

Multi-Level Reinforcement in Climate Governance

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1 Introduction

The increase of greenhouse gases and the scientific consensus on the consequences of man made changes to the atmosphere of the Earth, is a dramatic challenge to the governance of necessary climate mitigation. What is needed is a high speed of technological change towards a low-carbon economy, comparable to the industrial revolutions of past centuries, and it can be asked what strategic options exist that can accelerate mitigation efforts. Evidence shows that indeed, there have been cases of accelerated change in the last decade. The international diffusion of renewable energy technologies is a prominent example. This paper is dealing with mechanisms that can accelerate the diffusion of climate-friendly technologies.

Three types of interactive processes seem to be interesting in this regard:

1. Mutually reinforcing cycles: the interactive reinforcement of policy, (domestic) market growth and innovation initiated by ambitious political action;
2. the reinforced (international) diffusion of innovations from pioneer countries, which can be both:
 - a diffusion of low-carbon technologies from lead-markets and
 - a diffusion of the supporting policy, resulting from “lesson-drawing” by other countries;
3. the reinforced diffusion by multi-level governance both
 - as interaction between national policy innovation and higher-level harmonization which is a characteristic of the EU and
 - the horizontal dynamics on the sub-national level, induced by higher levels.

These mechanisms are characterized by a multi-factorial interactive reinforcement of innovation and diffusion processes. A reinforced diffusion of climate-friendly technology can be observed at different levels of the multi-level system

of global governance. The following analysis will refer to best practice (a pragmatic methodological decision, which excludes the discussion of failures).

2 Economic and political mechanisms of acceleration and reinforcement

Mechanisms of acceleration and self-reinforcement are not unknown in economics and political science. Brian Arthur presented a theoretical discussion on “dynamical systems of the self-reinforcing or autocatalytic type” both in the natural sciences and economics. According to him, self-reinforcing mechanisms in economics are related to four “generic sources”:

- large set-up or fixed costs, giving advantage to increasing economies of scale;
- learning effects, which act to improve products or lower their costs;
- coordination effects, which confer advantages to ‘going along’ with other economic agents;
- adaptive expectations, where increased prevalence in the market enhances beliefs of further prevalence (Arthur 1988).

Arthur mentions “virtuous cycles” and the option of “strategic action” and the possible role of policy “to ‘tilt’ the market” toward certain dynamics (Arthur 1988). Arthur also mentions an important condition for a new equilibrium: “self-reinforcement (that) is not offset by countervailing forces” but supported by “local positive feedbacks” (Arthur 1988). Although this is not extended and lacks discussion or empirical analysis, Arthur gives a remarkable early theoretical view on a phenomenon that has become highly important, particularly in environment and climate policy research. We will present empirical cases, which are compatible with the typology of his “generic sources”, but the picture is different if *policy-feedback* is included.

Modern *innovation research*, particularly on eco-innovation, has brought new theoretical and empirical insights into the phenomenon of accelerated technical change (Watanabe 2000; Hekkert et al. 2007; Bergek et al. 2008; IPCC 2011). Political science has added the dimension of *policy feedbacks* to the interpretation of interactive dynamics in modern policy-making (Pearson 1993; Patashnik 2008): Policies generate resources, incentives and information for political actors, which can reinforce the policy.

The present author has contributed to this research by adding the policy cycle to the reinforcing cycles of market growth and innovation in an analytical model for the diffusion of clean energy technology (Jänicke 2012). The policy

cycle (agenda setting – policy formulation – decision – implementation – policy outcome – evaluation – new agenda setting, etc.) is a mechanism of policy learning and change. It is particularly open to policy feedback, for instance if there are unexpected co-benefits of the policy.

“Lesson-drawing” (Rose 1993) is another potential mechanism of political reinforcement. It can support the diffusion of policy innovations, for instance if there is a certain “group dynamics” of countries: a collective learning leading to the broad adoption of a certain “trendy solution” (Chandler 2009).

There may be more types of acceleration. Economic but also regulatory competition (Héritier et al. 1994) can reinforce the diffusion of goods or policies. Both economists and political scientists are familiar with the purposeful use of a *window of opportunity* (Kingdon 1995). Here we find an incidental convergence of “multiple streams” providing a situational opportunity for decision makers (Zahariadis 1999). However, this does not necessarily produce a stable result and a new equilibrium. On the contrary, windows of opportunity (such as the situation after the Chernobyl or the Fukushima catastrophe) often close after a while. Therefore this type of acceleration without a new equilibrium is excluded from consideration here. This article deals with an accelerated *transformation*, i.e. change with stable long-term effects (Patashnik 2008).

3 The diffusion of eco-innovation and the interaction of policy and technology

The diffusion of innovative low-carbon technologies and innovative supporting policies are typically interlinked. There is, however, no clear causal relationship but a pattern of multiple interactions between technology and policy (Jänicke & Jacob 2007). Policy can support the innovators of a low-carbon technology, and the innovators may provide new technology-based policy options for climate policy. Policy may act as a first mover, and its diffusion by lesson-drawing may support the diffusion of the technology. Often, the technological innovation comes first (as in the case of wind power) and governmental support can reinforce its success in national and global markets. In any case, the interaction between policy and technology can contribute to a reinforced diffusion of both the low-carbon technology and the supporting policy. This is a “coordination effect” in terms of Arthur’s classification (Arthur 1988). In recent times there has been a rejuvenation of industrial policy (Stiglitz & Lin 2013; Hallegatte et al. 2013). It seems that green growth strategies and the designing of environmental and climate protection in terms of industrial policy are prominent examples of this tendency (UN 2007; UNEP 2011; OECD 2011; World Bank

2012). The translation of environmental and climate policy goals into the language of a technology-based economic strategy has become a success story in several countries. Many governments regard themselves as actors in a highly competitive global market for clean technologies, in which innovation is regarded as the core of competitiveness (Jänicke 2012). From the perspective of climate policy this means that this policy has been able to mobilize economic interests. The following analysis will show that this ability can be observed at all levels of the multi-level system of global governance.

4 Interactive cycles of climate-friendly innovation

It is a basic economic truth that growing markets induce demand for further innovation, which reduces production costs and improves the quality of the end-product. This is the *learning effect* in Arthur's classification (Arthur 1988). Markets for climate-friendly technologies, however, are characterized by the specific fact that they are typically *policy-driven* (Ernst & Young 2006). Therefore, a *third* dynamic system is relevant: not only the market and the technical innovation system, but also the political system – as a learning system – influences the process (see also Dierkes et al. 2001).

It has been shown that cases of accelerated diffusion of low-carbon technologies can be explained by the interaction of the three cycles. The author has studied 15 empirical cases in which these kinds of dynamic interactions can be observed (Jänicke 2012; 2012a). The development of green power in Germany after the introduction of attractive feed-in tariffs is an example (Weidner & Mez 2008). As in certain other cases – particularly in China – the policy starts with an ambitious target inducing an unexpected market growth, which again induces innovation and finally a positive policy feedback in the form of an increase in the policy's targets. The ambitious (and contested) German target in the year 2000 – 20% green power – was increased after nine years and again only one year. Later on, the ministry of environment proposed a target doubling the original.

5 Enforced diffusion from pioneer countries: lead markets and political lesson-drawing

A second mechanism of enforced diffusion is provided by national pioneers and trend setters (Jänicke 2005). The *creation of a lead market* for low-carbon technologies in a pioneer country together with political *lesson-drawing* (Rose 1993) by other countries has been a prominent mechanism for the international

diffusion of such technologies. Both mechanisms are independent, but they can reinforce each other.

The *economic* mechanism is the enforced diffusion of climate-friendly technologies via *lead markets*. Lead markets are the national “runway” where a new technology starts to international markets.

A national lead market is, according to Beise et al. (2003), “the core of the world market where local users are early adopters of an innovation on an international scale”. Well-known general cases are lead markets for mobile phones (Scandinavia), fax (Japan) or the World Wide Web and Internet (USA). They originated in markets with special market advantages, such as price, market structure, demand or export advantages.

Lead markets in pioneer countries have played a special role in the diffusion of low-carbon technologies. They have financed the *costs for technological learning* until the product was sufficiently cheap and effective to diffuse into international markets. And they had a *demonstration effect* proving that and how a certain climate-related problem could be solved, often with an economic advantage. This mechanism has become an important pathway for translating climate policy objectives into the logic of global markets. Examples include the development of wind power in Denmark and Germany, photovoltaic installations in Japan and Germany, heat pumps in Sweden, hybrid motors in Japan and fuel-efficient diesel cars in Germany. Examples for lead markets in emerging economies include solar water heating in China and bio-fuel technology in Brazil.

Lead markets for climate-friendly technologies arise in countries with a “regulatory advantage” and a “transfer advantage” (Rennings & Schmidt 2010). That means that the technology is supported by policy. Their international diffusion is supported by “lesson-drawing” by other countries. This political “*lesson-drawing*” is the second mechanism of reinforced international diffusion. In the context of lead markets it refers to the process of learning how to support markets for a specific climate-friendly technology and results in the diffusion of a specific supporting instrument or policy mix. Lesson-drawing is similar to Arthur’s mechanism of “adaptive expectations” – although it is *policy* learning. Similar to enforced technology diffusion, reinforced policy diffusion depends to a high degree on expectations, where increased prevalence in the global policy arena “enhances beliefs of further prevalence” (Arthur 1988).

The anticipated probability that a certain regulation will become an international standard (also supported by international harmonization) has become a strong driver of policy diffusion (Jänicke, Jörgens & Tews 2005). A *critical mass* of countries adopting a certain *trendy solution* (Chandler 2009) reinforces the diffusion (see also Witt 1997). At this stage, the process achieves sufficient

momentum to become self-perpetuating. The speed of diffusion and lesson-drawing in technology-related climate policy has been in many cases remarkable. The diffusion of the instrument of feed-in tariffs may be used as an illustration.

The diffusion of targets for green electricity occurred even faster. By early 2013, 138 countries had introduced targets for green power, a number that doubled since 2007 (REN21 2013). Even policies to support energy efficiency, which is often regarded as the more difficult part of climate policy, can have a high speed of international diffusion: out of 85 countries analysed by the French institute ADEME, the share of countries with national targets for energy efficiency doubled within only five years to 80% (ADEME 2013). This speed of diffusion is in clear contrast to the slow progress in international climate negotiations. Lesson-drawing has been characterized as “governance by diffusion” (Busch et al. 2006). It is remarkable that it is a completely voluntary process, significantly different from global climate governance by legally-binding international obligations.

So far, lead markets in rich countries have provided the basis for clean technologies to diffuse from industrialized economies into international markets. A more recent development is the role of lead markets in *emerging countries* like India, where the lag markets are developing countries. Most interestingly for a sustainable energy future are lead markets for *frugal innovations* (Tiwari & Herstatt 2012). Frugal innovations are not only cheap, simple and robust but also try to save resources at all stages of the supply chain (Jänicke 2013).

6 Multi-level governance: the vertical reinforcement of horizontal diffusion

6.1 *The role of the sub-national level*

Multi-level governance “characterizes the mutually dependent relationships – be they vertical, horizontal, or networked – among public actors situated at different levels of government” (OECD 2013; see also Bache & Flynders 2004). *Multi-level reinforcement* is the most interesting aspect. Schreurs and Tiberghien have used this formula to explain the dynamics of climate policy in the European Union and its member states (Schreurs & Tiberghien 2007; Jordan et al. 2012). However, it is also relevant in the global context. Here it is used to explain the dynamic interaction between the national and the sub-national levels.

At each level of the multi-level system of global climate governance, a broad variety of motives and opportunities can be observed. At the level of *provinces/regions or federal states*, the following motives to support or to adopt

climate-friendly technologies exist: rich regions can be motivated to transfer their successful economic policy to the new field of climate policy. Poor regions, on the other hand, can try to support renewable energies or energy-saving investments in the housing sector to overcome unemployment.

Another driver may be competition between the region and the national government (as in the case of Scotland or California). Geographical advantage might provide another condition to support renewals (as wind energy in coastal zones). Political scientists often point to the party constellation of a certain regional/state government (Delmas & Montes-Sancho 2011; Chandler 2009). In the EU there are several responsibilities for climate and energy – beyond emission trading – at the regional level (Wolfinger et al. 2012). There exist horizontal networks such as the Network of Regional Governments for Sustainable Development, which has been established at the World Summit in Johannesburg (2002).

Cities and local communities have important responsibilities in policy areas that are relevant to climate policy. Housing and the energy consumption of households, transport regulations and infrastructures, land-use and urban planning or waste policy are important policy fields in this regard. Most important is the responsibility for local energy supply, where cities in Europe or the US can have strong influence (cp. OECD 2013). The fact that 80% of EU greenhouse gases emissions are related to urban activities illustrates the importance of the local level. Thus, cities are also important places for climate policy experiments and innovations (Bulkeley & Castán Broto 2012). Horizontal international networks such as ICLEI or the Covenants of Mayors play an important role (Kern & Bulkeley 2009). In addition national networks such as the German “100%-Renewable Energy” network, the City Energy Project (USA) or the Chinese Low Carbon Eco-Cities Association can play a role. Local climate mitigation and horizontal lesson-drawing between cities is being explicitly supported by the EU Commission and also by the central government in China (Zhou et al. 2012).

6.2 *The case of the European Union*

The EU has provided best practice in climate mitigation and multi-level climate governance. By 2013 renewables accounted 72% of new electric power capacity and total greenhouse gases between 1990 and 2012 have been reduced by nearly 20%. Multi-level climate governance was often a purposeful strategy. The EU has a special policy framework for regions/provinces which also includes innovative cities. Other characteristics of EU countries that facilitate a *green*

opportunity structure include green political parties and public media. The EU has turned a “free market” into a market with clear environmental framework conditions. The World Bank recently confirmed, that the EU has a specific “environmentally sustainable growth model” (World Bank 2011).

There is also a specific European mechanism of multi-level reinforcement: the interaction of national environmental policy innovation with the European harmonization mechanism in the context of the common market. The EU commission can under certain conditions authorize member states to maintain or introduce more ambitious measures of environmental policy. When a member state is authorized to do this, “the Commission shall immediately examine whether to propose an adaptation to that measure” (Treaty on the Functioning of the European Union, Art. 114,7; 193). There is also a kind of lesson-drawing by the EU Commission: learning from empirical best practice. Therefore, environmental policy innovation in member states can with a certain probability become a European regulation, which is based on the objective of a „high level of environmental protection“. This mechanism can stimulate regulatory competition between member states to become the forerunner of a European regulation (Héritier et al. 1994; Schreurs & Tiberghien 2007). The UK emission trading scheme (2002) may be taken as an example. It was also intended to deliver ‘first mover advantages’ to UK companies before the introduction (2005) of the EU emission trade scheme (Rayner & Jordan 2011).

Climate policy as a process started in the EU at the national and sub-national level. Pioneer countries like Germany, Denmark and the United Kingdom (UK) generalized and integrated many political and economic experiments and best practices that had already taken place at lower levels, paving the way for their adoption at a higher level. Thus, climate policy innovations proceeded bottom-up to the European and global levels. Extending the national policy innovations to the European Union has often been a governmental strategy of member states to stabilize the national pioneer role, but also to create a European market for domestic innovations in climate-friendly technologies. The *Europeanization of climate policies* was accompanied by the establishment of lobby organisations, which articulated an economic interest for clean energy at the EU level. Examples include the European Renewable Energy Council, the European Alliance to Save Energy, the European Insulation Manufacturers Association, Lighting Europe and the European Heat Pump Association.

Meanwhile feedback can be observed at the local level, reinforcing earlier initiatives: cities and local communities, often organized as networks (Kern & Bulkeley 2009), use national and European policies and incentives – whether regulations, subsidies or public procurement – to mobilize economic interests for

climate-friendly technologies. These can be investments in forms of renewable energies or low-energy buildings.

Most remarkable is the role of the Covenant of Mayors with more than 5,000 (2013) participating local communities. It was launched by the European Commission together with the EU climate and energy package in 2008. Under it, the participating local authorities have to present action plans and a GHG reduction target of at least 20%. The economic dimension is underlined by the fact that the European Investment Bank is strongly involved in the financing of implementation measures. The Smart Cities Partnership Initiative of the EU Commission is a similar economic mechanism. The horizontal dynamics – particularly the competition between cities – are stimulated by an official Benchmark of Excellence, which is also a database of best practice (Covenant of Mayors 2013).

Private ownership of green power installations seems to be a strong driver of change at the local level in several countries. In Germany, more than half of the green power installations are owned by private persons. Europe, when compared with other global regions, has not only the advantage of a strong supra-national level of climate governance, but also the highest proportion of decentralized and local ownership of green power installations.

It seems that the *local level is a late mover in the process of climate policy, but now it has become the most dynamic driver of technical change* towards a low-carbon energy system. An evaluation of the Covenant of Mayors shows that 63% of the local communities being assessed by the EU are planning to reduce GHG emissions by more than 20%. So far, a reduction of about 370 million tons is expected by 2020 (EndsEurope 24.06.2013). The database of the Covenant provides empirical evidence that in recent years, the climate policy process has mobilized strong economic interests at the local level, mainly in the building sector (30% of the activities) and in local energy production.

The former policy initiative at the higher levels has created the necessary preconditions for this booming development at the sub-national level. The EU Directive on Energy Performance of Buildings, for instance, has stimulated a strong activity among local communities with pioneer cities such as Freiburg, Manchester, Copenhagen and Malmö playing an important role (REN21 2013a).

It seems that the former pioneer countries – Germany, Denmark and the United Kingdom – are again leading countries as far as these local dynamics are concerned (Jänicke 2011; Rayner & Jordan 2011). The three countries have achieved the highest GHG reduction rates. They have also the most ambitious GHG reduction targets for the period 1990–2020/25 (Germany 40–45%, UK 50%, Denmark 40%). In the three countries this was the result of policy-induced reinforcing cycles of innovation and market growth with policy feedback. They

are also cases of best practice regarding the mobilization of economic interests at the sub-national level.

6.3 Theoretical interpretation

How can this multi-level reinforcement process be explained? Why is it an advantage to play a multi-level game, compared with policies preferring one dominant level?

It seems that the multi-level system of climate governance has become a system with an inherent logic and dynamics. Meanwhile it has created an opportunity structure for innovation. The broad variety of agents and possible interactions may be one of its main characteristics.

The interaction between levels is another one. Additional factors are horizontal dynamics at lower levels – pioneer activities and lesson-drawing, networking and cooperation as well as competition – which are induced by climate-policy action at higher levels. The multi-level system of climate policy is a global system because it has a global base of climate-related knowledge, motivation and legitimacy. And it is a global system because a global market for climate-friendly technology has been established, together with the global arena of climate policy. An important condition of its innovation dynamics is the leadership role of the higher levels. Political leadership or even political entrepreneurship on the higher levels typically takes place in the form that experiments, innovations and best practices established on lower levels are generalized and integrated. Political innovators find a broader political constituency and economic innovators find larger markets. The second effect of vertical policy intervention of higher levels is its *impact on the horizontal dynamics at the lower level*: If the higher levels take the lead, providing regulatory financial or informational support to the lower levels, they will strengthen the role of pioneers at the lower levels and induce horizontal lesson-drawing, competition and/or cooperation at the same level. Pioneer cities or provinces/states at the lower levels become benchmarks for others, and the support from above provides new resources for the diffusion of climate-friendly innovation. This includes the extension of markets and the policy arena for innovators at the European and global levels. The mobilization of economic interests and the translation of climate policy goals into the language of market dynamics is an integrating common factor at all levels.

7 Policy conclusions

It has been shown that the acceleration of the diffusion of clean-energy technologies is a potentially strong option for climate policy. Several mechanisms of reinforcement have been presented that are highly likely to support each other. And the list of possible accelerators may be even longer than those presented. One additional likely mechanism of acceleration is the simultaneously rising price for fossil energy and the falling price of renewables.

It seems that the multi-level system of climate policy has already achieved its own *inherent logic*. It can be characterized by typical horizontal and vertical dynamics as well as long-term stabilization mechanisms and path-dependencies, based on institutional change, new economic interests and policy feedback. Several mechanisms can be used to support this process and to stimulate acceleration, although a comprehensive strategy still needs to be developed. So far, these processes are mainly the result of an interactive learning-by-doing. The dynamics in most cases have been induced by *competent practitioners*. That means that they are not the result of scientific design; instead, they are most often unintended and unexpected.

There can be no doubt about the difficulty of translating the complex task of multi-level governance into a comprehensive strategy. There needs to be more research on best practices to draw better and more comprehensive conclusions for government strategies. The main policy conclusions of this explorative analysis can be summarized as follows:

1. Translating climate policy objectives into the language of industrial policy and ecological modernization (Jänicke 2012) is a strong option for climate policy (while it is not the only solution, since there are limits to technological approaches).
2. Ambitious climate policies that are realistic in terms of a given capacity can induce market growth and interactive technological learning.
3. The mechanism of induced innovation and diffusion can create benefits and new interests that can lead to policy feedback with even higher ambition.
4. It has been possible to mobilize economic interests at all levels of the multi-level system of global governance.
5. Proactive leadership and support from higher levels can stimulate diffusion at lower levels.
6. National governments are still important players in this respect.

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