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# Lock-Ins in Climate Adaptation Governance

## *Conceptual and Empirical Approaches*

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### 7.1 Introduction

After more than a decade of implementation efforts in various fields of adaptation to climate change, a growing number of scholars have expressed their concern about an apparent lack of effect on current policy and practice. In short, while the call has been for ‘societal transformation’ (O’Brien, 2011; Termeer et al., 2017), what we are observing is more akin to inaction or at best incrementalist ‘muddling through’ (Tschakert & Dietrich, 2010). Despite an almost unanimous consensus over the need – in principle – for policies to promote climate adaptation, observers identify a widening mismatch between the scientific evidence and the adaptation needs identified by academics on the one hand and, on the other hand, uninformed, ignorant, or wilful persistence of conventional practices, with increasingly vulnerable communities, infrastructures, and agriculture as a result. Even where climate adaptation has entered public debates, and related strategies and policies are being developed, they are often surprisingly un-innovative and incremental in nature. Indeed, even in regions that show relatively high levels of adaptive capacity, which means that in principle they could adapt well, the dominant approach is to postpone action, and to ‘wait and see’ – often referring to persistent uncertainties (see Huitema et al., 2016).

Against this background, a lively debate has emerged about *barriers to climate adaptation* (Biesbroek et al., 2013, 2014; Eisenack et al., 2014; Moser & Ekstrom, 2010) and *path dependencies* (Wise et al., 2014). This has identified an impressive, indeed ‘seemingly endless’ number of barriers and challenges in adaptation planning and implementation (Biesbroek et al., 2013). However, the academic literature on adaptation governance barriers remains largely descriptive, ahistorical, and lacking in conceptual clarity. Little effort has been made to develop indicators that can identify and distinguish barriers from non-barriers, identify and prioritise their importance and severity, understand their history or evolution, or more systematically

identify interventions to deal with them (Biesbroek et al., 2013). Little attention has been paid to more theory-based understandings of the mechanisms at work in explaining the gaps and the underdeveloped state of adaptation policies in many countries. There is thus a need to go beyond the current context-specific and fragmented understanding of barriers, to embrace theoretical and comparative approaches, synthesising knowledge and more systematic analysis; a need that has also been identified by the Intergovernmental Panel on Climate Change (IPCC) (see Denton et al., 2014). Moreover, currently, the literature is essentially normative in its implicit assumption that barriers exist, that they are necessarily bad, and need to be overcome to allow for successful adaptation. Criticising such assumptions in the literature, Biesbroek et al. (2013: 1126) emphasise how the factors that are considered barriers are determined by ‘how actors interpret and value past events, which ultimately depends on personal values, ideas, and interests (O’Brien, 2009); what might be considered a barrier to one actor could be an opportunity to other actors (Burch, 2010)’. In addition, it has been pointed out that not all the barriers are the same, with some actually serving as ‘healthy selection mechanisms’ (Biesbroek et al., 2013).

Building on these criticisms of the concept of barriers, and in response to calls for more nuanced understandings of why adaptation policy remains in its current, relatively underdeveloped state, this chapter focuses on *lock-ins* as a particular conceptual approach to understand path dependencies and rigidities in policy processes. Although a so far underutilised concept in terms of adaptation research (Hetz & Bruns, 2014), arguably the ‘lock-in’ concept represents an improvement over the concept of ‘barriers’ in several ways. First, it allows more insight into why most implemented adaptation actions have been incremental and not transformative. To explain this situation, Wise et al. (2014) suggest a paradigmatic shift in adaptation science and practice towards conceptualising adaptation as an element of pathways – stressing the historical dimension that means that future developments are contingent on historical pathways and difficult to change. Second, as a less normative, more social-scientific concept, ‘lock-in’ has potential to throw more light on the nature of particular barriers, how they emerged, relate to one another, and might be addressed. Third, although authors often use the concept with a negative connotation to highlight how decisions in the past have led to a development or path that is difficult (but not impossible) to change and that has unwanted consequences, lock-ins can be positive in their effects as well as negative.

The lack of attention paid to the lock-in concept in adaptation literature, compared to the concept of barriers, is surprising in view of the acknowledged importance of an adaptive approach to governance (see e.g. Folke et al., 2005), taking account of the possibility of surprise and acknowledging irreducible uncertainties, and thus embracing the permanent need for learning and change

(see e.g. Huiteima et al., 2009). Governance and policy processes often lag behind climate change impacts, with the status quo often appearing as a ‘lock-in’, or the rather persistent pursuit of one specific policy or technological path, potentially in the face of pressures from different actors and/or the environment for change. Or policies might change towards adaptation, but little change actually takes place. Even if the need for change is obvious, the track record of previous decisions rebels against any such change.

Interestingly, the concept of ‘lock-in’ receives only limited mention in the adaptation-related sections of the AR5 IPCC assessment report (IPCC, 2014), where it is linked to the concept of ‘mal-adaptation’. The report states that ‘some near-term responses to increasing risks related to climate change may also limit future choices. For example, enhanced protection of exposed assets *can lock in dependence on further protection measures*’ (IPCC, 2014: 28, emphasis added). However, the concept remains underutilised in the current literature. According to Hetz and Bruns (2014), although there is growing interest in understanding adaptation limits, the concept of lock-ins has been ‘rather marginalised’ in adaptation research and in the planning literature (Hartmann, 2012).

This chapter begins to address this deficit, and map out an agenda whereby the strengths of the concept as applied in other domains can be brought to bear to better understand the dynamics at work in the governance of adaptation to climate change. It addresses and begins to set out a future research agenda for three sets of research questions. First, the chapter seeks to conceptually grasp lock-ins in climate adaptation governance and to identify indicators for lock-ins taking place and how can they be detected and described. Second, it seeks to explain lock-ins in climate adaptation governance by reference to central mechanisms originating from knowledge, discourse, and expertise; physical infrastructures; institutions and past policy tools as well as from actors. Third, in cases where they are harmful, the chapter asks how can lock-ins be overcome or abated? Accordingly, the chapter is structured in three main sections with Section 7.2 discussing the concept of lock-ins in several disciplinary contexts; Section 7.3 introducing central dimensions and explanatory avenues addressing the first and second set of research questions; and Section 7.4, by way of conclusion, focusing on the third research question.

## 7.2 Conceptualising Lock-Ins: Learning from Other Disciplines

Lock-in and path dependency are concepts that originate in (evolutionary) economics but that have also been picked up in political science, science and technology studies, as well as in economic geography. This section briefly reviews the literature, drawing out useful insights that may help to develop a concept of lock-ins and path dependence applicable to climate adaptation governance.

The notion of lock-in first entered currency in the discipline of *economics*, to highlight how large consequences may result from relatively ‘small’, often accidental events, and how particular courses of action, once introduced, can be virtually irreversible, however inefficient they may prove to be. Initially, it was closely associated with the issue of competition among technologies, identifying increasing returns to scale as the reason why one type becomes locked in (Arthur, 1989). Increasing returns to scale may result from positive information and network externalities, economies of scale in production, learning effects, and infrastructure availability. Decision makers come to be swayed by the large market share of a product or technology, rather than by its inherent properties.

Alongside the related concept of path dependence, scholars within economics and more broadly subsequently began to apply the ‘lock-in’ concept to companies and organisations (Schreyögg & Sydow, 2011; Sydow et al., 2009), institutions, and even consumers (Cecere et al., 2014). Unruh (2000), for example, has used the concept to explain the continuation of carbon-intensive modes of development by processes of technological and institutional coevolution (where each has a causal influence on the other).

From the perspective of *science and technology studies/sociology of knowledge*, lock-ins have latterly come to be viewed – implicitly at times – in more ontological terms (see e.g. Foxon, 2011). ‘Sociological analyses highlight how new technologies have a high degree of interpretative flexibility, and so the social networks relating to these technologies only gradually reach a state of stability or “closure” in which a widely shared understanding of the technology is achieved’ (Foxon, 2011: 2261).

In *political science*, Pierson (2000: 264) found Arthur’s increasing returns hypothesis ‘fertile territory for developing new propositions about the conditions that facilitate or impede various types of political change’. Institutions may be subject to increasing returns owing to, inter alia, political actors using their power to modify rules to their advantage. Change is possible, but remains bounded until something ‘erodes or swamps the mechanisms of reproduction’ (Pierson, 2000: 265). In this sense, lock-ins in policies are in sharp contrast to what has been discussed as ‘policy innovation’ (Jordan & Huitema, 2014).

Recent work by *economic geographers* makes a distinction between three main forms of regional industrial path development: path extension (equating to lock-in), path renewal, and new path creation (see Moodysson et al., 2016), potentially co-existing in the same region. A regional lock-in refers to a reinforcing set of well-established linkages between the production structure, the knowledge infrastructure, and the support structure that prevent, for example, industrial restructuring and manifests itself at the regional level (Moodysson et al., 2016), though it may relate to factors in other levels of governance (Hassink, 2010). For Hassink (2010: 452), policy lock-ins can be ‘considered as thick institutional

tissues aiming at preserving existing industrial structures and therefore unnecessarily slowing down industrial restructuring and indirectly hampering the development of indigenous potential and creativity'. Lock-ins, however, may also have 'positive' effects. The core argument put forward by Moodysson et al. (2016) is that a balance of policy change and policy continuity is required for nurturing and maintaining new path developments.

Wilson et al. (2015) highlight the usefulness of the lock-in concept in the analysis of community resilience and land degradation in Italy. Social, economic, and environmental 'lock-ins' facilitate better understanding of the challenges and opportunities for raising community resilience. Lock-in effects can be understood as 'drivers that shoehorn certain community decision-making processes into specific 'pathways' or development 'corridors' beyond which certain human decision-making actions become either 'unthinkable' or impossible to implement' (Wilson et al., 2015: 519). Wilson et al. (2015) develop lock-in variables that are 'non-directional', meaning that they can either raise or lower resilience, depending on each specific community context.

How can we define and conceptualise lock-ins in climate adaptation governance? From economic geography, we carry forward the insights that lock-ins tend to derive from an inter-related set of factors that may have their origins at multiple scales. In adaptation to climate change, a lock-in would imply that the range of conceivable options that are in principle open to decision makers is limited to a few alternatives, and that the origins of lock-in can be found in cognitive, political, infrastructure-related, and other historical paths creating specific dependencies. But we take seriously the insight that a balance of policy change and policy continuity may be required for nurturing and maintaining new path development.

### **7.3 Dimensions and Theory-Based Explanatory Avenues**

In this section we outline a set of elements that we suggest can, often in combination, lead to 'lock-ins' and path dependencies in climate change adaptation governance. In this sense they can be regarded as explanatory variables, the presence of which can explain a lock-in. In doing so, we also highlight how they may also serve as alternative *explanations* based on different theoretical assumptions. In doing so, we refer to (a) knowledge, discourse, and expertise; (b) physical infrastructures; (c) institutions and past policy tools; as well as (d) actors.

#### **7.3.1 Lock-Ins of Knowledge, Discourse, and Expertise**

Adaptation to climate change requires knowledge about the expected climate change impacts and the range of options for adapting to them. Nyamwanza and

Bhatasara (2015: 1184) have argued that the literature on adaptation governance has failed to pay ‘attention to the epistemological and ontological dimensions in climate adaptation research, yet these are the dimensions which are directly concerned with the analysis of the creation and dissemination of knowledge in any particular area of inquiry’. Accordingly, an investigation into discursive lock-ins to adaptation must start with an investigation into what constitutes legitimate knowledge on adaptation. Scientific knowledge has made the most far-ranging claims to truth and objectivity, based on methods that supposedly establish validity and replicability. ‘For a long time and in many places, science held (or continues to hold) the promise of closure through fact-finding’ (Mol, 2002: 177). However, it has been widely recognised that science fails to fulfil this promise. As Leipprand et al. (2017: 230) have shown in their empirical study of scientific policy advice (SPA) on the German energy transition that ‘SPA operates in a context where facts and values are inextricably linked’ and ‘different normative starting points lead to different approaches and research aims’. Significantly, Nyamwanza and Bhatasara (2015: 1189) claim that in adaptation policy, narrow representations of reality have tended to support incrementalist approaches, since the ‘methods used to plan adaptation to climate change ... have been heavily influenced by positivist scientific narratives of gradual change and economic narratives of marginal adjustments to that change’.

Mol (2002) has gone one step further and argued that we are not only seeing multiple perspectives on the same reality but actually multiple enactments of reality (i.e. multiple realities and multiple ontologies): ‘reality is never so solid that it is singular. There are always alternatives’ (Mol, 2002: 164). The literature on barriers to climate change adaptation has recognised this to some extent and acknowledged ‘that truth is composed of multiple local realities that can only be perceived subjectively’ (Biesbroek et al., 2014: 1020). However, Biesbroek et al. (2014: 1020) have interpreted the struggle between competing versions of reality as ‘frame contests’ that are rooted in individual values and material interests.

In this perspective, lock-ins need to be regarded as multiple realities that result from competing discourses that are a collective rather than an individual phenomenon. While discourses need to be reproduced by individual actors in order to remain stable, they are an intersubjective structure of shared meaning. A discourse is here defined as a heterogeneous ensemble of knowledge claims that creates certain visibilities, enables certain practices, incites certain forms of subjectivity, and legitimises certain power relations (Dean, 1999). Discourses are inherently linked to power relations: dominant discourses legitimise particular power relations, while those power relations define what constitutes legitimate knowledge (Foucault, 1976; Nyamwanza & Bhatasara, 2015). Foucauldian discourse analysis but also historical institutionalism thus helps to study



empirically how specific framings of problems achieve dominance and become 'institutionalised' (see Carstensen & Schmidt, 2016; Hajer, 1995).

The complex nature of adaptation to climate change rules out a single objectively right answer to any given problem. In climate change adaptation, as elsewhere, struggles between competing discourses and practices are ubiquitous. Conventional adaptation practices are thus buttressed by a level of proof, provided by expert communities that are formed around existing technologies, such as hydrological engineers. These communities have developed expertise (and associated 'policy tools' – see Jordan & Turnpenny, 2015) in line with the basic notions of their paradigm. What changes over time are often the tools (i.e. technical instruments, procedures) that produce 'different versions of the object' (Mol, 1999: 77).

It follows that a *discursive lock-in* can be studied as a set of dominant practices based on a particular ontology. The opening up of a locked-in policy regime is closely linked to the rise of a new ontology that offers the rationale for a policy change based on a different set of theoretical assumptions, methods, and scientific evidence than before. Changing the horizon of what is 'thinkable' is often a precondition for policy change. Späth (2012) has investigated four cases of regional initiatives that pursue energy self-sufficiency through the use of renewable energy sources in Austria. He reports that not all transitions can be explained by networks of actors alone but require a discourse analysis to fully understand their genesis: 'If we look at their very early beginnings, even before networks were formalized and plans discussed, we can, firstly, discern a discursive shift in what was thinkable with regards to development strategies, and secondly, a merging or linking of various discourses that have previously been separate' (Späth, 2012: 1258).

It is to be expected that established expert communities with their privileged practices will not be supportive when their paradigm is challenged, and other practices become more relevant. Leipprand et al. (2017) have studied the struggle between two competing advocacy coalitions (and their scientific bases) that followed the contested introduction of the Renewable Energy Act in Germany. They identify a polarisation between two advocacy coalitions based on science, namely those pushing for more renewables (proactive) and those defending the status quo (reactive). When the nuclear catastrophe in Fukushima hit in 2011, the energy transition was significantly speeded up by a discursive U-turn of the reactive coalition. Thus, the original idea of an energy transition has been significantly transformed and reinterpreted to become mainstream policy.

Finally, discursive lock-ins are neither positive nor negative by definition. It has to be assessed empirically, what their effects are. With new policy reforms in 2014, many have asked if the German energy transition is now being dismantled. In a



recent literature review, Buschmann and Oels (2019) argue that there is a (positive) discursive lock-in of the energy transition that protects it from being dismantled (see Geels et al., 2016; Hake et al., 2015; Lauber & Jacobsson, 2016; Strunz, 2014). Instead, in the face of protest, the energy transition is ‘only’ changing its form: from decentralised ownership back into the hands of the ‘big four’ energy utilities but still fully committed to the transition from nuclear-fossil to renewables (Geels et al., 2016).

### ***7.3.2 Lock-Ins in Physical Infrastructure***

The planning and construction of physical infrastructure is prone to lock-ins for various reasons, the simplest being the fact that infrastructure is usually built to last for long periods, often decades or even centuries. This means that almost any infrastructure reflects the ideas, discourses, and knowledge of a certain period and that later insights – for instance to the extent that climate change will occur – or innovations will in principle not be reflected in that design. In addition, much infrastructure is ‘line infrastructure’ connecting places and communities (e.g. roads, railways, but also dikes), which diminishes the possibility for local variation and experimentation. This is because communities, once the infrastructure has been built, are ‘in the same boat’, adjustments in one place affect the others, and maintenance will in principle be aimed at maintaining the entire infrastructure. Infrastructural lock-ins are also a matter of opportunity costs – investments made in one form, for instance large-scale dams, cannot be invested in other means of achieving an objective. This in turn has various societal side effects, notably that insights and technology are likely to develop further in the chosen direction (expert companies offering this type of solution flourish and employ staff, a centralised organisation oversees the necessary budgets) and that efficiency gains are being made – thus making it more difficult to deviate. Another societal effect concerns the expectations of those served or protected by the infrastructure – if they trust the solution is effective and will remain so, they will start counting on the protection offered, giving less consideration to private solutions, thereby becoming even more dependent on the effective function of the infrastructure. Infrastructural solutions may also become a source of (national or regional) pride, a symbol of the high technological capabilities of a society or community, making its wisdom more difficult to question.

Water governance is an area where some of these dynamics play out. Huitema and Meijerink (2010), for instance, describe how water transitions around the globe are instigated and pushed through. Often, new ways of dealing with water (droughts and floods) revolve around ‘soft’ solutions that focus on behavioural aspects at the individual or the household level. These include reversibility as an

important design criterion, and do not require the same amount of investment. Huiteima and Meijerink (2010) refer to this as the ‘greening of water management’. However, quite a few of these intended transitions meet with strong resistance from interests associated with infrastructure construction. In Spain, for instance, this has led to ferocious debates about the question of whether potential droughts should be addressed by lowering the demand for water, by installing desalinisation capacity, or by simply creating infrastructure that connects the water-poor North of Spain to the water-rich South of France (see Brouwer et al., 2013).

### ***7.3.3 Lock-Ins in Institutions and Tools***

In political science, institutions, as rules, procedures, norms, and habits of policymaking, tend to be regarded as a stable or conditioning element around human interactions (see e.g. Evans et al., 1985; Hall & Taylor, 1996; Immergut, 1998; March & Olsen, 1984; Peters, 2012; Schmidt, 2008; Steinmo et al., 1992). In that sense, they influence the framing of issues, who will be involved in their resolution, and whether and how the issues should be addressed. Institutions provide an element of predictability to societal interactions and thus represent a notion of lock-in in a special sense. From that point of view, institutions are often persistent, although they can change quickly in many different ways. The rich field of study on institutions includes examining how and why they are formed; how they embody values, ideas, discourses, interests, and power relationships; how and why institutions change (e.g. how different actors may maintain, alter, or even overthrow institutions); and their role in policymaking. Lock-ins in institutions may involve situations where the maintenance work is more successful than the activities of those who seek institutional change, perhaps even in the face of strong pressures for that change. Barnett et al. (2015: 5) thus find within six case studies in Australia that ‘the path-dependent nature of the institutions that govern natural resources and public goods is a deep driver of barriers and limits to adaptation. Path-dependent institutions are resistant to change. When this resistance causes the changes necessary for adaptation to be slower than changes in climate, then it becomes a limit to adaptation’.

One particular element of this locking-in process of policies as institutions are the *tools* employed by different policy actors in early phases of policy processes (i.e. policy formulation tools; Jordan & Turnpenny, 2015). With this we refer to the aides that policymakers use to prepare, implement, or evaluate policy, including cost–benefit analysis, scenarios, computer models, or participatory methods like citizens’ juries. Studying how, by whom, and why such tools are designed, selected, and deployed, and for what purposes, can be done through an institutional lens, thus revealing much about the institutions, and any potential

lock-ins. For example, a dominant focus on cost–benefit analyses in climate adaptation policies may become ‘locked in’ to only economically viable solutions with calculable payback schemes. The tool may have also shaped the policy process in a way that limits other ways of seeing other problems or solutions, either conceptually or because the tool designers form a powerful interest group. The tools themselves can therefore be seen as institutions.

### ***7.3.4 Path Dependence and Lock-Ins through Actors***

The path dependence approach holds that a historical path of choices has the character of a branching process with a self-reinforcing dynamic in which positive feedback increases, while at the same time the costs of reversing previous decisions increase, and the scope for reversing them narrows sequentially, as the development proceeds, finally leading to irreversibility and lock-ins (cf. David, 2001). Literature on path dependence and lock-ins often describes these irreversibilities and lock-ins as unexpected by the actors in charge (Hirsch & Gillespie, 2001). A decision by an actor in the system is not necessary for a lock-in to occur; instead, non-linear dynamics at the systems level generate these effects (Kline & Rosenberg, 1986). Actors with both limited understanding of the consequences of their decisions and narrow interests tend to be seen only as a marginal cause of lock-ins in path dependence literature. Generally, research on path dependence and lock-ins rarely dwells on the role of individual actors (Hirsch & Gillespie, 2001) and has been criticised for its ‘very simple actor model’ (Meyer & Schubert, 2007: 26).

Nevertheless, Wilson et al. (2015), in their research on community resilience, see socio-psychological lock-in effects as one of the most interesting sets of lock-ins. Research suggests that many individual actors are often reluctant to break path dependencies and change towards more resilient trajectories because of entrenched psychological conservatism, also referred to as ‘cultural resistance’ (Burton et al., 2008). Although adopting new technologies to ‘fix’ community problems may be relatively easy, developing a new attitude and shifting culture from one mental mode to another is difficult (Wilson, 2013). Thomsen et al. (2012) identify narrow-minded actors that favour short-term strategies as a reason for adverse path dependencies that lessen the likelihood of effective adaptation to climate change in future contexts. Psychological research suggests that individual actors are easily biased and selective in their information preferences and processing, that they generally seek to avoid regret and disappointment, and that they do so through, for example, denying the existence of a problem, not making decisions, delaying decisions, and not changing past decisions (Janis & Mann, 1977; Raiffa et al., 2002, cited in Hermans, 2008; Zeelenberg et al., 2000).

Table 7.1. *Cognitive frames grouped into four strategic contrasts, with examples of climate issues*

Perceptual distance	Goal orientation and focus	
	Promotion orientation	Prevention orientation
Distal view (long-term, broad categories)	<i>Social progress frame</i> Defines the issue as improving quality of life or harmony with nature	<i>Morality/ethics frame</i> Defines the issue in terms of right or wrong; respecting or crossing limits
	<i>Middle-way frame</i> Puts the emphasis on finding a possible compromise position between polarised views	<i>Pandora's box frame</i> Defines the issue as a call for precaution in the face of possible impacts or catastrophe
	Example: plan to reconcile adaptation and mitigation	Example: Al Gore's movie <i>An Inconvenient Truth</i>
Proximal view (short-term, narrow categories)	<i>Economic development frame</i> Defines the issue as investment that improves competitiveness	<i>Scientific uncertainty frame</i> Defines the issue as a matter of what is known versus unknown
	<i>Conflict/strategy frame</i> Defines the issue as a game among elites, a battle of personalities or groups	<i>Public accountability frame</i> Defines the issue as responsible use or abuse of science in decision-making
	Example: climate-proof city	Example: sea level discussion

Source: De Boer et al. (2010: 504).

In recent years, studies have deepened the concept of institutional path dependence to cognitive path dependence, showing that cognitive frames are also a factor in path dependence (Kaplan & Tripsas, 2008; Thrane et al., 2010). Also, in adaptation research the importance of cognitive frames is stressed (e.g. McEvoy et al., 2013). One particularly promising concept for understanding cognitive frames with regard to adaptation decision-making has been developed by De Boer et al. (2010, see Table 7.1) but has not yet been used to explain lock-ins and path dependencies in adaptation governance.

In contrast to the conceptualisation of path dependency as historically embedded, emergent processes, where specific decisive events are assumed to be the primary explanation for path development and in which actors only play a marginal role in causing lock-ins (e.g. Arthur, 1989; David, 1985), Garud and Karnøe's (2001) notion of path creation emphasises the role of strategic change and deliberate action (Meyer & Schubert, 2007). They stress the relevance of the strategic, deliberate, and mindful action of actors, who initiate the development of a path through intentional deviations from known procedures or rules. In

doing so, actors tend to be seen even as potential ‘unlockers’ of lock-ins and as problem solvers.

In the literature on climate change adaptation this notion of path-breaking and unlocking has been taken up. Thus, Burch (2010) identifies the necessity of an explicitly articulated high-level directive and leadership that stimulates an organisational culture of innovation and collaboration as crucial enablers of action on climate change. Wejs et al. (2014) identify the presence of institutional entrepreneurs in the adaptation process as key in building legitimacy for anticipatory adaptation action. Haasnoot et al. (2013) propose a method for decision-making under uncertain global and regional changes called ‘dynamic adaptive policy pathways’, in which a planner should create a strategic vision of the future, commit to short-term actions, and establish a framework to guide future actions. Levin et al. (2012) turn the literature on path dependency on its head to elucidate how mindfully and deliberately generating path dependencies can foster positive policy outcomes by focusing on gaining durability, expanding covered populations, and changing behaviours through largely unexplored progressive incremental forces.

Both perspectives on the role of actors, as narrow minded and as ‘mindful’, have their virtue. There are cases that show how narrow-minded actors contributed to negative lock-ins and path dependencies (e.g. Burton et al., 2008; Thomsen et al., 2012). But there are also cases that show how mindful actors contributed to create new positive pathways or unlocked negative lock-ins (e.g. Burch, 2010; Wejs et al., 2014). Nevertheless, research on the role of actors regarding path dependencies, path creation, and lock-ins in adaptation governance is still in its infancy and more empirical studies are needed.

#### **7.4 Roads Policy Analysis as a Case of Combining Dimensions of Lock-In**

In this section we offer a case study of how our interests in discourse, infrastructure, institutions and tools, and actors and networks as dimensions of policy ‘lock-in’ have been fruitfully combined, in a way that highlights their inter-relatedness and that can potentially serve as inspiration for future analyses of the origins and importance of lock-ins in adaptation.

The case centres on the controversial UK road-building programme, extensively analysed in political science, planning, and geography literatures, using concepts ranging from policy communities, advocacy coalitions (Dudley & Richardson, 2000), and discourse (Richardson, 2001), as well as discourse institutionalisation (Rayner, 2004; Vigar, 2002). These concepts have helped to examine how, particularly after 1989, critics of the government’s large-scale road-building programme challenged a dominant ‘Roads for Prosperity’ coalition, struggling to

undo what could be termed policy ‘lock-ins’ that were highly resistant to change. In a range of venues, at multiple levels of governance, opponents – often characterised as a ‘New Realist’ advocacy coalition (Dudley & Richardson, 2000) – identified a number of central assumptions that underpinned the road-building programme, and highlighted a related set of practices (or mechanisms) through which particular policy and planning outputs, increasingly recognised to be unsustainable (socially, economically, and environmentally), were routinely produced.

Among these assumptions were: (a) that increased mobility of people and goods, particularly by road, was both inevitable and desirable, and that any attempt to restrict this would be both economically harmful and an unacceptable infringement of individual freedom; (b) that new roads necessarily promote economic competitiveness; and (c) that the implications of road building for patterns of land use and the growing number of environmental policy commitments were not the concern of transport planners. Such assumptions, encapsulated in the storyline of ‘Roads for Prosperity’ (the title of the 1989 policy White Paper), were reflected in particular bureaucratic divisions of responsibility, large commitments to the national road budget (which encouraged local government planners to favour road-building solutions to local problems), and officially mandated project appraisal techniques that were perceived to exclude the public and embody a ‘predict and provide’ bias in favour of road-based ‘solutions’ to selectively framed transport ‘problems’. The practice dubbed ‘salami slicing’, whereby road upgrades along a corridor were appraised and presented piecemeal at successive public inquiries, allowed for incrementalist decision-making, and kept many cumulative environmental impacts out of the frame of assessment.

‘New Realists’ sought to challenge the policy lock-in in numerous ways. They posed new questions (e.g. over whether new roads generate new traffic that soon cancels out initial congestion-relieving benefits) and developed new storylines and analytical practices that could do justice to radical new transport-planning concepts that would obviate the need for road building, including demand management and modal shift. Commentators such as Vigar (2002) and Richardson (2001) used Foucauldian discourse-analytical concepts to highlight the close entanglement of policy networks, policy tools, and over-arching narratives or ‘storylines’ (cf. Hajer, 1995). To provide a fuller picture of how policy discourses are transmitted and become embedded in practices, and the ways in which policy networks are maintained, Vigar (2002) suggests that policy arenas – the institutional ‘sites’ where policy is discussed – should be a focus (cf. Dudley & Richardson, 2000). These may or may not be formally constituted, and the importance of any given arena is an empirical question. Focusing here allows the analyst to look beyond formal practices and organisational structures to the quality of relations

(or networks) among stakeholders, to determine the direction of flow of influence, as ideas develop, shift, and change (Vigar, 2002).

For Richardson and collaborators, the construction of knowledge about the likely implications of different courses of action that goes to inform decision-making, whether for individual projects, plans, or strategies, is a central preoccupation (Richardson, 2001; Richardson & Haywood, 1996). The sometimes-hidden techniques and mechanisms that routinely reproduce particular institutional commitments are examined as ‘practices’, in the Foucauldian sense. Practices refer to the ‘techniques of notation, computation and calculation; procedures of examination and assessment; the invention of devices such as surveys ... the inauguration of professional specialisms and vocabularies’; in short, the ‘apparently humble and mundane mechanisms which appear to make it possible to govern’ (Miller & Rose, 1993: 83).

In the UK transport policy case, these practices were particularly well ‘locked-in’, despite an overhaul of the official approach to appraisal (Rayner, 2004). Forecasting continued to be informed by assumptions of relatively inelastic demand for road use; cost–benefit analysis for road schemes continued to monetise all time-saving benefits enjoyed by future road users; and non-road modes often faced stricter assessment criteria. Additional and newly emerging assessment criteria and challenges such as climate change impacts thus struggled to be integrated meaningfully into the knowledge systems and discourses of the locked-in transport policies in the UK.

## **7.5 Conclusions**

Coming back to our initial questions concerning the conceptualisation, explanation, and revision of lock-ins, we will finally summarise some basic insights and sketch some future research needs. As iterated at great length in the recent literature on barriers to climate adaptation and based on numerous case studies therein, the case can be made that in view of an increasingly transformational challenge, too many present-day adaptation policies are slow and incrementalist in nature (Wise et al., 2014) or entirely absent. In seeking to understand why that is, we suggest that there is significant potential in researching different kinds of lock-ins affecting adaptation.

From discourse analysis (and from a focus on institutions and tools) we take the insight that lock-ins may derive from a set of practices that, despite being apparently appropriate mechanisms, serve to institutionalise a dominant, incrementalist discourse (Buschmann & Oels, 2019). Particular practices of spatial planning and allocations of bureaucratic responsibility may also constitute important procedures that are tied to existing approaches to the provision of



physical infrastructure. These various practices are overseen by established expert communities who are likely to be resistant when their paradigms and ‘knowledge hierarchies’ (Nyamwanza & Bhatasara, 2015) are challenged, and other practices become more relevant. However, when opening up to broader stakeholder groups and other communities, these actors may also be able to rethink, to become ‘institutional entrepreneurs’ (Wejs et al., 2014), and the extent to which this is possible is an empirical question for future research. It is thus important to know how expert communities in exchange with other knowledge-holding groups are involved in promoting or overcoming lock-ins and how they deal with proposals for transformation, which will often come about in the context of continuous negative evaluations of existing approaches (Owens et al., 2004).

From the perspective on physical infrastructures such as coastal protection measures, water and electricity grids, roads, etc., we can assume that their existence tends to underpin strong path dependencies once investment decisions have been made and measures have been implemented. Thus, innovations and changes are in principle only possible within the larger pathways of these infrastructures and can thus often not exceed incrementalist levels. More fundamental change is then only possible if the technical solutions fail to effectively abate the underlying problem or to provide the services they are expected to deliver. However, with a view to future research, it can be hypothesised that this change essentially requires also a change in discourse or the existence of alternative bodies of knowledge that provide a new paradigm or rationale for other technical or non-technical solutions.

In addition, guiding policies and the dominant choice of instruments and policy formulation tools often limit flexibility and constitute another source of lock-ins with a particular relevance in climate adaptation issues. As the case of UK roads policy demonstrates, the early focus on particular tools to guide policymaking provided for a lock-in that was then combined with an infrastructure lock-in, once heavy investments in roads had been made. However, the use of other policy formulation tools would allow for a change in perspectives and brings with it the possibility of bringing to the fore new ideas and forms of knowledge that might constitute path changes. How far this applies to climate adaptation policies on different levels is also an empirical question for future research.

This brings us to the last of our causes of lock-ins, namely the actors themselves and potential mental or cognitive lock-ins. While large parts of the economics literature are reluctant to discuss changes in preferences at all, they can be seen as pivotal for larger societal transformations and effective path changes in the field of climate adaptation. Thus, the need for more effective responses to climate impacts constitutes a strong case for individual and social learning and change (Collins & Ison, 2009; Hegger et al., 2012; Pahl-Wostl et al., 2007). While there is a wealth of knowledge and empirical evidence on small-scale learning and change processes, it

is left to future research to better understand and effectively support social learning processes on larger societal scales and with broader stakeholder groups.

Regarding the actual policy implications of lock-in research on adaptation, it can be assumed that the various causes of lock-ins relate to different political approaches to effectively address them and instigate change to unlock given adaptation pathways. Infrastructural lock-ins most likely require significant governmental efforts to change given practices often with substantial investments in novel technological or organisational approaches. Also, institutional lock-ins require strong political will and commitment by governments and various governance actors to reverse them. By contrast, behavioural or actor-based lock-ins will need to be addressed by more bottom-up and social-learning-based approaches that potentially change cognitive mindsets or basic understandings and framings. In particular, this relation between reflexivity and adaptiveness is at the core of the Earth System Governance Project (ESG) Science Plan of 2018 (ESG, 2018) and constitutes a promising future research field given the slowness and limitations of conventional governmental policies and their abilities to implement actual change and social transformations.

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