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## Environmental Innovation and Societal Transitions

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### Book review

**System Innovation: Synthesis Report, OECD (2015), 101 pp., <https://www.innovationpolicyplatform.org/system-innovation-oecd-project>**

Over the past two years, the OECD's Working Party on Innovation and Technology Policy (TIP) has been studying how the concept of 'system innovation' – used in the sense of 'socio-technical transition' – could help orient innovation policy towards meeting societal challenges. Recognizing that such an endeavor would benefit from mutual learning between policy makers, researchers and business representatives, several meetings were held in 2013 and 2014. The resulting thinking on system innovation (SI) was recently published in an OECD synthesis report, which can be seen as an intermediary output of this still ongoing capacity building project. In its roughly one hundred pages, the report explores the concept of SI as a promising horizontal and long-term policy approach to addressing social, economic and environmental challenges. The report is organized in four chapters.

The first chapter introduces the concept of SI by defining it as “a radical innovation in socio-technical systems which fulfill societal functions, entailing changes in both the components and the architecture of [a] system” (p. 15). The report highlights that this new perspective to study transitions focuses on the *direction* of technological change, stresses that transitions occur at *multiple levels*, and places greater emphasis on changes in the *demand-side*. However, while SI is acknowledged to be “explicitly concerned with the *direction* of innovation” (p. 40), and both the executive summary and the first chapter list a number of challenges to be addressed (e.g. unmet growth potential, inequality and climate), one wonders why this was not acknowledged in the title of the report (e.g. ‘System innovation for addressing societal challenges’). After providing an overview of SI as a complex and long-term process, the first chapter continues discussing different aspects of the concept in more detail. It also attempts to relate SI to conventional views of innovation, as expressed, for instance, in the OECD's Oslo Manual. It emphasizes that the appropriate framework to study SI “is demarcated by the sum of all innovations, radical and incremental, social and technological that combine to bring about the transition” (p. 20).

In the second chapter, the dynamic aspects of SI are elaborated in more detail. This starts with a discussion of four main impulses for change, namely environmental challenges (e.g. climate change), enabling technologies (e.g. ICT), changing demand patterns (e.g. caused by demographic changes), and disruptive shocks (e.g. oil price fluctuations). It stresses that such impulses can change over time, both in a reinforcing way (e.g. due to increasing returns of adoption) and a weakening manner (e.g. when overshadowed by other developments, such as the financial-economic crisis). In addition, the chapter establishes that the initial conditions of a system in terms of existing knowledge, market structure and infrastructures influence the speed of transition, and discusses institutional determinants of shifting capacity. Perhaps most significantly, the chapter initiates a discussion of the political conflicts and power struggles associated with transitions. It convincingly argues that SI “is not just an innovation challenge, but also a deeply political project, which may affect vested interests from powerful incumbents” (p. 35). Finally, the importance for SI of civil society, the media and public discourse in terms of shaping and legitimizing a vision is recognized. SI is not only acknowledged as an “economic, technical or managerial process, but also a political and cultural project” (p. 36).

The third chapter is devoted to the policy implications of the need for system innovations. It argues for more inclusive innovation policy making, which also considers transformational system failures, i.e. directionality, demand articulation, policy coordination and reflexivity failures. While these issues will be well known to the readers of this journal, traditional (innovation) policy makers who tend to focus on market (and structural system) failures as rationales for government intervention may be less familiar with them. A number of suggestions are made on how to improve current policy practices. These include a focus on system design (e.g. strengthening information flows), extending planning horizons (e.g. via mechanisms improving the credibility of policy making), managing resistance to change (e.g. through transitional assistance for affected groups), transfer of authority (e.g. by delegating funding decisions), organizational redesign (e.g. via co-ordination mechanisms to address multi-level governance gaps), and creating visions and long-term strategies (e.g. through a mix of top-down and bottom-up inputs). Aside from well-known innovation policy instruments, the report also recommends the use of procedural instruments (e.g. public consultation), and the significant upscaling of policy intelligence (e.g. new monitoring and

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measurement tools enabling reflexive evaluations of transitions, particularly regarding social changes). Furthermore, it is highlighted that the appropriate mix of instruments depends both on the transition stage and governance style, and is thus context-specific, implying that the mix ought to be adjusted over time as transitions unfold. The chapter closes with some initial thoughts on the role of business (in particular the financial service industry) and civil society.

The final chapter distills the key insights from thirteen national case studies conducted in different OECD countries. These case studies explore how SI thinking is already being applied – to various degrees – in several areas, such as sustainable buildings, e-mobility, smart cities or long-term care. Further information about the case studies is provided in an Annex, while the full case reports are available online at the OECD website. In addition, the chapters of the report contain excerpts from these case studies in order to provide the reader with concrete examples, such as the transition management approach used in the Netherlands. Of course, these illustrative case studies could be complemented by many more examples of current SI processes found in the academic literature, including this journal. Most will have in common, however, that the studied transition is still at an early phase, as suggested by the recent findings of the PATHWAYS project, underlining the presence of substantial barriers to SI.

Since the 'System Innovation' report draws heavily on inputs by Frank Geels and other transition and innovation policy experts, readers of this journal are probably well acquainted with many of the discussed ideas and concepts. Nevertheless, I would like to recommend reading the report for three main reasons. First, reading it in its totality will allow insights into the progress made in the formidable task of 'mainstreaming' transitions thinking, while also revealing some of the difficulties associated with this. An example is the substantial changes foreseen for (innovation) policy making that demand nothing less than a new mindset and capabilities of policy making bodies. Second, the report's remaining gaps and tensions may provide inspiration for future research, such as the measurement of SI, or promising strategies for managing resistance. In this regard, it is encouraging to see the continuing engagement of the OECD with SI, which has now moved on to analyzing how SI policy tools can promote industry 4.0 and green innovation. Finally, reading the report can be seen as a precondition for engaging in the ongoing public debate on sustainability transitions. Such an engagement with policy makers and other stakeholders is crucial to communicate the full value of the SI concept. Perhaps the most promising area for this is the challenge of decarbonizing the economy implied by the Paris Climate Agreement. In light of such a grand endeavor, the OECD report could help unlock previously shut doors at various levels of government, business and civil society to seriously engage with SI thinking and, in this sense, it represents an important milestone for the transitions community.

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