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on the Environment

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The way forward**

**Chapter 1:**

**Pioneering  
an ecological  
transformation**

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## Section 1

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## 1 Pioneering an ecological transformation

### 1.1 Introduction

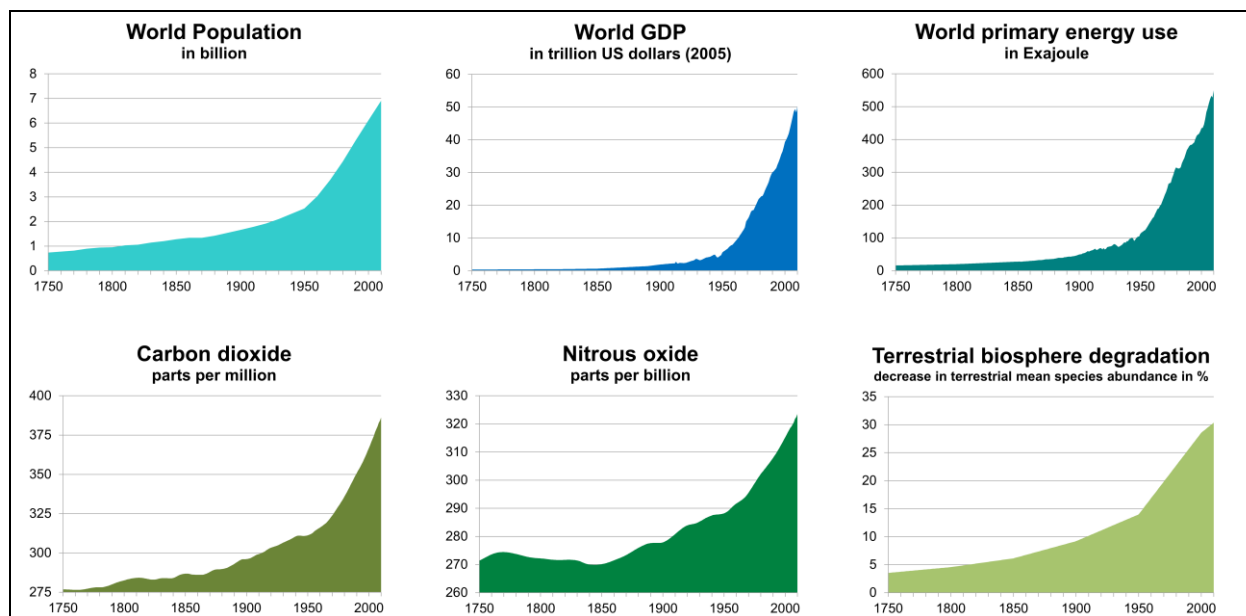
#### 1.1.1 Global growth trends call for an ecological transformation

14. Since the 1950s, socioeconomic growth trends have increased considerably worldwide in areas such as population growth, economic growth, traffic volume, food production and power generation (see Figure 1-1). At the same time, the ecological damage brought about by these evolutions has also increased dramatically in many domains. This in turn has increased the risk of abrupt and irreversible environmental change that could have serious social, political and

economic repercussions. In some areas, planetary boundaries have already been exceeded: the environment is overloaded with nutrients via crop and animal production, and biodiversity loss and climate change are worsening (IPCC 2014; ROCKSTRÖM et al. 2009; STEFFEN et al. 2015b; WBGU 2014b). The impact of human activity on the earth system today is so severe that scientists are now addressing the issue as to whether this evolution should be regarded as a new geological age, termed the Anthropocene (STEFFEN et al. 2015b; CRUTZEN 2002). In Europe as well, the environmental state in most domains is currently characterised by long-term negative trends, notwithstanding some improvements in soil, water and air quality (EEA 2015b; Statistisches Bundesamt 2014; MEYERHOFF and PETSCHOW 2014; Deutscher Bundestag 2015).

Figure 1-1

The growing pace of human impact on the earth system



SRU/UG 2016/Figure 1-1; data source: STEFFEN et al. 2015a

In light of the far-reaching reforms that are needed to counteract the dynamics of rising depletion of resources and sinks, the current environmental crisis poses not only a technical challenge, but above all a political and societal challenge. What is needed are not only new technical solutions, but also strategies that will orient policy decision making processes in democracies more toward these requirements and accelerate these processes as well.

#### 1.1.2 From technical protection of the environment to socioeconomic change

15. In the past, environmental policy was particularly successful as long as problems were clearly delineated, polluters were known, and technically effective solutions were available. Environmental

protection went hand in hand with economic success, provided that pioneering countries were able to develop products and technologies that did well in export markets. It also helped that the environmental policies in these pioneering countries were adopted by other countries around the world. However, this type of technical environmental protection did not bring about ecological restructuring, i.e. expanding ecologically sustainable sectors and shrinking highly polluting sectors.

This environmental protection paradigm has now reached its limits in many domains, particularly when it comes to environmental problems such as biodiversity loss and land use that can only be partly avoided through technical solutions (see Sections 4 and 5). And even where technical solutions work, there is a

risk that improvements will be absorbed in part or even completely due to an increase in economic activities that caused the pollution in the first place (e.g. increased transport volume) (SRU 2012).

In light of the global trends, it is urgent that fundamental reforms be instituted in various action fields. The German Advisory Council on the Environment (Sachverständigenrat für Umweltfragen – SRU) regards such an ecological transformation and fundamental changes in industrial society as a process that could take decades to unfold. These changes would involve not only radical technological change but also social and institutional innovations helping to keep economic activities within planetary limits (SRU 2012; SCHNEIDEWIND and SINGER-BRODOWSKI 2013).

The challenges that would need to be met to achieve this goal vary from one action field to another. Achieving the long-term goal of a climate-neutral Germany – which would entail the expansion of renewable energy and extensive electrification of numerous domains in a manner that radically alters the political and economic configuration of energy production – is a challenge for energy system flexibility and will require coordination on the part of many stakeholders and system components (SRU 2013b). Mere waste recycling alone is not enough to achieve the goal of closed-cycle management of raw materials. What is needed instead are new business models, as well as a transformation in product design and user behaviour. Transforming the agricultural sector will necessitate a paradigm shift that promotes environmentally compatible agricultural practices and new consumption patterns such as reduced meat consumption. Hence environmental policies should not be confined to promoting the expansion of classic environmental sectors and greater use of ecologically compatible technologies, but should also encompass social transformation processes (FANKHAUSER et al. 2013, p. 903; MOSTERT 2011, p. 404; EEA 2015b).

### 1.1.3 Germany's pioneering role for ecological transformations

**16.** Numerous actors in Germany and abroad have underscored the need to bring about far reaching transformation (REISCH and BIETZ 2014; Enquete-Kommission “Wachstum Wohlstand Lebensqualität” 2013; European Commission 2014b; WBGU 2014b; United Nations Secretary-General's High-Level Panel on Global Sustainability 2012; MEYERHOFF and PETSCHOW 2014; UBA 2013; United Nations – General Assembly 2015). However, their insights do not necessarily translate into specific steps leading to implementation. This section aims to shed greater light on the political and social factors that would pave the way for such a change; and in a subsequent step, describe how these factors relate to the main action fields for the transformation of environmental policy. Such action fields need to be conceived in both a domestic and international context. On these

grounds, this section addresses the connection between ecological transformation and pioneering ecological change.

**17.** Critics of efforts to bring about ecological transformation in Germany occasionally argue that Germany going it alone in this domain is not particularly useful for solving problems of global scope. The scientific advisory board of Germany's finance ministry claims that Germany, because of high economic costs, was “making payments in advance” in terms of climate protection, despite the fact that Germany's emission reduction efforts were fruitless in the absence of an effective global climate agreement (Wissenschaftlicher Beirat beim BMF 2010). In contrast, the SRU expressly advocates efforts to sustainably transform Germany's industrial sector and to place Germany in the vanguard of such efforts. Pioneering environmental policy means implementing innovations that set a good example and that are likely to be emulated by other countries. There are many sound reasons for adopting this approach:

- Global environmental policies require national pioneers. In the past, it was often a few countries whose pioneering policies paved the way for international agreements on the need for relatively high levels of environmental protection. In many cases, both European Union and international environmental protection efforts have been based on measures that have been previously proved successful at the national level (see Section 1.3). Pioneering ecological transformation can raise international awareness of the relevant ecological problems, point the way to solutions, and act as agenda-setters at international negotiations. Dynamic international environmental policies are unlikely to be instituted if no country actively pioneers such policies.
- Synergies can be utilised when it comes to the environmental protection on the local, national and global levels. For example, promoting ecologically sustainable modes of transport not only contributes to global climate protection, but can also improve local air quality, reduce traffic noise, and improve the quality of life in urban agglomerations (SRU 2012, Section 5). Such co-benefits are achieved through a so-called polycentric approach, whereby numerous actors adopt measures on various levels of action and learn from each other (OSTROM 2009). Multilateral climate policies must continue to significantly contribute to climate protection (see item 31). But even though a coherent global approach has not yet been achieved, this must not result in a situation where effective environmental policies are not forthcoming. The interaction between global top-down approaches and local bottom-up approaches was recently illustrated by the SRU in connection with the issue of nitrogen inputs (SRU 2015c, Sections 2 and 3).
- Germany is extremely well positioned to pioneer ecological transformation, thanks to, in particular,

its strong innovation system, the strength of its economy, and the generally widespread public support for an active environmental policy.

- Pioneering policies often enhance competitiveness. Regulations at the national level can promote the development of lead markets. For example, the proportion of Germany's economic activity accounted for by environmental sectors has grown steadily (see items 30 and 135).
- Germany's ecological footprint extends far beyond its borders. New consumption indicators show that Germany, via imports, makes extensive use of the natural resources of other countries, thus having a far stronger responsibility for sustainable resource use than purely domestic considerations suggest (BRINGEZU and SCHÜTZ 2014; EEA 2015b, p. 40 f.; HOFF et al. 2014).
- And finally, Germany simply cannot ask other nations to do what Germany itself does not. To be credible internationally in calling for protection of the natural basis of life, Germany will need to adopt the relevant measures – including unilateral ones, if necessary.

## 1.2 Recent theoretical approaches to transformation research

**18.** Existing research on environmental policy transformation processes is quite varied. Findings on transformation processes have emerged from a number of disciplines and fields of research, including (but not limited to) transition management, innovation and diffusion research, post-growth and eco-sufficiency research, and change management (SCHNEIDEWIND 2013; for a differentiated survey of the innovation-oriented literature see QUITZOW 2013). During the early days of transformation research, the focus was mainly on the impact of technical innovation on technological change (DOSI 1988). This perspective broadened over time, and change has come to be increasingly characterised as socio-technical change (GEELS 2004; MALERBA 2002). Social and institutional innovation are now being described as being among the main drivers of change (PEREZ 2009; SCHAFFRIN et al. 2014; NEGRO 2007; DOLATA 2009; HEKKERT et al. 2007; SCHNEIDEWIND 2013). Technical and social evolutions mutually adjust to each other, in a phenomenon known as co-evolution (GEELS 2004; HEKKERT et al. 2007; ROTMANS and LOORBACH 2008; DOLATA 2009; ROTMANS et al. 2001).

Research in these fields mainly focuses on the characteristics, key actors, mechanisms and drivers of ecological restructuring. The dynamics of change are also influenced by the public discourse, narratives and guiding principles occurring within the context of various action fields (SCOONES et al. 2015a; for a general assessment see GRIESSHAMMER and BROHMANN 2015).

**19.** Transformation research addresses the fundamental question as to how amenable transformation processes are to being managed. One view in the literature is that they cannot be steered in a centralised manner, but instead evolve as a series of not necessarily harmonious polycentric processes of change. The factors involved in this co-evolution include, for example, technological change, market trends, changes in social values, and social movements. Hence, on the one hand there is a greater need for steering and coordination; on the other hand there is no steering centre for these numerous trends. We refer to this phenomenon as a steering paradox. Against this backdrop, the role played by the state in the context of a market economy is being reassessed by scholars. Some authors take a sceptical view of the ability of governments to manage all these various processes of change (COLANDER and KUPERS 2014). But many authors take the view that government action is of major importance for successful transformation, because no other actor has comparable resources that are necessary to coordinate processes, scale individual innovations, and reduce uncertainty (MAZZUCATO 2015; GRIESSHAMMER and BROHMANN 2015; DOLATA 2008). Competitive markets will continue to play a central and indispensable role. Government action serves to establish suitable regulatory frameworks and guidelines, particularly in cases where external effects and other forms of market failure are detected.

### 1.2.1 The central role of innovation

**20.** Transformation processes begin with innovations (for an account of the basic pattern, see, in particular, GEELS 2004; 2002; GEELS and SCHOT 2007), often occurring in social and economic niches. Such niches – which in many cases are protected by political measures, non-governmental initiatives oriented towards the common good, or separate company divisions – are conducive to the development of radical innovations beyond habitual market and other rules, institutions and practices. Car-sharing and organic farming are examples of such phenomena.

**21.** Transformation processes reach a decisive stage when such niche innovations take on broader social, political and economic relevance, and thus also influence the relevant ground rules, standards, institutions, and constellations of power. This transition from niche innovation to an established system of rules has been described as a diffusion and acceleration process (NEGRO 2007), and is regarded by other authors as a process of searching that is barely amenable to planning. They thus view it as a conflictive process (NEWELL 2015).

Innovation is deemed a driver of change in cases where it competes with the rules and practices of existing domains (FLIGSTEIN and McADAM 2011, p. 9). As has been shown for various national climate protection goals and the expansion of renewable energy, mutual acceleration of political goals and measures, technological innovations and market dy-

namics in the relevant policy fields can be a key driver of transformational processes (JÄNICKE 2010; 2013).

Governments can be a drag on innovation – or can instead support and protect innovative niches by affording niche players space to experiment, granting them funding, or fostering the establishment of networks (LOORBACH und ROTMANS 2010; GEELS and SCHOT 2007; KEMP et al. 1998; MARKARD et al. 2012; FLIGSTEIN and McADAM 2011; BAUKNECHT et al. 2015). Governments can also provide guidance on the supply side (development of innovations) and the demand side (use of innovations). They can, not least, promote the diffusion of innovations to the next level and broader application of innovations.

#### The political dimension of transformation processes

**22.** In many cases merely promoting an innovation is not enough for it to be widely used (SZARKA 2012; HOWLETT 2014). The main reasons for this are (a) technological and institutional path dependencies that have become entrenched over time; and (b) strategies on the part of established industrial and other actors aimed at thwarting innovative practices (SZARKA 2012). It is only recently that transformation researchers have explicitly looked at this political dimension (GEELS 2014; LOCKWOOD 2015; MEADOWCROFT 2009; SCOONES et al. 2015b; NEWELL 2015; JORDAN and MATT 2014). Previously, transformation research in the social sciences mainly studied the state not so much from a political power and political interests perspective (STIRLING 2014; on the concept of power in environmental policy research see PARTZSCH 2015; WEILAND and PARTZSCH 2015), but rather from a governance and institutional perspective.

**23.** These approaches are rooted in a broader understanding of transformation processes. Hence recent research defines transformation as a fundamental restructuring of the balance of power within a strategic action field (FLIGSTEIN and McADAM 2011; NEWELL 2015; GEELS 2014, pp.15 and 17; STIRLING 2014). According to this view, most drivers of innovation are increasingly at odds with the logic of existing action fields, thus making innovation more than a matter of mere socio-technical change. Innovation alters the balance of power (albeit oftentimes only incrementally) between coalitions with a vested interest in the status quo, and change-oriented actors. The resulting balance of power and conflicts of interest determine the extent to which change can occur, and the types of change that are possible (FLIGSTEIN and McADAM 2011).

The underlying dynamics of this process are described as follows in the literature: Those who initiate change wish to see innovations emerge from their niche and become widely diffused, and thus pose a challenge to the status quo. Hence they are referred to as challengers, whose opponents are those interested in maintain-

ing the status quo, referred to as incumbents (SCHNEIDER and VEUGELERS 2010; WELLS and NIEUWENHUIS 2012; HESS 2014; GEELS 2014; SMINK et al. 2015; KUNGL 2015; WASSERMANN et al. 2015). In the interest of rendering these groups amenable to analysis, they are characterised as follows in the literature:

In theory, incumbents are expected to defend the status quo or strive to maintain the stability of a given action field. Status quo interests are advocated by those actors who have a disproportionately large influence on a given action field and whose interests and views find greatest expression in the prevailing organisational forms of the relevant action fields (FLIGSTEIN and McADAM 2011, p. 5). They are reluctant to participate in innovative markets, particularly if they are afraid of incurring losses in their established areas of business activity. They are also more open to incremental improvement than to radical innovation (SCHNEIDER and VEUGELERS 2010).

**24.** Strong influence of status quo actors over a given action field can result in what is known as lock-in effects, in whose presence any change in the status quo is precluded, even in cases where it would be advantageous from a social or economic standpoint. The costs that interest groups fear would arise from change prompt them to oppose a fundamental transformation. One example of a lock-in effect is the continued expansion of carbon intensive energy systems, despite the availability of alternative energy sources (UNRUH 2000, p. 8 ff.; HOLM-MÜLLER and WEBER 2010). There are various types of interest groups that can be characterised as incumbents. Hence governments may also wish to strengthen, for a particular action field, the predominant logic that drives their own actions (see item 27 f.). This typically protects the interests of incumbents (FLIGSTEIN and McADAM 2011, p. 6; GEELS 2014, p. 7). For this reason, fundamental change processes require a reorientation of government intervention (FLIGSTEIN and McADAM 2011, p. 15). Lock-in effects can also occur within individual industries and companies that are opposed to social change (WELLS and NIEUWENHUIS 2012, p. 1687).

**25.** Challengers, contrary to incumbents, comprise actors that occupy niches and have relatively little influence over the modes of operation of a given action field (FLIGSTEIN and McADAM 2011, p. 6). They pose a challenge to status quo socio-technical systems, and aim at transformational change. However, they receive little political, administrative or public support. In contrast, status quo practices driven by the vested interests of incumbents are largely accepted and supported (usually over lengthy periods) by government and social actors (ibid. pp. 9, 14 and 17). This constitutes an additional obstacle to innovation that challengers need to surmount.

Affiliation with a given interest group can evolve over time. Moreover, the same stakeholders and vested interests in a particular action field may advocate the



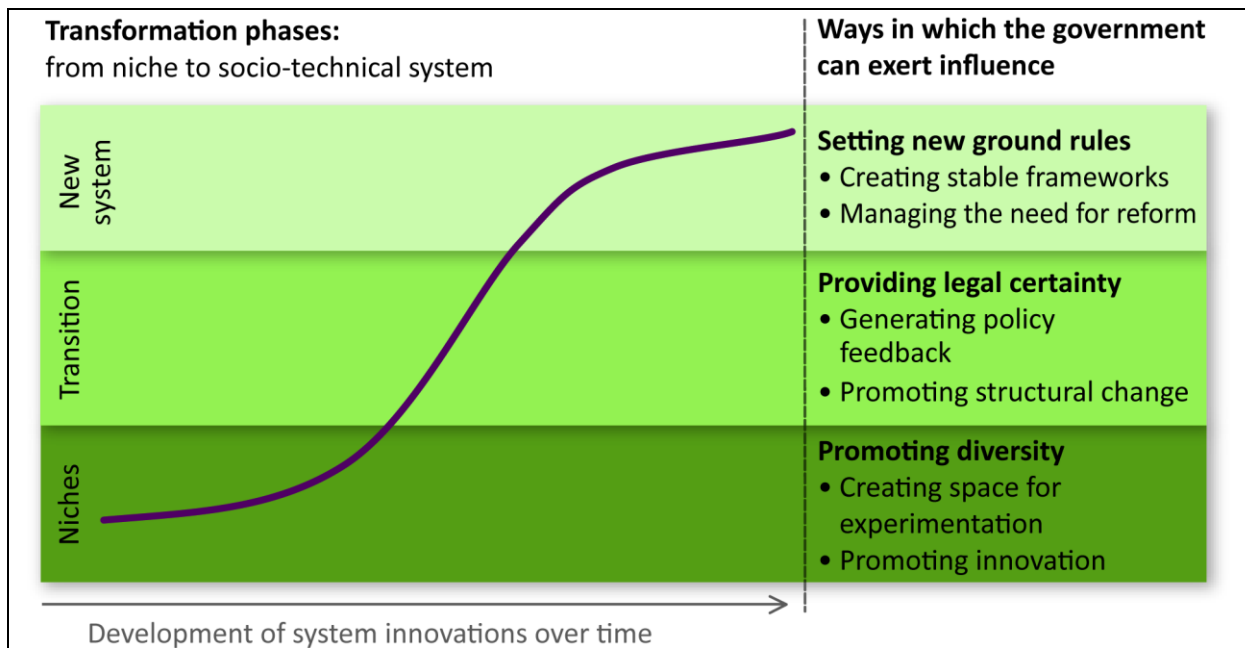
interests of incumbents in one field, while advocating the interests of challengers in another. Challengers can also be in competition with each other.

In order for phases of uncertainty to be used productively to support the desired transformation, government players can support change processes, particularly by doing the following: (a) targeting the inhibitory

dynamics in a given action field; (b) give stronger weighing to long term-oriented factual judgements beyond status quo interests; (c) allowing challengers to participate in the relevant decision making processes; and (d) strengthening the advocates of reform among those who principally defend status quo interests (ibid. p. 17).

Figure 1-2

**The role of state governance in innovation processes**



SRU/UG 2016/Figure 1-2

Figure 1-2 shows the various tasks of government steering and ascribes them to phases in a transformation process. As this graphic shows, the key tasks of government steering extend beyond merely promoting innovation. While the role of governments in the initial phases of transformation processes is mainly to promote the development of innovations, as these processes unfold governments also need to establish a stable and reliable framework for stakeholders, and address the problems of stakeholders who lose out due to structural change. In a new system, it falls to the government to create and maintain a stable policy framework.

**1.2.2 The government’s role in shaping structural change**

**26.** Innovation policies have thus far tended to focus on subsidising innovation and laying the groundwork for the launch of new products. But experience has shown that promoting innovation is not enough to bring about structural change. In order for transformation processes to achieve success, inhibitory structures must be cut back. In other words, structural change must be shaped and coordinated in the

political sphere, so as to allow the interests of competing social groups to be balanced, and accelerate transformation processes. This in turn means fostering not only technological change, but also the co-transformation of industry structures and the related social effects, such as in phasing out coal or transitioning to electric vehicles (SRU 2015a).

**1.2.2.1 Utilise feedback processes**

**27.** The transitional phases of transformation processes are particularly challenging when it comes to political steering (LOCKWOOD 2015). Altering political routines, entrenched over a lengthy period (and thus stable), and overcoming path dependencies and instrumental lock-in effects is a particularly knotty problem (JORDAN et al. 2012; UNRUH 2000; also see item 22). Hence transformation policymakers are faced with a paradox. They need to respond flexibly to change and have the capacity to adjust course as necessary, but at the same time reduce uncertainty, so as to provide potential investors with a suitable investment framework. Sometimes policymakers are faced with the task of adapting regulations that stand in the way of transformation. The concept of reflexive gov-

ernance meets these requirements entailed by complex socio-ecological and socio-technological problems via a strategy involving joint learning, experimentation and adaptation processes (VOSS and BORNEMANN 2011). This in turn necessitates knowledge-based, open, participatory, pluralistic and deliberative processes and institutions. Reflexive governance can be realised by shaping feedback processes via elements such as the ground rules of political processes, or instrument design. Over a period of several political cycles, the desired incentive effect of policy instruments will be reinforced and optimised via feedback mechanisms – thus also allowing for unsuitable governance initiatives to be modified.

#### Positive and negative policy feedback

**28.** Policy feedback is a political strategy that deliberately and incrementally shapes the conditions and balance of power for future political action (JORDAN and MATT 2014). In this context, “positive” policy feedback is defined as a process that helps to strengthen and stabilise a desired goal and that relies on enhanced feedback effects. In this process, a given policy measure strengthens the economic clout of a coalition of players that support this goal, so that in turn this coalition pushes for an adjustment of the initial governance initiatives. Negative policy feedback, on the other hand, is a mechanism whereby opponents of a policy objective are gradually weakened through policy measures. Shaping policy feedback can thus help to overcome path dependencies and deliberately influence such path dependencies, as well as lock-in effects (JORDAN and MATT 2014). Particularly in terms of transformation processes that aim to create a more sustainable society, some authors regard the active shaping of both of these types of policy feedback as crucial when it comes to providing targeted support for environmental and sustainability policy actors – in view of the fact that the latter tend to be under-represented and less well organised than players in the manufacturing domain (LOCKWOOD 2015; ANDERSEN and WOYKE 2003).

Reviewing processes and monitoring mechanisms provide opportunities to re-evaluate policy measures. They are thus a vital instrument of reflexive governance, create opportunities for adaptation to new circumstances, and trigger feedback processes, with a view to enhancing the desired effects (JORDAN and MATT 2014). Monitoring mechanisms create transparency and thus help to counteract the tendency on the part of some actors to be so-called free riders, i.e. to profit from common goods resources without contributing to their preservation. Opening up political decision making to heretofore excluded actors can allow for the use of untold stores of knowledge – which in turn would allow for the identification of innovations that would be accepted by the general public. In this regard, participatory processes are helpful for policymakers, to whom it then falls, during transitional periods, to identify and strengthen trends regarded as desirable by society at large, and to fore-

stall the fragmentation of innovation processes (NEWELL 2015; JACOBS and WEAVER 2015; STEVENSON and DRYZEK 2014; concerning the basic strategies of decision makers, see FLIGSTEIN and McADAM 2011, p. 17).

#### 1.2.2.2 The significance of new alliances

**29.** Transformations always entail a social dimension, in that they require the support, resources and knowledge of numerous interest groups. There are many approaches in social science research that shed light on how innovative ideas are supported by robust coalitions of interest groups. In order for such coalitions to be formed, the groups need to share a common goal. The more they agree in terms of not only their political goals, but also their core values, the more stable such coalitions are (SABATIER 1993). The prevalent concepts in this domain are advocacy coalition frameworks (*ibid.*), discourse coalitions (HAJER 1997) and transnational advocacy networks (KECK and SIKKINK 1999).

Framing and narratives can help government players to build coalitions, in that they promote the creation of crystallisation points for the identification of common goals and values, and raise awareness of the relevant co-benefits. Apart from promoting coalition building, narratives have a stabilising effect on coalitions and endow them with greater political clout (VAN ASSCHE et al. 2014; LEIPPRAND et al. 2016); they also promote discourse diffusion (KOOIJA et al. 2014) and can thus support transformational processes. But non-government players also make greater use of the power of discourse (particularly in cases where material resources are scarce), in the interest of enabling their interests and ideas to gain traction through mutual learning and persuasion (KECK and SIKKINK 1999; STONE 2000; TEWS 2002; WEILAND and PARTZSCH 2015). Government players can make a key contribution to framing and alliance formation for ecological transformation, by initiating participatory strategic processes and long-term roadmaps, as has been repeatedly recommended by the SRU – measures that have also been implemented on numerous occasions.

### 1.3 Transformation oriented policies in multi-level systems

#### 1.3.1 International diffusion of innovations by pioneering countries

**30.** In a globalised and interconnected world, change necessarily unfolds within a complex system comprising local, regional, national and international levels. Hence ecological transformations cannot be conceived as merely a national concern. Nonetheless, nation-states play a decisive role in environmental policies, as has been shown by research on pioneering countries (HOLZINGER 1994; JÄNICKE und WEIDNER 1997; ANDERSEN and LIEFFERINK 1997; LIEFFERINK and ANDERSEN 1998). These

studies, which explore the impact of ambitious national policies on the shaping of regulatory trends, show that pioneers also promote international innovations in that they demonstrate the technological and economic feasibility of environmental policy solutions and in so doing legitimise the introduction of such policies in other countries (JÄNICKE 2005, p. 140; LIEFFERINK et al. 2009; KNILL et al. 2012). The diffusion of stringent environmental standards and other policy instruments (BUSCH and JÖRGENS 2012) accelerates change in environmental policies (JÄNICKE 2012a; 2014). It has been shown many times that pioneering policies render pioneering countries more competitive, and strengthen them in numerous cases: national standards are diffused internationally, national regulations promote the early emergence of lead markets and open up export opportunities – and in some cases a pioneering environment attracts investors (BEISE et al. 2003; JACOB et al. 2005; BEISE 2004; CLEFF and RENNINGS 2012; QUITZOW et al. 2014; DE CIAN et al. 2012; on the internationalisation of innovation systems, see CARLSSON 2006; for more recent research results on the Porter hypothesis see ANDRÉ et al. 2009; CONSTANTINI and MAZZANTI 2012; SCHWAB und SALA-I-MARTÍN 2014, p. 55).

#### Significance of pioneer countries for a transformational agenda

**31.** Environmental research in the social sciences in recent decades has shown that nation-states adopting proactive and ambitious environmental policies can bring about both ecological and economic advantages. However, a significant portion of research being done on pioneering countries is rooted in a purely technical understanding of innovation (WEIDNER 2008, pp. 11 and 22; JÄNICKE and JACOB 2004; JÄNICKE 2005). Technical innovations and individual environmental policy measures lend themselves more readily to globalisation than is the case with complex socio-technical transformations. The dynamics of political processes in a given country are heavily influenced by its electoral system, institutions, political discourse, lines of conflict, and economic structures (von PRITTWITZ 2007). Only if such structures turn out to be compatible with the transfer per se can the policies of one country be successfully diffused internationally (DOLOWITZ and MARSH 2000; ROSE 2002; MOSSBERGER and WOLNAM 2003; TEWS and JÄNICKE 2005; STONE 1999; 2000; KECK and SIKKINK 1999; TEWS et al. 2003). It is thus obvious that complex and normative processes of social change involving evolutions such as an energy or mobility transition are more difficult to transpose to other countries. But even if each country develops its own specific transformation pathway, economic opportunities can potentially still open up for pioneering countries.

In this context, pioneering countries could be instrumental in obtaining international alliance partners for change processes and helping to shape the relevant

international discourse. Transnational communication increases the likelihood that one country will adopt another country's policies (HOLZINGER and KNILL 2004). This dynamic is strengthened by continued globalisation and interconnection, which also leads to the internationalisation of sectors that are incentivised by regulation. Successful implementation of pioneering policy can be a starting point for the development and strengthening of a shared identity on the part of innovation oriented stakeholders across national borders. Appealing policy models may promote the diffusion of political ideas and values, via so-called soft power (NYE 2004). Insofar as innovative policies uncover expanding menus of alternatives, they can also promote the expansion of coalitions of actors that promote change (JACOBS and WEAVER 2015, p. 448 f.).

#### Good prospects for Germany as vanguard of ecological transformations

**32.** Certain conditions, as well situational and strategic factors, can be beneficial for a particular nation to successfully assume a pioneering role in transformation processes. The studies discussed in this section show that Germany is well positioned in this regard.

**33.** The actions of a pioneering country correlate with the presence of a highly developed economy (JÄNICKE 2005; SCHWAB and SALA-I-MARTÍN 2014; VOGEL 1997). Germany is the largest economy in the European Union, accounting for around 20 per cent of the EU's GDP (Statista 2015). The policies of a large industrial nation such as Germany are monitored closely by other countries, as the German *Energiewende* shows. Thus, a strong economic performance can also enhance the model's appeal for other countries.

Germany, along with Sweden, Denmark and Finland, ranks among the EU countries with the highest innovation capacity (European Commission 2014d). In this regard, Germany's innovation system is notable for, among other things, tight networking between companies and research institutions. The country is one of the world's leading technology-product export nation (BMBF 2014a), and has also successfully improved and strengthened its capacity for technical innovation relative to that of other countries, ("Kommission gibt Startschuss für neuen Innovationsindikator", Press release of the European Commission, 13 September 2013; Deutsche Telekom Stiftung et al. 2014). This evolution is primarily ascribable to the fact that Germany's SME sector is highly specialised and well networked (HARTMANN et al. 2014). Germany has the capacity to bring about the complex innovations needed to successfully set in motion and accelerate far-reaching processes of social change (NEUMANN et al. 2015). Its capacity for innovation is particularly notable in the field of ecologically sustainable technologies, and the country is invariably ranked among the top performers in comparative studies of various

countries (FANKHAUSER et al. 2013; van der SLOT and van den BERG 2012; HANEMAAIJER et al. 2014). All in all, Germany's environmental sector has reached a high level of development. The share of GDP accounted for by this sector has been rising steadily for years, and with 13 per cent in 2013 has reached a comparatively high level (BÜCHELE et al. 2014, p. 9; van der SLOT and van den BERG 2012).

**34.** Another key requirement for a pioneering role is that a country's political institutions need to function well (JÄNICKE 2005; SCHWAB and SALA-I-MARTÍN 2014). Empirical research has shown that the state plays a crucial role in the development of innovation and technology paths, and in this context can also be regarded as an "entrepreneurial state" (MAZZUCATO 2014). This holds true in particular for the environmental domain (JÄNICKE 2012b). Apart from being a stable democracy with a reliable legal system, Germany also sets proactive environmental policy that can rely on a cross-party fundamental consensus. Moreover, Germany has put in place strategies and instruments that fund environmental innovations through measures such as the environmental innovation programme. This not only allows for the creation of key institutions that make it easier for environmental technology innovators to access the relevant markets, but also reinforces participatory processes and knowledge based discourse. In its 2015 environmental report, the German government announced its intention of reaching long-term objectives and addressing key issues through an integrated environmental programme, stating that the programme's goal "is to pursue a transformational approach that regards environmental policy as a driver of a sustainable society" (Deutscher Bundestag 2015, p. 183).

Concurrently with the emergence of industries that have brought about innovations in the field of environmental technology, a dynamic research landscape has emerged, has diversified and has demonstrated its competencies in this domain (SPERFELD and ZSCHIESCHE 2015, pp. 27 and 75 f.), going far beyond the kind of traditional research done at universities and research institutions. At every level of German administrations, environmental and climate policy integration processes unfold – which, however, need to be expanded and intensified still further, to enable sector policies such as transport policy and agricultural policy to focus more strongly on sustainability (SRU 2012, Section 11).

**35.** Broad public acceptance of environmental protection and an active civil society have also been identified as key requirements for a country to play a pioneering role in environmental policy (JÄNICKE 2005). The German public exhibits a high degree of environmental consciousness, with a post-materialistic attitude being relatively widespread. An overwhelming majority (86 per cent) of the German population is in favour of robust environmental policies at the national level, while the majority sees beneficial syner-

gies between environmental and economic goals such as competitiveness, affluence and jobs (BMUB and UBA 2015). Environmental protection also enjoys broad civil society support. While numerous opportunities to participate in environmental policies are available at the local and regional levels, environmental policy at the national level largely used to be influenced by the German corporatist tradition. In this context, the main participants in the policy formulation process are large powerful interest groups, whereas smaller groups of actors and the general public are largely excluded from the pre-parliamentary process in particular (for an account of the organisational structure of interest-group representation in Germany, see ANDERSEN and WOYKE 2003; VOELZKOW 2007). Changes aimed at bringing about greater transparency and participation are particularly prevalent in the environmental and energy policy sectors that come into play for ecological transformation. Examples can be found in the German *Energiewende*, in climate and resource policy, and within the framework of the research agenda processes.

### 1.3.2 Significance of a pioneering role in the EU multi-level system

**36.** The EU policy level is of crucial importance for national transformation policies and the related restrictions on and opportunities for action. Pioneers are of paramount importance in the EU, in that they provide fresh impetus for EU policies and in so doing help to create dynamic multi-level integration. Ambitious EU environmental policies in turn promote the emergence of transformational national policies. The EU plays an important part in the shaping of international environmental agreements, and has the capacity to initiate reinforcing processes in this regard.

#### Limited leeway for member states in the European single market

**37.** Certain EU action fields are Europeanised to a very high degree, in particular the single market, agricultural and structural policy, and environmental policy. The EU sets ground rules for these policy domains and establishes frameworks that the member states are required to adhere to. In this context, national policies are required to be "compatible with Community principles" – which means that they must be consistent with the particular importance placed on European market integration, and must implement various market-making policies (SCHARPF 1999; 2003; KNILL 2003; GEHRING 1996). In this regard, then, the EU is a limiting factor on the actions that member states are allowed to take.

However, there is still considerable leeway when it comes to implementation. For example, EU environmental policies often need to be transposed into national laws. For instance, the EU directive that regulates pollutant emissions from industrial installations sets only minimum standards. Member states are free to tighten these standards, via more stringent protec-

tive measures under Article 193 Treaty on the Functioning of the European Union (TFEU) (concerning these requirements, see CALLIESS/RUFFERT 2011, Art. 193 no. 1 ff.). EU environmental action targets rely largely on differentiated contributions (target/burden sharing) when it comes to reaching EU targets (GEHRING 1996; SRU 2007).

#### Europeanisation of national pioneering roles

**38.** The European Union has developed efficient mechanisms that allow for expeditious Europeanisation of national policies, particularly in cases where national measures could undermine the single market. This applies, for example, to product related environmental standards (GEHRING 1996; HOLZINGER and SOMMERER 2011; KNILL 2003) and waste management policy (TÖLLER 2012) – but also in part to EU climate and energy policy (SCHREURS and TIBERGHIE 2010; WETTESTAD et al. 2012; CALLIESS and HEY 2013b; JORDAN and RAYNER 2010). A comparison of 17 environmental policy measures from the years 1979 to 2000 reveal that EU consensus are more likely to be reached at a relatively high level (raise to the top) than at the level of the lowest common denominator (raise to the bottom) (HOLZINGER and SOMMERER 2011). The need for harmonisation was particularly urgent for product standards, to avoid national trade restrictions. In this context, environmental policy often became more ambitious (concerning the influences in this regard, see HOLZINGER and SOMMERER 2011, p. 230; HOLZINGER 2003; SCHARPF 1997, p. 522; 2003; for international examples see VOGEL 1997; DREZNER 2001). Pioneering EU member states are incentivised to Europeanise their environmental policies by virtue of the fact that doing so stabilises national innovations, and exporting model policies can potentially open up new markets and minimise the national costs of adapting to EU requirements (HÉRITIER et al. 1994; KNILL 2003, S. 124 f.; KNILL et al. 2012).

Owing to its right of initiative, the European Commission plays a special role in this institutional system. Because the Commission uses national regulatory systems and solutions as a blueprint for its own recommendations, it often rewards pioneering member states. Hence in contrast to the so-called initiation dilemma in the field of international negotiations, pioneering countries are at an advantage, as they have a better chance of seeing their own model adopted by

the European Commission – and thus Europeanised (GEHRING 1994, p. 229; KNILL 2003, p. 131 f.).

The EU's institutional system is regarded as being relatively receptive to innovative problem solving (PETERS 1994). At the same time, the EU has developed a consensus-oriented political culture and institutions in which the member states work together to reach compromise solutions (NEYER 2004; 2006; JACHTENFUCHS 2008, p. 393 f.; EICHENER 2000; GEHRING 2000). This basically opens up opportunities for the Europeanisation of national transformational policies – and thus also for their domestic-policy stabilisation.

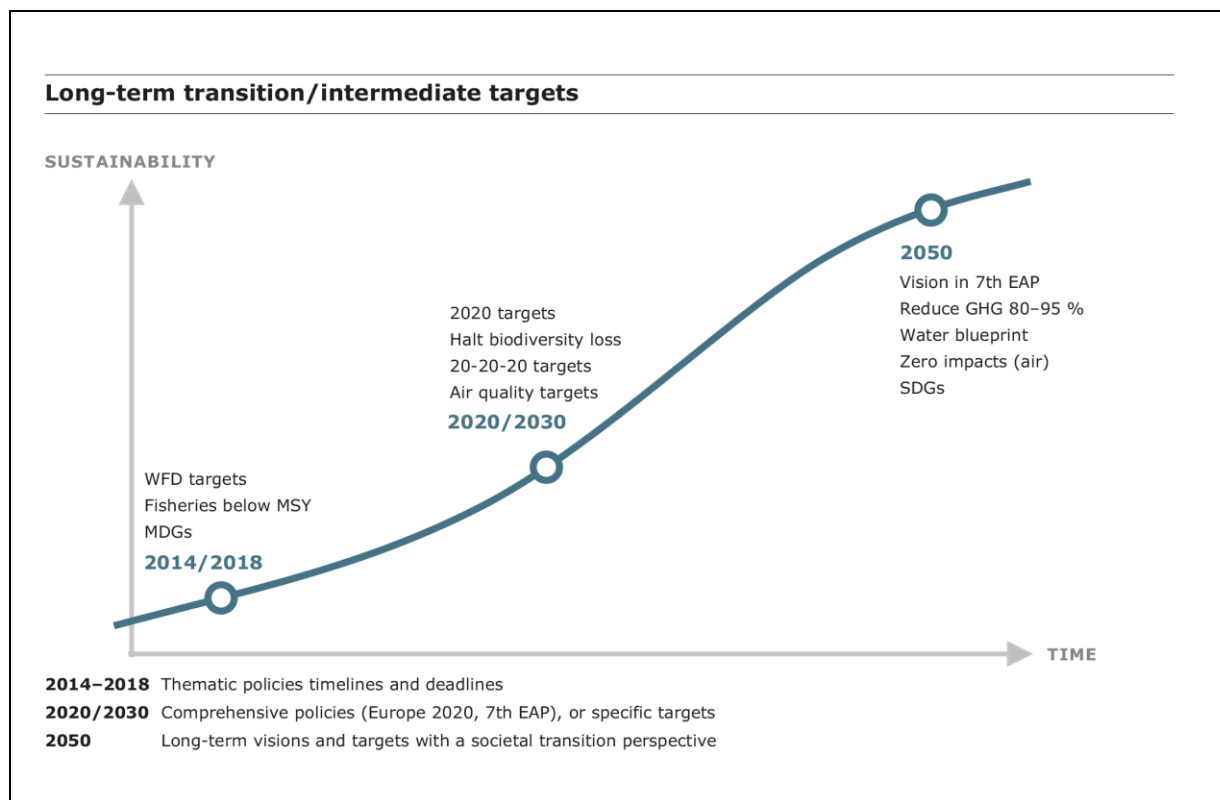
Moreover, the European Union is a key link between global and national environmental policies. It often sees itself as the driving force behind international environmental agreements, and thus seeks to set a good example when it comes to planning and implementing measures (OBERTHÜR and RABITZ 2014; OBERTHÜR and GROEN 2014; OBERTHÜR 2008).

#### Cycles of European Union environmental policy

**39.** In recent years, the European Commission has issued numerous strategy papers setting forth a transformational agenda, examples being the roadmap for a climate friendly economy by 2050 and the resource efficiency plan (SRU 2012, item 686 ff.), the biodiversity strategy, and the 7th Environmental Action Programme with its vision of a good life within planetary boundaries (HEY 2014; EEA 2015b; European Commission 2014b).

Figure 1-3 shows that an ambitious transformation agenda for the EU has already been formulated. This European Commission agenda has already been endorsed in part (e.g. the decarbonisation of the European economy) by the European Council, the EU Council of Ministers, and the European Parliament – and thus has the capacity to bring about a transformational agenda in strategic action areas. This creates numerous starting points (in particular in the interplay with member states that are pursuing similarly extensive agendas) for reciprocal reinforcement of Europeanised national policies and exemplary national implementation of EU strategies, i.e. multilevel reinforcement (SCHREURS and TIBERGHIE 2007; 2010).

### Long-term transition/intermediate targets related to environmental policy



Source: EEA 2015b, p. 26

40. The policy focus of the European Union tends to oscillate between an economics-oriented and a transformational agenda (von HOMEYER and WITHANA 2011, S. VIII and 225; HEY 2014). Stabilizing a long-term ecologically transformational agenda transcending these cycles is a challenging task. In light of current political and economic crises, the EU is likely to be weakened in general (KASSIM and LYONS 2013), and EU environmental policies in particular. This evolution does not amount to any reduction of environmental standards in general, but rather a tendency to postpone decisions or simply not decide at all (STEINEBACH and KNILL 2015). The officiating European Commission (whose term began in 2014) is more economics-oriented and political than its predecessor (von ONDARZA 2014). This is reflected by the following: the tendency to establish a clearer hierarchy in the Commission; renewed efforts to reduce bureaucracy and red tape; the “better regulation agenda”; failed as well as successful attempts to cancel a number of environmental projects (European Commission 2015d; also see Section 1.4.1). Key environmental directives such as the FFH Directive and the Birds and Habitats Directive are currently undergoing a so-called fitness check, in order to determine whether these directives could be modernised and merged. The ongoing negotiations concerning these directives could potentially result in a weakening of standards of protection. The main thrust of the fitness check programme (“Regulatory Fitness and Performance Programme” (REFIT)) is not to dynamically optimise environmental protection policies, but rather to “re-

move regulatory burdens” and “simplify and improve the design and quality of legislation”, particularly for small and medium-sized enterprises. In this context it is especially criticisable that the Commission devalued pioneering efforts on the part of individual member states in the field of environmental policy. In its communication on “better regulation for better results”, the Commission referred to the “more stringent protective measures” clause (Article 193 TFEU) as “gold-plating,” and faulted pioneering national policies for adding “unnecessary costs for businesses and public authorities”. Hence, in the Commission’s view, the member states should henceforth “explain the reasons for any such gold-plating” (European Commission 2015d, p. 8). Germany’s two governing parties have also endorsed the European Commission’s criticism of pioneering environmental policies. The coalition agreement of the CDU and the SPD states that EU directives should wherever possible be transposed literally into German law (so-called 1:1 transposition; CDU et al. 2013, p. 12). According to them, Germany should not avail itself of the national leeway for action. However, especially in the field of environmental law, EU directives often provide only for minimum standards that can be exceeded by member states. Art. 193 TFEU provides that protective measures adopted pursuant to Article 192 shall not prevent any Member State from maintaining or introducing more stringent protective measures. Compared to full harmonisation, this principle does a better job of taking into account the differences in the natural environment and in the economies of the various member states. Harmonisa-

tion, on the other hand, would hamper national pioneering policies and would thus itself preclude the option to adopt more stringent protective measures under Article 193 TFEU.

#### 1.4 Transformational policies in individual policy areas

**41.** The sections that follow aim to apply the conceptual insights on transformational policies to specific action fields. How would far-reaching transformational processes actually unfold in various sectors? To what extent is Germany already in the process of planning and implementing such processes? Which opportunities, constraints and starting points for government action are there in key problem areas?

The following three main environmental action areas have been selected that also play a central role in the EU's 7th Environmental Action Programme (European Commission 2014b): climate protection; circular economy; and biodiversity protection in the agricultural sector. In Germany, these action areas are currently in varying phases of development, and thus also face specific transformation-related challenges. Research policy is a fourth, horizontal, action field which provides key resources when it comes to meeting the ecological challenges of the future.

##### 1.4.1 Climate protection

**42.** The issue of climate protection makes it abundantly clear that fundamental economic and social reforms are needed, for the simple reason that the global economic system is primarily based on the use of fossil resources. Virtually all areas of economic life and civil society would be affected by far reaching decarbonisation; these domains include not only energy systems, but also areas such as transport and land use. Hence it is no accident that the academic work on transformation has often been linked with climate research (WBGU 2011).

###### 1.4.1.1 The political significance of pioneering national policies for global climate policy

**43.** Climate stability is a global public good. Measures aimed at reducing greenhouse gas emissions work to the benefit of all human beings. Hence there is little incentive for individual governments to play a pioneering role, and a strong incentive to exhibit so-called free-rider behaviour. In the interest of resolving this so-called "tragedy of the commons" in the climate protection domain, for the past two decades efforts have been underway to conclude a binding international treaty. Although adoption of the Kyoto Protocol in 1997 was regarded as a breakthrough, international climate policy has been in a crisis in recent years (PARKER et al. 2012; PARKER and KARLSSON 2010; OBERTHÜR and GROEN 2014). In the wake of the failed Copenhagen climate summit in 2009, the following view has become widespread: "Strong additional forces are therefore needed in the field of cli-

mate protection to urge the political decision-makers to act decisively and take complementary effective measures of their own." (WBGU 2014a, p. 3). At the 2015 Paris Climate Conference, a change of course was initiated, from the global top-down approach to a more flexible paradigm whereby countries now voluntarily commit themselves to meeting climate protection obligations. Under this new paradigm, a crucial role falls to pioneering countries for the success of international climate policy, in that ambitious proposals by individual countries could prompt other countries to expand the scope of their commitment to climate protection. In the past as well, climate policy was mainly driven by pioneers, whereby Germany and the European Union were in particular regarded as climate policy pioneers, and saw themselves in this light as well (BÄCKSTRAND and ELGSTRÖM 2013; ELGSTRÖM 2007; STEINBACHER and PAHLE 2015; AXELROD and SCHREURS 2015; ECKERSLEY 2013). Key drivers of climate policy have – in addition to new and detailed climate research findings – above all been pioneering countries. By virtue of the ambitious national objectives and policies that these countries have set, they have demonstrated the feasibility of climate protection and have been actively promoting cooperation on the international level (SAUL and SEIDEL 2011; SCHREURS 2012).

**44.** This is made possible, among other things, by the fact that climate policy can open up considerable co-benefits, such as improving air quality or reducing public healthcare costs (BUONOCORE et al. 2015). There are co-benefits not only for human health, nature conservation and other environmental assets (ANENBERG et al. 2012; EDENHOFER et al. 2015), but also for industrial policy (WALZ 2015; also see item 135). Such advantages make climate protection appealing at the local level as well and help to counter the argument that the tragedy of the commons can only be overcome through global action. And because such additional benefits have their greatest impact in decentralised settings, they afford climate policy-makers greater room for manoeuvre at all political levels. Polycentric solutions (i.e. non-hierarchically coordinated activities at various levels) can usefully complement international regimes. In decentralised settings, actors can more easily build the trust required for mutual cooperation and efficient self-regulation. Various forms of polycentric governance allow for the piloting and development of a host of solutions, while at the same time heightening the resilience of the system as a whole (OSTROM 2009; COLE 2015; WBGU 2011; 2014a). While the number of national climate protection measures is rising steadily (NACHMANY et al. 2014; FANKHAUSER et al. 2014; LA-CHAPELLE and PATERSON 2013), the argument concerning the manifold co-benefits of such measures is still not being sufficiently taken into account in the climate policy arena (IPCC 2014, p. 30). Narratives make it possible to draw greater attention to the co-benefits of climate policy, one example of this being

the nexus between climate policy and peace policy, as proposed by French President Francois Hollande at the Paris Climate Conference. German environmental minister Barbara Hendricks made a similar point in the run-up to the Paris negotiations, when she said “Climate policy is peace policy” – a phrase that found its way into the media coverage of the Paris Climate Conference negotiations and that had a major impact on climate policy discourse.

#### 1.4.1.2 The German *Energiewende*: pioneer of transformation?

**45.** Germany’s *Energiewende* combines climate policy goals with an industrial policy agenda. The German 2020 and 2030 climate policy goals are considerably more ambitious than those of the European Union (concerning climate targets, see SRU 2013b, item 1; 2015a). In promulgating the *Energiewende*, Germany has attracted international attention, and at the same time has staked its reputation for innovative policy on the transition’s success (STEINBACHER and PAHLE 2015; GIZ 2012; Konrad-Adenauer-Stiftung 2013; Agentur für Erneuerbare Energien 2014). The *Energiewende* has the following key elements: expediting the phase-out of nuclear power plants; supporting the expansion of renewable-energy installations; and improving energy efficiency. The German Renewable Energy Act (EEG) accomplishes the following: it provides investment certainty (i.e. providing “patient capital;” see MAZZUCATO 2014); it unlocks long-term cost reduction potential; and it has incrementally enabled renewable energy to emerge from its technological niche.

In many respects, the EEG is an embodiment of successful pioneering policies. The costs of solar and wind power have declined steeply, thus enabling other countries to begin using these technologies as well. The EEG has been successfully emulated by other countries (SOLORIO et al. 2014). For many years now, the European Union has tolerated the use of such national instruments aimed at implementing European goals for the expansion of renewable energy. Moreover, by dint of policy feedback (see item 27 f.), the EEG has also altered the balance of power between energy policy actors, in that representatives of renewable energy industries are no longer solely challengers of the status quo, but have now become part of a rapidly changing status quo regime (SRU 2013b; WAS-SERMANN et al. 2015).

**46.** The *Energiewende* is a transformational policy which goes far beyond a mere expansion of renewable energy. This undertaking clearly shows the kinds of challenges that are entailed by far-reaching socio-technical transformation processes, particularly when it comes to the transitional phase between niche development and a new socio-technical regime:

- *Technical reforms such as expanding renewable energy, power grids and electro-mobility go hand in hand with numerous legal, economic and social*

*reforms*, including planning-procedure reform, reform of regulatory frameworks, and changes in markets, business models and consumption patterns.

- *Transformational processes never unfold according to a master plan, although long-term targets and milestones are indispensable:* Experience has shown that certain effects and problems entailed by transformational processes cannot be predicted, particularly in view of the fact that technology and cost trends are prone to structural uncertainty. For example, it is difficult to predict when electric vehicles will have wide consumer appeal by virtue of lower prices and greater ranges. In addition, the extent to which the diffusion of solar power storage systems will be massively market-driven hinges on various economic, technical and regulatory factors. In view of these uncertainties and the potential for dynamic change, a constant readjustment of measures will be essential in many domains to achieve a certain degree of stability of the general direction.

**47.** In order for Germany to remain a lead market and continue to successfully implement the *Energiewende*, not only new technologies will need to be developed, but also technological pathways that can lead to lock-in effects will need to be abandoned, and outdated technologies will need to be phased out (see Section 1.3.2). This difficult task has yet to be successfully accomplished in connection with the *Energiewende*. Opposition, by those affected, to structural change that is not prompted merely by market forces but that is also the outgrowth of government action is perfectly understandable. The controversy over levying an additional tax on old coal-fired power plants via the so-called *Klimabeitrag* (climate levy) (BMW 2015a) shows that accelerating structural change will require political authority, plausible solutions, and compensation for those who are on the losing end of restructuring measures. In view of this challenge, the SRU has recommended that a national coal consensus be reached (SRU 2015a). Such a consensus should be elaborated via a platform comprising representatives of the energy industry, the federal government, *Laender* governments, organisations, and the scientific community, along the lines of the so-called ‘Ethics Commission for a Safe Energy Supply’ which helped build agreement on the accelerated nuclear phase-out after the Fukushima nuclear disaster. The attendant process should be overseen at the highest levels of government, and should be actively supported by federal agencies, ministries, and academic research. As successful handling of past discontinuities in economic structures (e.g. in the steel industry) has shown, socially responsible restructuring that leads to a carbon-neutral energy supply is well within reach. Moreover, an adequately resourced joint federal-*Laender* support programme should be developed for various measures such as elaborating severance schemes, avoiding redundancies, and retraining and qualification measures (SRU 2013b; 2015a). If efforts to



achieve a coal consensus are begun in time and adopt a long-term perspective, such a coal consensus would help build confidence in the *Energiewende*, defuse polarising conflicts, and create planning certainty for all concerned.

#### 1.4.1.3 The European Union as an impediment to and opportunity for transformational pioneering policies

The European single market: an obstacle for pioneering countries?

**48.** The strengthened consensus in the EU concerning Community climate policy and an EU energy transition resulting from the 2020 climate and energy package (CALLIESS and HEY 2013a) has been weakened by the lack of ambitious and binding national goals for 2030 for the expansion of renewable energy and for energy-efficiency (European Council 2014). This hampers climate protection policy in the EU Member States. The following two factors come into play in this regard: First, analysts observe a weakening of EU energy integration. Specifically, a weak EU governance framework for the implementation of climate protection goals suggests that solutions will henceforth be shaped by the member states (FISCHER and GEDEN 2015). Second, European policies in connection with the Energy Union (whose main focus is the European internal market) are exerting a growing influence on national policies for the promotion of renewable energy (TEWS 2015). For example, with the amended version of the Community Guidelines on State Aid for Environmental Protection and Energy (European Commission 2014c), the European Commission has, with some success, enforced internal market goals against national support schemes for renewable energy (KAHL 2015; WUSTLICH 2014). These state aid rules are mainly prompted by the fear that statutory feed-in tariffs will distort competition. For instance, during periods when Germany was feeding higher amounts of solar and wind power electricity into the grid, electricity prices in The Netherlands declined, resulting in income losses for Dutch power producers and expressions of discontent from Dutch regulatory authorities, on the ground of distorted competition (BAYER and BAKER 2014, p. 19). Hence, the manner in which national climate policies are implemented falls somewhere between the ambition to be a lead market and the exigencies of the EU single energy market. This field of tension nonetheless always requires preserving room for manoeuvre when it comes to policy pioneering. Despite certain derogations concerning the relevant application domain (in Article 194 TFEU), the “more stringent protective measures” clause (Article 193) of the TFEU is nonetheless of central importance.

Emissions trading: a disincentive for the adoption of pioneering policies

**49.** Owing to the current excess of emission allowances, emissions trading provides hardly any cli-

mate protection incentive and is a disincentive for the adoption of pioneering national environmental protection policies. When national measures bring about a reduction in carbon emissions in industries affected by emissions trading, emission allowances become available that can be used by other emitters. Hence it can happen that national reduction activities in sectors covered by EU emissions trading will not result in a reduction of overall European emissions – a phenomenon known as the waterbed effect (SRU 2015a). This does not affect, however, household, transport and other measures falling outside the scope of emissions trading.

The waterbed effect can be neutralised by cancelling emission allowances that are made available through additional emission reductions, as was recommended, for example, by the Federal Ministry for Economics and Energy (BMW<sub>i</sub>) in connection with the *Klimabeitrag* (climate levy) (BMW<sub>i</sub> 2015b). Moreover, national measures can aim for long-term dynamisation of climate policy, if they help create political agreement on more ambitious climate targets over time. The fact that, in future, the Market Stability Reserve (MSR) will be allowing greater leeway for the adoption of pioneering national environmental protection policies is a step in the right direction (European Commission 2014f; SRU 2015a; items 12 and 127). The purpose of the MSR is to establish stable frameworks and incentives for emission reductions by reducing excess emission allowances.

The discrepancies between EU and German climate policy goals have led to demands that national climate goals be eased (Wirtschaftsrat der CDU 2015). However, in the SRU’s view Germany should stick to its binding and ambitious climate policy goals for 2030 (greenhouse gas emissions reduction goal relative to 1990 levels for Germany: 55 per cent, versus 40 per cent for the EU.), for two reasons. First, the MSR will ensure that national emissions reductions are effective also in sectors covered by EU emissions trading. Second, abandoning a national climate goal would delay the implementation of the *Energiewende*. This in turn would mean that Germany fails to meet its long-term objectives. The credibility of the 2020 energy plan, which now enjoys broad political support, would be damaged (BMW<sub>i</sub> and BMU 2010); and thus investor and financial market confidence would suffer.

European Union offering opportunities for sustainable climate and energy policies

**50.** Whereas the single market and emissions trading limit the potential scope of ambitious national energy policies, the European Union nonetheless offers numerous opportunities for a transition to renewable energy. In concert with similarly-minded stakeholders, Germany can champion ambitious emissions reduction goals and the expansion of renewable energy. In the past, progressive forces at the EU and member state levels strengthened each other (SCHREURS and TIBERGHEN 2007; SCHREURS and TI-

BERGHIEN 2010; concerning the coalition between heads of government and environmental ministers, see HEY 2009). Even if the 2030 climate and energy package does not meet the highest ambitions, adherence to the triad of goals can be regarded as evidence that the European Union remains a leader in climate policy (SRU 2013a). Europe's transnational electricity grids and electricity markets not only help to reduce costs, but also enhance Europe's security of supply and ease the task of balancing the fluctuating amounts of solar and wind power electricity that are fed into the grid. Countries and regions such as Scandinavia and the Alpine region, with their sizeable upside potential for storage capacities, can also help handle such fluctuations. European institutions such as the Pentilateral Energy Forum constitute additional platforms for close cooperation in areas such as cross-border calculation of guaranteed output, and efficient use of cross-border interconnectors. The European Union also is an influential actor on the global level and can thus bring about progress in the international climate policy sphere. The institutional system and climate policy of the European Union offer opportunities for climate protection, as opposed to merely forestalling the adoption of pioneering national environmental protection policies.

#### 1.4.1.4 Conclusions

**51.** While the *Energiewende* is an example of transformational pioneering policies, it also clearly demonstrates the challenges faced by such an undertaking. Socio-technical transformation requires far-reaching and in-depth changes. As important as long-term targets and roadmaps are for the energy transition, it will simply not be possible to devise a master plan for every last detail of this ambitious undertaking. Hence the concept of reflexive governance will be all the more important, allowing as it does for learning and experimentation. The *Energiewende* demonstrates the need to not only foster the development of new technologies, but also to plan and support the phase-out of existing technologies. This undertaking is most likely to achieve political success if the relevant constellations of stakeholders receive long-term support and if new stakeholders are represented in various democratic arenas in accordance with their growing importance. In this context, long-term restructuring of Germany's coal industry should be launched without delay, via multi-stakeholder platforms, so as to allow for the achievement of socially responsible, climate-friendly restructuring based on consensus decision making, together with planning certainty for all stakeholders (SRU 2015a).

**52.** The advantages of a polycentric approach have already been demonstrated in the international sphere. European policies should be formulated in such a way as to enable individual member states to pursue more ambitious pathways. The German government should adhere to its far reaching climate policy goals for 2030 and implement them through additional measures, also in the sectors covered by EU

emissions trading. In doing so, it is crucial, for political and economic reasons, that EU goals also be factored into the goal and instrument equation, at every step along the way. The European Union's political credibility as a key driver in international negotiations should not be jeopardised. Economic synergies between national and European Union measures should be kept in mind. For emissions trading, this criterion could have been met via the interplay between the MSR (see item 49) and the *Klimabeitrag* (climate levy) (SRU 2015a).

#### 1.4.2 Circular economy

**53.** In order for ecological transformations to occur, it will also be necessary to decouple economic activity (which is increasing apace worldwide) from resource use and the environmental impact thereof (SRU 2012; item 114). In the broader context of the discourse on resource efficiency, optimisation of Germany's circular economy plays a crucial role in terms of ecological transformation. In recent studies, "circular economy" is defined very broadly, as the sum total of all measures that substantially increase the useful life and usage intensity of raw materials and other materials in the economy. This concept takes on a transformational cast insofar as it can bring about product innovation, altered consumption patterns, new business models, an incentivising policy framework, and a new economic paradigm (EEA 2014; UNEP 2011; FISCHER-KOWALSKI et al. 2011; ANDERSEN 2007).

Establishment of a circular economy is a classic win-win policy, because economic goals (e.g. strengthening domestic value creation, job creation, reducing vulnerability to price fluctuations on world markets) can go hand in hand with environmental benefits (BRINGEZU and BLEISCHWITZ 2009; FISCHER-KOWALSKI et al. 2011). A circular economy also gives rise to new and larger markets, by the growth of environmental technology sectors (VDI Zentrum Ressourceneffizienz 2011). In innovation-oriented discussions of raw materials, recycling is regarded as being of major importance as a source of secondary raw materials (WERLAND 2012). It has been estimated that by 2030 an all-encompassing circular economy could have a positive impact amounting to 7 per cent of European Union GNP, relative to the current development scenario (Ellen MacArthur Foundation et al. 2015, p. 12).

##### 1.4.2.1 From a linear value chain to a value creation cycle

**54.** A circular economy is one of the cornerstones of European Union plans and programmes for a resource efficient economy (European Commission 2010; 2011; 2014b). The European Commission would like to see full recycling of all resources, particularly metal and mineral raw materials. To this end, in July 2014, following a number of years of preparatory work, the Commission proposed a policy package

for a circular economy (European Commission 2014e) that met with a mixed response. The legislative proposals were withdrawn in early 2015 by the newly elected Commission (which took office in November 2014), in the context of their new Better Regulation Package (SRU 2016). A revised proposal for the revision of various waste management directives was issued in late 2015. The attendant action plan mandates numerous initiatives aimed at making circular-economy thinking (above and beyond waste policies as well) an integral part of the following domains: product policy; raw materials production; product design; product manufacturing; new consumption patterns; and the frameworks in secondary raw materials markets. The main terms mentioned in connection with production and consumption are “proposals,” “evaluation work” and “improved implementation” for existing regulations, as well as knowledge sharing (European Commission 2015a).

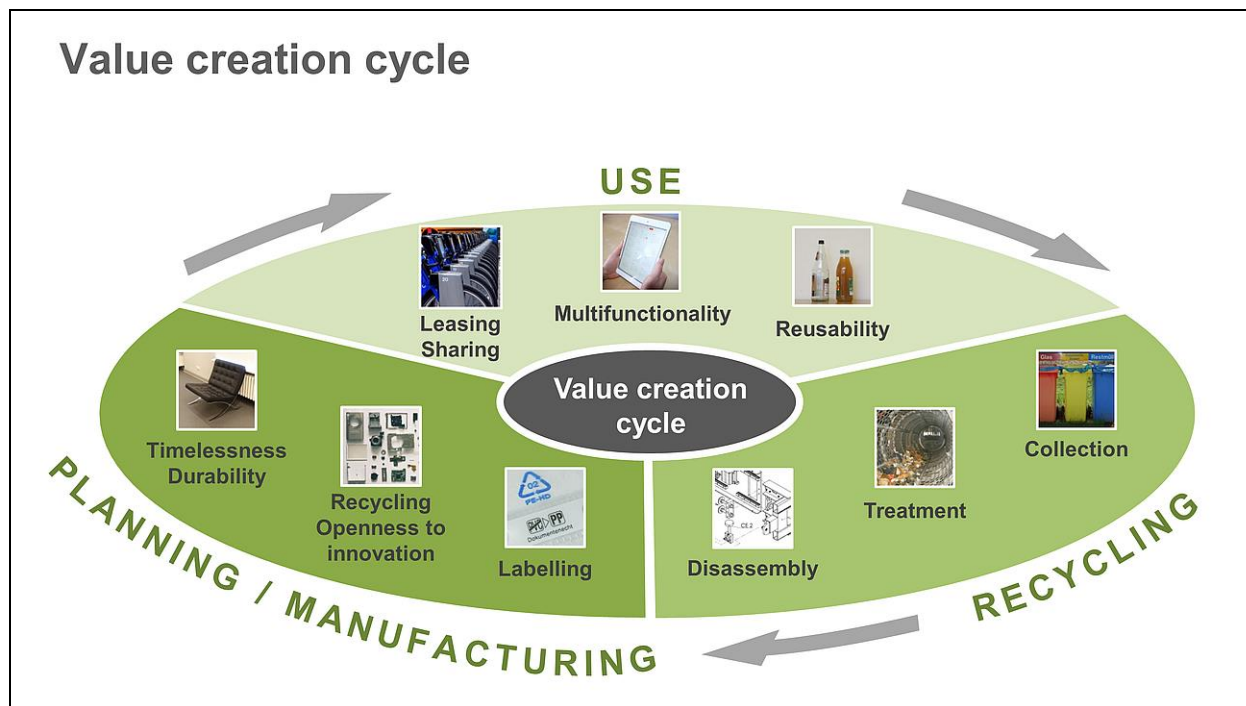
55. So far, European Union environmental policy mainly has relied on waste management policy to im-

plement elements of a circular economy. However, successful approaches (separate collection, technical preparation, extracting recycled materials for which a market already exists or can be created) so far only comprise the value creation steps in the recovery phase (see Figure 1-4). A circular economy offers considerably greater leeway. In such an economy, substantial innovation is likely to occur in connection with product planning and manufacturing, and thus will not fall within the scope of waste management policy (RLI 2015; Ellen MacArthur Foundation et al. 2015; BASTEIN et al. 2013, p. 20; WIJLMAN and SKÅNBERG 2015).

A circular economy also comprises the avoidance of resource use. This issue cannot be addressed through technical means alone, but will also require a change in consumption patterns and lifestyles (JARON 2014). This would entail, for example, parallel use of products by multiple users, for multiple purposes, or in multiple cycles via reconditioning.

Figure 1-4

Value creation cycle



SRU/UG 2016/Figure 1-4

There already exist proven statutory instruments that address waste management issues. However, above and beyond waste management law *per se*, basic management issues still arise. Whereas soft instruments (based on information and on people taking responsibility for themselves) are readily accepted by the business community, regulatory instruments such as ecodesign rules or cost-internationalisation measures (taxing resources, more extensive manufacturer re-

sponsibility) are considerably controversial (GRAAF 2015).

1.4.2.2 Circular economy via waste management policy: from pioneer to guardian of the status quo?

56. Germany has long been a pioneer EU member state in establishing a circular economy, with waste management practices being regarded as exem-

plary in the EU and around the world. Having now been in existence for two decades, Germany's circular economy is on the cusp of the second generation. The economically assessable potential has already been unlocked in many respects under today's conditions, by current waste management regulations; and thus the main focus now should be on product-design innovation and product stewardship. The goal here is to allow for realisation, to the greatest extent possible, of durable products, component recycling and the recycling of valuable raw materials. The European Union has yet to systematically implement even the first generation of this policy. In connection with preparation of the 2014 circular economy policy package an opportunity was missed to forge an alliance between Germany (in its capacity as a pioneering country) and a highly committed European Commission. The Commission's proposal met with criticism by the Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), some of which made good sense. The background of this process will now be discussed.

**57.** As part of the policy for a resource efficient Europe, the European Commission's 2014 legislative package on a circular economy counted as one of the most important policy proposals to come out of the tenure of EU Environment Commissioner Janez Potočnik. The package's goals were oriented toward a demonstrably achievable status, in light of what has been achieved by the three pioneering EU member states (European Commission 2014a, p. 52). This policy package called for a series of regular reviews of EU waste management law – namely the Packaging Directive, the Landfill Directive, and the Waste Framework Directive. The main goal of the policy package was to continue current EU efforts to institute substance-flow and mass-based waste management policy. The European Commission's impact assessment is predicated, both in general and for a pioneering country such as Germany, on the assumption that its proposals will have substantial welfare effects (European Commission 2014a, p. 63 ff.).

In Germany, the Commission's proposal came in for criticism from both the BMUB and the *Bundesrat*, notwithstanding the fact that it would have offered an opportunity for the Europeanisation of Germany's relatively ambitious waste management policy. The recycling regulations were particularly controversial, owing to their being linked with a new, standardised target-value calculation method, whereby recycling quotas would have been subtracted from installation-input conversion and sorting loss (European Commission 2014e, Art. 9(4) and 9(5)). This calculation method would have resulted in Germany having substantially lower waste quotas. Doubts were raised as to whether the new targets made ecological sense and were attainable from a technical standpoint (Bundesrat 2014; EUWID 2014c; ROGALSKI 2015, p. 40), resulting in the BMUB rejecting these recycling quotas. The BMUB also characterised as "illusory" the notion that the EU as a whole could adhere to a target involv-

ing a specific percentage of waste being deposited in landfill (EUWID 2014a), noting that qualitative targets that define the requirements for landfill material would make far more sense. According to the BMUB, what is needed are not "long term and somewhat unrealistic goals," but rather timely measures that "more robustly ensure that all member states will be able to meet the 2020 targets mandated by the [Landfill] Directive," before new and even more ambitious waste quotas are set (EUWID 2014b). Many of the concerns were communicated ahead of time to European Commission experts but were not taken into account (JARON 2014). In February 2015, as part of its better regulation agenda, the recently elected European Commission withdrew its proposal and submitted a revised one (European Commission 2015b). Among the political reasons for doing this was the lack of adequate member state support for an ambitious common target for 2030 (DOUMET and HERMANN 2014, p. 260).

It was only at this juncture that the BMUB clearly came out against withdrawal of the Commission's proposal, actively advocated this position in the Council of Environment Ministers, and stated their position in a December 2014 joint letter (EUWID 2015). This explicit and publicly visible backing, on the part of the BMUB, of the Commission's original proposal stands in contrast to the previously very severe technical criticism at this very same proposal from the BMUB administrative level. Hence an opportunity was missed, at both action levels, for the forging of a well prepared and – from a policy standpoint early-stage and high-level – alliance between pioneering countries such as Germany, Austria and Belgium, for the Europeanisation of ambitious waste management targets.

Amidst this debate, over the course of 2015 Germany was reluctant to launch any policy initiatives that would have attracted public attention – whereas other players, member states, and the European Parliament had already staked out a position in this regard (European Parliament 2015; Defra 2015).

**58.** As a result, the government was perceived as exhibiting an ambivalent attitude as to whether to support the reforms or the status quo. There has been little sign of a strategy being communicated in the EU or to the public that would enable Germany's wholly successful waste management policies to be Europeanised and at the same time optimised at home. The new circular economy policy package now offers a second opportunity for Germany to have a say in determining how the concept of a circular economy can be applied in the EU. The need for expert debate on this issue aside, the statements of intention in the 2015 Action Plan for the Circular Economy offer Germany the opportunity to actively promote efficient implementation of this action plan in a public forum, and in concert with other pioneering countries.

#### 1.4.2.3 A circular economy via product policy: a stepping stone to pioneer status?

**59.** The European Commission's 2015 Circular Economy Package has taken up the issues of product policy, resource efficiency and the circular economy in their respective contexts. This could become a viable starting point for a transformational circular-economy policy, in that it specifically allows for addressing the necessary harmonisation of product and waste management policies.

The Ecodesign Directive offers the opportunity to promote resource efficient product design at the EU level. Annexes I and II of the directive already indicate a number of ways in which general minimum requirements could be set. Requirements concerning product lifetimes, reparability, recyclability, low-pollution properties, quality (e.g. critical raw materials, material diversity, secondary raw materials content) and quantity (weight) of the raw materials being used are feasible and make good sense (FULVIO and TALENS PEIRO 2015; JEPSEN et al. 2015; VHK 2014; JEPSEN et al. 2012). It has been shown that this is already achievable via the pending Ecodesign Working Plan 2015-2017, for certain domains and product groups (BIO by Deloitte et al. 2014a; 2014b).

But at the same time, manufacturers are opposed to government interference with product policies, and feel that ecodesign should not become a "back door for the development of an instrument of all-encompassing government interference in manufacturing" (DIHK 2008; VCI 2013). Manufacturers want to see the Ecodesign Directive "judiciously" optimised without expanding its scope to include raw materials or additional product groups (BDI 2014; CECED et al. 2015).

**60.** In Germany, we are seeing the beginnings of initiatives concerning a second generation circular economy that goes beyond waste management policy. Germany's resource efficiency programme and an optimised draft version thereof, known as ProgRess II, sets forth highly ambitious economic, circular economy, and product specific targets and approaches. Specifically, the programme calls for the establishment of a new system of indicators and targets that would reflect the replacement of primary raw materials by secondary raw materials, whose proportional use would "be increased over the long term" (BMUB 2015a, p. 49). Implementation would, however, mainly be based on voluntary measures and the dissemination of information (BMU 2012; BMUB 2015a).

In terms of product policy, the draft version of ProgRess II sets a goal whereby "all new and amended implementing regulation between 2015 and 2020 implementing the Ecodesign Directive should be backed by material efficiency requirements that are of particular relevance to each of the product groups that come into play. This includes product information requirements" (BMUB 2015a). Transposition of the Waste Electrical and Electronic Equipment Directive

(WEEE) into German law means that manufacturers are required to design their electrical and electronic devices wherever possible in such a way as to make it easier to dismantle and recycle the components and materials in waste equipment. Detailed requirements can be spelled out through ordinances. It would be desirable for the recycling rules in Article 24 of the German electrical and electronic equipment law (Elektro- und Elektronikgerätegesetz 2015) to be more stringent than the EU directive's requirements, by setting concrete and quantifiable targets concerning qualitative and quantitative recycling of reusable components. This could have a beneficial effect on product design.

**61.** Another key action field is public procurement, through which the government can exercise considerable influence over the development of innovative products and services (UBA studies from 2008, 2011, 2012, 2015, 2016). In Germany, public procurement accounts for an estimated 13 per cent of gross domestic product (BMUB 2015d), and thus could potentially be a major driver of ecologically sustainable innovation. Although this mechanism unfolds successfully in certain domains such as the administrative regulation concerning the procurement of energy efficient products and services, it is not used nearly often enough (Staatssekretärsausschuss für nachhaltige Entwicklung 2015). Germany could in fact make more efficient use of public procurement than is currently the case, and could also exploit the improved legal possibilities at the EU level to a greater extent, through measures such as incorporating ecolabel requirements into public procurement processes. Compliance with the quantitative targets (e.g. increasing Blue Angel-certified recycled-paper use to 95 per cent in the run-up to 2020 insofar as possible) that the government has set via its programme of sustainability measures (Maßnahmenprogramm Nachhaltigkeit) should be monitored and documented. The draft version of ProgRess II calls for all new government framework contracts for standard products and services in the run-up to 2020 to contain concrete resource conservation requirements. The outcomes of such a measure should be monitored.

#### 1.4.2.4 Conclusions

**62.** Development of a circular economy is a priority area of action for the European Union. Germany is a technical and economic leader particularly in the waste management domain. But at the same time, the government's position towards EU circular economy policy appears rather defensive. In the SRU's view, the BMUB should develop more active pioneering policies for a European Union circular economy, particularly in view of the fact that the current proposal for a circular economy policy package has reopened the debate in this regard. The following are needed:

- an own specific vision as to how a national and EU circular economy should develop in the run-up to 2030, in terms of the European Commission's new

legislative proposal and expansion of the agenda beyond the scope of current statutory waste management instruments;

- promoting the incorporation of “design for resource efficiency” approaches into Ecodesign Directive implementing measures;
- active, early-stage and public communication of German approaches to implementation of a circular economy at the EU level;
- timely formation and strengthening of innovation-oriented alliances for an ambitious circular economy in the EU.

The government is far from having exhausted the potential for action in Germany. ProgRess I and II set ambitious targets above and beyond mere waste management. However, lawmakers appear to be very reluctant to endow these approaches with economic and regulatory instruments. But it is doubtful that a qualitative leap can be made toward resource productivity merely through “soft” instruments aimed at establishing networks, promoting innovation, and know-how transfer (SRU 2015b).

#### 1.4.3 Biodiversity and agricultural policy

**63.** Intensive farming is one of the main causes of biodiversity loss in Germany (BfN 2015; also see Section 6.5) and a major reason why Germany is a long way from reaching the goals for farming areas set forth in the national biodiversity strategy (BMUB 2015b). The need for action is well documented (EEA 2015a; SRU 2015c; 2013c; 2009), and the various policies that either directly or indirectly affect the ecological sustainability of the agricultural sector are amended on a regular basis. However, Germany has failed to use these opportunities for action, and has fallen short of biodiversity targets as well as other environmental quality and reduction targets under EU environmental law, particularly as regards waterbody protection and air pollution control (SRU 2015c, p. 249 ff.; 2013a, p. 9 f.). In light of the European Commission’s efforts to bring about ecological reforms in EU agricultural policy, Germany is not a leader in this domain, but is instead slowing progress in it.

**64.** Environmental pollution is also attributable to policy- and market-driven structural change in the agricultural sector. Owing to the growing trend toward deregulation of agricultural markets via previous Common Agricultural Policy (CAP) reforms and in the context of bilateral and multilateral trade agreements, producers are now confronted with considerable price volatility (von LEDEBUR and SCHMITZ 2011; TIETZ et al. 2011, p. 10) – for example in the milk production sector. Moreover, in their capacity as purchasers of agricultural products, the trade and processing sectors are highly concentrated. In addition, the food industry has been subject to stiffer price competition for many years now (BALMANN et al.

2012; WBA 2015, p. 55; HOFFMANN 2012). The interplay of these factors results in some cases in severe price pressures for producers, who tend to meet this challenge by expanding and intensifying their production, or by going out of business – also due to market constellations comprising producers, processors and traders (BUCKWELL et al. 2014, p. 22). At the same time, there is considerable competition for farmland owing to the high global demand for animal products and renewable resources. This, too, has resulted in more intensive farming and the decoupling of animal and crop production – an evolution that in many respects comes at the cost of ecologically sustainable farming methods. One example of this is the decrease in the amount of extensively used grassland (BfN 2014; SRU 2015c, item 207 ff.; HEISSENHUBER et al. 2015, p. 50 and 72 ff.).

**65.** These evolutions are incompatible with growing public awareness of, and consumers’ desire for, greater ecological sustainability and higher animal welfare in agricultural production (BMELV 2013; SRU 2015c, items 245–251 and 516–534; WBA 2015, p. 66 ff.). The agricultural sector lacks a shared vision that is compatible with these changes in social values. Such a narrative would help to incorporate greater ecological sustainability into the necessary agricultural policy and farming related environmental policy reforms. To this end, changes in the agricultural sector need to be transformational, by dint of encompassing all implementation levels in such a way that efficiency, consistency and sufficiency strategies are combined with each other (SRU 2015c, items 50–58). Fertilisers and plant protection products could potentially be used far more efficiently for farm production than is now the case (BLAG 2012; OENEMA et al. 2009; BUCKWELL et al. 2014). Consistency-oriented approaches aim at ecologically sustainable adaptation of production, through measures such as greater recirculation of nutrients (SRU 2015c, item 55 f.). Sufficiency strategies mainly hinge on a substantial reduction in the consumption of meat and other animal products, and thus address one of the key drivers of today’s intensive land use (SRU 2015c, items 45 and 337; SRU 2012, item 159 ff.).

##### 1.4.3.2 Germany’s role in European Union agricultural policy

**66.** The Common Agricultural Policy (CAP) is a lynchpin for orienting the agricultural sector. It has a massive budget and is empowered to make subsidies contingent on the environmental performance of farming operations, via policy and monitoring instruments. This potential for a greener CAP has yet to be adequately unlocked, despite a number of European Commission stabs at doing so (PE’ER et al. 2014, p. 1090). An SRU comment addressing the various elements of the Commission’s proposed CAP reform makes recommendations in this regard (SRU 2013c, p. 3 f.). In a special report titled “Nitrogen: Strategies for resolving an urgent environmental problem”, the

SRU critically analysed the outcomes of the reform (SRU 2015c, item 446–451).

Germany's negotiating position concerning the CAP displays a tendency toward favouring status quo interests over environmental interests, and inertia in this regard. Studies by political scientists have repeatedly demonstrated the capacity of German and EU agricultural policy to remain immune to other social requirements (GREER 2013; 2014; DAUGBJERG and ROEDERER-RYNNING 2014; ROEDERER-RYNNING 2015b; 2015a). The agricultural sector has been described as a particular type of political network, one that maintains "long-term relationships between a given political party, its constituents' lobbying groups, and the ministry that is responsible for the relevant policy domain (e.g. agricultural policy)" (MAYNTZ 2008, p. 47). The enormous political influence of the agricultural sector is ascribable not so much to its economic importance, but instead to the fact that it provides security of food supply for the population. Moreover, the agricultural sector receives strong public acceptance in rural farming regions. And finally, today's intensive-farming sector is part of a production system in which intermediate industries, downstream processing providers, and the trade sector all have a vested interest in intensive farming (SRU 2008; item 1037). The agricultural sector can be characterised as a government-linked sector, by virtue of the extensive subsidies it receives, the high frequency of market interventions, and a highly differentiated agricultural administration. According to one author, such government-linked sectors exhibit a high degree of self-governance, autonomy and path dependencies (MAYNTZ and SCHARPF 1995, p. 13 f.). There is a need for more comprehensive, up to date, and well-founded academic studies of interest groups and institutions in the German agricultural sector and its reform- versus status-quo oriented tendencies. The empirical evidence in this sphere is only partial as is exemplified by a report on the pivotal importance of the German Farmers Association as a lobbying group for the agricultural sector (von RIEGER 2007).

**67.** Historically, Germany has not actively promoted the reform of EU agricultural policy, and is part of a so-called conservative model in the EU (HÄRTEL 2011, p. 44; SRU 2008, item 1038; BISSELS and OPPERMANN 2011, p. 147). In many respects, Germany aligns itself with other large EU member states which, in connection with past reforms, have tried to thwart or undermine repeated attempts to make farm subsidies contingent upon meeting ecological criteria (FEINDT 2007; SRU 2008, item 1040; 2015c, items 228 and 446; JASPER 2013; DBV 2012; GREER 2013; BUREAU 2012). In contrast to member states such as Great Britain, Sweden, Denmark and The Netherlands, Germany has time and again joined forces with France in negotiations, in which these two countries have advocated maintenance of an agricultural budget containing a strong first pillar, and have opposed ambitious goals to align farm subsidies and meeting environmental requirements (GREER 2013,

p. 127 f.). In connection with the greening programme negotiations, the then agriculture minister Ilse Aigner characterised the 2013 EU Commission proposals of setting aside 7 per cent of ecological priority areas as absurd (EurActiv 2013). In response to the European Commission's proposals for the reform of EU agricultural policy, the German government pointed out that Germany sees itself as a pioneer not of an ecological reform, but rather as a pioneer in that "the domestic agricultural sector is being made suitable for the world market" (BMELV 2011, p. 2). "[The] principle of lump-sum payment for public goods and services in the agricultural sector via direct payments [has] basically worked out well [...]" (ibid p. 2). The government has also failed to adequately take advantage of the leeway for ambitious national transposition of the 2013 reforms from an environmental policy standpoint (AbL 2015, p. 17–24; SRU 2015c, item 447 ff.). Germany lags far behind other EU member states such as the UK, Estonia and Latvia when it comes to shifting funds from the first to the second pillar (rural development subsidies), where funds could be used in a far more targeted way (AbL 2015, p. 19). According to one study, EU agricultural reform has failed in bringing about any improvement in biodiversity protection (PE'ER et al. 2014). This is a development that may well be largely attributable to the aforementioned negotiating position taken by the German government.

This is one of a number of examples of how Germany is not doing enough to render the agricultural sector more ecologically sustainable, and thus more in harmony with the general public interest. Germany has time and again failed to adequately transpose EU agriculture-related environmental directives into German law, examples of this being transposition of the Water Framework Directive (SRU 2015c, item 358–393) and the Nitrate Directive (SRU 2015c, item 411–437). The European Court of Justice ruled in 2002 that Germany's 1996 Fertiliser Ordinance (Düngeverordnung) failed to fully transpose the Nitrate Directive into German law (EuGH v. 14. März 2002 – Rs. C-161/00). In 2013 the European Commission opened infringement proceedings against Germany ("Kommission fordert Deutschland zum Handeln auf", Press release of the European Commission, 10 July 2014). Denmark and other countries reacted far more decisively to remedy agricultural nitrate pollution (SRU 2015c, items 306 and 417; van GRINSVEN et al. 2012; KRONVANG et al. 2008). Among the reasons for Germany's failure to take sufficient action in this regard is the special and privileged treatment that has traditionally been accorded Germany's agricultural sector in German environmental law and other specific legislation (MÖCKEL et al. 2014; MÖCKEL 2015; EKARDT 2014). For many years now, demands have been made for "good agricultural practice" to be formulated in such a way that ambitious, concrete and enforceable requirements are set in regard to matters such as farmland use. Farmers, it is said, are in many cases exempt from environmental regulations without any equivalent specific legislation having been estab-

lished (MÖCKEL 2014, p. 14 ff.; SRU 2015c, p. 316 ff.).

#### 1.4.3.3 Advocates of reform in the German agricultural sector

**68.** Pressure to make the government's agricultural policies more ecologically sustainable is mainly external or coming up from the bottom (SRU 2008; item 1040 f.); it comes e.g. via financial restrictions on government appropriations, changes necessitated by world trade agreements (TANGERMANN 2012, p. 322; DAUGBJERG 2014), or via compliance with EU environmental regulations (SRU et al. 2013; LASKOWSKI and ZIEHM 2014, p. 316). Pressure to effect such reforms also originates from the following: (a) the growing animal-welfare and consumer-protection movements, which regard certain intensive-livestock farming practices as unethical, seek to bring about or realise changes in consumption patterns for health reasons; (b) rising expectations from the public about a more resource-efficient agricultural sector (WBA 2015, p. 61 ff; ZANDER et al. 2013; Wir haben es satt! 2015); and (c) increasing local protests concerning the construction of new intensive livestock farming facilities (WBA 2015, p. 63; NIEMANN 2014).

Countless environmental NGOs with large memberships advocate biodiversity conservation and the reform of agricultural policy (SPERFELD and ZSCHIESCHE 2015). In this regard, water conservation agencies, and associations of water suppliers in particular, constitute an influential economic interest group advocating the reduction of diffuse input, albeit with a focus on health- and drinking-water protection (BDEW 2014a; 2014b). Organic farming associations and associations of small-scale producers could also be a corrective in the debate on such issues. In concert with other stakeholders they have pushed for a more ecologically sustainable orientation in connection with past CAP reform processes, among other things (EuroNatur and AbL 2013). However, these groups have less political clout than the Deutscher Bauernverband (German Farmers Association), which plays a key role in agricultural policy decision-making (BRAND 2009; RIEGER 2007, p. 299 f.). But certain government players have also been pushing for reforms for many years now (RIEGER 2007). Calls for a more ecologically sustainable agricultural sector come from environmental players at both the federal and *Laender* levels, among others. In the run-up to the EU's Seventh Environmental Action Programme, the BMUB pushed for the environmental impact of nitrogen inputs to be given greater weight and for so-called nutrient cycles (nitrogen and phosphorus) to be realised in a more ecologically sustainable and resource efficient fashion (European Commission 2014b; item 28). The nitrogen-strategy concept proposed by the SRU will be a prominent feature of the envisaged integrated environmental program known as *Perspektive 2030*. The Federal Environment Agency (UBA) has actively and publicly advocated the inclusion of ambitious

ammonia and nitrogen oxides reduction targets in the revised NEC Directive (UBA 2015). The strongest support for more stringent regulatory and economic instruments aimed at reducing agricultural nitrogen inputs has come from the *Laender*. One example of this is the joint draft by the agricultural and environmental committees submitted to the German *Bundesrat* for comment (Bundesrat 2015), calling for a nitrogen strategy and improvements in the Fertiliser Ordinance (*Düngeverordnung*).

#### 1.4.3.4 Conclusions

**69.** There are currently major obstacles to an ecological transformation of the agricultural sector, and a lack of a jointly held vision concerning such a reform. The players who are instrumental in formulating such a vision are rather sceptical about ecological reform of the agricultural sector; moreover, there is little opportunity for other players with constructive agendas to have a say in the shaping of such policy. Some producers' interest groups can potentially exercise far more influence over such policy than is the case with environmental groups. In order for environmental interests to be given reasonable weight in this regard, the actors advocating for a reform will need to be strengthened step by step (see item 27 f.).

**70.** There is a need for a broad and constructive debate concerning sustainable agriculture – a debate that farmers should participate in and in which the differences between the vested interests (and in some cases the attendant conflicts between these interests) should be brought to light more clearly than has been the case in the past. In the agricultural sector, the state has the capacity to help accelerate the reform process – by supporting as well as demanding policies. Support schemes can increase the share of relatively ecologically sustainable farming. This in turn can help bring about further innovation and strengthens reform-oriented coalitions (along the lines that have emerged in other spheres; cf. JÄNICKE 2013; 2010). The transposition of innovative research-based approaches to actual practice is likewise a goal of the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-agri), which was launched in 2012 (European Commission 2015c). Policy reforms such as amendment of the Fertiliser Ordinance, the review of the greening dimension of the CAP, and changes in clean air policies will require actors in the agricultural sector to engage with new solutions. At the same time, the government should provide considerably greater support for actors whose business practices already implement ecological sustainability exceeding the statutory minimum and who thus count as pioneers in the agricultural sector. Promoting organic farming is an example of such support. Although the demand for organic products is growing steadily in Germany (BÖLW 2015, p. 15), the proportion of farmland used for such farming is stagnating, resulting in an increase in imported organic products (BMEL 2015a, p. 12). The new Federal Ministry of Food and Agriculture (BMEL) programme known as *Zukunfts-*



*strategie Ökologischer Landbau* (Strategy for the future of organic farming), which will be issued in late 2016, also aims to unlock this market potential more efficiently (BMEL 2015b). The SRU approves this initiative, whose implementation should be as effective as possible.

**71.** Impetus for innovation for ecological transformations also comes from civil-society movements. In this regard, the political debate concerning large-scale livestock farming and dietary habits (see item 64 f.) are of paramount importance when it comes to reform. Hence the expectations and concerns expressed by these movements should be addressed by policymakers in a constructive fashion (WBA 2015). The views of consumer, environmental, nature-conservation and reform-oriented agricultural interest groups should be given far greater weight via both formal and informal consultation and decision-making mechanisms on the part of federal and *Laender* agricultural policymakers. To this end, the latter need to take into greater account the pluralistic nature of the various interest groups that are pushing for agricultural policy reform. The privileged position of the German Farmers Association (Deutscher Bauernverband) in lobbying for particular policies of federal and *Laender* agriculture ministries (RIEGER 2007, p. 300) is an outdated model. Lobbyists for other farmers associations and other stakeholders should be on an equal footing with *Bauernverband* lobbyists.

**72.** Although the main responsibility for orienting German agricultural policy lies with *Laender* and federal agricultural ministries, the groundwork should be laid for environmental-policy stakeholders to be more involved, particularly when it comes to the orientation of EU agricultural policy and fleshing out agricultural legislation (see below). The institutional prerequisites in this regard also need to be provided for. For example, consideration should be given to enabling environmental ministries to have a far greater say on agricultural policy issues that are of major ecological significance. In its Environmental Report of 2012, the SRU has recommended that, for such issues, Germany's ministry of the environment should be granted a suspensive-veto right over these cabinet decisions (SRU 2012; item 712). The SRU's special report on nitrogen has discussed a number of organisational and institutional options in the context of a nitrogen strategy aimed at enabling environmental concerns to weigh more heavily in the balance for policy decision-making (SRU 2015c; item 628 ff.). These options could in many cases be transposed to the broader context of agricultural policy and agri-environmental policy issues. The ultimate goal should be to achieve policy integration to the effect that ecological issues are taken into consideration for all agricultural policy decisions.

To achieve an ecological transformation of the agricultural sector, it will above all be necessary to finally set specific soil-protection and nature-conservation related minimum standards for methods of agricultural

production, since such specificity is the very embodiment of this transformation. To this end, it is first necessary to transfer to the BMUB – which is, after all, in charge of environmental issues – the responsibility of setting standards of good practice in this domain. It is the appropriate entity to set good-practice requirements, for it has the greatest expertise in this regard. In the interest of achieving adequate coordination with the agriculture ministry – and opposed to the procedure laid down in the Fertiliser Act (Düngegesetz) and Plant Protection Act (Pflanzenschutzgesetz) – a consensus requirement should be established with the agriculture ministry (BMEL) (MÖCKEL et al. 2014, p. 372). Secondly, power to issue statutory instruments should be incorporated into (resp. expanded in) the Federal Nature Conservation Act (Bundesnaturschutzgesetz) and Federal Soil Protection Act (Bundes-Bodenschutzgesetz) to make the material requirements enforceable. Statutory requirements for good agricultural practice should be fleshed out and made more stringent in the Federal Water Act (Wasserhaushaltsgesetz) and Federal Soil Protection Act (SRU 2015c; item 409 f.).

In its *Naturschutz-Offensive 2020* (2020 nature conservation programme), the BMUB calls for direct-payment greening requirements to be tightened in connection with the 2017 review of the greening programme. Unconditional direct payments should be abolished for the next EU financing period (BMUB 2015c, p. 1). But in order for the BMUB to have a greater say in the upcoming reform and make it more environmentally oriented, it will need to engage more actively with the topic and provide more staffing to adequately address this issue.

The government should use its integrated environmental programme (*Perspektive 2030*), along with its nitrogen strategy (BMUB 2015c; Deutscher Bundestag 2015), to push harder for farm-sector reform. To achieve this, the government will need to do the following: (a) clearly explain the far-reaching nature of the necessary reforms; (b) develop a clear perspective on these reforms, supported by all relevant ministries; and (c) set ambitious goals. Hence agricultural-sector actors in general and the BMEL in particular will need to be included in the development of an integrated nitrogen strategy. Hence the SRU also regards this new strategy development process as an opportunity to shift government policy priorities in the direction of a more ecologically sustainable agricultural sector.

**73.** Under Germany's federal system of government, the *Laender* play a special role by virtue of their legislative powers. This enables them to set their own political priorities at the *Laender* level for a more ecologically sustainable agricultural sector, and to implement them via ambitious regulatory requirements (for examples see SRU 2015c and item 315 ff.; also see Section 6.6). The *Laender* also have leeway, and are responsible for, promulgating programmes for the promotion of rural development (second pillar of the CAP). They also have a say, via the *Bundesrat*, in the

shaping of the government's joint scheme for agricultural development and coastal protection. All of these elements afford opportunities to prioritise measures such as conservation-management agreements, organic farming and other agri-environmental measures. The *Laender* should be making greater use of such opportunities to contribute to transformation of the agricultural sector (SRU 2015c; items 355, 370-390 and 451; SRU 2013c).

#### 1.4.4 Research policy

##### 1.4.4.1 Transformation oriented research policy

**74.** Historically, research and innovation policy in Germany, as in many other countries, have mainly centred around fostering technology and competitiveness in a manner that did not engage with specific issues. But over the past decade, the view that research and innovation policy should be more oriented toward specific priority action fields has been increasingly gaining influence. There is now considerable and in-depth debate over the role of research and research funding in terms of key challenges facing today's society, not only at the international level (Future Earth 2014; PALSSON et al. 2013; STILGOE et al. 2013; OWEN et al. 2012), but also, and increasingly, in Germany (Wissenschaftsrat 2015; GRUNWALD 2015; SCHNEIDEWIND 2015; SCHNEIDEWIND and SINGER-BRODOWSKI 2013; von WISSEL 2015; ROHE 2015). The key phrases in this debate include, for example, 'transformation research', 'grand challenges', and 'responsible research and innovation'.

The reasoning behind this new scientific and research policy agenda differs in some respects. The main focus of such arguments from an environmental standpoint is that required transformational processes can only achieve success with scientific support. Transformation aimed at sustainability and climate compatibility is urgently needed to avoid undermining the elements that form the basis of our livelihoods (WBGU 2011). In this regard, many different bodies of knowledge will be necessary to gain an understanding of, and meet, the various ecological challenges (Wissenschaftsrat 2015). Research has the capacity (as has been shown, for example, by the Intergovernmental Panel on Climate Change assessment reports) not only to project developmental dynamics and their consequences, but also to describe sustainable technological and socioeconomic trajectories.

At the same time, it is becoming increasingly doubtful that purely market-driven technological advances and economic growth have the capacity to systematically and permanently bring about greater affluence and enhance the quality of people's everyday lives (SRU 2012, Section 1). Whereas in the past the ecological efficiency of many industries and products was considerably improved largely through incremental innovation, it is increasingly the case that radical innovations and systemic transformations are needed as well,

which cannot come about without targeted steering initiatives originating from the political and social spheres.

Social-science technological research has clearly shown that technological development is also a social process that is driven as much by social expectations and guiding principles, as by technical possibilities (BIJKER and LAW 1994; RIP et al. 1995). It thus follows that technological trajectories can be regarded as being amenable to social engineering, particularly in the early stages of innovation processes (GUSTON 2008). The goal of restructuring research and technological development processes is to enhance the transparency, reflexivity, social robustness and sustainability of knowledge production (STILGOE et al. 2013; SCHNEIDEWIND and SINGER-BRODOWSKI 2013).

In addition, the prevailing view of the interplay between governments and markets in innovation processes has changed. Empirical studies in the field of innovation research have refuted the at one time widely held view that policies should not favour any particular technology, on the ground that markets make such decisions more efficiently. Many successful and groundbreaking innovations originated not with private-sector initiatives, but with government support for research (MAZZUCATO 2014). Successful innovation strategies are often based on visionary policies, and on strategically orienting government funding of R&D toward the concomitant long-term goals (ibid.). Hence targeting global social problems can be a success factor in international competition.

**75.** The concept of transformational research and innovation policy has gained support in Germany as well, but it remains controversial, particularly in mainstream scientific organisations. Critics of such research fear the following: instrumentalisation of science by vested interests; erosion of freedom of research; a lowering of quality standards to render scientific research more socially relevant; a blurring of the boundaries between the political and scientific spheres, to the detriment of both (Die Zeit 18<sup>th</sup> of September 2014; STROHSCHNEIDER 2014; GRUNWALD 2015).

**76.** Government support for R&D in particular should be oriented toward sustainable development pathways, because the issue as to whether and how it is possible for economic activities to evolve within planetary boundaries is the central challenge of our time. However, this task needs to be addressed very discriminatingly, in that the transformational research agenda is relevant for many but by no means all scientific disciplines.

##### 1.4.4.2 Requirements for transformational research and research policy

**77.** The studies published to date mainly revolve around (a) general reflections on how transformational, sustainable and responsible scientific research dif-

fers from other research approaches; and (b) the consequent requirements (STILGOE et al. 2013; OWEN et al. 2012; WBGU 2011; GRIESSHAMMER et al. 2012; OBER 2014; Wissenschaftsrat 2015; SCHNEIDEWIND and SINGER-BRODOWSKI 2013). This literature identifies the following main requirements that transformational research should meet:

- It should be solution oriented with the aim of helping to address the challenges faced by today's society – and should thus take long-term ecological limits and scarcities into consideration, as well as develop political and social strategies.
- It should investigate the interplay between technological and social innovations and integrate a wide-ranging constellation of disciplinary perspectives into the research process as a whole.
- It should aim to ensure research quality and society's acceptance of innovation pathways by (a) carrying out its activities in a transparent fashion; and (b) involving relevant players in the research process and making use of their knowledge.

However, the discourse on the ramifications of these basic considerations for the manifold forms of research and research funding is still in its infancy. One example of these requirements being fleshed out is the guide to policy related sustainability research published by BMUB and UBA (JAHN and KEIL 2012).

**78.** German government's policy papers on research policy show that efforts are being made to orient research support more toward key social objectives. Ever since the first updated version of the High-Tech Strategy in 2010 (BMBF 2010), mission-oriented approaches and orienting research toward social objectives have been cornerstones of government research and innovation policy. In addition, the new 2014 High-Tech Strategy (BMBF 2014b) expands the definition of "innovation" to include social innovations, and embraces society as a key player in this regard. Moreover, numerous Federal Ministry of Education and Research (BMBF) programmes such as *Zukunftsstadt* (city of the future) and *Forschung für eine nachhaltige Entwicklung* (research for sustainable development) seem to be pointing to greater openness in what have traditionally been relatively closed political networks.

However, the extent to which such programmes are actually reflected by the structures, contents, and instruments of research support (project support, institutional funding, research activities of federal and *Laender* ministries) has yet to be methodically investigated. An assessment in this regard would also need to be based on the potentially controversial and normative assumptions as to what the relevant challenges facing today's society are and which types of transformations are needed to address them. The most important challenges will not lend themselves to identification via research alone but will instead need to be

identified via an open and pluralistic debate (Wissenschaftsrat 2015, p. 19 f.). The *Energiewende* is the only area in which there is a broad social consensus in Germany concerning the thrust of future development pathways. Given that this energy concept sets long-term goals for transformation of the energy system, it is possible to analyse to what extent current research priorities are in line with this vision (BMWi/BMU 2010).

#### 1.4.4.3 A case in point: energy research

**79.** An energy study commissioned by the SRU from the Wuppertal Institute (FISCHEDICK et al. 2015) found that the policy goals and priorities of the *Energiewende* have had a major impact on publicly funded research. The relevant research expenditure - the study found - has been stepped up considerably, there is a stronger focus on interdisciplinary and transdisciplinary research, and the relevant players are being afforded broader participation in shaping research programmes. However, the system of publicly funded research that aims to support transformational restructuring of the energy system has a number of shortcomings (ibid.). The SRU draws the following conclusions from the aforementioned study:

- The goals of the *Energiewende* are not fully reflected by research priorities, particularly when it comes to so-called institutional funding (i.e. core funding for certain research centres). Thus for example, nearly half of all institutional funding in 2013 for the Helmholtz Association went to fusion research. In 2014, around 25 per cent of all energy research funding still went to fusion and nuclear safety/final disposal of nuclear waste. But responsibility for orienting the research agenda toward sustainability also lies with the core-financed research institutions, in that they have considerable leeway in setting their own research priorities.
- Though the ministries involved have in some cases issued extensive reports concerning their energy research expenditures, it is difficult for outsiders to compile data that would allow for a systematic comparison of research priorities with *Energiewende* goals. A detailed breakdown of such expenditures of all ministries that is more instructive than the government's energy report would be desirable.
- Government energy research continues to centre around the technical domains, at the expense of the non-technical aspects of transformations (i.e. the relevant economic, social and legal issues), which have yet to be adequately studied.
- Certain key energy transition issues such as rebound research and energy sufficiency have not been given sufficient attention thus far.
- With its 'Forschungsforum Energiewende' (Energy transition research forum), the BMBF has launched a relatively transparent and participatory

process that aims to elaborate energy research priorities for the future. However, civil-society organisations have complained that their views and suggestions (e.g. the proposal of a Copernicus project on energy efficiency) have ultimately not been taken up. Public interest groups still do not participate to an adequate degree in research governance bodies and networks. For example, it has been pointed out that though a number of public interest groups are represented in a key innovation policy body known as the Hightech-Forum, no representatives of environmental interests are involved in the undertaking. Environmental organisations have noted that while established stakeholders have no difficulty pushing their agendas through, civil-society actors are denied access to certain informal networks (FISCHEDICK et al. 2015). Moreover, civil-society organisations often lack the financial resources and staff necessary to engage with such bodies to the necessary degree (ibid.).

- Despite the implementation of various measures aimed at improving inter-ministerial coordination (e.g. early-stage coordination and joint funding programmes), there is still considerable room for improvement in terms of cooperation between ministries on energy research. It often happens that early-stage coordination processes are used to delay or block another ministry's research programmes, for political reasons or because of diverging views on their usefulness. Joint ministerial programmes remain the exception rather than the rule. The efforts of the BMBF to play an active role in energy research via programmes such as *Energiewende* research forum and the so-called Copernicus projects have come in for criticism from BMWi as the ministry leading on energy policy. According to observers, BMWi chose not to participate in elaborating the Copernicus projects (FISCHEDICK et al. 2015).
- *Increased transparency and participation in research governance.* Research-governance decision-making bodies need to become more transparent and participatory, since research grant decisions invariably have a normative component. The controversy over the make-up of the Hightech-Forum shows that establishing quotas based on major social groups is not enough to achieve broad social legitimacy. It is crucial that the players represent a sufficiently broad spectrum of values, rationalities, and arguments. Ways must be found to provide general-interest advocacy organisations that lack the requisite resources with funding that will enable them to have a say in research-policy decisions. Moreover, established scientific institutions such as core-funded research centres and science academies need to develop approaches that will make these bodies more open to input from society. In the case of such science academies that aim for social and policy impact, it would seem, for example, that the process of co-opting of new members by existing ones is no longer in step with the times.
- *Expanding the scope of research on conditions for socioeconomic transformation.* Technological development is only one approach to solving problems. It is equally important to study the social conditions that could potentially promote the diffusion of innovations and the restructuring of socio-technical systems. While these research areas have become more important over the years, they clearly lack the necessary resources. In the SRU's view, funding for social science research on energy, agriculture, transport and other key transformation related issues should be greatly increased.
- *Accompanying technological development through participation and social science research.* Past technology related controversies have shown that public acceptance is of key importance for technologies and infrastructures. Hence, the BMBF should promote structures that enable civil-society actors to engage with technological developments at an early stage. This is already underway for grant programmes such as the Copernicus projects, but needs to be expanded and fleshed out. It is important that social perspectives are not dealt with in separate projects, but are instead integrated into technically oriented undertakings.
- *Defining long-term research priorities and improving cooperation between ministries.* It is unavoidable that various government agencies predicate their research projects on differing perspectives and priorities. In many cases, cooperation between line ministries is based on what can be termed a negative-coordination model – a practice where each ministry blocks the initiatives of another ministry when it perceives it as negatively affecting its interests (on the term: SCHARPF 1993). However, future-oriented and strategic re-

#### 1.4.4.4 Conclusions

**80.** Major efforts have already been made to not just adapt funding priorities to current policy goals, but also to incorporate procedural requirements such as transparency, networking, and interdisciplinary and cross-disciplinary cooperation. The SRU approves of government efforts in general (and those of the BMBF in particular) to implement mission-oriented and transformational research policies. But owing to long-standing formal and informal structures, these efforts only represent a first step toward a greater emphasis of government R&D grants on transformational processes, and a greater openness of established networks to other stakeholders. A more ambitious re-orientation of research policy is both possible and desirable. The scientific community itself should support this process by systematically reflecting on findings and experiences to date. The SRU recommends the following measures:

search funding can only be successful if a common basic understanding across line ministries is achieved and if conflicts over matters such as spheres of responsibility or sustainable technology pathways are resolved early on (positive coordination). Long-term research funding priorities should be jointly elaborated by the line ministries involved. This requires not only committees and initiatives (inter-ministerial task forces, joint grant programmes), but also a transformation in the administrative culture – an evolution that is still in its infancy.

- *Terminating funding for research areas that are no longer future-proof.* Research-funding decision makers need to systematically assess which research areas no longer merit funding in light of current policy goals and technical advances. This may include, for example, research on extracting fossil fuel resources, or incremental improvements in coal-fired power plants. In terms of fusion research, the policy decision not to refrain from completely abandoning this option for possible use in the future may be justified. Given that there are other more direct and urgent energy supply challenges (decarbonisation of the transport sector, load management, grids, energy storage and so on), SRU considers fusion research not to have a high priority at present. Hence it should be determined in the short term whether expenditures on fusion research can be reduced, or whether their timeline can be prolonged, without harming basic research infrastructure elements. Moreover, the general meaningfulness of fusion research should be reviewed regularly in light of cost and technology trends.

## 1.5 Conclusions and recommendations

**81.** The 7th Environmental Action Programme's vision of a good life within planetary boundaries is no longer achievable merely through ecological modernisation. An ecologically sustainable economy within these limits will require substantially reduced resource use and pollutant emissions – goals that are not achievable solely on the basis of technical innovations. Hence, we need to extend our understanding of innovation to include the dimensions of cultural, social and institutional transformation. The main task facing environmental policy is to advance comprehensive ecological transformations, and to implement them by means of concrete action plans.

Towards a transformational environmental policy

**82.** Far reaching transformation can only occur if cultural, political, economic and institutional change moves, in a co-evolution context, in a similar direction – which, however, cannot be legislated into existence. This phenomenon can be termed a steering paradox, owing to which there is a great need for management and coordination – but in the absence of a steering

centre for the many trends involved. Hence, this is exactly why the state remains a key player, by virtue of its broad legal, financial and symbolic resources. Indeed, the state needs to fulfil even greater requirements.

Thus environmental policy needs ambitious long-term goals involving a series of milestones, so as to provide the general public, the business community and policy makers with certainty in policy direction and provide an orientation guide for the manifold activities involved. At the EU level, this is provided for via the long-term roadmaps for a climate-friendly economy and a circular economy, while at the member state level progress reports on the National Sustainability Strategy and the envisaged integrated environmental programme will play a key part. Hence, concrete environmental policy goals should be elaborated within the framework of these strategies and programmes, for 2030 and (insofar as possible) for 2050. In order to be credible, such undertakings will need to be backed with reliable programmes of measures.

Of particular importance is conveying to the public the need for environmental action. Maintaining a high standard of living and preserving peace are possible provided that fundamental ecologically motivated change is achieved. “Great narratives” help to bring interrelationships of this nature to light and to win wide public support.

Effective environmental policy integration remains equally important. Environmental policy objectives need to be transposable into strategic sector specific goals for action, and need to be results-oriented in the various ministries as well. In previous reports, the SRU has proposed instruments that aim to improve environmental policy integration, such as joint leadership for cross-cutting issues, granting the Federal Environment Ministry a suspensive veto right, and enhanced support from the Federal Chancellery (mainstreaming).

Transformations are knowledge-intensive, particularly when it comes to analysing the structure of problems, possible socio-technical options for action, the drivers of transformation, narratives, institutional constraints, and undesirable side effects. For all of these reasons, transformation research is a key precondition for success, and is also crucial when it comes to addressing the steering paradox. The government in general and the BMBF in particular are already making major efforts to not only adapt funding priorities to long-term policy goals, but also to incorporate procedural requirements such as transparency, networking, and interdisciplinary and cross-disciplinary cooperation. But in order to change long-standing formal and informal structures, an even clearer change of course in the research policy domain would be desirable. All ministries should review their research activities with a view to transformation requirements, and should terminate funding of all research areas that are no longer in step with the times, make research policy more transparent and open it up for civil-society par-

ticipation. The fact that transformations necessitate socio-technical change should be taken into consideration systematically. In other words, the social sciences should be comprehensively incorporated into the funding programme design process, rather than being regarded as a mere appendage to a technically oriented research agenda. Research findings should catalyse, and be the occasion for, all political, economic and civil-society actors to jointly devise meaningful pathways to transformation. To this end, research dialogues should be deepened, and inter-agency research initiatives spanning all relevant ministries should be expanded.

**83.** Transformational policies need to take into account appropriately all phases of a given transformation process. Generally, an ideal-typical distinction is made between niches, rapid up-scaling, and implementation of a new model.

Niches, real-world laboratories, and pilot projects play a vital role in the early stages of transformation processes. The government today, more than ever before, needs systematically presented information that makes social trends and changes ascertainable early on. It might be worth considering for the government to issue regular reports on niches for ecological transformation, and for such reports to deal cogently with their development and problem solving potential, and with impediments for such niches to unfold as well.

Such niches need policy support that ideally will result in the up-scaling of successful technologies, as well as social innovations – as has occurred over the past 15 years in connection with the expansion of wind and solar power, which enjoys widespread public support. During the phase in which innovations are transformed from niche to mainstream market phenomena, procedures are needed that allow for the identification of sustainable “winning industries”. Owing to the close interconnection between new technologies and what are for the most part highly regulated or subsidised infrastructures, carefully prepared and comprehensively reviewed technology policy decisions are indispensable for such phases. Such key policy decisions need to be evaluated at regular intervals, however. In this regard, the concept of reflexive governance is crucially important, in that it involves (a) constant reviewing of technology policy decisions, and of their potential unanticipated consequences as well (among other things); and (b) making any necessary adjustments. Misguided decisions can only be rectified through learning innovation systems, as has been successfully done in the field of bioenergy policy. Such systems, on the other hand, can make it possible to strengthen strategically sound innovation pathways. Finally, a high degree of responsibility rests with the government in that it needs to communicate to the general public the requisite structural change, seek a minimum level of consensus, develop a long-term regulatory framework for restructuring, and support this process via social-policy measures. The SRU recently explained this complex task in a report on the

future of coal in the run-up to 2040. Innovative stakeholders as well as actors with a conservative take on restructuring need to be involved in this process, and new participatory platforms need to be devised above and beyond associations, trade groups and other mainstream organisations.

**84.** Transformations in EU member states should always take the broader European context into account. National policies are subject not only to EU policy restrictions, but also tasks and mandates to act. For example, the European Commission has elaborated long-term roadmaps toward a climate-friendly, resource-efficient, and resilient economy. The German government should actively engage with these roadmaps, and optimise them, flesh them out and above all strengthen them through its own exemplary practices.

At the same time, the government should unequivocally repudiate an agenda that lopsidedly seeks to prioritise business interests over public interest issues such as environmental protection. In this regard it should be noted in particular that the European Commission’s plan – in connection with its strategy for less bureaucracy and better regulation – to prevent member states from implementing farther-reaching national environmental policies and to aim at a 1:1 transposition of EU requirements is inappropriate and contradicts the spirit and purpose of the EU Treaty.

#### Actively pioneering environmental protection policies

**85.** Pioneers are indispensable for the dynamics of both EU and international environmental protection policies. Being a pioneer in the field of environmental policy means implementing innovations that set a good example that is likely to be emulated by other countries. Such pioneers are most likely to achieve political and economic success if they actively impart their experiences to other countries and build alliances – and thus provide impetus for transformational policies and the international diffusion of strategies for success.

All things considered, Germany has ideal conditions for being a pioneer in the environmental policy domain – the main assets being its highly developed economy, a high proportion of innovation-oriented industries, strong public support for environmental concerns, and extensive knowledge development and research capacities. Hence, in the SRU’s view, the government should make its pioneering environmental policies a general “trademark” of German environmental and sustainability policies. While Germany has been and still is in the forefront of many action fields, guiding principles are lacking in certain other fields, along with the willingness to support trends toward reform in the European Union.

#### Climate policy

**86.** The German *Energiewende* is the farthest-reaching example to date of a transformational pio-

neering role. Germany has short- and medium-term goals for climate protection and for the build-out of renewable electricity that are more ambitious than the EU's, and has a long-term roadmap and a medium-term targeted programme of measures such as the Climate Action Programme 2020 and the Climate Action Plan 2050. The *Energiewende* enjoys broad public support for a number of reasons, key among them being that it does not rest on the shoulders of only a few power companies, but rather is being advanced by many citizens either directly, or via investments in the build-out of renewable energy. However, there is room for improvement in the programme of measures. To ensure the continuing success of the electricity generation dimension of the *Energiewende*, a number of challenges need to be met, one of the most crucial being to phase out coal-fired power plants in a timely manner. The success of the *Energiewende* hinges on achieving a consensus concerning this phase-out.

Germany has traditionally been in the forefront of European Union climate policy, and in this capacity has advocated binding and dynamic EU targets for developing renewables as well as considerable leeway for member states to choose measures that fit the circumstances in their own countries. But with the agenda for a European Energy Union, backing for Germany's energy policy is dwindling in the EU. Thus it is all the more important that Germany advance a European energy transition as well.

#### The circular economy

87. Thanks to high recycling quotas and abolition of depositing untreated waste in landfills, Germany's achievements in the field of waste management far exceed those of EU member states in general. Given the conditions afforded by today's statutory waste management measures, the economic potential for an all-encompassing circular economy has largely been unlocked. Hence, having now been in existence for two decades, Germany's circular economy is on the cusp of the second generation. The main focus of further developing the German circular economy is on innovations in product design and product stewardship. The goal here is to allow for the manufacturing and diffusion of durable products, the use of recycled components, and the recycling of valuable raw materials.

It is nonetheless fair to say that Germany is in the forefront of such efforts, which have not been actively

Europeanised. An opportunity to Europeanise Germany's high standards for depositing untreated waste in landfills and household-waste recycling was missed in the run-up to the European Commission's first circular-economy proposal (in 2014), owing to disagreements on various technical issues between the Commission and the BMUB, among other reasons. When, in December 2015, the Commission resubmitted its circular economy package, the SRU therefore proposed the following: (a) a closer linkage between the expert and policy levels at the member-state and EU levels; and (b) a higher-profile policy stance on the part of Germany, aimed at having a greater impact on public opinion. To achieve this, it is vital that ambitious stakeholders in the European multi-level system work together. Germany should clearly avow its pioneering role in such efforts and provide impetus for the relevant EU legislation.

In terms of achieving improved product design, the SRU recommends that regulatory and market-based instruments be incorporated into the "soft" ProgRes II programme of measures.

#### Biodiversity and agricultural policy

88. The EU policy level, by virtue of its powerful instruments, plays a pivotal role in dealing with the challenges posed by biodiversity protection and agricultural policy. But when it comes to integrating environmental concerns into agricultural policy, Germany is not a pioneer, neither in terms of optimisation of the Common Agricultural Policy (CAP), nor the implementation and shaping of national policies. There is considerable need for reform in the nature conservation and waterbody protection domains. Enabling the manifold stakeholders to have a say in agricultural policy decisions should be a top priority, particularly when it comes to ecologically sustainable farming, and nature, animal and consumer protection. A key step in this direction would be the elaboration of guiding principles for sustainable agriculture, via a process involving participation by both farmers associations and environmental stakeholders. But this can only be achieved if institutional changes are made that ensure implementation of the necessary far reaching reforms. Hence, the SRU reiterates that a consensus at all levels is needed between environmental ministries and environmental administrations in all agricultural policy issues of ecological relevance.

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