
– INTERVENTIONS

– CONTRADICTIONS OF THE CLIMATE-FRIENDLY CITY: New Perspectives on Eco-Gentrification and Housing Justice

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Abstract

As local governments and corporations promote ‘climate friendliness’, and a low-carbon lifestyle becomes increasingly desirable, more middle- and upper-income urban residents are choosing to live near public transit, on bike- and pedestrian-friendly streets, and in higher-density mixed-use areas. This rejection of classical forms of suburbanization has, in part, increased property values in neighborhoods offering these amenities, displacing lower-income, often non-white, residents. Increased prevalence of creative and technology workers appears to accelerate this trend. We argue that a significant and understudied socio-environmental contradiction also occurs where the actual environmental outcomes of neighborhood transformation may not be what we expect. New research on greenhouse gas emissions shows that more affluent residents have much larger carbon footprints because of their consumption, even when reductions in transportation or building energy emissions are included. We describe an area in Seattle, Washington, the location of Amazon’s headquarters, experiencing this contradiction and show a distinct convergence of city investments in low-carbon infrastructure, significant rises in housing prices and decreases in lower-income and non-white residents. We conclude with a discussion of a range of issues that require more attention by scholars interested in housing justice and/or urban sustainability.

Introduction

This Interventions piece is based on growing recognition that improvements to urban nature and sustainability are intimately tied to gentrification and displacement (Dooling, 2009; Quastel, 2009; Checker, 2011; Immergluck and Balan, 2017). We especially wish to highlight one understudied, and we argue, not fully understood form of ecological gentrification associated with ideas of ‘low-carbon’ or ‘climate-friendly’ neighborhoods. While it is connected to forms of ecological gentrification that are more widely studied (for example, parks, green space, gardens, trails, brownfield remediation), we argue that there are unique features in both the drivers and outcomes of neighborhood change that accompany a focus on climate-change mitigation through urban design. Ultimately, we aim to provide evidence that a new socio-ecological *contradiction* accompanies the problem of displacement, where the intentions of low-carbon urban

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development (reducing greenhouse gas [GHG] emissions of urban residents) may not be what is actually occurring; rather, emissions may be increasing. Decarbonizing cities is, of course, essential and urgent if the catastrophic effects of climate change are to be averted. Our analysis is important in this effort, because the pursuit of the low-carbon city is accompanied by several shifts in urbanization that have a direct impact on who lives in the city, how they live, and with what environmental outcomes. The question we explore here, therefore, is who benefits from early steps in that direction, and at what costs—social *and* ecological?

The specific purpose of this Intervention is threefold: (1) to describe the ways in which urban efforts to be more ‘climate-friendly’ are contributing to new forms of ecological gentrification; (2) to examine the role of creative and technology industries and professionals in this process; and (3) to explore the actual environmental outcomes associated with this type of gentrification in terms of recent innovations in GHG modeling. In the sections that follow, we first identify key insights provided by ecogentrification studies that are relevant to an analysis of urban efforts to reduce GHG emissions. We argue for an expanded and more specific analysis of the intersections of carbon politics and gentrification as a particular form of ecological gentrification occurring in many North American cities.¹ We then consider economic development trends that appear to accelerate this process by attracting environmentally minded professionals—specifically, well-educated, upper-income, highly specialized workers who are concerned about their environmental impact—to such neighborhoods. Next, we review recent innovations in consumption-based approaches for GHG emissions accounting, which suggest that cities have greatly understated the emissions associated with higher-income urban residents’ consumption, even when they live in dense, seemingly low-carbon urban areas. We illustrate this contradiction with an empirical investigation of several centrally located neighborhoods in Seattle, Washington, that offer an ostensibly ‘low-carbon’ lifestyle and are attracting wealthier residents whose consumption is likely to lead to higher carbon emissions than that of their lower-income neighbors. We conclude with a discussion of the theoretical innovations, data needs and political projects that our provocation requires of urban studies scholars.

Ecological gentrification in the climate-friendly city

During a 2017 interview with The Atlantic Monthly group’s CityLab blog, New York City’s High Line park co-creator, Robert Hammond, admitted that ‘ultimately, we failed’ to build an urban park that serves the needs of existing residents (Bliss, 2017a). Despite the creators’ best intentions to create a revitalized urban green space that would benefit local residents, the High Line has become a premier destination for mostly white tourists visiting Manhattan (Reichl, 2016) and is widely understood as a key environmental amenity driving up housing prices in the area (Millington, 2015), epitomizing what is often called ecological gentrification. Hammond went on to say, ‘I want to make sure other people don’t make the mistakes we did, and learn how to deal with these issues’ (Bliss, 2017a). This candid and public admission of failure on the part of the High Line creators suggests a need for continued attention to the ongoing processes of eco-gentrification to better understand the problem and its solutions.

Sarah Dooling coined the term ‘ecological gentrification’ in 2009 to describe the processes by which homeless populations are displaced from urban parks as part of ecological improvement projects. The term has since been more widely deployed to

1 We are not suggesting that all forms of ecological gentrification are centrally about climate change or carbon politics, but rather that in some areas where a policy focus on climate change and/or carbon predominates, a particular type of ecological gentrification is occurring, with unique drivers and outcomes that produce specific contradictions and unintended outcomes.

describe the vicious cycle of economic disinvestment and environmental degradation that devalues urban space, followed by subsequent reinvestment and environmental remediation that increases property values and displaces exiting residents. Although many terms are used to describe this phenomenon—eco-gentrification, green gentrification and environmental gentrification—the sum of the research demonstrates that urban environmental improvements often cause the displacement of lower-income (often non-white) residents by higher-income (typically white) ones (Dooling, 2009; Quastel, 2009; Checker, 2011).

In the mid-2000s, some scholars were calling attention to increasing adoption and promotion of ‘win-win’ sustainability and climate-oriented policies in high-technology and knowledge-based urban economies (Krueger and Gibbs, 2007). At roughly the same time that While *et al.* (2004) were discussing the political benefits of a ‘sustainability fix’ and the rhetorical greening of urban governance, Gibbs and Krueger (2007) pointed to the inherent contradictions of growth-promotion strategies that espoused an environmental ethic. Noting a trend that would later intensify and become more acutely focused on climate, Gibbs and Krueger suggested that the success of the new green urban economies would be ‘intimately bound up with quality of life issues for elite groups of high-tech workers’ whose upward pressure on housing costs would force lower-paid service workers to suffer from ‘poor housing, longer commute times, and poor working conditions’ (*ibid.*: 117). As this trend became increasingly evident, researchers helped to spur a new research agenda that showed the ways in which environmental concerns, including those related to climate change, were fast becoming a justification for displacement and eviction of vulnerable populations.

The contradictions of sustainable development, smart growth and densification are a key part of this paradox. Quastel *et al.* (2012) note about ‘sustainability as density’ that ‘dense and walkable central city redevelopments are marketed to urban elites and lead to the subsequent takeover of former working-class districts by the “new” middle class of quaternary-sector and university-educated gentrifiers’ (*ibid.*: 1060). As the focus on climate mitigation and adaptation becomes an increasingly ubiquitous element of urban policy via strategies such as densification, mixed-use development and transit-oriented planning, it is absolutely necessary to think critically and comprehensively about the ways GHG emissions are part of these various planning efforts.

One response to this problem has been Curran and Hamilton’s (2012) suggestion that if environmental improvements were ‘just green enough’ (i.e. created ecological improvements, but not at such a scale as to attract massive new investment), neighborhood change would be modest enough to avoid major shifts in real-estate valuation. Specifically, the ‘just green enough’ strategy requires ‘projects that are explicitly shaped by community concerns, needs, and desires, rather than either conventional urban design formulae or ecological restoration approaches’ (Wolch *et al.*, 2014: 241; see also Curran and Hamilton, 2012). This could be applied to any number of the ecological gentrification problems that have been widely studied in the literature, including parks, gardens, green spaces, natural grocery stores and urban forests (see, for example, Quastel, 2009; Pearsall, 2010; Checker, 2011; Curran and Hamilton, 2012; Gould and Lewis, 2012; Bryson, 2013; Goodling *et al.*, 2015; Anguelovski, 2016), where the connection between a new environmental amenity and the potential for displacement is clear. But how this applies to more comprehensive and widespread urban climate efforts is less clear. Given the rising sense of urgency to act on climate change, and the subsequent focus on GHG emissions as an object of policy concern, we argue that climate change must become a more central feature of gentrification and housing justice studies. We must also consider the actual environmental outcomes (in addition to the significant social concerns) that result from climate-change policies in ways that are useful to both scholarly research and real-world policymaking.

- Conceptualizing urban climate-change politics as a specific type of eco-gentrification

We build on this literature to call for a more explicit focus on forms of ecological gentrification that occur beyond traditionally ‘green’ urban ecological interventions, towards those that are associated with the ‘gray’ ecologies of urban density and sustainability, such as alternative transit, mixed-use density and energy efficiency efforts (Wachsmuth *et al.*, 2016; Cohen, 2017; Wachsmuth and Angelo, 2018). More specifically, we argue that there is a new and coherent set of gray ecologies (*ibid.*) that have consolidated around ideas of the ‘climate-friendly’ or ‘low-carbon’ neighborhood, which we define as urban planning and neighborhood design techniques that are meant to encourage residents to lower their personal carbon footprint.² This is most often done by changing, through interventions in the urban form, the ‘day to day activities of household’ (Salon *et al.*, 2010: 2032), such as shifting one’s mode of transportation away from car use, living in mixed-use, dense, walkable environments, and choosing energy-efficient housing. While there are several models for low-carbon development offered by, for example, C40 and ICLEI (Local Governments for Sustainability), individual cities pick and choose from a variety of policy options, climate programs, infrastructure investments and public education campaigns according to their own budgetary constraints, organizational capacities and policy priorities. These efforts are coupled with GHG measuring and accounting techniques employed by local governments to create a new form of urban carbon politics (Rice, 2010; While *et al.*, 2010; Jonas *et al.*, 2011) with unique and specific drivers and outcomes of gentrification.

While we recognize that some scholars have already shown that urban energy and infrastructure policies are increasingly characterized by a narrative of climate mitigation and adaptation (While *et al.*, 2010), we argue that it is the increasing emphasis on carbon footprints and a parallel policy shift towards a focus on carbon that requires further consideration in relation to housing justice. This is important on two fronts. First, the urgency of climate action adds further weight and political salience to the idea that sustainability-oriented policy ignores social justice and will likely promote gentrification (Lubitow and Miller, 2013). Secondly, the quantifiable nature of GHGs allows a tangible target for urban climate policies (Rice, 2014a) that has yet to be fully interrogated for its actual environmental outcomes.

Therefore, we argue that urban carbon politics produce a distinct form of gentrification, as middle- and upper-income residents reject classic forms of suburbanization in favor of residential choices that afford them access to low-carbon infrastructure and mixed-use urban density. There is a need to expand the eco-gentrification literature to more explicitly and directly analyze urban development policies oriented around decarbonization, as they materialize through a specific form of urban carbon politics. In particular, urban climate politics involves ‘the increasing prevalence of carbon-centered policy mechanisms in city planning, including the use of GHG inventorying tools, adoption of GHG emissions reductions targets, and creation of climate action plans’ (Rice, 2014a: 385) that, while related to broader efforts at urban sustainability and greening, are distinct.

This form of eco-gentrification is distinct because, first, carbon politics touches almost *all* aspects of urban design and urban living, as opposed to specific greening projects or redevelopments in a city (parks, gardens, brownfield remediation). The growing concern for mitigating climate change and one’s own carbon footprint that is now widely accepted by many urban professionals, and encouraged by city planners, is central to the process by which ‘urban professionals can feel altruistic about riding their bicycles to work’ (Quastel, 2009: 719). In particular, walkable, bikeable, mixed-use

2 The term ‘climate-friendly’ is also used by many urban professionals involved in climate-change policy and planning.

communities, ideally with higher levels of density than have been typical in more suburban-style developments, have become popular in the pursuit and marketing of ‘climate-friendly’ urban lifestyles, and a favorite of new urbanists such as Jeff Speck. As Speck (2012: 55–6) argues, ‘It turns out that trading all of your incandescent lightbulbs for energy savers conserves as much carbon per year as living in a walkable neighborhood does each week’.

These ideas—more walking, more biking, denser development—are at the core of nearly every climate action plan in North American cities. Leading planners and policy networks offer up best practices and ready-made toolkits for low-carbon urban development (for example, ICLEI and the US Conference of Mayors—see Calthorpe, 2011), advocating urban retrofits that yield four-, five- and six-story high developments fronted by busy sidewalks, wide bike lanes and public transit. Since 2009, for example, the number of protected bike lanes has doubled every year in the US (People for Bikes, 2016) and public-transit use is breaking records (APTA, 2015). The implication is that while specific greening efforts might produce displacement at a *proximate* scale, there is the potential for gentrification associated with low-carbon development to cause gentrification *at a much broader level* within and across the city.

There are also distinct supply and demand pressures operating at the intersections of ecological gentrification and urban carbon politics. On the one hand, supply-side drivers include increased interest on the part of developers and local governments in building dense, ‘eco-friendly’ housing and neighborhoods, as they have proven to be quite profitable in some areas (Bagley and Gallucci 2013; Sah *et al.*, 2013; Seto *et al.*, 2014). These include Leadership in Energy and Environmental Design (LEED) certified buildings, eco-homes, eco-districts and even developments marketed specifically around ideas of low-carbon living—such as Portland’s ‘Carbon 12’ condominium development.³ LEED construction, in particular, has been connected to gentrification in several North American cities, especially as it comes to be a significant and widely recognized marker for ‘climate-friendly’ building design (Bunce, 2009; Cidell, 2009; Curran and Hamilton, 2012). This amounts to a new form of ecological urbanism being marketed and sold in many North American cities. Again, while related to other forms of urban greening, this emphasis on gray infrastructures is distinct from longstanding forms of urban greening traditionally associated with environmental gentrification, as it is conceptualized specifically around the idea of lowering carbon footprints.

On the other hand, in terms of demand-side drivers of gentrification associated with low-carbon living, there is increasing alignment between urban development and young professionals’ desire for environmentally friendly urban living as a key motive for choosing to live and work in ‘low-carbon’ neighborhoods (Florida, 2013; Cortright, 2014; Florida 2014). This alignment, which began in the 1990s with the emergence of a ‘smart growth’ movement backed by organizations such as the Environmental Protection Agency and the Sierra Club, has continued to deepen and grow in prominence (Grossarth and Hecht, 2007; Sierra Club, nd). Here, economic development priorities actually merge with consumers’ subjective preference. This corresponds with new studies on the youngest people in the workforce, who place increasing value on *where* they live relative to *what* they do (see, for example, Cortright and Coletta, 2004; Schrock and Jurjevich, 2015). Of course, the trend to ‘revitalize’ and densify strategic urban areas is not driven by climate-change concerns alone—hardly any social action is driven by a single motive—yet there is a crystallization of ideas around what a ‘climate-friendly’ lifestyle looks like.

Miriam Zuk, Director of the Urban Displacement Project at UC Berkeley, noting the clear connection of climate change with gentrification, argued in her 2015 blog entry

3 See <http://carbon12pdx.com/> (accessed 3 December 2018).

entitled ‘How to prevent gentrification and displacement in the fight against climate change’:

Where you live makes a big difference in your access to public transit, and to opportunities. Right now, all over the state, we’re seeing displacement and gentrification; lower-income people are being pushed out of their neighborhoods and away from that access (Zuk, 2015: npn).

Through this focus, we find a clear and direct relationship between gentrification, the desires of some urban residents for (what they understand as) low-carbon living, and municipal efforts to address climate change. We wish to sharpen the focus on low-carbon policy in US cities and processes of gentrification, which could be conceptualized as a type of *carbon gentrification*. We define carbon gentrification as middle- and upper-income residents’ preference for neighborhoods that offer the opportunity to walk, bike and ride transit in a mixed-use, dense urban environment, as a means to lower their carbon footprint, which are often, but not always, centrally located in urban areas, leading to a rise in housing prices for those areas. Bouzarovski *et al.* (2018: 2) make similar observations, stating that ‘the phenomenon of “low-carbon gentrification” ... is seen as a politically embedded process of changing the social and spatial composition of urban quarters under the pretext of climate change and energy efficiency imperatives’. Long and Rice (2019: 1002) further implicate low-carbon development as a gentrifying and even segregating force, because ‘the ability to live a climate-resilient lifestyle is a matter of income, education, and access’ and increasingly adds the ‘security of living in insulated districts that are less susceptible to climate hazards’. Given the rise of this phenomenon, we argue that it is crucial to understand how one of the most significant environmental challenges society currently faces (climate change) and one of the fastest-growing domains of urban policy (carbon governance) are implicated in everyday struggles over access to housing. The idea that by biking to work, walking to dinner and living in a dense urban environment urban residents can ‘do their part’ in the fight against climate change, may also mean that these actions are driving up housing values in neighborhoods perceived as being low-carbon. We turn our attention, next, to a class of urban workers—young creative- and technology-industry employees—who appear to accelerate these negative outcomes as they simultaneously desire a low-carbon lifestyle and have the income to afford it.

Creative and technology industries, the rise of the environmentally minded professional, and eco-gentrification

As noted, several supply and demand factors contribute to ecological gentrification associated with low-carbon development. Yet we wish to highlight a key political economic shift that we have observed appears to accelerate this trend: an increased presence of creative and high-tech industries and their workers. As economic activities in many urban areas shift towards the knowledge economy (particularly high-tech and startup firms), there is a parallel rise in employment opportunities for a specialized class of educated urban professionals who are filling the higher salaried jobs of an increasingly bifurcated tech sector and creative workforce (FRED, 2016; Mahmoudi and Levenda, 2016). These workers often exhibit a strong desire to live an eco-friendly urban lifestyle—and in particular a preference for urban mixed-use, high-density developments and alternative-transit-oriented communities that allow them to walk or bike to work (Cortright, 2014; Florida, 2014). As Florida (2013: npn) notes, ‘More and more techies are choosing to live in denser, livelier, and less car-dependent urban locations, where there are more amenities’. In referring to this group broadly as ‘techies’, Florida indirectly acknowledges that workers in the tech industry have become the more politically and economically influential members of the creative class, just as

early critics of his work suggested (see for instance, Peck, 2005; Zimmerman, 2008). This is not to say that other professionals and members of the creative class don't display similar lifestyle preferences, but tech workers' higher salaries and consumer power makes them the poster children of a growing labor force that—following their sector's proclaimed environmental ethos—exhibit a desire for environmentally conscious lifestyles (Murugesan and Gangadharan, 2012; ITIC, 2017). The growth of this labor force, which we call the environmentally minded professional class, has been widely acknowledged by mainstream media and publications that monitor urban growth trends (Conlin, 2011; Florida, 2013; Cortright, 2014; Florida, 2014; Lerman, 2016a). At the same time, there are other individuals in many professions that are interested in moving back to the central city, although not all of them are primarily motivated by environmental concerns. Yet, as we demonstrate here, the literature does point to a particular class of creative and tech workers who are part of broader public-private policy shifts towards greening and decarbonizing the city, while simultaneously promoting white-collar economic growth. This is an active agenda to green the city and make it 'creative' in a way that palliates environmental/climate concerns and safeguards growth.

In terms of the culture of these gentrifiers, the technology workforce today differs quite markedly from that in the 1990s, when suburban tech campuses predominated. Today's creative and technology workers tend to be relatively young, unmarried, child-free, and show a tendency towards moving to gentrifying neighborhoods proximate to the central city (Moos, 2014). These young professionals are prized by tech companies and startups because they operate well within a neoliberal knowledge economy that prizes mobility, flexibility and social capital. Furthermore, recent research has shown that young college-educated (YCE) migrants appear to place greater relative value on non-economic factors when selecting where to live and work (for example, political milieu, quality public transportation, walkability, food choices) compared to employment opportunities (Jurjevich and Schrock, 2012). During the late 1970s and early 1980s, for example, annual employment growth explained about 75% of the variation in net immigration of YCEs. In more recent periods, however, that relationship has fallen to about 50% (Jurjevich *et al.*, 2016). The environmentally minded professional class certainly exhibits the socio-demographic characteristics that often accompany gentrifying populations. In Seattle, for instance, the mean annual salary of computer, IT and mathematical occupation workers is 78% more than that of all workers, while in Austin, this same group earns 71% more than the mean annual salary (BLS, 2016a; 2016b). Both of these cities boast college educational attainment levels that are more than 20% higher than the national average, reflecting a broader trend in the movement of educated workers to US technology hubs (CBRE, 2016).

In an effort to recruit the eco-professional class, creative and technology firms have strategically and intentionally begun appealing to their desires for 'green' urban living (Greenberg, 2015) and using this as part of the green marketing of their companies more generally. Many technology and startup firms are (re)locating from their traditional suburban campuses to urban areas that make use of low-carbon infrastructure, higher levels of density and mixed-use development and better access to diverse food, exercise and recreational options (Fisher, 2015; Slavin, 2015; Florida, 2016). It is quite common for tech- and creative-industry firms to explicitly market themselves as working for environmental sustainability and climate-change mitigation. Firms have also begun touting the benefits of promoting a culture of health, creativity and sustainability in the workplace, with many companies opting to provide sustainable food options, 'worker wellness' programs and opportunities to engage with and promote various aspects of corporate sustainability (Delmas and Pekovic, 2012; NBS, 2013; Lerman, 2016a; Stringer, 2016).

With business support, city planners in several major North American cities have spurred the 'revitalization' of inner-city neighborhoods, the implementation of

smart growth and smart urbanism and public-transit and bike-lane expansion—an economic development agenda that has slowly merged with a low-carbon politics (Harvey, 1989; 2001; Hackworth, 2007; Tretter, 2012). Further, the aestheticization of the central city in the late 1990s and 2000s allowed a highly visible mobilization of capital at a time of heightened interurban competition, serving as an important mechanism for cities to distinguish themselves through branding and marketing (Brenner and Theodore, 2002; Scott, 2011). But has the success of these policies in attracting young, elite workers to densified central areas translated into meaningful reductions of GHG emissions? This is the question we turn to next, as we argue there is a new and significant socio-environmental contradiction emerging in the climate-friendly city.

Greenhouse gas emissions and the income effect

We turn now to an examination of the actual environmental outcomes that are likely to accompany these shifts in urbanization. We argue, drawing on emerging trends in the GHG modeling literature, that new residents of these gentrifying neighborhoods who locate there in large part for the low-carbon lifestyle, are likely to have *higher* overall carbon footprints when consumption associated with their higher income levels is taken into account. We understand this to be a contradiction in the classic critical theory sense: the very density factors that reduce direct GHG emissions by virtue of shortening commutes and putting more people in generally more efficient buildings now makes these new built environments more desirable, and thus more valuable. As a result, the changing neighborhoods tend to be occupied by the relatively affluent whose consumption contains significant embedded emissions that offset the benefits of reduced car- and utility-based energy use (Cohen, 2016; 2017). In short, we argue that capitalist land markets presently allocate desirable density in such a fashion that its ecological benefits are not realized precisely because of the affluence that makes living in such places possible. While we do not provide our own emissions data in this manuscript, we base our assertions on recent trends in the GHG modeling literature (discussed further on in this essay). Recent studies show that more affluent people have higher GHG emissions because of consumption, and that there is little or no evidence to suggest that they decrease their consumption when moving to more dense, transit-friendly and/or walkable neighborhoods. Actual carbon footprints and consumption patterns vary from person to person, of course, but we review the general trends and suggest that this points to a contradiction that needs much further analysis.

Specifically, in the context of urban climate policy, there has been a striking lack of attention to the ways in which income—and by association, consumption and waste—affect the emissions of cities and their neighborhoods. Cities have typically measured their GHG emissions using territorially based (sometimes called ‘production’) logic and methodology. This approach draws a line around an area, typically the jurisdictional boundary of a city, and then models the emissions caused by activities within that area to identify ‘scope 1’ emissions (for example, emissions directly produced in an area by driving a car). In cities, ‘scope 2’ emissions—those that are caused by power plants that feed energy into the city, and the emissions associated with solid waste that leaves the city—are typically also included in some form. According to this method of carbon accounting, auto-centric modes of commuting, combined with large, energy-inefficient homes in suburban and exurban sprawl, yield high carbon emissions. Conversely, by the same logic, urban cores have lower carbon emissions, principally because residents are more likely to rely on alternative forms of transportation and live in dense urban environments (Calthorpe, 2011).

An alternative approach to emission accounting has been developed that complicates this logic. Called consumption-based accounting, this method more

carefully assigns responsibility for the whole lifecycle emissions to the goods and services final consumer (an individual or an organization) (Yetano Roche *et al.*, 2014). For example, if a consumer purchases an automobile, all of the emissions associated with the construction of the automobile (likely produced beyond the particular city's limits), in addition to emissions resulting from the automobile's use, would be assigned to the jurisdiction where the consumer lives. Likewise, the emissions associated with the production of food, clothing, appliances, and so on, purchased (and then used or consumed) are also directly associated with urban residents and the city in which they live. Emissions from the production and transportation of goods and services are typically considered 'scope 3' emissions; in urban accounts, the emissions associated with air travel to and from airports are also considered 'scope 3' emissions, and these are also excluded from cities' customary GHG emissions inventories. Before the advent of consumption-based inventories, 'scope 3' emissions were not included in urban GHG assessments.

Few cities have conducted consumption-based footprints, but those that have calculated their total GHG footprint using the consumption-based approach report footprints that are at least twice as high as those measured by the territorial method (Stanton *et al.*, 2011; Erickson *et al.*, 2012; BSI, 2014). In San Francisco, a consumption-based count found that nearly four fifths of the GHG emissions associated with in-city consumption were physically emitted beyond the city's limits (Stanton *et al.*, 2011). In short, densification and alternative transit can reduce 'scope 1' and 'scope 2' carbon emissions in urban areas, but 'scope 3' emissions (those associated with consumption and purchased goods) are not necessarily reduced (or at least, not substantially) by popular urban climate initiatives that focus on urban form. A key factor of 'scope 3' emissions is that they are associated with income levels.

What about neighborhoods within cities? Here, too, new research is promising, although even more will be needed. So far, GHG models working at a finer spatial resolution have investigated the class- and lifestyle-based factors that cause variation in urban residents' emissions. Broadly, these studies have found that the benefits of density and alternative transit networks in prosperous, post-industrial cities are largely countervailed—but not entirely—by the individual consumption of relatively wealthy urban consumers who increasingly reside in the cities' dense and transit-rich districts; these studies cover several cities and countries, such as the US (Ummel, 2014), Finland (Heinonen *et al.*, 2011; 2013), the UK (Minx *et al.*, 2013) and China (Wiedenhofer *et al.*, 2017). This literature finds that in dense but prosperous neighborhoods, the reduced GHGs achieved by residential density are mostly—although not entirely—offset by high consumption of goods and services and leisure plane travel. Indeed, the principal reason why wealthier urban residents have higher carbon footprints is simply that their consumption increases with affluence. This is a widely accepted relationship, but one of which the implications for critical urban thought require further attention (Chancel and Picketty, 2015; Hubacek *et al.*, 2017). In New York City, for example, models of per capita, zip-code-based emissions flowing from consumption find that residents of Manhattan's residentially dense neighborhoods have carbon footprints comparable to those of residents in wealthy cities countrywide, despite Manhattan's density (Ummel, 2014; Cohen, 2016; Ummel, 2016). It is in the relatively dense, low- or mixed-income and transit-rich areas of New York's outer boroughs—especially Brooklyn, Queens and the Bronx—where density and low GHG emissions are found together.

To be sure, this research did not find that density has no effect on household emissions; rather, it finds that its effect is relatively small when 'scope 3' emissions are also accounted for. The most likely result of neighborhood gentrification, even if the process is accompanied by modest increases in density, is very modest reductions, maintenance of, or even increases in the area's household GHG emissions, depending on how many

lower-income residents are displaced by high-income residents.⁴ So, from the perspective of GHG emissions, gentrification is a serious problem. The impact of gentrification on a city's overall emissions level will, of course, depend on where new arrivals come from (i.e. from within or from outside the jurisdiction), and where those who are displaced move. In so far as densification paired with climate policy remains limited to parts of cities only, rather than the urban fabric as a whole, evidence strongly suggests that gentrification seriously undermines GHG reduction efforts. From this more holistic perspective, we note Jones and Kammen's (2014) finding that the densest American cities with the lowest GHG emissions have the most sprawling, high-emissions suburbs; in Freiburg, Germany, densification and gentrification of the city core has led to increased automobile commuting, and ensuing emissions, in the city's suburbs (Mössner and Miller, 2016). In short, emissions may be shifting around an urban area, but those neighborhoods with increasing numbers of affluent residents are very likely experiencing an overall increase.

Overall, then, the tendency to downplay or obfuscate individual consumption in conventional (territorially based) inventorying methods has consealed a new and significant contradiction between desires for 'low-carbon' living that are believed to be achieved via densifying urban design, and actual ecological outcomes, which are heavily influenced by income levels and consumption behaviors. Certainly, higher-quality data are needed here to more finely parse these relationships. Still, in general, high-income, walkable and bicycle-friendly communities catering to environmentally minded professionals are likely not to yield the advertised levels of carbon reduction, especially when more accurate methods of carbon accounting for consumption and purchased goods are considered. Strategies for decarbonizing urban life—either in terms of carbon reductions, or blending social and ecological policies in climate governance—should consider consumption-based accounting of carbon, especially for meeting social and environmental sustainability goals. Such strategies would need to take economic equity seriously and intervene across the whole of the urban fabric—not just in designated areas. We argue that this socio-environmental contradiction, where displacement of lower-income residents from climate-friendly neighborhoods could increase overall emissions for that area, requires more attention and evaluation by urban studies scholars interested in housing justice and sustainability (see also Wachsmuth *et al.*, 2016).

Seattle, Washington: emerging evidence of the contradiction of the climate-friendly city

In this section, we illustrate our research by considering an area in Seattle, Washington, that we believe exemplifies the processes of carbon gentrification described here. Specifically, we examine the centrally located neighborhoods of Capitol Hill, First Hill, South Lake Union and the Central District, where there has been an intense convergence of new investments in low-carbon infrastructure, new technology and creative-industry jobs, accompanied by rapidly rising house prices. The lead author's experience in conducting research in Seattle for more than a decade has offered a long-term perspective on this emerging shift in urbanization (see, for example, Rice, 2010; 2014b; 2016; 2018). During this time, more than 60 interviews were conducted with a variety of local government officials, environmental advocacy groups and climate-change specialists. Most recently, during the summer of 2017, new research was conducted on low-carbon urbanization in Seattle, including five new interviews (with a total of eight people) with housing-justice advocates and local officials in

4 Prevailing research does not include time series data for moderately high spatial resolution household carbon footprints; these data should be created, but will require substantial resources. It is theoretically possible that a subset of environmentally minded professionals who move into gentrifying neighborhoods also consume far fewer goods and services, and fly far less, than their demographic counterparts who are better represented by survey data and in models. However, there is no compelling evidence to suggest this.

Seattle. Participant observation was conducted at affordable-housing events and local sustainability efforts, and field observation was conducted daily in the South Lake Union and surrounding neighborhoods. These interviews, in combination with ongoing field observation of neighborhood change in Seattle, provide qualitative evidence of the claims we present here. We situate this information within demographic data from the US Census Bureau and archival research of Seattle newspapers and other mainstream reports on urbanization to illustrate our claims. We cannot, unfortunately, provide direct empirical analysis of emissions changes in these neighborhoods because these data are not available at this time, although we would argue that emissions trends in the neighborhoods discussed here follow those discussed in previous sections of this manuscript (increased emissions with higher incomes).

– Amazon comes to town

In 2007, Amazon announced that it planned to build massive new headquarters for more than 40,000 employees, covering 1.6 million square feet of office space, in the South Lake Union neighborhood of Seattle, Washington (Pryne, 2007). This former industrial and commercial area, located on the northern edge of downtown, was at the beginning of an upsurge in corporate interest, with Microsoft and biotechnology companies already relocating to the neighborhood. The area's development boom coincided with the materialization of many low-carbon investments and programs promoted in the city's climate action plan: a new light rail line to connect downtown to the airport, followed a few years later by approval of an extension to the University District and Capitol Hill neighborhoods; two new streetcars: one in the South Lake Union neighborhood and one in the nearby First Hill neighborhood; several protected bike lanes in downtown Seattle; and many new LEED or 'green' condominium buildings constructed throughout Seattle's urban core. As the city's largest source of emissions comes from the transportation sector, a significant amount of effort has been placed on increasing alternative transportation options and use among residents.

These investments have made working in South Lake Union, and living in the adjacent neighborhoods, very attractive to urban residents—especially Amazon employees—looking to live a low-carbon lifestyle. Amazon encourages its workers to live a climate-friendly lifestyle; this includes living near its headquarters. Amazon's real-estate director has said about its workforce: 'A lot of people don't even have a car. They want that urban experience right there' (Johnson and Wingfield, 2013). Around 25% of Amazon's employees walk to work—many of them from the new seven- and eight-story apartment buildings in Capitol Hill and surrounding neighborhoods—and 52% ride public transit (Redman, 2015). And recently, Google announced that it would move many of its offices to South Lake Union (Bishop, 2016), solidifying the neighborhood as one of the country's high-tech, low-carbon meccas. Google's site selection lead stated about the move to South Lake Union: 'We're looking forward to walking, biking and riding the streetcar through the neighborhood' (Lerman, 2016b).

Our own initial empirical analysis of Seattle census data illustrates four socio-demographic shifts likely to be indicative of carbon gentrification in these neighborhoods: racial/ethnic composition, educational attainment, income, and housing. First, in the Capitol Hill/First Hill/South Lake Union neighborhoods, and in the nearby historically African-American Central District neighborhood, the percentage of Black/African-American⁵ residents declined by more than 2% (10.3 to 7.8%) and 28% (52.7 to 24.7%), respectively, between 1990 and 2010 (US Census Bureau, 1990; 2000a; 2010—data compiled by the US 2010 Project, 2010). In the Central District neighborhood, in

5 Unlike Census 2000 and Census 2010, individuals could only identify as one race in the 1990 census. Thus 1990 data are reported as Black/African-American (Alone), non-Hispanic, while 2000 and 2010 data refer to individuals identifying as Black/African-American (Alone or In Combination), non-Hispanic.

particular, the remarkable decline of Black/African-American residents (a decline of 30% or more in census tracts 77, 87 and 88) coincided with a corresponding increase in the share of white alone, non-Hispanic individuals (an increase of 19%, from 30.3 to 49.1%) (see Figures 1 and 2). These racial/ethnic changes illustrate the pace of gentrification and displacement in certain Seattle neighborhoods. In the wake of these

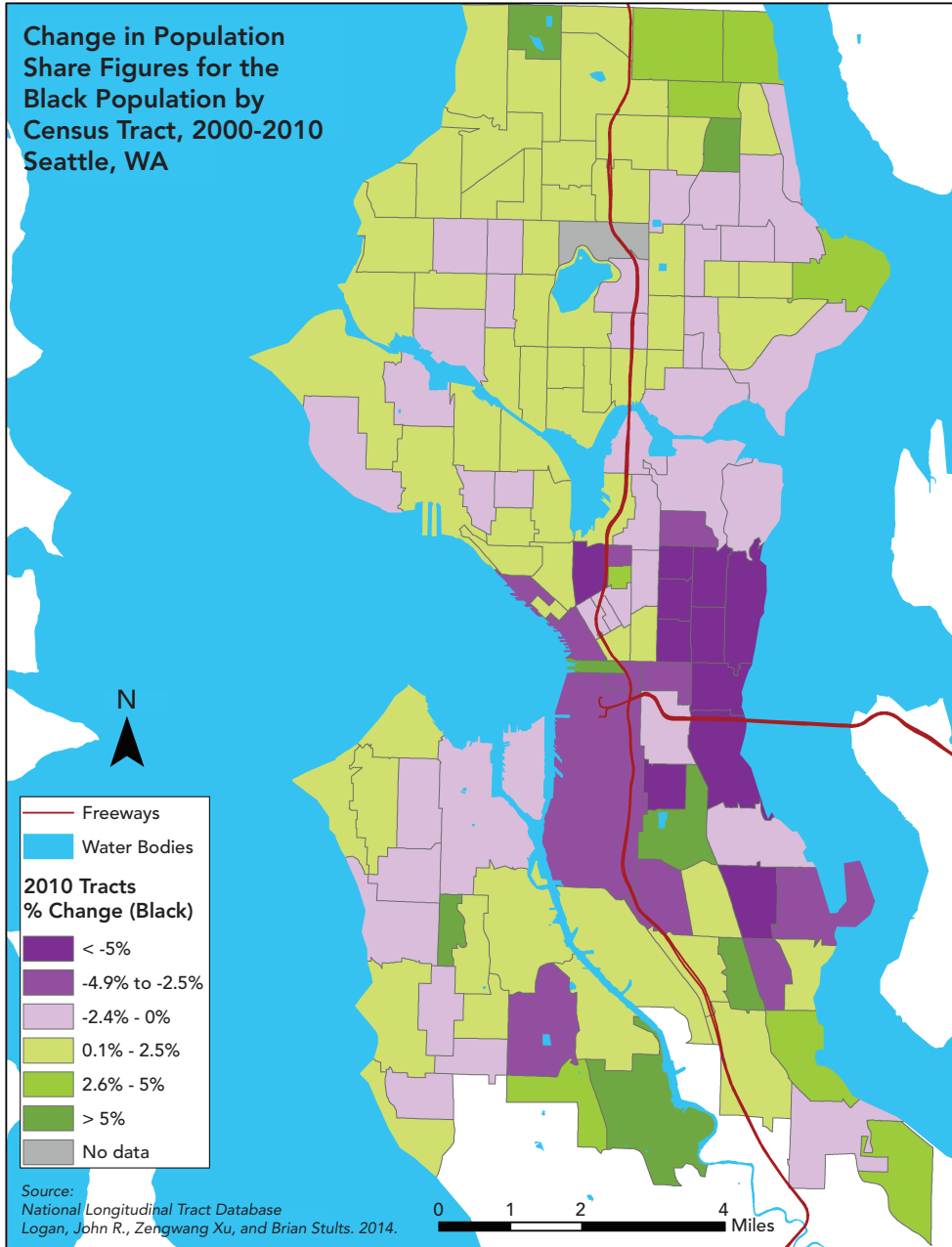


FIGURE 1 Change in Black/African-American population share by census tract, 2000-2010, Seattle, Washington (source: map produced by Kevin Rancik, based on data drawn from the US 2010 Project, Longitudinal Tract Database, in 2014)

demographic shifts, 2010 census data revealed that there were no longer any majority African-American census tracts in the City of Seattle and King County (US Census Bureau, 2010—data compiled by US 2010 Project, 2010).

Secondly, over the past 10 to 15 years, these neighborhoods posted gains in educational attainment that outpaced the citywide average. Where the share of Seattle

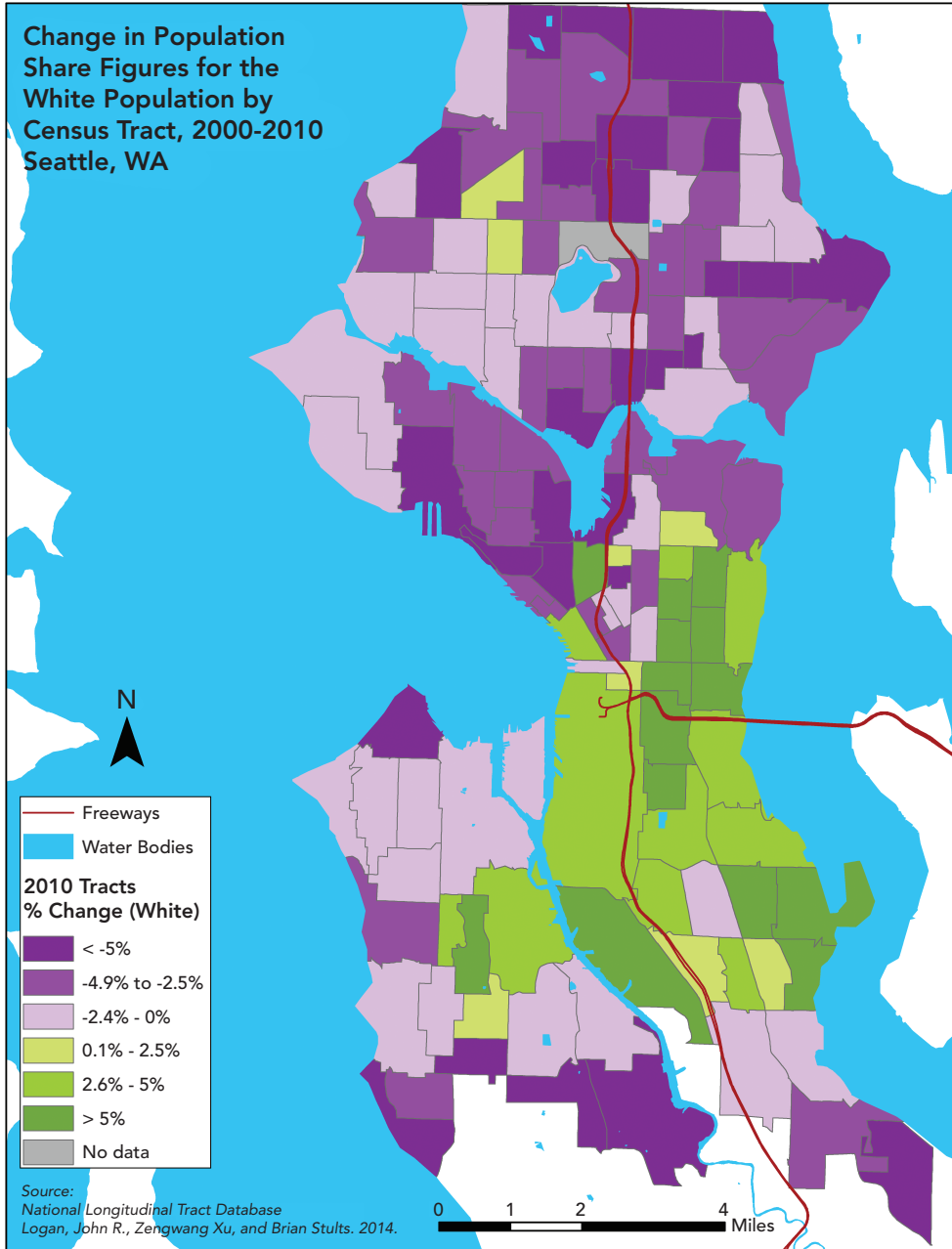


FIGURE 2 Change in white population by census tract, 2000-2010, Seattle, Washington (source: map produced by Jason R. Jurjevich, based on data drawn from the US 2010 Project, Longitudinal Tract Database, in 2014)

residents 25 years and older with a Bachelor's degree or higher increased by nearly 12% (from 47.2 to 58.9%) between 2000 and the 2011–2015 period, educational attainment levels in the Capitol Hill/First Hill/South Lake Union and Central District neighborhoods grew by 14.1 (from 53.3 to 67.4%) and 19.9%, respectively (from 35.6 to 55.5%) (US Census Bureau, 2000c; 2015a—2000 data compiled by US 2010 Project, 2010).⁶

Thirdly, both neighborhoods also recorded significant gains in income. Between 2000 and the 2011–2015 period, the average ratio of median household income in these neighborhoods, relative to the city median household income, increased by 18% (87 to 105%) and 20% (71 to 91%), in the Capitol Hill/First Hill/South Lake Union and Central District neighborhoods, respectively (US Census Bureau, 2000d; 2015b—2000 data compiled by US 2010 Project, 2010).

Fourthly, the median home value of owner-occupied housing in the City of Seattle escalated from \$359,000 in 2000 to \$453,000 during the 2011–2015 period (US Census Bureau, 2000b; 2015c—2000 data compiled by the US 2010 Project, 2010). This growth in median housing values, at 26.2%, was more than double the increase nationwide (12.3%). In the South Lake Union/Capitol Hill/First Hill neighborhood, average median home values grew by 11.9% (from \$439,000 to \$491,000), while prices in the Central District neighborhood soared by 17.7% (from \$335,000 to \$394,000). More recently, in 2017, Seattle led the nation in home price increases with an overall gain of 12.7% from 2016 to 2017 (Rosenberg, 2018). Rents are also rising in Seattle: between 2000 and 2011–2015, the median contract rent⁷ in Seattle climbed from \$963 to \$1,096, meaning that the increase (13.8%) in Seattle was more than double the US average (of 5.1%). In and around Seattle, some neighborhoods recorded higher increases in median rent. In the South Lake Union/Capitol Hill/First Hill neighborhood, for example, average median rent increased from \$969 in 2000 to \$1,258 in the 2011–2015 period—an increase of 30%. Similarly, in the Central District neighborhood, the median rent averaged \$763 in 2000, and stood at \$1,053 in the 2011–2015 period—a 38% increase (US Census Bureau, 2000e; 2015d—2000 data compiled by the US 2010 Project, 2010).

– Linking housing justice and climate justice in Seattle, Washington

Demographic data certainly show the rapid gentrification occurring in Seattle. But furthermore, during our interviews, observation, and analysis of local news reporting it became very apparent that the links between low-carbon development and displacement of lower-income, often non-white, residents in Seattle is of central concern to all the groups interviewed about affordable housing in Seattle. For example, one housing-justice advocate stated that her organization's message has been explicitly that 'climate justice is housing justice', and that there is an urgent need for more affordable housing to keep people—specifically non-white people—in the city, as wealthier residents move to the new transit-friendly parts of Seattle. Another member of a different housing-justice group stated that the climate-friendly lifestyle of Seattle has very much 'been marketed by big developers and people with a lot of capital ... it's a marketing strategy and a money-making strategy'. Another member of the same organization went on to say:

Bill Gates put the Microsoft campus out in the suburbs [of Seattle] to follow his workers, and Jeff Bezos [CEO of Amazon] has done the same thing—he has moved it [Amazon headquarters] downtown because he knows that is where his worker wants to be. So, for both of them, it's the high-tech labor market that drives their geographic decisions.

6 Data from the American Community Survey five-year combined file (2011–2015) (US Census Bureau, 2015) contain accompanying margin of error (MOE) values that are not reported here.

7 Here we report contract rent, which is the monthly base amount paid to the landlord. Other expenses, including cost of utilities, are not included in this figure.

Other local advocacy groups, including Got Green and Puget Sound Sage, which focus on sustainability issues for communities of color in Seattle, Washington, have conducted research on the issue. They wrote in a community-led research report:

Interviewees made the case that any local efforts to build climate resilience for our communities will be undermined if low-income people and people of color continue to be displaced to suburban cities, particularly if those suburbs are under-resourced and unable to conduct rigorous climate resiliency planning (Got Green and Puget Sound Sage, 2016).

These processes have also been documented and observed by the local media. Seattle's alternative weekly newspaper, *The Stranger*, for example, captured many of the rapid transformations in South Lake Union and adjacent neighborhoods of Capitol Hill (traditionally Seattle's LGBTQ-friendly neighborhood), First Hill and the Central District (Seattle's historically African-American neighborhood) in the article 'The mystery of Seattle's new-to-town tech workers', which stated:

Shiny new apartment buildings are springing up around Seattle to receive them—starting at their epicenter in South Lake Union and radiating outward into Belltown, downtown, Capitol Hill, and Ballard—as well as the bars and cafés and doggy-day-care businesses to serve them. You already know what else is springing up around the city as a consequence: rents (Kiley, 2015).

Observation around Amazon's new Doppler headquarters also makes these connections evident. New condominium high-rises are under construction all around Amazon's headquarters. These are tucked between light rail stations, streetcars and protected bike lanes, including one that goes right past the Doppler building's main entrance.

We believe that, taken together, the various data presented here underscore strong links between the location of higher-paying, more specialized technology companies, significant investment in low-carbon infrastructure, and signs of gentrification in these centrally located Seattle neighborhoods. Based on the trends in recent GHG emissions studies previously reviewed, we can expect that emissions in these neighborhoods are also increasing owing to higher overall consumption by upper-income residents. The question remains how widespread this trend is in various types of North American cities. It is important to recognize that there is a notable range in the policy priorities and experiences of US cities, and some metropolitan areas—such as New York City or Chicago—have been building in a 'low-carbon' (i.e. dense, transit-friendly) fashion for more than a century. Yet cities such as Seattle (but also Austin, Texas, and Atlanta, Georgia, as well as many others) have experienced significant development in the post-second world war era and are more recently investing in low-carbon infrastructure. Thus, further research is needed to investigate the various ways in which these trends influence Western US and Sunbelt cities versus their effects on historically dense cities that had developed extensively prior to the automobile era. Still, there are a number of cities that, like Seattle, are and will continue to invest in low-carbon infrastructure that will be subject to the processes described here. To determine the significance of our proposition, we conclude by turning to the various 'needs'—theoretical, data and political—that exist to fully understand and address this phenomena in Seattle and elsewhere.

Discussion and conclusion: what good is the low-carbon city if only the rich can live there?

The analysis provided here is of critical importance because, not only are other high-tech and creative firms following in the footsteps of Amazon and Seattle, but Amazon itself is in the process of building a new headquarters in Crystal City, Virginia

(known as HQ2). Their call for proposals for a new HQ2 highlighted the significant increase in higher-income workers they will draw to a new city, as it states that ‘Amazon will hire as many as fifty thousand (50,000) new full-time employees with an average annual total compensation exceeding one hundred thousand dollars (\$100,000) over the next ten to fifteen years’ (Amazon, 2017). Access to mass transit is listed as a ‘core preference’ of the site requirements, and it lists the potential contribution of \$43 million towards local ‘public transportation system as employees’ transportation benefit’ (*ibid.*). The call for proposals goes on to boast about the ‘redevelopment of South Lake Union and Denny Triangle with its sustainable buildings and open spaces’ as part of the positive impacts of its current HQ in Seattle (*ibid.*), and a CityLab blog even called Amazon’s request for proposals for HQ2 ‘transit reckoning’, arguing that:

Leaders of car-oriented cities around the country might be ogling some of the shiny new mass transit systems in the country and wondering how they might build one of their own ... Building effective mass transport—presumably, the kind Amazon is interested in—is not the same as building trains. Cities might look to Seattle, the city where Amazon already lives, to reverse-engineer their way to HQ2-style mobility (Bliss, 2017b).

Some social commentators have already noted the negative outcomes that competing for HQ2 might propose (including, but also going beyond those associated with the tax breaks and giveaways that might draw Amazon to a city). Seattle native Timothy Egan warned, for example, of skyrocketing housing prices and culture changes that accompany the import of thousands upon thousands of new, well-paid high-tech workers in a *New York Times* opinion piece titled ‘How Amazon took Seattle’s soul’ (Egan, 2017). More than 75 community organizations signed an open letter to Amazon CEO Jeff Bezos, stating that ‘We love that you’re looking for cities that have robust public transit infrastructure—but we know that an influx of 50,000 new people will strain our existing service, and building new transit to serve Amazon could divert funds from the rest of us. Let’s make sure that, as transit gets built out, it’s working for everyone in our community’ (ourHQ2wishlist.org, 2017). They go on to state: ‘It’s no secret that the tech industry has hastened an affordable housing crisis in Seattle and other cities around the country’. Practically speaking, these public warnings illustrate, directly and concretely, that the processes we have described here will continue to threaten housing justice in the next ‘climate-friendly’ city in which Amazon (or other major tech companies) choose to locate their headquarters.

Simply stated, our novel thesis is: *there is no climate justice without a clear and central focus on housing justice*. Furthermore, the failure of many academics and practitioners to see climate and housing justice as directly related may actually be producing negative environmental effects, as higher-income earners have larger carbon footprints. It is critically important to evaluate whether efforts to decarbonize cities are, in fact, having the social and environmental outcomes they wish to produce. As illustrated by our discussion of the New York City High Line earlier, there is widespread recognition that green spaces, remediation projects and even efforts at densification and transit-friendly planning create pressures on housing prices. Yet it is important to more clearly recognize that these pressures are produced by, and articulated around, a form of urban carbon politics (and their associated gray ecologies) that are much more widespread and far-reaching than the more localized ‘greening’ projects that have typically been the subject of eco-gentrification studies. As carbon becomes the primary metric around which urban sustainability efforts are understood, the contradiction we identify here is of increasing importance. Moreover, the forms of eco-gentrification associated with low-carbon living are far more than an unintended outcome, but rather, they are also a contradiction: greenhouse gas emissions are likely increasing in the areas meant to reduce overall emissions associated with urban living, primarily because of the

affordability issues associated with desirable low-carbon neighborhoods. It is important to extend our line of inquiry to evaluate more carefully the actual ecological outcomes that might result from carbon gentrification. We have suggested here that this is not only an issue for housing justice, but one for climate and environmental justice too. We must fully understand the dimensions of this problem to have adequate and robust community and policy responses.

This shift in focus towards intention and outcomes might also allow us to address a series of important questions about the ethical dilemmas and obligations of gentrification research that have been raised in this journal (see Schlichtman and Patch, 2014; Marcuse, 2015). For example: Do environmentally minded professionals and those rejecting the forms of suburbanization that dominated the landscape for so many decades really believe they are improving the environment? Are they aware of the displacement they help cause? A theoretical framework that would allow us to disentangle the motivations of gentrifiers, especially as they seek to employ a lifestyle that has been normatively espoused as good for the environment, is important to understand in relation to the goals of urban climate governance. New theoretical advancements about these ethical aspects of urban sustainability efforts might also allow us to better understand whether the climate-friendly city has the potential to meet its carbon-reduction goals in a socially responsible and just way, especially in the context of neoliberal and capitalist governance regimes.

From an empirical standpoint, the data needs are also significant. We need more data, from more cities, at a finer spatial resolution, which connect urban activities—particularly consumption—to GHG emissions, to fully assess the extent of gentrification that may be occurring. More data are also needed on the influence of the high-tech industry and its workforce on promoting or appealing to a low-carbon lifestyle, and the ways in which technology and creative industries interact with environmental policies and low-carbon infrastructure in the city. For example: How and why do some industries capitalize on the low-carbon infrastructure investments of cities, and what effect does this have on nearby populations? Conversely, what kind of lifestyle, encouraged by what kinds of planning interventions, is compatible with *both* increased social justice and reduced carbon emissions?

And finally, as for political commitments, we are concerned with what it means when densifying, ‘low-carbon’ cities are becoming accessible only to a small portion of higher-income urban residents through processes of gentrification associated with desires for low-carbon living. Local policymakers and urban theorists will have to confront the unintended social and ecological outcomes of low-carbon urban policies if they wish to achieve their stated social and environmental goals. We also argue for longtime residents of low-carbon neighborhoods having the ‘right to stay put’ (Newman and Wyly, 2006), both as a positive social and environmental goal. We believe that new kinds of dialogue between environmental planners and urban social movements are needed so that low-carbon, pro-density planning is at once more equitable and more consistent with the urgent imperative to reduce the carbon footprint of urban life. Better coalition building and more intentional conversations between urban sustainability champions and affordable housing advocates are urgently and critically necessary to address the negative effects of low-carbon gentrification. Moreover, gentrifiers themselves need to become more aware of, and involved in, the ways in which their well-intentioned actions have very real and significant negative outcomes.

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