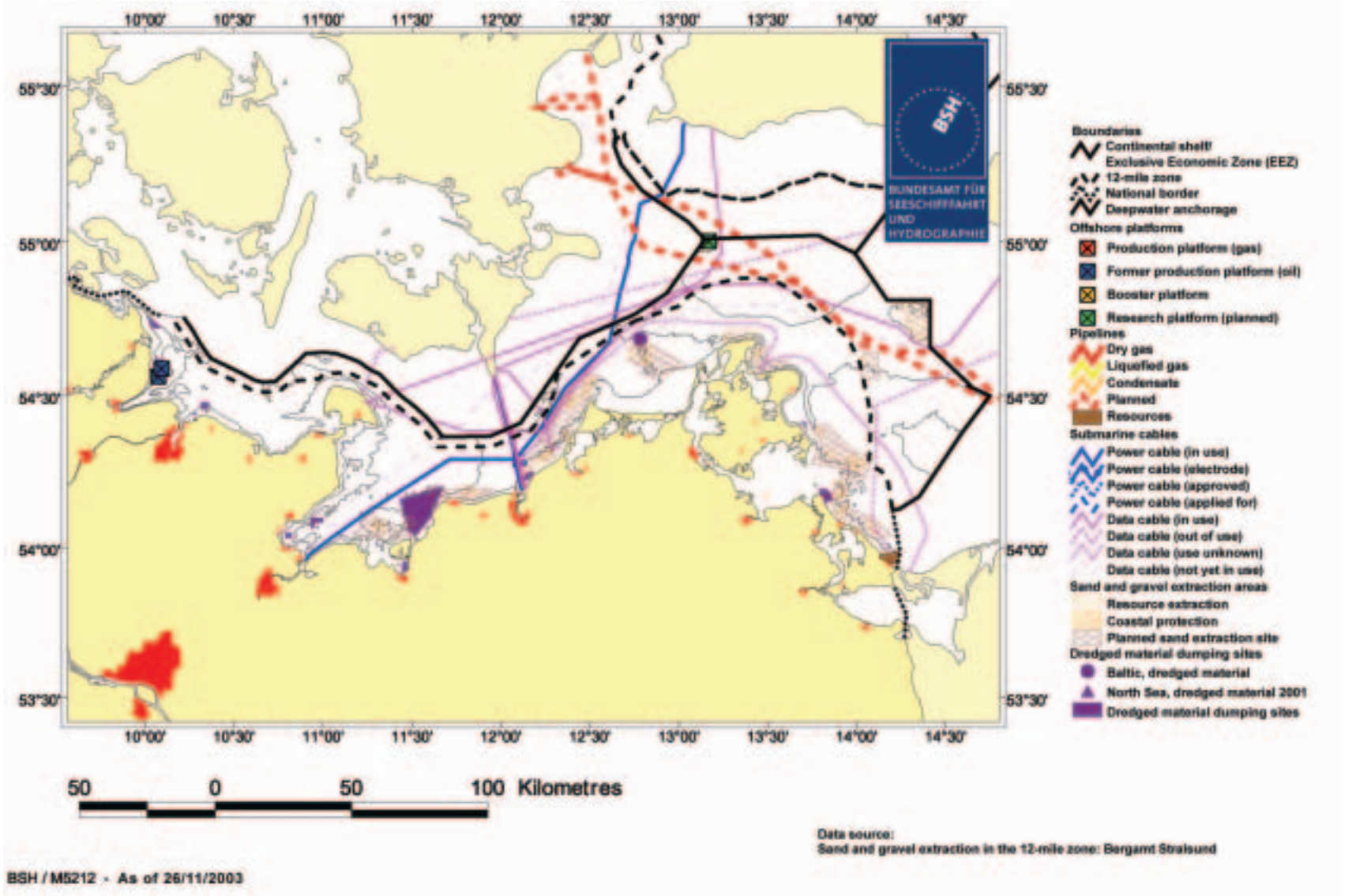
Source: BSH
[As of 2003-12-09]

North Sea: Cables, pipelines and sediment extraction and dumping areas



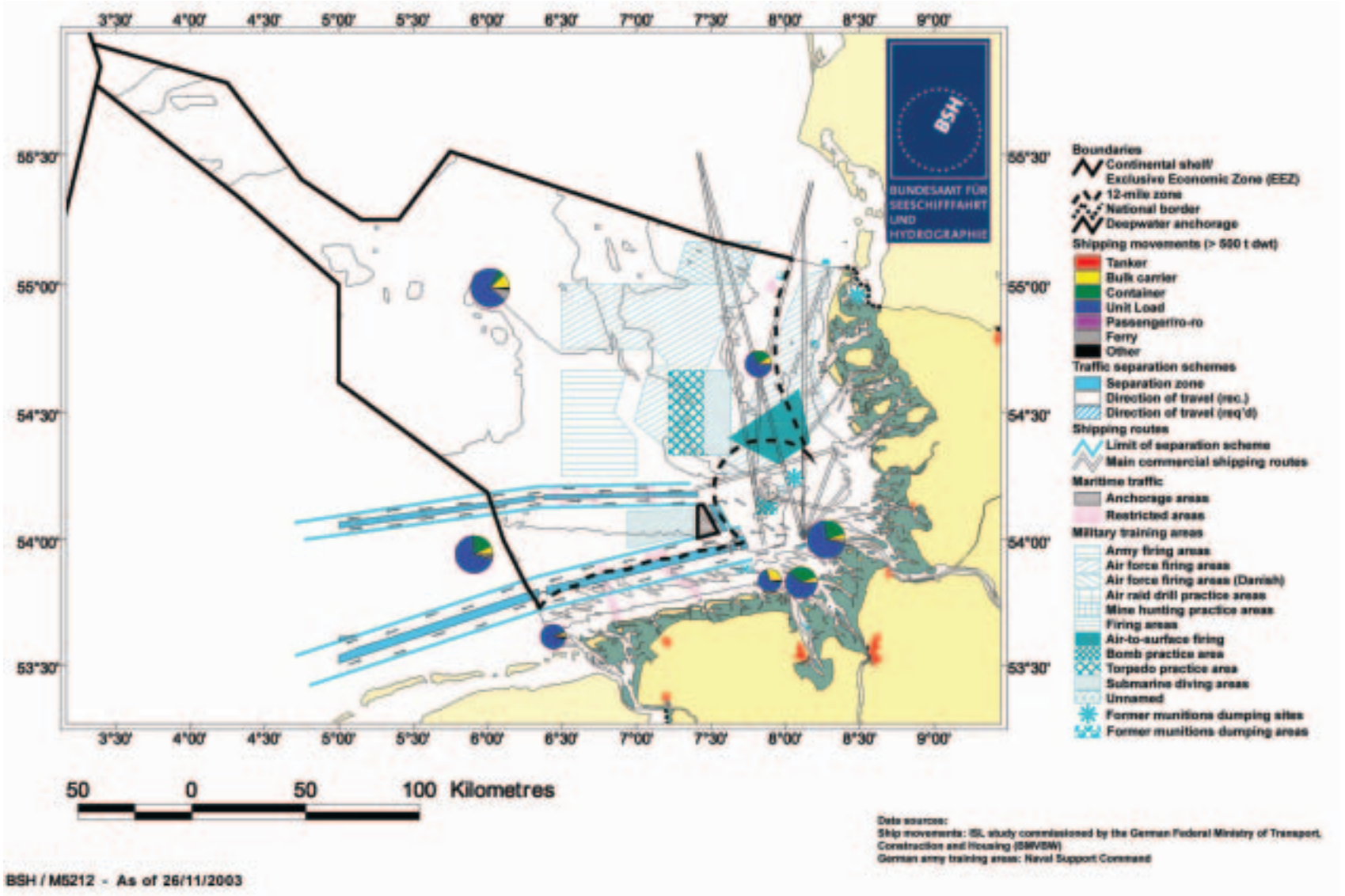
Source: BSH
[As of 2003-12-09]

Baltic Sea: Cables, pipelines and sediment extraction and dumping areas



Source: BSH
[As of 2003-12-09]

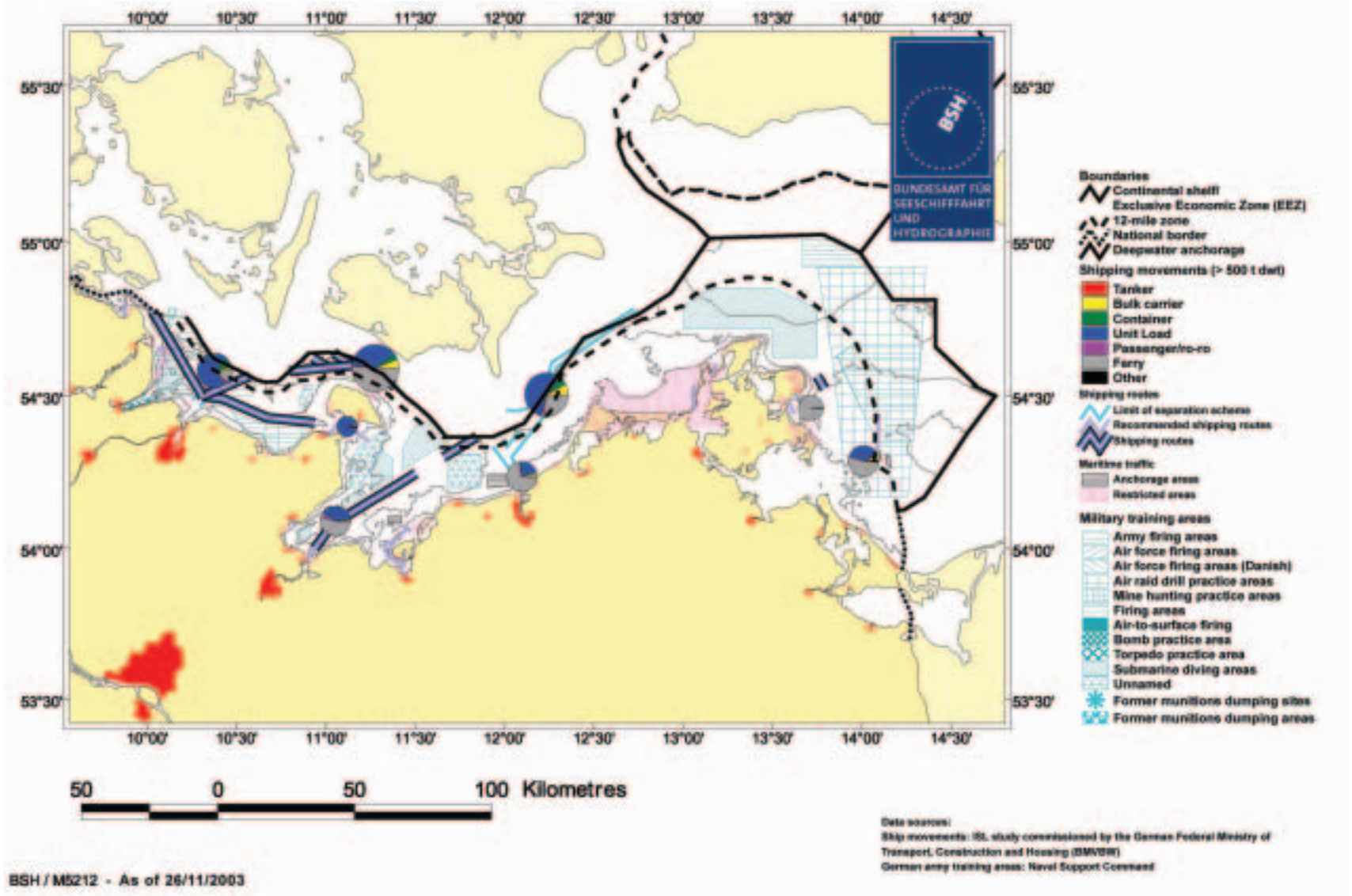
North Sea: Maritime traffic and military training areas



Source: BSH
[As of 2003-12-09]

Map 3-8a

Baltic Sea: Maritime traffic and military training areas



Source: BSH
[As of 2003-12-09]

HELCOM ship list
List of (very) high risk ships named by the EU Commission

Name of vessel	Type of vessel	Age	Detentions	Flag (*)
AIN TEMOUCHENT	Bulkcarrier	21	1	Algeria (Very high risk)
AIN OUSSERA	Bulkcarrier	20	1	Algeria (Very high risk)
NEDROMA	Bulkcarrier	25	1	Algeria (Very high risk)
BLIDA	Bulkcarrier	25	1	Algeria (Very high risk)
SERSOU	Bulkcarrier	21	1	Algeria (Very high risk)
AMIRA	Oil Tanker	7	1	Algeria (Very high risk)
EL DJAZAIR	Ro-Ro Passenger	32	1	Algeria (Very high risk)
HOGGAR	Ro-Ro Passenger	32	1	Algeria (Very high risk)
ZERALDA	Ro-Ro Passenger	32	1	Algeria (Very high risk)
GABRIELLE	Ro-Ro Passenger	38	4	Bolivia (Very high risk)
ALKYON	Ro-Ro Passenger	38	2	Bolivia (Very high risk)
EUROPA I	Ro-Ro Passenger	41	1	Bolivia (Very high risk)
TRINITY	Bulkcarrier	26	2	Cambodia (Very high risk)
LEGEND 1	Bulkcarrier	31	1	Cambodia (Very high risk)
RONGA	Bulkcarrier	31	1	Cambodia (Very high risk)
HANDY OCEAN	Bulkcarrier	26	1	Cambodia (Very high risk)
MED BULKER I	Bulkcarrier	25	1	Cambodia (Very high risk)
LAILA QUEEN	Bulkcarrier	26	1	Cambodia (Very high risk)
MED GENERAL IV	Bulkcarrier	31	1	Cambodia (Very high risk)
AL KHALED	Bulkcarrier	28	1	Cambodia (Very high risk)
BANAM	Bulkcarrier	40	1	Cambodia (Very high risk)
BELIZE CITY	Bulkcarrier	27	1	Cambodia (Very high risk)
BELMOPAN	Bulkcarrier	27	1	Cambodia (Very high risk)
FORT GEORGE	Bulkcarrier	28	1	Cambodia (Very high risk)
NICOLO ELISA	Bulkcarrier	28	1	Cambodia (Very high risk)
STAR	Bulkcarrier	28	1	Cambodia (Very high risk)
PURSAT	Bulkcarrier	40	1	Cambodia (Very high risk)
IULIANA T	Bulkcarrier	29	1	Georgia (Very high risk)
MELTEM G	Bulkcarrier	33	1	Georgia (Very high risk)
ARCHON	Oil Tanker	33	1	Honduras (Very high risk)
BLUE SEA	Bulkcarrier	27	1	Korean Dem. Rep. (Very high risk)
ALEXANDER K	Bulkcarrier	25	1	Lebanon (Very high risk)
ANGELA	Bulkcarrier	25	1	Lebanon (Very high risk)
FRINA	Bulkcarrier	30	2	Romania (Very high risk)
VALERIA	Bulkcarrier	27	2	Romania (Very high risk)
ALEXANDRU C	Bulkcarrier	28	1	Romania (Very high risk)
SABINA	Bulkcarrier	25	1	Romania (Very high risk)
TALIA S	Bulkcarrier	25	1	Romania (Very high risk)

Name of vessel	Type of vessel	Age	Detentions	Flag (*)
TIGRA	Bulkcarrier	26	1	Romania (Very high risk)
AHMAD-S	Bulkcarrier	21	1	Syrian Arab Republic (Very high risk)
SAMALI S	Bulkcarrier	27	1	Syrian Arab Republic (Very high risk)
MAI-S	Bulkcarrier	27	1	Syrian Arab Republic (Very high risk)
STARI GRAD	Oil Tanker	36	2	Tonga (Very high risk)
SLUNJ	Oil Tanker	43	1	Tonga (Very high risk)
SALIH C	Bulkcarrier	30	3	Turkey (Very high risk)
BERRAK N	Bulkcarrier	25	2	Turkey (Very high risk)
GULLUK	Bulkcarrier	23	2	Turkey (Very high risk)
ODIN BEY	Bulkcarrier	24	2	Turkey (Very high risk)
GOKHAN KIRAN	Bulkcarrier	18	2	Turkey (Very high risk)
HEREKE 4	Bulkcarrier	27	2	Turkey (Very high risk)
HILAL I	Bulkcarrier	26	2	Turkey (Very high risk)
SAPANCA	Bulkcarrier	28	2	Turkey (Very high risk)
GOLDEN S	Chemical Tanker	33	2	Turkey (Very high risk)
ALEMDAR 1	Oil Tanker	13	2	Turkey (Very high risk)
BOLU	Bulkcarrier	20	1	Turkey (Very high risk)
BURDUR	Bulkcarrier	21	1	Turkey (Very high risk)
ERKAN METE	Bulkcarrier	27	1	Turkey (Very high risk)
HAKKI DEVAL	Bulkcarrier	24	1	Turkey (Very high risk)
KIRAN PACIFIC	Bulkcarrier	17	1	Turkey (Very high risk)
MANYAS 1	Bulkcarrier	27	1	Turkey (Very high risk)
GULSER ANA	Bulkcarrier	18	1	Turkey (Very high risk)
KAPTAN NEVZAT KACAR	Bulkcarrier	19	1	Turkey (Very high risk)
OSMAN METE	Bulkcarrier	28	1	Turkey (Very high risk)
TAHIR KIRAN	Bulkcarrier	16	1	Turkey (Very high risk)
BARBAROS KIRAN	Bulkcarrier	18	1	Turkey (Very high risk)
BOLKAR	Bulkcarrier	22	1	Turkey (Very high risk)
C FILYOS	Bulkcarrier	13	1	Turkey (Very high risk)
HACI RESIT KALKAVAN	Bulkcarrier	25	1	Turkey (Very high risk)
MUZEYYEN ANA	Bulkcarrier	18	1	Turkey (Very high risk)
SOHRET	Bulkcarrier	31	1	Turkey (Very high risk)
SOLI	Bulkcarrier	26	1	Turkey (Very high risk)
ZEYNEP ANA	Bulkcarrier	26	1	Turkey (Very high risk)
ESIN S	Chemical Tanker	33	1	Turkey (Very high risk)
METIN KA	Chemical Tanker	30	1	Turkey (Very high risk)
HABAS	Gas Carrier	19	1	Turkey (Very high risk)
EMRE BENER	Oil Tanker	27	1	Turkey (Very high risk)
KAPTAN VEYSEL	Oil Tanker	25	1	Turkey (Very high risk)
VELI ALEMDAR	Oil Tanker	29	1	Turkey (Very high risk)
ANKARA	Ro-Ro Passenger	22	1	Turkey (Very high risk)

Name of vessel	Type of vessel	Age	Detentions	Flag (*)
KAPTAN BURHANETTIN ISIM	Ro-Ro Passenger	13	1	Turkey (Very high risk)
ARRAZI	Chemical Tanker	21	1	Morocco (High risk)
AL WAHDA	Oil Tanker	11	1	Morocco (High risk)
HECTOR	Bulkcarrier	25	2	St. Vincent & Grenadines (High risk)
MAPLE	Chemical Tanker	28	2	St. Vincent & Grenadines (High risk)
JOHANNA KATHRINA	Chemical Tanker	29	2	St. Vincent & Grenadines (High risk)
J SAFE	Bulkcarrier	21	1	St. Vincent & Grenadines (High risk)
KORO	Bulkcarrier	33	1	St. Vincent & Grenadines (High risk)
NESTOR C	Bulkcarrier	24	1	St. Vincent & Grenadines (High risk)
FIVOS	Bulkcarrier	25	1	St. Vincent & Grenadines (High risk)
LEPETANE	Bulkcarrier	29	1	St. Vincent & Grenadines (High risk)
SEA BRIGHT	Bulkcarrier	26	1	St. Vincent & Grenadines (High risk)
TITAN	Bulkcarrier	20	1	St. Vincent & Grenadines (High risk)
RHONE	Chemical Tanker	31	1	St. Vincent & Grenadines (High risk)
TAVIRA	Oil Tanker	25	1	St. Vincent & Grenadines (High risk)
PALOMA I	Ro-Ro Passenger	23	1	St. Vincent & Grenadines (High risk)
SUPERFERRY	Ro-Ro Passenger	31	1	St. Vincent & Grenadines (High risk)
BULK DIAMOND	Bulkcarrier	17	2	Cyprus (Medium risk)
PRINCESS ILARIA	Bulkcarrier	25	2	Cyprus (Medium risk)
BASKA	Bulkcarrier	28	2	Malta (Medium risk)
TIARELLA	Bulkcarrier	27	2	Malta (Medium risk)
ISMINI	Bulkcarrier	24	2	Malta (Medium risk)
GRAIN TRADER	Bulkcarrier	24	2	Malta (Medium risk)
TALYA I	Ro-Ro Passenger	35	3	Panama (Medium risk)
IRENE VE	Bulkcarrier	25	2	Panama (Medium risk)
AGIOS DIMITRIOS	Bulkcarrier	28	2	Panama (Medium risk)
FENIX	Bulkcarrier	24	2	Panama (Medium risk)
OCEAN SURF	Bulkcarrier	22	2	Panama (Medium risk)
PANDORA P	Bulkcarrier	20	2	Panama (Medium risk)
RODIN	Bulkcarrier	34	2	Panama (Medium risk)
PERGAMOS	Chemical Tanker	28	2	Panama (Medium risk)
TATRY	Chemical Tanker	28	2	Panama (Medium risk)
OLYMPIC PRIDE	Oil Tanker	21	2	Panama (Medium risk)

Source: After EU Commission Press Release IP/03/1116, Annex 3

The North Sea and Baltic marine environment remains heavily at risk. Overfishing, pollution, excessive nutrient run-off and intensive use of the region for shipping, raw material extraction and tourism all put marine ecosystems under massive pressure. Effective marine environment protection thus requires radical political action and fundamental policy correctives in fisheries, agriculture and chemicals regulation. These are the findings of the German Advisory Council on the Environment in its latest special report, Marine Environment Protection in the North and Baltic Seas.

The report:
- Surveys the key problem areas and the current situation.
- Identifies action needed in fisheries, chemicals, agricultural and shipping policy.
- Proposes an integrated European and national marine environment protection policy framework, including a marine planning regime.

The German Advisory Council on the Environment has advised the German Federal Government on environment policy issues since 1972. The current report follows on from a number of earlier studies on marine environment protection. The Council's membership, comprising university professors from a range of disciplines, ensures an academically neutral and comprehensive approach to the subject matter from natural science, economic, legal, political science and ethical perspectives.

ISBN-Nr. 3-8329-0943-5