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Transition policy and innovation policy: Friends or foes?

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ABSTRACT

There is a potential for misalignment between innovation policy and transition policy. This misalignment might hamper sustainability transitions. This paper discusses the sources of the incompatibilities between innovation and transition policy and gives policy recommendations on how to increase the area of alignment.

The current, unsustainable way in which important societal functions such as energy-, mobility-, and healthcare are fulfilled presents a grand challenge. Socio-technical transitions are necessary for these societal subsystems to become sustainable. A transition is defined as a fundamental change in the fulfillment of societal needs that can take 25–50 years to complete. Innovation is a key process in transitions as transitions require the development and diffusion of a wide range of new technologies alongside the development of new institutions and social practices (Geels et al., 2008).

In the past decade two strands of literature that seek to understand and analyze socio-technical transitions have been developed; the multi-level perspective (MLP) (Geels, 2002) and the technological innovation systems (TIS) approach (Carlsson and Stankiewicz, 1991; Jacobsson and Johnson, 2000; Markard and Truffer (2008)). The MLP distinguishes three levels (niches, regimes and landscapes) where changes take place. It emphasizes how the alignment of trajectories within levels, as well as between levels, produces transitions. The TIS framework conceptualizes the transition process as a build up process of different technological innovation systems (Hekkert et al., 2007). Policy makers who seek to induce and accelerate transitions for sustainability have adopted both approaches. In the literature such policies are described as *transition management* or *transition policy* (Smith and Kern,

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2009; Rotmans et al., 2001). An example of such a policy is the Dutch energy transition management policy (Kern and Howlett, 2009).

Because of the importance of innovations in sustainability transitions some scholars have argued that all innovation policy should be embedded in transition policy in order to ensure that innovative activity is directed towards more sustainable technologies (i.e., Foxon and Pearson, 2008). Building upon this earlier research, we discuss the relationship between innovation policy and transition policy and the expected consequences of this relation for societal transitions to sustainability. The Dutch energy transition policy case will serve to illustrate our argument.

Transition policy is the effort to guide or facilitate sustainability transitions, that is, to influence the speed and direction of the evolution of a socio-technical system and several countries have implemented such policy (OECD, 2011). The Dutch energy transition policy existed until 2011[1] and focused on energy efficiency and a reduction in the demand for energy on the one hand, and the stimulation of the development and deployment of new, more sustainable energy and mobility technologies on the other hand (Smith and Kern, 2009; Foxon and Pearson, 2008).

Whereas transition policy focuses on stimulating societal transitions, *innovation policy* traditionally seeks to facilitate innovation with the purpose of stimulating economic growth. Innovation policy may focus on stimulating basic research, providing R&D subsidies to firms, or protecting infant industries. Innovation policy can be generic, focusing on the general support of innovation in new and existing industries, or industry specific, focusing on the support of a specific industry. An example of a generic policy is the Dutch WBSO that subsidizes the wage costs of employees directly involved in R&D. Industry specific policies aim to support the emergence of new high profit industries through for example public private partnerships or thematic approaches, such as innovation programs for green chemistry or smart grid technologies. A second form of specific support targets the competitive advantage of those industries that are considered especially well developed and important for a nation's economy. An example is the research of enhanced natural gas recovery which is part of a program to construct a gas hub in the Netherlands. Besides stimulating innovation to strengthen current regimes and industries, innovation policy also has the aim to stimulate new and potentially high growth industries.

Although both innovation and transition policies seek to stimulate innovation, their policy objectives may be misaligned. Transition policy has the ambition to create changes that are beneficial for society at large, e.g., a lower impact of society on the natural environment, thereby taking into account the three aspects of sustainability (i.e., people, planet, and profit). While innovation policy goals may also direct innovations towards solving societal challenges, many innovation policy schemes seek to strengthen the economic positions of firms and thereby contribute to economic growth. Transition and innovation policies are only aligned when they stimulate innovations that contribute to both economic growth and sustainable development (Alkemade et al., 2009). The literature on environmental policy integration suggests that such alignment of goals is pivotal for the success of policy reforms (Jordan and Lenschow, 2010). Kern and Howlett (2009), for example, identify a process of layering in the Dutch energy transition case where transition policy goals where added to existing policy goals resulting in misalignments.

Two recent trends increase the potential for alignment. First, European innovation policy has explicitly acknowledged the role of innovations in addressing "major societal challenges" (European Commission, 2010). Second, the current discussion on the redefinition of growth focuses on a more inclusive concept of growth, taking into account sustainability and distribution effects, as well as on the question of how much growth is actually needed (Stiglitz et al., 2009). Nevertheless, in times of economic downturn economic growth remains a prime objective for innovation policy in most countries.

Although opportunities for alignment may increase, we argue that the scope of this alignment is rather limited for two reasons: First, transition policy and innovation policy fundamentally differ with respect to the type of innovation that is considered desirable. Second, incompatibilities arise when

[1] After elections in 2010 formal energy transition policy institutions have been broken down and many policy instruments were terminated. At the moment it is unclear how this affects energy transition policies.

transition policy focuses on the phasing out of existing industries and the reduction of unsustainable behavior. With respect to the first point, transition policy has the aim to drastically change the current production and consumption system. This is also labeled as a regime shift (Kemp, 1994). While the innovations to achieve such a regime shift may originate from the incumbents, they are often developed by new entrants (Christensen, 1997). Transition policy therefore has a strong focus on disruptive or competence-destroying innovations and on innovations that may contribute to the decline of the current socio-technical regime in the long run (Anderson and Tushman, 1990; Christensen et al., 2003).

Innovation policy for economic growth does not necessarily have such a regime shift objective and therefore the focus is more on competence-enhancing technologies. These are technologies that are perfectly aligned with the existing competences of firms and that strengthen the existing regime, such as innovative drilling techniques developed to capture more oil and gas from existing wells. Competence-enhancing innovations can however also contribute to sustainability transitions when they improve the sustainability of the incumbent regime. Examples are innovative catalytic crackers that improve the efficiency of automotive fuels and carbon capture and storage (CCS) technology. A risk in this scenario of *regime transformation* is that the innovations merely serve to strengthen the existing lock-in (Geels and Schot, 2007).

The second source of incompatibility between innovation and transition policies is formed by the importance of existing industries. As transition policy seeks to reach a more sustainable society it not only has to contribute to creating new, more sustainable socio-technical systems but also to phasing out existing, non-sustainable ones (Kern and Smith, 2008). Innovation leads to economic growth as it creates demand for new products and services. While sustainable development does not exclude the notion of economic growth, innovation for sustainable development focuses on increasing sustainability of existing production systems or on building new production systems that address needs that were previously satisfied in an unsustainable way. This latter form of innovation for sustainable development will only be successful if the old systems are actually replaced.

Because of the different goals of innovation policy and transition policy regarding existing regimes they may not only be misaligned but may even conflict as transition policy focuses on stimulating the new and phasing out the old whereas innovation policy often focuses on sustaining the old. The two types of policy are mainly aligned when it comes to stimulating new potentially high growth industries that contribute to sustainability transitions.

A second problem associated with a focus on alignment is the risk of legitimacy problems that occur when policies contribute to sustainability but not to economic profit or. Eventually a more sustainable society is characterized by changes in the set of available products and technologies. Transition policies therefore include attempts to stimulate the creation of significant home markets for more sustainable goods and services. Examples of such a policy are the tax exemptions to stimulate the adoption of energy efficient cars (i.e., hybrid vehicles) that are currently in place in many countries (OECD, 2011). From an innovation policy perspective, the formation of (sophisticated) demand in home markets is only considered a viable innovation policy activity if it challenges national industries to become more innovative and thereby increases their international performance (Porter, 1990). As the Netherlands does not have a domestic car industry, such market creation policies may contribute to sustainability but not to domestic growth as they strengthen foreign industries instead of national ones, thereby possibly creating legitimacy problems.

In summary, we argue that there are fundamental incompatibilities between transition policy and innovation policy. These incompatibilities arise from the fact that innovation policy often focuses on strengthening the current regime while transition policy has a regime-shift ambition (Kemp, 1994). Such misalignment may lead to conflicting and inconsistent policies and thereby hinder sustainability transitions. Alignment between transition policy and innovation policy can only be expected in the case where policy seeks to create new profitable industries that contribute to a more sustainable society. This area of alignment might however be insufficient to realize the transition to sustainability. Below we give recommendations on how to increase alignment and at the same time take into account fundamental incompatibilities.

First, the area where innovation policy and transition policy overlap can be broadened. This can be achieved using a more systemic approach. In such a systemic approach transition policy is considered an overarching policy goal that helps to align all other policies. Innovation policy, industry policy,

environmental policy, energy policy, economic policy, etc. are then designed with a clear transition goal in mind. This corresponds to the idea of environmental policy integration. Currently we observe this trend in the Innovation Union (European Commission, 2010). When searching to increase alignment a global perspective avoids the duplication of efforts (OECD, 2011). That is, national transition policies may take national and foreign capabilities into account when selecting technological trajectories; this requires international coordination (Alkemade and Hekkert, 2010).

Second, alignment can be improved if innovation policies are consistent with transition policies that seek to phase out unsustainable industries. More specifically, innovation policy then focuses on industries that fit within a sustainability transition scenario. Ceasing to support unsustainable industries may improve the competitive position of new industries and thereby increase the pace of sustainability transitions. This option requires a re-evaluation of generic innovation policy instruments as it limits access to public R&D funds.

Above we have identified several options to increase the alignment between innovation policy and transition policy. Although increased alignment might stimulate sustainability transitions a sole focus on alignment is not sufficient. It is not straightforward, and maybe not even desirable, to distinguish a priori between innovations that contribute to sustainability or profitability and innovations that do not. The determinants of innovative activity can be found both in science-based technology-push factors and society-based demand-pull factors (Dosi, 1982). Due to the fundamental uncertainties associated with innovation the selection of particular technological trajectories by innovation- or transition policy is always partly a political decision (Stirling, 2007, 2010; Shove and Walker, 2007). A policy that is based on alignment may therefore emphasize existing and proven technologies as they are least characterized by uncertainties. This might be undesirable from a sustainability transitions perspective as a focus on alignment implies a focus on less disruptive innovations with a shorter distance to market. Policies to increase alignment therefore need to be accompanied by policies that support potentially disruptive innovations.

References

Alkemade, F., Frenken, K., Hekkert, M.P., Schwoon, M., 2009. A complex systems methodology to transition management. Journal of Evolutionary Economics 19 (4), 527–543.
Alkemade, F., Hekkert, M.P., 2010. Coordinate green growth. Correspondence to Nature 468 (7326), 897.
Anderson, P., Tushman, M.L., 1990. Technological discontinuities and dominant designs: a cyclical model of technological change. Administrative Science Quarterly 35, 4.
Carlsson, B., Stankiewicz, R., 1991. On the nature, function and composition of technological systems. Journal of Evolutionary Economics 1, 93–118.
Christensen, C.M., 1997. The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Harvard Business Press.
Christensen, C.M., Raynor, M.E., Leffert, J., 2003. The Innovator's Solution. Harvard Business School Press Cambridge, MA.
Dosi, G., 1982. Technological paradigms technological trajectories. Research Policy 11, 147–162.
European Commission, 2010. Innovation Union Communication. European Commission.
Foxon, T., Pearson, P., 2008. Overcoming barriers to innovation and diffusion of cleaner technologies: some features of a sustainable innovation policy regime. Journal of Cleaner Production 16 (1), S148–S161, Supplement 1.
Geels, F.W., Schot, J., 2007. Typology of sociotechnical transition pathways. Research Policy 36, 399–417.
Geels, F., Hekkert, M.P., Jacobsson, S., 2008. The dynamics of sustainable innovation journeys. Technology Analysis and Strategic Management 20 (5), 521–536.
Geels, F.W., 2002. Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. Research Policy 31 (8-9), 1257–1274.
Hekkert, M.P., Suurs, R.A.A., Negro, S.O., Kuhlmann, S., Smits, R.E.H.M., 2007. Functions of innovation systems: a new approach for analysing technological change. Technological Forecasting and Social Change 74 (4), 413–432.
Jacobsson, S., Johnson, A., 2000. The diffusion of renewable energy technology: an analytical framework and key issues for research. Energy Policy 28 (9), 625–640.
Jordan, A., Lenschow, A., 2010. Environmental policy integration: a state of the art review. Environmental Policy and Governance 20, 147–158.
Kemp, R., 1994. Technology and the transition to environmental sustainability – the problem of technological regime shifts. Futures 26 (10), 1023–1046.
Kern, F., Howlett, M., 2009. Implementing transition management as policy reforms: a case study of a policy initiative in the Dutch energy sector'. Policy Sciences 42 (4), 391–408.
Kern, F., Smith, A., 2008. Restructuring energy systems for sustainability? Energy transition policy in the Netherlands'. Energy Policy 36 (11), 4093–4103.
Markard, J., Truffer, B., 2008. Technological innovation systems and the multi-level perspective: towards an integrated framework. Research Policy 37, 596–615.
OECD, 2011. Better policies to support eco-innovation. OECD Studies on Environmental Innovation.
Porter, M.E., 1990. The Competitive Advantage of Nations. Harvard Business Review 68, 2.

Rotmans, J., Kemp, R., Van Asselt, M., 2001. More evolution than revolution: transition management in public policy. Foresight 3 (1), 15–31.
Shove, E., Walker, G., 2007. 'CAUTION! Transitions ahead: politics, practice and sustainable transition management'. Environment and Planning A 39, 763–770.
Smith, A., Kern, F., 2009. The transitions storyline in Dutch environmental policy. Environmental Politics 18 (1), 78–98.
Stiglitz, J., Sen, A., Fitoussi, J.P., 2009. The measurement of economic performance and social progress revisited. http://www.stiglitz-sen-fitoussi.fr/documents/overview-eng.pdf.
Stirling, A., 2007. Deliberate futures: precaution and progress in social choice of sustainable technology. Sustainable Development 15, 286–295.
Stirling, A., 2010. Keep it complex. Nature 468, 1029–1031.