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Abstract

The development of a new policy instrument, "emissions trading", is analysed as an innovation journey in the realm of governance. Tracking the process by which a novel pattern of social regulation emerges and travels shows how "policy technology" develops according to dynamics of its own, partly independent of policy problems and goals. Interactions across science, policy development and particular domains of governance are critical for the transition between phases: from options to first developments, to experimentation with a prototype and to further diffusion and the formation of a new policy regime. Key factors are the use of openings in existing governance regimes, establishment of linkages with contexts of implementation and the generation of momentum through the "carbon industry" as an emerging service economy.

1 Introduction

In a broad sense, governance can be understood as de-facto existing patterns of regulation within a particular domain of societal interaction. To a large extent such patterns are rooted in institutions which emerge more or less unintentionally from interactions in economic and social life (Giddens, 1986/1984; Burns, Dietz, 1995; Greshoff et al., 2003). But there are also marked influences of design. Public policy is, among others, concerned with the (re-)configuration of institutions with a view to bring about desired outcomes of interaction. The particular techniques that are applied for this purpose are referred to as policy instruments: particular institutional designs which shall serve to steer social interaction into desired directions, often based on some kind of scientific model of underlying social dynamics. The governance of modern societies is to a considerable degree influenced and shaped by policy instruments. Hardly any realm of social interaction is left untouched by attempts at purposeful institutional reconfiguration with the purpose of steering society into certain desired directions. Understanding how innovation in governance happens, how new configurations emerge and how patterns of regulation transform, therefore suggests a closer look at the development and introduction of new policy instruments.

In contrast to the bulk of policy studies which analyse policy change as starting from shifting problem definitions and policy goals I here put the *means* of policy—or the *techniques* of governance—at centre stage. This perspective assumes that policy instruments have a life of their own, partly independent of problems and goals, which is worth investigating.[1]

This article uses the concept of the "innovation journey" to track the process by which new policy instruments come into being. The notion was introduced by Van de Ven et al (1999) as a loose concept to grasp the open ended nature of organisational innovation. Rip and Schot (1999; 2001) have proposed an elaborated and extended version for the analysis of socio-

technical innovation in a broader societal context.[2] They conceptualise science, technology and the market as three poles between which innovation networks can be mapped and specify patterns for particular phases in the innovation journey. Typical phases are the emergence of new options, delivery of proof-of-principle through early developments in a protected space, stepping out into real world application contexts by experiments with a prototype, and wider introduction and diffusion which may lead into the formation of a new technological regime. I build on this elaborated concept of innovation journey and explore in how far it can be transferred to the study of policy instruments as innovations in governance.

In this article I present the results of applying the concept to emissions trading, a new policy instrument whose emergence impacted considerably on environmental governance regimes throughout the world. Emissions trading already attracted attention as a remarkable case of policy innovation in its early days when it was merely a policy proposal by the US Environmental Protection Agency to introduce some flexibility into command-and-control regulation under the US Clean Air Act. A close observer at that time noted that "…remarkably few reform proposals (…) have successfully negotiated the perilous path from concept to implementation. Certainly this is not due to any shortage of ideas on how existing regulations or the regulatory process could be improved (…). Even if only a fraction of the proposals were to prove meritorious, the number of implemented reforms would be insignificant compared with the number of ideas. The paucity of implemented reforms suggests that there may be much to learn from those that did become policy. One leading example is the emissions trading program" (Tietenberg, 1985:2). Today, about twenty years later, emissions trading has become something like a global standard in environmental governance. With a view to the fundamental changes in concepts, institutions and practices of environmental policy (as compared to the formerly predominant mode of command-and-control regulation) emissions trading appears as not only a successful, but also a radical innovation in governance.[3]

Does the success of emissions trading signify natural progress in the development of governance through learning on the side of policy-makers? Did emissions trading break through because it proved to be the better instrument in fulfilling environmental policy goals? Literature on policy instrument choice would suggest this sort of explanation (Hall 1993; Howlett, Ramesh 1993; Jenkins-Smith, Sabatier, 1993; Rose, 1993). A side glance at the innovation studies literature, however, gives rise to some scepticism. For technological and organisational change it has been often noted that innovations are not always successful, because they are in any objective sense better, but that innovation processes are full of complexities and ironies. Successful innovations may be the result of the influence of powerful constituencies or contingent context conditions and path-dependencies (Nelson, Winter, 1982; David 1985; Dosi, 1988; Rip, Kemp, 1998; Van de Ven et al., 1999; Garud, Karnøe, 2001). This raises questions about how emissions trading actually became what it is. What made emissions trading successful? How did it become established in the context of pre-existing governance regimes? What were the origins, what was the course, what were phases of its innovation journey? Which factors and mechanisms shaped its dynamics?

I follow up on these questions by briefly setting out how the concept of innovation journey can be applied to policy instruments as a particular type of innovations in governance. Then I present a case study which reconstructs how emissions trading as a policy instrument unfolded, became embedded in existing governance contexts and gained momentum. In a separate section I highlight the emergence of regimes of policy technology as a relevant dimension

of governance dynamics. In conclusion I discuss the value added by introducing an innovation perspective to the study of governance.

2 Innovation journeys in governance

When using the concept of an innovation journey to study the life of policy instruments, I am actually looking at a case of innovation in governance (Voß, 2005). A brief excursion is necessary to indicate what an innovation journey in the realm of governance will look like, and how it is visible for emissions trading.

I use a broad notion of governance which comprises the totality of de-facto existing rule patterns which regulate interaction within a certain social domain like a nation state, a sector or a company. These rule patterns stabilise practices. They comprise codified and non-codified rules of behaviour as well as ideas and discourse patterns which influence actors' perceptions, also material technologies which shape the space of interaction. This broad notion of governance is not restricted to particular mechanisms or types of governance such as negotiation in networks (as opposed to hierarchical government). Instead, it comprises different types of governance patterns (and combinations of them). Hierarchical government can be one of them, such as regulation through the competitive forces of the market, guidance through dominant expectations, the channelling of perceptions through paradigms, or inducement of actions by technological functions. [4] Such de-facto existing conglomerate governance patterns are partly designed, partly emergent (Czada, Schimank, 2000; Rip, Groen, 2002). Against the background of such a broad notion of governance, political action can in a generic sense be understood as the intervention in de-facto governance with the aim to reconfigure patterns of interaction and by this way influence outcomes (cf. Héritier et al., 1998:11-13).[5]

Innovation in governance is here understood as the development of new configurations that work for shaping social interaction patterns and outcomes. This includes their introduction into existing governance structures. Innovation differs from change in that it is intentionally brought forward by actors with the aim to alter and control societal interaction (although outcomes maybe transintentional, cf. Greshoff et al., 2003; Voß et al., 2006).[6]

In this perspective, the development of policy instruments is a special case of innovation in governance, one which deals with the introduction of specific techniques for the intervention in de-facto governance with the aim of shaping interaction patterns and outcomes. Such techniques comprise the arrangement of heterogeneous elements, not only rules in the narrow sense of laws or administrative orderings. They comprise orientating symbols and value frames, theoretical models and narratives of interaction and outcomes, problem and goal definitions, specifications of functional mechanisms, expectations about the outcome of their working, legal rules, informal norms, adapted operational routines on the side of regulating agents as well as on the side of addressed societal actors, skills, financial resources, organisational capacities, technological artefacts, politically influential actors as sponsors etc. Innovating policy instruments involves the formation and stabilisation of such hybrid configurations and their embedding in contexts of use, i.e. in pre-structured interaction contexts of the real world where specific governance patterns are already in place.

In this sense, policy instruments can be linked with broad notions of technology as "configurations that work" (Rip, Kemp, 1998). They involve the engineering of hybrid networks of elements so that they play together in a way to produce an expected outcome. Configurations that work extend far beyond textbook designs. They involve user practices, maintenance,

regulation, financing, infrastructure, public acceptance etc. Due to the complex interplay of these heterogeneous elements much can go wrong in development and implementation. Compromises, unintended effects, repair work, setbacks, shifts in function, design and goals, and unwanted impacts are essential features of the innovation process. Irony is as common in the innovation of policy instruments as with other types of technology (Rip, 2006).

Rip/Schot develop the innovation journey concept with respect to examples from telephony, superconductors, pharmaceuticals, computers, aircraft, electric vehicles, polymers, biotechnology and multi-media. Although this is a broad and diverse field of technology, it centres on material technologies which are produced and used in a commercial environment. Their innovation journey concept thus needs some adaptation for policy instruments. They map the hybrid networks in which innovation occurs on a simplified differentiation of the poles of science, technology and regulation-market-society.[7] For the analysis of policy instruments as innovation in governance this scheme is turned into a map that stretches out between the poles of science, policy development and governance domain. Relevant areas of science include economics, law and the social sciences. Policy development comprises professional policy analysis and consulting, including provision of legal, financial and technical services. The governance domain is the field of de-facto governance including established practices of political intervention to which the instrument shall be applied.

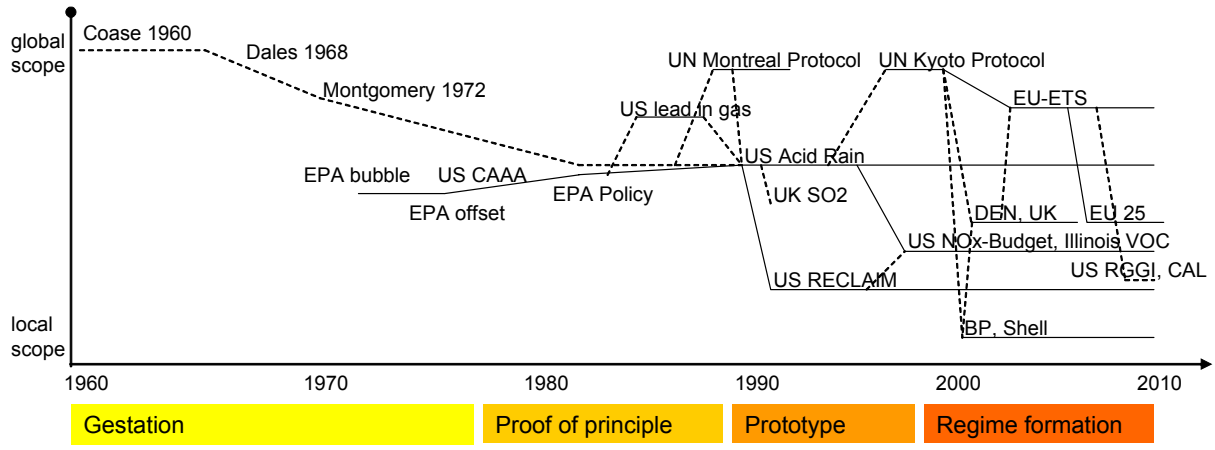
Continuing to use concepts and terminology from innovation studies, one can distinguish typical phases in the innovation journey: A phase of gestation brings up precursors in form of new options, variations in practice, emerging pressures on existing governance regimes, but without the linkages that make up a new configuration. A first critical stage shows developments towards linking-up various elements into a new configuration that could work. These developments take place in a protected space, shielded from immediate pressures of the political selection environment. If they are successful they establish a "proof of principle" that a new mechanism might work. Partly overlapping with this phase, the next phase develops a prototype and demonstrators as exemplars of a new policy instrument with articulated functional principles. With these, steps are taken out of the protected space and into real world governance contexts. First experiments with implementation occur when niches appear that represent an amenable local selection environment within the overarching context of established governance regimes. Learning and embedding takes place within these niches with communities of practice that share special experiences and skills. After proof of principle and prototype a third phase begins, if the instrument branches off from its niches into new openings within governance regimes. If experiences, skills, legitimisation, resources, social support from various implementation sites can be linked up with each other and cumulated, the innovation develops further momentum and may stretch or crack established regime structures of governance thus creating further space for expansion and diffusion. Enlarged scope and broader diffusion of the instrument entail differentiation of special skills, professions and organisations which link-up with policy developments and provide services such as legal advice, financing, training. Following this phase of expansion and diffusion local communities of practice become arched over by structures provide organisational capacities and technologies to support implementation, evaluation and maintenance to guard and retain the instrument. Benchmarks, standards and certification schemes come up. At this stage one can speak of the formation of a regime around the new instrument, a regime of policy technology that cuts across governance domains. Technological regimes have their own dynamics which may

interfere with the policy process, enable and restrict policy strategies, and become part of the dynamics of governance change.

These phases of an innovation journey are clearly visible in the case of emissions trading. In the following section I will use them to structure the case study on the development and introduction of the policy instrument. Emissions trading is a new instrument for environmental policy. It addresses the need to regulate the release of harmful gases into the atmosphere by making use of the market mechanism to regulate emissions across a population of installations.[8] The basic concept is to define a total amount of emissions by all sources which shall be subject to regulation (usually an entire sector of the economy), issue allowances for a proportionate amount of this total, and let these be traded freely among those actors who wish to produce corresponding amounts of emissions. According to economic theory this will lead to the optimal allocation of emissions: Those who are willing to pay most for the allowance are the ones who face the highest costs of reducing emissions. Other ones who have cheap opportunities for emission reductions will prefer to exploit them rather than buying permits. Emissions trading thus promises that whatever level of emission control is politically required, it can be achieved in the most efficient way, at minimal cost to society. Or, the other way round, each dollar spent on emission control produces the highest possible effect for the environment (Baron, Philibert, 2005; Tietenberg, 1985; Dales, 1968).

Figure 1 gives a brief overview on the major events and instances of implementation in the history of emissions trading. The vertical axis indicates the scope of application of a particular version of emissions trading. The dotted lines represent informal influences between instances of implementation, the solid lines represent formal legal relations.

Figure 1: Outline of Emissions Trading's Innovation Journey



A qualitative analysis of the dynamics in the innovation journey framework is presented in the following sections. I will use the adapted concepts from innovation studies which I introduced here, including poles and phases of the innovation journey, when they capture patterns and dynamics which I find in the case study. Providing additional insights by this way of looking at dynamics of governance I wish to show the added value of using these concepts.

3 Gestation and proof-of-principle: first developments in the shadow of command-and-control regulation at the U.S. Environmental Protection agency

In contemporary policy debates emissions trading is treated, as if it was always around – an unhistorical generic form of governing the environment which recently happens to be chosen for implementation. Against this backdrop it is inspiring to look back at when emissions trading first appears in policy debates. The reconstruction of wider developments at that time actually reveals events and processes in which the instrument took shape. Interestingly, emissions trading originated from two different strands of precursors, one in science and one in the practice of US clean air regulation. The scientific strand is the emerging concept of tradable rights to pollute. The practical strand is tinkering with flexible regulation by regulators at the US Environmental Protection Agency (EPA). These two strands brought up new options like theories, legal rules, legitimating narratives, routines, skills etc. that could be combined into a new type of policy instrument. First developments towards emissions trading as a new configuration in environmental governance started in a protected space provided by legal interstices in the incumbent command-and-control regime, "regulatory reform" as a prominent item on the presidential agenda and a concentration of economics skills within one of EPA's organisational units. A first emissions trading programme was cobbled together and grafted on existing regulation. With this a proof-of-principle became established for the working of emission markets, even if actual performance of the initial configuration remained behind expectations.

Looking back, a scientific trajectory emerged throughout the 1960s and 1970s with new findings in economic theory. With the conceptualisation of tradable permits as an alternative to command-and-control and taxes (Coase 1960) the establishment of emission markets became an option for controlling environmental pollution (Dales, 1968). A vigorous debate among economic theorists about pros and cons of permits vs. charges resulted in refined articulation of the concept, its representation in economic models and assemblage of arguments for its superiority over taxes including formal theoretical proof (Montgomery 1972). In an abstract and principled form new options for emissions regulation were invented in course of this debate.

Environmental governance, however, was only just about to become established, at that time. Regulatory practice became shaped in implementing facility oriented emission standards from the US Clean Air Act. In 1970 the US Environmental Protection Agency (EPA) was set up and environmental regulation started to show effect, including upcoming opposition from targeted industries who put the infant regime under pressure, for example, by circulating the idiom of a "growth ban". Attempting the balance between statutory provisions and interest groups EPA officials tinkered with "flexible regulation". A first instance was the "bubble concept", developed between 1972 and 1975, which allowed the breaching of standards for one particular facility, if it was compensated by emissions below the standards at another facility of the same company. The "offset mechanism" extended this concept to compensation across companies, one year later; so that a first limited market for emission rights became established. The offset mechanism was accommodated into the legal framework of the CAA in 1977 – officially not as a policy shift, but as pragmatic repair work within the existing command-and-control regime (Cook, 1988). It did represent an interstice within the regime, however. The opening was used by young entrepreneurial economists at EPA to set up a development programme for market based environmental regulation, starting from the practice of flexible regulation and linking it with the theory of tradable permits.[9] A protected space

within EPA was provided by the Office of Planning and Evaluation (later Office of Planning and Management, OPM) as an institutional stronghold for economic concepts in regulation.[10] The OPM came "to serve as an organizational home for reformers in the agency" (Cook, 1988, 10).

Within this protected space first developments for emissions trading as a new policy instrument took place. In 1978 the new Carter Administration was intrigued by the promise of a policy instrument that could dissolve critique against over-boarding regulation and supported experiments with new economic techniques of regulation at EPA (Cook, 1988, 46). [11] Within the laboratory created by the offset mechanism, OPM and White House support the emerging regulatory technique was shielded from immediate political contestation, it was developed in the shadow of broad public debates about political values and regulatory culture with resources in form of economic knowledge and institutional authority provided by the OPM and broader linkages to the regulatory reform movement.[12]

From early on, the development of market based regulation was based on the promise of more efficient and less contentious regulation: markets would smoothly organise themselves without much political intervention and minimise the resistance of business actors to environmental protection measures. In 1977 emissions trading was not more than an abstract model of tradable permits, on the one hand, and highly contextual, improvised practices of flexible regulation, on the other hand. It was something which Rip and Schot in their conception of technological innovation call a "hopeful monstrosity (…): full of promise, but not able to perform very well" (2001: 162). In fact, the label emissions trading was not yet attached to this promise at the time. Nevertheless, the promise worked to mobilise resources. After 1978 the OPM "grafted economic incentives in an incremental and piecemeal fashion on an existing directive framework" (Marcus, 1980:171). The result was a programme initially called "controlled regulation". In 1979 "emission reduction credits" were introduced as a currency for emissions amounts below standards. Further support came from the Reagan Administration's agenda for "regulatory relief" in 1980 (Cook, 1988:xi-xii, 1-2). In 1982 EPA presented a proposal for an "Emissions Trading Policy Statement. General Principles for Creation, Banking, and Use of Emission Reduction Units".

Part of these early developments was an increasing articulation of promises and requirements. Tinkering gave way to more systematic and coordinated research and development. For business actors to support the scheme it was necessary to assure liquidity of emission markets and avoid volatility of prices and related risks. This requirement shaped development efforts so that "banking" was introduced as a new design component to smooth price development. This further sophistication of the design of emission markets created promises for other actors like the finance industry who realised that trading and banking of emission certificates could be a future business field. Again, new requirements were added to assure that markets of emission certificates were compatible with the established financial market regime and its regulations and routines. The development agenda successively became more complex and more powerful in terms of the resources that were devoted to it. A promise-requirement cycle, as can be observed in processes of technological innovation, had kicked-in and boosted early developments of emissions trading in the protected space within CAA (van Lente, 1993; van Lente, Rip, 1998). Promise and requirement created momentum to overcome internal resistance to the innovation at EPA, for example by engineers and lawyers who had a central role for command-and-control regulation and feared devaluation of their competences (Cook, 1988:4). Early developments were interpreted as a "major crusade for regulatory reform in the EPA,

centered around the use of economic incentives" towards a transformation of regulatory practice according to a "culture of efficiency" (Cook, 1988, 62).

The EPA programme as a result of these efforts was not a transferable governance technology, but a laboratory creation which was built in a piecemeal fashion from existing elements of discourse, legislation and regulatory skills and practices and survived within the particular political space created by offset and OPM. Scenarios about its functioning in other governance contexts were diffuse or non-existent.

Some first checks of compatibility with public opinion and legal frameworks, however, have taken place at this early stage. Elements of EPA's emissions trading program were repeatedly contested at the courts, mainly by environmental NGOs who found it ethically unacceptable to put pollution on sale. A key point was the legal framing of emission reduction credits. The term "property right" which was proposed by economic theorists had to be substituted by the term "allowance" in order to retain legal powers of the state viz-a-viz the holders of permits (Tietenberg). Legal contestation and internal controversy at EPA delayed issuance of a final version of the Emissions Trading Policy Statement until December 1986.

In 1985 a first evaluation study of EPA's emissions trading program was published. The working of the configuration was assessed against the theory of tradable permit markets (Tietenberg, 1985). This pulled the nascent policy scheme out from the shadow of the command-and-control regime and highlighted it as a first instance of a new policy instrument in practice, a proof of the principle that emission reduction obligations could be traded. From the side of business, however, the new options for flexibility did not receive much attention. Banking and trading of emission credits was only sporadically used and did not result in any considerable cost reductions (Tietenberg, 1985). Most of these deficiencies were attributed to the fact that the theoretical design principles were not yet implemented systematically.

4 Stepping out into the real world with a prototype: Project 88 and transformation of the U.S. clean air policy regime

A second phase with major importance for the development of emissions trading sees the configuration of the U.S. Acid Rain Program as a prototype that is actually designed and presented as a new form of governance in its own right. This emissions trading exemplar explicitly combined economic theory with regulatory experiences from the EPA programme. It was announced as a paradigmatic shift towards market based environmental governance, became trimmed in the rough currents of an extended legislative process and became implemented as a core part of U.S. environmental governance. The prototype induced many attempts at reproduction within and outside the U.S. Several of these attempts were successful in the U.S. and worked to transform clean air policy from a command-and-control to a market based regime. Leading up to the development and implementation of the prototype was a comprehensive process of alignment and agenda building within environmental policy networks, labelled Project 88.

Normally, a radical innovation like emissions trading would be expected to find difficulties in acceptance. In the context of the EPA programme this was the case. The instrument had been kept to its niche, officially leaving the command-and-control regime intact. The wider world of environmental governance and political discourse in general, however, was undergoing some changes during the 1980s.

The problem of Acid Rain moved onto the political agenda, adding to the problem of health effects from local air pollution. The environmental movement gained broad support in society. At the same time, international competition increased, financial deficits grew, and trust in government eroded. The Reagan Administration championed regulatory reform for a business friendly society. These parallel developments furthered social cleavages around the conceptual opposition of ecology and economy. During the 1980s, several unsuccessful legislative proposals were launched to extend the application of emission standards from new sources to include existing sources. Although they were all accompanied by flexibility and burden sharing mechanisms, industrial and regional interests in the House, Senate and the Reagan Administration blocked off any political measures against Acid Rain in the 1980s (Ellermann et al., 2000, 20). On a global level the commission on environment and development, chaired by Gro Harlem Brundtland, published its final report in 1987. It took the environment-economy impasse as its starting point and proclaimed sustainable development as a vision for which diverging societal goals were to be reconciled.

It was against this background that emissions trading entered the next phase of its innovation journey. Around 1988, on the occasion of another presidential election in the USA, a broad range of political interests, notably from industry as well from the environmental movement, became enrolled in a concerted effort to feature emissions trading as a solution to reconcile environmental and economic interests and overcome the stalemate in Acid Rain Policy. In the wake of the election campaigns, a coalition of policy entrepreneurs initiated Project 88 as "a nonpartisan effort to find innovative solutions to major environmental and natural resource problems" (Project 88, 1988:ix).[13] With Project 88 emissions trading left its protected space and stepped out into the wider world of environmental politics. Insiders from the development network of the policy instrument became confronted with outsiders from the societal context on which the instrument would impact. These actors needed to be enrolled for successful implementation of a prototype. In this regard, pioneering parts of the administration and other users, legal frameworks, existing policy instruments, interest groups, issues in public discourse became integrated as part of the configuration in order to make it work. Extensive consultation with key figures from industry, environmental NGOs, government and academia produced a report entitled "Harnessing Market Forces to Protect the Environment". The report paved the way for a broad political coalition by framing environmental policy as a question of technical design, independent of contending values and political positions: "Project 88 steps away from ongoing debates over specific environmental goals, to focus instead on finding better mechanisms for achieving whatever standards are set" (Project 88, 1988:ix). The " report looks at ways to engineer the forces of the marketplace into our environmental programs, using economic incentives (and disincentives) to make the everyday economic decisions of individuals, businesses, and the government work effectively for the environment" (Project 88, 1988:2). "Project 88 bridges this gap [between environment and economy] by applying economic incentives to the work of environmental protection" (Project 88, 1988:9). By this way, Project 88 granted business some ownership of the instrument – indeed offering business opportunities in trading, banking and monitoring emission allowances – in order to "enlist the innovative capacity of American entrepreneurs in our environmental enterprise" (Project 88, 1988:9).

When the new Administration moved into office it started the implementation of a prototype. Project 88 was sent into a second round as to ensure embedding in the political context. The prototype followed the design of a cap-and-trade system which represented the state of the art

in economic theory. The proposed cap corresponded with the total sulphur dioxide emissions that would result, if emission standards from the 1970 CAA would be extended to all existing installations. With the help of emissions trading Bush could thus meet a long standing demand by the environmental movement. Looking back in 1991, when introducing proposals to include emissions trading into the Clean Air Act, President Bush said: "Let me commend Project 88 and groups like the Environmental Defense Fund for bringing creative solutions to long-standing problems, for not only breaking the mold, but helping to build a new one." (Project 88 - Round II, 1991:2). Final rules for emissions trading were adopted in January 1993. By 1994 a market had developed.

The other side of successfully stepping out into the wider world is that the messiness of reality breaks into the design. Whereas the first emissions trading program at EPA was deliberately built upon the institutional foundations of the command-and-control regime and only incrementally introduced trading as a flexibility measure, the US Clean Air Act was meant to be an example of emissions trading as discussed in economic theory. The transferral of the instrument from economics textbooks to political reality, however, brought several problems to the fore: In economic theory distributive effects were neglected, because in the world of market models they do not have an impact on the overall efficiency of the instrument. In the policy process they came to the fore and fed conflicts about alternative forms of allocating emissions reduction allowances and various other details of design (Ellermann et al., 2000, 27). The proposal by the administration also raised concern with respect to the feasibility and ethical acceptability of emissions trading – this time in larger circles than the few experts that had followed the development of the EPA mechanisms. In a complex constellation of involved parties with diverging interests and under high time pressure the neat theoretical concept of emissions trading had to be broken up and additional elements be introduced to repair it.[14] At the same time, however, such compromises and ad-hoc developments had to be rationalised in real-time in order to defend the project on the ground of the promise of efficiency in order to stabilise support for ongoing development work and secure acceptance by target groups and the wider public. In effect, as one of the later evaluators of the instrument has termed it, ”Title IV is built on more or less arbitrary emission limits, trading to reduce costs, and an allowance-allocation scheme that is at lest as messy as most tax legislation and that has a history with no more nobility” (Ellermann et al., 2000, 316-317).

Throughout the 1990s emissions trading became wide spread and accepted as an environmental policy instrument in the United States. Several emissions trading schemes became established on a regional level in the United States and the concept of market based regulation gained dominance.[15] At the same time, there was continued resistance internationally and especially in Europe.[16] Regulatory culture, institutions, balance of power of interest groups etc. provided a less favourable selection environment in Europe. Scepticism about the promises of market models was deeply anchored. Such were ethical and political concerns about shifting responsibility for emission reduction away from polluters. Command-and-control based regimes of environmental regulation were stronger in many European countries than in the US, with incumbent interests and institutional inertia making radical innovation more difficult (Woerdman, 2002b; Cass 2005).

Six years after it started, the US Acid rain Program was evaluated as a great success with respect to economic as well as ecological goals. One commentator emphasized that “(t)he explanation must lie in departures from the textbook world of perfect rationality, perfect competition, and perfect certainty, in which the system always follows the long-run equilibrium path

– that is, in mistakes, market imperfections, and forecasting errors" (Ellermann et al., 2000, 299).[17] Whether these additional factors were recognised or not, the prototype was recommended for large scale application: "We believe that our analysis of the U.S. Acid Rain Program supports a number of general lessons… The experience … clearly establishes that large-scale tradable permits programs can work more or less as textbooks describe…" (Ellermann et al., 2000, 315).

With the US Acid Rain Program as a working exemplar in place, however, "the concept of harnessing market forces to protect the environment has gone from being politically anathema to politically correct." (Stavins 2002, 1). At least in US environmental policy, "market-based instruments have moved center stage, and policy debates look very different from the time when these ideas were characterized as "licenses to pollute" or dismissed as completely impractical" (Stavins 2002, 14).

5 Regime formation: Kyoto, EU emissions trading, and the carbon industry

Emissions trading's innovation journey did not come to an end with becoming established the US environmental governance regime. It branched out into other governance regimes, found interstices to link up to and flourish. Emissions trading became linked to the Kyoto protocol of the nascent regime of international climate policy. From here on, it did not become further developed due to antagonistic positions of the USA and EU, but shot further branches into corporate governance regimes. BP and Shell implemented the first examples of trans-national greenhouse gas emissions trading schemes. These provided bridgeheads for the innovation to travel to European policy networks, surpassing the blockade on the level of international negotiations. The innovation was picked up and promoted by the OECD and by businesses who founded the International Emissions Trading Association as a means to promote emissions markets as a new business field for their services. Denmark and the UK started to develop national emissions trading schemes for greenhouse gases. Emission trading became a global policy hype which made it difficult to be against it. Scepticism in European policy development circles reversed into the expectation that it would come anyway and one should be part of it. US withdrawal from international climate negotiations freed the European Union to pursue emission trading on their own terms. The Commission orchestrated the development a European directive as framework for 25 interlinked emissions trading systems in the member states. With the implementation of the directive through connected national environmental policy networks in member states a regime formed around the instrument with specialised experts, professions, international organisations and emerging design paradigms and standards for development of the instrument. The policy regime takes on dynamics of its own. It is to stay and currently is expanding.

With international climate negotiations an opportunity opened up for emissions trading to branch out from US clean air policy into other governance domains. US diplomats with support of the international business community pressed international emissions trading into the Kyoto Protocol – against resistance of the European Union who feared that reduction commitments could be evaded by importing excess emissions rights ("hot air") from former socialist countries (Oberthür, Ott, 1999, 188-190; Damro, Luaces Méndez 2003, 76). The development of a working rule system for international emissions trading under the Kyoto Protocol finally stranded because the EU insisted to limit trading to 50% of required emission reductions (Woerdman, 2002a, 350-384; Cass 2005). This was not the only route, however, along which the innovation network branched out from US clean air policy. When international ne-

gotiations reached stalemate EDF set up an initiative to encourage business corporations to move ahead with company internal trading schemes for carbon emission allowances as a means to demonstrate their support for the instrument and show that it is feasible for the application to greenhouse gases. In 1998 BP indeed announced the introduction of such a scheme. Shell followed soon after (Zapfel, Vainio 2002, 8). The BP and Shell schemes attracted attention as the first application of emissions trading to greenhouse gases and on a trans-national scale. These examples allowed the instrument to travel through conferences and workshops to Europe and around the world and link up with discourses of local policy and business circles (Christiansen, Wettestad 2003, 9). Towards the end of the 1990s also the OECD picked up tradable permits and emissions trading as a pet proposal for which it could provide review and dissemination services and manifest its role a as a neutral policy broker and testing agency (OECD, 1997; OECD/IEA, 2004).[18]

Increasingly also actors beyond established environmental policy networks became enrolled in the innovation network. "(…) market intermediaries and other potential service providers (auditing companies, consultants, lawyers, academics, commercial conference organisers) saw a potential market arising and were more than willing to invest some resources under the header of business development." (Zapfel, Vainio 2002, 7). Their "helper's interest" (Prittwitz, 1990:116-121) brought forward exploratory studies and research & development activities in Europe which were justified by the need to be prepared for upcoming policy debates. Part of the dynamics in these years was the emergence of what is now called the carbon industry—an increasingly organised sector of specialised businesses that provide service for the development and maintenance of emissions markets. The International Emissions Trading Association (www.ieta.org) was set up in 1999 to promote the worldwide development of emissions markets. Its members are specialised consultancies, banks, brokers, exchanges, risk managers, project developers, journals, conference organisers, news services etc. Emissions trading gained additional momentum – not only as an environmental policy instrument, but also as a thriving service economy which started to actively advertise its products and lobby for the expansion of its market.

In the context of these ongoing developments on a supra- and sub-national level policy initiatives started to take shape also on a national level in Europe. In 1999 Denmark introduced the first emissions trading scheme in Europe. While this case gained little attention—as CO2 trading was closely linked to liberalisation of electricity and restricted to eight big companies—(Pedersen 2000, 3-5), a parallel initiative stirred up debate in policy cycles around Europe. In the UK business actors set up an Emissions Trading Group (ETG) to develop a voluntary scheme as an alternative to tax proposals. The ETG comprised multinational companies with experience from emissions trading in the US. Central actors from the US emission trading innovation network participated regularly in working group sessions (Smith 2004, 83-84). With the ETG a European bridgehead of the emissions trading innovation network became established. The benefit for the UK of a head start on global carbon markets was a key argument in advertising the initiative to government and societal stakeholders. In 2002 the UK government endorsed and financially supported a pilot scheme developed by the ETG on the ground of "to enable business to gain practical experience of emissions trading ahead of a European and international system, and to help the City of London establish itself as a global centre for emissions trading."[19]

Because of such investments and activities, the expectation of something new and big coming up in environmental policy was rising. A global hype started around emissions trading as the

policy instrument of the future. There was "a conference on emissions trading somewhere in the world every day, each accompanied by a raft of papers from universities, think tanks, and government agencies. In less than a decade, emissions trading has gone from being a pariah among policymakers to being a star – everybody's favourite way to deal with pollution problems" (Ellermann et al., 2000: 4). Europe was still rejecting emissions trading under the Kyoto Protocol, but European policy development networks were part of the hype. More and more believed that emissions trading would come, anyway, and that it would only be sensible to get involved—and the more believed in it the more likely it became that his would happen. This made it difficult to be against emissions trading. Around 2000 a reversal happened. Academics, analysts, consultants, environmental interest groups and others who were critical of emissions trading, turned into supporters, the debate shifted from the question of "if" to "how" (Zapfel, Vainio 2002:9-10). The hype enrolled important centres of policy development in Europe to the emissions trading innovation network. US experts frequently travelled to Europe for lecturing and consulting. Reports, technical terms, design principles, metaphors etc. started to circulate across the Atlantic (Zapfel, Vainio 2002, 7-8).

The European Commission became a hub of informal consultations and exploration of emissions trading as a policy instrument for domestic climate policy. The Commission hired US experts and started to take on the role of a policy entrepreneur for emissions trading within the European Union while keeping up resistance against international emissions trading under the Kyoto Protocol (Wettestad 2005, 16).[20] In 2000 the Commission tabled a Green Paper with a proposal for a European Emissions Trading Scheme (EU-ETS) and set up a stakeholder forum to develop it.[21] When the USA withdrew from the Kyoto Protocol in 2001 the next critical juncture arose. Emissions trading was freed of the delegitimising association with the US attempting to undermine reduction commitments and the EU was urged to take over the lead and demonstrate concrete successes in climate policy in order to keep the international process alive (Wettestad 2005, 16).[22] In 2001 the Commission tabled a draft Directive to establish the EU-ETS. The proposal acknowledged the diversity of political and technical circumstances on the level of member states by providing a mere framework to be filled by National Allocation Plans (NAP) which should specify concrete designs. The framework contained a common infrastructure for European emission markets, including the "Community Independent Transaction Log" (CITL) for registering and tracking allowances and it provided standards to ensure compatibility of the national systems with one another and with other European policies such as the 1996 Integrated Pollution Prevention and Control (IPPC) Directive and the liberalisation of energy markets. In an "ultra-quick process" the Directive became adopted in 2003 for the EU-ETS to commence in 2005 (Wettestad 2005).

With the requirement for 25 member states of the EU to adopt a NAP and develop their own domestic application of the EU-ETS framework the innovation network immensely broadened. Local expert communities and auxiliary service providers formed within national environmental policy networks in Europe and gave the emission trading configuration—and the "carbon industry"—as it had developed in the centres of European policy-making a firm grounding in national environmental governance regimes.

In the course of domesticating emissions trading within national policy contexts a tension became apparent between the need of standardised design for compatibility of emission markets and particular social, technical, environmental and—above all—political conditions in the respective settings of implementation. Powerful political interests, policy legacies, legal frameworks, specific industry structure required repair work and partial re-innovation to ar-

rive at configurations that could work embedded in peculiar contexts of use.[23] Ongoing conflicts between the European Commission and member states over the acceptability of various special shapes give ample evidence of these difficulties, but also shows that approval of NAPs by the Commission—as one of the elements of the EU-ETS framework design—establishes an effective mechanism for the standardisation of policy technology.

From 2005 on the EU-ETS established a European market of allowances for 2.2 billion tons of carbon emissions from 11,500 installations. In 2006 the daily transaction volume in emission allowances has reached 60 million Euro. Linked to this was a fundamental transformation of basic structures of environmental governance regimes. Tradable permits and certificates of all kinds have become state of the art in environmental regulation, hardly any problem to which they are not applied even in an exploratory manner. Linked to this shift are a stronger role for economic expertise and a reframing of the pollution problem from moral condemnation to efficient allocation. Attached to the new paradigm in policy development is a social infrastructure of specialised skills, professional careers, organisations and, in the case of emissions trading, the peculiar phenomenon of the carbon industry as a whole new service economy which prospers around emission allowances as an artificially created commodity. One can speak of a new policy regime that has developed around emission trading as a particular technology in environmental governance. Various parts of the working configuration plus elements of the multi-level infrastructure of policy development and carbon industry rely upon and mutually reinforce each other. This regime holds emissions trading in place—and it creates additional momentum. Even if, over the coming years, some of the great promises of efficiency and effectiveness would become deconstructed in scientific and political debate (for example, by highlighting transaction costs and hidden costs of regulation or unavoidable distortion of textbook design by implementation in the context of real world politics), there is a good chance, that the instrument will be retained, expanded and branching out into other governance domains. There is already evidence of developments to include air traffic into the EU-ETS and of establishing links between European climate policy as the new centre of the innovation network with regional initiatives for greenhouse gas emission trading in the USA and in other countries like Japan and Canada. A vision that guides these stabilising interactions between policy development networks is a global emission market of interlinked mutually compatible trading systems.

6 Technological regimes in governance

The case study of emissions trading reveals an interesting element in the dynamics of policy development which is worth to be discussed for itself. This is the formation of a regime around emissions trading as a policy instrument. What I intend to highlight is the quality of this regime as a technological regime in the realm of governance.[24] It represents a particular social structure that is arranged around and geared towards a particular *means* of policy, a *technique* of governance. This contrasts with established regime concepts in policy studies which are arranged around and geared towards particular problems and goals.[25] Technological regimes thus introduce cross-cutting patterns to the analysis of governance structures in specific problem domains (e.g. German energy policy, European competition policy, global climate policy). Their own momentum and trajectories constitute a lateral dynamic with implications for governance change.

The innovation journey of emissions trading is a clear example for the incremental build-up and solidification of expertise and organisational patterns which are specialised for develop-

ing and operating this particular policy instrument. Increasing sophistication and complexity of the configuration (to make it work in real world contexts) play an important role for the growth and differentiation of a community of experts for this particular technology. An important difference to other policy instruments is the additional creation of new economy as a central component of the working configuration– with all features of a general business sector, including market intermediaries, institutional infrastructures and organisation for political lobbying. The "carbon industry" associated with the establishment of markets for greenhouse gas emissions is an example in case.

The structuration and stabilisation of social patterns in instrument related interactions (including the emergence of specialised organisations) is important to note. It demarcates a deviation from understandings of policy instruments as ideas or purely cognitive constructs (Howlett, Ramesh 1993; Rose, 1993; Dolowitz, Marsh 1996).[26] With a view on regimes as an emerging social structure it becomes apparent how policy instruments develop a life of their own. A self-reinforcing momentum is generated by the dependence of regime actors' existence and growth on further development and application of the instrument. The more sophisticated it becomes, the larger the scope to which it applies, the more governance domains it enters the larger is the market for specialised expertise and services. From within the regime the policy instrument becomes seen as an end in itself, prior to the actual performance with respect environmental policy goals. In this direction policy instruments can be understood to influence and shape problem definitions and policy goals as much as they themselves are shaped by goal oriented policy design. This offers a view of governance change as co-evolution of policy technology with policy problems and institutional changes within particular governance domains.[27]

7 Conclusions

The innovation perspective on policy development which I adopted for the case study on emission trading brought aspects to the fore which are commonly backgrounded in policy and governance studies that take policy problems a their entry point. The case has shown that the policy instrument actually has a life of its own. It has grown and evolved in interaction with ongoing context changes, most importantly in the governance domains where working configurations were implemented. It also became apparent that policy instruments cannot adequately be understood as purely cognitive concepts which are passively waiting to be picked up and become enacted. An historical dynamic perspective on emission trading shows that the instrument took shape in course of an extended innovation journey with twists and turns. Design, legitimacy and attributed performance characteristics changed as the process was driven and shaped by the distributed agency of many actors, the formation of networks and establishment of linkages with various contexts of implementation. And it showed how technological regimes insert self-reinforcing trajectories to the development of policy instruments. This introduces a lateral dynamic to governance change which is partly independent of problems and goals.

These additional considerations are possible because of the use of the perspective of the innovation journey. Emissions trading turned out to be a clear-cut case, ideal to demonstrate the added value of the perspective. In other cases it may not always possible to reconstruct the innovation journey with the conceptual elements at hand. Some hypothetical generalisations may be drawn for other economic instruments, especially those that are based on expert knowledge of sophisticated theoretical constructs and that give rise to new markets for advice

and services. For deeper and more valid insights into the dynamics of innovation in governance, however, more case studies are needed for different kinds of policy instruments. This will yield additional insights from comparison and the elaboration of different types of innovation journeys.

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9 Endnotes

[1] With reference to John Kingdon's well known model of the policy process consisting of three interacting streams (2003/1995:116-144), one could understand the study of emerging policy instruments as an investigation into the "policy" stream which complements the analysis of agenda setting in the "problem" stream and of struggle for power in institutions of the political system in the "politics" stream.

[2] Arie Rip was also involved in the transfer of the concept to the realm of governance. I am indebted to him for important conceptual discussions and for specific comments on drafts of this paper. His contributions go well beyond what can be represented in formal citations.

[3] The notion of success in the relation to innovations is here used for widespread introduction and establishment of a novel configuration in governance. It does not imply an evaluation of its success in achieving proclaimed goals and purposes or broader societal impacts.

[4] This is a very broad notion which is applied in generic studies of generation and maintenance of social order (Mayntz, Scharpf, 1995; Schneider, Kenis, 1996; Benz, 2004). Even there, however, material technologies are usually not considered part of the governance structure of a societal domain (for this see Rip 2006). The dominant use in political science is as a term to contrast government. It carries a narrower sense then, denoting cooperative forms of governing through networks of private and public actors (Kooiman, 1993; Rhodes 1996; Stoker 1998; Héritier, 2002).

[5] Note that this understanding of policy includes strategies and actions by citizens, social movements, companies, associations, research institutes, media, and not only by public policy actors who are officially in charge for maintenance and development of society's governance.

[6] The boundaries between innovation and change, so defined, are analytical and cannot be empirically defined. In any kind of change enters some kind of intended action (Black, 2005).

[7] In this they refer to Michel Callon's "techno-economic network" mapping approach (Callon, 1992).

[8] The traditional approach of command-and-control regulation is to regulate emissions by individual installations, either by fixing emission limits or specifying technological standards.

[9] Linked to this entrepreneurial spirit are "career aspirations of new staff members" who "cast about for new initiatives which they could hook their stars to and use to separate themselves from the crowd" (Meidinger 1985:462-463).

[10] It was created as early as 1971 upon pressure from the Commerce secretary and was staffed by economists.

[11] Douglas Costle and William Drayton, two central figures of the innovation network, were appointed EPA director and deputy with responsibility for the OPM. Both had developed the "Connecticut Plan" for economic law enforcement based on the introduction of economic incentives into regulation (Cook, 1988, 69). William Drayton was directly responsible for the offset program and given additional staff of economist and policy analysts to pursue regulatory reform within the agency (Cook, 1988, 50).

[12] "The political (and statutory) breathing room the Carter people needed came in the form of the growth-ban crisis and its administrative remedy, the offset policy" (Cook, 1988: 70). "The offset policy provided a window of opportunity, albeit initially a narrowly opened one, allowing EPA reformers room to manoeuvre in exploring alternative control strategies with at least the semblance of incentive characteristics." (Cook, 1988, 46).

[13] Project 88 was formally a study. In effect it was a focussed strategy of coalition building. Key actors behind Project 88 were two senators who sponsored the project (Timothy E. Wirth, Colorado, and John Heinz, Pennsylvania), economist Robert Stavins, professor for public policy at Harvard and former official at the Environmental Defense Fund (EDF) who managed it, and a group of economic advisors around presidential candidate George H.W. Bush who promoted market based environmental policy instruments: „EDF was a major participant in the Project 88 effort and worked closely with White House staff to develop the administration's Clean Air Act proposal (…). In particular, Environmental Defense Fund economist Daniel Dudek cooperated with key personnel at the Council of Economic Advisers and the Office of the President's Counsel." (Hahn, Stavins 1991:24).

[14] Allocation was based on grandfathering, i.e. the distribution of allowances corresponding to past emissions (1985-87 average), rather than on the free auctioning of allowances to incumbents and newcomers alike. More important were further exemptions for plants that used flue-gas desulphurization (scrubbers) instead of abandoning the use of high-sulphur coal from eastern states. These plants received generous bonus allowances. Together with provisions for aiding displaced workers in high-sulphur coal mining states these exemptions had to be included for consent by the affected states and their industries.

[15] In 1994 EPA required states to establish market based systems of regulation in order to achieve national air quality standards. A prominent example is the Regional Clean Air Incentives Market (RECLAIM) for the regulation of NOx and SO2 in the Los Angeles area (Harrison, 1999). RECLAIM was developed in parallel with the US Acid Rain program from 1990 to 1993. It went into operation in 1994. Other examples which gained some international visibility are the NOx Budget program which was set up in 1999 and comprises nine states in the Northeast of the United States, and the Illinois VOC trading scheme established in 1999 for the Chicago area.

[16] Also in Europe the prototype induced some activity in exploration and development of emissions trading for regulating air pollution. A proposal for SO2 emission regulation in the United Kingdom failed to gain support in the legislative process (Sorrell, 1999). A proposal by the business community in Norway was fed into discussion but was not taken up as a formal policy proposal (Hoibye, 1999).

[17] Unintended effects helped to boost the instrument: Economic models for certificate price forecast did not account of context factors like structural change in transport market. It turned out that low-sulphur coal was much more widely available, because of an unanticipated reduction of transport costs. The latter was a result of

the liberalisation of the railroads in the 1980s, surging competition and a considerable drop in rail rates. This meant that low sulphur coal became an economic alternative to the installation scrubbers in order to meet limited emission allowances for many more plants as initially expected (Ellermann et al., 2000, 104-105).

[18] Cf. the role of testing agencies in technology development (Garud, Karnoe 2002).

[19] Press release by Defra, 12 May 2003: COMMENTARY ON PRELIMINARY 1ST YEAR RESULTS AND 2002 TRANSACTION LOG. Elsewhere it was acknowledged that "the City of London is being established as a centre for emissions trading, ahead of other locations such as Chicago, Frankfurt, Paris and Sydney. Emissions brokers are setting up operations in the UK, and there is considerable interest from overseas in using the UK scheme as a repository for holding international emissions allowances and credits. Although the UK emissions market will not be large in relation to other financial markets, the international emissions trading scheme is likely to be valued in multiple billions sterling, and will bring commensurate benefits to the City if trading activity is based here" (Defra: Regulatory and Environmental Impact Assessment of UK ETS)

[20] (Cass 2005) explains this divergence by "norm-entrapment" resulting from earlier strategies of delegitmising emissions trading as an attempt of the USA to evade emission reduction commitments. An important difference for the ecological effectiveness of the instrument is that internationally "hot air" (excess emission rights for former socialist countries due to deindustrialisation) was a considerable problem which did not apply to a EU wide trading scheme.

[21] "Astonishingly, the group – bringing together diverse interests with about 30 representatives from some Member States, industry, and environmental pressure groups – achieved a high degree of consensus and failed only to adopt a consensual recommendation in very few issues" (Zapfel, Vainio 2002, 11).

[22] Additional factors that made the Commission a key policy entrepreneur for emissions trading were the wish to avoid the uncoordinated development of incompatible systems on a national level and stranding of a community energy tax as centre piece of EU climate policy (The tax had required unanimity in the Council. Emissions trading only required a majority vote) (Christiansen, Wettestad 2003:6-7).

[23] Some uncontrolled complexification resulted from this, partly undermining the very principle of emission trading. In Germany, for example, allowances had to be distributed on the basis of historical emission (instead of being auctioned) in order to find acceptance by affected industries. In order to avoid discrimination of new market entrants, however, a special rule system has to be introduced for the equipment of new installations with emission allowances and another for the transfer of allowances in the case of a substitution of an old installation with a new one. Here, again, it was necessary to introduce specified benchmarks for different technologies and a guarantee of allowed emissions for 14 years in order to avoid resistance from big industrial players. This requires provisions to rule out "shadow-plants" which are officially kept in operation for the allowances that effectively are transferred to other plants or sold on the market.

[24] This is in analogy to the concept of technological regime in the realm of commodity production or service provision where it denotes a self-stabilising conglomerate of actors, ideas, institutions and artefacts around specific ways of doing things (Nelson, Winter, 1982; Rip, Kemp, 1998; Geels, 2002).

[25] Compare concepts of "international regime" (Krasner 1983), "regulatory regime" (Black, 2005). Also concepts such as "policy paradigms" (Hall 1993), "epistemic communities" (Haas 1992) or "advocacy coalitions" (Sabatier, Jenkins-Smith, 1993) hinge on policy problems, rather than particular solutions.

[26] It also complements Kingdon's account of the policy stream as an eternally boiling "primeval soup" by introducing dynamics of coagulation.

[27] This view links up with and indeed provides some specification of Kingdon's multiple stream model of the policy process (Kingdon, 2003/1995).

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