

3. Socio-technical transitions to sustainability

The implicit complexity, interconnectedness and multi-dimensionality of sustainability issues call for a system-based approach to policy and research (Mayumi and Giampietro 2006), but importantly this must be an approach that focuses on facilitating 'mutual learning rather than making blueprints' (Ravetz 2006). The danger is that if the objective becomes modelling in itself, rather than understanding organisational modes and learning processes which are inherently fluid, diversity within the 'system' in question is overlooked and the explanatory power of the model diminished (Stirling 2011). This means taking seriously that defining the system, or unit of analysis, is a normative undertaking (Meadowcroft 2009), whilst keeping in mind that all models of self-organising systems expire (Mayumi and Giampietro 2006). A systemic understanding of consumption patterns entails paying attention to the co-evolving nature of behaviours and infrastructures (Shove 2002) while recognising that theoretical concepts reflect dynamic realities and therefore need continual anchoring 'on the ground' (Genus and Coles 2008). The recent literature on socio-technical transitions presents an incipient theoretical framework which attempts to theorise societal changes on these grounds.

3.1 Transitions theory

'Transitions theory' is an overarching term covering different, but similar, theoretical approaches that analyse the development of 'socio-technical transitions'. Here, 'socio-technical' refers to the co-evolution of social and technological relationships while 'transitions' refers to the dynamics by which fundamental change in these relationships occur (hence the relevance to sustainable consumption). Based on insights from evolutionary economics, scholars of Science and Technology Studies (STS) and Innovation Studies have developed a 'quasi-evolutionary' approach to studying technological change (van den Bergh et al. 2011). In this model, the innovation process is characterised as a coupled dynamic of selective pressures and adaptive capacity in the dominant system ('regime'), in which a technology is embedded (Rip, 1992, Smith et al. 2005).

Acknowledging that these processes take place in a multi-dimensional space – comprising institutional rules, economic requirements, political negotiations as well as social and cultural rules and expectations – this perspective analyses the (re)configuration of social and technical elements by new innovations. Socio-technical relationships that have become 'locked-in' to stable configurations (which are mostly susceptible only to marginal change) are referred to as 'socio-technical regimes'. At this level, innovation processes tend to be incremental, i.e. new innovations are consistently adapted to suit the existing socio-technical configurations of the regime (Schot and Geels 2008). The dominant rules or modes of thinking which guide approaches and actions effectively exclude radically alternative innovations, and the regime is thus path dependent, or in a situation of lock-in (Kemp et al. 1998). This lock-in occurs both in institutions, social practices and technological infrastructures (Raven et al. 2010)

However, radical, path-breaking innovations can take place in 'niches', where rules, institutions and motives are different from the regime; these are 'protected spaces' where "nurturing and experimentation with the co-evolution of technology, user practices, and regulatory structures" take place (Schot and Geels 2008, p. 538). Experimentation across different projects and initiatives produce shared visions and practices that organise activities at the local level. Most innovations in this domain remain 'niche', but some niche innovations grow to become adopted by the regime (providing variety in the selection environment of the quasi-evolutionary model). The growth and transfer of niche innovations between different contexts is termed diffusion (Seyfang 2009) while the processes by which niche and regime differences are resolved are known as translation mechanisms (Smith 2007). It is the journey from niche to regime of a socio-technical innovation that is the core subject of transitions research.

Developments within and between niches and regimes take place against the background of broader social, economic, political and cultural changes. The 'socio-technical landscape' describes this analytical level; landscape characteristics mark broader structuration processes that influence niche-regime dynamics, but that are not open to unilateral change from actors within any single regime (Smith et al. 2004). Landscape processes can be pivotal for the success of a particular niche innovation: changes in landscape dynamics that lead to re-framings of norms and rules can open up windows of opportunity for the niche by destabilising the capability of a regime configuration to perform well according to those norms and rules (Schot and Geels 2008). These dynamics are important for understanding how and why broader societal developments affect the evolution (or break down) of 'possible would-be regimes' (Smith et al. 2010).

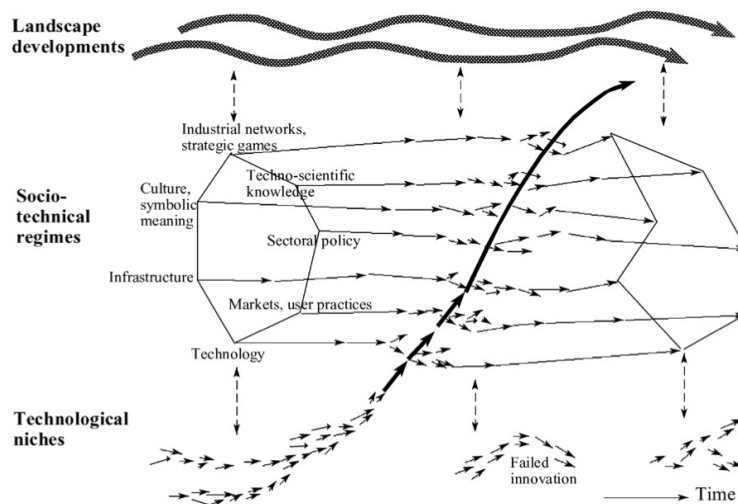


Figure 1. The multi-level perspective. From Geels (2002)

The three analytical levels of niche, regime and landscape form the theoretical basis of the multi-level perspective (MLP), a model which describes these entities as sitting, and interacting, within a nested hierarchy (see Figure 1). The long-term patterns of the three levels are seen as an effect of “social (inter)actions within semi-coherent rule structures that are recursively reproduced and incrementally adjusted by interpretive actors” (Geels 2010, p. 505). In this way, the occurrence of ‘fit’ between variations and selection mechanisms is seen as an ‘enacted multi-dimensional process’ involving economic, social, political and cultural factors (ibid.). Successful niches exert pressure on various aspects of regimes and thereby shape their trajectory against the background of larger landscape developments. In this sense, transitions research is interested in uncovering how socio-technical configurations that *might work* become configurations that *do work* among a plurality of transition pathways (Smith et al. 2004). In short, a transition in any socio-technical system involves dynamics between multiple actors on multiple levels, and transitions research aims to understand and capture these dynamics.

3.2 Sustainability transitions

Transitions research on sustainability is concerned with the development of sustainable practices and technologies, and how social networks emerge around alternatives to unsustainable incumbent regimes. Here, the object of innovation is often the socio-cultural context as well as specific technologies (Verheul and Vergragt 1995), with reconfiguration of socio-technical relationships opening up new realms of collective sustainable behaviours (Truffer 2003). In this way, the socio-technical niche is conceptualised as a space for the emergence and transformation of new subjectivities framed around sustainability issues (see for example Truffer’s (2003) study of the development of car-sharing in Switzerland). This transformation of subjectivities takes place through learning processes which gradually lead to the embedding of sustainability concepts in the social fabric (Hegger et al. 2007). A plurality of sustainability concepts and visions are thus seen as necessary to avoid narrowing the pathways to sustainability (ibid.), and visions occupy a central place in much of the transitions literature. Raven et al. (2010) see envisioning as a core activity in a cyclical process within social (sustainability) innovations which consists of four distinct clusters of activity: 1) structuring the problem in question; 2) developing a sustainability vision; 3) mobilising actors; and 4) monitoring, evaluating and learning.

On account of its systems approach and the co-evolutionary outlook which incorporate social learning processes and technological development, the transitions framework is thought to be well suited to analyse sustainability issues (Smith et al. 2010), and is increasingly applied to the area of sustainable consumption. However, a number of criticisms have been levelled against transitions theory. These can be broadly summarised as 1) application of the framework is difficult and has so far lacked consistency; and 2) some important dynamics involved in social change are not theorised adequately. The first kind of criticism focuses on problems related to giving meaning to the theoretical concepts in the field. In a survey of the transitions literature, Raven et al. (2010) found five different meanings of the concept of the regime, six different meanings of the niche, and four different meanings of the landscape. Genus and Coles (2008) have found that the MLP is applied unsystematically across different studies and that justification of choices and interpretations are repeatedly omitted by transitions researchers. At the same time, the unit of analysis is far from clear in the theory and involves both strategic choices and political decisions (Walker and Shove 2007). The lack of justifications and clarifications of these elements undermine attempts to disrupt regime thinking and pose a

challenge to the impartiality of research (see for example Hegger et al. 2007). Furthermore, the identification of a transition-in-the-making is in itself both complicated and problematic because it is usually only possible to determine whether a transition has taken place in retrospect (Vasileiadou and Safarzynska 2010).

The second type of criticism highlights different insights from social theory which are not appreciated by the theoretical framework. There is an apparent lack of acknowledgment and theorising of the social and political struggles involved in defining transitions (Meadowcroft 2009) as well as whose vision of sustainability is prioritised in transitioning (Shove and Walker 2007). This is particularly pertinent in relation to strands of transitions theory that actively engage management strategies. Shove (2002) also points out that the subjective, emotional, and psychological elements of practice tend to be under-represented. This is partially because practices 'cut across' the three analytical levels of niche, regime and landscape (Hargreaves et al. 2011) which themselves are difficult to distinguish empirically (Genus and Coles 2008). This in turn raises questions around scale as performed spatiality similar to, for example, actor-network theory (e.g. Callon and Latour 1981). Transitions theory could here be in danger of punctualising processes and power struggles taking place 'below' niche and regime levels. As Law (1992) puts it: "if a network acts as a single block, then it disappears, to be replaced by the action itself and the seemingly simple author of that action" (p. 385). Further, given the high level of abstraction and simplification inherent in the theory, Vasileiadou and Safarzynska (2010) finds there is a conceptual gap between agents and systems dynamics in the framework.

Later developments of transitions theory and the MLP have tried to accommodate some of the criticisms that have been raised. Most important, perhaps, is the abandonment of the 'nested hierarchy'-view, and the recognition that the three levels do not have ontological meaning but refer to 'different degrees of structuration of local practices' and are meant as a heuristic (Geels 2011). In this way the levels refer only to differing 'degrees of stability' and niches are not conceived as emerging 'within' any particular regime. This move may help avoid conflation of incompatible epistemologies and ontologies between niches and regimes – as well as between researchers and the researched. There is a danger of determinism if transitions theory assumes that niches are inherently aiming to displace the regime, and the managerial ethos that has been identified in much of transitions research (Shove and Walker 2007) originates in researchers' tacit notion of sustainability transitions as an issue of resource management. The 'degrees of stability'-view also opens up for other theories to inform analysis of how local practices 'stabilise' and spread. Moving above and beyond analyses that focus on *managing* the socio-technical sustainability transition, the New Economics approach suggests that understanding the 'on-the-ground' cultural and socio-psychological aspect of socio-technical systems of provision, is key to discerning how sustainable practices diffuse and consolidate around new rules and norms.