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Sustainability transitions in developing Asia: are alternative development pathways likely?

Introduction to a Special Issue of the *Technological Forecasting and Social Change Journal*

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Motivation

Conventional theories of economic development (cf. Rostow, Lewis, ‘balanced growth’ theories) argue that national economies move through stages involving a shift from agrarian to industrial production, a shift involving structural change in the economy, capability-accumulation and changes in markets and patterns of consumption. Typically development implies growing resource-intensity of economies early in the process of development, with major environmental impacts. Development in emerging Asian countries appears to be following this pattern and is thereby influencing the global demand for resources and generating major impacts on local, regional and global environments, including the global climate.

A key question for the global environmental change research community is whether industrial, economic and social transformations now underway in Asian countries will follow conventional trajectories, or whether more resource-efficient and sustainable development pathways may be possible. Investment patterns, government policies, the diffusion of new technologies, infrastructure development, urban planning and consumer behaviours would all play important roles in opening these pathways.

Recent developments in innovation theory related to sustainability have focused on the problem of cumulativeness and path-dependency in socio-technical regimes in industrialised countries. Socio-technical regimes are relatively stable configurations of institutions, techniques and artefacts – as well as rules, practices and networks – that determine the ‘normal’ development and use of technologies. This ‘transitions’ literature argues for a multi-level framework for analysing ‘systems innovation’ taking place over the longer-term. It

stresses the role of ‘socio-technical experiments’ in transforming prevailing socio-technical regimes (such as electricity systems or urban transport systems) operating within the specific economic and institutional (landscape) conditions that shape the rate and direction of change. In doing so, the ‘systems innovation’ approach seeks to analyse technological and industrial changes significant to environmental sustainability, placing them in a broader institutional and governance context.

The aim of this Special Issue of TFSC is to apply insights from the emerging stream of systems innovation research in the context of an analysis of economic and environmental transitions occurring in developing Asia. The aim is to illuminate the potential for alternative development pathways in the region, based on indigenous resources and capabilities operating in the context of globalisation, and to make theoretical contributions to the literature on technology, development and the environment. The conceptual starting point for this study is research that examines sustainability transitions within the framework of a multi-level perspective on system innovation.

Convergence

The paper on “Asian development pathways and sustainable socio-technical regimes” by Frans Berkhout, David Angel and Anna Wieczorek sets a stage for the remaining contributions. It refers to the models of development that presuppose that economic growth follows a pattern leading not only to a convergence between the structure, growth and productivity of economies over the long run, but also to a complementary convergence in the resource intensity and environmental pressure associated with growth in industrialising countries. The paper calls for greater attention to the resource and environmental *quality* of development. Particularly, it shows that applying the notion of ‘system innovations’ opens the way to envisaging the emergence of new, more resource-efficient socio-technical systems at the heart of more sustainable development pathways in developing Asia. Such sustainable socio-technical systems would emerge in the context of interaction between domestic and globalised markets, knowledge flows and governance.

Environmental governance

The second paper on “Environmental Rationalities and the Development State in East Asia: Prospects for a Sustainability Transition” by David Angel and Michael Rock looks more closely at the recent broad trends in environmental governance among the newly

industrializing countries of East Asia and the implications of these developments for a sustainability transition within the region. It focuses on the way in which existing political economies and governance structures promote stability or change in socio-technical regimes. In the case of the rapidly industrializing and urbanizing economies of East Asia, the trajectory of socio-technical regimes will have profound consequences for the local, regional and global environment. The review of trends in environmental governance as they relate to socio-technical regimes within the region traces a pattern of initial efforts to strengthen environmental regulatory regimes very much along the lines of the policy models of OECD economies. The degree to which these initial efforts have taken root varies from country to country in the region. What is beginning to emerge in several countries within the region, however, are a variety of policy and institutional innovations that potentially hold promise for opening up spaces for change in socio-technical regimes, and for creating opportunities for new pathways of industrialization and urbanization to take hold that are less pollution, materials and energy-intensive.

Globalisation

One of the profound global trends that have had an impact on the shape of emergent socio-technical regimes is globalisation. Michael Rock and David Angel in their contribution entitled "A hard slog, not a leapfrog: Globalisation and sustainability transitions in developing Asia" investigate how globalization influences transitions toward sustainability in the developing world. The authors argue that transformations of regimes, the networks and institutions governing technological and environmental practices in an industry can be positively influenced by globalisation, but it depends on how global forces interact with local socio-political landscapes – the political-economic institutions, values, and regulations broadly guiding an economy and its relationship to the environment. The authors evaluate these relationships through a comparison of two kinds of socio-political landscapes – the neo-liberal export-led development model commonly found in the developing world and the uniquely Asian capitalist developmental state. They show how the neo-liberal model emphasizes the power of market forces to facilitate upgrading and more sustainable industrialization. And then argue that capitalist developmental states in East and Southeast Asia have been better able to harness global economic forces for technological and sustainability transitions, through an openness to trade and investment and effective public-private institutions able to link cleaner technologies and environmental standards to production activities in firms. This argument is supported with firm-level evidence showing

the evolution of socio-technical regimes in two industries—cement and electronics. The two case studies demonstrate how interactions with OECD firms can contribute to environmental technique effects provided the socio-political landscape is amenable to changes in an industry's regime. Ultimately, the paper argues that the process of transition is complex and contingent; a hard slog not a leap frog.

Linkages

–The process of systems change is the focus of the following paper on “Enabling sustainability transitions in Asia: the importance of vertical and horizontal linkages” by Xuemei Bai, Anna J. Wieczorek, Shinji Kaneko, Shaun Lisson and Antonio Contreras. They argue that linkages between different levels in socio-technical systems are critical to explaining the emergence of sustainable development pathways. The absence of these linkages in many Asian contexts is an important factor obstructing sustainability transitions in Asia. This is even despite “sustainable development” appearing increasingly as a goal in national policies in Asian countries and there are many successful ‘sustainability experiments’ documented at local level throughout the region. The paper analyses interactions and linkages between sustainability experiments in niches and socio-technical regimes in four diverse case studies in Asian setting.

Socio-metabolic transformation

Systems innovations are typically seen as changes that occur at various levels of analysis, which become aligned and connected — people, organisations, societal functions, society. At the beginning of a process of systems innovation there may be many costly and persistent misalignments, which over time are reduced as the socio-technical system tends increasingly towards a new more stable configuration. A sustainability transition is defined as a set of fundamental changes in the domains of a system that serves a societal function but to fully understand a possible sustainability transition in developing Asia, it needs to be positioned in the context of an ongoing transition from an agrarian to an industrial use of energy and other resources. As is known from other world regions, an agrarian-industrial transition involves a major increase in material and energy flows (corresponding to a 2-4 fold increase in the demand for raw materials and energy). The socio-metabolic profile of the South-East Asian region still shows relatively low material and energy consumption per capita, suggesting that major growth may follow. Infrastructures that are closely bound-up in bulk material flows (transport, energy and food sectors) will be critical to future developments. The last paper in

this special issue on “Socio-metabolic transitions in developing Asia” by Heinz Schandl, Marina Fischer-Kowalski, Clemens Grunbuhel and Fridolin Krausmann illustrates the challenge and potential solutions from a number of national case studies.

Summarising

To answer our title research question - are alternative, more sustainable development pathways likely in Asia?, we give a qualified ‘yes’. Alternative pathways are conceivable, but under a set of institutional conditions that may be difficult to realise. The role of ‘socio-technical experiments’ in transforming these prevailing socio-technical regimes should not be underestimated, but alignments of regimes and landscapes to allow sustainable innovations to have transformative effects are also crucial. Experimentation is a globally connected process, especially when its goal is to contribute to a disruptive change towards sustainability, in advanced OECD economies, as well as in developing economies.

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