

**International Workshop Series “System Innovations for Sustainable Development,”
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pendency: The Management of Variation and Diversity in Innovation Systems”**

Innovation Regimes and Institutional Reflexivity

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Besides the predominant classic notion of “national innovation systems,” there are other important notions of innovation systems that refer to organizations (in particular, companies), industrial sectors, and technologies. For example, we can investigate the US innovation system as opposed to the German or Japanese innovation systems; corporate innovation systems developed by major companies such as IBM, Toyota, or Novartis; sector-specific innovation systems concerning computers, cars, or pharmaceuticals; and technology-related innovation systems characteristic for microelectronics, automated manufacturing, or biotechnology. In light of the wide variety of contexts to which the term innovation system has been applied, we need to be clear about the social entity in relation to which we use this term. Failing to do this is likely to render discussions about the management of, or variation and diversity in, innovation systems too abstract.

When talking about “innovation systems,” we also need to specify the scope of the analytical focus. For example, do we want to elucidate the innovativeness of systems, i.e. their ability to create and efficiently produce innovations? Do we also want to understand how innovation systems are influenced by, and influence, regulatory institutions? Do we, furthermore, intend to examine the ways in which innovation systems are embedded in, and dependent on, the complex fabrics of politics and culture? Do we also, in addition to analytical objectives, aim to pursue practical objectives, such as improving competitiveness, regulatory appropriateness, or socio-cultural integration of innovations? Of course, the actual significance of these objectives cannot be taken for granted, as their meaning differs among different places and times, and may be subject to social contestation. This is why we need to be aware that our concepts of innovation systems are – either explicitly or implicitly – attuned to certain theoretical and practical objectives. The extent to which we are able to take this basic fact into account will determine our ability to critically reflect upon, and subsequently expand, the foundations and capacities of innovation systems approaches.

The theme of “system innovations for sustainable development” poses particular challenges in both analytical and practical regards. First of all, as “sustainability” has gained positive appeal around the world as a concept articulating the need for long-term societal change, it has been claimed from divergent if not opposing perspectives. For example, while some portray sustainable development as a set of fundamental economic, social, and environmental transformations to secure the survival and well-being of humanity, others view sustainable development merely as solid and constant economic growth which, in turn, would automatically lead to beneficial social and environmental outcomes. Even if there is a widely shared understanding of the general concept of sustainability among a community of researchers (or policy makers) – as I suspect might be the case among the

participants of our workshop series – deliberations about sustainable system innovations are nevertheless situated in a wider discursive space that is characterized by competing or opposing concepts and perspectives. Thus the inherently contested and open nature of “sustainable development” poses another self-reflexive challenge to the analysis and management of innovation systems.

In my view, “sustainability” has come to represent serious concerns about the endangered future of human and other life forms on earth, thus articulating the need for fundamental societal change. From such a perspective I would like to approach the themes of “innovation for sustainable development” and “institutions and path dependency.” However, although exploring paths toward sustainable development may ultimately require comprehensive fundamental change, many processes of change could most likely be achieved in non-radical, incremental ways. If this is an adequate overall assessment, we then need to identify the distribution among and relationships between the various processes, dynamics and instances of change. All in all – and this is why sustainable development is such a big analytical and practical challenge – system innovations for sustainable development demand transformations at basically all levels mentioned above – national, sectoral, organizational, and technological – as well as international and global. And as we live in a world full of contradictions and inequities, transitions toward sustainable development are confronted with numerous, unevenly distributed obstacles.

My talk will have three objectives combining theoretical, methodological, and empirical considerations. First, I will present a notion of innovation regime capable of integrating the various levels and dimensions of innovations in society (for various reasons, I prefer a regime analytic over a system analytic framework). In addition to taking into account institutional, technological, discursive, and practical characteristics, I will suggest that we explore the political and cultural ecology of innovations in particular societies, as well as their transnational dynamics. While building on various (sub)disciplinary traditions – in particular from economics and political science – the integrative capacity of the regime analytic perspective suggested is mainly sociological. Second, I will argue that governance and transition management for sustainable development requires institutional reflexivity in various domains of society, as well as the effective integration of divergent institutional and practical rationales. The fundamental problem hereby is that the interests and norms predominant in a society often embody conflicting rationales and types of reflexivity. Taking biotechnology as an example, I will outline some key elements in the configuration of innovation regimes at various levels that structure the opportunities and limitations for successfully pursuing the environmental, economic, and social goals that constitute sustainability in its comprehensive sense. Third, I will provide an outlook – which includes climate change, biodiversity, mobility, and energy – that emphasizes major challenges to regime change toward sustainable development, as well as possible breakthroughs and transitions. These exploratory considerations show that incentives, opportunities and limitations for creating sustainable paths are unevenly distributed across international, national, regional, and local levels. I will conclude by emphasizing the need for comparative analyses of innovation regimes in order to map and better understand the diverging sociotechnological configurations of reflexivity and plasticity (i.e., variation and diversity) that enable or prevent sustainable change.