# Climate governance by experiment?

## Exploring local climate initiatives through transition theory

MAX THULIN | 2016
MVEM30 | MASTER'S THESIS IN APPLIED CLIMATE STRATEGIES | 30 HP
ENVIRONMENTAL SCIENCE | LUND UNIVERSITY

Max Thulin

MVEM30 Thesis for the fulfilment of M.Sc. in Applied Climate Strategies 30 hp, Environmental Science, Lund University

Supervisor: Roger Hildingsson, Department of Political Science, Lund University

CEC - Centre for Environmental and Climate Research
Lund University
Lund, Sweden, May 2016

# Abstract

The response to climate change in cities has proliferated over the last few decades, and progressive climate action at the local level is now ubiquitous. More specifically, local climate action often comes in the shape of 'climate change experiments', radical innovations at the local level designed to respond to the imperatives of mitigating and adapting to climate change in the city. This thesis explores the phenomenon of local climate experiments in order to better understand how they shape climate governance and low-carbon transitions. The objective is operationalized by creating a heuristic framework injected with transition theory discourse and applying this on the Swedish Climate Investment Programme (KLIMP). The study finds that through KLIMP, the Swedish Government has actively engaged in the trend of experimental governance and helped vitalise the local response to climate change. KLIMP is both indicative of this trend and a means by which it is being realised. Investing in and stimulating local climate experiments holds great potential in low-carbon transitions. However, the bias towards economic rationality, market-based logics and technological innovation that permeates KLIMP is seen as problematic since it narrows the transition pathways considered possible and tends to side-line 'soft' policy measures such as behaviour and social change, while at the same time serves to protect incumbent regimes and detract attention from the fossil fuel burning problem. The study concludes that notwithstanding showing great promise, local climate experiments are not the silver bullet, but rather one (albeit very important) policy measure in low-carbon transitions. The state still holds considerable clout in climate policy and governance and can with different types of policy influence the landscape, empower or destabilise regimes, and protect or discourage niche innovation, and thus requires explicit attention in order to understand and catalyse broad systemic low-carbon transitions.

*Keywords:* climate change experiments, low-carbon transitions, transition theory, multi-level perspective, KLIMP

# Table of Contents

# 1. Introduction

The urgent threat of climate change is now unequivocal, arguably posing as one of the most serious issues facing humankind (IPCC, 2014). Despite all the resources invested in global intergovernmental frameworks and agreements, greenhouse gas (GHG) emissions continue to rise, increasingly reducing the probability of remaining within the '2°C target' above pre-industrial levels (Jordan *et al*, 2013). In fact, if present trends continue, temperatures could reach over 5°C by the end of this century (IEA, 2013). These developments increasingly lead to the realisation that addressing this urgent threat requires transitions from unsustainable fossil fuel-based energy and transport systems towards low-carbon systems based on 'green' technologies and innovation including new infrastructures, policies, user practices, and cultural meanings (Geels, 2014). Indeed, estimations show that global carbon emissions must be cut by 80% by 2050 if the risks are to remain within acceptable limits (Stern, 2006). Such a transition, to an essentially carbon neutral society, is a herculean task of epic proportions, according to some scholars rivaling that of the industrial revolution (McDonough & Braungart, 1998). The analogy to the industrial revolution is apt since it implies a fundamental reconstruction of the very fabric of society, from technological innovation to changes in behavior and consumption patterns (Meadowcroft, 2007).

Traditionally, climate change has been considered a global problem requiring global responses. Nevertheless, climate change can also be argued to be a fundamental urban issue (Betsill & Bulkeley, 2007). With a majority of the world's population living in urban areas, cities represent sites of high consumption of energy, high production of waste, and significant sources of GHG emissions (Bulkeley *et al*, 2015). Indeed, cities and urban areas are estimated to produce over 70% of global energy-related carbon emissions (IEA, 2009). It is, therefore, perhaps not surprising that cities have become the focal point for significant climate governance efforts (Bulkeley, 2014). In the last few decades the local response to climate change has proliferated and is now ubiquitous. What began as spearhead projects in a few selected forerunning cities has evolved into a plethora of local actions to mitigate GHG emissions (Hoffman, 2011). Thus, in a sense, the global problem of climate change has become a local challenge.

In seeking to explain the possibilities of local governance in responding to climate change and transitions, scholarly attention in this field has so far mainly been concerned with assessing the development and implementation of climate policy in key urban infrastructure networks, such as energy and transport. Actions and initiatives that fall outside of this framework are regarded as curiosities, novel and interesting but of little substantial value. However, as several authors have begun to argue (e.g. Hoffman, 2011; Bulkeley *et al*, 2015), side-lining such interventions overlooks the ways in which climate governance is accomplished and challenged, and that such interventions can be regarded as 'climate change experiments' that are integral to the ways in which climate change response is being configured and contested. Authors also point to the importance of developing our understanding of such climate change experiments in order to understand how, why and with what implications experiments intervene in the city, as well as their potential role in low-carbon transitions (Bulkeley & Castán Broto, 2013).

## 1.1 Research aim and purpose

The overarching objective of this thesis is to explore the phenomenon of local climate experiments, in order to better understand how they shape climate governance and low-carbon transitions. This is operationalized by creating a heuristic analytical framework injected with central concepts from transition theory and applying this on the Swedish Climate Investment Programme (KLIMP), a state-funded programme aimed at climate initiatives at the local and regional level. In doing so, this thesis aims to contribute to a nascent field of policy and governance studies interested in the role of cities and other local actors in transitions to low-carbon futures (e.g. Bulkeley *et al*, 2015). More specifically, this thesis engages with the political dimension of climate experiments and the power relations between actors engaged in local arenas of experimentation and innovation. The overarching aim can further be broken down into the following analytical questions:

- How and with what rationale does the Swedish Government stimulate and encourage experimentation and innovation through local initiatives such as KLIMP?
- How can local climate experiments contribute and shape the governance of low-carbon transitions in socio-technical systems?

These purposefully broad and explorative analytical questions direct the research towards two distinct perspectives. The first attempts to explicate the role of the state

in local climate experiments and low-carbon transitions. The latter aims to conceptualise the role of cities and local actors engaged in experimental governance and their complex relation to other actors in socio-technical transitions.

## 1.2 Thesis outline

This first chapter has so far introduced the research problem at hand, and presented the research aim and purpose of this thesis. The following chapter presents a rich theoretical palette drawing on central concepts from climate governance, climate change experiments and transition studies, with the purpose of creating the thesis's analytical framework. Chapter 3 presents the thesis's methodological standpoints, research design and research process. In chapter 4, the empirical analysis of KLIMP is presented. Chapter 5 brings all the theoretical concepts and empirical findings of the study together in a discussion. The thesis closes on chapter 6, where the main conclusions are presented.

# 2. Theoretical framework

In the following chapter the theoretical points of departure and fundamental concepts underlying this thesis are presented. To set the scene and provide a context for climate governance by experiment, section 2.1 gives a brief overview of climate governance in general and the Swedish perspective in particular. Section 2.2 introduces the nascent research field of local climate governance by experiment and its central concepts. Section 2.3 focuses on how transition theory approaches experimentation and innovation, and how power and politics are relevant in the study of low-carbon transitions. The chapter closes on section 2.4, in which all the central concepts from the theory chapter are synthesised and the analytical framework of the thesis is presented.

## 2.1 Setting the scene: Swedish climate governance at a glance

Sweden is often recognised as a pioneer in progressive climate policy in international comparison (e.g. Hildingsson, 2014; Tobin, 2015) and is often top-ranked in international evaluations (e.g. Burck *et al*, 2011; OECD, 2014). The Swedish integrative central-local governmental system is, according to Lundqvist (2001: 3), somewhat of a paradox where "a strong central government exists in parallel with local governments enjoying a constitutionally guaranteed sphere of independence". Municipal financial and political powers are confirmed in the constitution and legitimised by the state through the 'planning monopoly' (Granberg, 2009). Thus, the responsibility for physical planning and climate measures lies with municipalities. Notwithstanding the relative municipal autonomy, the central government retains considerable clout and has a long tradition of top-down policy directives and mandates requiring municipalities to align local policies with national objectives (Nykvist & Whitmarsh, 2008). Within this governmental framework, municipalities are often provided with substantial financial, legal and professional resources from the state (Corfee-Morlot *et al*, 2009).

Although the stabilisation of carbon dioxide emissions has been a Swedish policy aim since 1988, climate governance in Sweden can be said to have begun in

earnest with the large implementation of Local Agenda 21 (LA21) in the mid-1990s (Dymén & Langlais, 2013). Sweden was very active in LA21, initiating and supporting citizen action with regards to sustainable development (Granberg & Elander, 2007). LA21 was spearheaded by the municipalities and is generally considered a successful tool in initiating climate and environmental efforts at the local level. Indeed, some LA21 initiatives still live on in certain municipalities, and LA21 has generally been integrated into more comprehensive municipal environmental programmes (Eckerberg & Forsberg, 1998). In 1998, LA21 was further strengthened and complemented by the 4.3-billion-SEK Local Investment Programme for Sustainable Development (LIP), which targeted local environmental initiatives in municipalities. LIP was succeeded in 2003 by the Climate Investment Programme (KLIMP), which focused more specifically on climate initiatives at the local level (SEPA, 2013). KLIMP, being the empirical focus of this thesis, will be presented in more detail in chapter 4. In 1999 Swedish environmental legislation was consolidated in the comprehensive Swedish Environmental Code. The Code is the basic legal instrument for achieving environmental objectives, and one of the objectives, 'reduced climate impact', explicitly targets climate change. Unlike other acts regulating welfare sectors, this act is not a detailed regulation. Instead, the Code promotes values and principles that need to be taken into account in decision-making and implementation. The Code thus offers the municipalities' considerable discretion in formulating and implementing environmental (and climate) policies (Granberg & Elander, 2007). In 2002, the Swedish Climate Bill (Swedish Government, 2002) further strengthened local climate measures, defining a clear role for municipalities in reaching national targets and policy goals (Lundquist & Biel, 2007). The governance shift in the Environmental Code and Climate Bill was part of the new governmental strategy for 'Ecologically Sustainable Sweden' and the creation of a 'Green People's Home'. In this new strategy economic prosperity and ecological sustainability would go hand in hand, a discursive shift towards ecological modernisation (Lundqvist, 2001, 2004). In this rationale, building an ecologically sustainable society was "not a hindrance to welfare development", quite the opposite, it was rather *positively* related to growth, since new resource-efficient technologies would have to be developed (Lundqvist, 2001: 323). This new technology would in turn create a rapidly growing market and thus become an "engine for growth and jobs" (ibid: 323). Ecological modernisation is still the hegemonic discourse permeating Swedish climate governance. According to the new Climate Bill in 2008 (Swedish Government, 2008), the reduction of carbon emissions is expected to come through economic instruments and changes in the productive sector, emphasising market solutions and technical innovations. Thus, the Swedish climate policy relies

almost exclusively on economic rationality as the way to transform society (Kronsell, 2013).

Today, notwithstanding the strong independence enjoyed by municipalities, sustainability governance in Sweden can be argued to consist of mostly state-led and hierarchical forms of governance. Although the initial implementation of sustainable development in LA21 and LIP was associated with a bottom-up approach to increase participation, the strategy of the 'Green People's Home' implied a shift towards effective problem-solving and administrative steering (Hildingsson, 2010: 161). Thus it seems, as Hildingsson (ibid: 161) so aptly puts it, that "the ambitions to strengthen participation from below have rather played out in new ways of governing from above". The Swedish state still retains considerable clout in the process of climate governance and sustainable development, and policy and reforms have to a large extent been state-led and characterised by aligning local governments with national policy goals (Corfee-Morlot *et al*, 2009; Hildingsson, 2014; Nykvist & Whitmarsh, 2008). The Swedish context is important to keep in mind as we delve deeper into local climate experiments and sustainable transitions in the following sections.

## 2.2 Government by experiment – a new mode of governance?

As briefly outlined in the introductory chapter, cities have over the past two decades been increasingly recognised as important arenas in responding to climate change (Bulkeley & Castán Broto, 2013). The increasing focus of climate change as an inherently urban problem stems from the understanding of cities as both loci for GHG emissions and as arenas for experimental and innovative niche practices (Bulkeley *et al*, 2015). On the one hand, cities are estimated to cause 70% of the world's energy-related emissions (IEA, 2009). On the other hand, cities contain all the essential components for system innovations, including technological, infrastructural, social and cultural elements (Bulkeley *et al*, 2011). Against this background, cities can be regarded as the ideal location for real-world experiments and radical system innovations, functioning as seedbeds for transitions (Geels, 2011a). Put more succinctly, cities can be viewed as both the cause and the solution to the fossil fuel burning problem (Bulkeley & Castán Broto, 2013).

In the last few decades the local response to climate change has proliferated and is now ubiquitous. What began as spearhead projects in a few selected forerunning cities has evolved into a plethora of local actions to mitigate GHG emissions (Bulkeley *et al*, 2015). This proliferation of local action can be attributed to frustration at the slow pace of national and global action on climate change and

sustainable development, as well as to the increasing realisation that municipalities can form their own visions and strategies in their specific local context (Hoffman, 2011). While the international negotiations have been dominated by national governments and states, there has been a growing awareness of the need to move 'beyond the state' in order to further develop the responses to climate change in cities (Bulkeley *et al*, 2015). This has led to an explosion in the diversity of actors that see both the threat of climate change and the promise of a response to it in cities, spanning municipal governments, the private sector and NGOs, thus creating a complex interwoven network of actors that constitute local climate governance (Bulkeley & Castán Broto, 2013). The collective efforts of this diverse range of actors have created a broad range of plans, policies and initiatives in response to climate change at the local level across diverse urban contexts (Bulkeley *et al*, 2015). Earlier studies on local climate governance have tended to side-line these efforts as demonstration projects or isolated examples of good practice, and have instead focused on the process of policy development or the implementation of national climate strategies. The same studies also tend to regard this proliferation of fragmented local responses as symptomatic of a *lack* of governance. Bulkeley and Castán Broto (2013) and Bulkeley *et al* (2015), however, take a different point of departure. Rather than treating these initiatives as either simply novel curiosities or as fragmented responses without real value, the authors argue that they are *integral* to local climate change governance. By side-lining these efforts and initiatives, earlier studies have overlooked the ways in which climate governance is accomplished and challenged at the local level (Bulkeley & Castán Broto, 2013). Bulkeley *et al* (2011), Hoffman (2011) and Bulkeley and Castán Broto (2013) further argue that these local initiatives can be regarded as 'climate governance experiments', in the sense that they are often explicitly experimental in character, seeking to test new technologies and practices concerning what addressing climate change at the local level can entail and which actors that can participate in the process of climate governance. Viewed in this way, local climate experiments are not some 'side show' to 'regular' climate policy, but rather they are becoming an integral part of climate governance at the local level (Bulkeley & Castán Broto, 2013). By bringing these experimental initiatives to the fore of analysis we can start to explore how climate governance is taking place at the local level, and further investigate their dynamics and what consequence they have for low-carbon transitions (Bulkeley *et al*, 2015).

To date, the most extensive empirical research on climate experiments has been conducted by Bulkeley and Castán Broto (2013) (see also Castán Broto & Bulkeley, 2013; Bulkeley *et al*, 2015). They conducted a comparative analysis focused on 100 global cities and compiled a database of 627 'climate experiments' in order to study the nature and characteristics of experiments in different sectors. Regarding who is

governing climate change at the local level their study shows that local governments have a prominent role, leading 66% of local climate change experiments. However, the database also suggests that other non-governmental actors also play important roles, with private actors leading 15% and civil society actors leading 9% of the local experiments. Bulkeley and Castán Broto's (2013) study also show that partnership is important in local climate governance. According to the database, almost half of the experiments involved some form of formal partnership between actors at different governance levels. This includes both vertical partnerships between local, regional and national governments and horizontal partnerships between governments, private actors and NGOs. These partnerships are especially important for municipal governments since they can be used as a means to facilitate further action for climate change taken by other actors and to extend the operation of the state (Bulkeley *et al*, 2015).

Bulkeley and Castán Broto's (2013) research demonstrates the growing importance of climate change experiments in climate governance and low-carbon transitions. The empirical findings of their study implies that this phenomenon can no longer be treated as isolated cases of good practice, but rather needs to be understood as integral to the governing of climate change at the local level. Yet, Bulkeley and Castán Broto's (2013) analysis is "limited in the degree to which it enables us to understand the significance of these experiments within their urban context", which includes understanding how they shape the dynamics of climate governance and to which extent they are able to contribute in catalysing broad systemic low-carbon transitions (Bulkeley *et al*, 2015: 23-24). This thesis aims to further expand on this research in order to improve the understanding of how this new mode of governance shapes climate governance towards low-carbon transitions. To further explore and understand these climate experiments I turn to transition theory discourse, presented in the following section.

## 2.3 Transition theory

This section introduces the broad research field of transition theory. Transition theory consists of a number of different perspectives, including (but not limited to) the socio-technical perspective (e.g. Geels & Schot, 2007, 2010) transition management (e.g. Loorbach, 2010) and reflexive governance (e.g. Grin, 2010). The

purpose here is not to give an extensive review of the entire field; such an endeavour would be an entire thesis in itself[1]. Instead, the focus is aimed at the central concepts of transition studies that are directly relevant to the empirical focus of this thesis.

### 2.3.1 Introducing transition theory

Given the large panoply of perspectives and narratives contained in the corpus of 'transition studies', the transition discourse is not easy to pin down (Hendriks, 2009). Nevertheless, at its core transition studies can be described as trying to understand the complexities of structural change (Avelino, 2011). In transition theory, 'transitions' can be defined as non-linear and long-term processes of change in which a socio-technical system is structurally transformed (Geels & Schot, 2007; Grin *et al,* 2010). The socio-technical configuration refers to the "relatively stable configurations of institutions, techniques and artefacts, as well as rules, practices and networks that determine the 'normal' development and use of technologies" (Smith *et al*, 2005: 1493). A rudimentary division can be made between two distinct fields of transition studies, the first referred to as *transition management*, the latter as *transition dynamics* (Avelino, 2011; Loorbach, 2007).

Transition *management* is a "new mode of governance to manage long-term societal change" (Loorbach, 2007: 79) that aims to facilitate and accelerate sustainability transitions in order to "resolve persistent problems in societal systems" (Loorbach & Rotmans, 2006: 187). As its name implies, transition management is mainly focused on *managing* (or *steering)* transitions and can be regarded as a governance model under development since it is continuously adapted and extended by the involved actors (Avelino, 2011). Transition management has gained particular attention from policy-makers and scholars in the Netherlands. Transition management, while interesting, will not be the main focus of this thesis, the main reason being its lesser relevance to the Swedish context. It is however important to note that several academic studies use the term transition management and transition theory interchangeably, and a strict delineation of the two concepts does not exist.

Compared to the aim of transition management to steer transitions, the aim of transition *dynamics* is to *understand* transitions. In transition dynamics, the primary object of study concerns societal systems at the level of sectors or regions. Societal systems are complex and involve not only social, cultural, institutional, and political

[1] For a state-of-the-art overview of the field, see Grin *et al* (2010).

dimensions, but also economic, ecological, and technological aspects (Avelino, 2011). Considering the complexity of these socio-technical configurations, structural change needs to be conceptualised from a holistic system perspective that includes changes at many different levels and the dynamic interaction between human and non-human aspects. In analysing transition dynamics, a variety of different frameworks have been developed (Grin *et al,* 2010). This thesis especially engages with one of the most prominent frameworks for the analysis of socio-technical transitions: the 'multi-level perspective' (MLP) (e.g. Geels & Schot, 2007; Grin *et al*, 2010; Smith *et al*, 2010).

### 2.3.2 The Multi-Level Perspective

The multi-level perspective framework (MLP) is "one of the most central concepts in transition studies" (Avelino, 2011) and is based on the work of Rip and Kemp (1998) and Kemp *et al* (1998). Since its inception the MLP has evolved considerably in an iterative process by authors in response to criticisms of the framework (e.g. Geels, 2011b; Geels & Schot, 2007). The MLP is used in transition studies to analyse socio-technical systems. A socio-technical system can be understood as a 'cluster' of elements that together contributes to meeting a certain societal need (for example energy, mobility or housing) (Geels, 2004). Usually the elements of technology, science, regulation, user practices, markets, cultural meanings, infrastructures, production and provision networks are considered (Geels & Kemp, 2007). At its core, the MLP distinguishes between different levels of 'functional aggregation' at the 'landscape' (macro), 'regime' (meso), and 'niche' (micro) level (Avelino, 2011). The MLP conceptualises transitions as unfolding by the interaction of these three levels of structuration (Paredis, 2013).

The *landscape* at the macro-level can be understood as the surroundings of a societal system. The landscape contains large-scale and long-term developments with a relatively slow progress, and is relatively autonomous from the other levels (Avelino & Rotmans, 2009). The landscape can only be influenced either in the long term or by external shocks like a disaster or crisis (van den Bosch, 2010), the perhaps most salient example pertaining to this thesis being climate change. The *regime* can be defined as the most 'dominant' cluster or constellation of actors, structures and practices in a particular societal system (Avelino & Rotmans 2009). The regime dominates the functioning of the societal system and because of its incumbent power and vested interests it seeks to defend the status quo (Geels, 2014; van den Bosch, 2010). At the micro level we find *niches,* arenas where new forms of experimentation and innovation can develop. Niches are part of the societal system but are able to

deviate from the dominant paradigms at the landscape level and incumbent interests at the regime level within that system (Avelino & Rotmans, 2009).

The often published Figure 1 explains the general idea of a transition within the MLP framework. At its core structural change takes place through the interactions and mutual adaptation within and between the different levels in the framework. In the MLP, innovation processes can take three distinct paths: through 'reproduction', 'transformation', or 'transition' (Geels & Kemp, 2007). *Reproduction* is essentially the

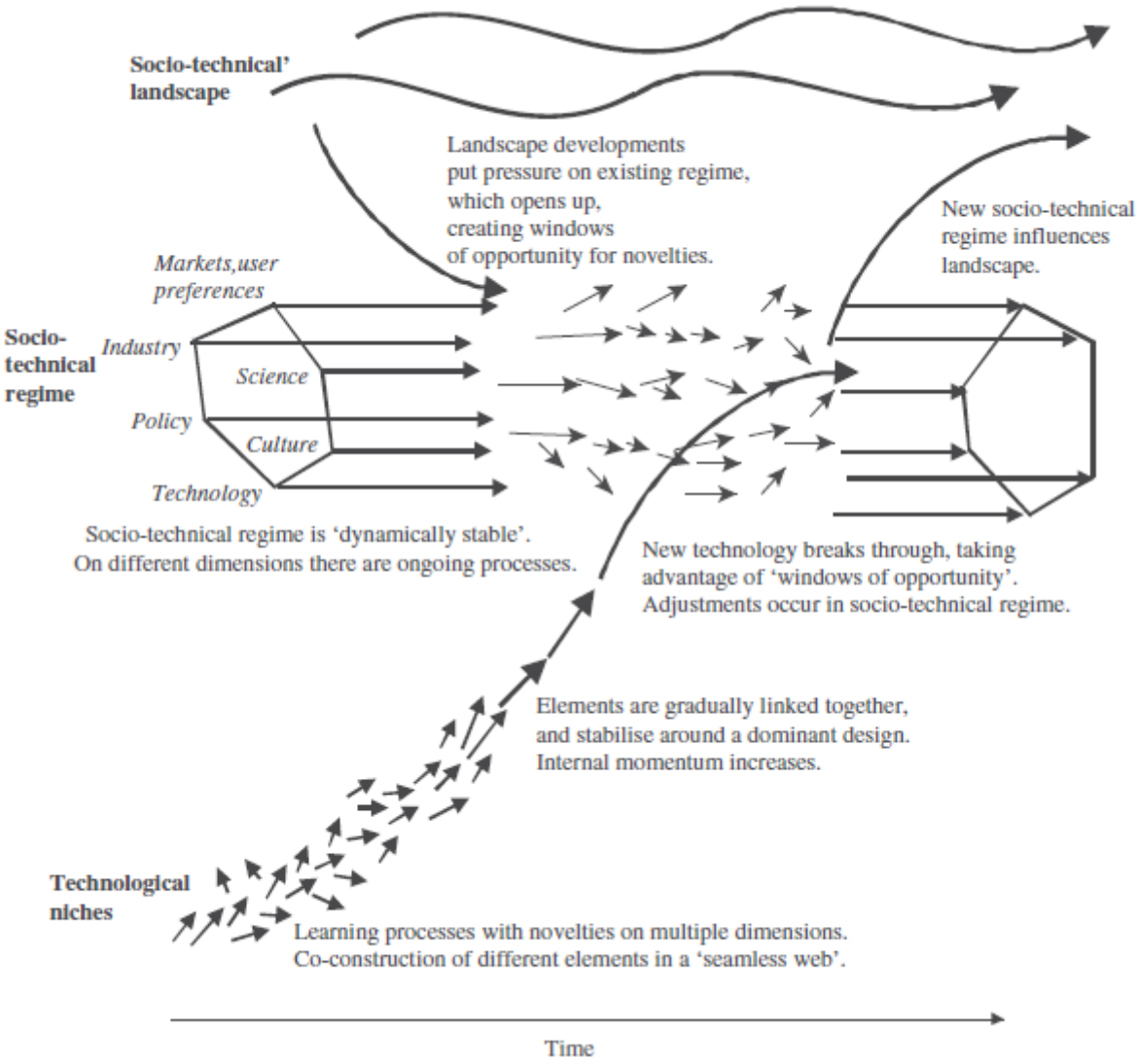


**Figure 1. The multi-level perspective framework on transitions (Geels and Schot, 2007: 401).**

regime maintaining the status quo, and change is incremental in trajectories or paths in line with the incumbent regime. Niches do not affect the trajectories at all, the regime is simply reproduced. In the *transformation* process, regimes are challenged by outside pressures which lead to a re-orientation of the direction of innovative activities. However, these 'outsiders' do not develop competing technologies, and as such the incumbent regime actors are not threatened. In other words, niches can help affect the innovation trajectory, but only in ways that fit the incumbent regimes (Kemp *et al*, 1998). Finally, the *transition* process refers to "a shift from one socio-technical system to another" (Geels & Kemp, 2007: 446) implying "major technological transformations in the way societal functions such as transportation, communication, housing, feeding are fulfilled" (Geels, 2002: 1257). In a transition, incumbent regime actors are replaced (at least in part) by a new regime, giving way to new socio-technical configurations (Geels & Kemp, 2007). Historical examples of such transitions are the transition from horse-drawn carriages to automobiles or the transition from sailing ships to steamships (Geels, 2002). The MLP is central to the understanding of how transition theory approaches concepts such as power and politics in relation to structural change, which is presented in the following section.

### 2.3.2 Transitions, politics and power

In the MLP, as described in the previous section, a transition is associated with a transformation of the regime and a particular power struggle between the current regime, upcoming niches and landscape pressures. As such, the MLP is very much a 'power-laden' concept (Avelino & Rotmans, 2009). However, although the MLP implicitly references power, the explicit attention to politics and power has long been a lacuna in transition theory (Kronsell, 2013). This apparent conceptual weakness is one of the most common points of critique of transition studies (e.g. Hendriks, 2009; Meadowcroft, 2007, 2009; Shove & Walker, 2007; Smith & Stirling, 2010). In response to this lacuna, a number of authors have recently begun to theorise the role of politics and power in transitions (e.g. Avelino & Rotmans, 2009; Hoffman, 2013; Meadowcroft, 2011). These studies have in turn led to theoretical and empirical research on discourses of politics and power in transitions (e.g. Avelino, 2011; Geels, 2014; Grin, 2010; Kern, 2011; Kronsell, 2013; Paredis, 2013). In this section I draw on these previous studies in order to create a conceptual understanding of politics and power in the MLP.

In order to approach and conceptualise the notions of power and politics in transitions I turn to an actor-centred perspective of the subject which is relevant

considering the "multi-actor nature of transitions" (Avelino & Wittmayer, 2015: 2) involving 'shifts in power' between a 'broad range of actors' (Rotmans & Loorbach, 2010). The actor-centred perspective emphasises that power is exercised by actors and not by structures or by institutions (e.g. Avelino, 2011; Avelino & Rotmans, 2009; Avelino & Wittmayer, 2015). By focusing on actors we can move beyond the structure-agency debate[2] (e.g. Giddens, 1984) and instead focus on interactions between actors on different levels within the MLP.

The macro-level *landscape* in the MLP provides the "technical and material backdrop that sustains society" (Geels, 2011a: 28) and contains the dominant discourses and norms that in turn create "a highly structural context for both the regime and niches" (Smith *et al*, 2005: 441). The normative discourse in the landscape in turn shapes and legitimises as well as frames issues for regime actors (Kronsell, 2013). To understand transitions it is imperative to also understand the context in which the transition takes place (Smith *et al*, 2005). As Kronsell (2013: 3) argues, "transitions always occur in some broader context of norms, institutionalized over time". These institutional factors create path-dependencies that impact and shape the discourse and solutions presented as viable and legitimate (Smith & Stirling, 2010). Shove and Walker (2007: 763) describe the landscape related to sustainable development as "dominated by hegemonic ideologies of neoliberal capitalism, global finance and commodity flows". Kronsell (2013) further points to the hegemonic discourse of ecological modernisation, as outlined in section 2.1, which frames climate change as a primarily technical challenge. With its focus on technological innovations, market-based logic, resource management and efficiency, ecological modernisation frames sustainability transitions as a primarily technological challenge (e.g. Hajer, 1995). This trust in technological fixes and liberal market logic is considered problematic by transition scholars since it closes the agenda and narrows the subjects and the actions considered possible for sustainable transitions (Kronsell, 2013). The field of transition studies has theoretical roots in traditions of system thinking, which highlight the co-evolution of both social and technical dimensions in transitions (Shove & Walker, 2007). Kemp and van Lente (2011: 121) call this the "dual challenge of sustainability transitions", which refers to a

[2] This is not saying that structure and agency should be ignored - quite the contrary. I agree with Avelino and Rotmans (2009: 553) in that "the agent-structure debate goes beyond a definition of power, and should therefore not be contained in it". Avelino and Rotmans (2009) argue that before we engage in a discussion on structure versus agency, the power of actors must first be understood. Thus, by focusing on actors I move beyond the structure-agency debate and leave it for a separate discussion, a discussion far too large for this thesis.

*change of systems* on the one hand (i.e. technology and infrastructure) and a *change of criteria* (i.e. consumer behaviour) on the other. Put more succinctly, transitions will only be sustainable when technology and behaviours change simultaneously. However, as elaborated above, due to the landscape context of ecological modernisation, behaviour change tends to be side-lined. As Shove and Walker (2007: 768) point out, "for all the talk of socio-technical co-evolution, there is almost no reference to the ways of living or to the patterns of demand implied in what remain largely technological templates for the future". This is echoed in a recent study by Geels (2014: 21), who warns that "policymakers and many transition-scholars have too high hopes that green innovation will be sufficient to bring about low-carbon transitions". Transition theory thus points to the importance of both behavioural and technical change to bring about large system transitions.

In the MLP, the *regime* can be defined as the socio-technical configuration of actors that provide the established and dominant way of fulfilling a certain societal function, for example energy or mobility (Smith *et al*, 2010). The basic idea of a regime is that incumbent actors form a core alliance at the regime level, oriented towards maintaining the status quo (Geels, 2014). This type of alliance has been ascribed many different names, the perhaps most salient being the 'historical bloc' (Levy & Newell, 2002) or 'carbon lock-in', which refers to the self-perpetuating inertia related to technical, economic and institutional aspects of fossil fuel-based energy systems (Unruh, 2000). The incumbent regime enjoys huge advantages, including institutional support, established infrastructure, developed networks, integration with social practices and broad political legitimacy (Meadowcroft, 2009). The regime can exert power through practices that distribute privilege and resources, but also in more subtle ways by adhering to and applying the normative power of the landscape (Smith & Stirling, 2010). In earlier research, the notion of regimes in the MLP has been mostly preoccupied with how nascent niches can circumvent the incumbent regime (Kronsell, 2013). However, in a recent account of how power can be incorporated in the MLP, Geels (2014) expands the power of regimes in terms of 'resistance', i.e. how incumbent regime actors can defend their position and resist transitions in various ways. Geels (2014: 36) argues that "the resistance of existing regimes is clearly hindering the progress of low-carbon transitions" and that more political focus needs to be directed at how to enact a 'deliberate destabilisation' of fossil fuel-based regimes to initiate their decline. Meadowcroft (2007: 360) has previously voiced the same arguments, and adds that political intervention "is often necessary to break the resistance of entrenched interests and to upset the existing equilibrium". Policy and politics should seek to deliberately destabilise the established ways of doing things and "initiate change that creates pressures for further reform and adjustment, rather than playing into feedback mechanisms that revert to

the status quo" (Meadowcroft, 2007: 360). Both Meadowcroft (2007) and Geels (2014) thus suggest that socio-political struggles with incumbent regime actors will be crucial in the case of low-carbon transitions. They argue that deliberate regime destabilisation initiated from politics and policy may be necessary to create opportunities for the wider diffusion of renewable energy, which currently struggles against incumbent and resisting fossil fuel regimes. Geels (2014) illustrates this by invoking the classic tale of 'David versus Goliath':

> So, rather than following the normal 'David versus Goliath' storyline, in which heroic green innovations overthrow the giant, this new agenda would shift the analytical agenda to better understand how 'Goliath' can be weakened, eroded and destabilized, to enhance the chances of green Davids (Geels, 2014: 37).

Such a deliberate destabilisation will require explicit politics, since the incumbent 'Goliath' most likely will defend himself in order to maintain the status quo.

On the *niche* level, the focus in the MLP lies on innovative practices and experiments that are part of the societal system but able to deviate from the dominant structures and challenge incumbent regime actors and institutionalised norms within that system (Avelino & Rotmans, 2009). Transitions are dependent on activities within niches since they provide protective settings that reduce the prevalent selection pressures in regimes (Smith & Stirling, 2010). This protective setting is referred to as 'protective spaces' in the MLP, spaces where path-breaking and radical innovation can evolve outside landscape and regime pressures (Kemp *et al*, 1998). As elaborated above, due to processes of lock-in and path-dependency, powerful incumbent regime actors enjoy structural advantages and can actively resist niche innovations and thus function as a kind of 'selection environments' for innovation and experimentation (Geels, 2002; Smith *et al*, 2010). The initial protection of niches is considered important since novel and path-breaking innovations are at a structural disadvantage against the mainstream selection environment prevailing in the regime (Smith *et al*, 2010). Recent transition literature has begun to explore the role of the state in creating these protective spaces. Different forms of government programmes and policy can both serve to protect and expose nascent niches, and encourage or discourage innovation (Meadowcroft, 2010).

A niche that has grown powerful enough to challenge an incumbent regime is in more recent transition literature referred to as 'niche-regimes'. Niche-regimes can be described as niches 'turning into regimes' or 'regimes in the making', and consist of niche actors that have formed a 'cluster' outside the regime (Avelino & Rotmans, 2009). As the niche-regime expands and becomes more mainstream, and their

innovations expand into new markets, the need for protection diminishes (Shove & Walker, 2007). Another important feature of the niche is its role as an 'arena' for transitions, where actors from disparate sectors can meet outside of regime pressures and experiment with path-breaking innovations that can lead to transitions (Loorbach, 2010). However, recent studies of such experiments show that the 'open deliberation' often turns into pragmatic and short-term solutions, with a focus on marketable technological fixes, neglecting social and institutional innovation (Meadowcroft, 2009; Kronsell, 2013). Moreover, the agenda for the experiments tends to be captured and dominated by regime actors, rarely involving 'outsiders' (Meadowcroft, 2009). Thus, there is a dilemma between an open deliberative process and the risk of having the agenda captured by the most powerful actors representing the existing regime (Kronsell, 2013).

In sum, it seems as though politics and power is ever present in socio-technical transitions, manifest on each of the three levels of the MLP. Politics can influence the landscape, empower or destabilise regimes, and protect or discourage niche innovation, and as such requires explicit attention in order to understand low-carbon transitions (Meadowcroft, 2011). Committing public resources and making decisions about long-term investments in large socio-technical systems inherently involves difficult political decisions (Hendriks, 2009; Meadowcroft, 2009). However, studies on both sustainable and low-carbon transitions speak of a 'post-political' discourse, a discourse which frames transitions as mainly a 'techno-economic management challenge' (e.g. Geels, 2014; Swyngedouw, 2010). This 'post-political frame' can be linked to the hegemonic discourse of ecological modernisation, as outlined earlier in this chapter, where the liberal market economy is seen "as the basic organisational structure of the social and economic order, for which there is no alternative" (Swyngedouw, 2010: 215). In liberal market economies the role of the state tends to be limited to rule-setting which implies that coordination of activities occurs mainly via market competition. This 'ideological hands-off' approach is often claimed by governments to be neutral, since it is up to the market to decide the trajectory of innovations. However, in effect this leads to incumbent regime actors, empowered by their privileged position, capturing the agenda and further entrenching their dominant position. While claiming neutrality, the government implicitly supports innovative pathways that fit incumbent interests, making it difficult to open up choices for wider political and cultural debate, thus side-lining alternative transition pathways (Geels, 2014).

## 2.4 The relevance of transition theory to climate experiments – synthesising the theory chapter and introducing the conceptual framework

The extensive corpus of theory above has so far introduced climate governance from a Swedish perspective (section 2.1), introduced the concept and phenomenon of climate governance by experiment (section 2.2), introduced transition theory and the multi-level perspective framework (section 2.3) and, finally, discussed how transition theory deals with the issue of power and politics (section 2.3.2). How does all this fit together and how does it relate to the empirical analysis at hand? In the following section the central concepts and theory presented above are synthesised in order to create a collective understanding of climate experiments and how they can be explicated through discourses and concepts drawn from transition theory.

First, the most obvious connection between the theoretical concepts is the emphasis on local experimentation and innovation. In Swedish climate governance, focus is aimed at the local level through programmes such as LIP and KLIMP; in climate governance by experiments, emphasis lies on how local innovation and experimentation contest and shape governance; and in transition theory, niche innovations are considered essential in initialising socio-technical transitions. Thus, broad local participation and experimentation is prevalent in all of the above. By drawing on concepts from transition theory regarding politics and power we tap into a rich governance literature that helps us 'open up' the phenomena of local experimentation by examining underlying and implicit power structures, for example how landscape pressures and incumbent regimes can shape the pathway of innovation (e.g. Geels, 2002; Smith *et al*, 2010) and how participation in local experiments tend to favour already empowered incumbent actors (e.g. Kronsell, 2013; Meadowcroft, 2009).

Second, as outlined in section 2.2, governance by experiment is said to happen in a context of experimental and diffused governance structures where new and novel ways of governing outside the state are tested, often described as bottom-up initiatives. However, the Swedish perspective, elaborated in section 2.1, shows that the state still holds considerable clout in climate governance. Thus, in order to understand niche experimentation and innovation in a Swedish context, it is vital to address the role of the state. By tapping into transition theory we can 'bring the state back in' (e.g. Hildingsson, 2014), by examining the ways in which the state can govern transitions by steering and enabling. As for example Geels (2014), Lundqvist (2004) and Meadowcroft (2007) argue, it is difficult to envision large societal transitions without the involvement of state governments. Here, transition theory

provides a deeper understanding of the local-national relations in low-carbon experiments.

Third, transition theory often stresses that social innovation is equally important as technical innovation in socio-technical transitions (e.g. Kemp & van Lente, 2011; Shove & Walker, 2007). Studies on both Swedish environmental governance and governance by experiment show that experimentation tends to emphasise market solutions and technical innovations, requiring large economic investments in, for example, energy- and transport systems, following the logic of hegemonic ecological modernisation discourses (Kronsell, 2013). In this regard, concepts from transition theory provide a deeper understanding of the contexts surrounding local climate experiments, such as landscape norms, hegemonic discourses and powerful incumbent regimes, contexts which shape the pathways of innovation and transitions.

In Table 1 below, the central concepts of the analytical framework are summarised. In the *landscape* we find the hegemonic paradigms that shape transition pathways, which create path-dependency and lock-in, adhering to the logic of ecological modernisation discourses. The *regime* consists of a fossil fuel historical bloc resisting radical change (i.e. 'Goliaths'). By deliberative destabilisation, innovative niches (i.e. 'Davids'), can challenge and possibly overthrow the regime. At the *niche* level we find the innovative experiments necessary to catalyse transitions. By creating protective spaces, nascent niches can develop into niche-regimes that can challenge incumbent regimes.

**Table 1. The thesis's analytical framework.**

| Level in the MLP | Central concepts from transition theory |
|---|---|
| Landscape | Path-dependency<br>(Carbon) lock-in<br>Ecological modernisation |
| Regime | (Fossil fuel) historical bloc<br>Innovative green 'Davids' (i.e. niche actors) versus unsustainable 'Goliaths' (i.e. incumbents)<br>Deliberate destabilisation |
| Niche | Innovative 'path-breaking' practices and experiments<br>'Protective space' for nascent niches<br>Niche-regimes |

# 3. Methodology

The following chapter outlines the epistemological, ontological and methodological grounding of this thesis.

## 3.1 Research design

As outlined in the introductory chapter, the overarching objective of this thesis is to explore the phenomenon of local climate experiments. Being a nascent field of governance studies, the specific literature on this subject is limited (Bulkeley *et al*, 2015). Thus, it is natural that the research design takes on an *explorative* character. The overarching analytical strategy in turn takes the form of a *policy analysis*, drawing on many concepts from *discourse analysis*. Discourse analysis is not a single approach, but a very broad field of inter- and multidisciplinary approaches that can be used in many different types of studies (Jørgensen & Phillips, 2002). Whatever the approach, however, they all share the point of departure that language does not neutrally reflect reality, but rather plays an active role in creating and changing it (Bergström & Boréus, 2012). Language does not only refer to communication (i.e. written and spoken language), but the entire social domain (Jørgensen & Phillips, 2002). In this thesis I engage specifically in the *argumentative* approach of discourse analysis (e.g. Fischer & Forrester, 1993; Hajer, 1995). At its core, argumentative discourse analysis critically examines how human activity is shaped and constrained by discourse. By explicitly linking policy change to 'discursive interaction' between 'discoursing subjects', Hajer (1995: 263) views politics as "a struggle for discursive hegemony in which actors try to secure support for their definition of reality". In other words, in the argumentative approach "politics becomes a contest about dominance between various meanings and conflicting interpretations in the policymaking sphere" (Hildingsson, 2014: 54) which in turn shapes the way problems and solutions are collectively framed (Hajer & Versteeg, 2005).

Moreover, the analytical strategy applied in this research can best be described as *interpretative*, in the sense that it "takes a critical stance towards 'truth' and puts emphasis on the communications through which knowledge is exchanged" (Hajer &

Versteeg, 2005: 176). In this strategy the analysis of meaning becomes central since "it is not an environmental phenomenon in itself that is important, but the way in which society makes sense of this phenomenon" (ibid: 176). This entails an anti-essentialist ontology, since it assumes that realities (plural) are socially constructed. Take, for example, the concept of 'sustainable development', which is constantly contested and interpreted in different social (historical, cultural and political) contexts (Hajer & Versteeg, 2005). Thus, this thesis can be described as taking a *constructivist* stance, in that "social phenomena and categories are not only produced through social interaction but that they are in a constant state of revision" (Bryman, 2012: 33).

In constructing the analytical framework and analysing the empirical material I use a combination of *induction* and *deduction*. The reasoning behind this is that the research objective and aim require the development of an analytical framework which can only partly be deduced from existing theories on experiments and transitions, due to the limited literature on the subject. As such, this thesis deduces central concepts from existing literature on climate experiments and transition theory and, together with the empirical material, induces the type of concepts needed to further understand the empirical phenomenon at hand. In this mix of induction and deduction, the theoretical framework and empirical material evolves simultaneously and interactively in an iterative process (Bryman, 2012). The research process is detailed further in section 3.3.

While the mapping of the empirical cases (detailed further in section 3.2.1) is mainly of a quantitative nature and some of the analysis is drawn from quantitative sources, the overall analytical approach is *qualitative*. A qualitative approach is a logical choice since qualitative methods allow for a more exploratory research that aims to answer 'how' questions and to provide analytical and theoretical explanations for the complex social processes under study (Bryman, 2012). The data collection of this thesis is based on two main methods, a literature study and case study research. The literature study explores existing theories related to transition experiments and includes theories on transitions, experimentation, politics and power, as detailed above, in order to create the thesis's theoretical framework. The case study in turn applies the theoretical framework in order to further understand the phenomenon of local climate experiments.

## 3.2 Case study

A case study approach is chosen since it enables an in-depth study of climate experiments within their specific local contexts. A case study can be defined as "an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-world context", and is considered especially useful when "the boundaries between phenomenon and context may not be clearly evident" (Yin, 2014: 18). More specifically, the empirical focus is the Swedish Government's Climate Investment Programme (KLIMP). Sweden and KLIMP are chosen for empirical illustrations, since they can be considered a 'critical case'. A critical case can be defined as "having strategic importance in relation to the general problem" (Flyvbjerg, 2006: 229) and is considered especially useful in making generalisations, with the main argument that "if it is valid for this case, it is valid for all (or many) cases" (ibid: 229). I argue that Sweden relates to a critical case in two ways. First, as outlined in section 2.1, Sweden is generally considered a pioneer in progressive climate policy. Second, as described in section 2.1, the Swedish Government has a long tradition of encouraging and stimulating local climate initiatives.

### 3.2.1 Selection of cases - mapping KLIMP experiments

The first step in selecting cases for this thesis is mapping all KLIMP projects that can be considered experimental or innovative. This selection is based on the Swedish Environmental Protection Agency's definition of 'experimental' or 'innovative'. For the purpose of this study, no determination as to whether the experiments meet the current academic definition is made. The sheer number of KLIMP projects and the difficulty in assessing their underlying rationales and motivations limits the ability to determine whether the experiments meet the formal definition. Furthermore, the academic interpretation of the terms 'experiment' and 'innovation' are complex, contested and normative. By adhering to the Swedish EPA's definition this thesis circumvents these contested terms and instead points the empirical focus towards the underlying governance structures they imply.

All KLIMP projects are collected in an online database, the Environmental Investment Register (MIR), managed by the Swedish EPA (MIR, 2016). The mapping of KLIMP projects for this thesis was performed using this database. The mapping turned my attention towards innovation in biogas, which received a large portion of the KLIMP grants. Furthermore, I wanted to echo the importance of the social aspect of socio-technical transitions in transition theory (as elaborated in

section 2.3). Thus, I searched for projects aiming to affect behavioural change. This search led me to *mobility management*, a recent phenomenon aimed at changing the behaviour in the transport sector. The mapping thus resulted in two separate 'themes' of experiments and innovation, biogas and mobility management. Furthermore, KLIMP was in operation between 2003 and 2012 and has now been replaced with the new climate investment programme Klimatklivet. By also analysing Klimatklivet, the study takes on an additional longitudinal perspective.

## 3.3 Research process and material

The general research process can be broken down into four distinct phases, as outlined by Figure 2.

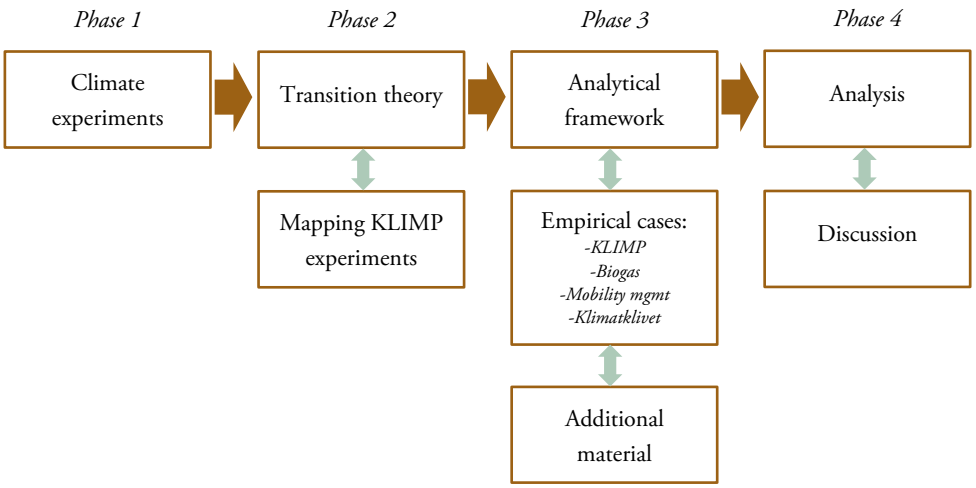


**Figure 2. The thesis's research process.**

In *phase 1* the phenomenon of 'climate experiments' was researched extensively through published academic articles and books, in order to get an overview of the research field and identify research gaps. The literature review in phase 1 identified transition theory as a relevant analytical tool for an empirical study of experiments, while the Swedish Climate Investment Programme (KLIMP) was identified as a relevant empirical illustration. In *phase 2* a literature review on transition theory identified central concepts of politics and power which formed the thesis's analytical

framework, and an extensive mapping of KLIMP experiments led to two empirical themes (see section 3.2.1). In *phase 3* the empirical cases were analysed through the analytical framework. The empirical cases consist of general overviews of KLIMP and the follow-up programme Klimatklivet, in addition to the two aforementioned themes, biogas and mobility management. The analysis of the empirical material through the analytical framework was then triangulated with additional material, such as academic literature and studies in the areas relevant of the empirical cases. The triangulation of additional data sources in this phase gives further contextual understanding of the cases (Yin, 2014). The research conducted in phase 3 in turn led to *phase 4*, in which the main findings of the research was aggregated and discussed.

It should be noted that while the overall research process adhered to a sequential logic, the phases were permeable, and as such the research process was both an iterative process horizontally between phases as well as vertically within phases. In this iterative procedure the research process itself was constantly refined and redefined.

# 4. Results and analysis

In this chapter the results and analysis of the empirical study are presented. The analysis is based on the analytical framework outlined in chapter 2, and throughout this chapter I return to the framework's central theoretical concepts. In section 4.1 KLIMP is analysed, mainly via official documents and reports. The following sections, 4.2 and 4.3, present the analysis of the two 'themes', biogas and mobility management respectively. In section 4.4 Klimatklivet, the successor to KLIMP, is analysed. The chapter closes on section 4.5, where a brief summary of the analysis is presented.

## 4.1 KLIMP

The Swedish Government's Climate Investment Programme (KLIMP) is the successor to the previous Local Investment Programme for Sustainable Development (LIP). LIP was operative from 1998 to 2002 and was one of the largest environmental investments ever in Sweden (SEPA, 2013). The aim of LIP was to support environmental efforts at the municipal level, but also to stimulate employment. During LIP's funding period some 4.3 billion SEK was allocated to environmental and climate investments at the municipal level (SEPA, 2010). LIP was replaced by KLIMP in 2003 (SEPA, 2008). KLIMP was implemented to serve as a complement to other national policy instruments in reaching the Swedish climate target as formulated in the 2002 Swedish Climate Bill (Swedish Government, 2002). A number of LIP's properties were kept, but while LIP focused on sustainable development more broadly, KLIMP was solely focused on climate actions in the areas of reduced greenhouse gas emissions, transition to renewable energy, and reduced energy consumption (SEPA, 2013). According to the Swedish EPA, KLIMP can be described as contributing to reaching the Swedish climate targets in three ways. First, through the overarching aim of reducing GHG emissions and energy consumption; second, by strengthening local climate action and cooperation between various local actors; and third, through collecting and disseminating knowledge and experience of climate initiatives in other parts of the country (SEPA, 2008).

Each programme in KLIMP had a 'programme owner', an organisation with the overarching responsibility for the programme. Each programme in turn had several different projects associated to them, where each project in turn had a project manager (SEPA, 2013). The starting point for a KLIMP application was for a local actor, usually a municipality, to conduct an inventory of the energy situation and GHG emissions within its geographical area. Following this, potential projects that could improve the climate and energy situation were then identified, which involved considerable cooperation between public and private actors in the local area (SEPA, 2009). The Swedish EPA, together with other relevant authorities, assessed all KLIMP applications and took other national instruments that existed at the time into account, such as subsidies, taxes and regulations. Contributions were not granted in cases where other policy instruments already existed (SEPA, 2013). The most effective projects were then selected and gathered in four-year programmes (SEPA, 2009). KLIMP was in operation during the period from 2003 to 2012, and five rounds of applications were made in total. The fifth and final round of projects received funding in 2008 and by 2012 all programmes and projects were finalized. In total 751 climate measures[3], collected in 124 programmes, received almost 1.2 billion SEK[4] of funding (MIR, 2016). Among the KLIMP projects that attracted funding, two dominant areas emerge in energy (production and distribution) and transport (road traffic), which together received almost 50% of the total available funding (SEPA, 2013). This includes, for example, expansion of district heating, transition to biofuels, and energy efficiency measures. Most salient is perhaps the fact that almost one third of the KLIMP grants went to biogas projects, which is the empirical focus of section 4.2. The focus on energy and transport in climate experiments is analogous to earlier studies. For example, in the aforementioned study of 627 climate change experiments in 100 global cities, Bulkeley and Castán Broto (2013) found that 45% of the all experiments had an energy focus, with transport not far behind. Considering what type of projects that attracted funding, it is evident that innovation and experimentation in KLIMP was heavily biased towards technology (MIR, 2016). From a transition theory viewpoint this can be problematic, since it narrows the range of transition and innovation pathways considered possible (Kronsell, 2013). Moreover, as certain transition theory scholars argue, too strong a focus on

[3] Initially, over 900 measures received funding. However, due to e.g. project cancellations, only 751 measures were actually finalised.

[4] 1.8 billion SEK was originally allocated in the budget by the Swedish Government. However, due to e.g. project cancellations, only 1.2 billion was actually disbursed.

technological innovation could serve to protect incumbent regimes. While stimulating green technology innovation remains important for transitions, Geels (2014: 37) warns that "a strong focus on new innovations may serve to protect existing regimes by detracting attention from the fossil fuel burning problem".

Cooperation between local actors, such as municipalities, private companies and organisations was strongly encouraged in the KLIMP application process. This is reflected in both the 2002 Climate Bill (Swedish Government, 2002) and the regulation on government grants for climate investment programmes (Swedish Government, 2003). The 2002 Climate Bill describes how important it is to encourage and take advantage of the progressive environmental action at the municipal level. It states that development based on local conditions is an important complement to national policy instruments, with the argument that government grants to local climate investment programmes should lead to an intensified interest in long-term climate action and collaboration between different local actors (Swedish Government, 2002). KLIMP was based on collaboration between national and local levels, and the idea was that municipalities, companies and other stakeholders would be encouraged to make long-term investments to reduce environmental impact, achieving both the Swedish climate target while also strengthening the local climate work (SEPA, 2013). The co-financing mechanism of KLIMP was also seen as a measure to this end. That measures would be partly financed by the applicant was expected to lead to an active involvement and accountability in local governments and other actors. Thus, it can be argued that KLIMP (and the previous LIP) stem from a Swedish tradition of centralized support to stimulate local environmental initiatives and to assist municipalities in programme implementation (Corfee-Morlot *et al*, 2009), as was the case with LA21, outlined in section 2.1. Indeed, both LIP and KLIMP was seen by the Swedish EPA as a means to strengthen the environmental work LA21 triggered at the local level (SEPA, 2013). It can be argued that the Swedish Government's rationale behind KLIMP correlates with central ideas from governance by experiment literature, such as local co-operation and innovation. In this regard, KLIMP can be seen as both reflective of the trends of decentralised and experimental climate governance and a means through which these trends are being realised (*cf.* Bulkeley *et al*, 2015).

In the selection process of KLIMP programmes and projects, the Swedish EPA applied an 'only the best measures' approach. This approach entails a process in which the Swedish EPA, together with the Swedish Road Administration, the National Board of Housing, Building and Planning and the Swedish Energy Agency, thoroughly assessed the programme- and project applications based on criteria such as cost and grant efficiency (SEPA, 2008; SEPA, 2009). The most central aspect of the 'only the best projects' approach is the focus on economic efficiency (SEPA,

2013). This is formulated, for instance, in the 2002 Climate Bill, which state that "the measures in the climate investment programmes will primarily be assessed based on cost-effectiveness" and that "it is important that the climate target can be achieved with the least possible cost to society" (Swedish Government, 2002, my translation). More specifically, the 'best programmes' were awarded grants for those projects that offered the "largest emission reduction per SEK" of the grant (SEPA, 2009: 4) The focus on economic rationality in KLIMP is perhaps not surprising, considering the history of Swedish climate governance outlined in section 2.1. Studies of Swedish climate policy (e.g. Hildingsson & Khan, 2015; Kronsell & Bäckstrand, 2010; Kronsell, 2013) show the importance of neo-classic economic values in the climate policy debate and the dominance of economic actors representing the fossil fuel consuming and carbon-intense industrial sectors in the Swedish policy process. The Swedish climate policy relies almost exclusively on economic rationality as the way to transform society (Kronsell & Bäckstrand, 2010) and Swedish climate policy is "dominated by the market-based policies and market-liberal norm of cost-efficiency" (Hildingsson & Khan, 2015: 247). This focus on production, market solutions and technical innovations is considered problematic in transition studies, since it tends to benefit incumbent actors defending the current status quo (Kronsell, 2013; Smith *et al*, 2010) and frames transitions as mainly a techno-economic management challenge (Geels, 2014).

There was however one exception to the cost-effectiveness criteria, relating to innovation of new technology. Both the 2002 Climate Bill (Swedish Government, 2002) and the regulation on government grants for climate investment programmes (Swedish Government, 2003) point to the importance to stimulate local innovation for learning and diffusion of new technology. They further state that new methods and technology should be tested, albeit in a smaller scale, even though they are normally associated with higher initial costs and lower cost-effectiveness (Swedish Government, 2002, 2003). According to the Swedish EPA's own assessments, 16% of the actions in KLIMP have been of an innovative or experimental nature, and have together received around 30% of the total funding. Several project managers state that they would not have been able to test these measures without the support from KLIMP funding (SEPA, 2013). Thus, just as in governance by experiment and transitions literature, KLIMP emphasise the importance of local experimentation and innovation. Even though economic rationality takes centre stage in KLIMP, innovation and experimentation is deemed important enough to bypass the 'maximum return on investment' criteria. However, it could be argued that the focus on green innovation is in fact to some degree based on economic rationale. In a recent report, the Swedish EPA states that the KLIMP funds aimed at innovation and experimentation has led to Sweden being an international forerunner in 'clean-

tech' products and services, bringing revenue to Sweden both in the form of export but also in marketing Sweden as a sustainable spearhead (SEPA, 2013). Thus, it can be argued that economic rationality based in liberal market logics (Shove & Walker, 2007) permeates innovation and experimentation in KLIMP.

Competition between applicants for KLIMP funding was fierce; the total sum of grants applied for was six times more than the KLIMP budget, meaning that many municipalities that applied did not receive funding (SEPA, 2013). Competition was generally considered a positive thing by the Swedish Government and the Swedish EPA, by its mechanism to promote the aforementioned 'best projects' approach with efficient and cost effective measures. However, project orientation involving municipal competition for funding is not necessarily the best way to initiate broad societal transitions. As Granberg (2009: 15) points out, competition in KLIMP led to "an unequal distribution of funds among municipalities favouring larger municipalities before smaller". This could in turn entail that municipalities with the greatest need for support have to go without, with potentially negative effects on local climate change action. Only 62 out of Sweden's 290 municipalities (around 20%) received KLIMP grants (SEPA, 2013). It is, as Ache (2000: 693) argues, that "for 'ordinary' cities and regions the risks of being left behind in the face of the new ecological economy are high". Thus, it could be argued that strengthening the institutional capacity of small and potentially weaker municipalities is needed.

Throughout the whole KLIMP process, the Swedish Government and the Swedish EPA have claimed political and ideological neutrality in the way funding was distributed. As the Swedish EPA expresses it, "the support has not been directed at any particular kind of technology, but has instead been given based on effect" (SEPA, 2009: 8). This is analogous to Swedish environmental governance in general. Even though the policy of ambitious environmental objectives is confirmed in legislation, there are no binding rules. Rather, the Swedish Government's relation to local climate initiatives is a case of enabling and guiding rather than steering and control (Granberg & Elander, 2007). However, as argued in the theory chapter, a lack of steering can indeed be a type of steering in itself. This is explained in transition theory through landscape pressures that shape innovation pathways and incumbent regimes that tend to capture the agenda (Meadowcroft, 2009; Kronsell, 2013). By giving grants to measures based on effect, masked by the post-political discourse of 'best climate measures' (*cf.* Swyngedouw, 2010), the state effectively promotes more established niche technology (often corresponding with the regimes agenda) and shuts out 'immature' technology (Geels, 2014). Thus, without steering, the state can contribute to narrowing the agenda on what type of technology is considered effective in bringing about transitions, which in turn legitimises certain technological pathways over others.

## 4.2 Theme 1: Biogas in Skåne

Of the some 751 projects in KLIMP, almost 200 of them were biogas related. Biogas projects received just over 400 million SEK, which is one third of the total allocated KLIMP funds (SEPA, 2011; SEPA, 2013). The projects are manifold and diverse in both scope and nature, but nevertheless two distinct categories of projects can be discerned, namely projects related to *gas production* and *traffic*. Out of the 200 aforementioned biogas projects, 47 are related to gas production and received around 50% of the funds, while traffic accounted for 111 projects and around 40% of the funds (MIR, 2016). Gas production relates to anaerobic digestion and treatment of biological and agricultural waste, and upgrading of biogas to vehicle gas. Traffic relates to distribution, biogas filling stations, and biogas vehicles. The funds were rather evenly distributed between private companies (44%), municipal companies (24%), and municipalities (22%). The remaining 10% was received by, for example, county councils and other state organisations (SEPA, 2011). Although projects in 17 of 21 counties in Sweden received funding for biogas projects, the projects were far from evenly distributed. One county in particular, Skåne, stands out, by receiving one third of the total biogas money. Two other counties, Västra Götaland and Stockholm were also large recipients. Together, the three aforementioned counties received over 60% of the total KLIMP funds that were allocated to biogas (SEPA, 2011; SEPA, 2013). This is particularly interesting when considering a study by Linné *et al* (2008) which estimates that there is substantial 'biogas potential' in other counties that received far less funding. The rest of this section will further analyse this prevalence of biogas projects in Skåne.

A number of pre-existing conditions in Skåne, dating back several decades, can help explain why the region was so successful in receiving KLIMP funding. First, actor-specific conditions applied. This relates to the biogas value chain, which is complex in the sense that it involves different and often disparate actors from several diverse but related sectors including farmers, energy companies and municipal waste management (Ericsson *et al*, 2013). Especially agriculture and food industries are traditionally strong sectors in Skåne, which is important for biogas since they produce the organic waste needed for biogas production. Second, in a study of the emergence of the biogas industry in southern Sweden, Martin and Coenen (2015) point out a few institutional and infrastructural factors that paved the way for the proliferation of biogas in Skåne. The study points to early activities concerning natural gas as a driver for the biogas industry. This due to the "synergetic effects between biogas and natural gas" (Lantz *et al*, 2007: 1839). Martin and Coenen (2015) traces activities in Skåne back to the early 1980s, with the construction of a

natural gas grid supplying southern Sweden with natural gas, leading to early adoption of natural gas buses in the public transportation system of Malmö (the region's largest city) in the 1990s. There were also early experiments by municipalities in the region turning organic waste from households into renewable energy. In the late 1990s the aforementioned natural gas grid was used in pilot experiments concerning the feed-in of biogas into the natural gas grid, leading to a proliferation of biogas upgrading technologies in the region. Thus, the emergence of the biogas industry in Skåne was favourably conditioned by the co-location of different but related sectors encompassing largely the entire value chain for biogas production and consumption (Martin & Coenen, 2015). Skåne was also successful in receiving funding from LIP, the precursor to KLIMP, for biogas projects. The emerging biogas industry in Skåne thus had previous experience in seeking funding, which probably helped them in also securing KLIMP funding (SEPA, 2011). As such, the relevant actors, activities and built-up of infrastructures in the region, coupled with the previous experience with seeking funding from LIP, can be seen as anchor for KLIMP projects in the region (Martin & Coenen, 2015).

Another important institutional factor was when the Skåne Regional Council in 2007 set up a goal that all public transport in the region should be fossil-free by 2020 (Region Skåne, 2015). Following the announcement of the goal, Skånetrafiken, the publically owned regional public transport company, took the decision to invest in biogas. The argument from Skånetrafiken was that the energy should be produced locally, and that is was important to decide only on *one* fuel technology, not on several at the same time. Biogas was regarded as the fuel with the highest regional potential, in part attributed to the increasingly developing regional specialisation in biogas (Martin & Coenen, 2015; Region Skåne, 2015). The Skåne Regional Council and Skånetrafiken's actions were important for biogas since Skånetrafiken consumes around two thirds of the upgraded biogas produced in Skåne (Ericsson *et al*, 2013). The grant from the KLIMP programme, still in place when the regional climate targets were set up, was used for the acquisition of biogas buses and public filling stations. The regional public transport system thus played a crucial role in promoting and legitimising biogas as a viable vehicle fuel and helped creating a local market for biogas.

In 2005 Biogas Syd, a regional association for biogas stakeholders, was founded in Skåne, driven by various public and private biogas actors in the region. The association was founded by its members and can be seen as a bottom-up initiative resulting from a growing need for operational and strategic interaction in the biogas sector in the region (Martin & Coenen, 2015). Another important network of actors is Sustainable Business Hub, a non-profit organisation of 'clean-tech' companies in southern Sweden, with several members engaged in the biogas sector (Ericsson *et al*,

2013). Martin and Coenen (2015) further describe the actors in the biogas industry in Skåne as forming a 'cluster'. I argue that the term cluster can be linked to the term niche-regime in transition theory (*cf.* Avelino & Rotmans, 2009). The term cluster can be understood as a spatial concentration of interconnected actors and various support organisations active in a particular field (Porter, 1998), while niche-regimes are understood as a 'regime in the making', a niche that has the potential to challenge the incumbent regime (Avelino & Rotmans, 2009).

The institutional factors presented above show the importance of local and regional preconditions for the proliferation of biogas in Skåne. The existent actors, infrastructure and earlier activities in the region provided an excellent seedbed for innovative practices (*cf.* Geels, 2011a). By actively supporting biogas, the regional council and the regional transportation company can, together with the funding from KLIMP, be seen as creating a 'protective space' for the biogas industry (*cf.* Kemp *et al*, 1998). However, by actively supporting one type of technology institutional factors also exclude others. Local and regional institutional factors thus help 'select' which type of technological path is chosen (Geels, 2002). If the nascent biogas cluster in Skåne can be regarded as a niche-regime operating in a 'protective space' as argued above, it holds (at least theoretical) great potential for challenging the incumbent fossil fuel regime. However, before challenging the regime biogas must first resolve the issue regarding competition with other alternative renewable fuels. As described by Sandén and Jonasson (2005), biogas competes with alternative fuels regarding funding and political space, especially at municipal level. For example, since 2006 large vehicle filling stations are required by law to provide at least one renewable fuel (commonly referred to as the 'pump law') (Swedish Government, 2005). This law has effectively supported the use of ethanol since those pumps are less expensive to install than pumps for biogas (Ericsson *et al*, 2013). Thus, to reiterate Geels (2014) 'David versus Goliath' metaphor, it seems as the current situation is more aptly described as 'David versus Davids' (biogas versus other types of renewables) rather than 'Davids versus Goliath' (biogas and other renewables together against the fossil fuel regime). On the other hand, as Lantz *et al* (2007) argues, biogas could benefit from efforts made by advocates for other alternative fuels if there are overlapping interests between them. If acceptance for renewable vehicle fuels increases in general, all renewables benefit from it, including biogas. Furthermore, it can be argued if the biogas cluster in Skåne fully corresponds with transition theory's definition of 'radical' or 'path-breaking' niche. As outlined in the theory chapter, incumbent regimes have vested interests in the existing ways of doing things and as such seek to steer innovation in a way that suits their interests and maintains the status quo. This can be achieved, for example, by 'incorporating' a nascent niche into their industry and institutions (Geels, 2014). For example, a

recent technical development of a 'dual fuel technology', a fuel made for diesel engines consisting of at least 20% diesel apart from biogas, exists today but is not widely spread (Ericsson *et al*, 2013). If this diesel/biogas blend were to be widely diffused it could serve to prolong the dominance of fossil fuels (*cf.* Meadowcroft, 2011).

Notwithstanding the proliferation of the biogas industry in Skåne, it may face challenges with regard to future growth. Due to lacking long-term perspectives, explicit rules and transparency on the national level provided by national policy, actors are recently becoming more hesitant to invest in biogas (Region Skåne, 2015). In this regard, the state can provide legitimacy through long-term policy (Martin & Coenen, 2015) which can strengthen the protective space for the biogas industry and further establish biogas as a niche-regime (*cf.* Kemp et al, 1998; Avelino & Rotmans, 2009).

## 4.3 Theme 2: Mobility management

Mobility management (MM) is a relatively young but burgeoning concept aimed at behaviour change in the transport sector. At its core, MM utilises more 'soft' measures, such as information (e.g. travel planning), communication (e.g. advertising campaigns), and education (e.g. MM courses for target groups), in order to influence travellers' behaviour (Atterbrand *et al*, 2005). The aim is to help facilitate the shift towards more sustainable transport modes (i.e. 'modal shift') (Brandt & Arnefalk, 2012; Nykvist & Whitmarsh, 2008). Put more succinctly, the aim is to influence the trip before it even begins. Mobility management should be seen as a complement to the traditional 'hard' measures in the transport sector, such as infrastructural investments and transport planning. The idea is that the soft measures in MM can enhance the effectiveness of traditional hard measures in the transport sector (Dickinson *et al*, 2012). The concept was originally developed at the European level, particularly in a number of EU projects under the European Platform on Mobility Management (EPOMM), but has since its inception proliferated at the local level all over the world (Atterbrand *et al*, 2005). MM activities are often coordinated at the local level in a so-called 'mobility management office' (mobilitetskontor). The aim of a regional or municipal MM office is to support municipal and regional efforts in promoting more sustainable travel patterns and influence local transport planning (Brandt & Arnefalk, 2012).

Turning then to the empirical analysis of mobility management measures in KLIMP it should firstly be noted that several individual projects that corresponds with concepts in MM have been implemented outside of formal MM offices in certain municipalities. These measures are sometimes labelled explicitly as MM-measures, while others may share the same concepts and nomenclature as MM but are not explicitly labelled as such. These measures are, for instance, campaigns to reduce car use and increase public transports, cycling or walking campaigns, or general awareness raising campaigns (MIR, 2016). Moreover, the database of KLIMP projects does not have a dedicated MM category. Instead, all measures that can be considered MM, explicitly or implicitly, are labelled as *information* measures. Thus, it is hard to give an exact number of how many implemented measures in KLIMP that can be considered MM measures in the academic sense of the concept (*cf.* Carlsson *et al*, 2012). Out of the 751 projects that received funding in KLIMP, around 170 of them are categorised as information projects (22%) (MIR, 2016). However, since information projects are far less resource intensive than for example energy or transport, they only received around 10% of the total allocated KLIMP grants (SEPA, 2013). Considering actual MM offices, the database show that six municipalities (Halmstad, Linköping, Lund, Norrköping, Stockholm and Östersund), four counties (Blekinge, Kalmar, Kronoberg and Östergötland), and one regional council (Skåne) had mobility management offices that received funding from KLIMP (MIR, 2016).

Without the extensive funding support from external sources such as LIP and KLIMP the proliferation of MM offices and MM related measures at the local level would most likely not have been as significant as it is today (Brandt & Arnefalk, 2012; Ljungberg *et al*, 2002). Municipal and regional transport planning in Sweden has traditionally been managed through emphasising hard measures as opposed to favouring soft and more intangible measures (Pettersson, 2014). The additional sources of funding from KLIMP enabled municipal actors to experiment and test soft measures through demonstration projects, which helped legitimise mobility management concepts and strengthen the role of soft measures in the municipal and regional organisations (Brandt & Arnefalk, 2012). The development of soft demand-side measures relating to MM were at first "coolly received" by planning authorities (Brandt & Arnefalk, 2012: 244). With the help of demonstration projects, municipal actors could prove that MM measures can and do work. Thus, the financing from KLIMP was crucial for implementing MM offices, and the MM offices were in turn crucial in achieving the political support needed for implementing MM measures in the municipal planning. However, as many MM offices relied on the external funding from KLIMP, they operated in project form during a limited time and often outside of the 'regular' municipal planning activities. Moreover, due to the nature of

the projects, they often had a short-term character which is problematic when trying to change long-term travel behaviours (Brandt & Arnefalk, 2012). In a study by Brandt and Arnefalk (2012) several MM offices are described as being poorly integrated with other municipal activities, often conducted independently from the municipal transportation planning authority and decisions taken by city planning officials. The study further states that a "majority of MM projects are planned independently and are not aligned with the rest of the projects in the municipalities" (Brandt & Arnefalk, 2012: 248), which has resulted in insufficient integration between MM measures and the general direction of the municipal transportation planning. This is even more accurate for those local projects that were not coordinated in a MM office, but more of a one-off character. These individual projects form a 'patchwork' of behavioural measures with very little influence on the overall municipal transport planning process. Thus, it is unclear to what extent the concepts of MM is integrated in the municipal planning after the MM projects stops receiving funding.

In the theory chapter, the multi-level perspective in transition theory describes change as interplays between different structurational levels in society, at the landscape, regime and niche levels. Regarding mobility and transport, the landscape is often described as consisting of a dominant 'mobility paradigm' in which developments and trends in society promotes the use of cars (e.g. Hildingsson & Khan, 2015; Nykvist & Whitmarsh, 2008; Whitmarsh, 2012). The mobility paradigm is maintained and reproduced through important landscape developments such as an increasing population, increasing incomes, and convenience of travel (Skinner *et al*, 2004). These landscape trends tend to reinforce the regime and mitigate against the development of mobility management niches (Nykvist & Whitmarsh, 2008). The transport system is characterised of inertia and widespread resistance to radical change (Elzen *et al*, 2004) which can be attributed to "infrastructure, manufacturing, and consumer behaviours" as well as "social values and identity" creating a "deeply entrenched habit of car use" (Nykvist & Whitmarsh, 2008: 1377). The mobility paradigm is a global trend and Sweden is no exception. Current models for transport planning in Sweden are locked-in to a system where increased transportation and high mobility are the central policy objectives (Hildingsson & Khan, 2015). Other objectives such as transport behaviour, modal shift and decarbonisation are secondary, resulting in a focus on hard measures such as new vehicle technologies and fuels as the appropriate innovation pathways in Swedish transport policy (Petterson, 2014). Against this background, mobility management in KLIMP becomes a particularly salient niche practice since it so clearly challenges the dominant mobility paradigm and incumbent car and fossil fuel regimes by bringing alternative views on reducing transport volumes and car use to

the fore. There is no question that MM measures in KLIMP clearly holds the potential of being a path breaking niche practice, such as described in transition theory. However, by operating in the mobility paradigm landscape and working against regime resistance more institutional support is needed. The funding from KLIMP have done much to implement the ideas and concepts of MM at the local level, but so far these measures have proven insufficient in making a real impact. Emissions from the transport sector have remained unchanged since 1990 levels and there are few signs of a trend towards a shift in mobility patterns (Nykvist & Whitmarsh, 2008). In a study of the decarbonisation of the Swedish transport sector Hildingsson and Khan (2015) point to a lack of national policy strategies for transforming transport behaviour. So far, it has been up to the municipalities themselves to implement transport behaviour measures which is problematic since local policy makers lack authority over long-term infrastructure developments. Thus, there is a dissonance between national and local policy in the transport sector, undermining MM measures. Moreover, as elaborated above, the short-term character of many MM measures form a 'patchwork' of behavioural measures that individually have a very hard time challenging the incumbent car regime and dominant mobility landscape. Thus, it can be argued that more state support is needed in order to stimulate and nurture MM measures at the local level, and to create the protective space as described by transition theory (e.g. Kemp *et al,* 1998).

Considering the apparent lack of national policy strategies, it is quite surprising to find that MM has in fact been integrated, albeit implicitly, in Swedish transport planning policy ever since the so called 'four-stage principle' was introduced in a governmental bill in 1997 (Swedish Government, 1997). Especially the first two steps correlates with concepts from MM. The first step in the four-stage principle is "measures that affect transport demand and the choice of modes of transport" and step two is "measures that result in more efficient use of the existing road network" (Swedish Government, 1997, 2008, translation in Hansson, 2012: 460). The Swedish Transport Administration (STA), the government agency responsible for transport planning in Sweden, must abide by the four-stage principle when prioritising new investments in the transport sector. However, the policy has been criticised for not being implemented as originally intended and in some cases the policy has simply been ignored (Hansson, 2012). Moreover, through a government resolution in 2011, responsibility for behavioural aspects concerning transport was in effect transferred from the STA to the municipal level, further weakening the central government's impact on behavioural change in transport patterns (Dickinson *et al*, 2012). Thus, state support to MM niche practices remains limited.

The implemented MM measures in KLIMP can be seen as experimental niches where path-breaking practices and innovations can develop (Hildingsson & Khan,

2015) and MM can arguably be seen as slowly becoming an increasingly integrated part of transport planning in a few spearheading municipalities (Dickinson *et al*, 2012). However, as transport behaviour measures are voluntary and often of a project character, far from all municipalities are involved and in those municipalities with MM projects they are seldom fully integrated in the planning process. Moreover, as evident by the analysis, state funding through programmes such as KLIMP have mainly been invested in 'hard' technological innovation. One core idea of MM is that the 'soft' measures contained in the MM panoply are most effective when applied in conjunction with traditional 'hard' measures of transport planning. It is in the combination of demand-side behavioural and social measures coupled with supply-side infrastructural and economic incentives that together offer a comprehensive and mutually reinforcing solution to stimulate behavioural change towards more sustainable modes of travel (Brandt & Arnefalk, 2012). Thus, it could be argued that further support from the state is needed to protect and nurture niche behavioural measures, such as mobility management. Perhaps Sweden could learn from the Netherlands in this regard, where a comprehensive national (but decentralised) mobility management policy has been implemented (Kemp *et al*, 2011; Persson *et al*, 2014). In 2004, the Swedish National Board of Housing, Building and Planning suggested in a report to the Swedish Government that a new 'national mobility office' should be established to act as an "arena for development" with a "holistic approach on transport issues" (Swedish National Board of Housing, Building and Planning, 2004: 83, my translation). The report further states that a national mobility office could help assist the Swedish Government in its overall responsibility for infrastructure investments (Swedish National Board of Housing, Building and Planning, 2004). Should such a national mobility office be implemented it could be seen as a protective space for mobility management measures at the local level, further strengthening the integration of MM concepts in municipal transport planning. It could also serve to strengthen the state-regional-municipal cooperation, which is important considering that infrastructural investments are ultimately a governmental concern (Hildingsson & Khan, 2015).

## 4.4 Klimatklivet

Klimatklivet ('The Climate Step', my translation) is the successor to KLIMP, inaugurated in a governmental regulation in 2015 (Swedish Government, 2015). Just as its predecessor KLIMP, Klimatklivet focuses solely on climate measures at the local level. Everyone except private individuals can apply for funding, including for

example municipalities, organisations, private companies, county councils and regions (SEPA, 2016a). When the first round of applications closed in early 2016, around 300 million SEK had been divided over 165 measures all over Sweden (SEPA, 2016b). Three more rounds of applications are planned for 2016 and in total 600 million SEK of funding is expected to be allocated each year in 2016, 2017 and 2018 (SEPA, 2016a). As with KLIMP, Klimatklivet applications will be assessed by the Swedish EPA together with the county administrative boards, the Swedish Energy Agency, and in some cases together with other relevant government agencies. The main criteria for ranking the measures is based on the largest reduction of emissions per invested SEK (Swedish Government, 2015). This entails calculating the 'climate benefit' for each measure. This is for example done by carrying out cost-benefit analyses, in which comparisons are made between emissions from the use of different types of energy with and without the investment during the lifespan of the measure. Extensive guidelines on how applicants should calculate climate benefits are found on the Swedish EPA's website (SEPA, 2016a). Thus, the overarching economic rationality and trust in market mechanisms found in KLIMP is still very much prevalent in Klimatklivet. Each application must categorise the measure by one of the following categories: *electric charging station, information measures, energy conversion, energy effectiveness, infrastructure, transport, vehicles, waste, production of biogas*, and *reduction of GHG emissions*[5]. Each category has 3-6 sub-categories. *Innovation* is the only sub-category prevalent in all categories (SEPA, 2016c), which can be seen as echoing KLIMP's secondary focus on innovation and experimentation. Considering the categories it is clear that technological solutions are still the main focus. Only one category, *information*, can be said to contain 'soft' measures. The focus on innovation and technology is also visible in the selection criteria set up for applications. When the main criteria (return on investment and largest 'climate benefit') is not enough to separate measures, the innovative capacity of the measure should also be taken into consideration (SEPA, 2016a).

As mentioned above, one round of funding has so far been divided between applicants. As with KLIMP, competition for Klimatklivet funding has been fierce, out of some 640 applications 165 measures were granted funding in the first round. In total, around 300 million SEK was divided between the projects. As with its predecessor KLIMP, biogas projects are still very prominent, receiving almost half of the allocated funds. One other major theme of applications concerns charging infrastructure for electric vehicles. Out of the 165 initial measures granted funding in

[5] Greenhouse gases other than carbon dioxide (i.e. nitrous oxide and methane).

the first round of Klimatklivet, 105 concerned charging infrastructure for electric vehicles and together they received 20% of the total Klimatklivet funding. The 105 measures combine a total of 1600 new charging points for electric vehicles, in effect doubling the amount currently installed in Sweden (SEA, 2016). Electric vehicles is an interesting niche practice to consider in mobility transitions. On the one hand it clearly challenges the fossil fuel regime. On the other hand there is a risk that promoting electric vehicles further enhances lock-in by feeding into the mobility paradigm. As Kemp and van Lente (2011) argue, the transition from fossil fuel vehicles to electric vehicles will only be truly sustainable when not only the vehicles change, but also the way in which they are used. In other words, the way we perceive mobility needs to be reframed as well. Simply replacing one vehicle technology with another may not lead to sustainability transitions. Kemp and van Lente (2011) further argue that sustainability transitions require that people accept constraints and are willing to live and behave differently. Transitions are always accompanied by changes in values and beliefs. Moreover, as Meadowcroft (2011) points out, there can be problematic competitive and synergistic impacts among technologies. For example, the lightweight materials developed for electric cars could also improve the mileage and emissions performance of fossil fuel vehicles, potentially prolonging their dominance.

In 2015 the Swedish Energy Administration (SEA) was appointed as national coordinator for electric vehicle charging infrastructure by the Swedish Government (SEA, 2016). It is therefore interesting to analyse the SEA's position on electric vehicles and charging stations. A majority of the approved applications are *public* charging stations, i.e. charging stations open for the general public. There are two types of charging stations: normal charging (65%) and fast charging (35%). The normal charging station is suitable for public transportation hubs where cars are usually parked for several hours. The fast charging stations are often placed along major roads or adjacent to shopping districts, places where cars are usually parked only a short while. These public charging stations are considered an important tool by the SEA in increasing the number of electric vehicles since they provide legitimacy and allow for good mobility (SEA, 2016). But the SEA also considers the *non-public* charging stations as equally important. Non-public charging stations can for example be located at a private parking space owned by a housing cooperative. The SEA considers these stations more advantageous over public stations since they provide charging where people live, i.e. where cars are parked a majority of the time. The SEA concludes that one of its most important roles is to encourage a charging infrastructure that captures the particular and unique conditions of electric vehicles and that it is especially important to "not copy a conventional fossil-fuel system" (SEA, 2016, my translation). This stance is interesting since it entails that the SEA

clearly recognises the fossil-fuel regime and has a strategy to not feed into it. However, it is questionable to what extent the SEA actually can influence the development of charging stations in their role as mainly provider of information and guidance. The SEA's argumentation also reflects the complex relationship between path-breaking niche innovation and mobility paradigm feed-in mechanisms. On the one hand the SEA argues that it is important to not copy a fossil-fuel system, which entails a new way of thinking about mobility. On the other hand it is important to provide legitimacy and mobility for electric vehicles in order to increase their diffusion, which entails placing charging stations at public places such as shopping districts. This in turn legitimises the mobility paradigm since the car is seen as the preferred transportation method to the aforementioned public places (Nykvist & Whitmarsh, 2008).

## 4.5 Summary of results and analysis

In Table 2 below the main findings of the analysis are presented. The following chapter in turn brings all the theoretical concepts and empirical findings below together in a discussion on their impacts on climate governance and low-carbon transitions.

**Table 2. Summary of the results and analysis.**

| Level in the MLP | Analytical framework | Summary of the results and analysis |
|---|---|---|
| Landscape | Path-dependency<br>(Carbon) lock-in<br>Ecological modernisation | Economic rationality based in market-liberal norm of cost-efficiency (maximal return on investment) permeates KLIMP (and Klimatklivet)<br>Strong emphasis on technical innovation, side-lining alternative pathways such as social and behavioural change<br>KLIMP showing signs of ideological 'hands-off' in a 'post-political' discourse<br>Biogas and electric vehicles have the risk of feeding into the 'mobility paradigm', further entrenching its dominance |
| Regime | (Fossil fuel) historical bloc<br>Innovative green 'Davids' (i.e. niche actors) versus unsustainable 'Goliaths' (i.e. incumbents)<br>Deliberate destabilisation | Incumbent fossil fuel regime resisting radical change<br>Lack of national policy instruments to destabilise and challenge incumbent regimes<br>Competition *between niches* rather than competition *between niche and regime*, i.e. more 'David versus Davids' (biogas versus other renewables) than 'Davids versus Goliath' (renewables versus the fossil fuel regime)<br>Competition for funding has the risk of already empowered incumbents capturing the agenda, possibly side-lining smaller municipalities, 'immature' technology, and alternative transition pathways |
| Niche | Innovative 'path-breaking' practices and experiments<br>'Protective space' for nascent niches<br>Niche-regimes | KLIMP both reflective of the trend of climate change experiments, and a means by which the trend is being realised<br>Biogas in Skåne, can be argued to have the characteristics of a niche-regime acting in a protective space (regional institutional and infrastructural factors)<br>Mobility management show characteristics of a path-breaking niche practice but lack institutional capacity (i.e. less protective space and niche-regime characteristics)<br>Questionable if biogas (KLIMP) and electric vehicles (Klimatklivet) can be considered 'path-breaking', by possibly contributing to mobility paradigm lock-in<br>Local and regional institutional and infrastructural factors as 'selection processes' |

# 5. Discussion

The analysis above is guided by the overarching objective to explore the phenomenon of local climate experiments and how they shape low-carbon transitions, aided by the analytical questions *how and with what rationale does the Swedish Government stimulate and encourage experimentation and innovation through local initiatives such as KLIMP?* and *how can local climate experiments contribute and shape the governance of low-carbon transitions in socio-technical systems?* Asking these purposefully broad and explorative analytical questions casts a broad net of theoretical concepts, encapsulating a broad array of empirical illustrations, and, quite predictably, ends up with a broad collection of results. Nevertheless, some particularly salient overarching conclusions can be discerned form these disparate perspectives.

The explored empirical cases of biogas and mobility management in KLIMP, and electric vehicle charging stations in Klimatklivet, overlap and intersect in a critical area for transitions in the transport sector. The nurturing of biogas- and electric cars in relative 'protective spaces', created in part by KLIMP, have the potential to challenge the incumbent fossil fuel regime. However, it does little to challenge the even more entrenched mobility paradigm at the landscape level, by feeding into its mechanisms of sustained or even increased mobility (*cf.* Nykvist & Whitmarsh, 2008). Moreover, as the analysis show, both biogas- and electric vehicles have the risk of merely serving as a feed-in mechanism of the incumbent fossil fuel regime and help maintaining the status quo (*cf.* Meadowcroft, 2007). In this regard, mobility management is a particularly salient niche practice, since it so clearly challenges the dominant mobility paradigm and incumbent fossil fuel regime. As certain transition theorists claim, social and behavioural change is equally important as the technical innovations (hence the term 'socio-technical' transitions) (e.g. Shove & Walker, 2007). Thus, the concept of MM clearly holds the potential of being path-breaking, but it is hard to imagine MM challenging and overturning the entrenched paradigm and regime on its own. Furthermore, the 'patchwork' of MM measures as outlined in the analysis begs the question whether this fragmented (at least in its current form) niche practice actually can make a noticeable impact. As the analysis show, Sweden in general, and KLIMP in particular, is permeated by ecological modernisation discourses with an evident emphasis on technical solutions

based in market logic which implies that societal change and behavioural measures, such as mobility management, often are side-lined. Combining both 'soft' and 'hard' policy measures coupled with a more active involvement of the state (and the EU) is probably needed to reach the critical point of actually catalysing a broad systemic low-carbon transition in the transport sector (e.g. Geels, 2014).

As the analysis show, the Swedish Government and the Swedish EPA have claimed ideological and political neutrality in the selection process of KLIMP projects. As KLIMP initially targeted initiatives in all Swedish municipalities, and did not specify a certain technology, it could have led to effects in all Swedish regions, and in all sectors. However, certain technologies (e.g. biogas) in certain regions (e.g. Skåne) received an unbalanced amount of funding. Investing funds in innovation and experimentation towards sustainability is, as the theory chapter informed us, not a 'post-political' project (e.g. Swyngedouw, 2010). Because of the path-dependency, lock-in, and hegemonic discourse of ecological modernisation at the landscape level, incumbent actors with vested interests at the regime level, and nascent niche-regimes with considerable institutional and infrastructural prerequisites at certain local and regional levels, large investments are never neutral. By not steering the funds in any direction, the state runs the risk of reproducing the landscape norms and regime interests, which in turn decides the pathways of innovations (Kronsell, 2013). Steering sustainability in a way that makes large socio-technical transitions possible includes navigating this nebulous and tortuous terrain of incumbent power, sunken investments and vested interests, and is as such a highly political venture (Meadowcroft, 2011). This relates to a tendency in the government by experiment literature (and indeed to some extent in transition theory literature) to overstate the *governance* aspect and play down the *government* aspect of transitions (e.g. Geels, 2014; Meadowcroft, 2009). As this study shows, the state still holds considerable clout in climate governance and policy in Sweden, and as such, state commitment to climate governance is highly relevant for the action of municipalities and other local actors engaged in climate initiatives. State intervention is equally important at all structurational levels of transitions, from protecting and nurturing experimental niche practices, to destabilise and weaken incumbent regimes, to realising that funding programmes are not post-political projects but rather exists in a landscape context of norms and discourses that influence all action in society (Meadowcroft, 2011). Thus, it can be argued that a more *steering* and *controlling* state is needed, as opposed to a *guiding* and *enabling* state (*cf.* Granberg, 2009), to actually bring about a low-carbon transition, for example by destabilising incumbent regimes (e.g. fossil fuels), and protecting nascent niche practices (e.g. mobility management).

The Swedish Government's rationale behind KLIMP grants was to fund the 'best projects' that would make the 'most cost-effective' contribution towards

achieving the Swedish climate target. As such, the local and regional experimental and innovative projects in KLIMP hold great potential in contributing to a Swedish low-carbon transition. Indeed, projections show that KLIMP have come a long way in reducing GHG emissions. However, reaching the critical point of an actual low-carbon transition most certainly entails even more radical innovation and experimentation at the local level, which might be side-lined in the very narrow selection process of economic rationality that permeates KLIMP. State funding through programmes such as KLIMP is one important factor in the initiation of local projects, and can help initiate transition processes. However, local climate experimentation is by no means the silver bullet, but rather one (albeit very important) brick in the larger governance puzzle to catalyse broad systemic low-carbon transitions.

# 6. Conclusions

This thesis explores the phenomenon of local climate experiments and how they shape low-carbon transitions, in regards to the Swedish Climate Investment Programme (KLIMP).

From the Swedish Government's perspective, the dominant reasoning behind KLIMP can best be described as economic rationality based in liberal market logics. The most central criteria in KLIMP was the 'only the best projects' approach, with the main focus of 'largest emission reduction per SEK'. This economic focus is perhaps not surprising, considering the history of Swedish climate governance and policy, permeated by neo-classic economic values and dominated by the liberal market norm of cost-efficiency. There was however one exception to the cost-effectiveness criteria, namely innovation of new technology. Thus, even though economic rationality takes centre stage in KLIMP, innovation and experimentation is deemed important enough to bypass the 'maximum return on investment' criteria. However, this bias towards technological experimentation and innovation in KLIMP is, from a transition theory viewpoint, problematic since it narrows the range of transition pathways considered possible and side-lines other 'soft' measures, such as behaviour and social change, while at the same time protects incumbent regimes and detracts attention from the fossil fuel burning problem.

Throughout the whole KLIMP process the Swedish Government and the Swedish EPA have claimed political and ideological neutrality in the way funding was distributed. However, a lack of steering can indeed be a type of steering in itself. By giving grants to measures based on effect, the state effectively promotes more established technologies and shuts out 'immature' technology. In this way, by *not* steering, the state narrows the agenda and legitimises certain technological pathways over others. This is evident in the case of biogas in Skåne, where a number of institutional and infrastructural preconditions in the region provided an excellent seedbed for the proliferation of biogas. Local and regional institutional factors thus help 'select' which type of technological path is chosen. Thus, even though the funding was not directed in any particular direction, masked by a post-political discourse of economic rationality, certain technologies (i.e. biogas) in certain regions (i.e. Skåne) captured the agenda.

Mobility management is a particularly salient niche practice to consider in transitions, since it so clearly challenges the dominant mobility paradigm and incumbent car and fossil fuel regimes. However, by operating in a landscape of norms and working against regime resistance, more institutional support is needed. The funding from KLIMP have done much to implement the ideas and concepts of MM at the local level, but so far these measures have proven insufficient in making a real impact against the prevailing mobility paradigm. In Klimatklivet, electric vehicles is an equally salient and paradoxical niche practice to consider in transitions as mobility management. On the one hand it clearly challenges the fossil fuel regime. On the other hand there is a risk that promoting electric vehicles further enhances lock-in by feeding into the mobility paradigm.

In sum, by focusing efforts on local initiatives through KLIMP, the Swedish Government has actively engaged in the trend of experimental governance and helped vitalise the local response to climate change. KLIMP is both indicative of this trend and a means by which it is being realised. Investing in and stimulating local climate experiments holds great potential in low-carbon transitions. However, local experiments are not the silver bullet, but rather one (albeit very important) policy measure among many others. The state still holds considerable clout in climate governance and can with different types of policy influence the landscape, empower or destabilise regimes, and protect or discourage niche innovation, and thus requires explicit attention in order to understand and catalyse broad systemic low-carbon transitions.

# References


Ache, P. (2000). Cities in old industrial regions between local innovative milieu and urban governance - Reflections on city region governance. *European Planning Studies, 8*(6), 693-709. doi: 10.1080/713666434

Atterbrand, A. S., Jorde, B., Kasin, O., Krag, T., Silfverberg, B., Skur, J. & Stenvall, M. (2005). *Mobility Management in the Nordic Countries.* Nordic Council of Ministers. Retrieved from: http://norden.diva-portal.org

Avelino, F. (2011). *Power in Transition: Empowering Discourses on Sustainability Transitions.* PhD dissertation. Erasmus University Rotterdam. Retrieved from: http://hdl.handle.net/1765/30663

Avelino, F. & Rotmans, J. (2009). Power in transition: an interdisciplinary framework to study power in relation to structural change. *European Journal of Social Theory, 12*(4), 543-569. doi: 10.1177/1368431009349830

Avelino, F. & Wittmayer, J. M. (2015). Shifting Power Relations in Sustainability Transitions: A Multi-actor Perspective. *Journal of Environmental Policy and Planning,* 1-22. doi: 10.1080/1523908x.2015.1112259

Bäckstrand, K., Khan, J., Kronsell, A. & Lövbrand, E. (2010). The promise of new modes of environmental governance. In: Bäckstrand, K., Khan, J., Kronsell, A. & Lövbrand, E. (Eds.). *Environmental politics and deliberative democracy: Examining the promise of new modes of governance*. Cheltenham: Edward Elgar, 3-27.

Bergström, G. & Boréus, K. (Eds.). (2012). *Textens mening och makt: metodbok i samhällsvetenskaplig text-och diskursanalys.* Lund: Studenlitteratur.

Betsill, M. & Bulkeley, H. (2007). Looking back and thinking ahead: a decade of cities and climate change research. *Local environment, 12*(5), 447-456. doi: 10.1080/13549830701659683

Brandt, C. & Arnfalk, P. (2012). Mobility Management Moving In: the journey of integrating MM into decision-making processes in municipalities. In: Carlsson, C. M., Emtairah, T., Gammelgaard, B., Jensen, A. V. & Thidell, Å. (Eds.). *Rethinking Transport in the Øresund Region: Policies, Strategies and Behaviours.* Øresund EcoMobility. Interreg IVa. Lund University, 243-251. Retrieved from: http://lup.lub.lu.se/search/record/2429902

Bryman, A. (2015). *Social research methods.* Oxford University Press.

Bulkeley, H. (2014). Climate change and urban governance: a new politics? In: Lockie, S., Sonnenfeld, D. A. & Fisher, D. R. (Eds.). (2014). *Routledge International Handbook of Social and Environmental Change.* Oxon: Routledge, 157-169.

Bulkeley, H. & Castán Broto, V. (2013). Government by experiment? Global cities and the governing of climate change. *Transactions of the Institute of British Geographers, 38*(3), 361-375. doi: 10.1111/j.1475-5661.2012.00535.x

Bulkeley, H., Castán Broto, V. & Edwards, G. A. (2015). *An urban politics of climate change: experimentation and the governing of socio-technical transitions.* London: Routledge.

Bulkeley, H., Castán Broto, V. & Maassen, A. (2011). Governing urban low carbon transitions. In: Bulkeley, H., Castán Broto, V., Hodson, M. & Marvin, S. (Eds.). *Cities and Low Carbon Transitions.* London: Routledge, 29-41.

Bulkeley, H., Castán Broto, V. & Maassen, A. (2014). Low-carbon transitions and the reconfiguration of urban infrastructure. *Urban Studies, 51*(7), 1471-1486. doi: 10.1177/0042098013500089

Burck, J., Bals, C. & Bohnenberger, K. (2011). *The Climate Change Performance Index: Results 2012.* Germanwatch and CAN Europe. Retrieved from: http://germanwatch.org/

Carlsson, C. M., Emtairah, T., Gammelgaard, B., Jensen, A. V. & Thidell, Å. (Eds.). (2012). *Rethinking Transport in the Øresund Region: Policies, Strategies and Behaviours*. Øresund EcoMobility. Interreg IVa. Lund University. Retrieved from: http://lup.lub.lu.se/search/record/2429902

Castán Broto, V. & Bulkeley, H. (2013). A survey of urban climate change experiments in 100 cities. *Global Environmental Change, 23*(1), 92-102. doi: 10.1016/j.gloenvcha.2012.07.005

Corfee-Morlot, J., Kamal-Chaoui, L., Donovan, M. G., Cochran, I., Robert, A., and Teasdale, P. J. (2009). *Cities, Climate Change and Multilevel Governance.* OECD Environment Working Papers, No. 14, OECD Publishing. doi: http://dx.doi.org/10.1787/220062444715

Dickinson, J., Håkansson, M., Ljungberg, C. & Wendle, B. (2012). Mobility Management - background, progress and state-of-the-art in Sweden and Denmark. In: Carlsson, C. M., Emtairah, T., Gammelgaard, B., Jensen, A. V. & Thidell, Å. (Eds.). *Rethinking Transport in the Øresund Region: Policies, Strategies and Behaviours.* Øresund EcoMobility. Interreg IVa. Lund University, 225-242. Retrieved from: http://lup.lub.lu.se/search/record/2429902

Dymén, C. & Langlais, R. (2013). Adapting to climate change in Swedish planning practice. *Journal of Planning Education and Research, 33*(1), 108-119. doi: 10.1177/0739456X12463943

Eckerberg, K. & Forsberg, B. (1998). Implementing Agenda 21 in local government: the Swedish experience. *Local environment, 3*(3), 333-347. doi: 10.1080/13549839808725569

Elzen, B., Geels, F., Hofman, P. S. & Green, K. (2002). Socio-technical scenarios as a tool for transition policy: an example from the traffic and transport domain. In: Elzen, B., Geels, F. W. & Green, K. (Eds.). *System Innovation and the Transition to Sustainability: Theory, Evidence and Policy.* Cheltenham: Edward Elgar.

Ericsson, K., Nikoleris, A. & Nilsson, L. J. (2013). *The biogas value chains in the Swedish region of Skåne.* Project Report. Lund: Environmental and Energy System Studies,

Department of Technology and Society, Lund University. Retrieved from: http://lup.lub.lu.se/record/4092765

Fischer, F. & Forester, J. (Eds.). (1993). *The argumentative turn in policy analysis and planning.* Duke University Press.

Flyvbjerg, B. (2006). Five Misunderstandings About Case-Study Research. *Qualitative Inquiry 12*(2): 219–245. doi: 10.1177/1077800405284363

Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Research Policy, 31*(8/9), 1257–1274. doi: 10.1016/S0048-7333(02)00062-8

Geels, F. W. (2004). From technical systems of innovation to socio-technical systems. Insights about dynamics and change from sociology and institutional theory. *Research Policy 33*, 897-920. doi: 10.1016/j.respol.2004.01.015

Geels, F. W. (2011a). The role of the cities in technological transitions: analytical clarifications and historical examples. In: Bulkeley, H., Castán Broto, V., Hodson, M. & Marvin, S. (Eds.). *Cities and Low Carbon Transitions.* London: Routledge, 13-28.

Geels, F. W. (2011b). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions. 1,* 24-40. doi: 10.1016/j.eist.2011.02.002

Geels, F. W. (2014). Regime resistance against low-carbon transitions: Introducing politics and power into the multi-level perspective. *Theory, Culture and Society Vol. 31*(5) 21–40. doi: 10.1177/0263276414531627

Geels, F. W. & Kemp, R. (2007). Dynamics in socio-technical systems: Typology of change processes and contrasting case studies. *Technology in society, 29*(4), 441-455. doi: 10.1016/j.techsoc.2007.08.009

Geels, F. W. & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy, 3*, 36, 399-417. doi: 10.1016/j.respol.2007.01.003

Geels, F. W. & Schot, J. (2010). The dynamics of transitions: a socio-technical perspective. In: Grin, J., Rotmans, J. & Schot, J. (Eds.). *Transitions to sustainable development: New directions in the study of long term transformative change.* New York: Routledge, 9-101.

Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. University of California Press.

Granberg, M. (2009) *Local governance and climate change: the example of Sweden.* Presentation "GAMUT presents", public lecture at the University of Melbourne, 2nd of April, 2009. Retrieved from: www.abp.unimelb.edu.au

Granberg, M. & Elander, I. (2007). Local governance and climate change: reflections on the Swedish experience. *Local environment, 12*(5), 537-548. doi: 10.1080/13549830701656911

Grin, J. (2010). Understanding transitions from a governance perspective. In: Grin, J., Rotmans, J. & Schot, J. (Eds.). *Transitions to sustainable development: New directions in the study of long term transformative change.* New York: Routledge, 223–319

Grin, J., Rotmans, J. & Schot, J. (2010). *Transitions to sustainable development: New directions in the study of long term transformative change.* New York: Routledge.

Hajer, M.A. (1995). *The politics of Environmental Discourse. Ecological Modernization and the Policy Process.* Oxford: Clarendon Press.

Hajer, M.A. & Versteeg, W. (2005). A decade of discourse analysis of environmental politics: Achievements, challenges, perspectives. *Journal of Environmental Policy and Planning 7*(3): 175–184. doi: 10.1080/15239080500339646

Hansson, L. (2012). In search of sustainability: examining the variation in a national planning model when applied to different urban transport projects. *Urban Transport XVIII: Urban Transport and the Environment in the 21st Century, 18,* 457-468. doi: 10.2495/UT120391

Hendriks, C. M. (2009). Policy design without democracy? Making democratic sense of transition management. *Policy Sciences, 42*(4), 341-368. doi: 10.1007/s11077-009-9095-1

Hildingsson, R. (2010). The deliberative turn in Swedish sustainability governance: participation from below or governing from above?. In: Bäckstrand, K., Khan, J., Kronsell, A. & Lövbrand, E. (Eds.). *Environmental politics and deliberative democracy: Examining the promise of new modes of governance*. Cheltenham: Edward Elgar, 145-164.

Hildingsson, R. (2014). *Governing decarbonisation: The state and the new politics of climate change.* PhD dissertation. Lund University. Retrieved from: http://lup.lub.lu.se/record/4779451

Hildingsson, R. & Khan, J. (2015). Towards a decarbonized green state? The politics of low-carbon governance in Sweden. In: Bäckstrand, K. & Kronsell, A. (Eds.). *Rethinking the Green State: Environmental Governance towards Climate and Sustainability Transitions.* Oxon: Routledge, 156-173.

Hoffman, J. (2013). Theorizing power in transition studies: the role of creativity and novel practices in structural change. *Policy Sciences, 46*(3), 257-275. doi: 10.1007/s11077-013-9173-2

Hoffmann, M. J. (2011). *Climate governance at the crossroads: experimenting with a global response after Kyoto.* Oxford University Press.

IEA (International Energy Agency). (2009). *Cities, towns and renewable energy: yes in my front yard.* Paris: IEA. Retrieved from: http://www.iea.org/publications

IEA (International Energy Agency). (2013). *Redrawing the Energy-Climate Map.* World Energy Outlook Special Report. Paris: IEA. Retrieved from: http://www.worldenergyoutlook.org/energyclimatemap

IPCC (The Intergovernmental Panel on Climate Change). (2014). *Climate Change 2014. Synthesis Report.* Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Retrieved from: http://www.ipcc.ch/report/ar5/syr

Jordan, A., Rayner, T., Schroeder, H., Adger, N., Anderson, K., Bows, A., Le Quéréa, C., Joshif, M., Mandereg, S., Vaughana, N. & Whitmarsh, L. (2013). Going beyond

two degrees? The risks and opportunities of alternative options. *Climate Policy, 13*(6), 751-769. doi: 10.1080/14693062.2013.835705

Jørgensen, M. W. & Phillips, L. J. (2002). *Discourse analysis as theory and method.* London: Sage.

Kemp, R., Schot, J. & Hoogma, R. (1998). Regime shifts to sustainability through processes of niche formation: the approach of strategic niche management. *Technology analysis and strategic management, Vol. 10*, 175-196. doi: 10.1080/09537329808524310

Kemp, R. & van Lente, H. (2011). The dual challenge of sustainability transitions. *Environmental Innovation and Societal Transitions, 1*(1), 121-124. doi: 10.1016/j.eist.2011.04.001

Kemp, R., Avelino, F. & Bressers, N. (2011). Transition management as a model for sustainable mobility. *European Transport/Trasporti Europei, 47*, 1-22. Retrieved from: http://hdl.handle.net/10077/6172

Kern, F. (2011). Ideas, institutions, and interests: explaining policy divergence in fostering 'system innovations' towards sustainability. *Environment and Planning C: Government and Policy, 29*(6), 1116-1134. doi: 10.1068/c1142

Kronsell, A. (2013). Gender and transition in climate governance. *Environmental Innovation and Societal Transitions, 7*, 1-15. doi: 10.1016/j.eist.2012.12.003

Kronsell, A. & Bäckstrand, K. (2010). Rationality and forms of governance. A framework for analyzing the legitimacy of new modes of governance. In: Bäckstrand, K., Khan, J., Kronsell, A. & Lövbrand, E. (Eds.). *Environmental politics and deliberative democracy: Examining the promise of new modes of governance*. Cheltenham: Edward Elgar, 78-91.

Lantz, M., Svensson, M., Björnsson, L. & Börjesson, P. (2007). The prospects for an expansion of biogas systems in Sweden - incentives, barriers and potentials. *Energy policy, 35*(3), 1830-1843. doi: 10.1016/j.enpol.2006.05.017

Levy, D. L. & Newell, P. (2002). Business strategy and international environmental governance: Toward a neo-Gramscian synthesis. *Global Environmental Politics 2*(4): 84–101. doi: 10.1162/152638002320980632

Linné, M., Ekstrandh, A., Englesson, R., Björnsson, L. & Lantz, M. (2008). *Den svenska biogaspotentialen från inhemska restprodukter.* BioMil AB and Envirum AB. Retrieved from: http://www.energigas.se/publikationer

Ljungberg, C., Lyborg, J., Rydén, C., Neergaard, K., Hyllenius, P., Wendle, B. & Envall, P. (2002). *Mobility Management i Skåne. Förslag till handlingsplan.* Trivector Rapport 2002:20. Retrieved from: http://www.lansstyrelsen.se/skane/Sv/publikationer

Loorbach, D. (2007). *Transition Management. New Mode of Governance for Sustainable Development.* PhD dissertation. Erasmus University Rotterdam. Retrieved from: hdl.handle.net/1765/10200

Loorbach, D. (2010). Transition management for sustainable development: A prescriptive, complexity-based governance framework. *Governance, 23(1)*, 161–183. doi: 10.1111/j.1468-0491.2009.01471.x

Loorbach, D. & Rotmans, J. (2006). Managing transitions for sustainable development. In: Olsthoorn, X. & Wieczorek, A. J. (Eds.). *Understanding industrial transformation:*

*views from different disciplines (Vol. 44)*. Dordrecht: Springer Science+Business Media, 187-206. doi: 10.1007/1-4020-4418-6_10

Lundqvist, L. J. (2001). Implementation from above: the ecology of power in Sweden's environmental governance. *Governance, An International Journal of Policy and Administration, 14*(3), 319-337.

Lundqvist, L. J. (2004). 'Greening the people's home': the formative power of sustainable development discourse in Swedish housing. *Urban Studies, 41*(7), 1283-1301. doi: 10.1080/0042098042000214798

Lundqvist, L. J. & Biel, A. (2007). *From Kyoto to the town hall: transforming national strategies into local and individual action*. London: Earthscan.

Martin, H. & Coenen, L. (2015). Institutional context and cluster emergence: The biogas industry in Southern Sweden. *European Planning Studies, 23*(10), 2009-2027. doi: 10.1080/09654313.2014.960181

McDonough, W. & Braungart, M. (1998). The next industrial revolution. *The Atlantic Monthly, 282*(4).

Meadowcroft, J. (2007). Who is in charge here? Governance for sustainable development in a complex world. *Journal of Environmental Policy and Planning, 9*(3-4), 299-314. doi: 10.1080/15239080701631544

Meadowcroft, J. (2009). What about the politics? Sustainable development, transition management, and long term energy transitions. *Policy Sciences, 42*(4), 323-340. doi: 10.1007/s11077-009-9097-z

Meadowcroft, J. (2011). Engaging with the politics of sustainability transitions. *Environmental Innovation and Societal Transitions, 1*(1), 70-75. doi: 10.1016/j.eist.2011.02.003

MIR (Miljöinvesteringsregistret). (2016). Retrieved from: www.naturvardsverket.se/mir

Nykvist, B. & Whitmarsh, L. (2008). A multi-level analysis of sustainable mobility transitions: Niche development in the UK and Sweden. *Technological forecasting and social change, 75*(9), 1373-1387. doi: 10.1016/j.techfore.2008.05.006

OECD (Organisation for Economic Co-operation and Development). (2014). *OECD Environmental Performance Reviews: Sweden 2014*. Paris: OECD Publishing.

Paredis, E. (2013). *A winding road. Transition management, policy change and the search for sustainable development*. PhD dissertation. Ghent University. Retrieved from: http://hdl.handle.net/1854/LU-4100031

Persson, A., Clark, A., Nilsson, A. & Stigell, E. (2014). *Cykeln och cyklisten – omvärld och framtid.* Trivector Rapport 2014:103.

Pettersson, F. (2014). *Swedish infrastructure policy and planning-conditions for sustainability.* PhD dissertation. Lund University. Retrieved from: http://lup.lub.lu.se/record/4317508

Porter, M. E. (1998). Clusters and the new economics of competition. *Harvard Business Review, 76*(6), 77–90. PMID: 10187248

Region Skåne. (2015) *Skånes färdplan för biogas. Strategisk del. Reviderad februari 2015.* Retrieved from: http://utveckling.skane.se/publikationer/

Rip, A. & Kemp, R. (1998). Technological Change. In: Rayner, S. & Malone, E. L. (Eds.). *Human choice and climate change - Resources and technology.* Columbus: Battelle Press, 327- 399. Retrieved from: http://purl.utwente.nl/publications/34706

Rotmans, J. & Loorbach, D. (2010). Towards a better understanding of transitions and their governance: A systematic and reflexive approach. In: Grin, J., Rotmans, J. & Schot, J. (Eds.). *Transitions to sustainable development: New directions in the study of long term transformative change.* New York: Routledge, 105–222.

Sandén, B. A. & Jonasson, K. (2005). Competition and co-evolution among contenders: The development of alternative transport fuels in Sweden 1974-2004. *4th European Meeting on Applied Evolutionary Economics (EMAEE).*

SEA (Swedish Energy Agency). (2016). *Laddinfrastruktur.* Retrieved from: www.energimyndigheten.se/laddinfrastruktur/ (Cited 2016-04-05)

SEPA (Swedish Environmental Protection Agency). (2008). *Climate Investment Programmes in Sweden – a tool for reaching the Swedish climate objective.* Retrieved from: www.naturvardsverket.se/Om-Naturvardsverket/Publikationer/

SEPA (Swedish Environmental Protection Agency). (2009). *Climate Investment Programmes. An important step towards achieving Sweden's climate targets*. Retrieved www.naturvardsverket.se/Om-Naturvardsverket/Publikationer/

SEPA (Swedish Environmental Protection Agency). (2010). *Effekter av investeringsprogrammen LIP och Klimp. Redovisning till regeringen april 2010.* Rapport 6357. Retrieved from: www.naturvardsverket.se/Om-Naturvardsverket/Publikationer/

SEPA (Swedish Environmental Protection Agency). (2011). Biogasproduktion för miljö och ekonomi. Resultat och erfarenheter av biogasåtgärderna inom Klimatinvesteringsprogrammen (Klimp). Rapport 6457. Retrieved from: www.naturvardsverket.se/Om-Naturvardsverket/Publikationer/

SEPA (Swedish Environmental Protection Agency). (2013). *Klimatinvesteringsprogrammen Klimp 2003–2012. Slutrapport. Redovisning till regeringen januari 2013.* Rapport 6517. Retrieved from: www.naturvardsverket.se/Om-Naturvardsverket/Publikationer/

SEPA (Swedish Environmental Protection Agency). (2016a). *Klimatklivet – lokala klimatinvesteringar.* Retrieved from: www.naturvardsverket.se/klimatklivet (Cited 2016-04-14)

SEPA (Swedish Environmental Protection Agency). (2016b). *Resultat för Klimatklivet.* Retrieved from: www.naturvardsverket.se/klimatklivet (Cited 2016-04-14)

SEPA (Swedish Environmental Protection Agency). (2016c). *Klimatklivet: Uppgifter till ansökan.* Available at: www.naturvardsverket.se/klimatklivet (Cited 2016-04-14)

Shove, E. & Walker, G. (2007). CAUTION! Transitions ahead: politics, practice, and sustainable transition management. *Environment and Planning A, 39*(4), 763-770. doi: 10.1068/a39310

Skinner, I., Fergusson, M., Kröger, K., Kelly, C. & Bristow, A. (2004). *Critical issues in decarbonising transport.* Tyndall Centre for Climate Change Research.

Smith, A. & Stirling, A. (2010). The politics of social-ecological resilience and sustainable socio-technical transitions. *Ecology and Society, 15*(1), 11. Retrieved from: http://www.ecologyandsociety.org/vol15/iss1/art11/

Smith, A., Stirling, A. & Berkhout, F. (2005). The governance of sustainable socio-technical transitions. *Research Policy, 34*(10), 1491–1510. doi: 10.1016/j.respol.2005.07.005

Smith, A., Voss, J. & Grin, J. (2010). Innovation studies and sustainability transitions: the allure of the multi-level perspective and its challenges. *Research Policy 39* (4), 435-448. doi: 10.1016/j.respol.2010.01.023

Stern, N. H. (2006). *Stern Review: The economics of climate change* (Vol. 30). London: HM Treasury.

Swedish Government. (1997). *Transportpolitik för en hållbar utveckling.* Proposition 2001/02:55.

Swedish Government. (2002). *Sveriges klimatstrategi.* Proposition 2001/02:55.

Swedish Government. (2003). *Förordning (2003:262) om statliga bidrag till klimatinvesteringsprogram.* Svensk författningssamling 2003:262.

Swedish Government. (2005). *Lag (2005:1248) om skyldighet att tillhandahålla förnybara drivmedel.* Svensk författningssamling 2005:1248.

Swedish Government. (2008). *Framtidens resor och transporter - infrastruktur för hållbar tillväxt.* Proposition 2008/09:35.

Swedish Government. (2015). *Förordning om stöd till lokala klimatinvesteringar.* Svensk författningssamling 2015:517.

Swedish National Board for Housing Building and Planning. (2004). *Hållbara städer och tätorter i Sverige – förslag till strategi.* Retrieved from: http://www.boverket.se/publikationer

Swyngedouw, E. (2010). Apocalypse forever? Post-political populism and the spectre of climate change. *Theory, Culture and Society, 27*(2-3), 213-232. doi: 10.1177/0263276409358728

Tobin, P. (2014). Blue and Yellow Makes Green? Ecological Modernization in Swedish Climate Policy. In: Bäckstrand,K. & Kronsell, A. (Eds.). *Rethinking the Green State: Environmental Governance towards Climate and Sustainability Transitions.* Oxon: Routledge, 141-155.

Unruh, G. C. (2000). Understanding carbon lock-in. *Energy Policy 28*(12): 817–830. doi: 10.1016/S0301-4215(00)00070-7

van den Bosch, S.J.M. (2010). *Transition Experiments: Exploring societal changes towards sustainability.* PhD dissertation. Erasmus University Rotterdam. Retrieved from http://hdl.handle.net/1765/20714

Whitmarsh, L. (2012). How useful is the Multi-Level Perspective for transport and sustainability research?. *Journal of Transport Geography, 24*, 483-487. doi: 10.1016/j.jtrangeo.2012.01.022

Yin, R. K. (2014). *Case Study Research: Design and Methods.* Fifth Edition. London: Sage.