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What sticks? Ephemerality, permanence and local transition pathways



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ABSTRACT

Climate change is increasingly governed through local configurations that are characterised by voluntary action, weak institutions and uncoordinated efforts. The impermanent and iterative nature of such initiatives makes it difficult to determine their enduring and potentially transformative impact. This review systematises how the sustainability transitions field has approached temporary initiatives. It finds broad agreement on the difficulty of sustaining local transitions, but little analytical engagement with how temporary initiatives shape transition pathways over time. The review therefore proposes a typology of temporal dimensions to help assess the dynamics between ephemerality and permanence in local transitions. By mapping the recent empirical sustainability transitions literature along these dimensions, ephemerality is found to be ubiquitous in local initiatives—there is a lot happening that does not endure but serves other functions. Actors deploy a range of local strategies directed at either formalising initiatives or retaining relevance by reinventing themselves, thus routinising sustainability transitions.

1. Introduction

Traditionally, climate change has been understood as a global problem requiring global solutions and long-term thinking. Recently, the climate challenge has been reframed as entailing action within more immediate time frames, foregrounding the temporal dimensions of rapid and deep societal transitions (Anderson and Bows, 2011; Delina and Sovacool, 2018; Rockström et al., 2017; Sovacool and Geels, 2016). Increasing attention is also being directed at the role of climate governance arrangements at local and regional levels (Bulkeley, 2016; Castán Broto and Bulkeley, 2013a; Evans and Karvonen, 2014; Feola and Nunes, 2014; Ornetzeder and Rohrer, 2013). These arrangements are often characterised by voluntary action, weak institutions, non-binding commitments and uncoordinated efforts (Biermann et al., 2017). Scholarship emphasises the role of loosely coordinated groups of public, private and civic actors in mobilising low-carbon transitions through collaboration, experimentation (e.g., urban living labs) and grassroots innovation at the sub-city scale (Grandin et al., 2018; Seyfang and Smith, 2007; Voytenko et al., 2016).

Such a framing of climate governance opens up the possibility of local agency and contextualised solutions. But the highly localised, and often explicitly impermanent and iterative, nature of such initiatives complicates assessment of their impact (is it cumulative and lasting?), and of their potential to instigate large-scale transitions (Castán Broto and Bulkeley, 2013b; Feola and Nunes, 2014; Williams, 2016). Vigorous academic debate on the geographies of urban sustainability transformation (Bridge et al., 2013; Hansen and Coenen, 2015; Truffer et al., 2015) highlights how local transition initiatives are embedded in and constitutive of other scales (Bulkeley, 2005), and how they propagate spatially through actor networks (Affolderbach and Schulz, 2016; Haarstad,

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2016). Such assessment uncovers a complex spatiality of transformation through which ideas and initiatives change as they are mobilised from one setting and scale to others (Bouzarovski and Haarstad, 2018; Bridge, 2018). The local and experimental sustainability governance discourse can be productively combined with discussions on the role of temporary interventions in the urban fabric. This latter discourse understands ‘ephemeral urbanism’ as both a precarious response to neoliberal trends and a transformative instrument that creates “spaces of questioning, experimenting and innovating” (Madanipour, 2017, p. 5; Bishop and Williams, 2012; Mehrotra et al., 2017). We argue that foregrounding the temporal aspect of local transitions is essential towards unpacking their durability: understanding how local transitions unfold over time can help identify what sticks. We use the term ‘what sticks’ to refer to change processes that are durable or ‘sticky’ so that actors are able to institutionalise them. While stickiness has been used in relation to the staidness of institutions in fields such as economic geography, we mobilise the metaphor to emphasise the temporal characteristics of any given institutionalisation process.

The transitions literature is already deeply concerned with temporality, tracing as it does how transition initiatives play out over time in a process towards increasing levels of structuration and institutionalisation (Geels, 2011; Raven et al., 2012). In recent years, the explication of the temporal dynamics of transitions has been advanced through the examination of longer historical transition pathways (Arapostathis and Pearson, 2019; Schot and Kanger, 2018) as well as through attempts to uncover instabilities and opportunities for rapid transitions of incumbent systems (Geels, 2018; Haarstad and Wanvik, 2016; Sovacool and Geels, 2016). Nonetheless, the time-bound, even ephemeral, character of local transition initiatives has seldom been examined closely. Yet, local transition initiatives are often explicitly experimental, impermanent and iterative (Castán Broto and Bulkeley, 2013b; Feola and Nunes, 2014), and can be understood as “a snapshot of how low carbon cities could evolve in the coming decades” to “test a range of new technical, regulatory and institutional configurations as well as social practices which are integral to delivering this goal” (Williams, 2016, p. 80). Our concern is thus distinct from previous efforts: we examine the role of *temporary* interventions in local transitions and their effects over time. This highlights the need to look at the dynamics of (im)permanence, or in other words, at what makes certain initiatives stick and how are they made durable over time. To assess the cumulative, lasting and possibly transformative impact of local transition initiatives, we therefore need to consider how these ‘snapshots of transition’ are positioned within longer sequences of events, and whether and how such sequences are structured to create durability. As Lockwood (2015, p. 86) notes, “successful transformations not only require instigation, but also have to be politically sustained over long periods”.

The dominance of shallow temporal frames— which Pierson (2004, p. 2) refers to as the “snapshot” view of political life— has been noted in the social sciences more broadly. There is, however, no dearth of promising approaches. Recent decades have witnessed a number of creative engagements that investigate the temporal aspects of social change (Adam, 1995, 1990; May and Thrift, 2001; Pierson, 2004); how time is socially organised within organisations (Whipp et al., 2002); the relationship between permanence and fluidity (Madanipour, 2017; Moss, 2016); and the processual nature of social change (Abbott, 2001; Bidart et al., 2012). These contributions highlight how permanence is itself dynamic and continuously performed, and shed light on the work that structures the temporal patterns of the disparate events that engender obduracy and permanence. Furthermore, they assess how particular events may influence ensuing sequences, and hence lead to substantive change (Garud et al., 2010; Madanipour, 2017).

This paper addresses the temporal dynamics of local transition initiatives. Based on a review of 150 papers in the empirical literature on local sustainability transitions, we systematise how the transitions field has approached the ephemeral aspects of temporality. While there is broad agreement on the difficulty of sustaining local transition initiatives, we find little analytical engagement with the relationship between temporary initiatives and their effects over time. We therefore introduce analytical categories that pertain to the dynamics between ephemerality and permanence. These can support further efforts to assess the substantive, enduring and transformative impact of local and temporary sustainability initiatives—in other words, to understand what makes local transitions stick.

The paper proceeds as follows. After an assessment of how temporality has been approached conceptually in the transitions literature (Section 2), we discuss how theories of time and temporality can enrich analysis of how temporary and ephemeral aspects of transition initiatives catalyse, revamp and routinise transition pathways (Section 3). This leads into a review of the recent empirical literature on local sustainability transitions. It provides a temporally-oriented assessment of the strategies that local actors pursue to stabilise temporary and experimental interventions, by driving institutional change (structural strategies), adaptively instituting social practices and new accountability mechanisms (relational strategies), and materialising them into the built environment (material strategies) (Section 4). The conclusion highlights the temporal dynamics of how actors, processes and resources across scales are brought into alignment to mobilise sticky local transition pathways (Section 5).

2. The ephemerality and permanence of local transitions

The proliferation of local, experimental and small-scale urban sustainability initiatives can be productively understood within the context of a more general trend of “ephemeral urbanism” (Bishop and Williams, 2012; Madanipour, 2017; Mehrotra et al., 2017). The temporary use of urban space and short-term interventions—ranging from street art, fairs and pop-up shops to squatting, temporary housing solutions and the Occupy movement—is playing an increasingly important role in how cities are formed and managed. These developments relate to neoliberal trends – including entrepreneurial governance and the privatisation of urban space – that involve rapidly changing urban geographies within and between cities. Rapid urban transformation creates economic and social voids that need to be filled. These give rise to increasing calls for flexibility in everything from employment arrangements to how urban space is used and structured. This is mirrored in the development of more experimental and flexible urban governance arrangements (Castán Broto and Bulkeley, 2013a). Hence, ephemeral urbanism has been associated with engendering precarious social conditions, economic opportunism and shallow solutions to structural problems. Such trends relate to what is more broadly seen as a general

acceleration of life in late capitalism (Wajeman, 2015) and to increasing interest in fast policy solutions to contemporary challenges (Peck and Theodore, 2015). Nevertheless, their transformative potential has not gone unnoticed. Madanipour (2017) observes that the temporary use of urban space provides an opportunity to critique and disrupt the structures of the status quo, and that it fashions arenas to innovate and experiment with alternative ideas and practices. Ephemeral urbanism may thus also open up for a broader range of actors and stakeholders, e.g., civil society organisations, to participate in shaping urban space.

Many of the opportunities and constraints of ephemeral urbanism are clearly recognisable in the literature on local urban sustainability initiatives. These disparate initiatives and projects involve a multitude of different actors—such as grassroots community groups, municipal planners and officials, enterprises and academics—who are often engaged in various partnerships with each other. These initiatives are also embedded in multilevel governance arrangements (Castán Broto et al., 2015), often closely connected to policies, institutions and resources at other scales (Sotarauta and Kautonen, 2007), and frequently networked with like-minded initiatives in other localities (Affolderbach and Schulz, 2016; Feola and Nunes, 2014; Haarstad, 2016). The types of activities are equally broad. They range from grassroots innovation in the energy sector to experimentation with alternative currencies, and from urban living laboratories to formal urban planning and municipal action stirred by national policies such as Germany's Energiewende. Here, social innovation, including innovation in governance structures (Warbroek and Hoppe, 2017) and the transformation of social practices (Freytag et al., 2014), is often just as important as material interventions and new technologies.

Irrespective of whether local transitions are initiated by grassroots groups or formal municipal actors, they often have in common that they are relatively financially constrained, have modest human resources (Kasa et al., 2018), and feature restricted and uncertain autonomy and mandates (Geels and Schot, 2007; Hawkey et al., 2013). Hence, scholarship highlights the challenges associated with maintaining continuity, and in sustaining, over time, activities that usually emerge as ephemeral, disruptive or otherwise ad hoc. Commonly cited obstacles include the project-based nature of many activities (Munck af Rosenschöld and Wolf, 2016; Sjöblom and Godenhjelm, 2009), the lack of continuity in embodied memory and the fragmented, unconsolidated nature of knowledge management (Grabher, 2004), financial barriers and the 'projectification of funding' (Borgström et al., 2016; Ehnert et al., 2018), changing objectives and personnel attrition due to, e.g., electoral cycles (Amundsen et al., 2018), and the lack of requisite locally held expertise (Sareen et al., 2018).

Yet, extant theoretical approaches have rarely been employed to analyse actors' efforts to sustain local initiatives and make them stick. Scholarship on local sustainability initiatives leans heavily on the multilevel perspective (Geels, 2002), wherein sustainability transitions are regarded as triggered in relatively protected niches that are nested in and influence a hierarchy of socio-technical regimes (comprising organisational standards, routines and habits) and larger structuring landscapes (comprising values, norms and structures). With its ensconcing concepts of regimes and landscapes, the multi-level perspective contributes a strong temporal dimension to the understanding of sustainability transitions. Drawing on Giddens' (1984) structuration theory, it posits regimes as endogenous structures that are continuously enacted (Geels, 2011), while landscapes represent the exogenous environment (Raven et al., 2012). Both are slow to change and hence become carriers of continuity. In effect, while the multilevel perspective offers what is essentially a processual approach to transitions, the temporal categories employed tend to emphasise inertia and the obduracy of incumbent regimes (see Haarstad and Wanvik, 2016); these create obstacles to the change efforts of niche actors (e.g., Nagorny-Koring and Nocht, 2018). There is increasing scholarly interest in unmaking this structural bind in order to open up pathways for change (Bridge, 2018; Geels, 2018; Shove, 2012).

Within this overarching framework, much local transitions research resonates with a common spatial scalar ontology. This ontology features a correlation between fast and ephemeral processes at spatial scales low in the hierarchy, and slower processes at higher spatial scales (cf. Geels, 2002; Gibson et al., 2000; Holling, 2001; Raven et al., 2012). In such a rendering, continuity is conceptually located not in the local, but within larger (e.g., regional and national) structures. For instance, in the multilevel perspective, processes in niches typically have a duration of up to ten years, while regimes last for decades, and landscapes represent the *longue durée* (Raven et al., 2012). Niches, regimes and landscapes are understood to exist at all spatial scales, but it is typically changes at the national or regional – rather than local – spatial scale that signify structural change (Hansen and Coenen, 2015; Sareen and Haarstad, 2018; Haarstad and Wanvik, 2016). The temporal dimension of often temporary local sustainability initiatives—with their ephemerality, urgency, uncertainties, emergence, contingencies, tensions and contestation—is predominantly treated as context, as background information: a backdrop to what is studied rather than an inherent, dynamic and constitutive part. There is little conceptual emphasis on the temporal dimensions of how transition efforts may be sustained *locally* (but see Barnes et al., 2018; Fuenfschilling et al., 2018; Fuenfschilling and Truffer, 2014; Garud and Gehman, 2012).

Enabling such a conceptual switch, argue Moss et al. (2015, p. 1551), requires a move away from regarding obduracy and institutional structure as a passive receptacle in which local sustainability transitions unfold, and towards an appreciation of institutions as "a constitutive component of socio-technical systems and their adaptation". Barnes et al. (2018) similarly observe that the literature on institutions in sustainability transitions privileges a national focus while according less attention to local institutionalisation processes. Fuenfschilling and Truffer (2014) likewise suggest that structural levels can be understood as degrees of institutionalisation to identify differentiated effects and agency across actors under transition. In order to apprehend the often messy "practice of navigating local governance to reconfigure urban selection environments" (Barnes et al., 2018, p. 70), the authors point out the need for an 'insider' ontology, one that can highlight the embedded agency of local actors in shaping and creating institutional structures. This is not to gainsay structural frameworks, which serve an important function that has been particularly influential in generating accounts of sectoral political economy, explicating power dynamics and tracing multi-scalar connections (Svensson and Nikoleris, 2018). Indeed, Fuenfschilling and Truffer (2014) posit that attention to institutional logics can help characterise and juxtapose structural elements in terms of their systemic relations to each other. We suggest that extending this relational line of approach is apt for a focus on the temporality of local sustainability initiatives.

Such treatment can alter the way scholars interpret the strategies that local actors employ over time to sustain their efforts under transition. [Garud and Gehman \(2012\)](#) point out that relational perspectives emphasise how emergent networks are reconfigured, while durational perspectives highlight intertemporal differences. Yet, a recent stock-taking piece on the state-of-the-art of sustainability transitions research in this journal ([Köhler et al., 2019, p. 16](#)) holds that “our understanding of how such stability is produced and of the junctures and openings within the urban fabric that enable transitions to occur is relatively limited.” This concludes the eighth of nine thematic subsections on transitions research, namely on transition geographies. This subsection comes closest to attending to local sustainability initiatives with its focus on spaces, scales and places, yet without explicitly foregrounding their temporality. It draws heavily on an extensive review of transition geographies research by [Hansen and Coenen \(2015\)](#), wherein the significance of time finds mention but is subdued as a factor, whereas key place-specific factors and the importance of relationality are highlighted.

The next section addresses the above literature gap. It draws from conceptualisation of temporality within human geography and processual analysis in order to introduce a temporal typology that can capture the local relationship between largely temporary sustainability interventions and more substantive change in the longer term. It categorises the temporal dimensions of particular practices through which actors at the local scale: disrupt the status quo to instigate transformative change (catalyse); innovate towards and adapt to new opportunities (revamp); and create self-reinforcing pathways as local transitions proceed apace (routinise).

3. Shaping the temporality of local transitions

To properly examine the dynamics of transitions, we need to attend to how local (niche) actors catalyse and negotiate transition pathways. As [Köhler et al. \(2019, p. 4\)](#) observe with regard to the active agency involved in the structuration of sustainability transitions, “interactions between niches and regimes occur on multiple dimensions (e.g. markets, regulations, cultural meanings, technologies) and are enacted by interpretive actors that fight, negotiate, search, learn, and build coalitions as they navigate transitions”. In the context of local transitions, the activities of these actors are predominantly of a short-term, project-based nature. In other words, niche actors have to deploy a range of strategies to sustain both themselves and their transitions for quite some time before their innovations are (possibly) structured into regimes. These strategies need to attend explicitly to the ephemeral character of local transition initiatives.

To examine these strategies, we suggest a temporal typology that is informed by recent work on the geographies of sustainability transitions, which highlights their relational character ([Bridge, 2018](#); [Haarstad and Wanvik, 2016](#); [Hansen and Coenen, 2015](#)). Much of this work within human geography is underpinned by process ontologies that emphasise plurality, motion and the ephemeral (or at least dynamic) nature of human arrangements ([Haarstad and Wanvik, 2016](#); [Jacobs, 2006](#); [Massey, 2005](#)). From this perspective, structures are performed through the recursive repetition of particular events ([Van Assche et al., 2014](#)), as opposed to being ‘outside’ and contextual factors. The spatial and material implications are made clear in [Jacobs’ \(2006\)](#) study of the global proliferation of the modernist residential high block. Jacobs emphasises that while these buildings may look alike at the surface and hence generate a ‘global effect’ of modernity, there is continuous translation and iteration at work to adapt them to particular social, cultural and political conditions. Rather than global logics or processes, she proposes persistent repetition, iteration and translation in specific local contexts, invariably involving some degree of variation, as the key driver of urban transformation.

This has implications for our manner of relating to the temporality of transition. While accounts of transition have traditionally emphasised stability, inertia and permanence ([Hodson and Marvin, 2010](#); [Rutherford and Coutard, 2014](#)), approaches have begun to apprehend the role of ruptures, unpredictability and instability in society’s relationship with carbon ([Haarstad and Wanvik, 2016](#)). Even in cases of surface continuity, there may be “considerable movement beneath the apparent stability” ([Moss, 2016, p. 268](#)). In this reading, then, continuity is the performed effect of a structured sequence of events, where an event’s impact depends on both its specific characteristics as well as its position in a longer sequence of events ([Madanipour, 2017](#); [Pierson, 2004](#); [Whipp et al., 2002](#)). Wit [Hedaa and Törnroos \(2002, p. 36\)](#), “[s]eemingly similar events are differentiated by their position in time and space and through their loadedness”. In other words, timing matters.

This moves past static construal to a notion of durability as reliant on continuous repetition, translation and reinvention. Likewise, [Jacobs’ \(2006\)](#) conception of a multitude of disparate local activities producing a ‘global effect’ is useful for conceptualising temporal durability as an ‘effect of permanence’. The idea of durability as performative repetition with variation invokes Deleuze and Guattari’s refrain: “Each time the refrain is picked up, it is articulated anew, yet it still remains recognisably the same repetitive series” ([Brown and Capdevila, 1999, p. 37](#)). The ‘temporal logic’ of local transitions, then, is actively performed as situated actors translate, negotiate, maintain and routinise transition initiatives by aligning a sequence of events (see [Hoffman and Loeber, 2016](#)).

To examine the potential of local transition initiatives to contribute to substantive transformation, we hence need to understand how distinct interventions are situated as moments in a longer sequence of events. Here we find it productive to channel key insights from the long-running tradition of temporal enquiry within processual analysis (e.g. [Abbott, 2001](#)). Specifically, [Bidart et al. \(2012\)](#) derive an analytical framework that offers four concepts to theorise temporal processes: context, driving forces, turning points and sequences. We customise this as a basis to foreground three dimensions of a temporal spectrum along which temporary interventions constitute part of a longer sequence of events.

For [Bidart et al. \(2012, p. 746\)](#), to apply context as a lens is “to analyse phenomena that are evolving in a context defined *a priori* as ‘the whole of elements present in a given situation’.” Driving forces refer to “a principle generating the movement of the ingredients and of their configurations over time” ([Bidart et al., 2012, p. 748](#)). Turning points are “intense rearrangement of the ingredients associated with an event, triggering a crisis and the emergence of an alternative and leading the process to change orientation” ([Bidart et al., 2012, p. 749](#)). Sequences concern “temporal segments of a process that link together a specific set of ingredients” ([Bidart et al., 2012, p. 747](#)).

We translate these concepts into ones that are customised with a view to enable operationalisation for research on the temporality of local sustainability initiatives. To us, ‘context’ seems unhelpful, as it is an aspect of the system description as a whole. It is as such too ubiquitous as a concept at par with the other three, which are features of processes. Hence, we propose an operationalisation of driving forces, turning points and sequences into three temporal dimensions of local transitions.

‘Driving forces’ in local sustainability initiatives are distinguishable as a departure from business-as-usual that crop up within the status quo and reassemble it in a different configuration over time. While consistent with the above definition, our operationalisation places emphasis on the ability of such occurrences to *catalyse* transitions. Events that are temporary, ad hoc, one-off and pop-up can instigate new urban transition pathways by disrupting the status quo and proposing alternative visions of desirable low-carbon futures. Temporary urban interventions can alter future event sequences by questioning the status quo of event sequences and highlighting alternatives, thereby engendering a state of instability to disrupt routines and birth new perspectives (Madanipour, 2017). Local actions can “undermine associations and beliefs, undermine compliance within institutions or delegitimise institutions by, for instance, questioning moral foundations” (Barnes et al., 2018, p. 70). Catalysis can span the overlapping domains of political jurisdictions, markets and practices (Bernstein and Hoffmann, 2018).

Next, ‘turning points’ in local sustainability initiatives refer to distinct inflections that engender new possibilities and processes. Here, we customise this as the ability to *revamp* transitions. Time-bound interventions can create arenas for innovation and experimentation with alternative, revamped practices. Path dependency (Arthur, 1989; Lockwood, 2015; North, 1991; Pierson, 2004) and path creation (Garud et al., 2010) scholars underscore how relatively small adjustments can leverage self-reinforcing mechanisms and thereby substantially impact future change trajectories. Path dependency work highlights emergent situational lock-in that constrains the scope of future action (Unruh, 2000), while path creation scholarship emphasises the structuring of societal options through the cultivation of self-reinforcing mechanisms and the strategic mobilisation of versions of the past that favour specific visions of the future (Garud et al., 2010). Niche actors can work with some degree of independence from the structural constraints of a regime by exerting innovative power where new resources can be developed (Avelino, 2017). Through such revamping, local transition initiatives can be integrated into change pathways for further institutionalisation and materialisation (cf. Lockwood, 2015).

Last, ‘sequences’ in local sustainability initiatives concern processes that amalgamate in ways that accomplish a semblance of continuity. Sequentiality does not equate transitions with linear processes, but rather identifies specific trends that display such characteristics. We operationalise this as the ability to *routinise* transitions. The chains of repetition that constitute durability can easily break due to a “precarious fragility of alternatives” (Hodson and Marvin, 2016, p. 1214). To stick, local transition initiatives wrestle with how to maintain durability through routinisation. Routinisation is hence related to Avelino’ (2017) idea of transformative power which is the “capacity of actors to develop new structures and institutions” in “niche-regimes”. Such interventions can nurture new social practices with potential to endure (Shove et al., 2012). They can be sustained through the ‘institutional work’ of creating new institutions or realigning the goals and structures of existing ones (Barnes et al., 2018; Fuenfschilling and Truffer, 2016; Thelen, 2009). Such institutional change is not merely structural, but spans relational changes in discourses and configurations of power and ownership (Moss et al., 2015). Planning and monitoring procedures levied to in-build accountability can shore up legitimacy (Kraft and Wolf, 2018). Local interventions can be further reinforced through spatial and socio-material commitments, e.g. decentralised renewable energy capacity installation.

While these three dimensions articulate the temporal spectrum, locating specific iterations of local transitions within any of them requires disaggregating these iterations into one of several strategies that capture the type of transition that these local interventions constitute. Following Sareen and Haarstad (2018), transitions comprise structural, relational and material changes; hence we parse the temporal strategies of local sustainability initiatives in terms of structural (pertaining to institutions and authority), relational (pertaining to adaptive social practices and forms of legitimation such as metrics and indicators), and material (pertaining to the built environment and the agency of infrastructure) types.

To recap, we have posited durability as the effect of recursive repetition with variation, and highlighted three dimensions in which temporary events shape subsequent sequences of events: they catalyse, revamp and routinise. We have categorised local transitions into three types of strategies: structural, relational and material. In the next section, we draw on extant scholarship to tabulate a matrix of local transition strategies across our temporal dimensions. On this basis, we discuss the temporal dimensions of the strategies deployed by actors in local urban transitions to shape durable trajectories of change.

4. Local strategies to make transitions stick

To map the temporal dimensions of the various strategies actors deploy in local transitions, we conducted an illustrative literature review of the empirical literature on local sustainability transitions. Relevant articles were identified through three queries in the Web of Science database: (a) “municipal* sustainab* OR climate”, (b) “grassroots innovation sustainab*”, and (c) “experiment climate OR sustainab*”. We supplemented this selection based on familiarity with thematic scholarship and by following up key citations. In total, the review included 150 articles. These were coded within the qualitative data analysis application NVivo, employing a scheme that combined the temporal dimensions (catalyse, revamp and routinise) and strategies (structural, relational and material) discussed in Section 3.¹ The strategies were summarised in a table and then grouped and consolidated under descriptive headings through iterative rounds of analysis, first independently by each author, and subsequently in consultation.

Our review of local sustainability transitions scholarship shows that, in spite of the oft-noted difficulty of sustaining local transition initiatives (Geels and Deuten, 2006; Hargreaves et al., 2013; Seyfang and Smith, 2007), a temporal lens that attends to their

¹ A fourth category, reflexive strategies, emerged while coding, but was subsequently consolidated with relational strategies.

Table 1
Strategies towards sticky local low-carbon transitions across temporal dimensions.

Temporal dimensions/ Strategies	Catalyse Open up a space for new ideas and modes of local action.	Revamp Innovation to reconfigure, reinforce or reorient transition pathways.	Routinise Secure longevity of activities and overcome the fragmented and fleeting nature of initiatives.
<i>Structural</i>	Reframe governance structures to make them more inclusive and enable institutional entrepreneurship (Aylett, 2013; Wolfram, 2018). Reconfigure existing institutions and shift resource allocation, policy-making protocols and organisational culture (Burch, 2010; Bernstein and Hoffmann, 2018). Create temporary work constellations, e.g., labs, and enable experimental action (Ramos-Mejía and Balanzo, 2018; Schmidt et al., 2014). Catalyse local action through other scales (Bulkeley et al., 2014; Moss et al., 2015).	Coordinate cross-sectorally for alternative solutions, e.g., in workshops that bring together actors from different departments to sketch cross-cutting solutions (Hrelja et al., 2015). Establish new circuits of exchange to foster innovation, e.g., through private-public partnerships (Bulkeley et al., 2014; Hatzl et al., 2016). Shift organisational forms: propagate associations and citizen cooperatives that reflect the aims and values of local initiatives (Hatzl et al., 2016).	Formalise organisations for civil society initiatives or associate with existing legal entities and existing communities of practice (Feola and Nunes, 2014; Ornetzeder and Rohrer, 2013; White and Stirling, 2013). Align transitions initiatives with municipal or national agendas (Kasa et al., 2012). Strategise for long-term funding and clarify legal structures (White and Stirling, 2013; Ehnert et al., 2018; Martin et al., 2015). Commercialise community initiatives (Bailey et al., 2010; Hargreaves et al., 2013).
<i>Relational</i>	Induce innovation seedbeds in everyday life (Korjonen-Kuusipuro et al., 2017). Connect diverse actors, cultivate openness and capitalise on epistemological and ontological variation (Longhurst, 2015; White and Stirling, 2013). Disrupt prevailing norms (Bernstein and Hoffmann, 2018; Boyer, 2018). Develop common visions and shared objectives (Amundsen et al., 2018; Bradbury and Middlemiss, 2015; McCormick et al., 2013; Seyfang and Haxeltine, 2012; Wolfram, 2017). Learn from elsewhere (Johannessen and Hahn, 2013).	Drive innovation through everyday practices (Korjonen-Kuusipuro et al., 2017). Reframe activities and explore radical ideas (Bailey et al., 2010; Korjonen-Kuusipuro et al., 2017). Enable social learning (Korjonen-Kuusipuro et al., 2017; Shey and Belis, 2013). Identify socially just alternatives (Smith et al., 2014; Westskog et al., 2017). Translate experiences across settings (Hildén et al., 2017) and identifying alternative solutions through reading into unsustainable initiatives (Ramos-Mejía and Balanzo, 2018).	Build community support for low-carbon lifestyle endeavours (Aiken, 2017; Ramos-Mejía and Balanzo, 2018; Seyfang and Haxeltine, 2012). Build non-partisan political support and ensure continuity through social networks (Hrelja et al., 2015; Bernstein and Hoffmann, 2018; Bulkeley et al., 2014). Standardise activities and stabilise pathways with global knowledge (Geels and Deuten, 2006; Hargreaves et al., 2013; Matschoss and Heiskanen, 2017; Ornetzeder and Rohrer, 2013). Develop skills and embody knowledge of practices (Korjonen-Kuusipuro et al., 2017; Pellicer-Sifres et al., 2018). Ensure iterative learning (Feola and Nunes, 2014).
<i>Material</i>	Circumvent obduracy through experiments (Bulkeley et al., 2014). Demonstrate viable alternatives (Seyfang, 2010; Bulkeley et al., 2014).	Experiment with how new grassroots sustainability technologies can support new practices (Korjonen-Kuusipuro et al., 2017; Seyfang and Haxeltine, 2012). Innovate in current voids (Bulkeley et al., 2014).	Maintain and repair material initiatives (Castán Broto and Bulkeley, 2013b). Build community through practical activities (Aiken, 2017; Seyfang, 2010).

ephemerality is rarely explicitly foregrounded. However, as we will see, the literature on local sustainability transitions does in fact feature good implicit coverage of this temporality of local transitions, hence shedding light on how situated actors navigate the dynamics of ephemerality and permanence in transitions. The various strategies employed by local transition actors across the three temporal dimensions are summarised in Table 1.

As Table 1 shows, durability or stickiness is not an inherent property of particular local transition initiatives. On the contrary, local transition actors proactively and strategically perform and embed durability by routinising transition activities in social and institutional practice. However, it is important to note that routinisation is rarely the objective at the outset; rather, it emerges as an orienting destination, the outcome of other dimensions that are ephemeral, transitory and cumulative. Temporary local initiatives also play other important roles: as catalysts of change, as a means of innovation, or as interventions that revamp marginalised properties of existing development trajectories. As local sustainability initiatives go, there is thus a lot happening that does not endure, but rather serves other functions, such as catalysing change.

4.1. Catalysis

A number of examples in the empirical sustainability transitions literature foreground how local actors catalyse transition through temporary measures: interventions that critique the status quo, challenge unsustainable entrenched practices, disrupt prevalent norms and orchestrate new configurations of actors, and hence open up space for new ideas and modes of local action.

Actors engage various *structural* strategies to catalyse action. For instance, by reframing governance arrangements, creating more inclusive formal and informal networks and involving a broad range of actors, transition initiatives can reframe “what is governed, how and by whom”, hence unlocking new forms of collective action which may “prepare and enable more fundamental shifts” (Wolfram, 2018; see also Korjonen-Kuusipuro et al., 2017 and Martiskainen, 2017). Similarly, capacity for alternative action can be fostered locally by reconfiguring existing institutions and shifting resource allocation, policy-making protocols and organisational

culture (Burch, 2010; Bernstein and Hoffmann, 2018). By creating “temporary settings and work constellations”, such as labs, local transition actors can innovate and implement ideas quite independently from their parent organisations’ institutional context (Schmidt et al., 2014, p. 244).

Such temporary constellations also allow for cross-pollination (Schmidt et al., 2014), a key *relational* strategy for local transition initiatives. Collaboration amongst a plurality of actors on a project basis allows initiatives to capitalise on epistemological and ontological variation and creates space for radical thinking (Longhurst, 2015), although individual positions may become re-entrenched as soon as funding dries up (White and Stirling, 2013). Here, experimental action can be seen as research endeavours that provide evidence of unsustainable technologies and social practices, as well as possible solutions (Ramos-Mejía and Balanzo, 2018). Temporary initiatives may also disrupt prevailing norms that entrench fossil fuel dependence (Bernstein and Hoffmann, 2018) and allow individuals to reorient their understanding of key issues (Boyer, 2018). A number of studies emphasise the importance of developing common visions in order to identify synergies amongst diverse actors (Amundsen et al., 2018; McCormick et al., 2013; Wolfram, 2017). Mobilising inspiration from successful initiatives elsewhere may also contribute to conditions for change (Johannessen and Hahn, 2013).

Temporary *material* interventions (e.g., grassroots innovations) can be used to demonstrate viable alternatives that are both low-carbon and require low investment, as Seyfang (2010) discusses in the case of (semi-)temporary dwellings. Furthermore, experimental practices may be used to expand the political space and circumvent the obduracy of existing regimes (Bulkeley et al., 2014). Yet, temporary sustainability initiatives may not only catalyse change, but also create spaces of experimentation and innovation in order to revamp and reconfigure transition pathways.

4.2. Revamping, reconfiguration and innovation

Local actors revamp initiatives that have fallen into disuse by tapping into their dormant properties, innovating, reconfiguring and consequently reinforcing or reorienting transition pathways. *Structurally*, local transition actors may attempt to drive sustainable innovation by coordinating across sectors, as in the case of Sundsvall, where planners and officers from different municipal departments met in workshops to sketch alternative solutions to “tricky” problems (Hrelja et al., 2015). They may also shift to organisational forms that reflect the aims and values of local initiatives, such as citizen cooperatives (Hatzl et al., 2016), or to foster innovation through public-private partnerships (Bulkeley et al., 2014).

Different *relational* strategies are also prominent as local actors revamp transition pathways. Scholarship underscores the important role of social learning between actors in such temporary constellations, which allows for actors to explore radical ideas. Here, transition actors may champion a cultural shift towards openness and diversity in order to support innovation, and employ techniques such as daydreaming to unlock exploration of marginalised, unusual ideas (Korjonen-Kuusipuro et al., 2017; see also Shey and Belis, 2013) and cultivate shared objectives through hands-on approaches (Bradbury and Middlemiss, 2015; Seyfang and Haxeltine, 2012). The literature also highlights continuous exchange and translation of ideas across settings as a key part of the local innovation process (Ornetzeder and Rohracher, 2013; Hildén et al., 2017). Local transition actors may also read into unsustainable initiatives elsewhere in order to identify alternative solutions (Ramos-Mejía and Balanzo, 2018). While grassroots actors may strive for wide dissemination of their solutions for sustainability, they are usually mindful that mainstream appropriation may undermine their critical edge. As Smith et al. (2014, p. 122) observe, the tension between entrepreneurialism and social justice can be “an important source of reflexivity in development” as grassroots innovations are crafted.

Materially, local transition actors may innovate in current voids and produce new regimes in parallel with current socio-technical systems, in order to fill gaps in the latter and reorient them (Bulkeley et al., 2014). Korjonen-Kuusipuro et al. (2017) highlight the close interplay between everyday practice and technological innovation in grassroots energy solutions, where everyday practices serve as cultural drivers in energy innovation and new technologies may in turn support new consumption practices.

Fleeting activities and constellations hence play important performative roles in local transitions by creating a discursive and geographical space for change (catalysis) and driving local innovation, experimentation and reconfiguration (revamping). Yet, both catalysis and revamping are ultimately ephemeral. They bring raw potential to the fore, they organise and align agency, but unless they are stabilised into routines, they risk being reabsorbed into nimbly adjusted business-as-usual flows. Hence, local transition actors pursue a range of strategies to routinise their initiatives in order to render them durable and channel them into substantive low-carbon transitions that stick.

4.3. Routinisation

Actors seek to routinise their initiatives and overcome the fragmentation and fleeting nature of constellations through formalisation, standardisation, normalisation and networking. *Structurally*, civil society initiatives often strive to formalise their activities by creating legal entities, and many initiatives pursue long-term funding strategies through commercialisation and project consortia (Bailey et al., 2010; Hargreaves et al., 2013; White and Stirling, 2013). For instance, Ornetzeder and Rohracher (2013) find the institutionalisation of grassroots innovation initiatives, such as cooperatives, important for strengthening both the commitment of participants and the ability to secure further funding. Similarly, the Transition Network encourages transition initiatives to formalise their organisations. Feola and Nunes (2014) find that successful initiatives tend to have a more formal organisational structure, including a steering group. At the same time, increasing formalisation may come at the cost of bureaucratisation and be difficult to align with the needs of volunteers (White and Stirling, 2013), and the commercialisation of initiatives risks excluding those who are not able to pay (Martin et al., 2015). Municipal actors strive to align initiatives with municipal or national agendas to ensure longevity (Feola and Nunes, 2014; Hodson and Marvin, 2012; Kasa et al., 2012). Amundsen et al. (2018, p. 24) highlight that it is “more likely for local institutions to be influential if

the values they hold are in line with those prioritised by higher level governance actors”.

Local transition actors also pursue various *relational* strategies to routinise their endeavours. Civil society actors may mobilise community support to normalise low-carbon social practices and lifestyles (Seyfang and Haxeltine, 2012), and municipal actors draw on non-partisan political support and leverage social networks to create continuity (Amundsen et al., 2018; Hrelja et al., 2015). The sharing, codification and standardisation of knowledge is often central here. Actors cultivate shared visions (Bernstein and Hoffmann, 2018; Fenton et al., 2015), standardise activities (Hatzl et al., 2016; Ornetzeder and Rohrer, 2013) and abstract and aggregate local learning into global knowledge through toolkits and handbooks (Geels and Deuten, 2006; Hargreaves et al., 2013; Matschoss and Heiskanen, 2017; Westskog et al., 2017). However, the context-specific, evolving and diverse nature of local transition projects may limit the relevance of the abstracted, generic lessons of manuals and toolkits (Hargreaves et al., 2013; Hatzl et al., 2016).

Finally, local actors pursue *material* strategies to visibilize alternatives (Seyfang, 2010), demonstrate technologies for sustainability (Bulkeley et al., 2014), and push infrastructural planning towards low-carbon solutions (Amundsen et al., 2018). The literature also underscores the role of practical activities for building community (Aiken, 2017; Seyfang, 2010).

4.4. Continuity as a dynamic sequence of activities

As evident from the above, the empirical transitions literature has outlined how local actors seek durability through embedment in networks and structures that align interests and set up political constellations for long-term transition agendas. Yet, this pursuit of continuity may come at the cost of bureaucratisation, exclusion, and the erosion of the diverse and context-specific nature of local transition initiatives. It is therefore worth underscoring that many local transition actors interpret durability in a more dynamic way. Here, local transition initiatives often build on a sequence of projects and organisations that feed into each other to constitute a transition pathway (Madanipour, 2017). This conception of continuity as dynamic is prominent in the Transition Movement. Here, communities are seen as temporary and initiatives are encouraged to “design their own demise from the outset”, enabling the composting of social energies and skills that can flow into new initiatives (Aiken, 2017). Similarly, they build on an understanding of the iterative nature of learning, which goes through cycles where “old knowledge and ways of learning are discarded in favour of new approaches or recombined with new ideas or processes” (Feola and Nunes, 2014, p. 247). Here, even material durability can be understood as dynamic and iterative, since material initiatives require continuous repair and maintenance, activities that involve elements of remaking and renewal (Castán Broto and Bulkeley, 2013a). As per this approach, then, transition initiatives continuously reinvent themselves, drawing on an iterative and dynamic connotation of temporality. Through continuous routinisation, durability is performed as an effect of a sequence of continuous repetition and (re)translation of temporal fragments in the form of projects, organisations, communities, practices and knowledge.

Highlighting the embedded agency of local actors in catalysing, revamping and routinising transition initiatives can hence aid empirical study of local sustainability strategies. From disruption, birth and contestation (catalysis), through ‘practice work’, regeneration and experimentation (revamping), to ‘institutional work’, imbrication and embedment (routinisation), local initiatives display distinct characteristics upon charting their diverse strategies along a temporal register. Some initiatives and constellations are quite ephemeral and open up space for experimentation and change, while others sustain themselves over time. Moreover, the three types of strategies—structural, relational and material—help distinguish between instances where, say, routinisation is happening within institutions (structural) as opposed to actor-networks (relational), or as infrastructural layering (material). Such distinctions are important in order to better apprehend the actual nature of temporary local sustainability initiatives, as well as ones that begin to crystallise. Whether actors are catalysing or revamping structural, relational or material change has vital implications for the initiatives they adopt; identifying these strategies can enable better analytical purchase over the characteristics of a given transition. It is such insight that can help us understand what makes certain initiatives stick.

Spatial and temporal dimensions of sustainability transitions are deeply intertwined. Embedding local efforts in layered or polycentric governance arrangements, forming networks with initiatives in other locations, and continuous exchange and mutual learning thus comprise integral components of durability. A temporal lens can help unpack deeper layers of meaning that underlie local initiatives, revealing situated efforts to catalyse, revamp and routinise sustainability transitions. Our proposed temporal typology hence provides a means to discuss how initiatives unfold over time. It moreover constitutes a generative analytical point of entry for fine-grained insights into how and why local initiatives evolve in specific ways, in a recursive relationship with the systemic changes they help enact.

5. What sticks?

In line with the need for rapid and deep transformations to sustainability, there is an urgency associated with the temporal dimension in transition studies. Yet, by and large, extant scholarship on sustainability transitions conceptually locates durability and inertia as external to local transition efforts. This places temporal emphasis on the obduracy of incumbent regimes. Our review of the literature on local and municipal scales evidences a need to articulate the situated temporal dynamics that are integral to how sustainability transitions are mobilised and practiced. We have therefore proposed an analytical vocabulary to capture the temporality of sustainability transitions at the local scale. It highlights the process temporality that is internal to local initiatives under transition, and foregrounds the structural, relational and material strategies that actors deploy locally to catalyse, revamp and routinise transitions.

In interrogating what sticks and why, part of our contribution is to highlight ephemerality as ubiquitous when mapping initiatives at the local scale—there is a lot happening that does not endure but serves other functions. A temporal typology that enables us to systematically explicate this tendency can serve an important corrective function in keeping discourse about transitions accurate. Locating action along the temporal dimensions of catalysis, revamping and routinisation is an important move away from stand-alone case analysis towards the contextualised treatment of local initiatives along the temporal scale.

Our perspective also foregrounds the dynamic nature of durability as the result of a structured sequence of repetition with variation. It follows that the stickiness of local transition pathways is a situated and relational process, not an essential property that inheres in particular innovations or interventions. This highlights the agency of local actors as they routinise sustainability initiatives by adaptively reworking their own oeuvre and by formalising and normalising initiatives. Such an analytical take also explicates how the obduracy of incumbent regimes is continuously performed; it thus foregrounds possibilities for targeted analysis of strategies to unmake such regimes.

As sustainability transitions scholarship increases its emphasis on the roles that local actors play, explicating how seemingly disparate and loosely coordinated initiatives are interconnected in time and space becomes important. There is an order to things that comes into sharp relief when we employ a temporal lens to unpack what constitutes durability. Future research can productively deploy the temporal vocabulary articulated above, and explore how to combine insights from complementary spatial and temporal conceptualisations. This is vital in order to address how strategies for sustainability transitions perform spatiotemporal change through unfolding local initiatives.

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