***Assembling place-based transitions: capitalist logics of green building in Vancouver, Canada*, accepted in Urban Geography, July 2023.** (authors' version prior to Journal formatting)

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Abstract

Green building is increasingly central in urban sustainability strategies to reduce greenhouse gas emissions, and to demonstrate leadership, innovation, and technological advances. In recent decades, urban municipalities have focused on green building to promote sustainability transitions: Vancouver offers a strategic example of a city that has adopted a range of green building policies for sustainability and boosterism purposes. Here, we explore the *relational* nature of green building niches, emphasizing the dense bundles of connections between niches and regimes, which influence emergent innovations. We combine assemblage thinking with sustainability transitions research to expose the relationality and interconnectedness of green building practices in specific places like Vancouver. Taking this approach allows us to explore the entangled nature of niche-regime relations, and the stickiness between places and practices: how place specificity affects the unfolding of transitions. We identify two logics driving green building in Vancouver (risk and innovation, and urban entrepreneurialism), which although differentiated nevertheless work to reinforce neoliberal sustainability activities. From this, we argue that although a wide range of green building approaches are implemented, policy and discourse tend to mainstream a weaker, incremental form of green building.

Keywords: assemblage; transitions; green building; urban sustainability; Vancouver

1. Introduction

The concept of sustainability 'transition' has become increasingly central to the pursuit of urban climate governance for policymakers, while many scholars have employed assemblage theory to conceptualize urban transformations (Durose et al., 2022). The 'urban' is seen as the appropriate scale for sustainability transitions, with cities seen as important spaces for experimenting with sustainability and engaging in visioning processes, nurturing, and protecting niche innovations and practices (Geels 2010). Policymakers, private firms, and non-governmental organizations frequently advocate for sustainability transitions, spanning a wide range of sectors, from energy to mobility, building, food production to water use. However, key transitions theories, such as the Multi-Level Perspective focused on the relationships between social and technological change have been critiqued especially for their limited conceptualization of space and relationships between and within different levels of analysis. Here we employ assemblage thinking to draw out the relationality of transitions-in-place. Despite green building forming a core element of many cities' sustainability practices, green building designs habitually embody weak ecological modernization discourses, even where cities signal otherwise. Thus, green building projects falling under the auspices of urban sustainability frequently align with a development model where sustainability represents a pathway to financial return (Rapoport & Hult, 2017).

We employ assemblage thinking[1] to address recent criticisms of the multi-level perspective (MLP). Insodoing, we suggest that assemblage thinking helps draw out the place-based dimensions of sustainability transitions, emphasizing the *relationality* of sustainability practices and discourses of transitions, as well as the problematic nature of key ideas in

[1] We employ assemblage theory here rather than policy mobility as the former enables us to emphasise spatial connections and relationalities, and to think about place-specificity in governing how transitions unfold, rather than a more specific focus on the mobility of certain policies. As Savage (2020) and others have outlined, assemblage and policy mobilities theories share some epistemological traits.

transitions theories, such as diffusion, translation and scaling up of practices like green building, which can empty places of their specificity, and assume that new ideas can be unproblematically transplanted. Sustainability transitions research has been contested for its impoverished consideration of spatiality and temporality. In contrast, assemblage thinking specifically emphasises these qualities: elements are pulled together in a given conjuncture only to disperse or realign, and the resultant shape may shift according to place and the angle of vision (Anderson and McFarlane, 2011: 125), thus changing the perspective. This approach underlines the uncertainty and constantly evolving nature of sustainability practices such as green building, drawing together elements which may be topographically distant, yet topologically close. Using the metropolitan area of Vancouver with its long history of urban sustainability efforts as a case study, we explore how specific spatial contexts reflect different interpretations of being *green* and the ways that new practices of green buildings intersect with, and complicate, existing ones. Insodoing, we reveal how, even in cities heralded as changing the status quo, the connective tissue between incumbent practices in place is hard to shift. We focus on green building in the City of Vancouver (CoV) and the University of British Columbia (UBC) as green building 'hotspots' within the region to better understand why certain 'innovations' emerge in, or are adopted by, some places but not others. A more relational approach enables us to explore the dynamics between stability and transformation (McFarlane, 2009; Anderson et al., 2012), within and across places.

Based on this analysis, we offer two contributions. Firstly, we illustrate how place specificity influences and affects *green* (economic) development, acting to promote or constrain sustainability transitions in specific locations. The common approach to green building in Vancouver is deeply enwoven *within* the existing, neoliberal, regime: the epistemological hegemony of economic growth at the landscape and regime levels shapes the niche activities that emerge, and *which* niche 'innovations' diffuse to a wider scale. Secondly, using

assemblage thinking with sustainability transitions theories helps expose the multi-faceted and spatially embedded relations that exist within and across green building assemblages, constructed through interconnected narratives, material infrastructures, and diverse actors that work to discipline the kinds of green building enacted. This approach highlights the connections between Vancouver's multiple green building practices and the wider assemblages-from-elsewhere. Despite a growing emphasis on the geographies of sustainability transitions, place specificities remain underacknowledged within sustainability transitions theories: this is important as such place specificity can substantially affect niche development, in particular the scale, extent, and form of such niches, so that niche developments in, for example, North America, differ substantively from those '*elsewhere'*.

In the following section we outline our theoretical approach, introducing both transition and assemblage theories. We then discuss our methods before outlining Vancouver's geographical context, followed by our analysis. Section 5 discusses the implications of our findings. We conclude by discussing how our research illustrates that Vancouver's green building transitions have principally reinforced existing neoliberal ideologies of 'green building as green growth.'

2. Transitions and assemblages of greening

To investigate the spatial and contextual specificities of green building in Vancouver we employ assemblage theory to bring a relational perspective to sustainability transitions theories. Cities and the urban neighbourhoods that constitute them are increasingly recognised as relational and emergent, rather than fixed wholes (Durose et al., 2022: 2143): as Blok (2013: 8) argues, an assemblage perspective "conceives of cities as ensembles of heterogeneous actors" thus acknowledging the active dynamics between multiple socio-material elements. Sustainability transitions research frequently focuses on specific

'systems', such as energy or transport, whereas assemblage thinking sees cities as consisting of multiple sites and socio-technical networks which are "relentlessly being assembled at concrete sites of urban practice" (Farías 2010: 2). We thus find assemblage thinking useful to problematize sustainability transitions approaches by focusing on the relations and interconnectivities between 'niches' and 'regimes' in and between specific *places*. Taking this approach facilitates a more integrated consideration of transition dynamics in specific places and the *translocal* relationships that constitute urban complexities, and which inform local practices and vice versa.

The multi-level perspective (MLP), as one approach within sustainability transitions research (STR), explains transitions in specific sectors by focusing on the role of innovation niches in enacting sustainability transitions (Rip & Kemp, 1998; Smith, 2003; Geels, 2005). The MLP identifies three synergistic, although often treated as discrete, levels: (1) the socio-technical *landscape*, which encompasses the wider context, and influences niche and regime dynamics through spatial structures, political ideologies, societal values, beliefs, concerns, the media landscape and macro-economic trends (Geels 2012); (2) socio-technical *regimes* that include interconnected systems of existing technologies, institutions, rules, norms and practices (Berkhout et al. 2003); and (3) *niches*, which are seen as test-beds for innovative ideas and technologies, thus creating new socio-technical constellations that challenge existing regimes (Späth & Rohracher, 2010). These 'levels' do not relate to spatial scale but rather suggest heterogeneous configurations of increasing stability, often viewed as a nested hierarchy with regimes embedded within landscapes and niches existing inside or outside of regimes (Geels 2012). Niches have frequently been seen as 'external' to regimes, rather than being closely integrated with, and indeed influenced by, regime characteristics: we suggest that some niches do not just exist within or alongside regimes but are closely embedded in specific

spatial and political contexts, with dense bundles of relations between some niches and regimes that can promote or hinder the kinds of 'innovations' that emerge and subsequently diffuse to the regime. Assemblage thinking helps address this integration and uncertainty, and aids the conceptualization of relationships between multiple elements (whether conceptualized as assemblages, niches, regimes, or landscapes). The MLP thus represents a component theory, where assemblage theory is ripe to unpack and problematize the ways that this works in practice.

Niche practices which align more closely with the regime may be adopted more readily: Smith (2003) notes how more compatible aspects can be cherry-picked by regime actors, reducing or excluding their transformative potential. Successful diffusion of niche experiments and innovations can be facilitated by tensions within landscapes and regimes: it is not necessarily a one-way process of exchange even though niche-regime interactions are often seen dichotomously (Avelino et al., 2016). Indeed, the mainstream regime may transform the niche rather than the reverse (Smith, 2006). In their case study on greenhouse technology in the Netherlands, Hoffman and Loeber (2015) demonstrate how innovative practices and vested interests are typically constituted in a dialectic manner and can incite processes of change in niches *and* regimes. This has implications for understanding niche-regime interactions as arenas where the "politics of transitions are played out" by various actors (Avelino et al., 2016: 560).

STR has focused on how existing regimes can be challenged and, potentially, disrupted onto a different, more sustainable path (Smith, 2003). Niches are viewed as a key mechanism for introducing new ideas, innovations, and practices, and niche actors can disrupt regimes in response to regime tensions. Such actors may represent systems builders, (or in assemblage

'language,' *assemblage operators*) cutting across niche and regime boundaries to translate new technologies. Such changes may provide a window of opportunity for new socio-technical configurations to replace existing regimes (Truffer, 2008). There is often an unquestioned normative assumption in STR that these new socio-technical configurations *will* be more sustainable, but less attention has focused on the role of capitalism in shaping transitions and *limiting* their sustainability (Feola, 2020). Much STR privileges *technological* innovations, thus reinforcing contemporary commitments to continued economic growth, whereby system disruption is frequently interpreted via a low-carbon 'clean-tech' ideology, using technological innovations to shift regimes towards carbon neutrality (Lestar & Bohm 2020; Hadfield & Coenen, 2022). Haarstad and Wanvik (2017: 437) note that STR focuses on large-scale 'systems' and thus tends to prioritize broad, long-term changes "rather than specific ruptures and instabilities in cities and elsewhere." They favour assemblage thinking over transitions thinking: rather than privilege one over the other, we argue that by combining the two, we can expose elements of uncertainty, relationality and interaction, aspects that require more analytical attention within STR.

In contrast to the MLP, assemblage thinking presents a flatter ontology and enables a way of thinking about the *connections* between places, actors, and practices. Deleuze and Guattari (1987: 85) use the term assemblage to focus on the relationships between material elements (bodies, actions, passions) and discursive elements (statements, plans, laws), which together suggest rhizomatic rather than linear linkages. Li (2007: 266) defines assemblage as a 'gathering of heterogeneous elements consistently drawn together as an identifiable terrain of action and debate.' These elements include entanglements of humans, materials, technologies, organizations, processes, policies, norms, and events, each imbued with the

capacity for agency within and beyond the assemblage. Assemblage emphasises the coming-together of both human and non-human 'things' which can adopt an emergent agency, enabling such 'things' (or 'elements') to *do* something, albeit with variations in specific times and places (Ghoddousi and Page, 2020). Li (2007: 265) identifies six practices that constitute assembling: we employ three practices, 'rendering technical', 'reassembling', and 'authorizing best practices,' as processes that emerged from our data on green building.

Within assemblages, processes of territorialization, deterritorialization and reterritorialization are important in denoting situations that are more, or less, coherent, as assemblages are continually being made and remade. McCann (2011: 145, original emphasis) emphasises this continual movement and the labour involved in enacting assemblages: 'assemblages are always coming apart as much as coming together, so their existence in particular configurations is something that must be continually *worked at.'* Processes of territorialization refer to the ways in which an assemblage creates coherence by selecting component parts from a homogenous repertoire or the extent to which components become homogenised (DeLanda, 2016: 22). Thus, territorialization is understood as a process where the boundaries of a territory are created, where the rules of the game within that territory are enforceable (Vandergeest et al. 2015). Processes of territorializing and deterritorializing respectively and simultaneously strengthen and weaken specific assemblages. One strength of the assemblage perspective is in acknowledging the multiplicity of co-existing assemblages and the constant work required to build and stabilise these heterogeneous networks. As Anderson et al. (2012: 172) argue, taking an assemblage approach "demands an empirical focus on how spatial forms and processes are themselves assembled, are held in place, and work in different ways to open up or close down possibilities." Assemblages thus specifically emphasise the existence and creation of *spatialities*. This seems, to us, critical to

how transitions happen in specific places, or not. It is specifically in highlighting the relationships between *sites* in an assemblage and the ability to account for translocal influences that we find assemblage thinking helpful in problematizing STR. Socio-technical transitions typically focus on technological innovations in given systems/sectors/industries, whereas assemblage thinking enables a broader conceptualization of the entangled relations between the material, social and ideational (McFarlane & Anderson, 2011) across multiple (intersecting) assemblages. This encourages consideration of the diverse spatial and temporal implications of transitions in specific places.

Assemblages reflect individual specificity via historically unique, contingent, and persistent configurations existing at multiple scales, whether "an individual person, an individual community, an individual organization, an individual city" (DeLanda 2006: 19). Assemblages can, then, exist at multiple scales, whilst also being connected to and interacting with other assemblages. In this way, assemblage thinking helps explain the heterogeneity, porosity, and messiness in social systems, compared with the apparent orderliness and linearity of the MLP (Gibbs and O'Neill, 2014). Furthermore, assemblage thinking emphasizes difference and the potential for volatility (DeLanda, 2006): we should thus *expect* geographical differences in transitions and understandings of sustainability. STR has been critiqued for its limited engagement with geographies of transitions (Coenen et al., 2012) and focus on the national level. Although this is changing, assemblage thinking offers useful entry points to understand geographical and historical contingency of spatiotemporal contexts (Jessop et al., 2008). Furthermore, STR frequently understand space as bounded, which fails to address the fluid and messy nature of transitions (see Binz et al., 2019). Taking a relational approach can better account for interconnections between multiple scales, places, and across 'regimes.' Specific locations represent contingent assemblages influenced by different dimensions, such as varieties of capitalism and place-specific norms and histories, to

differing degrees, hence opening or foreclosing opportunities for more, or less, sustainable practices. Taking an assemblage approach exposes how specific and hegemonic interpretations of 'green' building can limit the diffusion of some kinds of green building while accelerating others. This approach also highlights the strong connections and relations *between* the different regime dimensions including technologies, institutions, rules, norms, and practices as outlined in the MLP, rather than seeing these dimensions as distinct.

For us, assemblage thinking enables a more integrated understanding of the relationships between niche, regime, and landscape, and offers insights into the spatial and temporal specificity of transitions. The multiplicity and instability emphasized by assemblage thinking brings a much-needed messiness and volatility to transitions thinking, to help connect transitions in multiple 'systems' (including landscape 'systems' like capitalism) and places, and to problematize transition pathways. Therefore, transitions in green building can be conceptualized as continuous, open-ended, and non-linear, and, crucially, spatiotemporal.

In summary, assemblage thinking infers a stronger sense of close entanglement and co-dependency between elements within and outwith specific assemblages, thus drawing our attention to the close enmeshing between the MLP's landscape, regime and niche and to the relational, contested, and entangled processes of assembling transitions. Such approaches help theorize more rapid and ruptural changes in shorter time-spaces, imperative in the climate emergency. In bringing assemblage thinking and the MLP together, we suggest Smith and Raven's (2012) binary of 'fit-and-conform' or 'stretch-and-transform' reduces the complexity of everyday life. We need to be attuned to the possibilities of the world for being otherwise: assemblage thinking emphasizes instability, and the possible futures that may emerge from the durability or instability of particular orderings or compositions (Anderson et

al., 2012; McCann, 2011), and thus offers an enhanced conceptualization of how incumbent regimes can be disrupted.

3. Methods

Our analysis draws on qualitative research conducted in Vancouver during 2014 and 2015 as part of a larger international project analyzing green building innovations as climate change mitigation strategy focusing on cities that *lead* and those that *emulate* such green building practices. Our research objectives focused specifically on understanding how transition processes in green building come into being and develop over time (inspirations and motivations), how they unfold and evolve into practice (or not), as well as on developing biographies of green building innovations for specific case studies including Vancouver.

The data was collected using three approaches: firstly, an in-depth analysis of secondary documents to map relevant actors, processes and projects; secondly, a World Café expert workshop (Preller et al., 2017) with participants from city governments, scientific institutions, businesses and the non-profit sector to identify and map different examples of green building; and finally, 34 interviews with Vancouver green building experts (designers, architects, and policymakers) and site visits (including expert-led tours). Interviews lasted approximately one hour, and were conducted, transcribed, coded, and analyzed by both authors. Our analysis involved predetermined codes that were used across the research project, as well as allowing for inductive coding in the specific case studies, here Vancouver. Both authors coded separately and then discussed the coding of each transcript. In our analysis, the MLP and assemblage thinking have emphasized the role of place, and the relationships and meanings constructed by actors and materials involved in green building,

such as expert testimonies and policy documents, that circulate, intersect, and transmute in specific places.

Next, we introduce Vancouver, and outline how green building has unfolded at multiple spatial scales. Our analysis employs three intersecting assemblage processes, using Li's (2007) framework: 'rendering technical', 'reassembling', and 'authorizing best practices'. We respectively focus on (1) green building certification schemes; (2) novel approaches to urban design and planning, and (3) green building experiments and demonstrations projects ('best' practices and an opportunity to lead the agenda by 'being first').

4. Vancouver: the sustainable city?

Greater Vancouver, in British Columbia (BC) on Canada's west coast, is the largest urban agglomeration in BC with approximately 2.46 million inhabitants. It is a federation of 21 local authorities, one electoral area and one Treaty First Nation which vary considerably in their commitment to sustainable development generally, and green building specifically. Two municipalities frequently seen as green leaders (*systems builders* or *assemblage operators*) are the focus of our analysis: the CoV and UBC.[2] There are, then, multiple layers of governance, which align at times, yet conflict and contradict at others: this geographical distinctiveness sees different ideas about sustainability and green building at the neighborhood, city, Metro region, provincial, federal, and North American scales and through actor changes including elections.

The aesthetic attractions of the coast and mountains surrounding the Vancouver sub-region are regularly attributed as evoking a strong environmental consciousness and responsibility

[2] UBC and the University Endowment Lands are together with other unincorporated areas part of Greater Vancouver Electoral Area A.

amongst its population, essentialized as a '*West Coast Spirit*'. Vancouver's tourism industry and globalized real estate market utilize these in making Vancouver a global consumption city. Vancouver has a long history of environmentalism and sustainability, which has shifted from the 1970s' focus on nature conservation and protection towards more recent concerns of liveability and climate activism. Organizations and policymakers frequently employed this '*West Coast Spirit*' discourse to support and narrate sustainability actions. Such discourses are rarely questioned and contribute to the 'landscape' of how sustainability is understood and subsequently implemented in Vancouver (Table 1).

Alongside the city-region and provincial policies on sustainability and climate change, strategies exist at the Federal level with, for instance, the Federal Government adopting a Pan-Canadian Framework on Clean Growth and Climate Change in 2018. This introduced a national agreement linking multiple scales of governance and set new industrial regulations, increased fuel efficiency standards, and made Federal resources available for installing renewables (MacNeil & Paterson, 2017). Buildings require radical improvements to meet strict climate change targets (MacNeil and Paterson, 2017).

[Table 1 near here]

In the policy regime, a range of political initiatives, including TEAM (1972), Change of Clouds (1990) and Cool Vancouver (2003) reports, have established environmental issues on the municipal agenda (Table 2). In 2011, under Mayor Robertson, the CoV introduced the Greenest City Action Plan (GCAP), reinforcing a narrative of green leadership (Affolderbach and Schulz, 2017). According to the CoV, the GCAP's main goal is to stay "on the leading edge of urban sustainability," representing a step towards the longer-term goal to become a

100% renewable city by 2050 (CoV, 2015). Alongside the CoV, UBC has been recognized for its sustainability research, teaching and practice. Vancouver is regularly considered to be one of the world's most liveable and 'green' cities associated with innovative urban development and planning which inspires other cities (McCann 2011). These discourses often prevent deeper scrutiny of the actual sustainability credentials of such initiatives and claims. The green policy agenda that formed a core of Mayor Robertson's Vision Vancouver government (2008-2018) has been weakened (or *deterritorialized*) under Kennedy Stewart's subsequent council. Stewart, an independent candidate, declared his commitment to affordable housing and a sustainable, carbon-free economy, including a City-wide plan ('Making Room') to increase housing choice in low-density neighborhoods by changing zoning regulations. The challenges of low urban density, and geographical restrictions of the coastline and mountains, means that development strategies over the past 20 years have concentrated largely on infill and the contentious *densification* policy.[3] These 'constraints' restrict urban development and pose challenges, especially for affordability and social justice. Population pressures together with increased costs of living exacerbate the challenge of providing both sufficient *and* affordable housing: between 2005 and 2017, residential property prices in Vancouver increased by 261%. A mortgage stress test and related taxes aim to tackle such overheating (Dahmen et al., 2018). As a result, the City's sustainability strategies have been criticized for creating an unaffordable and exclusionary housing policy. Our analysis emphasizes the relational and place-based nature of what is considered 'green' or 'sustainable': this manifests as an interpretation of being 'greenest' that is *consistent* with, and which reinforces, economic growth in Vancouver, as Table 2 shows.

[3] http://www.metrovancouver.org/services/regional-planning/PlanningPublications/140509_RPA_Density_and_Urban_Growth.pdf

[Table 2 near here]

Thus, capitalism is far from a passive backdrop, but in fact strongly informs and shapes the nature of sustainability transitions, including the kinds of niche practices that are considered translatable. Neoliberal ideals of private property, new markets, innovation, and entrepreneurial economic growth underpin the landscape and regime dimensions in Tables 1 and 2 respectively. In Vancouver, private property ownership and investments in properties (which can remain unoccupied, treated as 'investment' not 'home' by overseas investors) are a specific problem leading to housing market becoming overheated. Actors and institutions actively construct landscapes and regimes to reflect dominant narratives around a (neoliberal) sustainability consensus. In urban sustainability transitions work, a set of core locations, frequently in the Global North, form strong relationship ties between actors, materials, and discourses, consolidating narratives of sustainability with ideas around innovation, technology and entrepreneurialism, whilst delegitimizing 'alternative' ideas (discordant approaches excluded by the sustainability consensus). An assemblage reading provides a means to understand place-specific, existing neoliberalisms 'not as a singular, circulating, encompassing hegemonic force, but as a contingent set of translating logics that have to be enacted in practice' (McFarlane 2011b: 379). Using this context to inform our analysis, we identify different but simultaneously *neoliberal* logics shaping assemblages and guiding transitions in Vancouver. We explore these by examining three green building approaches' differential connections to the mainstream neoliberal construction regime/assemblage.

5. Detecting green building niches in Vancouver

Conditions to transition towards sustainable approaches more generally, and green building specifically, are relatively favorable in Vancouver. Over the past decades, public support for

sustainability has increased and a wide range of actors have established (specific forms of) green building. The CoV and UBC can be seen as both organizational assemblages themselves (DeLanda, 2006), but also as green building *assemblage operators*. They encompass multiple developments representing different innovations at diverse spatial scales, adopting different forms and interpretations of green building, facilitated by local planning regulations, and informed by green building practices in other places (e.g., cities). These have changed over time, as some have transformed policies, practices, and norms, while other examples have remained more marginal.

5.1 Universalizing green building through certification standards: rendering green building technical

Green building gained prominence in Canada in the 1990s, with a focus on energy efficiency and reducing the use, and carbon footprint, of building materials. During this time, the building industry was presented with guides and schemes on reclaiming materials, material recycling, waste, and energy efficiency. The "Building Environmental Performance Assessment Criteria" (BEPAC) was the first environmental assessment program for building in North America introduced at the 1989 International Building Performance Simulation Association meeting in Vancouver (Leslie, 2008) under which 18 buildings were assessed. It influenced subsequent certification schemes including BREEAM, BOMA and LEED. The establishment of a wide range of building rating tools in the North American context in the following years firmly established building certification as a technical means to managing green building. The first pilot version of LEED was developed in the late-1990s and quickly established a common vocabulary and language for green building in Canada. Many respondents noted key actors, for instance the US-Green Building Council's Bob Berkebile

for introducing green building into Canada: he was one of "*the big personalities, that have actually made green building work in North America*" (interview, 2015). The Canada Green Building Council (CaGBC) was established in 2002, and licenses LEED in Canada, which is widely promoted and adopted. Green building experts in Vancouver considered the city to be an "*early adopter of LEED*": "*the people that drove LEED Canada, the CaGBC, were largely Vancouverites and some of the early projects were here in Vancouver*" (interview, 2014). LEED thus helped to territorialize one interpretation and practice of green building in Canada. For some, this early adoption of green building in the region was attributed to the '*West Coast Spirit*' because '*It's just always been kind of an area of heightened environmental awareness*' (interview 2015).

There are over 20,000 certified green buildings in BC, especially downtown Vancouver (Pembina Institute 2017). Accreditation of green building using certification standards is broadly accepted in BC[4] and represents the coding and territorialization of a green building certification assemblage. The widespread adoption of green building tools illustrates the appeal of establishing shared and often standardized approaches. Interviewees emphasized how "*LEED allowed the mainstream to understand, in very simple terms, that a Gold building is better than a Silver building*" (Interview 2014). Certification schemes such as LEED represent social technologies and tools that help translate rationales for governing into practical instruments that can guide action (Wilshusen, 2019), yet whilst such standardization is popular with policymakers it can limit experimentation with different practices and can institute a tick-box exercise for developers. Even though Vancouver's 2011 GCAP enshrined LEED into building bylaws and other municipal policies (Affolderbach and Schulz, 2017),

[4] https://www.pembina.org/pub/bc-green-buildings-2017

participants expressed frustration with LEED, as limiting both innovation and emissions reductions:

> especially in the residential development sector, [builders say] 'just don't make us do LEED, we will do anything [else].' […] It is costing them money. It is complex. It has all these unintended outcomes – But it just hasn't evolved as quick as we have. […] And in essence we have looked at what does LEED give us versus what are the outcomes we are trying to achieve, and it gives us almost nothing. […] It doesn't do anything for climate change. [It] actually doesn't reduce energy use (interview, 2015)

These frustrations illustrate how what happens locally is connected to translocal assemblages beyond the city, as well as limiting the emergence of new practices: using information garnered during European policy visits, the CoV introduced PassivHaus Standards as an alternative to LEED. The CoV introduced a zero-emissions building plan for new buildings in December 2016, and a zero-emissions building catalyst policy in 2018 to support builders and developers to achieve certification from either PassivHaus International or the International Living Future Institute. The Vancouver Building Code revisions require new buildings to be zero carbon by 2030 and existing buildings by 2050. Thus, buildings and ideas of what is green change over time, with reference to practices elsewhere and according to local conditions and accepted norms.

In 2006, UBC introduced its own green building rating system, the Residential Environmental Assessment Program (REAP) for residential buildings. REAP "*ensures lower consumption of water, energy and resources, and higher-quality indoor environments and*

construction practices"[5] compared with standard (North American) residential buildings (at the time). Since 2008, all new UBC constructions and major renovations must achieve LEED Gold. To support this, UBC developed an implementation guide to ensure alignment between LEED certification and UBC policies: LEED provided a framework to reterritorialize UBC's green building practices. UBC's Green Building Action Plan (UBC, 2018) also identifies possible alternatives to LEED certification, such as PassivHaus and Well Building Standard certifications. Benchmarking and certification act as key tools on UBC's campus estate, both for retrofitting and new builds. Despite UBC subsequently promoting their leadership role in green building innovations, historically, this was not the case. Participants reported that in the past, common responses included "*you just are not going to get me to do green building unless every other developer in the Lower Mainland is doing it*" (Interview 2014).

Green building standards and tools can be seen as a form of coding and territorializing an assemblage, whereby green building relations are increasingly fixed by the set of rules established in these schemes (DeLanda, 2011). Such schemes frequently promote a technological transition that emphasize efficiencies. Through anchoring in regulations and policies, technology is established as core to green building transitions. While the green building standards established new green building practices, these are easily aligned with existing building practices in a growth-oriented property market. With property prices rising, building green is often presented as a business opportunity where the Building Code offers trade-offs of (more generous) floor area and building height for 'greener' buildings. From this angle, the reliance on green building rating tools lock-in particular forms of green building, and such certification schemes may restrict more radical thinking, hindering more transformative aspirations.

[5] https://sustain.ubc.ca/campus/green-buildings (accessed 14 June 2020).

5.2 Urban design and planning: reassembling and embedding green building and 'sustainability'

The example of green building assessment tools and certification schemes illustrates the role of governance and policies in coding in green building assemblages, albeit via a narrow focus on *technological* innovations. This has involved reassembling how green building and interpretations of sustainability are understood, moving away from the 1970s green building pioneers' low-tech, deep-green practices, towards technologically-mediated, market-driven 'innovations.' Green building innovations also include innovations in urban planning that draw on green building approaches intended to be more holistic in relation to other elements of urban life (work, mobility, community, etc.). The GCAP coded and territorialized the idea of sustainability in specific ways as it identified clear goals and indicators for progress management and defined best practices to be used in leading climate change action. While tools and best practices were largely derived from elsewhere, it was the hard, quantifiable targets and the time horizon for implementation that were seen as major achievements (Affolderbach & Schulz, 2017).

The laneway house (Figure 1) was a planning 'innovation' attempting to reassemble and embed the idea of sustainability by densifying housing. The CoV adopted laneway housing regulations and guidelines in 2009. The laneway house was developed to densify single-family residential areas through infill development in back alleys with small floor area homes (originally averaging 50m^2).

[Figure 1 about here]

However, combining elements of green building, such as thick insulation, with smaller building envelopes in an area of high real estate values and limited land-space presents challenges. One laneway housing designer emphasized this for smaller properties, given that floor area calculations *include* wall thickness:

> Floor area is gold. That couple of square feet *matters*! For a laneway house, we do thick walls, and [the planners] actually asked us to come back and to shrink the building by 20% because so much of it [got] eaten up by the thickness of these super insulating walls. We said: "*this is an absolutely absurd situation*," where you have the [GCAP] and we are trying to be green and there is this complete disincentive for doing that. (Interview, June 2015)

This meant that building a laneway house to PassivHaus standard, for example, "*is almost impossible: the surface area, the volume ratios, it is just too hard*" (ibid.) so that building to high levels of thermal insulation, widely agreed to be necessary to reduce the energy demands of buildings, can be counterintuitive in cities like Vancouver. Such planning tensions suggest that the green building approaches codified by standards like PassivHaus can be decoded by 'innovations' (such as laneway houses) in other areas – thick, well insulated walls are not compatible with densification and small building envelopes. PassivHaus originated in Germany, but expanded to other geographic locations, including Vancouver, leading to new components in green building assemblages and the possible mutation of PassivHaus approaches as they diffuse to new territories.

Following a review of the first 100 laneway housing developments, the CoV sought to encourage more laneway houses by increasing the floor area and speeding up the permit

process to increase construction of laneway housing. However, the City's data shows that 90% of laneway houses are built alongside a new house: 45% of all new houses are built with a laneway house, while densification of *existing* houses is relatively low (CoV, 2018). It is still unclear whether laneway houses increase land value rather than diversifying the rental market and offering lower cost housing.[6] Further, all laneway houses were found to have at least one parking place with 40% providing more than one parking space underlining how transit assemblages can deterritorialize green building assemblages, as dependency on private, individual transport decodes planning innovations intended to embed sustainable living.

Many respondents recognized UBC for its sustainability actions, and in actively recreating what sustainability means, especially in relation to green building, through its teaching, research, and practice. UBC's curriculum on sustainability has attracted students and researchers to UBC, and many respondents argued that:

> Sustainability is one of the core commitments [of UBC] [I]t is what UBC is known for, for a long time. It is part of its West Coast Spirit. Sustainability has been engrained on the West Coast for a long time. (Interview 2014)

Despite this, the narrative and priority of sustainability can change in relation to changes in personnel and agendas, for instance, a change in the President led to "winds of change" and a reorientation away from sustainability. Understandings and reframing of green building and sustainability occurs as different actors exert their influence and agendas, or move on:

[6] https://www.citylab.com/design/2019/05/vancouver-affordable-rent-housing-home-prices-zoning-density/588916/

> [It] comes down to people – individuals – that really were champions for driving and promoting change. And so, the UBC campus goes back 20 or 30 years where we had individuals […] who were interested in driving change around sustainability. (Interview, 2014)

With new leaders, the role of sustainability moved from being a guiding principle to part of broader agendas on research excellence. A suite of planning strategies guide development at UBC's Vancouver campus which bridge academic research/practice, teaching, and building design. Its 2018 GBAP suggests that UBC is in a unique position to explore new areas of policy, where academic expertise can help create green building solutions that subsequently inform policies at UBC and beyond. While respondents talked of risk and innovation, policy documents promote the use of certification schemes like LEED.[7]

In addition to local actors and their practices, those in Vancouver look to 'elsewhere' to develop a 'consensus' on what green building, and urban sustainability, is. 'Elsewhere' can be *topographically* close, such as cities like Portland and Seattle in the Pacific Northwest which share the 'West Coast Spirit', or *topologically* close (Prince, 2017), for instance "*looking to Europe: Copenhagen for the cycling, Freiburg for the green building*." This view represents how some policymakers labored to gather what they saw as the most sustainable global practices of green building, to be assembled in Vancouver to quantitatively achieve the sustainable city. Looking to such 'elsewheres' represents the view that "*what's going on in Europe [is] far more advanced.*" This dynamic was seen as an exchange of ideas and practices, as policymakers in Vancouver drew inspiration from 'other' cities (albeit within a limited range of countries in the 'Global North), but it was also recognized that those

[7] https://planning.ubc.ca/sites/default/files/2019-12/PLANS_UBC_VCampusPlanPart22014.pdf (accessed 18 June 2020).

cities also attempted to "*outgreen Vancouver*," so that green building is dynamic and emergent relationally between place-based assemblages.

5.3 Green building experiments and demonstration projects: authorizing best practice and being first

Demonstration projects and urban experiments have been widely used to promote urban sustainability globally, and represent 'referencescapes' (McCann, 2017) for sharing 'best practices' between (sustainable) cities. This is similarly the case for green building in Vancouver where individual buildings, as well as neighborhood developments, have been used to demonstrate ambitious, and often varying, visions of greening. Some of these take the form of experiments, whereas others were designed as flagship developments to explicitly signal green leadership (Affolderbach et al., 2019). Being 'first' is used by cities to position themselves as green leaders, often linked to entrepreneurial opportunities (McCann, 2013). Vancouver boasts many 'firsts' – from being the 'greenest city' to the first convention centre in the world to receive LEED Platinum certification: the city, its businesses and institutions are competing to be first, across multiple scales.

South-East False Creek (SEFC) is a green neighborhood developed on the waterfront in Vancouver. Early aspirational plans outlined a 'sustainable community', yet its eventual development was driven by the need to accommodate athletes for the 2010 Winter Olympics. The development was awarded LEED Platinum (2011) at the neighborhood level, the second neighborhood globally at the time to meet Platinum standard. The ideas embodied in SEFC were based on 'best practices' sought from 'elsewhere', motivated by Vancouver's desire to be the 'greenest city' globally, and to inspire the next generation of green cities.

> If we adopt enough best practices, we'll become a sustainability city. We built enough storm water swales, if we have enough LEED or BREEAM buildings we will be a sustainable city […] you know we looked at other Olympic villages and we looked at other sustainable developments out there and tried to replicate it. (Interview, 2015)

This approach to quantity embodies a neoliberal approach to being sustainable, whereby sustainability can be achieved from having *more* green buildings, or *more* electric vehicles, *more* innovation, yet without questioning ever-growing material consumption. It also glosses over the place-based specificities of sustainability: replicability is a core concept within STR yet its weakness is in not recognizing the multiple, layered, and relational ways that being green or sustainable combines the 'in-heres' with the 'out-theres' (Peck, 2015). Such best practices do discursive work in identifying which practices are seen as consistent with urban sustainability initiatives, and what types of green building are accepted (or not).

The CoV was consequently keen to use SEFC in city marketing activities, promoting new-found skills and technologies to attract investment, as then Mayor Robertson (2010, in Westerhoff, 2015: 95) outlined:

> [This] demonstrates that we can be world-leading in green buildings. […] this in turn should attract capital, green capital, and make this city even greener. This is a direct representation of putting capital into green projects, investing in these new technologies, and creating something that is world-leading.

Rapoport and Hult (2017: 1782) discuss the mobilization of global norms of urban sustainability and note that what is marketed as sustainable is that which "enhance(s) competitiveness in the search for economic growth and investment capital." What is marketed as sustainable in the built environment often is *not* sustainable, and frequently relies on new technologies at the expense of wider socio-environmental change. One respondent suggested that decisions made at SEFC to incorporate 'luxury' additions (e.g., Italian marble worktops, expensive windows), resulted in a popular narrative that negatively equated 'green' with expense. Best intentions in green building practices can create circumstances and norms that undermine or decode that assemblage, weakening the chances of sustainability transitions occurring more widely in green building.

UBC has similar ambitions of 'being first' and demonstrating leadership, drawing on research and innovation at the University. Respondents suggested there was a culture of innovation and risk-taking, and that 'being first' was a strong motivational factor:

> I think we're going to continue to try to be sort of the 'first' for a lot of things. I think we're good at it because we're willing to just jump in and do something when we know that the rest of the world hasn't tried it yet. (Interview 2015)

Being first was seen to influence building practices beyond the University and to establish new forms of 'best practice'. The CK Choi building (1996) was mentioned by many as being particularly inspirational, and an early risk for the University. One respondent noted that "*a lot of buildings took inspiration from the CK Choi building […] beyond the UBC campus*" which demonstrates how:

> [UBC has] been good at embracing the risk that comes with doing different things. […] when you look at the CK Choi building I mean that building does not have a municipal sewer connection […] that's a huge risk. (Interview 2015)

[Figure 2 about here]

However, although the CK Choi building was cited for its inspirational off-grid design, it has rarely influenced the design and construction of subsequent buildings and failed to be mainstreamed or replicated. Instead, recent innovations at UBC have been technologically- and market-driven, using now mainstream certification standards and technologies such as solar panels, as opposed to low impact or passive design technologies. The 'Tall Wood Building' is one recent 'experiment,' indicating this shift in green building away from off-grid and more towards mainstream innovation practices. Jim Carr, Canada's Minister of Natural Resources, described it as a:

> remarkable building, the *first of its kind in the world*, […] another shining example of Canadian ingenuity and *innovation* — opening up a world of possibilities for our forest and construction industries (emphasis added).[8]

This building pushed 'the envelope' of what was deemed possible in wooden construction at the time and involved UBC working in partnership to support "*designers and contractors [to move] beyond their comfort zone in a way that not a lot of owners would*." (Interview, 2015). The Tall Wood Building has been used to market Vancouver's forestry and construction sectors, and UBC itself. This, then, transforms understandings of wooden building, away

[8] http://dailyhive.com/vancouver/ubc-tall-wood-building-worlds-tallest (accessed 13 June 2018).

from sustainable and small-scale uses of wood as a substantively different material from the steel-glass-concrete complex central to mainstream building, instead promoting wood as another economic opportunity. Despite recognizing that the use of glass and concrete in many 'green' buildings is "*not a smart way to build*" (interview, 2015) it has nevertheless become part of the mainstream urban sustainability consensus.

The specificity of building green *within* North America was recognized by some participants. While examples *have* been drawn from elsewhere internationally, there was a wider feeling that:

> The North American context is fundamentally different. The challenges are different, the politics are different. In the States, you cannot even talk about Europe. You cannot even say: in Copenhagen, they do this, because people get so turned up […] If you want to point to another example, in North America, maybe you can, but do not talk about Europe. (Interview, June 2015)

This suggests powerful political ideologies and geographical imaginaries continue to influence sustainability practices (including building), and the nature of what constitutes appropriate places to learn from. Thus, the 'best' practices adopted by cities like Vancouver typically emerge from an epistemic community of cities in particular geographical locations that interpret sustainability as economic opportunity.

6. Discussion: Differential logics driving green building in Vancouver

Here we draw out the implications of our examples above, specifically that where the idea of green building has moved from niches into the mainstream or regime, it has done so in a way that constitutes a consolidated but *conventional* approach to green building that is consistent

with existing (non- or very light-green) practices. Our analysis suggests that local scale niche and regime green building activities are enmeshed to different degrees with wider, global and universalizing practices of sustainability through an urban sustainability assemblage that offers a common repertoire of places, projects, and discourses of what sustainability and green building are, and *are not*. Our research identifies that practices that do not align with mainstream building approaches are presented as one-off examples or actively resisted, thus limiting the forms green building takes.

The different approaches to green building enacted by two key institutional actors in Vancouver, the CoV and UBC, we argue, are founded on differential logics, but result in the same outcome: green building that is consistent with, and constitutive of, neoliberal economic growth (Table 3). In both institutions, these logics reinforce neoliberalism albeit from different perspectives: one promotes an urban entrepreneurial approach whereas the other is driven by taking risks, innovating, and experimenting. They reinforce each other to locate Vancouver as a place that attracts mobile, educated and 'green' lifestyle workers and sustainability capital that relates to other cities with similar characteristics, yet without changing the mainstream construction sector nor significantly enhancing building sustainability. Vancouver represents a city with a strong sense of self-identity as a global city with heightened responsibilities in responding to climate change, drawing on the '*West Coast Spirit*' narrative. However, these 'responsibilities' often play out in predictable, neoliberal ways, which is frequently commensurate with existing practices tied to high material consumption and neoliberal ideals.

[Table 3 near here]

Assemblage thinking brings to the fore the ways that histories shape places contemporaneously and adds pluri-temporal dimensions to STR. Accordingly, elements like '*West Coast Spirit,*' planning histories, and extant processes of construction shape processes of *green* building. As McFarlane (2011: 652) notes, there are "multiple and interrelated temporalizations of capital, social relations, cultures, materials, and ecologies that produce the city, but that have been and continue to be resisted and subject to alternative possibilities." The 'green' building assemblage, as currently formatted, is relatively stable, and precludes certain places, actors, materials, and practices from playing a central role in the assemblage and thus limiting sustainability transitions. Taking an assemblage approach better allows for understanding relationality *within* assemblages but also *between* assemblages, thus highlighting the tensions between green building and transport, or green building and energy, bringing to the fore the idea of how transitions can be enabled or hindered transitions by the interactions between multiple places and sectors. As DeLanda (2006: 3) argues, 'at all times we are dealing with assemblages of assemblages.'

In terms of niche-regime relationships, green building experiments and demonstration projects in Vancouver present an interesting case. They constitute often protected and well-nurtured niches that are usually *not* set up to transform the regime. Rather, they comprise deliberate niche projects that demonstrate significantly different green building futures that exist in parallel to the existing regime rather than challenging it and offer further opportunities for capital accumulation through green construction. While these projects have not transformed the regime, the narrative and practice of demonstration and flagship projects (i.e., 'being the first') has become an established cultural practice at the regime and landscape level, especially as it can be co-opted by the regime for city marketing and inward investment purposes.

Thus, regime dynamics affect the niche innovations that are translated to the regime, so that, for instance, aspects of niche projects that are more amenable to the mainstream construction sector have been coded by certification schemes like LEED. Even though assessment and certification tools have been influenced by green building practices developed by early deep green pioneers, they now align closely with the existing construction regime. In applying such certification approaches to green building, growth coalitions 'render climate change practical' (Okereke et al., 2009: 76), using techniques that align with the corporate framing of sustainability as improved (eco-)efficiency (Freidberg, 2014). Thus, adopted definitions of sustainability in cities like Vancouver, are increasingly used to reinforce local growth dynamics and to foster urban competitiveness geared towards the regional and the global level.

We argue that a relational view of niche-regime relations within transitions is required, to acknowledge the complex and entangled ways that niche ideas and innovations emerge and evolve, rooted in specific spatiotemporal conjunctures. By combining assemblage thinking with the MLP we can expose how transitions are assembled in places, and that the nature of such transitions are dependent on place-based narratives and histories that shape how new ideas develop. In this way, the form that niches take are much more embedded *within* the regime than is often recognized in STR, so that what is considered sustainable or green in Vancouver might not be seen as such in other timespaces, or cities / geographical contexts. As McClintock (2018: 584) argued, the ways in which one space is seen as sustainable, green, or liveable may render another unliveable or uninhabitable: thus, what is considered 'green', or 'niche', is *always* relational. There is not a global standard of greening, but certain spaces always embody greater (or lesser) degrees of 'sustainability' against which the

'other' can be distinguished. Conclusively, rather than thinking of niche activities as an either/or of 'fit and conform' versus 'stretch and transform' (Smith & Raven, 2012), we suggest that a relational approach to understanding transitions is better, recognizing the fluid processes of fitting and stretching that acknowledges spatial specificities and temporalities: assemblage thinking offers this more elastic dynamic to be recognized. This suggests a stickiness between *places* and the *nature* of transitions: different histories, actors, practices, materials combine with contemporary politics and practices which frame emerging visions of the future to create place-contexts that are acquiescent to certain types of transitions unfolding, which may or may not enhance sustainability.

7. Conclusions

Taking a relational approach allows us to expose the materiality of sustainability transitions, to understand the place-based interpretations and practices of sustainability, and to consider the processes of change (and stability) exerted by best practice sharing. Thus, sustainability is contested and negotiated in an evolving and interconnected context-specific process but remains closely wedded to neoliberal capitalist ideologies. Focusing on the ways that capitalism produces specific spatial forms and political economies highlights the spatiotemporal nature of transition dynamics. Niche-regime relations, moreover, occur within specific conjunctures – there are dense bundles of connections between niche and regime in specific temporal and spatial contexts. Empirically, our examination of Vancouver suggests that neoliberal and urban entrepreneurial logics limit *radical* change, which leads us to argue that STR needs to focus more on the nature and interpretations of *sustainability* guiding such transitions to expose its (frequently) neoliberal and anthropocentric tendencies, and to engage in problematizing how vested interests of the regime can be challenged

through discordant debate, rather than expecting that regime actors can adopt niche practices without significant change on their part.

There are many different definitions and practices of green building in Vancouver, yet a tendency towards neoliberal discourses of profit, developer choice and prerogative, and technological innovations has dominated rather than witnessing a radical shift in construction practices. Key actors in Vancouver have acted to promote certain expressions of green building that align with mainstream practices, and which envision green building as a means for bolstering capital accumulation, thus failing to meet more progressive expectations of green building. Vancouver's particular 'brand' of sustainability thus follows norms established in the Global North where sustainability acts as a mechanism for further economic, entrepreneurial, and technological innovation expansion. This techno-econocentric approach reinforces normative patterns of 'modern' developmentalism and economic growth without critically reflecting on what may be necessary to respond to the multiple environmental (and social) crises. Existing examples of more transformative building types and practices (or even elements of such) have not been mainstreamed into policy or practice. The processes of assemblage that we employ here show how the labor involved in assembling green building in Vancouver has witnessed a material shift away from more sustainable practices contributing to a cumulative shift in building approaches in ways that fit the contemporary economic imperative: neoliberal profit seeking through property development consistent with existing construction practices.

We argue that contrary to the commonly marketed image of Vancouver, more radical forms of green building alter-assemblage remain a niche activity, while flagship developments (e.g., SEFC) influence the mainstream only in ways that are compatible *with* the mainstream, and which frequently fit with established neoliberal standards. Indeed, the concept of

mainstreaming may be problematic in that radical dimensions get lost when mainstream actors and growth coalitions co-opt such ideas and initiatives.

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