

## **TOWARDS AN INTEGRATED ANALYTICAL FRAMEWORK TO MAP SUSTAINABILITY TRANSITIONS IN FOOD SYSTEMS**

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### **ABSTRACT**

Transitions to sustainable food systems are considered necessary to address sustainability challenges in industrial food systems – but also to achieve food and nutrition security especially in countries of the South. To facilitate such transitions, we need a thorough analytical understanding of change processes in food systems. Different transition frameworks have been suggested in the literature, with the Multi-Level Perspective (MLP) on socio-technical transitions being the most prominent. While MLP has proven to be a useful heuristic, earlier studies have identified weak points (e.g. regarding agency, power, landscape factors and institutional innovations) calling for the integration of complementary concepts. This paper proposes a framework for the analysis of sustainability transitions in food systems that integrates elements of the Social Practices Approach, Transition Management, Strategic Niche Management and Innovation Systems. The starting point of the suggested analytical process is to map emerging sustainable food systems along the MLP levels of niche, regime and landscape. To better understand processes of creating and developing initiatives in food systems, our mapping relies on Innovation System approaches (e.g. identifying actors and their networks), Transition Management (e.g. niche stabilization and expansion processes) and Strategic Niche Management (e.g. breakthroughs). As wider transitions require a reconfiguration of relevant regimes, interactions across levels are of particular interest. The Social Practices Approach helps to make niche-regime interactions explicit. Finally, by looking at the impacts and outcomes of change initiatives, we can make statements about the type of transition pathway taken – and whether an initiative has transformative potential or is an incremental adaptation. Further work is needed to refine and test the framework in different contexts.

**Keywords:** *sustainability transitions, transition framework, multi-level perspective, food systems, agriculture.*

### **INTRODUCTION**

The identification and understanding of trajectories that can navigate societies towards sustainability have become a focus of socio-ecological research (Lachman,

2013). Complexity, ambiguity, interconnectedness and multidimensionality of sustainability problems imply that selective change will not be sufficient - there is a need for transformative systemic change (STRN, 2010). Markard *et al.* (2012) defined sustainability transitions as “*long-term, multi-dimensional and fundamental transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption*”.

The early research on sustainability transitions tended to focus on energy and mobility systems (Hinrichs, 2014). Accordingly, current transition frameworks are better suited for understanding such systems. Sutherland *et al.* (2014) considered the inherent complexity of food systems as the main factor that complicates the analysis of food systems. Our interest was to identify elements of different conceptual approaches that would help to accommodate the particularities of food systems – other authors have suggested such an integration of perspectives (e.g. Markard & Truffer, 2008; STRN, 2010; Geels, 2011; Geels *et al.*, 2015; Spaargaren *et al.*, 2016).

Lachman (2013) reviewed the most prominent transition frameworks including the Multi-Level Perspective (MLP), Strategic Niche Management, Transition Management, and Innovation Systems. We therefore reviewed these frameworks, integrated selected elements with the purpose of developing an integrated framework which is better suited to the particularities of food systems.

### **THE MULTI-LEVEL PERSPECTIVE AS A CONCEPTUAL FOUNDATION**

We propose to structure the mapping of transition dynamics in food systems along the levels of the Multi-Level Perspective (Box 1). The MLP has proven to be a helpful construct for making meaning of complex processes – MLP comprises landscape factors, i.e. trends that create opportunities or exert pressures on systems to change. Social behaviour and rules are structured in regimes – these regimes are affected by landscape factors and may be challenged by niches. New practices and ideas emerge from niches – such as more sustainable ways of producing, processing or consuming food. The degree of interaction between the MLP levels determines the impact of niche initiatives towards transformative change.

**Box 1. The Multi-Level Perspective (MLP) on socio-technical transitions.**

MLP is a widely-used approach to analyse socio-technical transitions. According to the MLP (Rip & Kemp, 1998; Geels, 2002; Smith *et al.*, 2005; Geels, 2010; Schot & Geels, 2008; Smith *et al.*, 2010; Geels, 2011) transitions come about through interactions within and between three levels: *niches* (micro level; locus of radical innovations); *regimes* (meso level; locus of established practices and associated rules); and *landscape* (macro level; exogenous trends). In MLP, niche-innovations build up internal momentum, changes at the landscape level create destabilising pressure on the regime, and regime destabilisation creates windows of opportunity for radical niche innovations (Markard & Truffer, 2008; Geels, 2011). MLP emphasises that processes at niche, regime and landscape levels should be aligned for a transition to be successful (Geels, 2011). While the MLP has proven to be a useful heuristic to characterize transition processes, it was criticised for the lack of conceptualisation of agency, power and politics; the superficial specification of regimes; its bias towards bottom-up change models; the vague role of landscape

Considering the criticisms of MLP (Box 1) and the particularities of food systems, we further operationalize the analysis of niche, regime and landscape level using elements of Transition Management, Strategic Niche Management, Innovation Systems and Social Practices Approach (Figure 1).

**NICHES: CHALLENGING BUSINESS-AS-USUAL**

The niche and the activities within it are vital for sustainability transitions (Hinrichs, 2014). When they attempt to bring about change, niches may focus on alternative technologies and practices, new configurations of actor groups, new networks, new beliefs and values, or new policies. Depending on the character of the niche, it may challenge or eventually replace the incumbent regime (Lachman, 2013; Darnhofer, 2015). To usefully characterize niches, we follow the recommendations by Sutherland *et al.* (2014), asking: what exactly is the niche that is analysed? In what way is the novelty it proposes different from the current regime? What regime(s) does it aim to transform?

*Transition Management* (Rotmans and Loorbach, 2009), and *Strategic Niche Management* (Kemp *et al.*, 1998) help to better understand mechanisms and processes of niche creation and development: Has the niche been supported by government policies? How were niche-initiatives organized internally? How did the niche develop rules, adapt in learning processes and stabilized its networks?

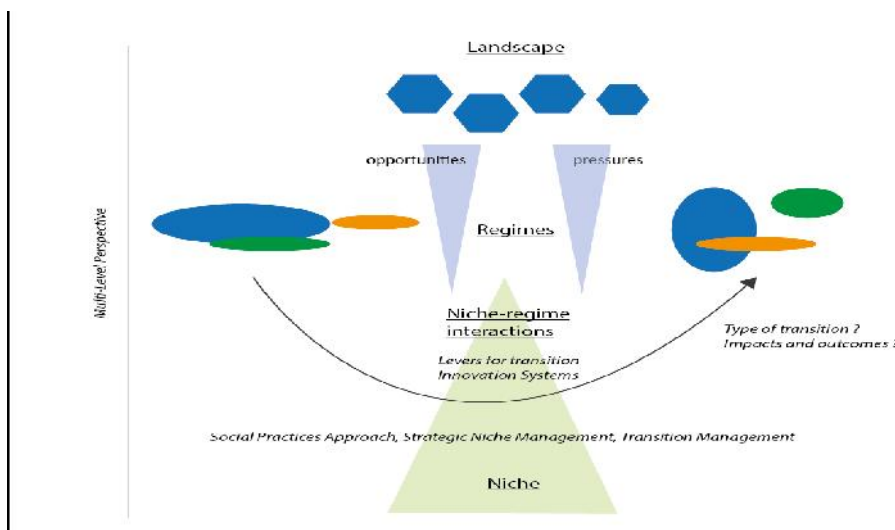


Figure 1. Proposed sustainability transition analytical framework.

Source: Adapted from Geels (2011), Darnhofer (2014), Geels & Schot (2007), Shove & Walker (2010), Hekkert *et al.* (2007), Sutherland *et al.* (2014), Kemp *et al.* (1998).

### REGIMES: ESTABLISHED RULES AND INSTITUTIONS

The analysis of the elements of a food system regime will have to include the network of involved actors and social groups; the set of formal and informal rules that guide the activities of actors; and material and technical elements (Geels, 2004). We can distinguish between regulative, normative and cognitive components (Table 1).

Table 1. Types of rules and institutions in socio-technical regimes.

Type	Examples
Regulative	Laws, formal rules, incentive structures, sanctions, governance systems, power systems, protocols, standards, procedures
Normative	Norms, values, role expectations, authority systems, codes of conduct
Cognitive	Beliefs, priorities, problem agendas, bodies of knowledge (paradigms), models of reality, jargon/language

\*Source: Sterrenberg *et al.* (2013).

Food subsystems (e.g. production, consumption) are shaped by different sub-regimes (e.g. science and education, culture). Related regimes that impact food systems are energy and recreation regimes. The drawing of boundaries between different food subsystems and between various regimes is often difficult and has to be explicitly justified. As for interactions between regimes, Raven and Verbong (2009) proposed to focus the analysis on four types: competition, symbiosis, spill-over and integration.

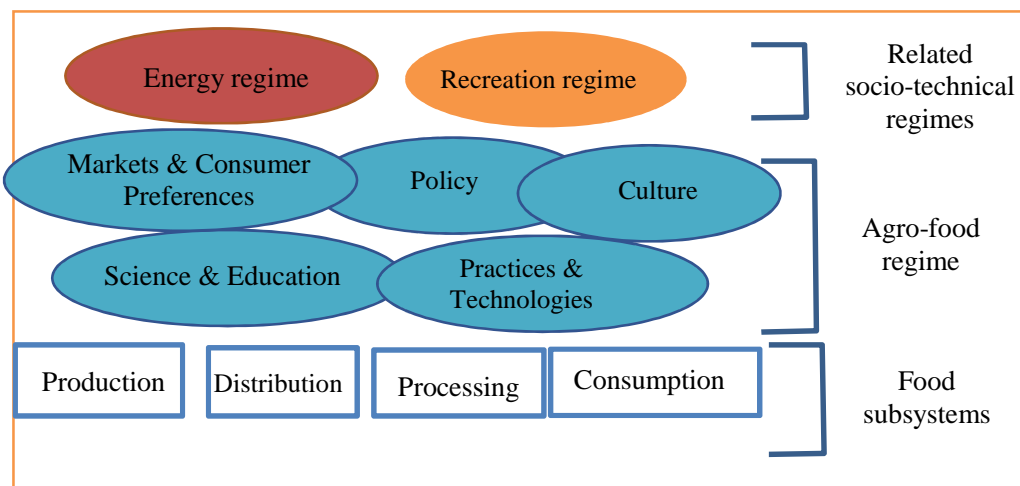


Figure 2. Food sub-systems governed by the agro-food regime and shaped by closely related socio-technical regimes.

\*Source: Adapted from Geels (2002), Geels (2011) and Darnhofer (2014).

### LANDSCAPE: EXTERNAL TRENDS

The analysis and characterization of the landscape considers external trends, changes and exogenous factors that create pressure or opportunities in food systems (Figure 3). The various trends are interrelated and linked through reinforcing feedback loops.

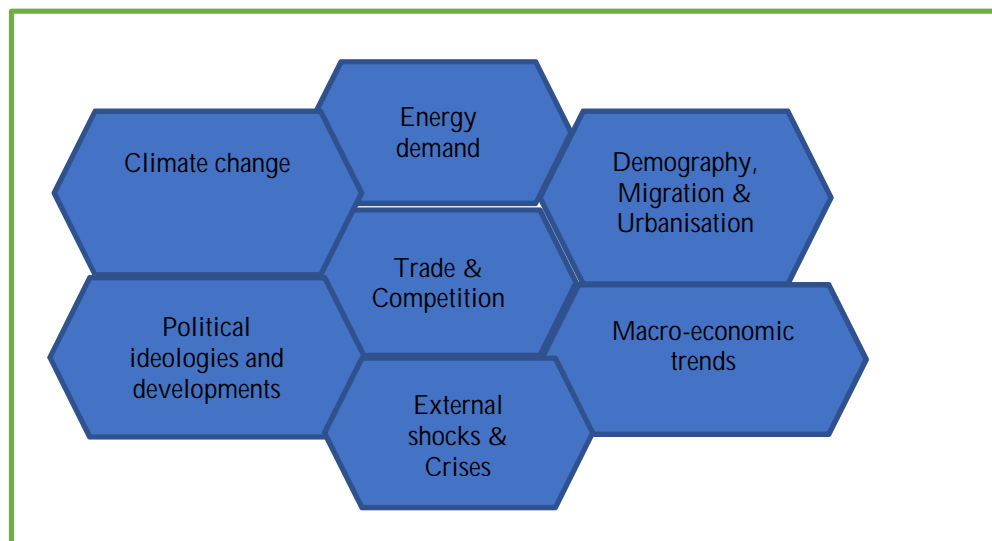


Figure 3. Examples of landscape elements shaping food systems.

\*Source: Adapted from Geels (2002), van Driel & Schot (2005), Lachman (2013) and Darnhofer (2014).

## **IDENTIFYING LEVERS FOR SUSTAINABILITY TRANSITIONS**

A deeper transition to sustainability requires a reconfiguration of relevant regimes. To identify potential levers for initiating change, we thus have to look closely at niche-regime interactions and regime-regime interactions. Niche-regime relations do not necessarily have to be opposed – regime structures can overlap or align with niche proposals. A characteristic way how niches interact with regimes is to ‘anchor’ (cf. Elzen *et al.*, 2012) by proposing new rules/institutions, technical systems (technology, infrastructure, processes, practices) or networks (social groups, human actors, organizations). Anchoring can also take the form of legitimization: scientific, policy/politics, legal, practical, civic (Montenegro de Wit & Iles, 2016). Leverage points for transition are thus found at the interfaces where interactions occur.

## **TYPE OF TRANSITION**

Transitions may differ regarding the interactions between niches, regimes and landscapes. To facilitate transformative change, it is important to understand different transition pathways. Geels and Schot (2007) proposed the following categorization, according to timing and nature of multi-level interactions: transformation, technological substitution, reconfiguration, de-alignment and re-alignment. Transition pathways can also start in one pathway but later shift to another. De Haan and Rotmans (2011) identified three basic patterns of regime shifts: re-constellation (top-down constellation change), empowerment (bottom-up constellation change), and adaptation (internally-induced constellation change).

## **ASSESSING TRANSITION IMPACTS AND OUTCOMES**

The analysis of transition impacts requires the definition of a desirable state of a system that we want to achieve – such as food and nutrition security through sustainable food systems. Accordingly, we need to specify sustainable food systems, and assess how transition initiatives increase (or decrease, or have no impact on) different system sustainability dimensions (environmental, human, social, cultural, political, financial, physical). The higher the number of dimensions being driven towards sustainability, the higher is the impact of such an initiative and its contribution to a wider food sustainability transition. Principally, we can assess the outcome of an initiative by comparing the current to the previous state (cf. longitudinal analysis with a historical retrospective) or by comparing it to the conventional food system in the same area (cf. horizontal analysis).

## **CONCLUSIONS**

This paper proposes an integrated analytical framework for understanding transitions in food systems. We rely on the Multi-Level Perspective to structure the analysis and integrate additional frameworks to further specify the analytical categories (niche, regime, landscape, levers for transition, type of transition and

impact). These frameworks include Innovation Systems, Strategic Niche Management, Transition Management and the Social Practices Approach. We believe the integrated framework can help to better understand food system transition dynamics both from vertical – landscape to regime to niche – and horizontal – in-between niches, within regimes – perspectives. Further work is needed to refine and test the framework in different contexts in industrialized food systems and those of the Global South.

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