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Paradigm Shifts in Urban Planning

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Commentary

The Death and Life of Collaborative Planning Theory

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Abstract
It has been over 20 years since Judith Innes proclaimed communicative action to be the "emerging paradigm" for planning theory, a theoretical perspective which has been developed into what is known as collaborative planning theory (CPT). With planning theory shifting to a new generation of scholars, this commentary considers the fate of this intellectual movement within planning. CPT never achieved the paradigmatic status its advocates desired because of its internal diversity and limited scope. However, its useful combination of analytical and normative insights is attracting the interest of a new generation of researchers, who are subjecting it to rigorous empirical testing and addressing longstanding theoretical weaknesses. Like Jane Jacob's classic book *The Death and Life of Great American Cities*, CPT has made an enduring impact on planning theory, even as it has failed to achieve a total revolution in thinking.

Keywords
collaborative planning theory; communicative action; Jürgen Habermas; planning theory

Issue
This commentary is part of the issue "Paradigm Shifts in Urban Planning", edited by Matthias Drilling (University of Applied Sciences and the Arts Northwestern Switzerland, Switzerland), Efrat Eizenberg (Israel Institute of Technology, Israel), Janet Stanley (University of Melbourne, Australia), Lee Boon Thong (Nilai University, Malaysia) and Andreas Wesener (Lincoln University Canterbury, New Zealand).

1. Introduction

In 1995, Judith Innes, at the time a full professor of planning at UC Berkeley, proclaimed communicative action to be the emerging paradigm for planning theory (Innes, 1995). In her telling, this new paradigm was taking the place of an earlier generation of "systematic," largely positivist thinkers. Replacing them was a new group of scholars who studied planning as a "interactive, communicative activity," (Innes, 1995, p. 183). Their work drew on various theoretical perspectives, but especially ideas from Habermas's *Theory of Communicative Action* (1984, 1987), which she argued was the work most likely to "provide the principle framework for the new planning theory"(Innes, 1995, p. 186). Her proclamation was met with a combination of disinterest and theoretical counter-arguments, such as those by Huxley and Yiftachel (2000) and Fainstein (2000), who argued that the new ideas neglected adequate accounts of power, the state, and political economy. In the years since, many practitioners have found the ideas to be abstract and difficult to connect with their concerns, and most planning academics eschewed the paradigm for a range of alternative perspectives, even as a group of scholars have continued to develop a body of scholarship which has come to be called collaborative planning theory (CPT). The purpose of this article is to reflect on the general development of CPT in the ensuing two decades, and investigate what life remains in CPT or whether it is destined for a quiet death as it is eclipsed by new ideas.

2. Collaborative Planning Theory Defined

Since there is no single classic work which defines CPT, I begin with a description of its central ingredients, before providing a brief overview of the distinctive characteristics of several influential CPT theorists. However, it should be noted this section is necessarily incomplete,

and not all theorists mentioned even use (or would accept) the term "collaborative planning theory" to describe their work. CPT shares several ingredients: 1) a focus on deliberation as the primary activity through which planning is accomplished, 2) the use of Habermas's ideas to analyze this deliberation and propose normative advice for professionals, and 3) an adoption of Habermas' concept of communicative rationality in the place of instrumental rationality.

The classic works in the field share almost as many differences as similarities. John Forester's works (1989, 1999) carefully examined professionals' activities, engaging with questions of professional practice and ethics. However, his theoretical discussions are deeply submerged in the footnotes of his classic books. In subsequent years, Forester's work (2013) has migrated towards expanding the set of issues he considers by drawing on interviews with practitioners. In contrast, Innes and her frequent co-author Booher, both based in California, primarily studied large, multi-year projects with standing stakeholder committees, such as the CALFED Bay-Delta Program (Booher & Innes, 2002; Innes & Booher, 1999a, 1999b, 1999c). They are interested in how such groups operate, and how stakeholder groups can often create new solutions through extended deliberations. Their empirical research has culminated in what they call the DIAD model: achieving collaborative rationality within a planning process requires a Diversity of interests, Interdependence of interests, and Authentic Dialogue (Booher & Innes, 2002). However, their publications have involved a string of insightful but mostly theoretical articles, only culminating in a book in 2010 (Innes & Booher, 2010). Recently they have urged theorists to overcome "dividing discourses," yet only describe several areas where further theoretical work is needed (Innes & Booher, 2015). Finally, Healey's 1997 book *Collaborative Planning* is probably the intellectually richest version of CPT. Where Forester, Innes and Booher can be fairly critiqued for their primary focus on deliberation within planning conference rooms, Healey's intellectual scope is more expansive. Her book contains chapters on the spatial, economic, and environmental dimensions of planning, and her account of social processes draws not only on Habermas, but also the sociologist Anthony Giddens and other institutional theorists. But such eclecticism makes her defy simple characterization, and the wide scope makes it hard to distill into principles for practice or further scholarly development.

In addition to these four authors, a variety of other scholars have also contributed to the development of CPT. Although a full accounting is beyond the scope of this article, this group includes Stein and Harper, who have developed ideas they call "dialogical planning" (Harper & Stein, 2006; Stein & Harper, 2003), Charles Hoch, who contributed insights from pragmatic philosophy to CPT (Hoch, 2007), Tore Sager, whose work on social choice theory in planning often discussed CPT (Sager, 2002), and Richard Margerum, who developed practical insights from empirical cases (Margerum, 2002, 2011).

3. The Death…

With many of these theorists nearing retirement age (Healey and Innes are already emeritus), we might wonder about the fate of this intellectual movement. One would be hard-pressed to identify many planning scholars in the next generation following in this tradition, for three primary reasons: CPT's focus on planning practice, use of abstruse theory, and normative content. CPT mostly describes practice, and seemingly neglects substantive issues—which many continue to believe form the core of planning. In addition, the reliance on Habermas' dense and confusing philosophy may have made it off-putting for scholars seeking broad scholarly audiences. Finally, and most importantly, CPT is both normative and analytical. That means it purports to guide analysis—by suggesting relationships between independent variables and outcomes and providing analytically useful concepts—as well as provide guidance about how to define good planning practice. To an outsider, it might seem obvious that planning needs such a theory. However, this normative content is a further reason it has been shunned in the academy, where similarly abstract but less prescriptive theorists like Foucault are seemingly a better fit in academic culture of critique (Flyvbjerg & Richardson, 2002). However, this choice provides little guidance for professionals, who must work within existing flawed institutional contexts.

4. …and Life

However, as is often the case, the eclipse of the first generation of this intellectual movement has been followed by new work contributing fresh perspectives. While not all parts of CPT are suited for empirical testing, younger scholars are pushing in that direction. Carissa Schively Slotterback showed that clever use of surveys could provide empirical evidence of the elusive concept of collaborative learning (Schively, 2007). Drawing on surveys of groups engaged in transportation planning activities, Deyle and Wiedenman seem practically surprised when their data finds that "nearly all of the hypotheses" arising in the CPT literature were confirmed (Deyle & Wiedenman, 2014, p. 269). These papers suggest that empirical investigations of the planning process informed by CPT, although difficult, are possible.

The theoretical foundation is also seeing needed attention. One problematic issue is the theory's seeming relativism. CPT does not describe how to reconcile local collaborative agreements with external perspectives. Goldstein describes one such example of this, when the scientific judgements made by a collaborative group for a habitat conservation plan were rejected during an unexpected external scientific peer review (Goldstein, 2010). His practical conclusion is that planners must serve as

epistemic mediators, working to ensure the results of collaboration are tailored for multiple anticipated audiences. Another typical mismatch is between the normative positions reached through collaborative dialog, and those held by external audiences. The concept of the public interest, which is missing from Habermas' concept of communicative rationality, continues to play an important role for practitioners since it provides a useful external normative viewpoint on planning missing from CPT. Hanna Mattila has tackled this point head-on in a recent interesting recent article in Planning Theory, which suggests CPT could be revised to include the concept of "generalizable interest" developed in later works by Habermas and feminist scholars (Mattila, 2016).

Another empirical critique of CPT is the acrimonious and frankly political nature of planning debate, where the authentic dialogue called for by CPT is difficult to find. Two theorists have attempted to address this question. First, Peter Matthews agrees in a recent article that "it may be naïve to assume that intersubjective understanding can be reached in a rapidly moving planning and policymaking process" (2013, p. 151), however the article concludes that over the 20-year history of community activity in two neighborhoods targeted for regeneration, Habermas' ideas did describe how activists successfully used deliberation to critique outside assumptions about issues such as the causes of youth antisocial behavior and the scope of regeneration activities itself. Second, if planning frequently involves frankly political choices, then a more suitable perspective would be social choice theory, which accounts for self-interested, strategic behavior. In a string of thoughtful articles and books, Tore Sager has argued that while social choice theory can apply to some planning situations, in others collaborative rationality can serve as a needed complement. In a recent book, he considers not only how planners should respond to strategic pressures, but also suggests CPT could encompass greater attention to substantive criteria (Sager, 2013). In the view of one reviewer, the result is a CPT which is "less theoretically pure but practically stronger and theoretically richer" (Fischler, 2014, p. 325).

Another neglected issue has been whether CPT applies only to rich, liberal democratic societies. While it may logically apply best to liberal democratic states where power is widely dispersed and speech rights are protected by laws and norms, it seems that at least some of the ideas could be adapted for applications in the Global South. A recent article has pushed in this direction, using collaborative ideas to analyze the leadership activities of the mayor of Surakurta, Indonesia during the process to successfully move a market (Fahmi, Prawira, Hudalah, & Firman, 2016). Ironically, considering how CPT might be applied across diverse nations may clarify issues neglected in existing CPT scholarship, such as this article's useful discussion of leadership.

For my part, I have always been disturbed by the deep disinterest within CPT about the use of technology. Surely good planning today requires not only talk, but also on drawing on the best information, which is increasingly done through the use of computer databases and models. It also seems obvious that those who wield technical analysis skills often do so to promote particular values or alternatives, often resulting in epistemological conflicts. However, technical analysis is often portrayed as a simple add-on to collaborative planning, something which is external to deliberation. I attempt to explain why this is problematic in theoretical terms in a recent article in the *Journal of Planning Theory & Practice*, where I question Habermas' assumption that technology is exclusively associated with instrumental rationality and conclude discourse ethics alone is insufficient to prevent systematic domination by knowledge technologies (Goodspeed, 2016).

5. Conclusion

Will collaborative planning ever become planning theory's dominant paradigm? This brief review suggests that it may not. However, CPT has also proved more durable than perhaps some have thought. The articles cited above show new scholars who are pushing CPT into new intellectual territory, even as planning theory as a whole remains very diverse. It seems inappropriate and unlikely for planning to coalesce around a *single* paradigm. CPT may play a similar role as Jane Jacobs classic book referenced by this article's title, *The Death and Life of American Cities*. Both this book and early CPT were framed as an overthrow of an intellectual status quo (for Jacobs it was the flawed urban renewal policies of "orthodox city planning theory"), both were widely read and influenced practice, but neither resulted in the wholesale reconstruction of the field that their most ardent supporters desired.

Therefore, it's hard to say what the future will hold. Perhaps in the face of the growing severity of climate change, widening economic inequality, and stagnating development in the Global South, theorists will cast aside the mushy business of collaboration in lieu of theories which justify urban policies aimed at these problems. However, as Booher and Innes have observed, social and technical shifts may have the opposite effect (Booher & Innes, 2002). No matter what formal style of politics a country is said to have, the number and variety of voices is expanding everywhere. The diffusion of communication technologies and social media has resulted in a fragmented, volatile political culture worldwide. Within such a culture, the premium earned for achieving consensus will continue to grow and the places which can marshal it will reap the rewards. In this future, even as the popularity of CPT as an analytic theory may continue to languish, its appeal as a practical one will only increase.

Conflict of Interests

The author declares no conflict of interests.

References

Booher, D., & Innes, J. (2002). Network power in collaborative planning. *Journal of Planning Education and Research*, *21*(3), 221–236.

Deyle, R. E., & Wiedenman, R. E. (2014). Collaborative planning by metropolitan planning organizations a test of causal theory. *Journal of Planning Education and Research*, *34*(3), 257–275.

Fahmi, F. Z., Prawira, M. I., Hudalah, D., & Firman, T. (2016). Leadership and collaborative planning: The case of Surakarta, Indonesia. *Planning Theory*, *15*(3), 294–315. doi:10.1177/1473095215584655

Fainstein, S. S. (2000). New directions in planning theory. *Urban Affairs Review*, *35*(4), 451–478.

Fischler, R. (2014). Reviving critical planning theory: Dealing with pressure, neo-liberalism, and responsibility in communicative planning. *Planning Theory*, *13*(3), 324–325. doi:10.1177/1473095214521584

Flyvbjerg, B., & Richardson, T. (2002). Planning and Foucault: In search of the dark side of planning theory. In P. Allmendinge & Mark Tewdwr-Jones (Eds.), *Planning futures: New directions for planning theory* (pp. 44–62). London and New York: Routledge.

Forester, J. (1989). *Planning in the face of power*. Berkeley: University of California Press.

Forester, J. (1999). *The deliberative practitioner: Encouraging participatory planning processes*. Cambridge, MA: MIT Press.

Forester, J. (2013). *Planning in the face of conflict: The surprising possibilities of facilitative leadership*. Chicago: American Planning Association Planners Press.

Goldstein, B. E. (2010). Epistemic mediation: Aligning expertise across boundaries within an endangered species habitat conservation plan. *Planning Theory & Practice*, *11*(4), 523–547.

Goodspeed, R. (2016). Digital knowledge technologies in planning practice: From black boxes to media for collaborative inquiry. *Planning Theory & Practice*, *17*, 1–24. doi:10.1080/14649357.2016.1212996

Habermas, J. (1984). *The theory of communicative action (Vol. 1: Reason and rationalization of society)*. Boston: Beacon Press.

Habermas, J. (1987). *The theory of communicative action (Vol. 2: Lifeworld and system: A critique of functionalist reason)*. Boston: Beacon Press.

Harper, T. L., & Stein, S. M. (2006). *Dialogical planning in a fragmented society: Critically liberal, pragmatic, incremental*. New Brunswick, NJ: Center For Urban Policy Research.

Healey, P. (1997). *Collaborative planning: Shaping places in fragmented societies*. Vancouver: UBC Press.

Hoch, C. J. (2007). Pragmatic communicative action theory. *Journal of Planning Education and Research*, *26*(3), 272–283. doi:10.1177/0739456x06295029

Huxley, M., & Yiftachel, O. (2000). New paradigm or old myopia? Unsettling the communicative turn in planning theory. *Journal of Planning Education and Research*, *19*(4), 333–342. doi:10.1177/0739456x0001900402

Innes, J. E. (1995). Planning theory's emerging paradigm: Communicative action and interactive practice. *Journal of Planning Education and Research*, *14*(3), 183.

Innes, J. E., & Booher, D. E. (1999a). Consensus building and complex adaptive systems—A framework for evaluating collaborative planning. *Journal of the American Planning Association*, *65*(4), 412–423.

Innes, J. E., & Booher, D. E. (1999b). Consensus building as role playing and bricolage—Toward a theory of collaborative planning. *Journal of the American Planning Association*, *65*(1), 9–26.

Innes, J. E., & Booher, D. E. (1999c). Metropolitan development as a complex system: A new approach to sustainability. *Economic Development Quarterly*, *13*(2), 141–156.

Innes, J. E., & Booher, D. E. (2010). *Planning with complexity: An introduction to collaborative rationality for public policy*. London and New York: Routledge.

Innes, J. E., & Booher, D. E. (2015). A turning point for planning theory? Overcoming dividing discourses. *Planning Theory*, *14*(2), 195–213. doi:10.1177/1473095213519356

Margerum, R. D. (2002). Collaborative planning building consensus and building a distinct model for practice. *Journal of Planning Education and Research*, *21*(3), 237–253.

Margerum, R. D. (2011). *Beyond consensus*. Cambridge, MA: MIT Press.

Matthews, P. (2013). The longue durée of community engagement: New applications of critical theory in planning research. *Planning Theory*, *12*(2), 139–157. doi:10.1177/1473095212455212

Mattila, H. (2016). Can collaborative planning go beyond locally focused notions of the "public interest"? The potential of Habermas' concept of "generalizable interest" in pluralist and trans-scalar planning discourses. *Planning Theory*. doi:10.1177/1473095216640568

Sager, T. (2002). *Democratic planning and social choice dilemmas: Prelude to institutional planning theory*. Aldershot: Ashgate.

Sager, T. (2013). *Reviving critical planning theory : Dealing with pressure, neo-liberalism, and responsibility in communicative planning*. New York: Routledge.

Schively, C. (2007). A quantitative analysis of consensus building in local environmental review. *Journal of Planning Education and Research*, *27*(1), 82–98.

Stein, S. M., & Harper, T. L. (2003). Power, trust, and planning. *Journal of Planning Education and Research*, *23*(2), 125–139. doi:10.1177/0739456x03258636

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Article

The Potential of Volunteered Geographic Information (VGI) in Future Transport Systems

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Abstract
As transport systems are pushed to the limits in many cities, governments have tried to resolve problems of traffic and congestion by increasing capacity. Miller (2013) contends the need to identify new capabilities (instead of capacity) of the transport infrastructure in order to increase efficiency without extending the physical infrastructure. Kenyon and Lyons (2003) identified integrated traveller information as a facilitator for better transport decisions. Today, with further developments in the use of geographic information systems (GIS) and a greater disposition by the public to provide volunteered geographic information (VGI), the potential of information is not only integrated across modes but also user-generated, real-time and available on smartphones anywhere. This geographic information plays today an important role in sectors such as politics, businesses and entertainment, and presumably this would extend to transport in revealing people's preferences for mobility and therefore be useful for decision-making. The widespread availability of networks and smartphones offer new opportunities supported by apps and crowdsourcing through social media such as the successful traffic and navigation app Waze, car sharing programmes such as Zipcar, and ride sharing systems such as Uber. This study aims to develop insights into the potential of governments to use voluntary (crowdsourced) geographic information effectively to achieve sustainable mobility. A review of the literature and existing technology informs this article. Further research into this area is identified and presented at the end of the paper.

Keywords
government; sustainable mobility; transport; VGI

Issue
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1. Introduction

The capacity of the transport system to support the growing mobility needs of populations have been pushed to the limit in many cities and the approach of governments to resolve the problem has been to increase capacity (where this is possible) and repeat what has been the practice so far (Banister, 2007). This however has resulted in congested networks, unhealthy living conditions due to air and noise pollution, and infrastructures

that are both unequal in dealing with particular groups within the population as well as costly to build and maintain. Miller (2013) contends the need to identify new capabilities (instead of capacity) of the transport infrastructure in order to increase efficiency and increase capacity without extending the existing infrastructure. This could easily extend to quality of service where the potential of information to improve a service is high (Brescia Mobilita, 2015).

Susan Kenyon and Glen Lyons (2003)—extending earlier work by Lyons (2001)—described the potential of information to influence travel choices. Specifically they identified integrated traveller information to help make transport decisions. Both the transport industry and the research community supported this thesis with many cities developing multimodal information systems to support sustainability-oriented decisions (Kramers, 2014). A decade later and further developments in the use of geographic information systems (GIS) and a greater disposition by the public to provide volunteered geographic information (VGI), the potential of information is not only to be integrated across different modes but also to be user generated, real time and available on smartphones anywhere. User generated 'geographic' information play today an important role in sectors such as politics, businesses and entertainment, and presumably this phenomena would extend to transport in revealing people's preferences for mobility (Gal-Tzur et al., 2014) and therefore be useful for decision making and support.

The widespread availability of smartphone technology and the growing coverage of ubiquitous data communication networks in urban areas are causing a dramatic transformation in the way geographic information is produced and consumed (Manovich, 2009). It has also offered new opportunities for what are termed cooperative transport systems supported by smartphone apps and crowdsourcing through social media such as the successful community based traffic and navigation app Waze, bought by Google for $1.3 billion (Rushe, 2013); Moovit for transit planning; community car sharing programmes such as Zipcar; and more recently peer-to-peer vehicle and ride sharing systems such as Getaround, Uber and Bridj. Some of these systems have already been branded by Lanzendorf (2014) as Mobility 2.0 however many would not be so successful without enough users actively participating and generating information (knowledge co-production). Preliminary analyses of the use of social media in urban transport (using facebook, Twitter and WhatsApp) show good levels of engagement amongst city dwellers (Gruppo Brescia Mobilita, 2014). Other examples include UbiGreen, a mobile tool using (volunteered) geographic information about personal travel to support behaviour change towards greater use of green transport (Froehlich et al., 2009).

It is this revolution in the potential of data-driven planning, management and use of transport systems that has led Winter, Sester, Wolfson and Geers (2011) to call for a new interdisciplinary field called computational transportation science, defined as a science concerned with the study of transport systems where people interact with information systems (e.g. interfaces for driver assistance, or integrated transport information); where systems monitor and interpret traffic (e.g., mining for activity patterns, or crowdsourcing to monitor events); or where systems manage the traffic (e.g. control of traffic flow at traffic lights, or toll management). It is the second objective that is of particular interest to our research here. In particular, the study aims to develop insights into the potential and role of governments to use voluntary (crowdsourced) geographic information and social media effectively for sharing information, creating opportunities for collaboration, enhancing government responsiveness, planning and governance to achieve sustainable mobility and climate change goals (related studies included Bertot, Jaeger, & Hansen, 2012 and Panagiotopoulos, Bigdeli, & Sams, 2014).

This article reflects on (i) the technologies that are changing the way travellers move, particularly those using information that is co-produced through crowdsourcing and VGI techniques (ii) the technology potential for supporting and achieving sustainable mobility goals, and (iii) what role exists for governments (if any at all) in the use of user generated geographic information and the new mobility services.

A review of the literature and existing technology informs this article and the objective is to stimulate further research into these growing technologies as well as increasing participation and government role through the development of VGI and Citizen Science for travel and transport. This introduction is followed by a review of literature on the challenges facing cities and urban areas with respect to mobility and the potential of information to modify, support and improve travel behaviour. Section 3 deals with a broad review of new mobility services, providing a typology based on the type of information is used and disseminated. Section 4 defines the potential of the technology, information and behaviour change for sustainable mobility, whilst also discussing the opportunity provided by applying responsible research and innovation to mobility services. Section 5 discusses the role and responsibilities of governments in using information and crowdsourcing for sustainable mobility. The paper also attempts to define the role and need for regulation in this highly dynamic and evolving sector. Finally, Section 6 provides some conclusions and ideas for further research.

2. Transport and the City

In September 2015 McKinsey & Company published an article titled "Urban mobility at a tipping point" in which they claim that new business models and technologies are emerging to solve the mobility challenge faced by cities (Bouton, Knupfer, Mihov, & Swartz, 2015). Previous to that in 2008, The Economist published an article with the title "Nomads at last", claiming a change in people's

lives and mobility with the advent of mobile technologies (The Economist, 2008). Dal Fiore, Mokhtarian, Salomon and Singer (2014) provide a set of perspectives on the impact of mobile technologies on travel, but whilst they primarily look at travel behaviour issues, there is an increasing realisation that mobility is changing because of the ubiquitous nature of mobile phones and their advanced functionality and capabilities.

As cities grow across the world the need for effective transport infrastructures is increasingly becoming a major challenge. Existing infrastructure cannot support increasing numbers of vehicles, congestion is costing too much (see Christidis & Ibanez Rivas, 2012) and the European Environment Agency attributed 432,000 premature deaths across Europe originating from long-term exposure to $PM_{2.5}$, 75,000 premature deaths linked to NO_2 long-term exposure and 17,000 premature deaths associated with O_3 short-term exposure (European Environment Agency, 2015). Transport contributes significantly to these pollutants.

The quality of life of millions of people around the world is being affected by transport systems unable to cope with the growing and changing mobility needs. And whilst some cities are experiencing a decline in car ownership (for peak car effects see Metz, 2015), there are others which continue to grow their fleet with even bigger impacts on their economies, environment and public health (see for example Rhode and Muller (2015) mapping air pollution concentrations in China).

2.1. The Challenges of Transport in Cities

Sustainable mobility was defined in the European Commission's Thematic Strategy for the Urban Environment as being "a transport system which allows the basic access and development needs of individuals, companies and societies to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations; is affordable, operated fairly and efficiently, offers choice of transport mode, and supports a competitive economy, as well as balanced regional development; limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and, uses non-renewable resources at or below the rates of development of renewable substitutes while minimising the impact on the use of land and the generation of noise" (European Commission, 2004). Over the years this definition has raised many questions. As a vision or aspiration however it has stimulated a change in the thinking of policy makers and stakeholders. Goals like environmental protection and ideas like participatory democracy, which were foreign to the minds of transport planners not so long ago, are now establishing themselves on the transport policy agenda. Despite this, there is still a need for some guiding principles, if 'sustainability' is to become more than green rhetoric (Attard, 2006).

The European Union target for the transport sector is to reduce emissions of greenhouse gases by at least 60% by 2050 compared with 1990. There are also targets to move towards means of travel that use less energy, make efficient use of land and pollute less (EU, 2011). There is also support for this through the Clean Air Package and Climate Change obligations which following Paris COP21 look at even stricter measures to reduce CO_2 emissions. Governments therefore have an obligation to tackle transport. This obligation could be translated into various roles governments can take to seek the most effective measures to achieve sustainable mobility.

Apart from pollution which has a significant impact on urban dwellers' quality of life, there are other challenges facing transport in cities. More complex mobility patterns supported by hypermobility (Adams, 2001) and what is termed the 'mobile revolution' (Steinbock, 2005) are happening and changes are evolving very fast. Traditional transport planning does not take into consideration these complex, dynamic patterns of movement. Whilst policy and governance have not managed to utilise the potential of this revolution for cities through crowdsourced information, social media, participatory sensing and what is envisaged to be part of smart cities as defined by Batty et al. (2012).

Cities transport systems are changing as a reaction to growing needs. A number of technologies are driving changes in the more traditional modes such as innovative solutions for the future bus (Musso & Corazza, 2015), electrification, connectivity, and autonomous vehicles (Fagnant & Kockelman, 2015). Bicycle sharing schemes have increased to over 721 cities worldwide (Meddin & DeMaio, 2014) and walking is being incentivised through apps such as BitWalking where people generate digital currency whilst walking. Public transport is being challenged by new mobilities offering more demand responsive services and, through technology, alternatives which for some are considered 'disruptive'. This is however highly contested with the example of Uber maybe causing disruption to licensed taxi drivers but certainly not inventing a radical new service, and therefore disrupting very little of the current system.

The future urban transport will be technologically driven, will require private and public financing and as already seen, new business models and ventures to support the mix of modes and services on offer. Technologies and urban populations which are increasingly becoming connected and accustomed to sharing information will offer new opportunities to discover new ways of travel, but is there an opportunity for government to capitalise on this information and use it for policy making?

2.2. The Potential of Geographic Information and Crowdsourcing

Over the years as technology progressed a number of authors have tackled the issue of information provision and the opportunities that these offer. Information as a

facilitator of public transport use is probably the most common purpose, however Lyons and Harman (2002) identified also the potential of comparative information, promoting public transport as a sustainable and viable alternative.

This was supported much later by Kramers (2014) who stated that there is potential in traveler information systems to support sustainability-oriented decisions. She examined nine information systems available at the time and compared their functionality but also the potential of influencing the traveller and direct them to a sustainable alternative. Even more she hinted at the opportunity of community based apps which could support such systems to provide more information. Crowdsourcing is seen here as the 'other' data that could complement public authorities own data. Nash (2010) reviewed the potential of Web 2.0 applications for public participation in transport planning and looked at a number of applications for which data is generated through crowdsourcing, for example www.livablestreets.info. Similarly, Iveroth and Bengtsson (2014) looked at IT as an enabler and identified actors and their social activities as the factors that determine the success of behaviour change. The extent to which people are able and willing to change are key to sustainable mobility policy.

Lyons and Harman (2002) identify a number of issues related to users and information. These include a list of traveller concerns, information packaging and opportunities by which information can influence travel behaviour (see Figure 1). Some of these concerns can be alleviated through crowdsourced information and sharing (e.g. peer-to-peer reviews) and has been to a certain extent tested by apps such as Waze, in the case of car based travel and Moovit for public transport travel. Weiser, Scheider, Bucher, Kiefer and Raubal (2016) have explored how geographic information and communication technology can contribute to support individuals engage in more sustainable lifestyles without posing unrealistic restrictions on their mobility needs (contribution to sustainable mobility). They claim that technology enables novel, interactive, participatory, and collaborative approaches to support people through real-time, user and location-specific feedback on current as well as future behavior. They identify two ways in which *location-aware ICT* can be utilized for direct support in mobile decision-making and for evaluating the various aspects of people's mobile behavior. The facility offered by technology to users to monitor their travel behavior (for examples see the "Meili Mobility Collector" by Prelipcean, Gidofalvi, & Susilo, 2014), describe and rate their own mobility performance and peers tagging each other's mobility behavior with 'likes' or emojis, allow for the creation and collection of potentially useful volunteered geographic information.

So far however Government led initiatives have been few and far between. Haklay et al. (2014) drew up a report for the World Bank on *Crowdsourced Geographic Information Use in Government* and analysed 29 case studies from across the world, out of which only three applications related to transport (the UK's FixMyStreet, Street Bump in Boston and the Portland Transportation Planner). It is evident that despite the potential there has been very little use of such volunteered geographic information by governments for transport planning and policy.

In recent years, development of Web 2.0, of mobile technologies and the possibilities enabled by ubiquitous WiFi has led to information being used to develop a number of new services in the fields of personalised transport (car sharing and taxi hailing services) and public transport (shared on demand transport services). These relatively new services benefit from information being generated primarily through crowdsourced geographic data, and supported by more traditional information about travel habits and activities. Whilst in many cases apps collect information from the service users (e.g. Bridj), in the case of Finland, the Ministry of Transport and Communications rolled out Traffic Lab, a real time traffic information services development in partnership between local government and businesses to collect anonymous traffic data from private vehicles (opting in to the system). Information is collected about traffic through a mixture of in-car systems, GPS, short range radio signals and mobile network (Haaramo, 2014).

1. People undertaking journeys rarely seek information, as journeys are undertaken regularly without much reflection on behaviour beyond habit.
2. People have very poor judgement of cost and time when travelling by car with control over their journeys being seen as important. Public transport in contrast, is seen as difficult as information is sought from unfamiliar and uncertain sources.
3. Information about interchange is critical, and is seen as a key barrier to travel by public transport.
4. Information is required en route especially in the case of disruptions.
5. There are issues with trust over the information provided, especially where information is provided for guidance only.
6. Travellers are concerned with their own journeys so targeting information is essential.
7. Lifestyle changes are opportunities for travel behaviour change.
8. Very often people do not know what they want and must be made aware of information available.

Figure 1. Traveller information and users (adapted from Lyons & Harman, 2002).

Pender, Currie, Delbosc and Shiwakoti (2014) show how the combination of smartphone devices and dynamic information (crowdsourced and conventional) can have a positive impact on travellers in the case of disruption in services. The information however must be accurate as issues related to trust could have a negative effect on travellers. Social media can assist in addressing the real time information needs of disrupted commuters and provide operators and governments yet another resource.

Among the benefits that are associated with crowdsourcing, VGI and citizen science, authors have noted that citizen science can be used to provide high quality and effective information for scientific projects with social and environmental benefits through increased awareness and collection of data at the scale and extent that are not possible in regular projects (Bonney et al., 2014). Cooper, Dickinson, Phillips and Bonney (2007) also identified the benefits of increased awareness and ability to monitor local issues, whilst Zook et al. (2010) emphasized the benefits of the speed of response, the ability to tap a range of expertise and the potential and importance of engaging remote participants in an activity.

3. VGI and New Mobility Services—A Typology

This article attempts to develop a typology of some of the new mobility services and VGI efforts available in cities around the world in order to support some of the concepts mentioned in Section 2. The rapid developments in the sector have seen the rise and fall of these services with extreme competition being evident between service providers (for example Uber's clash with Didi Dache in China). Some services have been bought out by competitors (e.g. Sidecar was bought by GM after investing heavily in Lyft) and successful start ups bought by large companies (Waze, who was bought by Google). Table 1 provides for the different typologies based on four main characteristics: scale, ownership, type of information and transport mode.

The list provided in Table 1 is not intended to be exhaustive and the examples are just a snapshot of the variety of services provided around the world. These are also some of the more popular and quoted examples in the literature which not necessarily aimed at discussing sustainable mobility, however claiming a contribution to resolving some of the more pressing challenges in transport and indirectly resolving problems of private car use, congestion, pollution and mobility in cities. A quick search by city would uncover a good number of other services, some of which only available in the local language. This has been a major constraint for the research when the website or app, or the information about the service, is not available in the english language.

This list shows the variety of services offered from taxi hailing services which are now available in any city. And even in this category there are the traditional licensed black cabs (Gett) alongside AddisonLee which offer minicab services in the UK. The word disruption has been associated with services like Uber, Didi Dache, Ola and Lyft which match drivers with passengers through an online app and offer ride sharing services. This however has been heavily criticised with Christensen, Raynor and McDonald (2015) demonstrating why Uber is not a disruptive innovation at all, merely disrupting the traditional taxi industry (McGregor, Brown, & Gloss, 2105).

There is also a unique contribution of VGI in some of these services. Many depend on crowdsourced data (primarily through smartphone technologies) to locate clients. A look at the apps around shared services developed over more recent years show the use of crowdsourced data in the establishment of demand. Bridj uses a team of data scientists considering everything from census data to social-media posts and volunteered location information by users to figure out where a city has the biggest need for bus services. The app then optimizes pickups, drop offs and routing based on demand (Bouton et al., 2015). And whilst more traditional, mode specific apps use conventional data to support travel by public transport (Moovit), there are more apps based on VGI providing services to travellers by car, such as Waze, Google Maps, Apple Maps, and MapQuest which use OpenStreetMap data to optimize data from crowdsourcing. In these cases we find reference to both active and passive crowdsourcing. This affects not only the type and quantity of information but also to a certain extent, quality (Haklay, 2013).

Other examples include the many transport portals which provide multi-modal transport information services in every city and country (TFL Journey Planner and the UbiGo pilot) and those newer services which aim at integrating transport information for use by operators, governments and travellers alike, such as the Traffic Lab in Helsinki which is funded by the Ministry of Transport and Communication. Street Bump on the other hand seems to be the only crowdsourced information portal which is supported by public funds (Boston's Mayor's Office) and freely available to the community at large, as well as use by the municipality to ensure data coverage (Harford, 2014). In addition to that, FixMyStreet works through a charity providing a similar service in the UK, acting as the intermediary between citizens and their local council, although a version that is run by the local council is also available.

The efforts are primarily driven by private enterprise and show how information, both crowdsourced and conventional encourage new services, some of which in support of sustainable mobility principles. It is clear however from the list that there is still very little public sector engagement, something noted by Nash (2010) when referring to Web 2.0 applications.

4. New Technologies and Services for Sustainable Mobility

Whilst much of the research into these new mobility services has looked at user profiles (Hinkeldein, Schoen-

Table 1. A typology of mobility services.

Service	Scale		Ownership		Type of Information		Mode of Transport	
	Global	Local (national)	Public Owned	Private Owned	Conventional	Crowd sourced or VGI	Personal	Shared
Taxi Hailing / Booking Services								
Gett	x			x	x		x	
Easy Taxi	x			x	x		x	
AddisonLee		x		x	x		x	
ecabs		x		x	x		x	
Ridesharing Services								
Uber	x			x		x	x	
Didi Dache		x		x	x		x	
Ola		x		x		x	x	
Lyft		x		x		x	x	
Blablacar	x			x		x	x	
Peer-to-Peer Car Renting								
Getaround		x		x		x	x	
On Demand Shared Transport Services								
UberPool	x			x		x		x
Lyft Line		x		x	x	x		x
Kutsuplus		x		x		x		x
Via		x		x		x		x
Chariot		x		x	x			x
Bridj		x		x	x	x		x
Public Transport Information Services								
Moovit		x		x	x			x
Traveline		x		x	x			x
DB Bahn		x	x		x			x
ratp.fr		x	x		x			x
Traffic Information Services								
Waze	x			x		x	x	
Google Maps	x			x	x	x	x	
Apple Maps	x			x	x	x	x	
mapquest	x			x	x	x	x	
TomTom	x			x		x	x	
Garmin	x			x			x	
Multi-Modal Travel Information								
Google Transit	x			x	x			x
UbiGO		x	x	x	x	x		x
Trafiken.nu		x	x		x			x
TFL Journey Planner		x	x		x			x
Traffic Data Repositories								
LIVE Singapore		x		x	x		x	x
Traffic Lab Helsinki		x		x	x		x	x
Transport Wiki and Citizen Platforms								
Streets Wiki		x		x		x	x	
cyclopath		x		x		x	x	
Street Bump	x		x	x		x		x
FixMyStreet		x		x		x		x

duwe, Graff, & Hoffmann, 2015), performance (Shaheen & Cohen, 2007) and challenges (Sochor, Stromberg, & Karlsson, 2015), not many have reviewed their potential towards sustainable mobility, quantifying the real value of the sharing economy and the value of the information they hold or provide. Martin and Shaheen (2011) have looked at greenhouse gas emission impacts of car sharing and earlier Martin, Shaheen and Lidicker (2010) analysed the impact of car sharing on household vehicle holdings. Even fewer have looked at the implication of using crowdsourced data (VGI) in these services and the impacts on mobility (Gal-Tzur et al., 2014).

Ultimately this has an impact on the level of intervention by governments in support of such services, as well as the likely efforts by governments to promote or otherwise such initiatives. This however will be further discussed in Section 5. Some of the literature in Section 2 has already demonstrated the applications of conventional data and VGI to encourage the use of sustainable transport alternatives. Various applications (listed in Table 1) showed indirect implications on sustainable mobility through the potential of travel behaviour change, use of public transport and shared modes and traffic information. This section describes briefly the technological developments and the implications on behaviour change as a means of achieving sustainable mobility, and the more recent opportunity in applying Responsible Research and Innovation in the field of sustainable mobility.

4.1. Technology Developments

According to Castells et al. (2006) mobile devices resulted from the desire for more personal freedom, productivity and efficiency. Mobile technology has allowed for people to choose where they want to be without the constraints of a physical location. Apart from the many additional services offered through smartphone technologies such as maps, real time information and services, the technology has provided for travel which can be easier and more productive. This is also an opportunity for research as few authors have worked on revising the concepts and theories surrounding the value of travel time savings from use of mobile technology (Holley, Jain, & Lyons, 2008; Mackie et al., 2003; Victoria Transport Policy Institute, 2013), which in turn would have implications on the cost-benefit of greener (public) transport infrastructures which contribute to sustainable mobility goals (Næss, 2016).

In 2008 studies started looking at using mobile phones to determine road and traffic condition and later, transport modes. These devices equipped with an array of sensors and data capture equipment were also able to locate people and their information (Mohan, Padmanabhan, & Ramjee, 2008; Reddy et al., 2010; Williams, Thomas, Dunbar, Eagle, & Dobra, 2015; Yuan, Raubal, & Liu 2012). Since then much of the technology in terms of smartphone technology such as WiFI, Bluetooth, camera, GPS receiver, accelerometers, digital compass and microphone all able to collect information on the go has not only increased rapidly but also become cheaper and more pervasive amongst the population (Haklay, 2013).

The ability of people to collect information from a basic smartphone, through a downloadable app, sensor or through citizen science efforts has evolved very fast. Literature identified in Section 2 (e.g. Weiser et al., 2016) and some of the more open platforms and applications identified in Table 1 (e.g. FixMyStreet, Bridj and Waze) show how public engagement through either explicit or implicit applications or through citizen science projects are leading the way towards a change in the information available. Critics of volunteered information still cast doubts over the quality of the information collected by active and passive means (Flanagin & Metzger, 2008). Later research however found voluntary data to be as accurate as professional data (Haklay, 2010).

The successful use of technology, whether directly or indirectly through the use of VGI and other conventional data, can have significant implications for sustainable mobility. Research has for at least the last two decades looked at means of collecting data and providing it to users to enhance user experience, improve service delivery and more recently to try and change travel behaviour. These have increased the attractiveness of more traditional services but also allowed for the development of new services, as demonstrated in Section 2 and 3 of this article. Quantifying the impact on sustainable mobility goals requires interdisciplinary research bringing together technologists, transport planners and geographers.

4.2. Behaviour Change

In addition to the technological developments a broad array of new work-life arrangements are being put into practice. A number of authors identified the relationship between technology and travel (de Graaff & Rietveld, 2007; Kwan, 2007). Salmon (1986) categorised the effects into two, namely substitution and complementarity. Technology affects people's use of time and increases the spatial and temporal flexibility of their daily activities (Kwan, 2002). Black (2001) showed how people increased their geographical mobility with the use of mobile communication, which in turn has an impact on travel behaviour (Black, 2001). More research went into the impact of e-commuters with Roy, Martinez, Miscione, Zuidgeest, and van Maarseveen (2012) providing a comprehensive review of impacts on travel distance and number of trips generated. Interestingly Van de Coevering and Schwanen (2006) observed an increase in trip generation when the availability of information about activities and people of interest made people travel more to participate in those activities and meet people.

According to Dal Fiore et al. (2014) these transformations are backed by employers who are allowing employees to telecommute, equipping them with laptops, tablets, smartphones and WiFi connectivity so that their attachment to work and information is not linked to a fixed location. The nomads referred to in The Economist

in 2008 have now spread to many of society's various layers and the behaviour change towards more complex travel patterns is evident. This makes measuring the behaviour more difficult for transport planners and subsequently for sustainability policy which is being threatened by unsustainable growth in private travel and unrestrained mobility.

The applications which today affect everyday life are collecting information about users, directly or indirectly through the provision of information or through their use. The potential of this *big data* generated by private and public entities offers an opportunity to design the policy of the future, taking into account the issues associated with the data, the users (sample bias) and the spatio-temporal dimensions to which the data is attached. Research has started in this field with some interesting results leading to new breakthroughs for transport planning (Iqbal, Choudhury, Wang, & Gonzalez, 2014) and transport behaviour research. Yuan et al. (2012) and Williams et al. (2015) looked at the potential of mobile phone usage records and how it correlates with travel behavior, and mobile phone use as a measure for human mobility. Both studies identify valuable new insights into travel behavior and the challenges posed by the current technologies in fully utilizing the data generated from these technologies. Technologies that help us understand and influence behavior provide us with an opportunity to achieve sustainable mobility goals. Initial research in this area is promising (see for example Hamari, Koivisto, & Pakkanen, 2014).

4.3. Applying Responsible Research and Innovation for Sustainable Mobility

In the European Commission Horizon 2020 Programme there is an emphasis on science with and for society through the application of Responsible Research and Innovation (RRI). RRI is defined as an approach that anticipates and assesses potential implications and societal expectations with regard to research and innovation, with the aim to foster the design of inclusive and sustainable research and innovation. This strongly impinges on the need for public engagement where the future is co-created with citizens so as to bring on board the widest possible diversity of actors that would not normally interact with each other (European Commission, 2016).

In this context the idea of involving or extending crowdsourcing to real life problems and challenges such as those faced by cities in dealing with transport networks and services is very useful. The potential of using the benefits of VGI to give back citizens a sustainable future is waiting to happen.

5. Government Role and Responsibilities

So far this paper has discussed how new mobile technologies have facilitated not only the collection of VGI across a number of sectors but has also presented opportunities for the transport sector to develop new services through which mobility is provided in numerous new ways and has the potential (as some studies have already demonstrated) to contribute to sustainability. There is still however a lot of research which is required to ascertain the overall contribution of these technologies to sustainable mobility. Against this setting, the study aims to also develop insights into the role of governments to use voluntary (crowdsourced) geographic information and social media effectively for sharing information, creating opportunities for collaboration, enhancing government responsiveness, planning and governance to achieve sustainable mobility and climate change goals. The role of governments in this study is emphasized because of the overarching reach and opportunity these technologies have to support the potential of new mobility services through VGI.

Over the years the traditional interactions between Governments and the public have been dramatically challenged by new technologies that have unlocked unimagined opportunities for citizens to do more for themselves and be actively involved in tackling social problems (Bertot, Jaeger, Munson, & Glaisyer, 2010; Johnston & Hansen, 2011). Social media, mobile connectivity and the web interactivity have facilitated co-production of knowledge of services traditionally associated with things like neighbourhood watch and school crossing. This has changed the landscape from a dissemination one to a production and collaboration one (Benkler, 2006). Examples include Singapore's Government with You e-government strategy and UK's Big Society programme, both aiming to devolve power and facilitate collaboration between the people and governments.

In his work Linders (2012) identified three models of collaboration and mutual value creation as (i) citizen sourcings (citizen reporting websites); (ii) government as a platform for citizens to propose and make improvements; and (iii) Do-It-Yourself (DIY) government where citizens self-organise and government plays a passive role as a facilitating framework. In this context it is evident to see how the various new mobility services have been facilitated by technology but also by governments. The question however is more related to the third point made by Linders in that to what extent is the facilitating role of governments going to encourage services which have a significant impact on sustainable mobility and what other roles and responsibilities will governments have to or should undertake in order to exploit the full potential of such technologies, crowdsourcing and maybe co-production?

In the context of transport futures governments have certainly a role and a responsibility given the importance of mobility to economic development, well-being, equity and its impact on the environment. Linders (2012) identified five new roles and responsibilities for government and Table 2 attempts to relate them to the transport sector and identify potential benefits and contributions to sustainable mobility.

Table 2. Government roles and responsibilities and transport sector benefits.

Role and Responsibility	Transport Sector Example (refer to Table 1)	Benefits and Contributions to Sustainable Mobility
The government sets the tone and defines how actions should be conducted by setting rules, monitoring performance and enforcing compliance.	Facilitating conditions for transport operators to be creative is mostly seen in the different approaches taken by the US and Europe towards services like Uber. Rules and regulations should provide for a level playing field without restricting ideas stemming from new technologies and crowdsourced information.	As the regulatory framework in the transport sector becomes more liberal, governments have the responsibility to ensure proper understanding of the social and environmental implications of innovations. Only in this manner can new ideas and services truly benefit and contribute to sustainability in transport.
Government sponsorship in terms of financial resources or simply administrative/integrative support to co-production efforts.	Bridj (smart urban logistics platform, which uses big data, mobile technology, and pattern learning to provide a shuttle network that responds to the city's demand patterns) has recently launched a new service under public-private partnership with Kansas City Area Transportation Authority (Business Wire, 2016).	Behaviour change (Section 4.2) is probably the most significant benefit from these new technologies whereby people shift from private cars to shared public transport systems. In this manner there is far more effective use of public infrastructure and reduced emissions.
The role of government as mobilizer and motivator to get citizens together and organised.	TrafficLab is lead by the Ministry for Transport and Communication in Finland and aims to motivate, through access to information, potential new mobility services. Access to mobile technology data and adoption of VGI motivates many of the technologies reviewed in Table 1 and discussed in Section 4.1.	The benefits of some of the new mobility services have been quantified. Any motivation from government to co-develop or support better services (through the use of conventional and crowdsourced data) could potentially increase benefits.
Government has the ultimate responsibility for public well-being by monitoring society-led co-production.	The concerns over passenger safety and security in ride sharing. See the cases of assault linked to Uber (Annear & Pattari, 2015). The redirection of traffic through residential roads by Waze and creating Waze Traffic in roads not designed for heavy traffic (Bliss, 2015).	This is a particularly important role for government as some mobility services have shown not to contribute to sustainability. The adoption of RRI (Section 4.3) could be a potential avenue for developments in VGI and transport research.
The role of government to step in when third parties fail or to set boundaries for government action.	Most transport services are market led, so-called innovations and disruptors (e.g. Waze, Uber, Lyft) but others are also social enterprises (e.g. FixMyStreet) which contribute to government's' role to maintain infrastructure.	Potential of market led innovations, and more importantly social enterprises that have shown significant contribution to the effective functioning of governments (through information sourcing) and promotion of sustainability should be supported by governments.

5.1. Role and Need for Regulation

Transport as a sector is heavily controlled by politics and regulation. An underlying principle is driven by the need to support a public infrastructure which drives economies and promote social welfare through the strong relationship that exists between mobility, economy and equity (social well-being). This is mirrored in the long-term vision of Europe's Common Transport Policy and in specific sectors such as EC Regulation 1370/2007

for the use of competitive tendering in the provision of public transport services (European Commission, 2007) which recognizes the importance of subsidies where services are considered to be part of the welfare state.

It is evident from the review of roles and responsibilities that regulation has a major contribution to make to ensure that new mobility services offer benefits for sustainable mobility. Some of the examples shown in Table 2 raise concerns over the underlying principle driving some of these new services, and cyber libertarian approaches in this sector have stirred many debates over employment, security, safety, violation of contracts and equity amongst scholars (see Epstein, 2015). This increases the responsibilities for governments to search for a balance between true innovation which will contribute to solving some of the more critical concerns affecting our transport systems and societal concerns with growth and sustainable economic growth.

Under the right conditions that facilitate collaboration between governments and the public, and through an understanding of the capabilities embedded in crowdsourced geographic information and citizen engagement, governments and policy makers can start benefitting from the increasingly pervasive stream of information being generated through smartphone technologies, sensors and citizens open to contribute and engage. Open communication channels, public sector champions and change leaders, improved response time for technical problems, effective feedback and timely policy are amongst the conditions which would greatly impact the collaboration between governments and the public. Haklay et al. (2014) identified a list of factors that influence the use of VGI and issues surrounding the adoption of VGI in government. In addition to this, effective regulation which facilitates the availability and use of crowdsourced geographic information could significantly improve policy making and reduce the onus on governments to spend substantial amounts of money on traditional data collection methods which are slowly becoming more redundant and do not reflect the dynamic nature of mobility today.

6. Conclusions and Further Research

Continued advancements in technologies, connectivity and user engagement have revolutionised many important sectors and there is no reason to believe that this will not happen in transport. Early innovators are already paving the way to show how new mobility services can help with the transport problems facing our cities. This however has not happened with discussions relating to the information they provide and use, the legal issues, their sustainability and their overall contribution to goals such as air quality improvements and social well-being.

The increase in number and the dynamic nature of these new technologies, data and services also suggest that more research is required to understand their (economic) sustainability, their contribution of sustainability goals and their impact on cities, where most technologies are deployed. Research into the conceptual requirements and design, system component and evaluation of new services and applications aimed at changing behaviour have already been identified by Weiser et al. (2016) and impinge heavily on their success or otherwise to attract users. And whilst some applications have managed successfully to engage a relatively large user base, research should also be encouraged into ways to promote green alternative transport. For example, can applications like Waze provide green alternative routes and services to its users?

Furthermore research must also be carried out to identify the natural and social factors affecting patterns of mobility and technology use. To date much of the research looking at determinants of travel has not combined the implications of technology use and information provision and collection. Applications such as UbiGreen, Waze, Moovit and others which rely on both collection of VGI and provision of information (feedback to user) can have significant impact on travel behaviour, and subsequently on transport systems sustainability.

The rising trends in crowdsourcing, citizen science and information on the go are providing a new opportunity for innovators, however there is also a role for governments. This role cannot be restricted to regulation and control or to simply ensure the delivery of equitable and sustainable services, but it must also make effective use of the potential embedded in conventional and volunteered geographic information for policy and citizen engagement. Preliminary research into the use of VGI in governments has shown a fair amount of success. More research is therefore required into technology and policy transfer, and the quantification of benefits for governments to invest more in VGI for sustainable mobility.

This paper aimed at a review of the technologies that have developed over the last few years through conventional and crowdsourced (VGI) data, it shed some light on the potential for these new mobility services to achieve sustainable mobility goals and the important role that government has in the use of user generated information and the regulation of new mobility services.

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Conflict of Interest

The authors declare no conflict of interests.

References

Adams, J. (2001). The social consequences of hypermobility. *RSA Lecture*. Retrieved from http://johnadams.co.uk/wp-content/uploads/2006/hypermobi

lityforRSA.pdf

Annear, S., & Pattani, A. (2014, February 9). Uber driver charged with assault. *Boston Globe*. Retrieved from http://www.bostonglobe.com/metro/2015/02/09/boston-uber-driver-charged-with-indecent-assault-and-battery-boston-police-say/k9eKsX2q95hA9bdM13IorJ/story.html

Attard, M. (2006). *Coping with change. The problems of adopting sustainable transport policies in the small island state of Malta* (Ph.D. thesis). University College London, London.

Banister, D. (2007). The sustainable mobility paradigm. *Transport Policy*, *15*(2), 73–80.

Batty, M., Axhausen, K., Fosca, G., Pozdnoukhov, A., Bazzani, A., Wachowicz, . . . Portugali, Y. (2012). *Smart cities of the future* (Paper 188). London: UCL Centre for Advanced Spatial Analysis Working Paper Series.

Benkler, Y. (2006). *The wealth of networks: How social production transforms markets and freedom*. Yale University Press.

Bertot, J., Jaeger, P., Munson, S. & Glaisyer, T. (2010). Engaging the public in open government: Social media technology and policy for government transparency. *Computer*, *43*(11), 53–59.

Bertot, J. C., Jaeger, P. T. & Hansen, D. (2012). The impact of policies on government social media usage: Issues, challenges and recommendations. *Government Information Quarterly*, *29*(1), 30–40.

Black, W. R. (2001). An unpopular essay on transportation. *Journal of Transport Geography*, *9*(1), 1–11.

Bliss, L. (2015, April 29). L.A.'s love/hate relationship with waze continues. One council member is pushing the city to partner with the app to reduce congestion on residential streets. *The Atlantic CityLab*. Retrieved from http://www.citylab.com/commute/2015/04/las-lovehate-relationship-with-waze-continues/391832

Bonney, R., Shirk, J. L., Phillips, T. B., Wiggins, A., Ballard, H. L., Miller-Rushing, A. J. & Parrish, J. K. (2014). Next steps for citizen science. *Science*, *343*, 1436–1437.

Bouton, S., Knupfer, S. M., Mihov, I. & Swartz, S. (2015). *Urban mobility at a tipping point*. McKinsey & Company. Retrieved from http://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/urban-mobility-at-a-tipping-point#0.

Brescia Mobilita. (2014, November 7) #SocialBus. *Brescia Mobilita*. Retrieved from http://bresciamobilita.it/public/resources/brescia%20mobilita/utenti/eventi/comunicato-per-la-stampa7nov14.pdf

Business Wire. (2016, February 11). Bridj, Kansas City area transportation authority launch pilot program to extend urban mobility with Ford Transit vans. *Business Wire*. Retrieved from http://www.kxxv.com/story/31194041/bridj-kansas-city-area-transportation-authority-launch-pilot-program-to-extend-urban-mobility-with-ford-transit-vans

Castells, M., Fernández-Ardèvol, M., Qiu, J. L., & Sey, A. (2006). *Mobile Communication and Society. A Global Perspective*. Cambridge: MIT Press.

Christensen, C. M., Raynor, M. E., & McDonald, R. (2015). What is disruptive innovation? *Harvard Business Review, December*, 44–53.

Christidis, P., & Ibanez Rivas, J. N. (2012). *Measuring road congestion*. Institute for Prospective Technological Studies (IPTS), European Commission Joint Research Centre. Retrieved from http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=5600

Cooper, C. B., Dickinson, J., Phillips, T., & Bonney, R. (2007). Citizen science as a tool for conservation in residential ecosystems. *Ecology and Society*, *12*(2), 11.

Dal Fiore, F., Mokhtarian, P. L., Salomon, I., & Singer, M. E. (2014) "Nomads at last"? A set of perspectives on how mobile technology may affect travel. *Journal of Transport Geography*, *41*, 97–106.

de Graaff, T., & Rietveld, P. (2007). Substitution between working at home and out-of-home: The role of ICT and commuting costs. *Transportation Research Part A: Policy and Practice*, *41*(2), 142–160.

Epstein, R. (2015). The libertarian: "Uber and innovation". *Hoover institution*. Retrieved from http://www.hoover.org/research/libertarian-uber-and-innovation.

European Commission. (2004). *Towards a thematic strategy on the urban environment. Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of Regions COM (2004)60 final*. European Commission. Retrieved from http://www.europarl.europa.eu/meetdocs/committees/rett/20040316/com_com(2004)0060en.pdf

European Commission. (2007). *Regulation (EC) No. 1370/2007 of the European Parliament and of the Council of 23rd October 2009 on Public Passenger Transport Services by Rail and by Road*. European Commission. Retrieved from http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:315:0001:0013:EN:PDF

European Commission. (2016). *Horizon 2020 Responsible Research and Innovation*. European Commission. Retrieved from https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

European Environment Agency. (2015). *Air quality in Europe: 2015 report* (EEA Report 5/2015). Retrieved from http://www.eea.europa.eu/publications/air-quality-in-europe-2015

Fagnant, D. J., & Kockelman, K. (2015). Preparing a nation for autonomous vehicles: opportunities, barriers and policy recommendations. *Transportation Research A: Policy and Practice*, *77*, 167–181.

Flanagin, A. J., & Metzger, M. J. (2008). The credibility of volunteered geographic information. *GeoJournal*, *72*(3-4), 137–148.

Froehlich, J., Dillahunt, T., Klasnja, P., Mankoff, J., Consolvo, S., Harrison, B., & Landay, J. (2009). UbiGreen: Investigating a mobile tool for tracking and support-

ing green transportation habits. *Proceedings of CHI 2009*. Boston. Retrieved from https://www.cs.washington.edu/sites/default/files/hci/papers/tmpGfDHel.pdf

Gal-Tzur, A., Grant-Muller, S. M., Kuflik, T., Minkov, E., Nocera, S. & Shoor, I. (2014). The potential of social media in delivering transport policy goals. *Transport Policy*, *32*, 115–123.

Gruppo Brescia Mobilita. (2015) La Mobilita entra in rete. The Gruppo Brescia Mobilita and Social Customer Care. *Brescia Mobilita*. Retrieved from http://docplayer.net/988054-The-gruppo-brescia-mobilita-and-social-customer-care.html

Haaramo, E. (2014). Death of the car: The tech behind Helsinki's ambitious plan to kill of private vehicles. *ZDnet*. Retrieved from http://www.zdnet.com/article/death-of-the-car-the-tech-behind-helsinkis-ambitious-plan-to-kill-off-private-vehicles

Haklay, M. (2010). How good is OpenStreetMap information? A comparative study of OpenStreetMap and Ordnance Survey dataset s for London and the rest of England. *Environment and Planning B*, *37*, 682–703.

Haklay, M. (2013). Citizen science and volunteered geographic information: Overview and typology of participation. In D. Sui, S. Elwood, & M. Goodchild (Eds.), *Crowdsourcing geographic knowledge. volunteered geographic information (VGI) in theory and practice* (pp. 105–122). Dordrecht: Springer.

Haklay, M., Antoniou, V., Basiouka, S., Soden, R., & Mooney, P. (2014). *Crowdsourced geographic information use in government* (Report to GFDRR). London: World Bank.

Hamari, J., Koivisto, J., & Pakkanen, T. (2014). Do persuasive technologies persuade? A review of empirical studies. In *Persuasive Technology* (pp. 118–136). Berlin Heidelberg: Springer.

Harford, T. (2014, March 28). Big data: Are we making a big mistake? Financial Times. Retrieved from http://www.stat.ucla.edu/~yuille/Courses/Stat161-261-Spring14/Big%20data_%20are%20we%20making%20a%20big%20mistake_%20-%20FT.pdf

Hinkeldein, D., Schoenduwe, R., Graff, A. & Hoffmann, C. (2015). Who would use integrated sustainable mobility services—and why? In M. Attard & Y. Shiftan (Eds.), *Sustainable urban transport* (Transport and Sustainability, vol. 7, pp. 177–203). London: Emerald Group Publishing Limited.

Holley, D., Jain, J., & Lyons, G. (2008). Understanding business travel time use and its place in the working day. *Time and Society*, *17*(1), 27–46.

Iqbal, S., Choudhury, C. F., Wang, P., & Gonzalez, M. C. (2014). Development of origin-destination matrices using mobile phone call data. *Transportation Research Part C: Emerging Technologies*, *40*, 63–74.

Iveroth, E., & Bengtsson, F. (2014). Changing behavior towards sustainable practices using Information Technology. *Journal of Environmental Management*, *139*, 59–68.

Johnston, E., & Hansen, D. (2011). Design lessons for smart governance infrastructures. In A. P. Balutis, T. F. Buss, & D. Ink (Eds.), *American governance 3.0: rebooting the public square?* (pp. 197–212). New York: Routledge.

Kenyon, S., & Lyons, G. (2003). The value of integrated multimodal traveller information and its potential contribution to modal change. *Transportation Research Part F: Traffic Psychology and Behaviour*, *6*(1), 1–21.

Kramers, A. (2014). Designing next generation multimodal traveler information systems to support sustainability-oriented decisions. *Environmental Modelling and Software*, *56*, 83–93.

Kwan, M. P. (2002). Time, information technologies and the geographies of everyday life. *Urban Geography*, *23*, 471–482.

Kwan, M. P. (2007). Mobile communications, social networks, and urban travel: Hypertext as a new metaphor for conceptualising spatial interaction. *The Professional Geographer*, *59*, 434–446.

Lanzendorf, M. (2014). *The black spot of policy evaluations: Social change and mobility 2.0*. Paper presented at the Royal Geographic Society (with IBG) Annual Meeting, London. Retrieved from http://conference.rgs.org/AC2014/104

Linders, S. (2012). From e-government to we-government: Defining a typology for citizen co-production in the age of social media. *Government Information Quarterly*, *29*(4), 446–454.

Lyons, G. (2001). Towards integrated traveller information. *Transport Reviews*, *21*, 217–235.

Lyons, G., & Harman, R. (2002). The UK public transport industry and provision of multi-modal traveller information. *International Journal of Transport Management*, *1*, 1–13.

Mackie, P. J., Wardman, M., Fowkes, A. S., Whelan, G., Nellthorp, J., & Bates, J. (2003). Values of travel time savings UK. University of Leeds. Retrieved from http://eprints.whiterose.ac.uk/2079/2/Value_of_travel_time_savings_in_the_UK_protected.pdf

Manovich, L. (2009). The practice of everyday (media) life: From mass consumption to mass cultural production? *Critical Inquiry*, *35*, 319–331.

Martin, E. W., & Shaheen, S. (2011). Greenhouse gas emission impacts of carsharing in North America. *Intelligent Transportation Systems, IEEE Transactions*, *12*(4), 1074–1086.

Martin, E. W., Shaheen, S., & Lidicker, J. (2010). Impact of carsharing on household vehicle holdings: Results from North American shared-use vehicle survey. *Transportation Research Record: Journal of the Transportation Research Board*, *2143*, 150–158.

McGregor, M., Brown, B., & Gloss, M. (2015). Disrupting the cab: Uber, ridesharing and the taxi industry. *The Journal of Peer Production*, *6*. Retrieved from http://peerproduction.net/issues/issue-6-disruption-and-the-law/essays/disrupting-the-cab-uber-ridesharing-

and-the-taxi-industry
Meddin, R., & DeMaio, P. (2014). The bike-sharing world map. *Bike-Sharing World*. Retrieved from www.bikesharingworld.com
Metz, D. (2015). Peak car in the big city: Reducing London's transport greenhouse gas emissions. *Case Studies in Transport Policy*, *3*(4), 367–371.
Miller, H. J., (2013). Beyond sharing: Cultivating cooperative transportation systems through geographic information science. *Journal of Transport Geography*, *31*, 296–308.
Mohan, P., Padmanabhan, V., & Ramjee, R. (2008). Trafficsense: Rich monitoring of road and traffic conditions using mobile smartphones. In *Proceedings of the Conference on Embedded Networked Sensor Systems* (pp. 323–336). New York: ACM.
Musso, A., & Corazza, M. V. (2015). The European bus system of the future: Research and innovation. *Transportation Research Procedia*, *5*, 13–29.
Næss, P. (2016). Inaccurate and biased: Cost-benefit analyses of transport infrastructure projects. In P. Næss, L. Price, & H. Despain (Eds.) *Crisis System: A critical realist and environmental critique of economics and the economy*. New York: Routledge.
Nash, A. (2010). Web 2.0 applications for improving public participation in transport planning. *Proceedings of the Transportation Research Board 89th Annual Meeting* (pp. 1–25). Washington DC: Transportation Research Board.
Panagiotopoulos, P., Bigdeli, A. Z., & Sams, S. (2014). Citizen-government collaboration on social media: The case of Twitter in the 2011 riots in England. *Government Information Quarterly*, *31*, 349–357.
Pender, B., Currie, G., Delbosc, A., & Shiwakoti, N. (2014). Social media use during unplanned transit network disruptions: A review of literature. *Transport Reviews*, *34*(4), 501–521.
Prelipcean, A., Gidofalvi, G., & Susilo, Y. O. (2014) Mobility collector. *Journal of Location Based Services*, *8*(4), 229–255.
Reddy, S., Mun, M., Burke, J., Estrin, D., Hansen, M., & Srivastava, M. (2010). Using mobile phones to determine transportation modes. *ACM Transactions on Sensor Networks*, *6*(2), 13.1–13.27.
Roy, P., Martinez, A. J., Miscione, G., Zuidgeest, M. H. P., & van Maarseveen, M. F. A. M. (2012). Using social network analysis to profile people based on their e-communication and travel balance. *Journal of Transport Geography*, *24*, 111–122.
Rushe, D. (2013, June 11). Google buys Waze map app for $1.3bn. *The Guardian*. Retrieved from http://www.theguardian.com/technology/2013/jun/11/google-buys-waze- maps-billion.
Salmon, I. (1986). Telecommunication and travel relationship: a review. *Transportation Research Part A: Policy and Practice*, *20A*, 223–238.
Shaheen, S., & Cohen, A. (2007). Growth in worldwide carsharing: An international comparison. *Transportation Research Record: Journal of the Transportation Research Board*, *1992*, 81–89.
Sochor, J., Stromberg, H., & Karlsson, I. C. M. (2015). Implementing mobility as a service. Challenges in integrating use, commercial and social perspectives. *Transportation Research Record: Journal of the Transportation Research Board*, *2536*, 1–9.
Steinbock, D. (2005). *The mobile revolution. The making of mobile services worldwide*. London: Kogan Page.
The Economist. (2008). Nomads at last. *The Economist*. Retrieved from http://www.economist.com/node/10950394
Van de Coevering, P., & Schwanen, T. (2006). Re-evaluating the impact of urban form on travel patterns in Europe and North-America. *Transport Policy*, *13*, 229–239.
Victoria Transport Policy Institute. (2013). Chapter 5.2 Travel Time. *Victoria Transport Policy Institute*. Retrieved from www.vtpi.org/tca/tca0502.pdf.
Weiser, P., Scheider, S., Bucher, D., Kiefer, P., & Raubal, M. (2016). Towards sustainable mobility behavior: Research challenges for location-aware information and communication technology. *GeoInformatica*, *20*, 213–239.
Williams, N. E., Thomas, T. A., Dunbar, M., Eagle, N., & Dobra, A. (2015). Measures of human mobility using mobile phone records enhanced with GIS data. *PLoS ONE*, *10*(7), 1–16.
Winter, S., Sester, M., Wolfson, O., & Geers, G. (2011). Towards a computational transportation science. *Journal of Spatial Information Science*, *2*, 119–126.
Yuan, Y., Raubal, M., & Liu, Y. (2012). Correlating mobile phone usage and travel behavior—a case study of Harbin, China. *Computers, Environment and Urban Systems*, *36*, 118–130,
Zook, M., Graham, M., Shelton, T., & Gorman, S. (2010). Volunteered geographic information and crowdsourcing disaster relief: A case study of the Haitian earthquake. *World Medical and Health Policy*, *2*(2), 7–33.

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Article

Re-Thinking Housing: From Physical Manifestation of Colonial Planning Policy to Community-Focused Networks

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Abstract
Current housing systems and policies for First Nations communities in Canada produce a physical manifestation of ongoing colonialism: the house. Examinations of the physical community and house yield an understanding of deeply systematized imperial struggles between Indigenous communities and planning as a discipline. Indigenous families are in crisis as the housing system and Federal planning policies have not allowed for the provision of adequate nor appropriate homes. The recent independent Truth and Reconciliation Commission has begun a civic discussion, accompanied by a new federal government looking to begin a new relationship with Indigenous peoples—here we explore how planning can be a leader in this shift. The 'contact zone' is used as an operational lens to examine the ways discourse is used to shape the existing housing system. An interdisciplinary and global approach informs interventions in the existing housing system and policies, creating a community-driven model, and uncovering a reimagined role for the planner.

Keywords
Aboriginal; development planning; First Nations; housing; inclusive and sustainable development; Indigenous planning; participatory planning; spatial planning

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1. Introduction

The independent Truth and Reconciliation Commission's Calls to Action, as well as the most recent federal election have brought discussion of a 'new relationship' (Liberal Party of Canada, 2015) with Indigenous peoples to the fore of public discussion in Canada. Indigenous peoples in Canada currently live with inequitably low funding and programming in education and health (Office of the Chief Coroner, 2016), and Indigenous youth are disproportionately being made wards of the state through "inequitable and discriminatory provision of child welfare services" (*First Nations Child and Family Caring Society of Canada et al. v. Attorney General of Canada*, 2016, p. 2). Numerous inquests, court cases, and policy documents recognize the link between poor housing, mental and physical health outcome gaps, and the ongoing crisis of Indigenous youth suicide (Finlay, Hardy, Morris, & Nagy, 2010; Mushkegowuk Council, 2016; Standing Senate Committee on Aboriginal Peoples, 2015; Truth and Reconciliation Commission of Canada, 2015). Housing deficiencies in on-reserve First Nations communities are alarming; rates of crowding are seven times the national average—a housing shortage that is forcing community members off reserves. Forty-three percent of homes are in need of major repair because of mold, fire, and structural damage (Statistics Canada, 2015), and "housing problems are most acute in remote communities" (Standing Senate Committee on Aboriginal Peoples, 2015, p. 4). These remote communities, the subject of this article, make up the majority of set-

tlements across the mid-Canada corridor (see Figure 1), an east-to-west band across many provinces and territories loosely defined by the limits of the boreal forest. A culturally diverse area, the mid-Canada corridor is most commonly associated with its "treasure house of natural resources" (Rohmer, 1969, p. 1), not its people, owing to its vast separation from the densely populated, urban concentrations of power in Canada.

The link between the current housing system and community health crises is rarely analyzed through the lens of planning and its processes. The housing crisis facing Canada's Indigenous population is the physical manifestation of the continued implementation of assimilative policies of Canada's federal government, from the Gradual Civilization Act through to the Indian Act. Colonialism forced the relocation of Indigenous peoples to reserves and severed communities from their traditional land, while removing Indigenous children from their homes to reside in residential schools disintegrated traditions, language, and culture. Reserves became sites of 'suburban' community layouts, with houses not constructed to meet climactic demands and with no relationship to Indigenous culture or values. Cultural dislocation itself is understood to create the illness, depression, substance abuse, violence, and suicide found in so many communities (Kirmayer, Brass, & Tait, 2000). Land use planning, as a discipline, has been complicit in Canada's imperialist objectives, facilitating both a constant expansion of territory and an imposition of Western values. The physicality and essential nature of housing makes it the perfect unit of analysis through which to understand planning's relationship with Indigenous peoples. The paradigm shifts needed to create a culturally appropriate, wellness-promoting housing system for remote and isolated First Nations communities in the mid-Canada corridor becomes part of the reconciliation project currently underway.

For more than half a century, Canada's federal government has recognized its failure in housing policy for Indigenous peoples (Carter, 1993)—a problem it continues to acknowledge through various reports, commissions, and hearings (Indian and Northern Affairs Canada, 1990; Royal Commission on Aboriginal Peoples, 1996; Standing Senate Committee on Aboriginal Peoples, 2015). But improvements in outcomes have not occurred (Office of the Auditor General [OAG], 2006, 2011). Consistently, the government has relied on a series of ad-hoc solutions; "short-term, crisis oriented initiatives that respond to a specific problem" (Carter, 1993, p. 6) but do not reconsider the housing system holistically. Periodically, specific 'symptoms' of poor housing, such as health, crime, or 'morality,' attract mainstream attention and a push is made to systemize a new level of adequacy that reflects the societal 'concern of the day' but neglects the assimilative principles that the system is built upon.

The house is a powerful cultural tool, and housing systems should not be reduced to only the creation of shelter or isolated dwelling units, but must be considered as part of a complex network of community assets. This conceptualization of housing is not unique to either the Western or First Nations traditions (Royal Commission on Aboriginal Peoples, 1996). While it is known that no homogenous culture exists across the many Nations

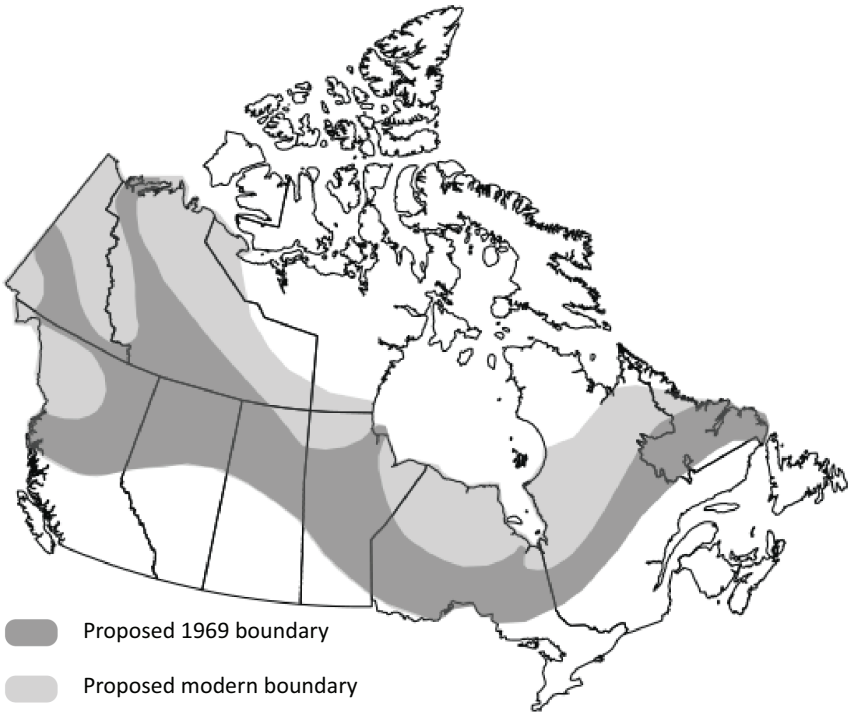

Figure 1. Mid-Canada Corridor. Diagram of Canada adapted from the 1969 concept of the Mid-Canada Corridor (Rohmer, 1969) and its modern re-imagining to include newly discovered resource rich areas (Van Nostrand, 2014).

of Indigenous peoples throughout the vast near-north of Canada being examined in this paper, the Tsimshian of Central British Columbia provide one example of housing concepts among Indigenous communities: they understand housing as a "literal as well as symbolic seat of culture" (Perry, 2003, p. 603).

The Indian Act, enacted just after Confederation in 1866, remains an active destructive force in lives of Indigenous peoples within Canada. The aim of this policy, as described by former deputy superintendent of Indian Affairs, Duncan Campbell Scott, was "to continue until there is a not a single Indian in Canada that has not been absorbed into the body politic" (Indian and Northern Affairs Canada, 1978, p. 114). Housing inevitably became a powerful site of Canada's assimilationist project: As cultural superiority was assumed, the house became a tool through which to assert force. A standard housing regime was created that characterized Indigenous people as homogenous and needing to change, and culminated in a rigid urban structure, steeped in Western cultural norms, "grid patterns reminiscent of city subdivisions" (Ross, 2006, p. 120) that was manufactured across mid-Canada, ignorant to local culture, ways of living, and geography (see Figure 2 for an example).

Reimagining housing systems as value-driven equitable networks within communities requires the deconstruction of the colonial structures that support the existing system. To do this, the unique role of the planner must be recognized. The planner acts as an intermediary, implementing policy constructed by the settler state for Indigenous people—an interaction managed by power relationships. In seeking change, this paper focuses on interventions that can alter these interactions and processes, and how such changes would project onto the built environment. Planning's critical role of implementation in the housing system, together with the discipline's modern theoretical potential as emancipator (Ugarte, 2014) and provider of hope (Forester, 1982), provides an opportunity for planners to be leaders in building a new relationship and championing change with Indigenous communities.

This paper begins by examining the historical context through which housing policy has developed, and the existing policies governing development in First Nations communities across Canada's near-north. Informed by international anti-colonial thought including but not limited to planning literature we seek alternative conceptualizations of relationships in the development and implementation of housing policy in Canada. Indigenous voices and understandings are put in the center of this process to demonstrate a radically different approach to land, its use, and its regulation. This paper does not suggest one large-scale policy revolution to erase the impact of colonial land use policy on housing in remote Indigenous communities; rather, it explores paradigm shifts that can be made within the planning process that can spark the process of decolonization.

2. Frontiers and Contact Zone

Capitalizing on the role of the planner in the implementation of housing systems, we sought possible in-

Figure 2. Eabametoong First Nation. Typical 'suburban' streetscape of a mid-Canada corridor First Nations community. Source: Author.

terventions not at the policy level, but in the processes of engagement. A frame of analysis was required to understand how such disruptions could be projected onto the built environment and we adopted the concept of the 'contact zone,' a space, both physical and perceived, in which planning processes take place (Barry & Porter, 2011). First conceptualized by Mary Louise Pratt (1991, 1992), the contact zone is a place of meeting and conflict between cultures. Equality is not presupposed within the contact zone and interactions often proceed "in [the] context of highly asymmetrical relations of power" (Pratt, 1991, p. 34). Acknowledging the context of power inherent in (post)colonial relationships situates the planning process within a historically accurate conceptual framework.

The contact zone is the place where the state, and those acting on its behalf, meet Indigenous peoples. Discourse is highly mediated and codified in policy; roles and responsibilities are strictly prescribed. Housing's physical form is a reflection of this discourse, transposing the dominant values onto the built form. Barry and Porter (2011) importantly understand the contact zones as, "contested sites that have both transformative and oppressive possibilities" (p. 173). Disruptions at the level of implementation have the potential to realign discourse within the contact zone—shifting power or reassigning responsibilities, creating wholly new outcomes. Interventions do not create new contact zones because interactions retain their historical context (Pratt, 1991), but they allow for the creation of a radically different product. The creation of a culturally appropriate built form requires a decolonization of the housing system, but does not require it to begin with policy.

Razack (2015) and Furniss (1999) explain the use of power within the contact zone of Indigenous/Settler relations is controlled by the frontier myth. These authors build on a series of metaphors and symbols described in the work of Richard Slotkin (1973), combining the cultural historical ideas of a tabula rasa North America, and Indigenous peoples being brought into a civilized state by European settlers. In Canada, the frontier is understood as, "marked by boundaries and the encounter of opposites: civilization and savagery, man and nature, whites and Indians, good and evil" (Furniss, 1999, p. 198). The Western planning tradition, founded in a Euclidean pursuit of order and stability (Friedmann, 1993), serves to further the myth of 'civilizing' (and thereby destroying Indigenous cultural practices), but can be reoriented towards action. Existing housing frameworks and interventions are examined in this paper to clarify how implementation processes, and the assumptions that uphold them, are projected onto the built environment.

3. Planning's Complicity in Cultural Erasure

Different treaty histories, points of contact, and levels of economic, government, and religious coercion have created distinct colonial legacies across Canada. Broadly, First Nations peoples living in the communities across the mid-Canada corridor encountered much later direct government intervention—beginning only in the early twentieth century—than those in first colonized areas adjacent to the St. Lawrence Seaway and the Great Lakes of southern Canada. Before government intervention, settler influence was already occurring through the Hudson's Bay Company, established in 1670, whose trade was accompanied by the spread of disease, over-hunting, and trapping. When direct government intervention did arrive in the mid-Canada corridor, its land use processes were informed by the previous two centuries of development across southern Canada. Understanding the housing policies introduced in these communities over the last half-century requires an understanding of the historical attitudes that led to their development.

Canada's federal government has inherited a unique jurisdictional position in First Nations communities, founded in The Royal Proclamation of 1763, with the first tripartite agreement between the British Crown, Canadian Colony, and Indigenous peoples. Land sovereignty was already a question in the 18th century, and the agreement established that Indigenous peoples had pre-existing rights to land in the establishing Canadian colony, but installed the Crown as "protector of Indian people, particularly in matters involving land" (Indian and Northern Affairs Canada, 1978, p. 5). Procedures were enumerated for acquiring land by settlers or the colony. A sense of benevolence saw the Crown assume responsibility until it deemed First Nations people, "were able to occupy and protect them [the lands] in the same way as other citizens" (Indian and Northern Affairs Canada, 1978, p. 1). The conception of a nation-to-nation relationship was born from the Proclamation, and with it, land rights that could not be extinguished. But also born was enduring inequality in land-use decisions.

As settler populations grew, and risk of war with the United States subsided with the 1814 Treaty of Ghent, the Crown's impetus for relationship-building to create military allies of Indigenous peoples diminished. "Other aspects of British Indian Policy such as civilization and protection became more prominent" (Indian and Northern Affairs Canada, 1978, p. 12) meaning that the full impetus of the Crown's perceived superiority could now be implemented in policy. Peacetime, and a focus on the economic development of the home front, pushed the expansion of empire westward and northward. Satisfying newly arriving settlers, Miller (2001) argues, meant the existing methods of acquiring land through statutory provisions and consent of Indigenous peoples were seen as prohibitively time-consuming and costly; Indigenous peoples were now an "expensive encumbrance and an obstacle to agricultural expansion" (p. 118).

The dominant belief in the mid-nineteenth century was that "only by isolating Indians on reserves, could the resident school teacher, agent and missionary achieve success in preparing Indians for integration" (Indian and Northern Affairs Canada, 1978, p. 16). The reserve sys-

tem provided a land-use plan that enforced these transitional spaces. The project of assimilation, jointly undertaken by government, church, and business, required the destruction of all cultural practices in these spaces. Reserves tied First Nations communities to a particular land-base, enforcing where possible agrarian economies similar to those practiced by settlers, while making available large tracts of land (Monk, 2006). On-reserve housing completely re-ordered domestic life by altering family structures, normalizing gender roles, and providing a basic economic unit, housing design served a clear colonial moralizing agenda, which recognized that "there is no better teaching tool than the object of a good well-ordered Christian home" (Perry, 2003, p. 594).

The discovery of gold in the Yukon Territory and other minerals in Northern Ontario and Saskatchewan pushed the frontier and its land-use processes into the mid-Canada corridor between 1899 and 1907 with the signing of Treaties Eight, Nine, and Ten. Roy (2006) argues that planning became complicit in the project of empire, not through warfare but through the narrative of progress. The tools of the planner facilitated economic expansion and resource extraction; building, surveying, mapping, and development became the weapons with which the frontier was conquered. As the political tool accompanying the ordering and division of land, the treaty process had already established a pattern of dispossession and broken promises (Buckley, 1992). Despite the already dismal conditions of First Nations peoples in the mid-Canada corridor, legacies of colonial economic forces meant that Indigenous inhabitants who thought the treaties brought "a relationship of friendship and mutual assistance with the government, were shocked by the treatment they received" (Miller, 2001, p. 204).

During this period of territorial expansion, the Indian Act was transforming as well. What was formerly outlined as "protection slid into interference, persuasion was dropped for aggressive efforts to redirect cultural practices" (Miller, 2001, p. 206). Formal policy was shifting engagement with Indigenous communities; the contact zone had become a place of aggression. Settler growth required a policy focus on dispossession. Frank Oliver, then Minister of the Interior stated, "there are certain circumstances and conditions in which the Indian by standing on his treaty rights does himself an ultimate injury, as well as does an injury to the white people, whose interests are brought into immediate conjunction with interest of the Indians" (Indian and Northern Affairs Canada, 1978, p. 109). Power was codified to ensure an 'orderly' use of land in which productivity and the economically efficient use of land superseded Indigenous rights and interests (King, 2010; Porter & Barry, 2015).

4. Direct Housing Intervention in First Nations Communities of the Mid-Canada Corridor

After World War II, government attention began to focus on social responsibility for all Canadians. The Curtis Report explained that Canada had fallen behind other Western states in "providing greater governmental assistance for housing as a matter of welfare and public concern" (Advisory Committee on Reconstruction, 1944, p. 9), and assigned housing systems an important role in the development of a social welfare agenda. Development programs in this period, the 1944 National Housing Act and the creation of the Central Mortgage and Housing Corporation (CMHC) created national bodies capable of large-scale poverty alleviation projects.

In the 1950–60s, the emerging national sense of social responsibility drove government to the remote First Nations communities of the mid-Canada corridor and the far north. The introduction of government services including family allowance, day schools, and increased health services forcibly changed living patterns (Carter, 1993). Families were told that in order to collect welfare payments and receive services they must live permanently at service points (Carter, 1993; Ross, 2006). The first housing system stemmed from a program of coerced settlement (Deirmenjian & Jones, 1983), requiring the building of many units to meet the new demand.

The government supplied houses nationally through the so-called Crash Housing Program; units were standardized and basic, intended only as a temporary solution to bring local residents up to an adequate standard of living. Immediately, however, the housing was recognized as "being too small, the sanitation facilities inadequate, the quality of construction poor and the method of heating inappropriate" (Carter, 1993, p. 13). Units had been provided to mid-Canada corridor First Nations communities in line with the national concern for social responsibility, but served only to exacerbate the conditions of substandard housing and health (Thompson & Thompson, 1972). The Crash Housing Program was the first in a series of national "ad hoc, short-term, crisis-oriented initiatives" (Carter, 1993, p. 6) formalized in the mid-1960s that brought southern-Canadian based housing designs and concepts north, as a means of establishing a national level of adequacy. The result was the loss of local, culturally-specific housing designs in favor of a 'suburban' model being implemented across Canada for its efficiency and affordability (Royal Commission on Aboriginal Peoples, 1996, S.4.2.1) "in ignorance of the economic, psychological and physical reality" (Ross, 2006, p. 120).

The current policy, the 1996 On-Reserve Housing Policy, is only the second formal housing policy for First Nations communities. Developed in response to the "limited range of housing designs and technologies" (Indian and Northern Affairs Canada, 1990, p. 6) on reserve, it recognizes "the principle that First Nations should have meaningful control over their own housing programs" (Indian and Northern Affairs Canada, 1990, p. 17). Monk (2006) states that the policy was championed by the federal government for its increased flexibility, tying funding to long-term planning initiatives developed locally rather than specific projects. A significant shift from a centrally controlled policy of national equality and standardiza-

tion, the four stated principles here were: First Nations control, First Nations expertise, shared responsibilities, and increased access to private sector financing.

Despite recognizing the importance of First Nations control of housing, a 2011 evaluation of the policy revealed that it, and its accompanying programs, "did not adequately incorporate a First Nations' perspective and was poorly communicated to First Nations" (OAG, 2011). Downloading control was not accompanied by the requisite resources to develop the capacity or plans required to create localized systems, thus undercutting any chance the policy may have had at success (OAG, 2011, 2015). Continued poor housing conditions illustrate the policy's ineffectiveness. Auditor General reviews in both 2008 and 2011 were skeptical of any significant improvements noting, "results have not kept pace with housing needs" (OAG, 2011). Despite the focus on flexibility, the policy amounts to a shifting of burden, nominally moving control to First Nations without the required investment. Funding, and with it power, remain centrally controlled by the federal government and the focus on homeownership and private lending markets ignores the non-market economies of remote mid-Canada corridor First Nations communities, showing a continued reliance on inappropriate southern-Canadian models for solutions.

5. Conceptual Rifts in Planning: Indigenous Worldviews in the Contact Zone

Western planning negated other worldviews in the early twentieth century due to its reliance on a rational economic model that followed broader cultural shifts of the time. Ted Jojola (2013) asserts that one ramification of the assumed dominance of this model is that, "there is very little written about the ethical, methodological, and epistemological approaches to community design and planning by Indigenous communities" (p. 457). Although forms of land use that counter and predate the dominant discourse of order and efficiency may have been ignored, they are not lost.

To control the existing housing provision system and dominate the land use regime, planning has relied on two main tools: assertions of authority through an essentializing of technical knowledge, and a tokenism in participation created through liberalisms' mechanism of recognition. These tools, while supported by dominant ideologies have not always been enshrined in policy, but have instead relied on a maintenance of the status quo through planning's implementation process. Power continues to be asserted methodologically by understanding that "land and 'resources' are seen in a utilitarian light" (King, 2010). The standardized existing built form demonstrates that "the technology adopted in many cases was based on industrial building systems in the hope that the rationale of factory and industrial production will lead to more efficient housing production and lower costs" (Keivani & Werna, 2001, p. 85). Alternative theoretical models rooted in local cultures exist, however, and counter the drive for efficiency and cultural assimilation that would produce vastly different housing systems.

5.1. Indigenous Planning

Planning theorists from radical and anti-colonial perspectives are establishing a literature of Indigenous Planning, focused on community-level values (see for example, Jojola, 2008, 2013) instead of state-based solutions (Hibbard & Lane, 2004). Decolonization of the planning process is only possible through a "complex renegotiation of values, knowledge meaning, agency and power between planning and Indigenous peoples" (Porter, 2010, p. 153). The impetus to begin a decolonization process starts with a recognition of planning's involvement in the marginalization of Indigenous communities and a questioning of "established normative assumptions of planning's role in bettering the world" (Ugarte, 2014, p. 153). Recognition is required that the existing Western rational model does not fulfill the discipline's ethical requirement to justice and future-based practice (Friedmann, 2002). The reiterations of critical planning processes search for ways to make planning a "positive site for the exercise of Indigenous self-determination" (Barry & Porter, 2011, p. 173).

The role of Indigenous communities in the planning process provides one site of potential change. Instead of prioritizing Indigenous values, the nominal recognition and control that accompanied the 1996 On-Reserve Housing Policy had the effect of subjugating and compartmentalizing Indigenous interests (King, 2010; Rankin, 2010; Sandercock, 2004), acting as a form of "internal colonization" (Hibbard & Lane, 2004, p. 98). Shifting from the more overt colonial tactic of civilizing through forcible changes, participation in the planning processes is "couched in the vernacular of mutual recognition" (Coulthard, 2007, p. 438). But as Alfred and Corntassel (2005) argue, participation without any fiscal controls or an overturning of existing power structures serves only as a "distraction that diverts energies away from decolonizing and regenerating communities and frames community relationships in State-centric terms" (p. 600).

Indigenous planning advocates for models that are community-focused or space-based, and asserts that validity requires that "a community plan cannot be developed from the outside looking in" (Hibbard, Lane, & Rasmussen, 2008; Mannell, Palermo, & Smith, 2013, p. 122). Recognition therefore is not bestowed by the state, but is inherently held and asserted by local populations (Dorries, 2012). Shifting modes of recognition in the contact zone rejects the standardized approach applied to First Nations communities who are depicted as homogenous in policy, and instead highlights their uniqueness in values, visions, and goals.

The planner adopts a new role in an Indigenous led-housing system. Rather than imposing a model aiming to create a national level of adequacy, the planner instead becomes a learner, adopting and sharing a model to meet local need (Lane, 2006; Rankin, 2010; Simp-

son, 2001). The communicative nature of the contact zone allows for the planner to form relationships not possible at the policy level. Shifting discursive power allows the planner to become a conduit for Indigenous voices and disrupt imperial political regimes. Planning processes can be transformed from a place where hegemony is reproduced to one that recovers and centers Indigenous voices (Rankin, 2010). Projected onto the built environment, this implies that housing systems are not standardized engineering solutions, but are process, design, and technology solutions representative of individual communities.

Positioning the planner as a learner allows the contact zone to become the site where local housing needs, priorities, and preferences are enumerated. Context-specific housing visions can then be created by individuals within a community, focused on their specific culture and needs. The planning process becomes decolonized when the housing system it develops creates sites of cultural regeneration. The Royal Commission on Aboriginal Peoples proposed in 1996 "that better housing and community services, as well as the processes and activities leading to them, will improve community morale and increase every individual's sense of self-worth and identity" (p. 348). Through a reflexive practice and focus on listening, planners can establish processes that result in appropriate housing where local housing needs, priorities, and preferences are enumerated and delivered. This paradigm shift would also create changes in Canada's Indigenous communities and their community health.

5.2. Alternative Ways of Knowing

Shifting participation is only valuable if changes also occur to what is considered valid and to substantive participation. Planners must give up their narrow focus on technocratic expertise, enlightenment scientific-rational thought, and economic efficiency—all textually based knowledge systems—and embrace the emancipatory potential of planning. Doing so would force reflexivity on the part of the planner. When working with a specific community, a planner cannot assume that their training has equipped them with knowledge or values that are similar to the population they are working with.

Leanne Simpson (2001) explains that "knowledge might come to us from relationships, from the Elders, oral traditions, experimentation, observations from our children, or our teachers in the plant and animal worlds" (p. 142). Contrasted against the rigidity of textual traditions, Simpson describes a more experiential and personal journey towards knowledge, which make take different forms across different cultures. This is a journey that Kurtz (2013) describes as self-discovery, and is part of a lifetime of learning and sharing.

The cultural specificity of knowledge creation prevents broad assumptions from being made about the effects of alternative ways of knowing in the contact zone. King (2010) illustrates one example through a cultural understanding of land. He identifies the significant difference in understanding land innately as a part of holistic community wellness, rather than an asset to be managed, controlled, and developed. When land is the law around which society is governed, policies cannot be made to order and manage the land.

In the housing context, we can derive another example from The Royal Commission on Aboriginal Peoples (1996), which describes a past where Indigenous housing embodied local cultures. If cultural identity and community wellness are understood as a primary function of housing, rather than the pursuit of assimilation, poverty reduction, or disease control, we would be forced to assume a radically different discourse within the planning process. Recording and building to promote cultural identity and wellness would create a radically different built form.

Extracting local knowledge without first dismantling existing systems continues the frontier myth. Indigenous knowledge cannot be divorced from the systems that created it; knowledge removed from its contextual foundation is meaningless and entrenches power systems. An example in which Indigenous peoples enter a contact zone and share their knowledge in the existing Canadian development framework is through the Traditional Ecological Knowledge component of environmental assessments. It is understood that Elders hold information about the land, its history, and places on the land that are unique (King, 2010; Simpson, 2001). However, in documenting, digitizing, and incorporating this knowledge into a broader system, "researchers were not interested in all kinds of knowledge, and they remain specifically interested in knowledge that parallels the Western scientific discipline of ecology" (Simpson, 2001, p. 138) thus mirroring the reliance on empiricism throughout existing processes. Fitting this knowledge into the existing textual base requires a process of translations—a "recasting of others' way of putting things in terms of our own ways" (Geertz, 1983, p. 10). Recasting Indigenous knowledge, in particular, through a colonial lens creates ample opportunity for misuse, removing the knowledge from the community that produced it and continuing a cycle of Indigenous dispossession.

Decolonizing the contact zone sufficiently to allow for localized understandings requires dismantling a system in which "design, structure, and implementation are so steeped in technical language and procedure of bureaucracy that Indigenous peoples have immense difficulty accessing of participating in them in earnest" (King, 2010, p. 79). This decolonization implies a shift in the burden of the planning process from community participant to planner. The contact zone is currently controlled by one knowledge system, thus demanding a fluency on the part of Indigenous peoples as a basis for participation. The planner can reject sole authority through textual knowledge, understand the existence of a local knowledge system, and assume the burden of reorienting their values to create contextual meaning for the processes being undertaken.

Many models to include Indigenous knowledge are described in the literature of various disciplines (Calliou, 2015; Jojola, 2013; Kurtz, 2013), each serving as a reminder that the rational-scientific model currently given preference has alternatives. The alternative models demonstrate the possibility of rejecting the idea that housing is a problem solely of health, poverty, or design that must be solved through science. Instead, diversity can be brought to the built form of the house and community, representing the diversity of understandings present within communities. Physical forms will shift as the housing system comes to represent local knowledge structures, and the houses and the landscapes between them that are created will be embodiments of the Jojola's (2013) assertion that "culture is not a fad, it is a way of life" (p. 465).

5.3. Learning from the Global South

Participatory processes valuing local knowledge and identity are beginning to take hold in Global South housing provision systems. The Global South is a site where the body politic has, in some situations, been effective in using political pressure to address issues of poverty, moving policy beyond centralized planning towards holistic comprehensive models. Housing is no longer being thought of as either a problem of poverty that can be solved through the generosity of the state, or a problem of economics that the market should be relied upon for solutions. Rather, housing is being viewed as a problem of equity affecting and affected by a wide series of variables. Housing, as already demonstrated, is a manifestation or symptom of the systems that create it. Harris (2015) wrote, "What matters more than physical conditions are the processes that produced, and still shape, them" (p. 122).

Large international governmental and aid agencies, traditionally reliant on neo-liberal and market-based solutions, have begun "joining environmental, social and economic development in housing" (Pugh, 2001, p. 408). Angel (2000) summarized these changes as place-based solutions that require, and are improved by, a variety of state, local, and non-governmental actors. According to a World Bank policy, localization and working with local agencies comes with "less certitude" (Buckley & Kalarickal, 2006, p. viii), or what is elsewhere described as "a subtler, messier, more balanced approach" (Harris, 2015, p. 129). Rigidity and generalizations are being dropped for more complex nuanced solutions. United Nations programs now include slum resident surveys, and the World Bank values flexibility recognizing, as Indigenous planning does, that solutions must be community-based.

The shift towards place-based, holistic-systems approaches in housing provision systems also signals a move away from understanding houses in isolation. Changing the scale of housing intervention from the unit to the community forces the context of a house to be considered. As Belsky et al. (2013) explain, this also changes the time horizon of the housing process; rather than one-off project-to-project approaches, a longer-term focus on learning local needs and preferences takes hold. The anticipatory nature of such an undertaking, sensitive to climate, demographics, and geography, requires a participatory process to facilitate the required knowledge creation. The projection onto the built form then comes to represent a process not managed or driven by individual programs but instead directed by values.

Belsky et al. (2013) develop the concept further, applying Caroline Moser's (1998) concept of asset building to housing. Housing provision systems here are understood as part of a complex calculation performed by each community, balancing their housing need against others, while maximizing existing skills and resources within the community. Notably, removing housing from a policy silo, and understanding its role within the larger community development framework allows the provisioning system to reinforce local development trajectories. Additionally, this flexibility not only permits housing to be a growing asset within the community but to develop local capacity—itself an asset. Housing provision then creates a reinforcing model developing both appropriate houses, and community members capable of managing the development and maintenance of the system.

6. Decolonizing Planning: Change in the Canadian Regime

Housing as it currently exists on-reserve in the mid-Canada corridor symbolizes planning's complicity in a colonial political regime. Through its processes planning continues to enact the assimilationist ideas of its earliest lawmakers. Reliance on technical, scientific knowledge and coercion through the language of participation has undermined Indigenous people from participating in the development of their housing. The dominant housing system is created on a model of economic efficiency, rationality and standardization, distributing across the country a uniform product to establish a level of Western-defined adequacy at the expense of culture. The result has been a marginalization of Indigenous peoples facilitated by planning's continuation of the frontier myth in its implementation of federal policy.

Examples of community-based housing systems in Canada are sparse, in particular across the mid-Canada corridor where financial resources and access to power are limited. Peri-urban reserves, and off-reserve urban Indigenous people have gained increased attention, having their voices centered in housing discussions as local and regional planners shift away from their inclusion only as stakeholders (Metro Vancouver Aboriginal Executive Council, 2015; National Aboriginal Housing Association, 2009; Walker, 2005).

Oujé-Bougoumou, located in Northern Quebec, within the mid-Canada corridor is an example of a community and its partners building housing symbolic of a culture and its people. Having been forcibly relo-

cated nine times over eighty-five years, the community reached separate agreements with the provincial and federal governments to establish and construct a new community. The development of the community, taking place over ten years was guided in discussion-, dreaming- and visualization-sessions by three principles: to be constructed in harmony with the environment and the traditional Cree philosophy of conservation; provide for the long-term financial requirements of community members; and reflect the Cree culture in its physical appearance and function (Malnar & Vodvarka, 2013). Despite setbacks from engineering flaws in individual houses, "the community was created for longevity; every decision was made by considering the requirements of future generations" (Stevens & Reid, 1999, p. 8); the radial form and fluidity in lot shapes show clear, built-form distinctions from other mid-Canada corridor communities (see Figure 3). Under the special circumstances of this case, a radically different built form was created.

Centering Indigenous knowledge in the planning process can create a housing system supportive of cultural regeneration and increased community wellness. Implementation changes alone can only create incremental change; building new units differently and projecting local understandings of culture and wellness are needed. Oujé-Bougoumou demonstrates that communities across the mid-Canada corridor require funding of a large magnitude to meet the existing scale of housing need and meet the goals of Reconciliation. Contact zone interventions break the cycle of colonialism, but colonialism's damage can only be undone by matching shifts in power with expenditure that allows new discourses to be projected widely onto the built environment. Deconstructing the rational model, and shifting towards Indigenous planning and ways of knowing would allow the discipline to become a leader in establishing a new relationship with Indigenous peoples in Canada and could result in the development of a model that policy can support and replicate across other disciplines.

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Figure 3. Oujé-Bougoumou, Quebec. Radial grid formed in the development of the new Oujé-Bougoumou community. Source: Author with base from Google Earth.

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References

Advisory Committee on Reconstruction. (1944). *Report IV: Housing and community planning: Final report of the subcommittee*. Ottawa: King's Printer.

Alfred, T., & Corntassel, J. (2005). Being Indigenous: Resurgences against contemporary colonialism. *Government and Opposition*, *40*(4), 597–614.

Angel, S. (2000). *Housing policy matters: A global analysis*. New York: Oxford University Press.

Barry, J., & Porter, L. (2011). Indigenous recognition in state-based planning systems: Understanding textual mediation in the contact zone. *Planning Theory*, *11*(2), 170–187.

Belsky, E. S., DuBroff, N., McCue, D., Harris, C., McCartney, S., & Molinsky, J. (2013). *Advancing inclusive and sustainable urban development: Correcting planning failures and connecting communities to capital*. Cambridge, MA: Joint Center for Housing Studies of Harvard University.

Buckley, H. (1992). *From wooden ploughs to welfare: Why Indian policy failed in the Prairie Provinces*. Montreal: McGill-Queen's University Press.

Buckley, R. M., & Kalarickal, J. (2006). *Thirty years of World Bank shelter lending: What have we learned?* Washington, DC: The World Bank.

Caillou, B. (2015). Methodology for recording oral history in the Aboriginal community. In K. R. Llewellyn, A. Freund, & N. Reilly (Eds.), *Canadian oral history reader* (pp. 25–52). Montreal: McGill-Queen's University Press.

Carter, T. (1993). *Evolution of Northern housing policy*. Winnipeg, MB: Institute of Urban Studies.

Coulthard, G. S. (2007). Subjects of empire: Indigenous peoples and the 'politics of recognition' in Canada. *Contemporary Political Theory*, *6*, 437–460.

Deirmenjian, S., & Jones, M. (1983). *Planning for communities in the North: A preliminary evaluation of an innovative approach in the Northwest Territories*. Toronto: Ryerson University.

Dorries, H. J. (2012). *Rejecting the "False Choice": Foregrounding Indigenous sovereignty in planning theory and practice* (Doctoral Dissertation). University of Toronto, Toronto, Ontario.

Finlay, J., Hardy, M., Morris, D., & Nagy, A. (2010). Mamow Ki-ken-da-ma-win: A partnership approach to child, youth, family and community wellbeing. *International Journal of Mental Health and Addiction*, *8*, 245–257.

First Nations Child and Family Caring Society of Canada et al. v. Attorney General of Canada 2016 CHRT 2 T1340/7008 (Canada).

Forester, J. (1982). Planning in the face of power. *Journal of the American Planning Association*, *48*(1), 67–80.

Friedmann, J. (1993). Toward a non-Euclidian mode of planning. *Journal of the American Planning Association*, *59*(4), 482–485.

Friedmann, J. (2002). *The prospect of cities*. Minneapolis: University of Minnesota Press.

Furniss, E. (1999). Indians, odysseys and vast, empty lands: The myth of the frontier in the Canadian justice system, *Anthropologica*, *41*(2), 195–208.

Geertz, C. (1983). *Local knowledge: Further essays in interpretive anthropology*. New York: Basic Books.

Harris, R. (2015). International policy for urban housing markets in the Global South since 1945. In F. Miraftab & N. Kudva (Eds.), *Cities of the Global South reader* (pp. 122–133). Hoboken: Taylor and Francis.

Hibbard, M., & Lane, M. B. (2004). By the seat of your pants: Indigenous action and state response. *Planning Theory & Practice*, *5*(1), 97–104.

Hibbard, M., Lane M. B., & Rasmussen, K. (2008). The split personality of planning: Indigenous peoples and planning or land and resource management. *Journal of Planning Literature*, *23*(2), 136–151.

Indian and Northern Affairs Canada. (1978). *The historical development of the Indian Act: Second edition*. Ottawa: Treaties and Historical Research Centre, P.R.E. Group, Indian and Northern Affairs.

Indian and Northern Affairs Canada. (1990). *Laying the foundations of a new on-reserve housing program* (Discussion Paper). Ottawa: Indian and Northern Affairs Canada.

Jojola, T. (2008). Indigenous planning—An emerging context. *Canadian Journal of Urban Research*, *17*(1), 37–47.

Jojola, T. (2013). Indigenous planning: Towards a seven generations model. In R. Walker, T. Jojola, & D. Natcher (Eds.), *Reclaiming Indigenous planning* (pp. 113–140). Montreal: McGill-Queen's University Press.

Keivani, R., & Werna, E. (2001). Modes of housing provision in developing countries. *Progress in Planning*, *55*, 65–118.

King, H. (2010). Give it up: Land and resource management in the Canadian North. Illusions of Indigenous power and inclusion. In *Canada's North: What's the plan? The 2010 CIBC scholar-in-residence lecture*. Ottawa: The Conference Board of Canada.

Kirmayer, L. J., Brass, G., & Tait, C. L. (2000). The mental health of Aboriginal peoples: Transformations of identity and community. *Canadian Journal of Psychiatry*, *45*, 607–616.

Kurtz, D. (2013). Indigenous methodologies: Traversing

Indigenous and Western worldviews in research. *AlterNative: An International Journal of Indigenous Peoples*, *9*(13), 217–229.

Lane, M. B. (2006). The role of planning in achieving Indigenous land justice and community goals. *Land Use Policy*, *23*, 385–394.

Liberal Party of Canada. (2015). *Real Change*. Retrieved from https://www.liberal.ca/realchange

Malnar, J. M., & Vodvarka, F. (2013). *New architecture on Indigenous lands*. Minneapolis: University of Minnesota Press.

Mannell, L., Palermo, F., & Smith, C. (2013). Community based and comprehensive: Reflections on planning and action in First Nations. In R. Walker, T. Jojola, & D. Natcher (Eds.), *Reclaiming Indigenous planning* (pp. 113–140). Montreal: McGill-Queen's University Press.

Miller, J. R. (2001). *Skyscrapers hide the heavens: A history of Indian-White relations in Canada* (3rd ed.). Toronto: University of Toronto Press.

Monk, L. (2006). *Decolonizing home: A re-conceptualization of First Nations' housing in Canada* (Thesis). Queen's University, Kingston, Ontario.

Moser, C. (1998). The asset vulnerability framework: Reassessing urban poverty reduction strategies. *World Development*, *26*(1), 1–19.

Mushkegowuk Council. (2016). *Nobody wants to die. They want to stop the pain: The people's inquiry into our suicide pandemic*. Retrieved from http://peoplesinquiry.com/thepeoplesinquiry

Metro Vancouver Aboriginal Executive Council. (2015). *Towards an urban Aboriginal housing and wellness strategy for Metro Vancouver: 2015–2020*. Retrieved from http://www.mvaec.ca/downloads/uahws-full-report.pdf

National Aboriginal Housing Association. (2009). *A time for action: A national plan to address Aboriginal housing*. Retrieved from http://www.ontarioaboriginalhousing.ca/wp-content/uploads/2014/09/NAHA_Action_Plan_July_2009_FINAL.pdf

Office of the Auditor General. (2006). *Report to the Auditor General of Canada: Chapter 5—Management of programs for First Nations*. Ottawa: Office of the Auditor General.

Office of the Auditor General. (2011). *Report of the Auditor General to the House of Commons: Chapter 4—Programs for First Nations on reserves*. Ottawa: Office of the Auditor General.

Office of the Chief Coroner. (2016). *Jury recommendations based on Thunder Bay Inquest*. Retrieved from http://www.nan.on.ca/upload/documents/jury-verdict-and-recommendations.pdf

Perry, A. (2003). From 'the hot bed of vice' to the 'good and well-ordered Christian home': First Nations housing reform in nineteenth-century British Columbia. *Ethnohistory*, *50*(4), 587–610.

Porter, L. (2010). *Unlearning the colonial cultures of planning*. Farnham: Ashgate Publishing Limited.

Porter, L., & Barry, J. (2015). Bounded recognition: Urban planning and the textual mediation of Indigenous rights in Canada and Australia. *Critical Policy Studies*, *9*, 22–40.

Pratt, M. L. (1991). The Arts of the Contact Zone. *Profession*, *91*, 31–40.

Pratt, M. L. (1992). *Imperial eyes: Travel writing and transculturation*. New York: Routledge.

Pugh, C. (2001). The theory and practice of housing sector development for developing countries, 1950–99. *Housing Studies*, *16*(4), 399–423.

Rankin, K. N. (2010). Reflexivity and post-colonial critique: Toward an ethics of accountability in planning praxis. *Planning Theory*, *9*(3), 181–199.

Razack, S. (2015). *Dying from improvement: Inquests and inquiries into Indigenous deaths in custody*. Toronto: University of Toronto Press.

Rohmer, R. (1969). *Mid-Canada development corridor: A concept*. Toronto: Acres Research and Planning limited.

Ross, R. (2006). *Dancing with a ghost: Exploring Aboriginal reality*. Toronto: Penguin Canada.

Roy, A. (2006). Praxis in the time of empire. *Planning Theory*, *5*(1), 7–29.

Royal Commission on Aboriginal Peoples. (1996). *Report of the Royal Commission on Aboriginal peoples*. Ottawa: The Commission.

Sandercock, L. (2004). Indigenous planning and the burden of colonialism. *Planning Theory & Practice*, *5*(1), 118–124.

Simpson, L. (2001). Aboriginal peoples and knowledge: Decolonizing our processes. *The Canadian Journal of Native Studies*, *21*(1), 137–148.

Slotkin, R. (1973). *Regeneration through violence: The mythology of American frontier, 1600–1800*. Middleton, CT: Wesleyan University Press.

Standing Senate Committee on Aboriginal Peoples. (2015). *On-reserve housing and infrastructure: Recommendations for change*. Ottawa: The Senate of Canada.

Statistics Canada. (2015). *Housing Conditions*. Retrieved from http://www.statcan.gc.ca/pub/89-645-x/2015001/housing-logement-eng.htm

Stevens, C., & Reid, J. A. (1999). Building sovereignty: The architectural sources of Oujé-Bougoumou. *Canadian Issues*, *21*, 124–142.

Thompson, D. K., & Thompson, C. T. (1972). *Eskimo housing as planning cultural change*. Ottawa: Department of Indian Affairs and Northern Development.

Truth and Reconciliation Commission of Canada. (2015). *Truth and reconciliation commission of Canada: Calls to action*. Retrieved from http://www.trc.ca/websites/trcinstitution/File/2015/Findings/Calls_to_Action_English2.pdf

Ugarte, M. (2014). Ethics, discourse, or rights? A discussion about a decolonizing project in planning. *Journal of Planning Literature*, *29*(4), 403–414.

Van Nostrand, J. (2014, September 8). If we build it, they

will stay. *The Walrus*, pp. 34–39.
Walker, R. C. (2006). Searching for Aboriginal/Indigenous self-determination: Urban citizenship in the Winnipeg low-cost-housing sector, Canada. *Environment and Planning A*, *38*, 2345–2363.

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Article

Shifting Approaches to Planning Theory: Global North and South

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Abstract
Planning theory has shifted over time in response to changes in broader social and philosophical theory as well as changes in the material world. Postmodernism and poststructuralism dislodged modernist, rational and technical approaches to planning. Consensualist decision-making theories of the 1980s took forms of communicative and collaborative planning, drawing on Habermasian concepts of power and society. These positions, along with refinements and critiques within the field, have been hegemonic in planning theory ever since. They are, in most cases, presented at a high level of abstraction, make little reference to the political and social contexts in which they are based, and hold an unspoken assumption that they are of universal value, i.e. valid everywhere. Not only does this suggest important research methodology errors but it also renders these theories of little use in those parts of the world which are contextually very different from theory origin—in most cases, the global North. A more recent 'southern turn' across a range of social science disciplines, and in planning theory, suggests the possibility of a foundational shift toward theories which acknowledge their situatedness in time and place, and which recognize that extensive global difference in cities and regions renders universalized theorising and narrow conceptual models (especially in planning theory, given its relevance for practice) as invalid. New southern theorising in planning is drawing on a range of ideas on societal conflict, informality, identity and ethnicity. Postcolonialism and coloniality have provided a useful frame for situating places historically and geographically in relation to the rest of the world. However, the newness of these explorations still warrants the labelling of this shift as a 'southern theorizing project' in planning rather than a suggestion that southern planning theory has emerged.

Keywords
collaborative and communicative planning; global South; southern planning theory; universalized theory

Issue
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1. Introduction

Over the last several decades the field of planning theory has splintered into a large number of different and competing positions, many of which have more recently been challenged epistemologically by theorists taking a southern and postcolonial perspective. Broader philosophical shifts in cognate disciplines towards post structural and postmodern thinking undoubtedly broke the monopoly of the modernist, rational, technical planning model which held sway in the 1950s and 1960s. But planning thought has also been influenced by changing social, political and material conditions across the globe: the shifting relationship between planning and markets; the declining dominance of the state in some parts of the world in managing change in the built environment; and new global issues such as sustainability and climate change, urban and regional inequalities, ethnic and identity claims and migration. The purpose of this article is to argue that a "foundational" (Allmendinger, 2002) shift is occurring in planning theory as new perspectives question some of the fundamental assumptions of

previous planning ideas. These southern theorists take both global (relational) and local (recognizing the importance of context and place) views, and while it is far too early to suggest a coherent southern position, the article offers some examples of emergent thinking and their commonalities.

The first part of this article gives an overview of these multiple strands of contemporary 'mainstream' planning thought and traces their sources of influence which, in themselves, are often overlapping and interwoven. The second part of the article then argues that these positions have a common epistemological base which has been open to challenge from planning theorists questioning their validity and generalizability. Southern planning theorizing (a broad term covering distinct strands and regional variation) starts from different premises and different sets of assumptions, and different ambitions as to where and how such theory can be useful.

2. The Splintering of Postmodern Planning Theory

The rational, technical, planning model of the 1950s and 1960s had origins within a positivist epistemology, rooted in the enlightenment tradition of modernity, and was concerned primarily with procedural planning issues. In keeping with its intellectual informants, this model assumed that through "the application of scientific knowledge and reason to human affairs, it would be possible to build a better world, in which the sum of human happiness and welfare would be increased" (Healey, 1992, p. 145), and that this could be achieved by the application of a scientifically rational method by rational individuals (planners). This method took the form of a set of steps managed by the planner. Engagement with stakeholders and communities was not part of this process and the planners' role was that of the technical expert in managing the process.

The 1980s saw a philosophical break from the dominance of a modernist, positivist orientation in a number of social science disciplines, and a shift towards 'post-positivism' which Allmendinger (2002, p. 87) defines as:

- "a rejection of positivist understandings and methodologies (including naturalism) and embraces instead approaches that contextualize theories and disciplines in larger social and historical contexts;
- normative criteria for deciding between competing theories;
- the ubiquity of variance in explanations and theories; and
- an understanding of individuals as self-interpreting, autonomous subjects."

Postmodernism, post-structuralism and post-positivism in the social sciences found expression in a range of new social theories which planning theorists drew on to find new ways to explain and suggest roles for planning. Allmendinger (2002, p. 77) describes planning theory in the 1980s as being in a "hyperactive state" giving rise to new theories such as neoliberal and public choice perspectives; postmodern planning; neo-pragmatism; political economy approaches and collaborative planning. In the years since Allmendinger's 2002 attempt to provide a typology of planning theory this hyperactivity and diversification has continued. There have been critiques and refinements of earlier post-positivist planning theories as well as further new planning ideas drawing on social science thinking on complexity, assemblages, actor-network theory, power, feminism, ethnicity, race and identity politics, the post-political, new institutionalism, post-colonialism and issues such as rights, informality, resistance, environment and climate change, technology and more. Debates on planning ethics and values have also continued, cutting across many of these issues and ideas.

2.1. Communicative and Collaborative Planning Theory

In the early days of the post-positivist shift, communicative and collaborative planning had a clear dominance and critiques and refinements of these strands of theory, often drawing on other social science concepts, are still very evident in journal publications. In two top-ranked planning theory journals (*Planning Theory* and the *Journal of Planning Education and Research*) articles in this field still (August 2016) occupy four out of the top five 'most cited' listings. It is therefore worth elaborating on these areas of planning theory, strands within them, and their epistemological standpoint, before moving on to how different positionings of planning theory are emerging from a global and 'southern' theory perspective.

Communicative and collaborative planning ideas emerged as early post-positivist theoretical moves. Both served to shift attention away from finding 'objective laws' to govern social behaviour towards the socially-constructed ways in which social norms and practices are produced, legitimated, become hegemonic and are transformed. Both were inspired by Habermasian communicative theory but place and context, as well as locally dominant intellectual traditions, underlie the emergence of the two different but related sets of ideas.

In the United States, John Friedmann (1973) offered an early critique of the rational planning model and a recognition of the importance of interpersonal relations in effective planning. At about the same time Donald Schon (1971, 1983) also began to develop an interest in how professionals learn through doing, rather than drawing on abstract rules or theories. In developing this line of thought, John Forester (1989) used Habermas and critical pragmatist thinking (and its links on this continent to the ideas of Rorty) to draw attention to the way public professionals collaborate in practice. Innes (1995) developed ideas of how planners acquire knowledge in practice in consensus-building processes. Gen-

erally these theorists argued for a focus on action and research rather than on abstract theory in the development of planning processes (Hoch, 1994). The term 'communicative planning', linked to these ideas, focuses on the social relations which connect actors together and the dynamics of these relations in planning practice.

In the UK, Patsy Healey drew, in part, on Giddens's structuration ideas and the European perspective of individuals embedded in constraining institutional and social relations (Healey, 1997a) to understand the work of planners and how institutions shaped plan-making.[1] She adopted the term 'collaborative planning' with emphasis on the institutional context within which these processes take place. Norwegian planning theorist Tore Sager (1994), as well, used Habermasian ideas of communicative rationality, but was also influenced by critical pragmatism and Foucault's perspective on power.

Allmendinger's (2002, p. 93) noting of geographical difference is significant: he suggests that US-based thinkers were responding to the nature of planning in the US which was "more varied and fluid both institutionally and in terms of processes and ends", while British and European thinkers were responding to a context "where more uniform and concrete processes and institutions help structure outcomes and ends". However, changing the scalar lens through which to understand these positions highlights their commonalities. Planning theorists on both sides of the Atlantic were immersed in planning in advanced capitalist economies where the nature of cities and regions, their institutional capacities and management, and the functioning of civil society, were (and still are) very different from many other parts of the world. And, argues Allmendinger (2002, p. 93), they shared a similar world view, paradigm or "framing theory" in planning which he describes as "a reflexive modernist frame [which] points towards a realist ontology". Their realist position is at variance with mainstream postmodernism and also with those ideas which celebrate societal difference: communicative and collaborative planning processes acknowledge difference but then work towards a Habermasian idea of consensus. Further, theorists continue the interest of rational scientific planning in a focus on decision-making processes in planning rather than outcomes (Yiftachel, 1989). The work of the Fainsteins (2013) has been a significant exception here.

A central source of common thinking for collaborative and communicative planning lies in the work of Jurgen Habermas' communication theory and his understanding of how power operates in processes of dialogue (Harris, 2002; Purcell, 2009). With a concern to protect and extend democracy, Habermas conceptualizes the "life-world" (or public sphere) as separate from and outside "the system" of formal economy and government. Within the life-world it is possible for rational and inherently democratic human beings to reach consensus, and co-ordinate action, through the process of communication (communicative rationality). Here the "force of the better argument" will determine the final validity of a particular position. Habermas recognizes that communication can be distorted in various ways and puts forward a set of criteria, or discourse ethics, to guide communication processes: if processes are inclusive, empathetic, and open, and if existing power differences between participants can be neutralized, then the outcome of such a process can be considered valid (Habermas, 1990a, 1990b). For many communicative planning theorists, this has come to mean that the aim of planning is a just process, and that if the process is just, the outcome (for example, the achievement of socially just cities) will be as well (see Fainstein & Fainstein, 2013).

Communicative and collaborative planning theorists (although in different ways) echo Habermas' faith in civil society as a source of democracy, and as a vehicle for placing pressure on the state to act more responsively. Healey refers to the "democratic deficit" (the distance between the state and civil society), and argues that planning "seeks ways of recovering a new participatory realization of democracy and of reconstituting a vigorous, inclusive public realm that can focus the activity of governance according to the concerns of civil society" (Healey, 1999, p. 119). The state, in terms of this position, is therefore downgraded as a role player relative to non-state actors, and civil society is seen as the main standard-bearer of the democratic project.

Habermas' assumption regarding the potentially consensual nature of discourse in the public sphere has also influenced communicative planning theorists (see Huxley, 2000), although to varying degrees. While writers in this school do not deny the operation of power, the hope still holds that if communication processes are correctly managed (according to Habermas' discourse ethics), then it is possible for voluntary but binding agreements to be reached. Basic to their position is an assumption of universal citizenship, where differences between actors occur mainly at the level of speech or ideas and can be overcome through argumentation.[2] Thus: "the power of dominant discourses can be challenged at the level of dialogue; through the power of knowledgeable, reflective discourse; through good arguments; and through the transformations that come as people learn to understand and respect each other across their differences and conflicts" (Healey, 1999, p. 119). Healey refines the idea of universal citizenship further to acknowledge that communicating groups may operate within different "systems of meaning", which means that "we see things differently because words, phrases, expressions, objects, are interpreted differently according to our frame of reference" (Healey, 1992, p. 152). The assumption remains that these differences can be accommodated in a consensus-seeking process (Flyvbjerg, 1998; Purcell, 2009).

[1] Important early published sources of these ideas are Forester (1989) and Healey (1992, 1997b).

[2] Noting that John Forester has insisted that he did not hold with imaginary ideals of speech but rather with the power of planning in practice.

2.2. Critiques and Shifts

The centrality of communicative and collaborative positions in planning theory over the last two and a half decades has inevitably given rise to numerous critiques, as well as refinement of the ideas by early proponents and others. The wide and ever-expanding field of postmodern social science theory has been a source of many of these ideas.

It is not possible here to do justice to this rich field of theorising and this section will focus on just one aspect which has inspired critique and which has also proved to be a source of ideas for southern thinkers. Habermas assumes that communicating groups are involved in dialogue on relatively equal terms, and power imbalances inherent in patriarchal, class-based (or ethnicity or race-based) societies, or in different or conflicting worldviews, will either not find their way into these processes, or can somehow be managed. This could be seen as a liberal conception of society within a prevailing western philosophy which assumes consensus as an unquestioned possibility. But, as mentioned above, this sits uneasily with those postmodern theories which recognize and celebrate social difference.

The "cultural turn" in social theory raised interest in how culture and context shapes knowledge and behaviour (Storper, 2001) and inspired an important strand of planning theory concerned with how planning can function where there are social divides and conflicts. New work widened the range of sources from which difference can emerge in planning: class or material circumstances, ethnicity, gender, age, race, religion, sexuality, world-view etc. The clear connection between cultural difference and place (or context) also introduced (possibly for the first time) a recognition that universalized (or place-blind) planning theory had its limitations. Watson (2002), for example, argued that governance, the nature of civil society, and relationships to land and place are very different in the African context. The work of Fincher and Jacobs (1998) in urban theory was important here. Bringing together cultural, political and economic positions on difference, together with a perspective on place and location, they produced a "located politics of difference" (Watson, 2006). Fincher and Jacobs (1998) describe the major shift in thinking about difference which is away from something that is pre-given and fixed to something that is socially produced and multiply located. What this points to, they argue, is the multiplicity of differences that may cohere around any one person: "social distinctions are constituted in specific contexts through multiple and interpenetrating axes of difference…and at any one time we may be fixed into or strategically mobilize different aspects of the array of differences through which our embodied selves are known" (p. 9). Which aspect dominates is not haphazard: often the attribute to be emphasized is that which contributes most significantly to a subject's marginalization or empowerment and this can and does vary significantly with place, and time.

However, new planning ideas on difference usually broke with the concept of universal citizenship without necessarily recognizing place-based difference. Leonie Sandercock's work (1998) on multiculturalism questioned what constituted citizenship, how this is fragmented by identity, and the role of the planner in relation to this question. As opposed to the idea of universal citizenship, her society is structured by relationships between culturally different groups, based on sexuality, ethnicity, gender or race. This diversity needs to be celebrated rather than repressed: that is, the claims of groups need to be recognized and facilitated. Sandercock is not just interested in recognizing difference in procedural terms (in order to move towards a more homogenous or equal society); she is interested in "substantive difference", or affirming a society made up of different groups (Storper, 2001).

In many other ways, however, Sandercock's multiculturalism had a great deal in common with collaborative and communicative planning theories. She held with the notion of civil society as an autonomous site of resistance and social movements as primary agents of change. She placed her own work within what she terms a "radical planning model", with roots in advocacy planning, happening most often outside the formal structures of state and economy. Her work focused on agency and "the local", and on the kinds of processes and discourses which shape planning debates. As Beauregard (1998) noted, both communicative planning theorists and multicultural theory shifted the emphasis in planning theory from outcomes to process and from consequences to consciousness. Multicultural planning also retained a Habermasian concept of power in the process of communication, a position which had attracted extensive critique from Foucauldian planning theorists by the late 1990s (Flyvbjerg, 1998: Huxley & Yiftachel, 2000).

Planning theorists have continued to write about social difference and identity, but this has not been a dominant strand in the field, and generally these ideas have not taken up Fincher and Jacob's point about the equivalent importance of place or location in constructing strategically mobilized difference. Many of these (mainstream) planning ideas make no reference to their contextual informants and assume a space-blind or universal applicability to their concepts very much along the lines of planning theories which have preceded them. Exceptions emerge from scholars who worked outside of the global North and in those parts of the world where differences are obvious (see Watson, 2012). The contributions of Caroline Moser, Carole Rakodi and Suzanne Speak to planning and gender theory are an example. Oren Yiftachel, whose writing on ethnicity, identity, land and planning is informed by the context of Israel/Palestine, has been an important voice arguing for recognition that much of mainstream planning theory, which claims universality, is in fact shaped by a global North context (Yiftachel, 2006a, 2006b). The article now turns to an emerging "framing" (Allmendinger's term) of plan-

ning theory which questions some existing and pervasive foundational assumptions: in particular claims of universality, failure to recognize the role of context and failure to acknowledge relational historical forces which bind together and continue to shape different parts of the world.

3. The Southern Theorizing Project in Planning

Over the last decade or so a new set of planning ideas has emerged primarily from theorists working in, or interested in, the global South. This is a diverse set of theorists who have contributed in many different ways from different contexts. They draw on different social theories to inform their planning ideas, but in doing so they join scholars in a number of other disciplines which have taken a recent "southern turn".[3] The term global South is used here, and by other southern theorists, to mean far more than a geographical South: "It references an entire history of colonialism, neo-imperialism, and differential economic and social change through which large inequalities in living standards, life expectancy and access to resources are maintained; and opens new possibilities in politics and social science" (Dados & Connell, 2012, p. 13).

3.1. Challenging Global North Theory

Much planning theory to date has been produced by scholars located in the global North (Stiftel & Mukhopadhyay, 2007), although this is beginning to shift. Much of this theorising makes some important methodological errors: this is not specific to planning theory but, it can be argued, can also be found in disciplines on which planning theory draws. Firstly, authors fail to specify the contextual informants of their research, in other words the precise nature of cities, planning systems, institutional culture, civil society etc. on which their conclusions are based. As Allmendinger (2002) showed for planning (see above) even small differences in these between the US and the UK resulted in the two rather different approaches of communicative and collaborative planning theory. Healey's (1997a, 2003, p. 117) comment that she sees her own work situated in "a particular North-west European experience" is an important recognition of this kind of influence, but there are few theorists who locate their work in this way. Newer literature is starting to recognize this problem: for example see Hytönen (2016) who uses the case of Finland to argue that sources of legitimacy in public planning might be fundamentally different outside of the Anglo-American tradition. But generally there is a failure in much current planning theory to recognize and surface the very significant differences between various parts of the world, especially between global North and South and also within these regions.

Informants of cities and planning are not only local: there are also wider and global influences of intellectual ideas and material context. Some southern planning theorists argue that planning cannot be understood outside of the reality of postcolonialism or coloniality, wherever it is studied. Social scientist Mignolo (2007, p. 476) holds that modernity and coloniality are relational and inseparably interlinked, and an understanding of modernity requires that its (ongoing) global project is taken into account: "There is no modernity without coloniality". Or as Jacobs (1996) has put it: London (for example) must be understood as a postcolonial city because of the way its colonial past shapes its present. Urban and planning theorist Ananya Roy (2009) uses the term "worlding" of cities to emphasise their linking into global circuits of various kinds, creating ever-shifting cores and peripheries, and emphasising the importance of understanding the world in an inter-connected and inter-relational way.

A second, and related, methodological error is to generalise findings from unspecified and unlocated informants to the rest of the world, in other words the incorrect universalizing of theory based on research in just one region of the world. Planning theory is not alone in doing this, in fact claiming universal relevance for global North ideas is a defining characteristic of post-Enlightenment thinking and has allowed and perpetuated northern theoretical hegemony across the disciplines. In sociology, Connell (2007, p. ix) questions the "belief that social science can have only one, universal body of concepts and methods, the one created in the global North". In urban studies, a recent attempt by Scott and Storper (2014) to claim all cities can be understood through a single conceptual model of the dynamics of agglomeration and the unfolding of an associated nexus of locations, land uses and human interactions, has been roundly critiqued (see Robinson & Roy, 2015, and others). The challenge from the latter authors is that this model is located in an understanding of (a handful of) global North cities and does not hold in most other parts of the world. The counter from Scott and Storper (2014), that city difference across the globe simply expresses empirical variation and does not warrant other theoretical models is, Robinson and Roy (2015) argue, a misreading of historical difference as empirical difference.

Dissatisfaction with global North planning theory which simply does not 'fit' outside of this context, in planning theory as well as in other disciplines, has given rise to new theorizing which in part aims to unsettle and critique northern theory and also to pave the way for new thinking about planning theory and practices.

3.2. Southern Planning Theory?

Planning theorists challenging the foundational "framing" of much current planning theory through writing about, from, or in relation to, planning and the material and social world outside of the global North, do not necessarily all refer to themselves as southern planning

[3] In the social sciences (Comaroff & Comaroff, 2012; Connell, 2007; Rosa, 2014); in urban studies Robinson and Roy (2015); and in gender studies Connell (2014) and Morrell (2016). See Connell (2014) for southern theory across a wide range of disciplines.

theorists. Yet there are common elements that link their work: questioning the unsupported universalizing of theory from one small part of the world (the global North) to everywhere else; challenging the assumptions (often unspecified) on which these ideas are based; paying attention to global and historical forces which shape different parts of the world and the nature of the links and relationships between them; recognizing the importance of place and context and using "situated" knowledge of what happens there to speak back to theory (but not to all other places, as universalized theory tries to do); and recognizing that the extent of difference between places and people goes beyond minor empirical variation and requires new conceptual thinking.

These planning theorists have drawn on global historical processes (capitalism, imperialism, postcolonialism); local, in-depth understanding of particular cities and regions; and various forms of community resistance, to raise new ideas. A common thread which runs across many of these new ideas is the need to understand and work with the fundamental divisions and conflicts which shape societies in all parts of the world, but often more severely in global South regions. Habermasian concepts of power and consensual dialogue as a planning approach seem to be particularly inappropriate in these contexts. The idea that planning operates in contexts characterised by "conflicting rationalities" (Watson, 2003) between states and markets driven by the logic of modernization, control and profit, and poorer communities driven by the logic of survival, has been one way of framing these divisions. But the nature of these logics and conflicts varies across the global South, as more recent work in this area has shown—see below.

The case study research method is often used and influential new literature is emerging in the urban studies field on the value of comparative case research across global North and South (see Robinson, 2014). In planning, the single case method has long been useful where the aim is to document and analyse real-life planning events in order to build and test theory, noting a central methodological rule that it is not possible to generalize from one case to all other cases (Flyvbjerg, 2004). The complexity and diversity of urbanisms and urban processes which emerge from in-depth case study work on southern contexts support the contention that the very different processes and factors which produce cities defy the possibility of capture in a single universal theoretical model, as Scott and Storper (2014) suggest.

In a recent article Oren Yiftachel (2016) responds to these debates in urban and planning theory to suggest a different epistemology of learning about South(east) cities. Drawing on a deep understanding of a single city—Jerusalem—he argues that cities like this can be used, not as universal models, but as a window to see the relational nature of urban forces, the rise of new categories and concepts, and the transformations which they bring about over time. In the case of Jerusalem it would be impossible to understand the city through one theoretical position or category: "powerful colonial, capitalist, religious, national, gender and military forces—and many sites of resistance—have co-shaped the city…(and)…have fluctuated in the levels of dominance over time" (p. 485). He emphasizes the multiple structural, and often conflicting, urban logics which shape cities, and the nature of their interaction in a particular (identified) place, producing and shaping 'real' urban spaces (p. 488). Understanding these logics and power relations through the planning and development of the city, as he suggests, clearly offers a very different approach to planning theory.

Yiftachel (2016) builds on his work on ethnically-motivated spatial change in Israel/Palestine and elsewhere. His particular concern is with ethnicity 'at home' where ethno-nationalistic states use space and (ethnocratic) planning as a tool of political repression against ethnically marginalized castes, races, religions or cultures: the Palestinians in Israel or African people in apartheid South Africa, for example. In developing this line of argument, Yiftachel (2006b, 2009) argues that ethnocracy produces 'gray' spaces which only partially incorporate the ethnically marginalized and which lie between the legal and the illegal of formal planning systems. These 'informal' settlements have planning permission withheld as a deliberate tactic of political exclusion: ethnocratic states therefore use and promote informality as a way of containing the 'ungovernable'.

In a further example of using a southern case to speak back to planning and urban theory, Gautam Bhan (2016) draws on research on "basti" (informal settlement) evictions in Delhi, India, to challenge the dynamics of contemporary urbanism across 'urban peripheries' more generally. Evictions are a process which has gathered pace in Delhi and other large cities of the South, as the economic value of urban land rises and a 'middle-class' urban aesthetic takes hold. This can be described as an "elite insurgent urban citizenship that produces and claims the city" (p. 152) and which has displaced the urban poor from both urban land and the developmental imagination. While urban control takes strength from the involvement of the courts in Delhi planning processes, basti-dwellers are constantly marginalized and impoverished by these processes. This research allows Bhan to suggest new southern theorization of the "judicialization" of planning, of urban citizenship and of impoverishment and inequality.

Postcolonial theorizing (in all its diversity and recognizing colonisation as an ongoing process–as coloniality) has had a major influence on southern thinkers in planning and other disciplines. Libby Porter (2010) draws on in-depth research in Australia and other settler-colonies, to expose the ways in which Western planning ideas stereotype culture, persist in the dominance of Western norms and laws and exclude other voices of difference and dissent as a process of dispossession of indigenous populations. Ananya Roy (see 2015 and numerous earlier publications) has called for paying attention to the way in

which the "field of action" is structured by imperial practices, and to question taken-for-granted theoretical categories such as formal/informal, global cities and so on. She calls for new ways of understanding the dynamics of urbanism and for taking into account global processes of "worlding" (the "art of being global") rather than conceptions dominated by world city and global city discourses.

Faranak Miraftab argues that a liberal notion of inclusion in planning may recognize difference and call for citizen participation but does not challenge power and merely incorporates differences (Miraftab, in press). Building on an earlier radical tradition of insurgency in planning (and James Holston's work in Latin America) she takes the idea of "insurgent planning" to colonial and postcolonial contexts and to a reliance on the direct actions of citizens to bring about change. She proposes a framework structured by the concepts of "invited" spaces of action (sanctioned and tolerated by dominant groups) and "invented" spaces of action (opened up through resistance and ostracized and criminalized by dominant groups). With similar concerns but in the different context of Southeast and Central Asia, Nihal Perera (2016) argues that subaltern classes are often unable to engage in open protest where state or corporation-produced space does not fit their needs. However, they shape urban space in more subtle and covert ways through "indigenization" of space.

The project of building new planning theory "from the South" is still in its infancy but the flurry of new ideas suggests a revival of the "hyperactivity" in planning theory which Allmendinger noted at the time of the demise of the rational scientific planning model. However, there is as yet no clarity as to what is southern planning theorizing, how it contributes to intervention (planning action), and how it will deal with the difficult issue of generalization.

3.3. The Project of Building Planning Theory/ies "From the South"

The newness of many of the explorations still warrants the labelling of this shift as a "southern theorizing project" in planning rather than a claim that southern planning theory has emerged. Currently such a project confronts a number of challenges. The issue of theoretical generalization raises the question: would southern planning theory not create dangerous binaries between theory for the North and theory for the South? Or is there a danger that it would repeat the parochialism of current Northern planning theory, which produces universal generalizations on the basis of contextual assumptions of planning in cities in relatively small and a-typical regions of the world? Would it not suggest that both global North and South regions and cities are relatively homogenous areas capable of categorization, when they are known to be highly diverse, continually in flux and generally resistant to categorization? These objections are justifiable: we cannot aim to replace Northern planning theory with Southern planning theory, or set up artificial binaries between North and South, and certainly knowledge of cities in the global South, and the planning ideas which they might inspire, can neither be generalized to the global North, nor generalized across the very diverse territories of the global South.

Southern theorists all emphasise the importance of context and place instead of seeking to create universalized theory. But some degree of generalization is required in research if we are not to treat each city or place as entirely unique. Southern social theorist Raewyn Connell insists that a form of generalization, through the collective practice of social scientists, has "a crucial epistemological function". "Theory", she argues, "is the way we speak beyond the single case. It involves imagination, the search for patterns, the critique of data. It is how we get the criteria for comparisons and the terms of a diagnosis" (Connell, 2007, p. 225). But, she concludes, it is also about knowing the limits of such theory and where it does not apply.

This suggests some kind of meso-level of theorizing in which ideas are more or less useful in different parts of the world. But Connell cautions against "mosaic epistemologies" which involve "separate knowledge systems (that) sit beside each other like tiles in a mosaic, each based on a specific culture or historical experience, and each having its own claims to validity" (Connell, 2015, p. 59). They offer a clear alternative to universal knowledge but they tend to be fixed, subject to reification and unable to engage reflexively with other knowledge systems. On the other hand, solidarity-based epistemology allows "mutual learning on a world scale, in which different formations of knowledge are respected but enter into educational relations with each other" (Connell, 2015, p. 59). It requires, she suggests, a common orientation to social justice at the world scale framed by a postcolonial perspective. In a different approach to meso-level theorizing, Patsy Healy (2012) argues for the need to understand the "contingent universals" of any situation: in other words, understanding what is specific to a place and what can be shared learning across different localities and contexts.

A related question on southern theorizing has to do with its purpose. In anthropology the Comaroffs (2012) say their interest is in the effect of the South on theorising more generally, taking the position that southern sensitivity generates critical perspectives through being "eccentric". Contradictions can be understood better from "outside", they argue. So their interest, they say, is not in a geographical south but in "southness as eccentricity". In sociology Connell (2014) argues for uncovering and recognizing a globally operating "political economy of knowledge" which shapes and controls (through research funding, university rankings, journal publication etc.) the kind of knowledge produced in Southern regions and marginalizes its contribution to dominant theoretical production. She suggests that southern theory is not so much about making different propositions, but

about different knowledge practices: to start learning in new ways and with new relationships.

I hold with the Nietzschean idea of perspectivism: that all ideas come from a particular perspective or position and there is no one truth or answer to planning problems that can be applicable in all contexts. The notion of perspectivism has been used as well in feminist theory (in particular the work of Donna Haraway, 1991) which challenged the belief in objectivity in science and "the view from no-where". This implies that planning research and practice needs to be firmly located in a place (or context), that the values and objectives of planning in that place are always surfaced, that concepts from other parts of the world can be tested (not simply applied) in context and new ideas (not 'best practices') can feed back to the growing and diverse international 'pot' of planning theories and concepts.

4. Conclusion

The field of planning theory has seen some significant shifts over the past several decades, usually influenced by theoretical shifts in other cognate disciplines and by shifts in the world's political, economic and social dynamics. While more recent planning theory has fragmented in numerous different directions and theoretical areas, a growing critique in related disciplines (especially urban studies) which questions the universalizing of Northern concepts to the rest of the world, has been paralleled by similar shifts in planning. As this article has argued, this can be seen as proposing a foundational shift as it questions the epistemological roots of much current theorizing.

While a fertile area of research appears to have opened up, one which can hopefully generate a more international body of work on planning and draw in many new voices from parts of the world previously silent, southern theorizing is still limited in terms of both contributors and scope. Particularly important, however, is that thinking needs to move beyond an understanding of contexts and into what this means for planning practice. Healey (2012) proposes transnational learning through detailed narrative case studies of planning which then carry these "origin narratives" with them if and when their relevance to other contexts is considered. As she recognizes, however, this will not overcome the deep divides and conflicts, and antagonistic norms, which characterise so many places. It is hard to escape the reality that developing planning strategies in any context is an inherently political process in which, frequently, planning ideas become attached to a political project involving domination of one group by another (and one might add, involving patronage and corruption as well). There is no shortage of issues for southern theorizers to tackle.

Conflict of Interests

The author declares no conflict of interests.

References

Allmendinger, P. (2002). Towards a post-positivist typology of planning theory. *Planning Theory*, *1*(1), 77–99.

Beauregard, R. (1998). Writing the planner. *Journal of Planning Education and Development*, *18*(2), 93–101.

Bhan, G. (2016). *In the public's interest: Evictions, citizenship and inequality in contemporary Delhi*. New Delhi: Orient Blackswan Private Limited.

Comaroff, J., & Comaroff, J. L. (2012). *Theory from the south: Or how Euro-America is evolving towards Africa*. London: Paradigm Publishers.

Connell, R. (2007). *Southern theory. The global dynamics of knowledge in social science*. Cambridge: Polity.

Connell, R. (2014). Using southern theory: Decolonizing social thought in theory, research and application. *Planning Theory*, *13*(2), 210–223.

Connell, R. (2015). Meeting at the edge of fear: Theory on a world scale. *Feminist Theory*, *16*(1), 49–66.

Dados, N., & Connell, R. (2012). The global South. *Contexts*, *11*(1), 12–13.

Fainstein, N., & S. S. Fainstein (2013). Restoring just outcomes to planning concerns. In N. Carmon & S. S. Fainstein (Eds.), *Policy, planning, and people: Promoting justice in urban development* (pp. 32–53). Philadelphia: University of Pennsylvania Press.

Fincher, R., & Jacobs, J. (Eds.). (1998). *Cities of difference*. New York and London: Guilford Press.

Flyvbjerg, B. (1998). Empowering civil society: Habermas, Foucault and the question of conflict. In M. Douglass & J. Friedmann (Eds.), *Cities for citizens* (pp. 185–212). Chichester: John Wiley and Sons.

Flyvbjerg, B. (2004). Phronetic planning research: Theoretical and methodological reflections. *Planning Theory and Practice*, *5*(3), 283–306.

Forester, J. (1989). *Planning in the face of power*. Berkeley: University of California Press.

Friedmann, J. (1973). *Re-tracking America: A theory of transactive planning*. Anchor Press: New York.

Habermas, J. (1990a). *Moral consciousness and communicative action*. Cambridge: MIT Press.

Habermas, J. (1990b). *The theory of communicative action*. Cambridge: MIT Press.

Harraway, D. (1991). *Simians, cyborgs and women: The reinvention of nature*. New York: Routledge.

Harris, N. (2002). Collaborative planning. In P. Allmendinger & M. Tewdwr-Jones (Eds.) *Planning futures: New directions for planning theory* (pp. 21–43). London: Routledge.

Healey, P. (1992). Planning through debate: The communicative turn in planning theory. *Town Planning Review*, *63*(2), 143–162.

Healey, P. (1997a). Situating communicative practices: Moving beyond urban political economy. *Planning Theory*, *17*, 65–82.

Healey, P. (1997b). *Collaborative planning. Shaping places in fragmented societies*. London: Macmillan.

Healey, P. (1999). Institutional analysis, communicative

planning, and shaping places. *Journal of Planning Education and Research*, *19*(2), 111–121.

Healey, P. (2003). Collaborative planning in perspective. *Planning Theory*, *2*(2), 101–123.

Healey, P. (2012). The universal and the contingent: Some reflections on the transnational flow of planning ideas and practices. *Planning Theory*, *11*(2), 188–207.

Hoch, C. (1994). *What planners do: Power, politics, and persuasion*. Chicago: Planners Press.

Huxley, M. (2000). The limits to communicative planning. *Journal of Planning Education and Research*, *19*(4), 369–377.

Huxley, M., & Yiftachel, O. (2000). New paradigm or old myopia? Unsettling the communicative turn in planning theory. *Journal of Planning Education and Research*, *19*(4), 333–342.

Hytönen, J. (2016). The problematic relationship of communicative planning theory and the Finnish legal culture. *Planning Theory*, *15*(3), 223–238.

Innes, J. (1995). Planning theory's emerging paradigm: Communicative action and interactive practice. *Journal of Planning Education and Research*, *14*(3), 183–189.

Jacobs, J. (1996). *Edge of empire: Postcolonialism and the city*. New York: Routledge.

Mignolo, W. (2007). Delinking: The rhetoric of modernity, the logic of coloniality and the grammar of decoloniality. *Cultural Studies*, *21*(2), 449–514.

Miraftab, F. (in press). Insurgent practices and decolonization of future(s). In M. Gunder, A. Madanipour, & V. Watson (Eds.). *The Routledge handbook of planning theory*. London and New York: Routledge.

Morrell, R. (2016). Making southern theory: Gender researchers in South Africa. *Feminist Theory*, *17*(2), 191–209.

Perera, N. (2016). *People's spaces. Coping, familiarizing, creating*. New York and London: Routledge.

Porter, L. (2010). *Unlearning the colonial cultures of planning*. Aldershot: Ashgate.

Purcell, M. (2009). Resisting neoliberalization: Communicative planning or counter-hegemonic movements. *Planning Theory*, *8*(2), 140–165.

Robinson, J. (2014). New geographies of theorising the urban: Putting comparison to work for global urban studies. In S. Parnell, & S. Oldfield (Eds.). *Handbook for cities of the global south* (pp. 57–70). London: Routledge.

Robinson, J., & Roy, A. (2015). Global urbanisms and the nature of urban theory. *International Journal of Urban and Regional Research*, *40*(1), 181–186.

Rosa, M. (2014). Theories of the South: Limits and perspectives of an emergent movement in Social Sciences. *Current Sociology*, 1–17.

Roy, A. (2009). The 21st-century metropolis: New geographies of theory. *Regional Studies*, *43*(6), 819–830.

Roy, A. (2015). Who's afraid of postcolonial theory? *International Journal of Urban and Regional Research*, *40*(1), 200–209. doi:10.1111/1468-2427.12274

Sager, T. (1994). *Communicative planning theory*. Aldershot, Hants: Avebury.

Sandercock, L. (1998). *Towards cosmopolis: Planning for multicultural cities*. Chichester: John Wiley.

Schon, D. (1971). *Beyond the stable state*. London: Temple Smith.

Schon, D. (1983). *The reflective practitioner*. New York: Basic Books.

Scott, A. J., & Storper, M. (2014). The nature of cities: The scope and limits of urban theory. *International Journal of Urban and Regional Research*, *39*(1), 1–15.

Stiftel, B., & Mukhopadhyay, C. (2007). Thoughts on Anglo-American hegemony in planning scholarship. *Town Planning Review*, *78*(5), 545–572.

Storper, M. (2001). The poverty of radical theory today: From the false promises of Marxism to the mirage of the cultural turn. *International Journal of Urban and Regional Research*, *25*(1), 155–179.

Watson, V. (2002). The usefulness of normative planning theories in the context of Sub-Saharan Africa. *Planning Theory*, *1*(1), 27–52.

Watson, V. (2003). Conflicting rationalities: Implications for planning theory and ethics. *Planning Theory and Practice*, *4*(4), 395–408.

Watson, V. (2006). Deep difference: Diversity, planning and ethics. *Planning Theory*, *5*(1), 31–50.

Watson, V. (2012). Planning and the 'stubborn realities' of global South cities: Some emerging ideas. *Planning Theory*, *12*(1), 81–100.

Yiftachel, O. (1989). Towards a new typology of urban planning theories. *Environment and Planning B: Planning and Design*, *16*(1), 23–39.

Yiftachel, O. (2006a). Re-engaging planning theory? Towards 'south-eastern' perspectives. *Planning Theory*, *5*(3), 211–222.

Yiftachel, O. (2006b). *Ethnocracy: Land and identity politics in Israel/Palestine*. Philadelphia: University of Pennsylvania Press.

Yiftachel, O. (2009). Critical theory and 'gray space': Mobilization of the colonized. *City*, *13*(2–3), 246–263.

Yiftachel, O. (2016). The Aleph—Jerusalem as critical learning. *City*, 20(3), 483–494. doi:10.1080/13604813.2016.1166702

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Article

Clumsy City by Design—A Theory for Jane Jacobs' Imperfect Cities?

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Abstract
How do different concepts of justice correspond with the principles of diversity in cities introduced by Jane Jacobs? This contribution connects Jane Jacobs' ideas on the diverse city with Mary Douglas' Cultural Theory and its concept of clumsy solutions. According to Douglas' Cultural Theory, every social situation can be described in terms of the four ideal-typical "rationalities": individualism, egalitarianism, hierarchism, and fatalism. These four rationalities are again linked to different concepts of justice: libertarian, utilitarian, or social justice. Douglas' Cultural Theory assumes that in every social situation all four of those rationalities emerge in some way and concludes that if a situation is not polyrational, it is less robust. This opts for imperfect and "clumsy solutions". It is argued that clumsy solutions, the four rationalities and related concepts fit Jane Jacobs' claim for more diversity in urban design. This essentially calls for imperfect cities by design, '*built*' by Jacobs' generators for diversity. Although this outcome might not be revolutionary in the current debates about urban design, the concept of clumsy solutions provide a foundation for Jane Jacobs' atheoretical claim for a diverse city. This contributes to new reflections on the urban planning paradigms of Jane Jacobs.

Keywords
clumsy solutions; Cultural Theory; diversity; Jane Jacobs; just city; libertarianism; Mary Douglas; social justice; urban design; utilitarianism

Issue
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1. Introduction. Urban Design Principles for Diversity in Cities

Jane Jacobs regarded diversity as a natural feature of big cities (Jacobs, 1961). Cities, however, do not generate diversity "automatically […] just by existing, [but] they generate it because of the various efficient economic pools of use that they form" (Jacobs, 1961, p. 148). Since then, the ideas of Jacobs have been reflected numerous times in urban design and planning. The debate on diversity in cities has not diminished and is still relevant for contemporary urban planning. Declarations such as "cities are by definition places of intense diversity and heterogeneity" (Dahinden, 2013, p. 39) or "diversity represents the new guiding principle for city planners" (Fainstein, 2005b, p. 3) reflect the tone in the discussion about this condition in cities. Fainstein sees diversity—among others—as a key criteria for the just city, encompassing diversity of the physical environment as well as social relations (Fainstein, 2010). Diversity matters in urban planning.

Jacobs formulated the idea that "the ruthless, oversimplified, pseudo-city planning and pseudo-city design

we get today is a form of 'un-building' cities" (1961, p. 408). This is a phenomenon which we were able to observe in past years during the modern urban planning era, which was fuel for conflict for Jacobs' fight against Robert Moses and still can observe today, while recognizing that there is a trend again towards large-scale redevelopment projects (Schubert, 2014, p. 9). Jacobs recommended to generate diversity by urban planning. She prefers "fine-grain, block-by-block diversity" (Larson, 2009, p. 36). Therefore, she suggests four design principles in her most famous book *The Death and Life of Great American Cities* (Jacobs, 1961, p. 150):

- Mixed use of an area which attracts the presence of people on the streets and places;
- Short blocks with frequent street crossings and opportunities to turn corners;
- Fairly close-grained mingle of buildings (age and condition);
- Dense concentration of people, including dense concentration of residents.

Jacobs' design principles pursue diversity. This advice for urban design shall serve urban planners as a basis to design more diverse cities.

Jacobs complained that city planning in the 1960's ignored urban theory and instead misused the cities as "an immense laboratory of trial and error" (Jacobs, 1961, p. 6). But Jacobs' design principles also lack theoretical foundation. So, can we justify Jane Jacobs' design principles with theory? Contemporary authors raise the concern that planning theory in general does not sufficiently address substantive aspects of planning, namely urban design (Fainstein, 2005a; Jabareen, 2006; Sternberg, 2000; Talen & Ellis, 2002). Urban design is often assigned to values such as beauty; planning theorists are diffident and cautious towards such normative issues (Talen & Ellis, 2002). Instead, urban design relies on "architectural ideas whose theoretical justifications are unclear" (Sternberg, 2000, p. 265). Urban design is understood here as the self-conscious creation of cities (Lang, 2009) by a public planning authority. Urban designers have generated urban design based on "eclectic reading, common sense, on-the-job experience, and personal predilection" (Talen & Ellis, 2002, p. 44). Theoretical discussions in planning predominantly address procedural aspects of planning (Sternberg, 2000; Talen & Ellis, 2002) and the justification of the planning activity itself (Hartmann & Needham, 2012). Recently, Beauregard reaffirmed the need for a planning theory that is more concerned with the planning substance itself.

There is not only a lack, but also a need, for more theoretical considerations of the ideas of Jane Jacobs, specifically for her claim for diversity in cities. Planners make choices over issues which are often highly contested (Campbell, 2006). Because these choices are contested—Needham points out that planning "makes people poorer or richer" (Needham, 2006, p. 3)—it is an activity that is profoundly concerned with justice (Campbell, 2006). The decisions made by urban planners and urban designers, about place-making shape our living environment. "[T]he ethical dimension in question cannot be separated from the 'physical' dimension of the city (i.e. urban design, technology, architecture, and related fields)" (Kidder, 2008, p. 254). Planners raise the question, why they plan and what is planning for. The inherent normative dimension and complexity of planning (Hartmann, 2012) and planning interventions have been tried to justify for instance in the building environment by economic theory (Moore, 1978).

How to deal with normativity? There are in social and political science two conceptual camps of dealing with the normativity: one camp builds on the assumption that societies function on same or similar normative premises; the other camp acknowledges pluralism and assumes that the complexity of society impedes the development of policy solutions (Benford & Snow, 2000). The rational choice theory or the *homo oeconomicus* are typical contenders of the first camp. They approach policy issues with the idea to find one perfect fitting solution (Hartmann & Hengstermann, 2014). Mary Douglas' Cultural Theory also belongs to theories acknowledging pluralism in social situations, rejecting approaches from the first camp. It provides a simple analytical scheme that allows reducing the pluralism to a manageable number of four without rejecting pluralism. This theory cannot resolve normativity, but it can help to reflect on it in a structured way. This paper is an attempt to provide this theoretical reflection relating different concepts of justice with Mary Douglas' Cultural Theory and its clumsy solutions, which have been introduced by Marco Verweij, Michael Thompson and their colleagues (Verweij, 2011).

The remaining paper is subdivided in three main sections. First, an overview of three fundamental and competing concepts of justice is provided, and they are used to examine today's issues and outcomes in spatial planning. Second, a theory is introduced dealing with the diversity of different rationalities and justice approaches, which is Cultural Theory, as developed by Mary Douglas, Michael Thompson, and fellows. This theory is used to derive the concept of the clumsy city as an approach to deal with pluralism, thus creating diversity in the city. In the third section, this concept is compared with Jane Jacobs' ideas on design principles for a diverse city. The combination of Jane Jacobs, Cultural Theory and the concepts of justice thus provide not only a theoretical foundation, and to some extent a justification of Jane Jacobs' ideas, but also a solution—a clumsy one—for dealing with diversity in urban design and planning.

2. Different Concepts of Justice and the City

A range of different opinions explore what is just and what is not (Davy, 1997). Different schools of thought have produced different concepts of justice (Sandel, 2007). Concepts of justice—most of the time implicitly—

are grounded in people's daily lives, their moral understanding, and general ethics. But they are also embedded in law and politics. People's notion of justice helps them to justify and legitimize activities, because a concept of justice defines what the right thing to do is (Sandel, 2010).

Why should urban planners be concerned with different concepts of justice? A concept of justice has always been part of the urban planning construct and eventually different concepts of justice contradict each other (Thaler & Hartmann, 2016). Acting according to one concept inherently implies neglecting and even acting against other concepts of justice (Davy, 1997). Inevitably the result is injustice in urban planning. Urban planners need to be equipped with the knowledge and ability to reflect on different concepts of justice. Our focus will be, according to Douglas' Cultural Theory we introduce later in this paper, on the concepts of justice known as Utilitarianism (Bentham, 1907/2007; Mill, 1863/2007), Libertarianism (Hayek, 1944/1991) and Social Justice (Rawls, 1971/2005). These concepts of justice in their main ideas are still being used and seen as common perspectives among concepts of justice. Therefore, in the following sections, we will briefly sketch the basic rationales of each of these three concepts and outline their principles and influences for urban design.

2.1. Utilitarian Justice—The City for the Greatest Happiness of the Greatest Number

Utilitarian justice in its fundamentals pursues the key axiom 'maximize happiness' (Bentham, 1907/2007). It is developed by Jeremy Bentham and John Stuart Mill. Bentham is deemed to be the founder of Utilitarianism and became famous through his book *An Introduction of Moral and Legislation*, where Mill represents a more moderate notion of Utilitarian justice (Mill, 1863/2007). The utilitarian concept of utility involves two main outcomes: (1) pleasure (positive reaction) and (2) pain (negative reaction). The resulting distribution of 'pleasure' and 'pain' benefits the majority (at the costs of minorities). We can conclude that Utilitarianism starts from the premise that every decision should be based on weighing happiness and pain, and likewise costs and benefits. The end purpose is to raise happiness and to minimize pain (Sandel, 2010).

How can we translate this moral principle into public decisions? Here, we are not just evaluating our own happiness and pain, but instead assessing an approach that strives for "the greatest happiness of the greatest number that is the measure of right and wrong" (Bentham, 1907/2007). This slogan implies that it's not just the intensity of happiness that counts, but also the size of the group who is benefitting (Sandel, 2007).

So, what does it mean for urban design? In planning processes, the "greatest happiness principle" or the "principle of utility" is achieved in utilitarian justice when we gain more *utility* than *pain* for society. In this way, Utilitarianism acts as a spokesman for powerful urban planning. According to this concept of justice, the state has the task to protect the happiness of the majority (Davy, 2012). So utilitarian urban planners need to ask whether a certain planning measure will, in sum, increase more pleasure than inducing pain. This implies that such planning accepts sacrifices (e.g. expropriation of landowners, imposing nuisances to some) if with this measure the benefits of more land users will be increased. This provides a clear guideline for urban planners, if they manage to assess costs and benefits of certain plan alternatives. Urban planners are equipped with multiple methods, such as cost-benefit analysis, GIS models, and so forth. The result of a utilitarian urban design would most likely be a very functional and almost sober city with rather straight lines, clear rules and separated functions. The city of Le Corbusier, or urban design according to Bauhaus principles, might resemble ideas of a utilitarian city (Steinø, 2013), as well as the social welfare function (Alexander, 2002).

We agree with Steinø that "cities should be more than just functional entities, providing merely for utilitarian needs" (Steinø, 2013, p. 73). Furthermore, there are two main objections against utilitarianism: first, it's hard to fully evaluate all benefits and costs (pain and pleasure, respectively) in a fair way, and it is also difficult to achieve consensual evaluation methods. Second, one mode of thought suggests individual rights are a value in itself. In this case, the question rises of what the other concepts of justice are.

2.2. Libertarian Justice—The City of Freedom and Opportunities

Libertarian justice emphasizes the liberty of individuals (Sandel, 2010). The state should be as minimal as possible, reducing its interventions to the reduction of market failures (Hess & Ostrom, 2007; North, 1990). Libertarian justice supports the idea of an invisible hand in the market, which ultimately leads to fair outcomes. Libertarian principles are hostile to utilitarian principles, because the latter focuses on the maximization of happiness for the greatest number, which brings losses, but consents to them to maximise the happiness of each individual. Freedom of individual self-determination is central in libertarian justice (Hayek, 1944/1991; Johnson, Tunstall, Priest, McCarthy, & Penning-Rowsell, 2008). This can be summarized in the principle that libertarianism supports individual rights to life, liberty, and the pursuit of happiness. This doctrine can also be found in the "The Declaration of Independence" in the United States. Important thinkers of libertarian justice are Milton Friedman, Robert Nozick and Friedrich A. Hayek. John Locke is also a central figure because he applied libertarianism to the concept of property rights (Hartmann, in press).

The libertarian city would designate itself as a city of freedom and opportunities. This translates into an urban design with minimal rules. Most likely this city will

develop with large plots of individually owned land and minimal public spaces. In the Netherlands, there is an experiment that resembles this concept of justice: the case of Almere Oosterweld. This is an area of about 4,300 hectare, which will accommodate circa 15,000 new residential houses. Within this ongoing project, building regulations have been minimized to allow each landowner to develop his or her own idea of home. It is promoted as an area that embraces creativity and opportunity. Summarized, in a perfect libertarian world, a libertarian city facilitates liberty and self-ownership for each individual in the society.

Critiques on libertarian justice address the inherent increase of inequalities. Privatization and gentrification processes, for instance, are two negative examples of possible symptoms caused by a libertarian planning policy. Critics suggest that the initial resource allocation supports the haves against the have-nots. Therefore, the initial unequal assignment of property rights to different persons undermines the very principle of the right to life, liberty, and the pursuit of happiness.

2.3. Social Fair Justice—The City of Fairness and Equality

The *Theory of Justice* in 1971 from John Rawls is one of the key publications on social justice (Sandel, 2010). Rawls' thoughts became very influential in debates on concepts of justice, but also gained attention in the planning literature in recent years (Basta 2015; Basta & Moroni, 2013; Campbell & Marshall, 2002; Fainstein, 2010). As a critique of utilitarian principles, Rawls offered a new point of view on social justice that shares some ideas with Utilitarianism and cannot be seen as entirely detached from that theory (Campbell, 2006). Rawls's main point of criticism was that Utilitarianism is just looking for an overall sum of happiness, but not how is it distributed in the society (Basta & Moroni, 2013).

According to Rawls, we need a social contract with defined rules based on ethical aspects, which foster our daily life as we coexist. Rawls puts one's position, that is potentially involved in the construction of the social contract, behind a so-called "veil of ignorance" (Rawls, 1971/2005). This puts one in a position where all the members of a society slip into the same role: ultimately describing his first principle. This means we don't know anyone's rank or status in society. Executed further, this means we don't know if these members are poor or rich, or if we are dealing with talented or untalented people. Since our own position is unknown as well, ideally, when we raise the veil of ignorance, all rights, chances and opportunities are distributed equally among the society (Rawls, 1971/2005).

The socially just city is designed in a way that all groups of the society are included. There is space for bankers and beggars, children and elderly, citizens and refugees. From Rawls's standpoint it would not be fair for all groups to have their space, but instead emphasizes improving the life prospects of the least advantaged, as we're living in a world full of inequalities. In a socially just city under Rawls, this leads to spacious communal areas, affordable housing, and open and attractive public spaces.

There exist variations and related concepts to social justice, which shall not be in the focus in this paper. For further reading we recommend Sandel (2010) and Harvey (1996). Critiques on social justice focus on its actual realization. Although many people see an inherent and intuitive moral supremacy of social justice compared to the other concepts, it is a very costly concept of justice. In addition, libertarians criticize that in a purely socially just world, incentives for innovation and performance are lacking. As in utilitarianism, the socially just city needs strong and powerful urban planning to enforce the redistribution and allocation of resources.

3. Mary Douglas' Cultural Theory and Clumsy Solution

The previous section leaves us with a dilemma: there are three different but opposing concepts of justice. None is ultimately superior to the other as each concept has its justification and its inherent logic, but also has its pitfalls. They contradict each other. This section compares the three concepts of justice with Cultural Theory.

Cultural Theory is a social-constructivist theory. Although Cultural Theory originates from anthropology and has been much used in research on risk-perception (Douglas & Wildavsky, 1983; Renn, 2008), it has also been applied and discussed in planning theory (Davy, 1997, 2004; Hartmann, 2011; Hartmann & Hengstermann, 2014; Hendriks, 1999). In contrast to many other approaches in cultural anthropology, Mary Douglas developed a theory that enables analyzing social interactions without complicated ethnographic analysis. Her claim was to develop a framework "that is able to deal with culture everywhere". Thus, her field work was not confined to Melanesia or Africa, but includes western societies (Mamadouh, 1999). Cultural Theory does not restrict itself to analyzing cultures with all its variations in definition, but instead refers to social solidarities (Thompson, Ellis, & Wildavsky, 1990).

Basically, Cultural Theory is built on the assumption that every social situation can be described in terms of four ideal-typical (Hendriks, 1999) "cultures" (Ellis & Thompson, 1997) or "rationalities" (Davy, 2008; Hartmann, 2012): individualism, egalitarianism, hierarchism, and fatalism. These rationalities can be acted out by individuals, groups of individuals, or institutions (Douglas, 1986). They describe different rational ways to perceive and act in certain situations. It is an important notion to assign rationalities to situations, not to persons. A situation-oriented approach asks how, not by whom, rationalities are involved in certain situations (Davy, 2004). The situation-oriented approach to Cultural Theory assumes that a persons' actions do not determine situations but rather situations determine a persons' actions. This is an important premise to translate this theory to

urban design. The same person can act out one rationality in one particular situation, and another rationality in another situation.

The rationalities are assumed to be internally consistent, mutually contradictory, and jointly exhaustive (Schwarz & Thompson, 1990). This means that each rationality is rational on its own, but irrational from the perspective of the other rationalities (Thompson, 2008). The four rationalities are mapped out in the two-dimensional "grid and group" scheme (see Figure 1). "Grid" indicates the extent of decision-making autonomy to which a decision maker is bound to externally imposed structures, rules, and prescriptions. A high grid stands, accordingly, for heteronymous decision-making; a weak grid refers to a high degree of self-determination. "Group" indicates whether an individual is likely to join a group or prefers to act as an individual. The higher the group dimension, the more community-bounded an individual acts (Ellis & Thompson, 1997). Since the two dimensions are independent, they form a diagram with two axes and four quadrants. The four rationalities can be located in each quadrant, so that each rationality can be described by a combination of the two dimensions, grid and group. The differences between the rationalities are illustrated with a pictogram, showing a ball in a landscape. The ball represents the world; the landscape represents the behavioral characteristics of the world towards interventions (Ellis & Thompson, 1997) (see Figure 1). These pictograms explain how the rationality believes that the world reacts on disturbances and helps build understanding about appropriate problem-solving mechanisms for the four rationalities. They are characterized in the following paragraphs.

Individualism: The individualistic pictogram shows a ball on the bottom of a valley (see Figure 1). It cannot crash down; rather it is in a relatively stable equilibrium. In this world, trial and error allow exploration of new possibilities. Individualism is the most libertarian rationality. It rejects regulations and does not believe in collaborative governance styles. Instead, individualism prefers market approaches. Urban design serves to achieve efficient allocations of goods (Sorensen & Day, 1981). For individualism, private property is regarded as a driving force for economic growth and welfare (Ostrom, 2000). Public goods are considered a source for market failure (Cooter & Ulen, 2004). Individualism fits the concept of libertarian justice.

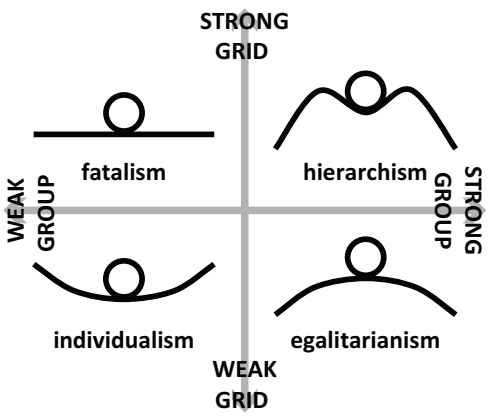

Figure 1. The rationalities of Cultural Theory ("grid and group" scheme).

Egalitarianism: The egalitarian rationality is illustrated by a ball on the top of a hill. It is an unstable equilibrium. This rationality neglects governmental interventions and market schemes, and instead places a strong emphasis on community. As the organizing principle of individualism is the market, moral commitment to the community is the egalitarian principle of organization (Thompson, 2008). Participative and collaborative approaches such as "communicative planning" are welcome (Huxley, 2000). Planning should be carried out less by law and regulations and more by consensus and cooperation. Accordingly, urban design should create social spaces to allow communities to assemble and collaborate. This is a radically different leitmotif than the individualistic idea of maximizing private property. Egalitarianism has a strong link with the concept of social justice.

Hierarchism: This rationality is depicted by a ball embedded in a small dip on top of the hill. The preferred mode of governance is by rules and regulations. Theoretically, as in Thomas Hobbes's "Leviathan," members of society give power to an institution that governs the welfare of all people. The integrity of the institution is essential to keep the ball on top of the hill. Such institutions do not necessarily need to be governmental (Douglas, 1999). It is often put forward that hierarchism is able to prevent a tragedy of the commons (Hardin, 1968). This rationality prefers to regulate common goods, instead of using market approaches or community schemes to allocate and distribute goods. The rationality of hierarchism is linked with utilitarian justice.

Fatalism: Whereas the three previously presented rationalities are often categorized as active rationalities, fatalism is the passive rationality. It stands for a laissez-faire governance approach. This rationality neglects planning because of the complexity and wickedness of the world. According to fatalism, it is simply not possible to predict the chaotic jumble of the world. This is a very planning-hostile rationality, because every intervention depends on luck and fate. The ball lies in a flat landscape: this pictogram reflects the unpredictability of the equilibrium. Fatalism does not prefer any of the three presented concepts of justice, but does not believe in justice at all: just luck and fate.

Each of the four rationalities prefers its own concept of justice (or none, in the case of fatalism) (Schwarz & Thompson, 1990). Still, Cultural Theory does not determine which concepts of justice are the best or most suitable. Cultural Theorists regard the four rationalities as a system of plausible, rather than empirically demonstrably true, rationalities (Dake, 1992; Hartmann, 2012; Renn, 2008). For urban design, the dilemma of competing concepts of justice remains, in addition we are in a

dilemma of four rationalities, each of those thinking to be the only plausible rationality.

One of the central assumptions of Cultural Theory is that in every social situation, all of these four rationalities occasionally emerge in some way, which is known as the 'impossibility theorem' (Ellis & Thompson, 1997). This impossibility theorem implies that if a situation is perfectly monorational (e.g. a well-ordered utilitarian and designed city), the respective other rationalities reject this situation. Vice versa, polyrational situations in which all four rationalities and their related concepts of justice are embraced, are more robust than a single-rational situation (Davy, 2004). This leads to the idea of designing cities in a way that all rationalities are embedded, in the building process as well as in the ideas of the outcome. From the point of view of each rationality, such a city can never be perfect so the urban design is always a compromise, and it appears clumsy. From this argument, the concept of clumsy solutions originates, which has been developed by Marco Verweij, Michael Thompson and their colleagues (Verweij, 2011).

A clumsy solution is seemingly the opposite of classical city planning back in the 1950's and 1960's when Jane Jacobs was in the heyday of her political activities and critique against orthodox city planning (Jacobs, 1961). A clumsy solution isn't looking for the well-designed city (e.g. the grid system, as used in the United States to provide a car-friendly environment). Rather, a clumsy solution would be an approach to provide a car-friendly setting, but also opt for a city that embraces all four rationalities and their related concepts of justice.

4. Diversity in Cities as Clumsy Solutions

So far, we discussed how different concepts of justice, as with the different rationalities introduced by Douglas' Cultural Theory, are reflected in cityscapes and how they correspond with the principles for diversity in cities introduced by Jane Jacobs. In one last step, we combine the concepts of justice with urban design by referring to Douglas' Cultural Theory's clumsy solutions. Clumsy solutions, as outlined above, support the idea of an imperfect—even clumsy—urban design. Clumsy means the embodiment of different notions of justice in a clumsy solution. This means embracing libertarian principles (providing individual liberty), utilitarian justice (greatest happiness for the greatest number), and social justice (equality of outcome) at the same time. Fatalism then opts to not design the city completely, but to leave some aspects of urban design open.

How can we picture such an urban design? The resulting city might come pretty close to the ideal city pursued by Jane Jacobs. She frames design principles in her famous book *The Death and Life of Great American Cities*, whose functions are to create a basis to tap a city's full potential: mixed uses, aged buildings, small blocks and an adjusted population density (Jacobs, 1961, pp. 150f.). Furthermore, Jacobs specifically formulates the need for economic diversity in a city, a consequence from her design principles and that is far more than just touching the physical design of a city. She supports the idea of a mixed use of economies, which means neighborhoods cannot flourish if merely offering a single use economy. A neighborhood needs big firms and retailers, but also needs small and local economies since the smaller ones are as important as the big ones to vitalize a neighborhood. Hospers, vice versa, agrees that "diversity is of major importance not only from a social perspective, but also from an economic viewpoint" (2014, p. 127). This gets underlined by Moroni as well, who argues for diversity, to let "economic urban vitality" emerge (2016, p. 4). In a next step Jacobs states that her physical design principles combined with her recommended economic condition unleash commercial diversity. When Jane Jacobs explains that the: "Commercial diversity is, in itself, immensely important for cities, socially as well as economically" (Jacobs, 1961, p. 148) she describes the process that richness in a cities' commerce, produces diversity in various other forms as for instance social diversity, a cities' population and its users. Put together, Jacobs' vision of a well working and functioning city includes neighborhoods where there is space for everybody. This can be translated into the terminology of Cultural Theory: Space for different rationalities in a clumsy city.

This builds a bridge between Jane Jacobs' thoughts and different rationalities of Douglas' Cultural Theory with their inherent concepts of justice. Jacobs' claim for diversity is not based on a theory but stems from an intuitive normative claim for how a city should work. Douglas' Cultural Theory argues for diversity and provides such theoretical underpinning. But how does the diversity in urban design as put forward by Jacobs fit the diversity of different rationalities by Cultural Theory?

To understand the relation between Jacobs' and Douglas' ideas, the cities that are a result of a city built to Jane Jacobs' generators for diversity needs to be compared to the clumsy city that Douglas would promote. Based on the statement that "urban design can change the spatial organization of the city, and consequently how it works" (Madanipour, 2006, p. 185) it can also change the emerging social situations. The emergence of different rationalities creates a more diverse population and therefore more diverse urban spaces. Assumed that Jacobs' generators for diversity are adopted, the city creates diversity in uses through insisting on a mix of primary uses. Through this, the city creates a higher diversity in social interactions during the whole day, and logically as a consequence different emerging rationalities. Ensured short blocks again raise the possibility of more social interactions and social situations. Further on, varied aged buildings make room for different social classes as well as new economies and this engenders again the presence of different rationalities. Through her last condition in having a minimum density she also tries to make sure of more social interactions that create social situations. Seifert reflects this: "returning to Jacobs: in the first instance, de-

sign, structure, and form do not here mean what is material, built, but something socio-cultural, that endows built objects, in their various realizations, with meaning" (Seifert, 2014, p. 57). So, a city 'built' by Jane Jacobs' design principles is more polyrational. We can picture this situation, when imagining the contrary, for example a district with no mixed uses, large blocks, large and modern concrete buildings including large streets with few crossings. This would mean rather more monorational social interactions, thus social situations and ultimately unstable conditions since they are not clumsy. When Hirt discusses zoning in the American and European planning system, she declares that we make decisions about "social and spatial ordering" (Perin in Hirt, 2012, p. 389) and that these decisions "both reflect and construct social norms" (Hirt, 2012, p. 378).

5. Conclusion

Finally, Jacobs and Cultural Theory both reject cities entirely designed according to elegance and a rational-comprehensive planning, but promote cities that embrace imperfection and clumsiness. Jacobs prefers clumsiness over elegance because of her claim that "genuine, rich diversity of the built environment is always the product of many, many different minds, and at its richest is also the product of different periods of time with their different aims and fashions" (Jacobs, 1981). Cultural Theory and its clumsy solutions agrees with this but justifies clumsiness via its robustness against perfect solutions. Clumsy solutions embrace all four rationalities and their inherent concepts of justice. Jacobs promotes diversity out of a normative claim, in the clumsy city diversity is a result of different and competing rationalities. In that way, Douglas' Cultural Theory helps to justify Jacobs' urban design principles.

What can we ultimately learn from the particular perspective of Cultural Theory and assigned concepts of justice about the relevance of Jane Jacobs' urban design principles for today's cities? Jane Jacobs' ideas on how cities should look like have been criticized as being normative, and she has been blamed as being an urban activist (Fainstein, 2005a; Sternberg, 2000). To some extent, this cannot be rejected from the arguments above. However, in terms of Cultural Theory, Jane Jacobs' ideas can be an indication of the impossibility theorem. Jacobs opposed monorational city planning, such as the utilitarian ideas of Robert Moses in rebuilding New York. From the point of view of Cultural Theory, it is not a surprise that she pushed forward ideas of social justice and even libertarian elements in her concepts of the city. The design principles of Jacobs also resemble utilitarian aspects, such as the clear grid she prefers for blocks. The polyrationality in Jacobs' approach lies also within her diverse approach to design a city, because when we look at Jacobs' design principles, they're not solely about physical design. Her words of advice go far beyond the form of buildings. Also Klemek agrees when he says "robust functional diversity was fundamentally more important to her than superficial stylistic distinctions" (Klemek, 2011, p. 120). One of the reasons why the urban design based on Jacobs' design principles seems so appealing is because it is clumsy as well as the resulting diversity. In Jacobs' vision of a diverse city, there is space for everybody. Space for various situations, space for differing rationalities, space for different concepts of justice, space for diversity. In a nutshell: space for clumsy solutions.

There could be better ways to embrace four different rationalities and their related concepts of justice, but this contribution provides a theoretical framework and justification to pursue clumsy cities by design. Ultimately, the theoretical underpinning of Jacobs urban design principles does not only provide a justification of her ideas from the 1960's, but because the argument of Cultural Theory prevails still today, it argues for the continuing relevance of the design principles for diversity in cities. This asks for further empirical research testing and proving this argument. Ultimately, the discussion on connecting the visions of Jane Jacobs with Cultural Theory can contribute to revitalize the—often normative—debates on the just city and question existing paradigms in urban planning.

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Conflict of Interests

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References

Alexander, E. R. (2002). The public interest in planning: From legitimation to substantive plan evaluation, *Planning Theory*, *1*(3), 226–249.

Basta, C., & Moroni, S. (Eds.). (2013). *Ethics, design and planning of the built environment*. Dordrecht: Springer.

Basta, C. (2015). From justice in planning toward planning for justice: A capability approach. *Planning Theory*, *15*(2), 190–212.

Benford, R. D., & Snow, D. A. (2000). Framing processes and social movements: An overview and assessment. *Annual Review of Sociology*, *26*(1), 611–639.

Bentham, J. (2007). *An introduction to the principles of morals and legislation*. Mineola, NY: Dover Publications. (Original work published 1789)

Campbell, H. (2006). Just planning: The art of situated ethical judgment. *Journal of Planning Education and Research*, *26*(1), 92–106. doi:10.1177/

0739456X06288090
Campbell, H., & Marshall, R. (2002). Utilitarianism's bad breath? A re-evaluation of the public interest justification for planning. *Planning Theory*, *1*(2), 163–187. doi:10.1177/147309520200100205
Cooter, R., & Ulen, T. (2004). *Law and economics*. Boston: Addison-Wesley.
Dahinden, J. (2013). Cities, migrant incorporation, and ethnicity: A network perspective on boundary work. *Journal of International Migration and Integration*, *14*(1), 39–60. doi:10.1007/s12134-011-0224-2
Dake, K. (1992). Myth of Nature: Culture and the social construction of risk. *Journal of Social Issues*, *48*(4), 21–37.
Davy, B. (1997). *Essential injustice: When legal institutions cannot resolve environmental and land use disputes*. Wien: Springer.
Davy, B. (2004). *Die Neunte Stadt: Wilde Grenzen und Städteregion Ruhr 2030*. Wuppertal: Müller+ Busmann.
Davy, B. (2008). Plan it without a condom! *Planning Theory*, *7*(3), 301–317.
Davy, B. (2012). *Land policy: A German perspective on planning and property*. Farnham, Surrey: Ashgate.
Douglas, M. (1986). *How institutions think* (1st ed.). Syracuse, NY: Syracuse University Press.
Douglas, M. (1999). Four cultures: the evolution of a parsimonious model. *GeoJournal*, *47*, 411–415.
Douglas, M., & Wildavsky, A. (1983). *Risk and culture: An essay on the selection of technical and environmental dangers*. Berkeley: University of California Press.
Ellis, R. J., & Thompson, M. (Eds.). (1997). *Culture matters: Essays in honor of Aaron Wildavsky*. Boulder, CO: Westview Press.
Fainstein, S. S. (2005a). Planning theory and the city. *Journal of Planning Education and Research*, *25*(2), 121–130. doi:10.1177/0739456X05279275
Fainstein, S. S. (2005b). Cities and diversity. Should we want it? Can we plan for it? *Urban Affairs Review*, *41*(1), 3–19.
Fainstein, S. S. (2010). *The just city*. Ithaca: Cornell University Press.
Hardin, G. (1968). The tragedy of the commons. *Science*, *162*(3859), 1243–1248.
Hartmann, T. (2011). *Clumsy floodplains: Responsive land policy for extreme floods*. Farnham, Surrey: Ashgate.
Hartmann, T. (2012). Wicked problems and clumsy solutions: Planning as expectation management. *Planning Theory*, *11*(3), 242–256.
Hartmann, T. (in press). Ethik in der Raumplanung. In H. H. Blotevogel, et. al. (Eds.), *Handwörterbuch der Stadt- und Raumentwicklung*. Hannover: ARL.
Hartmann, T., & Hengstermann, A. (2014). Territorial cohesion through spatial policies—An analysis with Cultural Theory and clumsy solutions. *Central European Journal of Public Policy*, *8*(1), 30–49.
Hartmann, T., & Needham, B. (Eds.). (2012). *Planning by law and property rights reconsidered*. Farnham: Ashgate.
Harvey, D. (1996). *Justice, nature and the geography of difference*. Malden, MA: Blackwell.
Hayek, F. A. (1991). *The road to serfdom*. London: Routledge. (Original work published 1944)
Hendriks, Frank. (1999). The post-industrialising city: Political perspectives and cultural biases. *GeoJournal*, *47*(3), 425–432.
Hess, C., & Ostrom, E. (2007). Introduction: An overview of the knowledge commons. In E. Ostrom (Ed.), *Understanding knowledge as a commons. From theory to practice* (pp. 3–26). Cambridge, MA: MIT Press.
Hirt, S. (2012). Mixed use by default: How the Europeans (don't) zone. *Journal of Urban Planning Literature*, *27*(4), 375–393.
Hospers, G-J. (2014). Beyond diversity: Jacob's death and life and its relevance for Dutch urban regeneration policy. In D. Schubert (Ed.), *Contemporary perspectives on Jane Jacobs* (pp. 125–136). Aldershot: Ashgate.
Huxley, M. (2000). The limits to communicative planning. *Journal of Planning Education and Research*, *19*(4), 369–377.
Jabareen, Y. R. (2006). Sustainable urban forms: Their typologies, models, and concepts. *Journal of Planning Education and Research*, *26*(1), 38–52. doi:10.1177/0739456X05285119
Jacobs, J. (1961). *The death and life of great American cities*. New York: Penguin Books.
Jacobs, J. (1981). Can big plans solve the problem of renewal? In S. Zipp & N. Storring (Eds.), *Vital little plans: The short works of Jane Jacobs*. New York: Random House.
Johnson, C. L., Tunstall, S., Priest, S. J., McCarthy, S., & Penning-Rowsell, E. (2008). *Social justice in the context of flood and coastal erosion risk management: A review of policy and practice* (R&D Technical Report FD2605TR). London: Defra-Report.
Kidder, P. (2008). The urbanist ethics of Jane Jacobs. *Ethics, Place & Environment*, *11*(3), 253–266. doi:10.1080/13668790802559668
Klemek, C. (2011). *The transatlantic collapse of urban renewal: Postwar urbanism from New York to Berlin*. Chicago: The University Press.
Lang, J. (2009). International urban design: Theory and practice. *Proceedings of the Institute of Civil Engineers—Urban Design and Planning*, *162*(1), 7–17. doi:10.1680/udap.2009.162.1.7
Larson, S. (2009). Whose city is it anyway? Jane Jacobs vs. Robert Moses and contemporary redevelopment politics in New York City. *Berkeley Planning Journal*, *22*(1), 33–41.
Madanipour, A. (2006). Roles and challenges of urban design. *Journal of Urban Design*, *11*(2), 173–193. http://doi.org/10.1080/13574800600644035
Mamadouh, V. (1999). Grid-group cultural theory: An introduction. *GeoJournal*, *47*(3), 395–409.

Mill, J. S. (2007). *Utilitarianism, Liberty and Representative Government*. Milton Keynes, UK: Wildside Press. (Original work published 1863)

Moore, T. (1978). Why allow planners to do what they do? A justification from economic theory. *Journal of the American Planning Association*, *44*(4), 387–398. doi:10.1080/01944367808976917

Moroni, S. (2016). Urban density after Jane Jacobs: The crucial role of diversity and emergence. *City, Territory and Architecture*, *3*(1), 13. doi:10.1186/s40410-016-0041-1

Needham, B. (2006). *Planning, law, and economics: The rules we make for using land*. Abingdon, UK: Routledge.

North, D. C. (1990). *Institutions, institutional change, and economic performance. The political economy of institutions and decisions*. Cambridge, NY: Cambridge University Press.

Ostrom, E. (2000). Private and common property rights. In B. Bouckaert & G. de Geest (Eds.), *Encyclopedia of Law & Economics* (pp. 333–379). Ghent: Edward Elgar and the University of Ghent.

Rawls, J. (2005). *A theory of justice* (Original ed.). Cambridge, MA: Harvard University Press. (Original work published 1971)

Renn, O. (2008). *Risk governance: Coping with uncertainty in a complex world*. London: Earthscan.

Sandel, M. J. (2007). *Justice: A reader*. Oxford: Oxford University Press.

Sandel, M. J. (2010). *Justice: What's the right thing to do?* (1st ed.). New York: Farrar, Straus and Giroux.

Schubert, D. (2014): 50 Years: "the death and life of great American cities". In D. Schubert (Ed.), *Contemporary perspectives on Jane Jacobs* (pp. 3–10). Aldershot: Ashgate.

Schwarz, M., & Thompson, M. (1990). *Divided we stand: Redefining politics, technology & social choice*. Philadelphia, PA: University of Pennsylvania Press.

Seifert, J (2014). Visual order and perceptual form: Contrasting Jane Jacob's urban design rejection with Kevin Lynch's approach. In D. Schubert (Ed.), *Contemporary perspectives on Jane Jacobs* (pp. 55–64). Aldershot: Ashgate.

Sorensen, A. D., & Day, R. A. (1981). Libertarian planning. *Town Planning Review*, *52*(4), 390–402.

Steinø, N. (2013). Urban design and planning. One object—Two theoretical realms. *Nordisk Arkitekturforskning*, *2*, 63–85.

Sternberg, E. (2000). An integrative theory of urban design. *Journal of the American Planning Association*, *66*(3), 265-278. doi:10.1080/01944360008976106

Talen, E., & Ellis, C. (2002). Beyond relativism: Reclaiming the search for good city form. *Journal of Planning Education and Research*, *22*(1), 36–49. doi:10.1177/0739456X0202200104

Thaler, T., & Hartmann, T. (2016). Justice and flood risk management: Reflecting on different approaches to distribute and allocate flood risk management in Europe. *Natural Hazards*, *83*(1), 129–147. doi:10.1007/s11069-016-2305-1

Thompson, M. (2008). *Organising and disorganising: A dynamic and non-linear theory of institutional emergence and its implications*. Axminster: Triarchy Press.

Thompson, M., Ellis, R. J., & Wildavsky, A. B. (1990). *Cultural theory*. Boulder, CO: Westview Press.

Verweij, M. (2011). *Clumsy solutions for a wicked world: How to improve global governance*. New York: Palgrave Macmillan.

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Article

Using Systematic Observations to Understand Conditions that Promote Interracial Experiences in Neighbourhood Parks

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Abstract
We analysed observations from 31 neighbourhood parks, with each park mapped into smaller target areas for study, across five US cities generated using the System for Observing Play and Recreation in the Community (SOPARC). In areas where at least two people were observed, less than one-third (31.6%) were populated with at least one white and one non-white person. Park areas that were supervised, had one or more people engaged in vigorous activity, had at least one male and one female present, and had one or more teens present were significantly more likely to involve interracial groups ($p < 0.01$ for each association). Observations in parks located in interracial neighbourhoods were also more likely to involve interracial groups ($p < 0.05$). Neighbourhood poverty rate had a significant and negative relationship with the presence of interracial groups, particularly in neighbourhoods that are predominantly non-white. Additional research is needed to confirm the impact of these interactions. Urban planning and public health practitioners should consider the health benefits of interracial contact in the design and programming of neighbourhood parks.

Keywords
Intergroup Contact Theory; interracial contact; parks and recreation; SOPARC; urban parks

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1. Introduction

Urban parks have held a prominent place in city planning, landscape architecture, and public health scholarship for well over a century (Cranz, 1982; Wheater et al., 2007). Recent literature has identified four potential pathways whereby green space in cities may promote public health: stress reduction, increased physical activity, improved air quality, and social cohesion (Hartig, Mitchell, de Vries, & Frumkin, 2014). The first three of these pathways have received more scholarly attention than the democratic and social implications of people across race/ethnicity and

socioeconomic status coming together in public spaces (Eisenman, 2016). Building from the concept of psychosocial health, this paper considers the role of parks in bringing people together across racial/ethnic groups and, potentially facilitating interracial contact as an important and underappreciated pathway to increasing social cohesion, reducing racial prejudice, and improving human health. We analyse observations from 31 neighbourhood parks in five US cities to determine the characteristics of parks, neighbourhoods in which the park is located, and activities offered at the park that correlate with people across racial groups simultaneously occupying the same part of the park. We conclude by calling on urban design and planning to focus on creating and managing public spaces that promote social interaction across race/ethnicity as well as income, gender, and age groups.

Before describing data collection and analysis methods, we review literature from four distinct areas of scholarship that together create the conceptual and methodological foundation for our research: (1) urban planning and landscape architecture's history of promoting urban parks as democratic public spaces that foster cohesion between groups of different socio-economic and ethnic background; (2) research on social interaction, social cohesion, and intergroup contact in public spaces and green spaces within leisure studies and environmental and social psychology; (3) public health research on chronic exposure to prejudice and institutional racism as primary contributors to racial health disparities; and (4) recent public health research utilizing systematic social observations and environmental audits of outdoor public spaces including neighbourhood parks. By borrowing from these distinct areas of scholarship, we present a conceptual framework and suggestions for measurement and research design that highlight and test the underappreciated public health benefits of people coming together across race and ethnicity in neighbourhood parks.

2. Background and Significance

2.1. Urban Parks

As the world undergoes a third major period of urbanization (Angel, 2011), local governments are adopting new types of parks and green space strategies. This includes creation of rail trails and greenways, retrofitting landfills, cemeteries, rooftops, and parking areas, covering highways and reservoirs, sharing schoolyards, closing roads, and creating urban farms and community gardens (Harnik, 2010). There is also increasing attention on tree planting and site scale greening initiatives (Keeley, 2011; Young, 2011). Situated within an historical context, this bloom of activity can be seen as an effort to increase the liveability of cities in an urbanizing age (Eisenman, 2016), in much the same way that reform-minded urban designers and leaders advanced city parks in the 19th century (Schuyler, 1986).

Historically, social workers, urban planners, landscape architects and public health practitioners looked to parks as antidotes to many of the problematic and unhealthy aspects of cities (Dannenberg, Frumkin, & Jackson, 2011). The 19th century parks movement developed in response to the negative impact of urban industrialization on physical health, mental health, and social bonds (Cranz, 1982; Eisenman, 2013; Schuyler, 1986). Frederick Law Olmsted, Sr. the 19th century landscape architect famous for designing Manhattan's Central Park, Brooklyn's Prospect Park, and Boston's Emerald Necklace, thought natural scenery was critical "to give the mind a suggestion of rest from the devouring eagerness and intellectual strife of town life" (Olmsted, 1870). Olmsted believed that parks would promote democratic values and social life by bringing together diverse people, "each individual adding by his mere presence to the pleasure of all others" (Olmsted, 1870).

The large, curvilinear "pleasure grounds" of the 19th century that benefited primarily upper middle class residents gave way to the smaller, rectilinear "reform parks" of the early 20th century, focused on social reform, children's play, and assimilation of European immigrants (Cranz, 1982; Cranz & Boland, 2004). During the Progressive Era, parks were expected to "reduce class conflict, reinforce the family unit, to socialize immigrants to the American way of life, to stop the spread of disease, and to educate citizens" (Cranz & Boland, 2004, p. 103). During the mid-20th century, parks became recognized primarily as sites of recreation, and stadiums and asphalt basketball courts were added liberally. By the 1960s, some public officials looked to parks to help resolve racial tensions and stop riots, focusing on open space as places of participation, revitalization, and social control (Cranz, 1982). But as with Olmstead Sr.'s hope that the mere presence of diverse people together in green spaces would add to the "pleasure of others", these efforts to reduce racial tensions lacked strong theoretical foundations and empirical evidence.

2.2. Social Interaction and Intergroup Contact

Urban parks have been associated with positive mental health benefits distinct from any physical health benefits such as increased physical activity (Sturm & Cohen, 2014; Sugiyama, Leslie, Giles-Corti, & Owen, 2008). Public health studies have shown a correlation between access and use of parks or open space and lower resting heart rate, reduced stress, and better mental health across age groups (Balseviciene et al., 2014; Grazuleviciene et al., 2014; Song et al., 2014). Much of the literature linking use of public spaces to health focused on the restorative nature of green settings and contact with nature (Francis, Wood, Knuiman, & Giles-Corti, 2012; Kaplan & Kaplan, 1989; Ulrich, 1984). Less research has focused on social interaction as the important mechanism, with parks and open space facilitating the development of supportive relationships (Berkman

& Glass, 2000; Cattell, Dines, Gesler, & Curtis Mingling, 2008; Francis, Giles-Corti, Wood, & Knuiman, 2012; Francis, Wood et al., 2012; Putnam, 2000). Public health research has considered racial/ethnic variation in park use (Derose, Han, Williamson, Cohen, & RAND Corporation, 2015), but these studies do not consider whether people across race/ethnicity are interacting in parks. Contemporary urban greening literature also addresses social cohesion as a possible link between urban green space and human health. Here, research suggests that community green spaces that do not impede ground level views can reduce antisocial outcomes such as crime and household aggression (Donovan & Prestemon, 2012; Kuo & Sullivan, 2001), and that this may be due to signalling social ties, increasing informal surveillance, or mitigating mental fatigue (Jacobs, 1961; Kaplan, 1995; Newman, 1972; Wilson & Kelling, 1982). Some studies also suggest that community green spaces can promote pro-social outcomes such as greater neighbourhood social ties, more face-to-face contact, larger groupings of people, and increased interaction between youth and adults (Coley, Kuo, & Sullivan, 1997; Kuo, Bacaoica, & Sullivan, 1998; Sullivan, Kuo, & DePooter, 2004). As with the earlier park movements, these contemporary discussions lack specificity about how parks and other forms of green space promote prosocial behaviour and social cohesion.

We turn, then, to the fields of leisure studies and environmental and social psychology where researchers have focused on the social nature of parks and other natural environments and investigated the implications of these social interactions for different populations across location, age groups, income levels, race/ethnicity, and immigrant status. Rapid urbanization, car ownership, increased employment rates for women, and increased importance of social media and electronic communication has led to the weakening of neighbourhood ties in urban areas (Kazmierczak, 2013). Beyond the feelings of security and belonging, neighbourhood social ties may be important to dissemination of information and mutual aid (Kazmierczak, 2013; Kuo, Sullivan, Coley, & Brunson, 1998). Public spaces including neighbourhood parks can facilitate development of meaningful social ties. Kazmierczak (2013) found that even in inner-city neighbourhoods with high levels of deprivation, parks served as sites for initiating and strengthening social ties for those who visit parks regularly. These "everyday places" can contribute to a general sense of well-being by providing a relief from daily routines and stress at home through social interactions that may be as simple as nods and smiles (Cattell et al., 2008).

A number of studies have investigated the positive impact of social interactions in parks and other public spaces on facilitating acculturation and adaptation for immigrant groups (Peters, Elands, & Buijs, 2010; Stodolska, Peters, & Horolets, 2016). Main (2013) investigates the meaning of urban parks for immigrants using the concepts of place attachment and place identity, finding that natural and social elements of urban parks can provide important reminders of immigrants' sending communities. Seeland, Dübendorfer and Hansmann (2009) describe how public urban green spaces can help foster social inclusion as immigrant youths have opportunities to build cross-cultural social capital through sports and other forms of active play.

Several of these studies emphasize the importance of aesthetic qualities and design, arguing that parks need to be attractive and well-maintained, and have adequate seating and shade in order to maximize their positive impacts (Francis, Wood et al., 2012; Kazmierczak, 2013; Peters et al., 2010). Preferences regarding park attributes may also differ by gender and ethnicity (Ho et al., 2005). Many studies also note that cross-cultural, interracial, and inter-ethnic interactions can lead to social tension, particularly in public spaces that may be racially demarcated and where there may be conflict over use of space for activities such as sporting events and vending (Lee & Scott, 2013; Main, 2013; Peters et al., 2010). Parks must be understood as operating within a historical, socio-ecological, and political-economic context, making them "ideologically charged" and often "ethnoracially inscribed" spaces (Byrne & Wolch, 2009) that can be experienced as both barriers (Byrne, 2012) or "green walls" (Solecki & Welch, 1995), discouraging access, for racial/ethnic minorities, as well as "green magnets" that potentially improve interracial relations (Gobster, 1998). In other words, simply facilitating social interactions across groups is not enough to insure positive benefits for immigrants or racial/ethnic minorities.

Allport's intergroup contact theory (1954) offers a framework for understanding the conditions under which interracial and inter-ethnic social interactions, such as those that may occur in urban neighbourhood parks, can have positive impact on people on both sides of the interaction by reducing bias and conflict. These conditions include people across groups experiencing equal group status within the encounter, common goals, an experience of intergroup cooperation, support from authority and "friendship potential" (Brown & Hewstone, 2005; Dovidio, Gaertner, & Kawakami, 2003; Pettigrew, 1998). Recent research has also considered the role of expectations; when individuals across groups approach intergroup contact with positive expectations, the interactions are more likely to generate positive outgroup attitudes (Deegan, Hehman, Gaertner, & Dovidio, 2015).

Researchers across disciplines have tested intergroup contact theory in the context of military, worksites, schools, neighbourhoods, housing complexes, and religious congregational settings. Longitudinal studies (Binder et al., 2009; Christ et al., 2010; Eller & Abrams, 2004; Levin, van Laar, & Sidanius, 2003) and meta-analyses (Hodson & Hewstone, 2013; Pettigrew & Tropp, 2006) demonstrate consistent and relatively large and positive effects of intergroup contact on prejudice and intergroup conflict across age groups, settings, and countries (Pettigrew, 2016). These positive effects of intergroup contact are not limited to the group members

who are directly involved in the interaction but extend to the larger group by impacting norms (Christ et al., 2014; Pettigrew, 2016). Fewer studies have applied intergroup contact theory to urban public places such as neighbourhood parks. One study by Lee and Scott (2013) investigated the experience of Korean American males ages 19–36 playing pickup basketball or soccer. Most participants indicated that interracial contact through recreational sports contributed to harmonious interracial relations and that the optimal conditions of such contact as defined by intergroup theory need not be satisfied for positive contact to occur. They pointed, instead, to skill level and physical attributes of participants, length of contact, and climate within the recreational setting as key factors.

The Lee and Scott (2013) study, like other research in leisure studies focusing on social interactions in public parks, employed a qualitative research methodology (Cattell et al., 2008: Peters et al., 2010; Seeland et al., 2009; Stodolska et al., 2016). While in-depth interviews, ethnography, and focus groups are ideal for understanding the meanings people assign to interracial and interethnic interactions, they necessarily employ very small samples that limit their generalizability. Other studies have used surveys to capture information from residents about their interracial and inter-ethnic interactions in public parks and the meanings they assign those experiences (Ho et al., 2005; Maas et al., 2009; Main, 2013; Peters et al., 2010; Rios, Aiken, & Zautra, 2012; Seeland, Dübendorfer, & Hansmann, 2009). While these studies have larger samples, they rely on self-report about the frequency and conditions of interracial and inter-ethnic contact.

2.3. Racism and Health Disparities

Within public health literature, concern about the role of urban neighbourhood parks in racial health disparities has focused on lack of physical access to parks, disproportionate exposure to park disamenities, and racial disparities in park use by people of color (Abercrombie et al., 2008; Watson, Harris, Carlson, Dorm, & Fulton, 2016; Weiss et al., 2011). The pathway linking parks and public health has focused on parks as sites for physical activity, not social interaction. Distinct from the extensive literature on parks, public health research has focused on numerous ways in which prejudice and institutional racism negatively impact health, particularly for Blacks/African Americans (Gee & Ford, 2011; Gee, Walsemann, & Brondolo, 2012; Jones, 2000; Krieger, 1999). Most research identifies stress, caused by the "accumulated insults arising from every-day and sometimes violent experiences of being treated as a second-class citizen" (Krieger, 1999, p. 332), as a critical link between racial discrimination and health. Recent research has also documented a connection between discrimination and increased risk-taking behaviours (Jamieson, Koslov, Nock, & Mendes, 2013). While only one of many aspects of racism, interpersonal conflict and discrimination, or what Krieger (1999) calls "socially inflicted trauma", contributes to the lived experience—and negative health consequences—of racism. Krieger refers to "embodiment" as the way that discrimination "gets under the skin". (Krieger, 1999, 2016). Decreasing or eliminating racial prejudice and discrimination could, therefore, have positive health implications for Blacks/African Americans. Numerous studies, most of them published outside of public health, consider parks as sites of racial discrimination (Gobster, 1998, 2002; Rishbeth, 2001; West, 1989) but they do not link exposure to discrimination to racial health disparities.

2.4. Public Health Measures of Park Use and Features

Public health research has focused on the human health implications of parks primarily as sites for promoting physical activity (Brownson, Hoehner, Day, Forsyth, & Sallis, 2009; Cohen et al., 2007; Jones & Lachowycz, 2011; Kaczynski & Henderson, 2008). While this body of research largely neglects the potential pathway linking parks and improved health through social cohesion and intergroup contact, it does offer important tools for measuring park conditions and activities that can be applied to research focused on these social pathways. Research on parks and physical activity has increasingly employed objective measures of human behaviour, through systematic observation, electronic devices such as accelerometers, heart-rate monitors, and global positioning systems (GPS), and systematic audits of built environment conditions (King, Glanz, & Patrick, 2015; McKenzie, Cohen, Sehgal, Williamson, & Golinelli, 2006; McKinnon, Reedy, Berrigan, & Krebs-Smith, 2012). Specifically, studies have employed physical activity logs, GPS, accelerometers, and direct observation of physical activity on the way to (Evenson, Wen, Hillier, & Cohen, 2013) and within parks (Kaczynski, Luke, Potwarka, & Saelens, 2008; Quigg, Gray, Reeder, Holt, & Waters, 2010) to document the public health value of these investments. These are promoted as objective measures of physical activity in response to the documented social desirability and recall bias of survey-based and other self-report measures of physical activity.

In summary, we draw on scholarship from planning and landscape architecture history, leisure studies, psychology and public health to focus attention on the importance of social interactions rather than only on physical activity. In connecting public health research on the negative health impacts of racial discrimination for Blacks/African Americans to Allport's theory of intergroup contact (1954), we identify a specific possible causal pathway that links positive interracial social interactions in neighbourhood parks to improved health for all groups.

Borrowing from the observation measures used for public health studies on physical activity in parks, we employ a method of systematic observation to identify

what combination of people, across age, gender and race, are present in the same section of urban neighbourhood parks across five cities as a first step in understanding the conditions under which interracial contact is most likely to occur. By employing quantitative methods to analyse a large sample of observations, we offer a complement to the more nuanced qualitative research in order to identify patterns across multiple cities and parks.

In this study, we address the following research questions: (1) How frequently are people across racial groups present in the same section of parks at the same time? (2) What are the characteristics of park areas and park activities that correlate with the co-presence of park users across racial groups? And (3) What neighbourhood characteristics in which parks are located are correlated with the co-presence of park users across racial groups? We use our results to highlight they ways that urban planners and public health professionals can work deliberately to design and program neighbourhood parks to maximize their public health impact. Our analysis of who is coming into contact in parks has important implications for understanding and, potentially, improving interracial and interethnic relations. This is especially timely in light of the ethnic confrontation that is entangled with contemporary globalization and urbanization around the world, and within the United States, the "Age of Ferguson" and Black Lives Matter movement (Derickson, 2016).

3. Research Methods

The System for Observing Play and Recreation in the Community (SOPARC) is a validated direct observation tool for assessing use of park and recreation areas, including park users' physical activity levels, gender, activity types, and estimated age and ethnicity groupings (McKenzie et al., 2006). SOPARC has been used to show variability in physical activity levels across park users by age, gender, race/ethnicity (Besenyi, Kaczynski, Wilhelm Stanis, & Vaughan, 2013; Reed & Hooker, 2012; Reed, Hooker, Muthukrishnan, & Hutto, 2011; Reed, Price, Grost, & Mantinan, 2012), park areas (Besenyi et al., 2013), parks, cities, and seasons (Chow, McKenzie, & Sit, 2016; Cohen et al., 2013; Ward et al., 2014), urban versus rural settings (Shores & West, 2010) and neighbourhoods based on walkability, racial composition and income (Cohen et al., 2013; Van Dyck et al., 2013; Ward et al., 2014). Previous studies have used SOPARC data on gender, age, and race/ethnicity to document disparities across groups in the use of parks and physical activity levels (Evenson, Jones, Holliday, Cohen, & McKenzie, 2016; Kaczynski, Wilhelm Stanis, Hastmann, & Besenyi, 2011) but not to investigate the combinations of people who are co-present in parks.

Observations were made using SOPARC at 31 neighbourhood parks across five different US cities during the spring, summer and fall between 2008 and 2010. Researchers from Albuquerque, NM, Columbus, OH, Chapel Hill/Durham, NC, and Philadelphia, PA selected six parks each and researchers from Los Angeles CA selected seven neighbourhood parks from areas with different racial/ethnic and income composition. Some but not all parks included a recreation center and full-time staff. Trained staff observed all areas of each park at four randomly-selected 1-hour intervals between 7am and 8pm on two randomly selected weekdays and two randomly-selected weekend days over at least 3 seasons of the year (Cohen et al., 2011). The time of day and day of the week were recorded for each observation. Two observers worked together to document the type of activity and each person's physical activity (sedentary, walking, vigorous), gender, age group (child, adolescent, adult, senior), and race/ethnicity (Latino, African American, White, and other). Reliability checks with a third independent observer were conducted to insure that the procedure had good reproducibility (Ward et al., 2014). Prior studies indicate that SOPARC can assess these measures reliably (Cohen et al., 2007).

3.1. Characteristics of Park Target Areas

Overall park size was calculated as a continuous variable (in acres). Each park was mapped and divided into discrete target areas to make observations more manageable. The type of facilities present (i.e., playground, baseball field, basketball court, indoor weight room) were documented for each target area. Two staff rotated around the park, systematically observing each target area and identifying whether it was physically accessible (i.e., not locked), empty, organized (scheduled sporting event or exercise class), and supervised by park staff, coach, volunteer, or teacher.

3.2. Characteristics of Park Users

Observations were coded based on the total number of people present, whether at least one male and one female was present, only males were present, or only females were present and whether any children, teens, adults or seniors were present. Based on data collected in the field, all observations were later coded as interracial or not based on whether at least one white and one non-white person were present in the same target area at the same time. Interracial was defined exclusively as the simultaneous presence of someone white and someone non-white in the same target area. We chose to operationalize interracial this way because whites represented the largest (Columbus and Chapel Hill/Durham) or second largest (Albuquerque, Los Angeles, and Philadelphia) demographic group in all of the cities. Also, historically racial/ethnic conflict in the United States has been defined largely in the context of white privilege and white supremacy that categorizes all non-whites as "other" (Mills, 1997). Research using SOPARC has consistently shown high levels of inter-rater reliability in regard to the total number of people observed, age, gender, and race/ethnicity (Evenson et al., 2016).

3.3. Characteristics of Activities

Staff identified the number of males and number of females being sedentary or standing without moving (heretofore referred to as sedentary), moderately active (such as walking), or vigorously active. SOPARC has also been shown to have high levels of inter-rater reliability for physical activity levels (Evenson et al., 2016). They also identified the primary activity for the females and males inside the target area (i.e., sitting, running, swinging) as well as whether there were any spectators present. All observations were later coded based on whether the primary activity involved a team sport, a playground activity, sedentary activity, such as sitting, standing, picnicking, reading, or lying down, moderate activity such as walking, or whether anyone within the target area was being vigorously active or not.

3.4. Characteristics of Park Neighbourhoods

The neighbourhood racial/ethnic and income characteristics of each park were determined using 2000 US Census data for block groups with centroids within half a mile of park boundaries for parks in all cities other than Chapel Hill/Durham where block groups with centroids within 0.8 mile were used because of much lower population densities. The population density and the percent of neighbourhood residents who were white, Black/African American, and Hispanic/Latino and living in poverty were determined for all parks. Neighbourhoods were then identified as having a high interracial mix (no racial/ethnic group made up more than 50% of population) or medium interracial mix (no racial/ethnic group made up more than 70% of the population), and as having a high poverty (poverty rate greater than 25% or not) or low poverty (poverty rate less than 15% or not). Poverty rate was measured as a continuous variable for the GEE model.

3.5. Statistical Analysis

Descriptive statistics were generated to compare the timing of observations, characteristics pf park target areas, and characteristics of park activities across cities and neighbourhoods. Generalized Estimating Equations (GEE) were used to analyse the SOPARC data. GEE models are appropriate given the clustered nature of the sample (i.e., multiple target areas with park) and multiple observations taking place on the same day in the same park in the same city.

This research protocol was approved by the Institutional Review Boards of the University of Pennsylvania, RAND Corporation, The Ohio State University, University of North Carolina, and Behavioral Health Research Center of the Southwest/PIRE.

4. Results

Of the 43,706 observations made across the 31 parks, only 7,352 (16.8%) included two or more people present in the same target area at the same time. Less than one-third of these observations (31.6%) included at least one white and one non-white person. The frequently of observations of interracial groups varied by city, with the highest rate (40.5%) in Chapel Hill and the lowest (23.6%) in Philadelphia. There were also significant differences across cities in the age and gender of park participants and the amount of sedentary behavior, walking, vigorous activity, and supervised activity (see Table 1).

Table 2 shows that many of these same variables varied based on the characteristics of neighbourhoods in which the parks were located. The co-presence of park users across racial groups was more likely to occur in neighborhoods with a high interracial mix (39.6%) relative to neighbourhoods with a moderate interracial mix (28.8%) and in both low poverty (26.2%) and high-poverty (16.3%) areas relative to all areas (31.6%). Differences in who was observed using parks across gender and age-groups was more pronounced based on neighbourhood racial/ethnic and income composition. Female park users were nearly twice as likely to be observed in a target area when no males were present in low-poverty areas (27.3%) than high-poverty areas (13.4%) while male park users were more likely to be observed in a target area with no females present in low-poverty (46.7%) than high-poverty (30.1%) areas. Parks in high-poverty areas were less likely to have any adults (64.3%) or any seniors (4.0%) present than areas overall (80.0% and 11.2%, respectively).

Through the multivariate GEE analysis (Table 3), a number of characteristics of the park users, their activities, and park neighbourhood were significantly associated with the co-presence of park users across racial groups. If children or teens were present or both men and women were present, there was significantly greater likelihood than if only adults, only men, or women were present (log odds ratio = .18, .51, and .62, $p = .048$, .0001, and .0001, respectively). In terms of what park users were doing, supervised activities were significantly more likely than non-supervised activities (log odds ratio = .79, $p = .0001$) and vigorous activities (log odds ratio = .42, $p = .0001$) were significantly more likely than moderate or sedentary activities to involve park users across racial groups. Only 634 of our 7352 observations (8.6%) involved supervised activities, but 358 of these (56.5%) involved the co-presence of people across racial groups and 351 (55.4%) involved at least one person being vigorously active. Gyms, baseball fields, lawns, and tennis courts were most likely to be the sites of supervised activities that included park users across racial groups and vigorous physical activity. Basketball courts were the most likely to be supervised and involve vigorous physical activity, but they were less likely than gyms, baseball fields, and tennis court to have people across racial groups present at the same time.

Neighbourhood characteristics showed some interesting associations, as well. Neighbourhoods with high and medium racial mix were significantly more likely to

Table 1. Descriptive statistics by city for sample of park observations (N = 7352*).

	All cities N = 7352	Albuquerque N = 1141	Chapel Hill/ Durham NC N = 1664	Columbus OH N = 826	Los Angeles N = 2193	Philadelphia N = 1528
Timing of Observations						
Weekend	3509 (47.7%)	628 (55.0%)	1042 (62.6%)	403 (48.8%)	733 (33.4%)	703 (46.0%)
Spring	1777 (24.2%)	458 (40.1%)	583 (35.0%)	233 (28.2%)	0**	503 (32.9%)
Summer	3085 (42.0%)	353 (30.9%)	459 (27.6%)	330 (40.0%)	1339 (61.1%)	604 (39.5%)
Fall	2248 (30.6%)	330 (28.9%)	622 (37.4%)	263 (31.8%)	612 (27.9%)	421 (27.6%)
Characteristics of Target Areas						
Playground	897 (12.2%)	145 (12.7%)	192 (11.5%)	129 (15.6%)	209 (9.5%)	222 (14.5%)
Supervised	634 (8.6%)	30 (2.6%)	193 (11.6%)	113 (13.7%)	229 (10.4%)	69 (4.5%)
Team Sport	885 (12%)	108 (9.5%)	157 (9.4%)	83 (10.0%)	306 (14.0%)	231 (15.1%)
Characteristics of Park Activities and People in Target Areas						
Interracial	2321 (31.6%)	387 (33.9%)	674 (40.5%)	245 (29.7%)	655 (29.9%)	360 (23.6%)
Physical Activity						
Sedentary	2353 (32.0%)	367 (32.2%)	313 (18.8%)	172 (20.8%)	946 (43.1%)	555 (36.3%)
Walking	998 (13.6%)	223 (19.5%)	294 (17.7%)	41 (5.0%)	288 (13.1%)	152 (9.9%)
Vigorous	2654 (36.1%)	285 (25.0%)	761 (45.7%)	323 (39.1%)	767 (35.0%)	518 (33.9%)
Gender						
Male and Female	3549 (59.5%)	285 (44.0%)	761 (65.7%)	323 (61.9%)	767 (47.5%)	518 (45.9%)
Female Only	890 (14.9%)	151 (23.3%)	143 (12.3%)	68 (13.0%)	261 (16.2%)	267 (23.6%)
Male Only	1526 (25.6%)	211 (32.6%)	254 (21.9%)	131 (25.1%)	586 (36.3%)	344 (30.5%)
Age Group						
Any Children	4060 (55.2%)	609 (53.4%)	947 (56.9%)	590 (71.4%)	1115 (50.8%)	799 (52.3%)
Any Teens	1791 (24.4%)	261 (22.9%)	284 (17.1%)	271 (32.8%)	555 (25.3%)	420 (27.5%)
Any Adults	5885 (80.0%)	922 (80.8%)	1491 (89.6%)	559 (67.7%)	1924 (87.7%)	989 (64.7%)
Any Seniors	820 (11.2%)	163 (14.3%)	240 (14.4%)	36 (4.4%)	333 (15.2%)	48 (3.1%)

* This represents the subset of all observations where two or more people were present in the same park target area at the same time.

** No observations were conducted during the spring in Los Angeles.

have park users across racial group co-present (log odds ratio = .72 and .71, p = .009 and .004, respectively) than racially homogenous neighbourhoods in their community parks. Poverty level of a neighbourhood had a significant and complex relation, through the interaction with the percentage of white population in the neighbourhood. In a white-majority neighbourhood (e.g., %white = 50%), poverty level was not significantly associated with interracial grouping. In a neighbourhood with a relatively low percent of white residents (e.g., %white = 10%), poverty level had a significant and negative association (log odds ratio = -.05, p = .01). On the other hand, the percentage of white population always had a significant and positive association regardless of the local poverty level. For example, in a relatively high-income neighbourhood with 10% households in poverty, every percentage point of white population had an estimated log odds ratio of .02 (p = .0004) for interracial grouping. In a relatively low-income neighbourhood with 30% households in poverty, the log odds ratio for interracial grouping is .04 (p = .0001). Differences among cities were not significant in the multivariate model when controlling for the percent poverty and racial composition of the area around the park, suggesting the lack of unobserved confounders for the outcome of interest besides poverty, racial/ethnicity structure, and their interaction.

5. Discussion

Extensive observation across five cities, three seasons, and 31 neighborhoods reveal that only a fraction of target areas in neighbourhood parks are populated by two or more people at any given time, and in less than one-third of the populated areas those park users represented different racial groups, defined as at least one white and one non-white person. Still, we identified 2,123 instances where people of different racial groups were co-present, suggesting that neighbourhood parks can potentially serve as places that promote intergroup contact. While our results speak only to co-presence, and not necessarily "contact" as described by Allport, they provide some quantitative evidence that applying interracial contact theory to understanding psychosocial pathways between park use and human health is worthwhile. Further-

Table 2. Descriptive statistics by area racial/ethnic and income composition for sample of park observations.

	Interacial mix		Poverty	
	Moderate interracial N = 2,420	**High interracial** N = 1,183	**Low poverty** N = 3266	**High poverty** N = 1269
Weekend	1242 (51.3%)	399 (33.7%)	1610 (49.3%)	515 (40.6%)
Spring	743(30.7%)	175 (14.8%)	573 (17.5%)	288 (22.7%)
Summer	1110 (45.9%)	840 (71.0%)	947 (29.0%)	646 (50.9%)
Fall	567 (23.4%)	97 (8.2%)	1643 (50.3%)	335 (26.4%)
Playground	335 (13.8%)	169 (14.3%)	315 (9.6%)	160 (12.6%)
Supervised	98 (4.0%)	85 (7.2%)	254 (7.8%)	101 (8.0%)
Team Sport	235 (9.7%)	187 (15.8%)	628 (19.2%)	238 (18.8%)
Interracial	698 (28.8%)	469 (39.6%)	856 (26.2%)	207 (16.3%)
Physical Activity				
Sedentary	891 (36.8%)	524 (44.3%)	921 (28.2%)	458 (36.1%)
Walking	296 (12.2%)	149 (12.6%)	484 (14.8%)	108 (8.5%)
Vigorous	706 (29.2%)	396 (33.5%)	1207 (37.0%)	427 (33.6%)
Gender				
Male And Female	1239 (62.1%)	659 (59.1%)	452 (15.8%)	452 (45.0%)
Female Only	320 (16.0%)	153 (13.7%)	890 (31.0%)	170 (16.9%)
Male Only	439(22.0%)	303 (27.2%)	1526 (53.2%)	382 (38.0%)
Age Group				
Any Children	1325 (54.8%)	649 (54.9%)	1428 (43.7%)	665 (52.4%)
Any Teens	570 (23.6%)	349 (29.5%)	694 (21.2%)	501 (39.5%)
Any Adults	1875 (77.5%)	997 (84.3%)	2551 (78.1%)	816 (64.3%)
Any Seniors	231 (9.5%)	123 (10.4%)	369 (11.3%)	510 (4.0%)

more, our research shows that certain parks, park users, and neighbourhood characteristics make the co-presence of park users across racial groups—and potentially interracial contact—more or less likely. Some of these, like neighbourhood racial/ethnic and income composition, cannot be changed easily, while others, such as whether males and females and children are present at the same time or activities are supervised, are modifiable. To understand the impact of these empirical results on intergroup contact, we turn first to the modifiable factors where there are the greatest opportunities for intervention.

The factor that can potentially be modified most easily is the supervision of specific activities in parks. Supervision might take the form of a coach, referee, park staff person, or an adult who represents some level of authority and provides a certain amount of oversight. While having full-time staff at neighbourhood parks may be financially unrealistic in all communities, volunteers including summer high school and college interns, graduate students and faculty (Han et al., 2015), City Year and VISTA (Volunteers in Service to America) volunteers, or retirees may present low- to no-cost strategies for organizing and supervising activities in neighbourhood parks. This could be modelled after supervised recess at school through programs such as Playworks (Beyler, Bleeker, James-Burdamy, Fortson, & Benjamin, 2014).

Unlike the supervision of park activities, neighbourhood racial/ethnic and income composition—which also holds a considerable influence on whether people across racial groups are co-present—are not easily modifiable. The neighbourhood parks with the most observations including people across racial groups were located in areas of relatively low poverty and majority but not exclusively white populations. The one exception was a park in Los Angeles that had a moderate poverty rate (18.3%) and no majority racial/ethnic population but significant white and Latino populations. The neighbourhood parks with the highest poverty rates and largest Black/African American populations were least likely to have people across racial groups co-present. This does not preclude interventions focused on increasing the amount of supervised activities in neighbourhood parks; having supervised activities makes vigorous physical activity more likely even when interracial contact is unlikely. But deliberate efforts to promote interracial contact are most likely to be successful in areas of low and moderate poverty and with at least some racial/ethnic mix. That parks in areas with even non-majority Black/African-American populations are unlikely to have much interracial contact demonstrates the high levels of white prejudice that need to be reversed. These results demonstrate yet another way that the persistence and co-occurrence of racial/ethnic and income segregation at the neighbourhood level can reinforce health disparities by making intergroup contact in parks unlikely (Krieger, 2016).

The strengths of this research include the large sample of observations from neighbourhood parks across five different cities and different racial/ethnic and income com-

Table 3. Analysis of GEE parameter estimates for interracial contact.*

	Estimate	SE	95% Confidence Interval		Z-value	p-value
State						
CA	0.198	0.3135	−0.4165	0.8126	0.63	0.5277
NC	0.3877	0.2934	−0.1873	0.9626	1.32	0.1864
NM	0.3121	0.3101	−0.2957	0.9198	1.01	0.3143
OH	0.3452	0.3265	−0.2947	0.9851	1.06	0.2903
PA	referent	referent	referent	referent	referent	referent
Timing of observation						
Weekend	−0.1982	0.0996	−0.3935	−0.0029	−1.99	0.0466
Spring	−0.0515	0.0875	−0.2229	0.1199	−0.59	0.5559
Summer	−0.0835	0.0641	−0.2091	0.0421	−1.3	0.1928
Fall	referent	referent	referent	referent	referent	referent
Characteristics of Park and Target Areas						
Park Size (Acres)	0.0015	0.0079	−0.014	0.0171	0.19	0.8464
Playground	−0.1649	0.1349	−0.4293	0.0995	−1.22	0.2216
Team Sport	0.1228	0.0983	−0.0698	0.3154	1.25	0.2115
Supervised	0.7927	0.1157	0.5659	1.0196	6.85	<.0001
Characteristics of Park Activities and People in Target Areas						
Physical Activity						
Sedentary	−0.0175	0.0647	−0.1443	0.1093	−0.27	0.787
Walking	−0.1522	0.1189	−0.3851	0.0808	−1.28	0.2005
Vigorous	0.4166	0.0641	0.2909	0.5424	6.5	<.0001
Gender						
Male and Female	0.6184	0.0749	0.4715	0.7652	8.25	<.0001
Female Only	−0.1128	0.1348	−0.377	0.1514	−0.84	0.4027
Male Only	referent	referent	referent	referent	referent	referent
Age Group						
Any Children	0.1836	0.0928	0.0017	0.3655	1.98	0.0479
Any Teens	0.514	0.0777	0.3617	0.6663	6.61	<.0001
Characteristics of Park Neighborhood						
Percent Poverty	−0.0573	0.0224	−0.1011	−0.0134	−2.56	0.0104
Percent White	0.0135	0.0094	−0.005	0.032	1.44	0.1513
%Pov * %White	0.0009	0.0004	0.0001	0.0016	2.33	0.02
High Racial Mix	0.7183	0.2751	0.1792	1.2575	2.61	0.009
Mod Racial Mix	0.7129	0.248	0.2268	1.199	2.87	0.004

*Statistical model adjusts for everything listed in the table in addition to accounting for the correlation of multiple target areas within parks.

position. No previous published study has analysed such a large number of observations as an objective measure of the co-presence of racial groups. While the parks were not selected at random, the days of the weeks and times of the day when observations were conducted were selected randomly, and observations were conducted over three seasons, depending upon the city, allowing for some generalizability of findings across US cities.

The limitations of this analysis are important to acknowledge. Operationally defining interracial as involving white and non-white park users likely underestimates the true amount of interracial activity, which could include co-presence in park areas among non-white groups such as Asians, Blacks/African Americans, and Latinos that could also have important health implications. This binary approach to defining interracial also masks important historical differences in how Hispanic/Latinos and Asians are perceived and treated by whites as forms of discrimination between minority groups (Fernandez & Witt, 2013; Sharaievska, Stodolska, Shinew, & Kim, 2010). Using SOPARC, we are able to identify areas where people across racial groups are co-present, but we cannot assume this involved contact, as described by Allport. In reality, people occupying the same general area within a park could be participating in separate activities that involve no interaction. Also, our

analysis treats individual park target areas as the unit of analysis without accounting for their size.

6. Implications for Future Research

Research on intergroup contact frequently emphasizes the conditions that facilitate positive effects, such as the presence of authority to support both groups. We may be able to infer that supervision of park activities constitutes this authority, but we know nothing about the nature of those interactions—including the amount of civility, engagement, friendship, or conflict—through observations using the conventional SOPARC measure. Further research is needed to investigate the nature of the interactions among people across racial groups and their impact on individual attitudes and behaviours. Adaptations to SOPARC might include new considerations of the verbal language, body language, tone of voice, eye contact, physical contact, and other characteristics of the interaction among park users. Or, on the model of Cohen et al. (2016), separate measures of intoxication, smoking, fighting, or groups of people who were intimidating others within parks might be used in conjunction with SOPARC observations to measure conflict and potentially negative interactions. Existing measures of segregation might also be applied to the spatial configuration of park users across race/ethnicity, on the model of Echols, Solomon and Graham (2014) study of seating patterns in a school cafeteria using measures of exposure (potential for interaction among people across groups) and entropy (how evenly people across group are spread out over a space).

This study calls on researchers across disciplines to consider more broadly the contributions of parks to public health beyond physical activity and the psychosocial benefits of exposure to nature. Urban parks were purposefully designed in the 19th Century with high expectations and democratic ideals, even if they may not have been intended to challenge white prejudice and institutional racism. The potential for neighbourhood parks and other outdoor, green public spaces to promote interracial contact represents an important and underappreciated pathway linking urban design and human health. Urban planning must meet this mandate for realizing the promise of neighbourhood parks by more carefully theorizing, designing, maintaining and then activating these public spaces to achieve equity and health.

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Conflict of Interests

The authors declare no conflict of interests.

References

Abercrombie, L. C., Sallis, J. F., Conway, T. L., Frank, L. D., Saelens, B. E., & Chapman, J. E. (2008). Income and racial disparities in access to public parks and private recreation facilities. *American Journal of Preventive Medicine*, *34*(1), 9–15.

Allport, G. W. (1954). *The nature of prejudice*. Reading: Addison-Wesley.

Angel, S. (2012). *Planet of cities*. Cambridge, MA: Lincoln Institute of Land Policy.

Balseviciene, B., Sinkariova, L., Grazuleviciene, R., Andrusaityte, S., Uzdanaviciute, I., Dedele, A., & Nieuwenhuijsen, M. J. (2014). Impact of residential greenness on preschool children's emotional and behavioral problems. *International Journal of Environmental Research and Public Health*, *11*(7), 6757–6770.

Besenyi, G. M., Kaczynski, A. T., Wilhelm Stanis, S. A., & Vaughan, K. B. (2013). Demographic variations in observed energy expenditure across park activity areas. *Preventive Medicine*, *56*(1), 79–81.

Beyler, N., Bleeker, M., James-Burdamy, S., Fortson, J., & Benjamin, M. (2014). The impact of playworks on students' physical activity during recess: Findings from a randomized control trial. *Preventive Medicine*, *69*, S20–S26.

Binder, J., Zagefka, H., Brown, R., Funke, F., Kessler, T., Mummendey, A., Leyens, J.-P. (2009). Does contact reduce prejudice or does prejudice reduce contact? A longitudinal test of the contact hypothesis amongst majority and minority groups in three European countries. *Journal of Personality and Social Psychology*, *96*(4), 843–856.

Brown, R., & Hewstone, M. (2005). An integrative theory of intergroup contact. *Advances in Experimental Social Psychology*, *37*, 255–343.

Brownson, R. C., Hoehner, C. M., Day, K., Forsyth, A., & Sallis, J. F. (2009). Measuring the built environment for physical activity: state of the science. *American Journal of Preventive Medicine*, *36*(4), S99–S123.

Byrne, J. (2012). When green is White: The cultural politics of race, nature and social exclusion in a Los Angeles urban national park. *Geoforum*, *43*, 595–611.

Byrne, J., & Wolch, J. (2009). Nature, race, and parks: Past research and future directions for geographic research. *Progress in Human Geography*, *33*(6), 743–765.

Cattell, V., Dines, N., Gesler, W., & Curtis Mingling, S. (2008). Mingling, observing, and lingering: Everyday public spaces and their implications for well-being and social relations. *Health & Place*, *14*(3), 544–561.

Chow, B. C., McKenzie, T. L., & Sit, C. H. P. (2016) Public parks in Hong Kong: Characteristics of physical activity areas and their users. *International Journal of Environmental Research and Public Health*, *13*(7), 639.

Christ, O., Hewstone, M., Tausch, N., Wagner, U., Voci, A., Hughes, J., & Cairns, E. (2010). Direct contact as a moderator of extended contact effects: Cross-

sectional and longitudinal impact on outgroup attitudes, behavioral intentions, and attitude certainty. *Personality and Social Psychology Bulletin*, *36*(12), 1662–1674.

Christ, O., Schmid, L., Lolliot, S., Swart, H., Stolle, D., Tausch, N., . . . Hewstone, M. (2014). Contextual effect of positive intergroup contact on outgroup prejudice. *Proceedings of the National Academy of Sciences of the United States of America*, *111*(11), 3996–4000.

Cohen, D. A., Bing, H., Derose, K. P., Williamson, S., Marsh, T., Raaen, L., & McKenzie, T. (2016). The paradox of parks in low-income areas: Park use and perceived threats. *Environment and Behavior*, *48*(1), 230–245.

Cohen, D. A., Lapham, S., Evenson, K. R., Williamson, S., Golinelli, D., Ward, P., McKenzie, T. L. (2013). Use of neighborhood parks: Does socio-economic status matter? A four-city study. *Public Health*, *127*(4), 325–332.

Cohen, D. A., McKenzie, T. L., Sehgal, A. S., Williamson, S., Golinelli, D., & Lurie, N. (2007). Contribution of public parks to physical activity. *American Journal of Public Health*, *97*(3), 509–514.

Cohen D. A., Setodji, C., Evenson, K. R., Ward, P., Lapham, S., Hillier, A., McKenzie, T.L. (2011). How much observation is enough? Refining the administration of SOPARC. *Journal of Physical Activity & Health*, *8*(8), 1117–1123.

Coley, R. L., Kuo, F. E., & Sullivan, W. C. (1997). Where does community grow? The social context created by Nature in urban public housing. *Environment and Behavior*, *29*(4), 468–492.

Cranz, G. (1982). *The politics of park design: A History of urban parks in America*. Cambridge, MA: MIT Press.

Cranz, G, & Boland, M. (2004). Defining the sustainable park: A fifth model for urban parks. *Landscape Journal*, *23*(2), 102–104.

Dannenberg, A. L., Frumkin, H., & Jackson, R. J. (Eds.). (2011). *Making healthy places: Designing and building for health, well-being and sustainability*. Washington, DC: Island Press.

Deegan, M., Hehman, E., Gaertner, S. L., & Dovidio, J. F. (2015). Positive expectations encourage generalization from a positive intergroup interaction to outgroup attitudes. *Psychology Bulletin*, *41*(1), 52–65.

Derickson, K. D. (2016). The racial state and resistance in Ferguson and beyond. *Urban Studies*, *53*(11), 2223–2237.

Derose, K. P., Han, B., Williamson, S., Cohen, D. A., & RAND Corporation. (2015). Racial-ethnic variation in park use and physical activity in the city of Los Angeles. *Journal of Urban Health*, *92*(6), 1011–1023.

Donovan, G. H., & Prestemon, J. P. (2012). The effect of trees on crime in Portland, Oregon. *Environment and Behavior*, *44*(1), 3–30.

Dovidio J. F., Gaertner, S. L., & Kawakami, K. (2003). Intergroup contact: The past, present and the future. *Group Processes and Intergroup Relations*, *6*(1), 5–21.

Echols, L., Solomon, B. J., & Graham, S. (2014). Same spaces, different races: What can cafeteria seating patterns tell us about intergroup relations in middle school? *Cultural Diversity and Ethnic Minority*, *20*(4), 611–620.

Eisenman, T. S. (2013). Frederick Law Olmsted, green infrastructure, and the evolving city. *Journal of Planning History*, *12*(4), 287–311.

Eisenman, T. S. (2016). Greening cities in an urbanizing age: The human health bases in the 19th and early 21st centuries. *Change Over Time*, *6*(2), 216–247.

Eller, A., & Abrams, D. (2004). Come together: Longitudinal comparisons of Pettigrew's reformulated intergroup contact model and the common ingroup identity model in Anglo-French and Mexican-American contexts. *European Journal of Social Psychology*, *34*(3), 229–256.

Evenson, K. R., Jones, S. A., Holliday, K. M., Cohen, D. A., & McKenzie, T. L. (2016). Park characteristics, use, and physical activity: A review of studies using SOPARC (System for Observing Play and Recreation in Communities). *Preventive Medicine*, *86*, 153–166.

Evenson, K. R., Wen, F., Hillier, A., & Cohen, D. A. (2013). Assessing the contribution of parks to physical activity using global positioning system and accelerometry. *Medicine and Science in Sports and Exercise*, *45*(10), 1981–1987.

Fernandez, M., & Witt, P. (2013). Attracting Hispanics to a public recreation center: Examining intergroup tension and historical factors. *Journal of Leisure Research*, *45*(4), 423–444.

Francis, J., Wood, L. J., Knuiman, M., & Giles-Corti, B. (2012). Quality or quantity? Exploring the relationship between public open space attributes and mental health in Perth, Western Australia. *Social Science & Medicine*, *74*(10), 1570–1577.

Francis, J., Giles-Corti, B., Wood, L., & Knuiman, M. (2012). Creating sense of community: The role of public space. *Journal of Environmental Psychology*, *32*(4), 401–409.

Gee, G. C., & Ford, C. L. (2011). Structural racism and health inequities: Old issues, new directions. *Du Bois Review*, *8*(1), 115–132.

Gee, G. C., Walsemann, K. M., & Brondolo, E. (2012). Life course perspective on how racism may be related to health inequities. *American Journal of Public Health*, *102*(5), 967–974.

Gobster, P. H. (1998). Urban parks as green walls or green magnets? Interracial relations in neighborhood boundary parks. *Landscape and Urban Planning*, *41*(1), 43–55.

Gobster, P. H. (2002). Managing urban parks for a racially and ethnically diverse clientele. *Leisure Science*, *24*(2), 143–159.

Grazuleviciene, R., Dedele, A., Danileviciute, A., Vencloviene, J., Grazulevicius, T., Andrusaityte, S., . . .

Nieuwenhuijsen, M. J. (2014). The influence of proximity to city parks on blood pressure in early pregnancy. *International Journal of Environmental Research and Public Health*, *11*(3), 2958–72.

Han, B., Cohen, D. A., Derose, K. P., Marsh, T., Williamson, S., & Loy, S. (2015). Effectiveness of a free exercise program in a neighborhood park. *Preventive Medicine Reports*, *2*, 255–258.

Harnik, P. (2010). *Urban green: Innovative parks for resurgent cities*. Washington, DC: Island Press.

Hartig, T., Mitchell, R., de Vries, S., & Frumkin, H. (2014). Nature and Health. *Annual Review of Public Health*, *35*, 207–228.

Ho, C-H., Sasidharan, V., Elmendorf, W., Willits, F. K., Graefe, A., & Godbey, G. (2005). Gender and ethnic variations in urban park preferences, visitation and perceived benefits. *Journal of Leisure Research*, *37*(3), 281–306.

Hodson, G., & Hewstone, M. (2013). *Advances in intergroup contact*. London: Psychology Press.

Jacobs, J. (1961). *The death and life of great American cities*. New York: Random House.

Jamieson, J. P., Koslov, K., Nock, M. K., & Mendes, W. B. (2013). Experiencing discrimination increases risk taking. *Psychological Science*, *24*(2), 131–139.

Jones, A. P., & Lachowycz, K. (2011). Greenspace and obesity: A systematic review of the evidence. *Obesity Reviews*, *12*(5), e183–e189.

Jones, C. P. (2000). Levels of racism: A theoretic framework and a gardener's tale. *American Journal of Public Health*, *90*(8), 1212–1215.

Kaczynski, A. T., & Henderson, K. A. (2008). Parks and recreation settings and active living: A review of associations with physical activity function and intensity. *Journal of Physical Activity and Health*, *5*(4), 619–632.

Kaczynski, A. T., Luke, R., Potwarka, M. A., & Saelens, B. E. (2008). Association of park size, distance, and features with physical activity in neighborhood parks. *American Journal of Public Health*, *98*(8), 1451–1456.

Kaczynski, A. T., Wilhelm Stanis, S. A., Hastmann, T. J., & Besenyi, G. M. (2011). Variations in observed park physical activity intensity level by gender, race, and age: Individual and joint effects. *Journal of Physical Activity and Health*, *8*(Suppl 2), S151–S160.

Kaplan, R., & Kaplan, S. (1989). *The experience of Nature: A psychological perspective*. Cambridge, New York: Cambridge University Press.

Kaplan, S. (1995). The restorative benefits of Nature: Toward an integrative framework. *Journal of Environmental Psychology*, *15*(3), 169–182.

Kazmierczak, A. (2013). The contribution of local parks to neighborhood social ties. *Landscape and Urban Planning*, *109*(1), 31–44.

Keeley, M. (2011). The Green Area Ratio: An urban site sustainability metric. *Journal of Environmental Planning and Management*, *54*(7), 937–958.

King, A., Glanz, K., & Patrick, K. (2015). Technologies to measure and modify physical activity and eating environments. *American Journal of Preventive Medicine*, *48*(5), 630–638.

Krieger, N. (1999). Embodying inequality: A review of concepts, measures, and methods for studying health consequences of discrimination. *International Journal of Health Services*, *29*(2), 295–352.

Krieger, N. (2016). Living and dying at the crossroads: Racism, embodiment, and why theory is essential for a public health of consequence. *American Journal of Public Health*, *106*(5), 832–833.

Kuo, F. E., Bacaicoa, M., & Sullivan, W. C. (1998). Transforming inner-city landscapes: Trees, sense of safety, and preference. *Environment and Behavior*, *30*(1), 28–59.

Kuo, F.E., & Sullivan, W. C. (2001). Environment and crime in the inner city: Does vegetation reduce crime? *Environment and Behavior*, *33*(3), 343–367.

Kuo, F. E., Sullivan, W. C., Coley, R. L., & Brunson, L. (1998). Fertile ground for community: Inner-city neighborhood common spaces. *American Journal of Community Psychology*, *26*(6), 823–851.

Lee, K. J., & Scott, D. (2013). Interracial contact experience during recreational basketball and soccer: Korean American males' perspective. *Journal of Leisure Research*, *45*(3), 267–294.

Levin, S., van Laar, C., & Sidanius, J. (2003). The effects of ingroup and outgroup friendships on ethnic attitudes in college: A longitudinal study. *Group Processes and Intergroup Relations*, *6*(1), 76–92.

McKenzie, T. L., Cohen, D. A., Sehgal, A., Williamson, S., & Golinelli, D. (2006). System for Observing Play and Recreation in Communities (SOPARC): Reliability and feasibility measures. *Journal of Physical Activity & Health*, *3*, S208–S222.

McKinnon, R. A., Reedy J., Berrigan, D., & Krebs-Smith, S. M. (2012). The National Collaborative on Childhood Obesity Research catalogue of surveillance systems and measures registry: New tools to spur innovation and increase productivity in childhood obesity research. *American Journal of Preventive Medicine*, *42*(4), 433–435.

Maas, J., van Dillen, S. M. E., Verheij, R. A., & Groenewegen, P. P. (2009). Social contact as a possible mechanism behind the relation between green space and health. *Health & Place*, *15*(2), 586–595.

Main, K. (2013). Planting roots in foreign soil? Immigrant place meanings in an urban park. *Journal of Environmental Psychology*, *36*, 291–304.

Mills, C. (1997). *The racial contract*. Ithaca, NY: Cornell University Press.

Newman, O. (1972). *Defensible space: Crime prevention through urban design*. New York: Macmillan.

Olmsted, F. L. (1870). Public parks and the enlargement of towns. *The Urban Design Reader*, 28–34.

Peters, K., Elands, B., & Buijs, A. (2010). Social interactions in urban parks: Stimulating social cohesion? *Urban Forestry & Urban Greening*, *9*(2), 93–100.

Pettigrew, T. F. (1998). Intergroup Contact Theory. *American Review of Psychology*, *49*(1), 65–85.

Pettigrew, T. F. (2016). In pursuit of three theories: Authoritarianism, relative deprivation, and intergroup contact. *Annual Review of Psychology*, *67*, 1–21.

Pettigrew, T. F., & Tropp, L. R. (2006). A meta-analytic test of intergroup contact theory. *Journal of Personality and Social Psychology*, *90*(5), 751–783.

Putnam, R. D. (2000). *Bowling alone. The collapse and revival of American community*. New York: Simon and Schuster.

Quigg, R., Gray, A., Reeder, A., Holt, A., & Waters, D. L. (2010). Using accelerometers and GPS units to identify the proportion of daily physical activity located in parks with playgrounds in New Zealand children. *Preventive Medicine*, *50*(5), 235–240.

Reed, J. A., & Hooker, S. P. (2012). Where are youth physically active? A descriptive examination of 45 parks in a southeastern community. *Child Obesity*, *8*(2), 124–131.

Reed, J. A., Hooker, S. P., Muthukrishnan, S., & Hutto, B. (2011). User demographics and physical activity behaviors on a newly constructed urban rail/trail conversion. *Journal of Physical Activity & Health*, *8*(4), 534–542.

Reed, J. A., Price, A. E., Grost, L., & Mantinan, K. (2012). Demographic characteristics and physical activity behaviors in sixteen Michigan parks. *Journal of Community Health*, *37*(2), 507–512.

Rios, R., Aiken, L. S. & Zautra, A. J. (2012). Neighborhood contexts and the mediating role of neighborhood social cohesion on health and psychological distress among Hispanic and Non-Hispanic residents. *Annals of Behavioral Medicine*, *43*(1), 50–61.

Rishbeth, C. (2001). Ethnic minority groups and the design of public open space: An inclusive landscape? *Landscape Research*, *26*(4), 351–366.

Schuyler, D. (1986). *The new urban landscape: The redefinition of city form in nineteenth-century America*. Baltimore and London: Johns Hopkins University Press.

Seeland, K., Dübendorfer, S., & Hansmann, R. (2009). Making friends in Zurich's urban forests and parks: The role of public green space for social inclusion of youths from different cultures. *Forest Policy and Economics*, *11*(1), 10–17.

Sharaievska, I., Stodolska, M., Shinew, K. J., & Kim, J. (2010). Perceived discrimination in leisure settings in Latino urban communities. *Leisure*, *34*(3), 295–326.

Shores, K. A., & West, S. T. (2010). Rural and urban park visits and park-based physical activity. *Preventive Medicine*, *50*, S13–S17.

Solecki, W. D., & Welch, J. M. (1995). Urban parks: Green spaces or green walls? *Landscape and Urban Planning*, *32*(2), 93–106.

Song, C., Ikei, H., Igarashi, M., Miwa, M., Takagaki, M., & Miyazaki, Y. (2014). Physiological and psychological responses of young males during spring-time walks in urban parks. *Journal of Physiological Anthropology*, *33*(8), 1–7.

Stodolska, M., Peters, K., & Horolets, A. (2016). Immigrants' adaptation and interracial/interethnic interactions in natural environments. *Leisure Sciences*, 1–17. doi:10.1080/01490400.2016.1213676

Sturm, R., & Cohen, D. (2014) Proximity to urban parks and mental health. *The Journal of Mental Health Policy and Economics*, *17*(1), 19–24.

Sugiyama, T., Leslie, E., Giles-Corti, B., & Owen, N. (2008). Associations of neighbourhood greenness with physical and mental health: Do walking, social coherence and local social interaction explain the relationships? *Journal of Epidemiology and Community Health*, *62*(5), e9.

Sullivan, W. C., Kuo, F. E., & DePooter, S. (2004). The fruit of urban nature: Vital neighborhood spaces. *Environment and Behavior*, *36*(5), 678–700.

Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science*, *224*(4647), 420–421.

Van Dyck, D., Sallis, J. F., Cardon, G., Deforche, B, Adams, M. A., Geremia, C., & De Bourdeaudhuij, I. (2013) Association of neighborhood characteristics with active park use: An observational study in two cities in the USA and Belgium. *International Journal of Health Geographics*, *12*(1), 1.

Ward, P., McKenzie, T. L., Cohen, D., Evenson, K. R., Golinelli, D., Hillier, A., Williamson, S. (2014). Physical activity surveillance in parks using direct observation. *Preventing Chronicic Disease*, *11*.

Watson, K. B., Harris, C. D., Carlson, S. A., Dorm, J. M., & Fulton, J. E. (2016). Disparities in adolescents' residence in neighborhoods supportive of physical activity—United States, 2011-2012. *MMWR Morbidy and Mortality Weekly Report*, *65*, 59601.

Weiss, C. C., Purciel, M., Bader, M., Quinn, J. W., Lovasi, G., Neckerman, K. M., & Rundle, A. G. (2011). Reconsidering access: Park facilities and neighborhood disamenities in New York City. *Journal of Urban Health*, *88*(2), 297–310.

West, P. C. (1989). Urban region parks and Black minorities: Subculture, marginality, and interracial relations in park use in the Detroit metropolitan area. *Leisure Sciences*, *11*(1), 11–28.

Wheater, C. P., Potts, E., Shaw, E. M., Perkins, C., Smith, H., Casstles, H., . . . Bellis, M. A. (2007). *Returning urban parks to their public health roots*. Manchester and Liverpool: Manchester Metropolitan University and Liverpool John Moores University.

Wilson, J. Q., & Kelling, G. L. (1982). Broken windows: The police and neighborhood safety. *The Atlantic Monthly*, *249*(3), 29–38.

Young, R. F. (2011). Planting the living city: Best practices in planning green infrastructure—Results from major US cities. *Journal of the American Planning Association*, *77*(4), 368–381.

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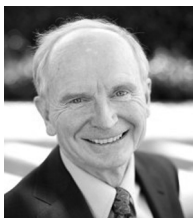

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Article

Assessing Threats and Conservation Status of Historical Centers of Oak Richness in California

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Abstract
Oak trees are emblematic of California landscapes, they serve as keystone cultural and ecological species and as indicators of natural biological diversity. As historically undeveloped landscapes are increasingly converted to urban environments, endemic oak woodland extent is reduced, which underscores the importance of strategic placement and reintroduction of oaks and woodland landscape for the maintenance of biodiversity and reduction of habitat fragmentation. This paper investigated the effects of human urban development on oak species in California by first modeling historical patterns of richness for eight oak tree species using historical map and plot data from the California Vegetation Type Mapping (VTM) collection. We then examined spatial intersections between hot spots of historical oak richness and modern urban and conservation lands and found that impacts from development and conservation vary by both species and richness. Our findings suggest that the impact of urban development on oaks has been small within the areas of highest oak richness but that areas of highest oak richness are also poorly conserved. Third, we argue that current policy measures are inadequate to conserve oak woodlands and suggest regions to prioritize acquisition of conservation lands as well as examine urban regions where previous centers of oak richness were lost as potential frontiers for oak reintroduction. We argue that urban planning could benefit from the adoption of historical data and modern species distribution modelling techniques primarily used in natural resources and conservation fields to better locate hot spots of species richness, understand where habitats and species have been lost historically and use this evidence as incentive to recover what was lost and preserve what still exists. This adoption of historical data and modern techniques would then serve as a paradigm shift in the way Urban Planners recognize, quantify, and use landscape history in modern built environments.

Keywords
Quercus; species distribution models; urban planning; vegetation type mapping

Issue
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1. Introduction

Urban areas serve as important landscapes for a wide range of species. However, the rapid spread of urban development has heightened concern globally over potential losses in biodiversity and ecosystem services generated through landscape conversion. Sustainable planning initiatives in conjunction with ecological knowledge can help sustain biodiversity and reduce landscape fragmentation in urban environments. Calls for the integration of landscape ecology principles, natural resource conservation, and landscape history into urban planning has increased. In conjunction, the types of tools and data normally reserved for ecological analysis have begun to be used in the planning arena. The blending of principles from landscape ecology, urban planning data, and geospatial modelling tools represent a paradigm shift in the way we recognize, quantify, and use landscape history in planning our modern built environments. Current and future sustainable urban planning practices in both developed and undeveloped areas require detailed information on past landscapes. However, historical information is often spatially discontinuous and may require statistical extrapolation to fill in gaps and create regional descriptions. The use of species distribution modeling (SDM), also called environmental niche modeling (ENM), is common in the conservation and ecological restoration communities, but these tools have been underutilized in the urban planning arena. These models generate regional scale descriptions of past vegetation communities or taxa distributions, and may offer critical information in sustainable planning processes that want to reintroduce natural vegetation to already urbanized areas, or want avoid substantially altering the environment.

Oaks and oak woodlands are emblematic of California landscapes. They occupy about 13% of the state or 4 million ha in diverse canopy mixtures of eight primary tree species of the genus *Quercus:* coast live oak (*Q. agrifolia*), black oak (*Q. kelloggii*), valley oak (*Q. lobata*), blue oak (*Q. douglasii*), Oregon white oak (*Q. garryana*), Engelmann oak (*Q. engelmannii*), canyon live oak (*Q. chrysolepis*), and interior live oak (*Q. wislizeni*). Oak woodlands are defined by the presence of native oak species within a Mediterranean climate system (Pavlik, Muick, Johnson, & Popper, 1991). In California, tree density and canopy cover varies widely, and woodland appearance ranges from open savanna with widely dispersed trees and understory dominated by Mediterranean annual grasses to dense oak dominated forests (Barbour, Keeler-Wolf, & Schoenherr, 2007). These ecosystems play important roles for wildlife, insects, fungi and lichens (Grivet, Sork, Westfall, & Davis, 2008) while the oaks themselves provide critical ecosystem services, their large canopies creating microclimates and regulating air quality and their root systems providing stability and water filtration (Marañón, Ibáñez, Anaya-Romero, Muñoz-Rojas, & Pérez-Ramos, 2012; Standiford & Huntsinger, 2012). Oaks and oak woodlands are deeply rooted in California's history. Native Americans used and managed them extensively, deriving food and commodities from oak products (Anderson, 2005). Through the setting of seasonal fires Native Americans retained the quality of oak woodland habitat for game species while curbing pests and disease. Despite the cultural and ecological importance of oaks, the history and practice of converting oak woodlands is lengthy (Bartolome et al., 2002). Lower elevation woodlands, such as the valley oak woodlands of the fertile central valley, were converted to intensive agriculture while the woodlands in the surrounding foothills were historically used for extensive livestock grazing and fire wood production. Since the 1940's it is estimated that California has lost 5,000 km^2 of oak woodland to three main drivers: development, range clearing, and agriculture (Gaman & Firman, 2006, Kueppers, Snyder, Sloan, Zavaleta, & Fulfrost, 2005; Pavlik et al., 1991). In this paper we focus on one of these drivers, urban development as 3,000 km^2 (~one quarter) of the remaining oak woodlands is projected to be at risk of development before 2040.

California has one of the most rapidly growing human populations and this rate is accelerating (California Department of Finance, 2013; Medvitz & Sokolow, 1995). Over 80% of hardwood lands in California are privately owned (California Fire and Resource Assessment Program, 2010), changing land use in the form of subdivisions has fostered expansion of the urban-suburban footprint (Huntsinger, Buttolph, & Hopkinson, 1997; Huntsinger & Fortmann, 1990). The urban interface with oak woodlands, once confined to the major population centers (San Francisco Bay, Sacramento, the Los Angeles basin), now extends throughout the entire state.

Historical ecologists have reconstructed historical distributions and landscapes by extracting mapped and textual data from archives using these products in planning urban and working landscapes (Beller, Downs, Grossinger, Orr, & Salomon, 2015; Grossinger, Striplen, Askevold, Brewster, & Beller, 2007). For example, photographs, maps, and data originally captured for purposes such as taxation or land surveying have become useful data sources in reconstructing historical vegetation conditions (Grossinger et al., 2007; Stein et al., 2010; Whipple, Grossinger, & Davis, 2011). In addition to mining historical archives, detailed distribution maps of past vegetation conditions are predicted using species distribution modeling (Schussman, Geiger, Mau-Crimmins, & Ward, 2006). SDMs are inferential models that develop relationships between species presence (and sometimes absence) and the key environmental variables that define an environmental niche, and use that relationship to map the niche across space (Graham, Ferrier, Huettman, Moritz, & Peterson, 2004; Keenan, Maria Serra, Lloret, Ninyerola, & Sabate, 2011; Peterson, 2011). The niche, often defined primarily with climatic variables, generates a probability surface of a species occurrence based on the ranges of the climatic variables where a species is

known to exist and where those ranges exist in a given space. There are critiques related to these models (e.g. bias in time, assumption of climatic equilibrium, sensitivity to spatial scale) ; but they do serve regional goals. Given limited species locality information, these models help fill in the gaps of probable species occurrence and generate reasonable regional descriptions of a species distribution based on the input variables.

SDMs have traditionally been used in natural resource, conservation, and ecological fields to reconstruct historical habitats and examine climate change impacts (Kueppers et al., 2005; Schussman et al., 2006; Warren, Wright, Seifert, & Shaffer, 2014), to map biotic invasions and disease spread (Kelly, Guo, Liu, & Shaari, 2007; Václavík & Meentemeyer, 2009), to examine bio-richness and speciation mechanisms (Graham et al., 2004; Rushton, Omerod, & Kerby, 2004), and to inform conservation and species management priorities (Kelly, Fonseca, & Whitfield, 2001; Raxworthy et al., 2003; Zhang et al., 2012). Yet their use in urban settings for planning remains limited (Milanovich, Peterman, Barrett, & Hopton, 2012). In this paper, we argue that urban planning can benefit from a deeper understanding of past distributions of important landscape features, such as vegetation communities and key taxa; the use of historical data and species distribution modeling can aid in protection, guide in planning and management, and lend insight to future distributions given recent climate variability and landscape change.

In this paper, we use a digitized collection of historical vegetation data from a broad-scale California plant community survey from 1920–1930 to map historical oak tree species richness. We then use oak tree occurrence data to model oak richness across California focusing on eight dominant oak species (excluding data on shrub oaks and rare hybrid taxa); coast live oak (*Q. agrifolia*), black oak (*Q. kelloggii*), valley oak (*Q. lobata*), blue oak (*Q. douglasii*), Oregon white oak (*Q. garryana*), Engelmann oak (*Q engelmannii*), canyon live oak (*Q. chrysolepis*), and interior live oak (*Q. wislizenii*). We present results in map form for individual species and as overlays conveying oak richness (historical oak "hot spots"). We then analyze how areas of historical oak richness (hot spots) juxtapose current patterns of urban lands and conservation areas and comment on potential opportunities for the reintroduction of lost habitat as well as current areas of potential protection. We use species richness, a known measure of biological diversity—to represent hot spots where several endemic species of oaks overlap. Historical oak richness or oak hot spots describe potential regional biodiversity hot spots that may represent ecological transition zones—areas where species range margins overlap—that constitute a favourable environment for species persistence or adaptation. Regional biodiversity hot spots—as defined in terms of numbers of species—are often conservation priorities that serve as a cost-effective way to preserve the greatest number of species. Using this historical dataset we are motivated by two questions: (1) where have areas of modeled historical oak richness been lost due to land conversion to urban uses; and (2) to what extent have conservation lands been able to preserve areas of historical oak richness.

1.1. Historical Vegetation Data: The Vegetation Type Mapping Collection

During the 1920 and 1930s, Vegetation Type Mapping (VTM) crews surveyed 16 million ha (40%) of California's wildlands. They collected vegetation information at over 18,000 plots, produced detailed maps of dominant vegetation for over 100,000 km^2, gathered over 23,000 herbarium specimens, and took over 3,000 photographs depicting California vegetation and landscapes (Colwell, 1977; Ertter, 2000; Kelly, Allen-Diaz, & Kobzina, 2005; Kelly, Ueda, & Allen-Diaz, 2008; Wieslander, 1935). The parts of the collection: maps, plot data and photographs have been used separately, primarily to investigate drivers of change, including climate and fire, and of changes in forest and chaparral communities around the state (Kelly et al., 2016). In this paper we use both the digitized georeferenced the plot data (Kelly et al., 2005; Kelly et al., 2008), and the digitized georeferenced polygons from the VTM vegetation maps (Thorne, Kelsey, Honig, & Morgan, 2006; Thorne, Santos, & Bjorkman, 2013) to develop distribution models for these oak species. We did not use the VTM georeferenced herbarium specimens to avoid potential duplication. To our knowledge this is the first effort to use both the maps and plot data in conjunction with modern species distribution modelling methods to create a comprehensive historical distribution of a taxa. This effort thereby increases the sample size of occurrence records usually gained from the use of georeferenced herbarium specimens alone.

2. Methods

2.1. Historical Oak Data

Location data for eight *Quercus* species was extracted from VTM using digitized vegetation maps and plot data (Kelly et al., 2005). The ∼18,000 VTM plots although concentrated primarily along the Sierra Nevada mountain range and the central and southern coastal ranges (Figure 1) were surveyed across a gradient of vegetation types. The records contain data regarding tree stand structure (number per diameter class), percent cover of dominant vegetation by species, soil type, parent material, leaf litter, elevation, slope, aspect, parent material, and other environmental variables. The VTM vegetation map dataset consists of hand drawn polygons covering over 100,000 km^2 in which species comprising 20% or greater of the visual cover of a stand were recorded.

We generated the oak species occurrences used for distribution modeling by obtaining the centroids of polygons in which oaks were recorded as a dominant species.

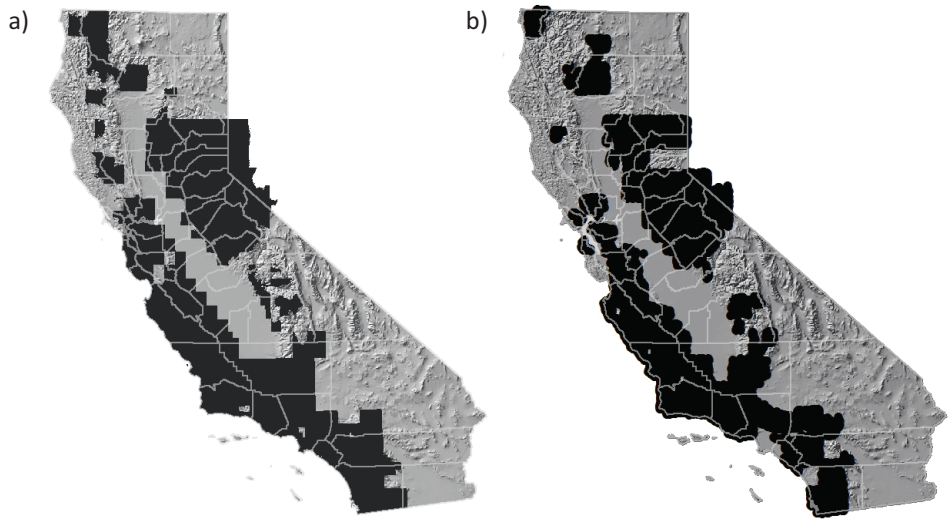

Figure 1. Locations of a) VTM vegetation maps and b) VTM vegetation plots in California.

Although the exact extent of the vegetation polygons maybe imprecise as they were hand drawn and distinguished through visual interpretation from nearby vantage points, the use of polygon centroid is likely to reduce the error in the overall sample from inexact locality placement. We removed duplicate localities from map and plot datasets for the same species. We then examined potential outliers and inconsistencies with visual and overlay methods (Hijmans, Schreuder, De la Cruz, & Guarino, 1999). The total sample size for each species is listed in Table 1. It is important to note that these localities were confirmed presences of oak species and do not necessarily constitute the species entire range or environmental niche, the confirmed presences were limited in scope to the extent of the original VTM surveys which left out large portions of the Central Valley, North Coast, and Mojave. Additionally, the assembled occurrence data may underestimate potential occurrences within mixed stands due to the 20% cover threshold for reporting species. Despite the potential shortcomings of this dataset the VTM survey coverage is the most comprehensive and detailed historical survey of vegetation available for California.

2.2. Distribution Modeling

We use a reduced set of 30 year average (1960–1990) bioclimatic ("Bioclim") (Hijmans, Cameron, Parra, Jones, & Jarvis, 2005) variables at ~1km spatial resolution to model the historical distribution of the eight oak species. These climatic variables are commonly used to model distributions based on specimens collected from across the 20th century (e.g., including oaks. As this study did not involve predictions across multiple time periods, we opted to use the Bioclim data as it is the most widely used global climate dataset and has benefits in terms of replicability and access. To reduce problems associated with extensive collinearity of predictor variables we examine pairwise correlations among the 19 standard Bioclim variables across California and selected a single variable from pairs with a greater than 0.85 correlation coefficient (Pearson et al., 2006). We used 8 variables: mean diurnal temp range (Bio2), isothermality (Bio3), maximum temperature in the warmest month (Bio5), minimum temperature in the coldest month (Bio6), temperature annual range (Bio7), mean temperature in the wettest quarter (Bio8), annual precipitation (Bio12), and precipitation seasonality (Bio15).

Table 1. VTM dataset sample sizes used in species distribution modeling for eight California oak species.

Species	Common name	Plot locality Records	Map locality records	Total
Q. agrifolia	Coast Live Oak	1,653	18,966	20,619
Q. chrysolepis	Canyon Live Oak	1,594	12,484	14,078
Q. douglassii	Blue Oak	1,732	14,826	16,558
Q. engelmannii	Engelmann Oak	61	555	616
Q. garryana	Oregon White Oak	169	952	1,121
Q. kelloggii	California Black Oak	3,126	13,413	16,539
Q. lobata	Valley Oak	601	3,777	4,378
Q. wislizeni	Interior Live Oak	2,677	9,356	12,033
	Total	11,613	74,329	85,942

We constructed and assessed the distribution models using Maxent v3.01 called from the R 3.03 statistical environment (R Development Core Team, 2013) using the Dismo package (Hijmans, Phillips, Leathwick, & Elith, 2012). Background (pseudo-absence) data were generated by randomly sampling 10,000 points from the full area of VTM plot and map sampling (Figure 1). We used a k-fold sampling (with k = 4 or 25%) of the occurrence data for each oak species to partition the data into testing and training data, with each round of modeling containing 75% training and 25% testing data. We then assessed model fit using the AUC (area under curve) statistic, which evaluates the performance of model as a series of tradeoffs between true positives and false positives (Fielding & Bell, 1997). AUC values range from 0–1 with a value of 0.5 representing a model with prediction probabilities close to random, and values greater than 0.5 signify a model with a greater power to predict areas of high suitability in locations of known species presence (Phillips, Anderson, & Schapire, 2006). Using the AUC statistic, we confirmed how well the distribution predicted by our model matched the distribution from a sample of the historical occurrences. We used the maximum sensitivity plus specificity threshold to convert each modeled result from continuous probability scores (e.g. 0–100%) to binary predicted/not-predicted scores (e.g. 0 and 1). This threshold has performed well in a recent evaluation of presence-only threshold methods (Liu, White, & Newell, 2013). We then used this threshold to create individual surfaces that articulated the high probability range of each oak species given the climatic variables. Finally, we summed the eight binary predictions/surfaces for each species to generate a map of modeled historical oak richness for California. Historical oak richness or oak hot spots describes regions where there is spatial coincidence in the modeled ranges of individual oak species. Since these models are based on climatic variables alone the modeled areas of oak richness represent areas of historical climate that were highly suitable for an overlapping number of oak species. Low historical oak richness is represented as single species of oak, moderate represents 2–5 overlapping species ranges, and high represents 6 or more overlapping species ranges.

2.3. Areas of Oak Threat and Conservation

We examined modeled hot spots of historical oak richness as they juxtapose with current urban areas and with protected areas in California using an overlay analysis of the binary maps of modeled historical oak species distributions and statewide spatial layers depicting current urban and protected areas. We used two current statewide products that depict urban footprints and protected areas. The urban footprint, derived from the 2010 decennial census, is useful for analyzing urban growth and associated impacts (U.S. Census Bureau, 2014). The California Protected Areas Database (CPAD, 2013) database tracks public, conservation and trust land ownership representing the most complete publicly available representation of landownership for the state of California. Both were provided by the U.S. government data portal: http://www.data.gov.

3. Results

Species distribution model support (AUC) ranged from 0.83 for *Q. chrysolepis* to 0.98 for *Q. engelmannii* (Table 2). The mapped binary results for individual oak species are shown in Figure 2, along with a statewide view of modeled historical oak richness. Areas of high historical oak richness (six or more oak species) include: a) the North Coast Ranges, b) the South Coast Ranges, c) the Sierra Foothill Belt, d) the Transverse Ranges including the Tehachapi Mountains, and e) the Peninsular Ranges (Figure 2).

We overlaid the map of modeled historical oak richness on the current urban footprint and the current conserved lands and found that impacts from development and conservation vary by species and richness. Impacts from urban development have been relatively small (∼5.5% of the land) within the areas of high oak richness (Table 3), however 17% of the historical distributions of individual oak species are found in current urban areas. Coast live oaks (*Q. agrifolia*) and Engelmann oaks (*Q. engelmannii*) are the most disproportionately affected; with ∼19% of each modeled range now under the modern urban footprint. Additionally, the ranges of valley oak (*Q. lobata*), blue oak (*Q. douglasii*), Oregon white oak (*Q. garryana*) may be underrepresented in these models due to the lack VTM survey of coverage in these species normal ranges which include the Central Valley and the North Coast.

Areas of moderate historical oak richness (2–5 oak species) have some protection on conservation lands ranging from 27 to 39% of their predicted historical distribution. Four oak species have approximately half of their modeled historical range on current protected lands (*Q. chrysolepis*, *Q. garryana*, *Q. kelloggii*, and *Q. wislizeni*).

Table 2. AUC values from each species distribution model of eight California oak species, and threshold values using the Maximum Sensitivity and Specificity method for binary predictions of presence and absence.

Species	Area Under Curve (AUC)	Maximum Sensitivity + Specificity Threshold
Q. agrifolia	0.887	0.42
Q. chrysolepis	0.831	0.43
Q. douglassii	0.842	0.48
Q. engelmannii	0.987	0.17
Q. garryana	0.947	0.33
Q. kelloggii	0.869	0.44
Q. lobata	0.865	0.42
Q. wislizeni	0.853	0.45

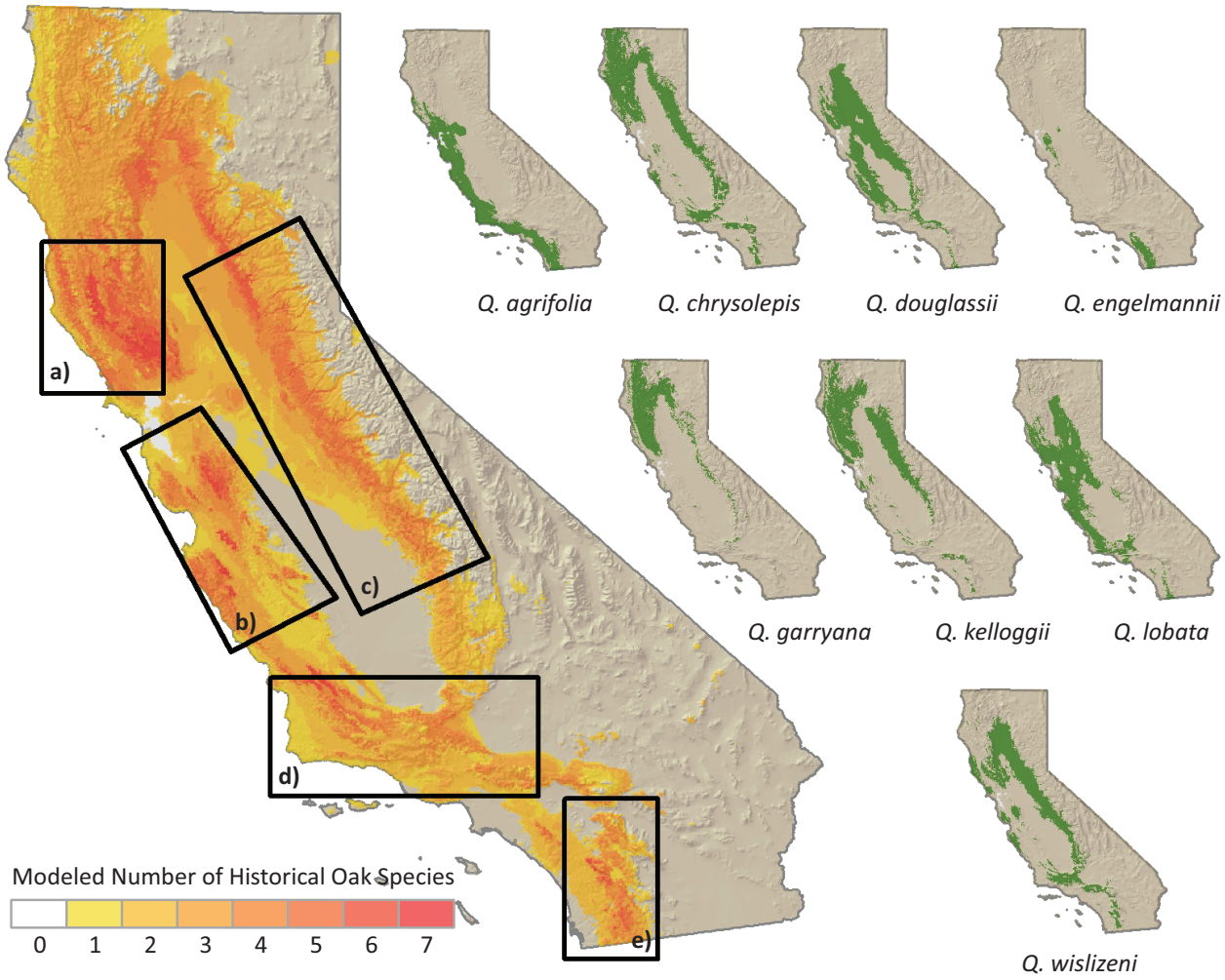

Figure 2. Modeled Number of Historical Oak Species: a) North Coast Range, b) South Central Coast Range, c) Sierra Nevada Foothills, d) Transverse Ranges including the Tehachapi Mountains, and e) Peninsular Ranges. Individual binary maps of eight modeled oak distributions are also shown.

However, hot spots of historical oak richness (6 or more oak species) currently have low representation in conserved lands. Of the mapped areas identified as supporting suitable habitat for seven oak taxa: 4% fall within areas developed since 1930, and 13% fall within lands with current conservation protection. For the conservation of high oak richness these regions would be high priority areas for conservation land acquisition.

A visual comparison of areas of modeled historical oak distribution with urban areas and parks, public, conservation and trust ownership lands is found in Figure 3. We focus on three urbanizing areas of the state: a) the San Francisco Bay Area, b) the Sacramento/Sierra Foothills area, and the c) Los Angeles area; as well as two areas that have high richness and recent conservation: d) the inner Coast Ranges of Napa and Lake Counties, and e) the Tehachapi Mountains. Despite the fact that current urban areas do not occur in areas of high historical oak richness, there is considerable spatial juxtaposition of current urban footprint and areas of moderate historical oak richness (2–5 species) in large urban areas across the state. In the San Francisco Bay Area (Figure 3a), a 3,490 km^2 region covering ten counties, 918 km^2 (26.3%) of single species range, 2,556 km^2 (73.3%) of moderate species richness (2–5 oak species), and 10 km^2 (0.3%) of *Quercus* hot spots have been converted to urban areas. This region of the state is a matrix of intermixed parkland and urban area: the cities of Contra Costa and Alameda on the east side of the San Francisco Bay area surrounding and encroaching on the biologically rich area of Mt. Diablo, although some of this land is protected in public, conservation and land trust lands. In the southern San Francisco Bay area, the rapid expansion between the San Jose urban area and Morgan Hill is encroaching on an area rich in oak species richness.

In the Sacramento and Sierra Foothills area (Figure 3b), a 1,630 km^2 region covering five counties, 241 km^2 (14.8%) of single species range, 1,293 km^2 (79.3%) of moderate species (2–5 oak species) richness, and 2.9 km^2 (0.2%) of *Quercus* hot spots have been con-

Table 3. Modeled Historical Oak Richness. Area supporting oaks predicted to occur based on species distribution models, by number of oak tree species richness and individual oak species, and the percentage found within urban or protected areas.

Species	Total km^2	% in Urbanized Areas	% in Protected Areas
Q. agrifolia	58,597.8	18.62	26.61
Q. chrysolepis	88,543.9	0.92	54.88
Q. douglassii	83,423.5	5.07	17.18
Q. engelmannii	9,373.6	18.99	32.49
Q. garryana	43,882.6	0.75	50.18
Q. kelloggii	68,182.2	1.57	47.25
Q. lobata	76,616.5	8.27	19.50
Q. wislizeni	46,606.0	4.42	51.80

Number of Species	Description	Total km^2	% in Urbanized Areas	% in Protected Areas
1	Low	39,775.7	16.86	32.91
2		59,748.6	7.57	32.85
3	Moderate	62,484.7	4.02	38.57
4		20,924.4	3.03	39.35
5		9,114.3	2.66	27.81
6	High	2,533.2	1.45	24.66
7		959.5	4.03	13.11

verted to urban areas. The Sierra Foothills are a rich area for oak species, and are increasingly threatened with urban and exurban expansion: particularly along the Interstate 80 and Highway 50, shown as the twin arms of urbanization located east from the city of Sacramento in Figure 3b. There are few large parks or open space lands in this Foothill Belt (150–900 m in elevation) to help conserve oak richness: most federally owned lands in the Sierra Nevada are located in the mixed Conifer belt and higher (above 900 m). In both of these areas urban expansion has affected the moderate (2–5 oak species) richness class the most.

In the Los Angeles area (Figure 3c), a 9,169 km^2 region covering five counties, 4,219 km^2 (46.0%) of single species range, 1,113 km^2 (12.1%) of moderate species (2–5 oak species) richness have been converted to urban areas. No high *Quercus* richness areas were converted to urban areas. Oak habitat extends south from the Transverse Ranges and rings the mountains surrounding the Los Angeles Basin (Fig. 3c) and Peninsular Ranges to the border with Mexico. This is an area of active urban growth; however, there are considerable large extant open space areas (primarily federal lands) to serve as preserves.

The inner Coast Ranges of Napa and Lake Counties in northern California (Figure 3d) and the Tehachapi mountains of southern California (Figure 3e) are areas of high oak richness that have recently significantly increased their conservation of oak diversity. In 2015 the area identified with high oak richness in Napa and Lake counties was proclaimed as a new National Monument (Berryessa Snow Mountain) and in 2010 the purchase of 62,000 acres of Tejon Ranch, located in the Techachapis was approved.

4. Discussion

Reconstructing historical distributions and patterns of richness is critical to understanding the current landscape, how it functions, as well as to provide for thoughtful and informed management, protection, restoration, and planning decisions (Rhemtulla & Mladenoff, 2007). The history of a landscape or the historical distribution of a species does not establish a linear path for the future, but rather, provides a foundation of understanding (White & Walker, 1997), and gives context to the trajectories of species and landscapes (Foster et al., 2003). Urban planning principles urge the integration of elements from the surrounding flora, fauna, and topography in building sustainable landscapes (McHarg, 1971; Steiner, 2008). Therefore, integrating historical landscape ecological research with disciplines that investigate and modify the built environment such as planning provides a pathway for directing future landscape change. Understanding and mapping historical distributions of natural vegetation types, as well as using historical data in modern modeling provides opportunity for ecologically and historically based decision making, planning, and policy direction. As human population increases, planning projects increasingly modify current infrastructure and existing structures. Therefore, knowledge of past landscape history could provide critical inspiration for re-greening cities and re-connecting them with their past. Many of California's urban areas were constructed in landscapes historically rich in oak woodlands: this disappearance of oaks within the urban landscape has since motivated plans to return oaks even within heavily urbanized areas (Grossinger et al., 2007; Whipple et al., 2011). The utility of historical data to drive environmental niche

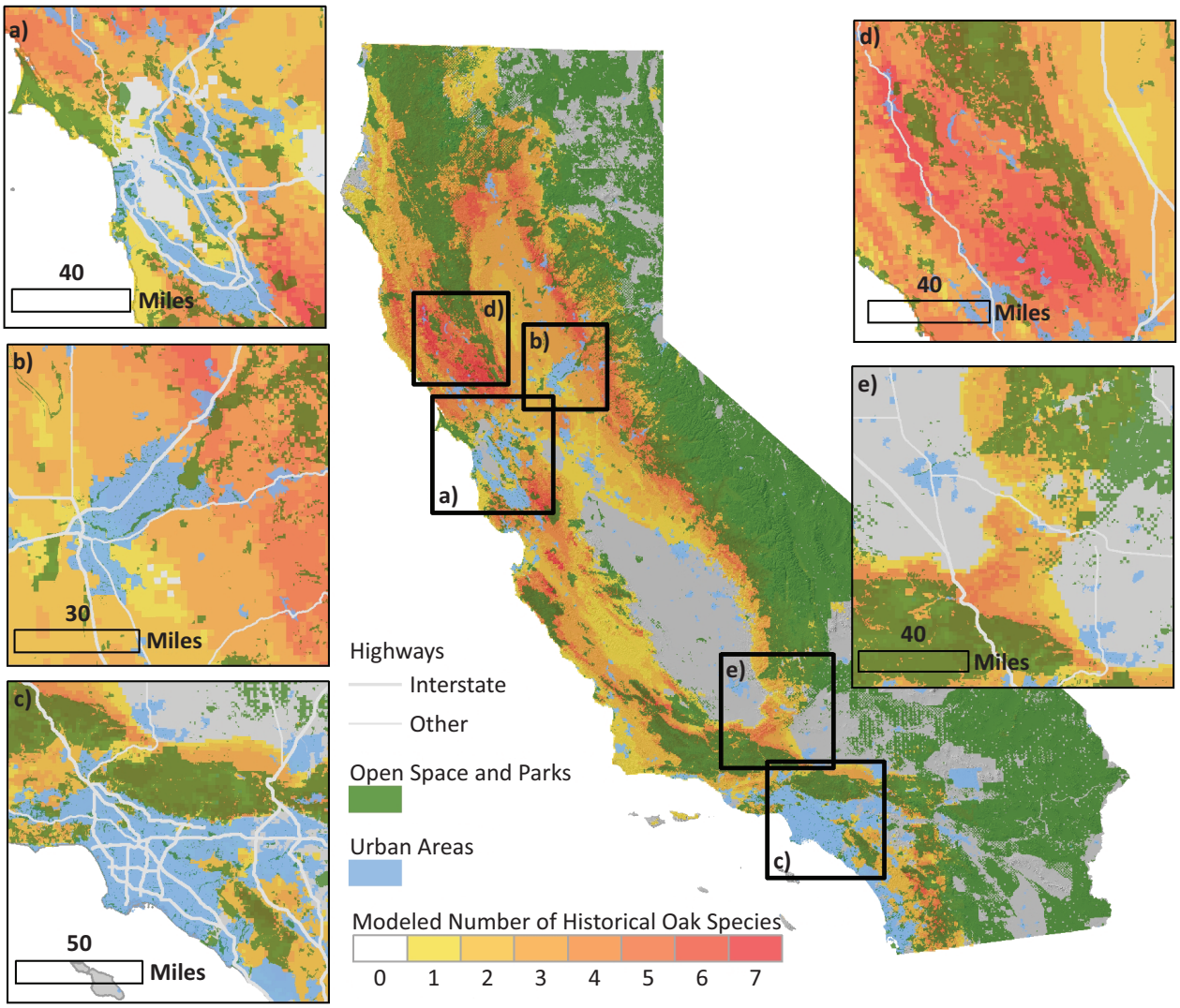

Figure 3. Areas of historical *Quercus* richness mapped with current urban and protected areas, with a focus on juxtaposition of historical oak richness and urban areas: a) San Francisco Bay Area, b) Sacramento/Sierra Foothills, c) Los Angeles; as well as areas where historical oak richness are not near protected areas: d) Napa/Sonoma/Mendocino Counties and e) Tehachapi mountains.

models, generating past species distributions and reconstructions of vegetation communities is an unexplored theme in urban planning. This study of using a single historical dataset (VTM) to provide historical distributions of one taxa is just one example of the capabilities and value added information that rich biogeographic data can lend to urban planning. We argue that the lack understanding of past landscapes and important vegetation communities is a potential oversight within urban planning that is easily remedied through the use of the techniques and data presented in this paper and strengthened with other rich biogeographic datasets available for the state (see Table 4). By linking the past with the present through the use of modeling techniques we carry invaluable ecosystem and human health services into our modern urban environments.

Through the development of environmental niche models, we have found that California oaks have been greatly impacted by urban development and this is likely to continue. Historical land use change, such as widespread clearing of blue oaks during "rangeland improvement" programs (Bolsinger, 1988), and current and future loss of habitat for urban and ex-urban expansion, will further fragment intact oak woodlands, eroding the sustainability of the oak woodland ecosystem and its associated products and ecological services, including wildlife habitat provision (Hilty & Merenlender, 2004), genetic richness, and evolutionary potential (Grivet et al., 2008). The Sierra Foothills region (Figure 2c) of the state is an example of these complicated interactions with urban and suburban growth predicted to double by 2020 at great consequence to forests and rangelands (Theobald,

Table 4. List of the most comprehensive biodiversity databases for California with reference to the type of data they hold, the number of specimens reported at the time (11/2016) and their extent. These databases provide historical and current species occurrence information that can be used to construct species distribution models. Note that some records are redundant, and may be housed in multiple databases.

Database	Data	Number of specimens/localities	Extent
Global Biodiversity Information Facility (GBIF) http://www.gbif.org	Plants and Animals	624,423,832	Global
California Natural Diversity Database (CNDDB) https://www.wildlife.ca.gov/Data/CNDDB	Plants and Animals-rare species only	86,000	California
HOLOS-Berkeley Ecoinformatics Engine* https://holos.berkeley.edu	Plants, Animals, Maps	>3 million	Primarily California
GAP http://gapanalysis.usgs.gov/species	Animals only	1,480 species	United States
Vertnet http://vertnet.org	Animals only	80 million	Global
Biodiversity Information Serving Our Nation (BISON) https://bison.usgs.gov	Plants and Animals	>100 million	United States
INaturalist http://www.inaturalist.org	Plants and Animals	3,173,095	Global
CalFlora https://www.calflora.org	Plants only	>1 million	California
Consortium of California Herbaria (CCH) http://ucjeps.berkeley.edu/consortium	Plants only	>2 million	Primarily California
iDigBio https://www.idigbio.org	Plants and Animals	73,192,805	Global

* locality information used in this paper was sourced from HOLOS-Berkeley Ecoinformatics Engine

2005). Urban growth in this area has extended into rural areas through rapid development of low density housing, increasing competing interests in the urban/wildlife interface, challenging fire management in these arid ecosystems, and illustrating the complex relationship between natural resource management and urban development encountered across the state (Byrd, Rissman, & Merenlender, 2009). Historical species richness and distribution data such as presented may serve to highlight areas where developmental pressures are encroaching upon high oak richness, prompting further investigation.

Oaks in particular, are emblematic of California landscapes and serve as keystone cultural and ecological species providing ecosystem services through the provisioning of shade, soil stabilization, air and water quality regulation, food and shelter for animals, as well as providing aesthetics linked to increased property value. As more historical landscapes are being lost to increased urbanization and climatic pressures are projected to reduce species ranges (Kueppers et al., 2005), it is critical to maintain species diversity and reduce habitat fragmentation by making our built and natural environments more cohesive through the strategic placement and reintroduction of important habitats and species, such as oaks. Through the use of historical data and modeling the integration of lost landscape features starts from a more informed position. Current efforts (e.g. Grossinger et al., 2007; Whipple et al., 2011) in the California Bay Area serve as an example of how coordinated efforts between local open space councils, local stewards, and urban planning officials can led to "re-oaking" (Grossinger et al., 2012, Grossinger & Beller, 2011): the reintroduction of oak woodland landscapes and of native oaks to the urban forest canopy. Future efforts in urban planning would also benefit from the use of historical data and modeling to locate hot spots of species richness, understand where habitats and species have been lost historically, and use this evidence as incentive to recover what was lost and preserve what still exists.

Understanding past distributions as we have done in this paper is a critical step in the development of future models that address the impacts of a changing climate. Future climate models for California show trends of increasing temperatures, creating longer summers and shorter, warmer winters, with less snowpack retention and therefore a diminishing water source to last through the longer, drier summers (Cayan, Luers, Hanemann, & Franco, 2006; Luers, Cayan, Franco, Hanemann, & Croes,

2006; Thorne, Boynton, Flint, & Flint, 2015). Expected increasing temperatures will likely exacerbate existing ecological problems from pests and diseases (Cayan et al., 2006; Luers et al., 2006). Diseases such as *Armillaria*, *Hypoxylon* (root rot) and *Phytophthora ramorum* (commonly known as "sudden oak death") are expected to more easily infect drought-stressed trees (California Fire and Resource Assessment Program, 2010; Cayan et al., 2006; Luers et al., 2006). *P. ramorum*, which can rapidly kill coast live oak (*Q. agrifolia*) and California black oak (*Q. kelloggii*), among other species, has already been confirmed in 14 counties in the state of California (California Oak Mortality Task Force, n.d.).

Policy measures to protect oaks and oak woodlands might be a way to conserve areas of oak richness, but measures are complicated by the fact that the majority of oak-dominated woodlands in the state (>80%) are located on private lands (Davis et al., 1998; Pavlik et al., 1991; Santos & Thorne, 2010; Standiford & Bartolome, 1997). Further, the notion of oak woodlands as a traditional working landscape historically reduced their value in the eyes of the conservation community possibly delaying formalized protection until the 1970's (Cox & Underwood, 2011; Santos, Watt, & Pincetl, 2014). However, following this formalization of protection, the decentralized structure to statewide conservation and protection of oak woodlands, including the lack of statewide information on patterns of oak distribution and richness, has left the responsibility to protect and regulate oaks unclear.

The environmental consequences of inconsistent policy may have detrimental effects on the distribution of oak woodland communities. Since many of the oak hot spots identified span administrative and county boundaries, the need for a statewide mandate and clear delegation of protection and regulation authority is essential in developing a regional approach to conservation of oaks and oak woodland habitat. Although local policies may be inconstant county to county, they are still critical to developing a multi-scalar approach to conservation of oaks from individuals to landscape. Local strategies of conservation such as land acquisition in the form of land trusts and conservation easements Merenlender, Huntsinger, Guthey, & Fairfax, 2004) and open space designation, would benefit from the mapping of past, current, and future oak distribution and richness. For instance, areas of modeled historical oak richness—the North Coast Ranges, the South Coast Ranges, the Sierra Foothill Belt, the Transverse Ranges, and the Interior Coast Ranges are important repositories for plant species endemism (Grivet et al., 2008; Thorne, Viers, Price, & Stoms, 2009), and are critical conservation areas for oak woodlands that could be looked at more closely for incorporation under conservation easements open space designations, or planning that incorporates oaks and woodland habitat into new communities. Making transparent the locations of hot spots of richness gives strength and reasoning to local initiatives and could potentially initiate consistent statewide policy.

5. Conclusions

In this paper, we combined modeled data from a historical dataset with modern data on urban and protected areas, to provide a base for understanding the pressure of development on the distribution and richness of oak species. Areas of modeled historical oak richness were compared to the current footprint of urban areas and current conserved lands. We found that about a fifth of the area that previously contained a single oak species in the past is now urban with nearly 20% of the modeled historical range of both coast live oaks and Engelmann oaks now under the modern urban footprint. Areas of moderate historical oak richness have some protection on conservation lands but have been disproportionally affected by urban areas. Four oak species (*Q. chrysolepis*, *Q. garryana*, *Q. kelloggii*, and *Q. wislizeni*) are moderately protected, with around half of their modeled range currently on conservation lands. Hot spots of high oak richness (e.g. six *Quercus* species) currently have low proportional representation in conserved lands with only 13% of the modeled range within current conservation protection. Plans for protecting oak woodlands in California are complicated by policy, which can be local in scale, and fragmented with no uniting statewide mandate. Many of the areas of high historical oak richness span administrative boundaries, and thus are difficult to manage by policy measures alone. We therefore encourage the use of historical data to encourage and guide protection of these landscapes in the form of policy and regulations, and to help in planning for future urban greening efforts resurrecting oak habitat that sits waiting beneath modern sidewalks.

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Conflict of Interests

The authors declare no conflict of interests.

References

Alvey, A. A. (2006). Promoting and preserving biodiversity in the urban forest. *Urban Forestry and Urban Greening*, *5*(4), 195–201.

Anderson, K., (2005). *Tending the wild: Native American*

knowledge and the management of California's natural resources. Oakland, CA: University of California Press.

Araújo, M. B. (2002). Biodiversity hotspots and zones of ecological transition. *Conservation Biology*, *16*(6), 1662–1663.

Barbour, M., Keeler-Wolf, T., & Schoenherr, A. A. (2007). *Terrestrial vegetation of California*. Oakland, CA: University of California Press.

Bartolome, J. W., McClaran, M. P., Allen-Diaz, B. H., Dunne, J., Ford, L. D., Standiford, R. B., . . . Forero, L. C., (2002). *Proceedings of the fifth symposium on oak woodlands: Oaks in California's changing landscapes* (pp. 22–25), Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Beller, E., Downs, P., Grossinger, R., Orr, B., & Salomon, M. (2015). From past patterns to future potential: using historical ecology to inform river restoration on an intermittent California river. *Landscape Ecology*, *31*(3), 581–600. dx.doi:10.1007/s10980-015-0264-7

Bolsinger, C. L. (1988). *The hardwoods of California's timberlands, woodlands, and savannas* (Vol. 148). Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Buerki, S., Callmander, M. W., Bachman, S., Moat, J., Labat, J. N., & Forest, F. (2015). Incorporating evolutionary history into conservation planning in biodiversity hotspots. *Philosophical Transactions of the Royal Society B*, 370(1662), 20140014.

Byrd, K. B., Rissman, A. R., & Merenlender, A. M. (2009). Impacts of conservation easements for threat abatement and fire management in a rural oak woodland landscape. *Landscape and Urban Planning*, *92*(2), 106–116.

California Department of Finance. (2013). *Report P-1: State and County Population Projections by County, by Race/Ethnicity, and by Major Age Groups, 2010–2060 (by decade)*. Sacramento, CA: California Department of Finance.

California Fire and Resource Assessment Program. (2010). *The changing California: Forest and range 2010 assessment*. Sacramento, CA: California Department of Forestry and Fire Protection.

California Oak Mortality Task Force (n.d.). Retrieved from www.suddenoakdeath.org

California Protected Areas Database. (2013). *CPAD Version 2013b*. Oakland, CA: GreenInfo Network. Retrieved from http://www.calands.org

Cavender-Bares, J., Gonzalez-Rodriguez, A., Pahlich, A., Koehler, K., & Deacon, N. (2011). Phylogeography and climatic niche evolution in live oaks (Quercus series Virentes) from the tropics to the temperate zone. *Journal of Biogeography*, *38*(5), 962–981.

Cayan, D., Luers, A. L., Hanemann, M., & Franco, G. (2006). *Scenarios of climate change in California: An overview*. Sacramento, CA: California Climate Change Center.

Colwell, W. L. (1977). The status of vegetation mapping in California today. In M. G. Barbour & J. Major (Eds.), *Terrestrial vegetation of California*. Sacramento, CA: John Wiley & Sons.

Cooper, W. S. (1922). *The broad-sclerophyll vegetation of California: An ecological study of the chaparral and its related communities* (No. 319). Washington, DC: Carnegie Institution.

Cox, R. L., & Underwood, E. C. (2011). The importance of conserving biodiversity outside of protected areas in Mediterranean ecosystems. *PLoS One*, *6*(1), e14508.

Davis, F. W., Stoms, D. M., Hollander, A. D., Thomas, K. A., Stine, P. A., Odion, D., . . . Warner, K. (1998). *The California Gap Analysis Project—Final Report*. Santa Barbara, CA: University of California, Santa Barbara.

Elith, J., & Leathwick, J. R. (2009). Species distribution models: Ecological explanation and prediction across space and time. *Annual Review of Ecology, Evolution, and Systematics*, *40*(1), 677–697.

Ertter, B. (2000). Our undiscovered heritage: Past and future prospects for species-level botanical inventory, *Madroño*, *47*(4), 237–252.

Ferenc, M., Sedláček, O., & Fuchs, R. (2014). How to improve urban greenspace for woodland birds: Site and local-scale determinants of bird species richness. *Urban Ecosystems*, *17*(2), 625–640.

Fielding, A. H., & Bell, J. F. (1997). A review of methods for the assessment of prediction errors in conservation presence/ absence models. *Environmental Conservation*, *24*(1), 38–49

Foster, D., Swanson, F., Aber, J., Burke, I., Brokaw, N., Tilman, D., & Knapp, A. (2003). The importance of land-use legacies to ecology and conservation. *BioScience*, *53*(1), 77–88.

Gaman, T., & Firman, J., (2006). *Oaks 2040: The status and future of oaks in California*. Oakland, CA: California Oak Foundation.

Gordon, A., Simondson, D., White, M., Moilanen, A., & Bekessy, S. A. (2009). Integrating conservation planning and landuse planning in urban landscapes. *Landscape and Urban Planning*, *91*(4), 183–194.

Graham, C. H., Ferrier, S., Huettman, F., Moritz, C., & Peterson, A. T. (2004). New developments in museum-based informatics and applications in biodiversity analysis. *Trends in Ecology and Evolution*, *19*(9), 497–503.

Grivet, D., Sork, V. L., Westfall, R. D., & Davis, F. W. (2008). Conserving the evolutionary potential of California valley oak (Quercus lobata Née): A muiltivariate genetic approach to conservation planning. *Molecular Ecology Notes*, *17*(1), 139–156.

Grossinger, R. M., Askevold, R. A., Beagle, J., Beller, E. E., Brewster, E., Gardner, S., . . . Striplen, C. J. (2012). *Napa Valley historical ecology atlas: Exploring a landscape of transformation and resilience*. Berkeley, CA: University of California Press.

Grossinger, R., & Beller, E. (2011). "Oak landscapes in the recent past." In L. R. Costello, B. W. Hagen, & K.

S. Jones (Eds.), *Oaks in urban landscapes: Selection, preservation, and care* (pp. 222–223). Davis, CA: UC Agriculture and Natural Resources.

Grossinger, R. M., Striplen, C. J., Askevold, R. A., Brewster, E., & Beller, E. E. (2007) Historical landscape ecology of an urbanized California valley: Wetlands and woodlands in the Santa Clara Valley. *Landscape Ecology*, *22*(1), 103–120.

Guillera-Arroita, G., Lahoz-Monfort, J. J., Elith, J., Gordon, A., Kujala, H., Lentini, P. E., . . . Wintle, B. A. (2015). Is my species distribution model fit for purpose? Matching data and models to applications. *Global Ecology and Biogeography*, *24*(3), 276–292.

Guisan, A., & Thuiller, W. (2005). Predicting species distribution: Offering more than simple habitat models. *Ecology Letters*, *8*(9), 993–1009.

Hampe, A. (2004). Bioclimate envelope models: what they detect and what they hide. *Global Ecology and Biogeography*, *13*(5), 469–476.

Hijmans, R. J., Cameron, S. E., Parra, J. L., Jones, P. G., & Jarvis, A. (2005). Very high resolution interpolated climate surfaces for global land areas. *International Journal of Climatology*, *25*(15), 1965–1978.

Hijmans, R. J., Phillips, S., Leathwick, J., & Elith, J. (2012). Dismo: Species distribution modeling. *R package version 0.7-17*.

Hijmans, R. J., Schreuder, M., De la Cruz, J., & Guarino, L. (1999). Using GIS to check co-ordinates of genebank accessions. *Genetic Resources and Crop Evolution*, *46*(3), 291–296.

Hilty, J. A., & Merenlender, A. M. (2004). Use of riparian corridors and vineyards by mammalian predators in Northern California. *Conservation Biology*, *18*(1), 126–135.

Huntsinger, L., Buttolph, L., & Hopkinson, P. (1997). Ownership and management changes on California hardwood rangelands: 1985 to 1992. *Journal of Range Management*, *50*(4), 423–430.

Huntsinger, L., & Fortmann, L. P. (1990). California's privately owned oak woodlands: Owners, use, and management. *Journal of Range Management*, *43*(2), 147–152.

Jepson, W. L. (1910). *The silva of California* (Vol. 2). The University Press.

Kark, S., Schneider, C. J., & Smith, T. B. (2001). Biodiversity hotspots and beyond: The need for preserving environmental transitions. *Trends in Ecology and Evolution*, *16*(8), 431.

Keenan, T., Maria Serra, J., Lloret, F., Ninyerola, M., & Sabate, S. (2011). Predicting the future of forests in the Mediterranean under climate change, with niche-and process-based models: CO2 matters! *Global Change Biology*, *17*(1), 565–579.

Kelly, M., Allen-Diaz, B., & Kobzina, N. (2005). Digitization of a historic dataset: The Wieslander California vegetation type mapping project. *Madroño*, *52*(3), 191–201.

Kelly, M., Easterday, K., Rapacciuolo, G., Koo M., McIntyre, P., & Thorne, J. (2016). Rescuing and sharing historic vegetation data for ecological analysis: The California Vegetation Type Mapping project. *Biodiversity Informatics*, *11*, 40–62.

Kelly, M., Guo, Q., Liu, D., & Shaari, D. (2007). Modeling the risk of a new invasive forest disease in the United States: An evaluation of five environmental niche models. *Computers, Environment and Urban Systems*, *31*(6), 689–710.

Kelly, M., Ueda, K., & Allen-Diaz, B. (2008). Considerations for ecological reconstruction of historic vegetation: Analysis of the spatial uncertainties in the California Vegetation Type Mapping dataset. *Plant Ecology*, *194*(1), 37–49.

Kelly, N. M., Fonseca, M., & Whitfield, P. (2001). Predictive mapping for management and conservation of seagrass beds in North Carolina. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *11*(6), 437–451.

Kueppers, L. M., Snyder, M. A., Sloan, L. C., Zavaleta, E. S., & Fulfrost, B. (2005). Modeled regional climate change and California endemic oak ranges. *Proceedings of the Academy of Sciences*, *102*(45), 16281–16286.

Liu, C., White, M., & Newell, G. (2013). Selecting thresholds for the prediction of species occurrence with presence-only data. *Journal of Biogeography*, *40*(4), 778–789.

Luers, A. L., Cayan, D. R., Franco, G., Hanemann, M., & Croes, B. (2006). *Our changing climate: Assessing the risks to California*. Sacramento, CA: California Climate Change Center.

Marañón, T., Ibáñez, B., Anaya-Romero, M., Muñoz-Rojas, M., & Pérez-Ramos, I. (2016). Oak Trees and woodlands providing ecosystem services in Southern Spain. In I. D. Rotherham, C. Handley, M. Agnoletti, & T. Samojlik (Eds.), *Trees Beyond the Wood conference proceedings* (pp. 291–299). Sheffield, UK: Wildtrack.

Marcucci, D. J. (2000). Landscape history as a planning tool. *Landscape and Urban Planning*, *49*(1–2), 67–81.

McHarg, I. L. (1971). *Design with nature*. Garden City, NY: Doubleday/Natural History Press.

Medail, F., & Quezel, P. (1999). Biodiversity hotspots in the Mediterranean Basin: Setting global conservation priorities. *Conservation Biology*, *13*(6), 1510–1513.

Medvitz, A. G., & Sokolow, A. D. (1995). Population growth threatens agriculture, open space. *California Agriculture*, *49*(6), 11–17.

Merenlender, A. M., Huntsinger, L., Guthey, G., & Fairfax, S. K. (2004). Land trusts and conservation easements: Who is conserving what for whom? *Conservation Biology*, *18*(1), 65–75.

Milanovich, J., Peterman, W., Barrett, K., & Hopton, M. (2012). Do species distribution models predict species richness in urban and natural green spaces? A case study using amphibians. *Landscape and Urban Planning*, *107*(4), 409–418. doi:10.1016/

j.landurbplan.2012.07.010

Myers, N., Mittermeier, R. A., Mittermeier, C. G., Da Fonseca, G. A., & Kent, J. (2000). Biodiversity hotspots for conservation priorities. *Nature*, *403*(6772), 853–858.

Nielsen, A. B., van den Bosch, M., Maruthaveeran, S., & van den Bosch, C. K. (2014). Species richness in urban parks and its drivers: A review of empirical evidence. *Urban Ecosystems*, *17*(1), 305–327.

Niemelä, J. (1999). Ecology and urban planning. *Biodiversity & Conservation*, *8*(1), 119–131.

Pavlik, B. M., Muick, P. C., Johnson, S. G., & Popper, M. (1991). *Oaks of California*. Los Olivos, CA: Cachuma Press.

Pearson, R. G., & Dawson, T. P. (2003). Predicting the impacts of climate change on the distribution of species: are bioclimate envelope models useful? *Global Ecology and Biogeography*, *12*(5), 361–371.

Pearson, R. G., Thuiller, W., Araújo, M. B., Martinez-Meyer, E., Brotons, L., McClean, C., . . . Lees, D. C. (2006). Model-based uncertainty in species range prediction. *Journal of Biogeography*, *33*(10), 1704–1711.

Peterson, A. T. (2011). *Ecological niches and geographic distributions* (MPB-49). Princeton, NJ: Princeton University Press.

Phillips, S. J., Anderson, R. P., & Schapire, R. E. (2006). Maximum entropy modeling of species geographic distributions. *Ecological Modeling*, *190*(3), 231–259.

R Development Core Team. (2013). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing.

Raxworthy, C. J., Martinez-Meyer, E., Horning, N., Nussbaum, R. A., Schneider, G. E., Ortega-Huerta, M. A., & Peterson, A. T. (2003). Predicting distributions of known and unknown reptile species in Madagascar. *Nature*, *426*(6968), 837–841.

Rhemtulla, J. M., & Mladenoff, D. J. (2007). Why history matters in landscape ecology. *Landscape Ecology*, *22*, 1–3.

Rissman, A. R., & Butsic, V. (2011). Land trust defense and enforcement of conserved areas. *Conservation Letters*, *4*(1), 31–37.

Rissman, A. R., Lozier, L., Comendant, T., Kareiva, P., Kiesecker, J. M., Shaw, M. R., & Merenlender, A. M. (2007). Conservation easements: biodiversity protection and private use. *Conservation Biology*, *21*(3), 709–718.

Rudd, H., Vala, J., & Schaefer, V. (2002). Importance of backyard habitat in a comprehensive biodiversity conservation strategy: a connectivity analysis of urban green spaces. *Restoration Ecology*, *10*(2), 368–375.

Rushton, S. P., Omerod, S. J., & Kerby, G. (2004). New paradigms for modelling species distributions? *Journal of Applied Ecology*, *41*(2), 193–200.

Santos, M. J., & Thorne, J. H. (2010). Comparing culture and ecology: Conservation planning of oak woodlands in Mediterranean landscapes of Portugal and California. *Environmental Conservation*, *37*(2), 155–168.

Santos, M. J., Watt, T., & Pincetl, S. (2014). The push and pull of land use policy: Reconstructing 150 years of development and conservation land acquisition. *PloS One*, *9*(7), e103489.

Schussman, H., Geiger, E., Mau-Crimmins, T., & Ward, J. (2006). Spread and current potential distribution of an alien grass, *Eragrostis lehmanniana Nees*, in the Southwestern USA: Comparing historical data and ecological niche models. *Diversity and Distributions*, *12*(5), 582–592.

Scott, T., & Standiford, R. B. (2001). Value of oak woodlands and open space on private property values in Southern California. Investigación agraria. *Sistemas y recursos forestales*, *10*(1), 137–15.

Seto, K. C., Fragkias, M., Güneralp, B., & Reilly, M. K. (2011). A meta-analysis of global urban land expansion. *PloS One*, *6*(8), e23777.

Standiford, R. B., & Bartolome, J. (1997). *The integrated hardwood range management program: Education and research as a conservation strategy* (USDA Forest Serivce General Technical Report PSW-GTR-16). Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Standiford, R., & Huntsinger, L. (2012). Valuing forestland environmental services: A case study for California's oak woodlands. *Proceedings of the International Symposium of Forest Economics 2012 (ISFE2012)* (pp. 273–281). Beijing, China.

Stein, E. D., Dark, S., Longcore, T., Grossinger, R., Hall, N., & Beland, M. (2010). Historical ecology as a tool for assessing landscape change and informing wetland restoration priorities. *Wetlands*, *30*(3), 589–601.

Steiner, F. (2008). *The living landscape* (2nd ed.). Washington, DC: Island Press.

Theobald, D. M. (2005). Landscape patterns of exurban growth in the USA from 1980 to 2020, *Ecology and Society*, *10*(1), 32.

Thorne, J., Viers, J., Price, J., & Stoms, D. (2009). Spatial patterns of endemic plants in California. *Natural Areas Journal*, *29*(4), 344–366.

Thorne, J. H., Boynton, R. M., Flint, L. E., & Flint., A. L. (2015). The magnitude and spatial patterns of historical and future hydrologic change in California's watersheds, *Ecosphere*, *6*(2), 1–30.

Thorne, J. H., Kelsey, R., Honig, J., & Morgan, B. (2006). *The development of 70-year-old Wieslander vegetation type maps and an assessment of landscape change in the central Sierra Nevada* (prepared for the California Energy Commission, Public Interest Energy Research). Davis, CA: University of California Davis.

Thorne, J. H., Santos, M. J., & Bjorkman, J. H. (2013). Regional assessment of urban impacts on landcover and Open space finds a smart urban growth policy performs little better than business as usual. *PloS One*, *8*(6), e65258.

U.S. Census Bureau (2014). National Geospatial Data As-

set (NGDA) Urban Area.

Václavík, T., & Meentemeyer, R. K. (2009). Invasive species distribution modeling (iSDM): Are absence data and dispersal constraints needed to predict actual distributions?. *Ecological Modelling*, *220*(23), 3248–3258.

Waddell, K. L. & Barrett, T. M. (2005). *Oak woodlands and other hardwood forests of California, 1990s* (PNW-RB-245).

Warren, D. L., Wright, A. N., Seifert, S. N., & Shaffer, H. B. (2014). Incorporating model complexity and spatial sampling bias into ecological niche models of climate change risks faced by 90 California vertebrate species of concern. *Diversity and distributions*, *20*(3), 334–343.

Whipple, A. A., Grossinger, R. M., & Davis, F. W. (2011). Shifting baselines in a California oak savanna: Nineteenth century data to inform restoration scenarios. *Restoration Ecology*, *19*(101), 88–101.

White, P. S., & Walker, J. L. (1997). Approximating nature's variation: selecting and using reference information in restoration ecology. *Restoration Ecology*, *5*(4), 338–349.

Wieslander, A. E. (1935). A vegetation type map of California. *Madroño*, *3*(3), 140–144.

Wu, J. J. (2008). Making the case for landscape ecology an effective approach to urban sustainability. *Landscape Journal*, *27*(1), 41–50.

Zhang, M. G., Zhou, Z. K., Chen, W. Y., Slik, J. F., Cannon, C. H., & Raes, N. (2012). Using species distribution modeling to improve conservation and land use planning of Yunnan, China. *Biological Conservation*, *153*, 257–264.

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Article

Post-Colonial Urban Development and Planning in Cyprus: Shifting Visions and Realities of Early Suburbia

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Abstract
The paper studies the evolution of early suburban neighbourhoods in the context of post-colonial urban development and planning. The Planning Report of the colonial Government of Cyprus in 1959 examined the foundations of urban development in Cyprus and at the same time put forward a surprisingly sustainable vision for the future of planning. Despite these early intentions and guidance, urban districts developed in a way that is far from sustainable, according to widely accepted criteria and indicators (participation, effectiveness of planning and development control, sprawl, character and identity, green spaces). The basic hypothesis is that planning has proved insufficiently capable of providing rational urban development. The paper outlines the roots of the planning shortcomings over the last fifty years. British perceptions of planning from the first half of the 20th century influenced the 1959 Report, which affected, in turn, the legislation which followed. Reasons are given as to why development constraints and land market restrictions have prevented the implementation of rational key ideas and sustainable visions throughout the years. The paper concludes by attempting to visualize these dynamic processes in early suburban neighbourhoods and measures distortions of densities, green spaces, and layouts by taking an early suburban district as a case study.

Keywords
city expansion; development control; land speculation; neighbourhood layout; suburban development; urban densities; urban sprawl

Issue
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1. Introduction

The aim of the paper is to investigate the evolution of early suburban neighbourhoods in the context of post-colonial urban development and planning in Cyprus. A parallel goal is to codify the type of economic interests or neoliberal practices applied in this context.

During the first half of the 20th century, the British Colony of Cyprus was a rural economy in which more than 70% of the population was settled in small rural communities (Morris, 1959). The beginning of the suburban expansion of the existing towns began before the Second World War without any structured legal framework or regulation in place. The colonial vision of spatial development was unable to depart from the philosophy of international development, which favours growth no matter what the ecological, social or geopolitical consequences (Harvey, 2001, p. 121).

Is it valid to discuss the neoliberal foundations of planning at the European periphery in the mid-20th century? Neoliberalism is a broad term that encompasses a multitude of different emphases and positions that aim at the dominance of a free market over other common values. Central planning interferes with the market, re-

duces personal liberty, and undermines the rule of law by creating discretion within the state apparatus. For various reasons, planning undertaken at a local level is usually closer to the interests of the market (Allmendinger, 2009). Neoliberal views accept that some form of control of land use may be centrally coordinated, but only in order to help rather than hinder the market. In the context of a distinct division between society and the investor, the state sacrifices urban commons, such as space and spatial resources, in order to benefit the real estate market and capital accumulation. If planning is a type of regulation, neoliberal deregulation occurs where regulated societies exist (Allmendinger, 2009). What happens in the case of unregulated, transformational societies at the periphery?

The research starts with a background examination of the original British planning system on the island, followed by a description of the Planning Report of 1959 and the socioeconomic conditions of the post-colonial period. Recent planning documentation is used in order to highlight the weaknesses of planning practice at the neighbourhood scale. Pallouriotissa district, an early suburb of Nicosia, is chosen as a case study in order to illustrate the planning output and the evolution of development on the microscale of the local suburban block.

Sustainable Urbanisms is today a basic critical framework, which can test how far urban common lands and other spatial resources are considered of benefit to the developer or local communities. The 'sustainable neighbourhood', a concept defined (and quantified) differently by various scholars (Drilling, 2013; Farr, 2011), forms a good basis for assessing post-colonial neighbourhood development. Basic elements of a 'good neighbourhood' include the presence of environmental and social amenities, optimum densities and a responsive layout, distinct character and identity, and sufficient green spaces. A participatory process in the transformation of places is also seen as part of the sustainable performance of place (Healy, 2010). These parameters can only be regulated through statutory regulation, and thus set and managed by the public sector.

Substantiation by research and quantitative data has gradually been abandoned in official planning documents on urban development in Cyprus following the 1959 Planning Report. The paper attempts to overcome this lack of detailed and up-to-date spatial data firstly by 'decoding' planning documents. The second step is to examine in more detail the microscale of the suburban block and describe indicative features of a purposefully selected case study sample. The focus is on an early suburban district of Nicosia, which records in its built fabric almost all the shifts of the sixty-year period.

How have the other crucial issues, highlighted by the Report, evolved over the sixty years? In Chapter 4 the paper examines briefly the following themes: (i) participatory and democratic planning—planning authorities and local powers, (ii) city expansion, urban sprawl, and "over-parcellation", (iii) taxation, betterment levy, and regulation of the free real estate market, (iv) the impact of ribbon development. Chapter 5 subsequently focuses on urban design features such as (i) attractiveness of place, (ii) building typologies, (iii) block scale densities sizes, and (iv) green spaces.

2. Planning Concepts in Britain in the First Half of the 20th Century

Cyprus was under British rule from 1878 but the public administration structure was built after 1925, when the island officially became a colony. Obviously, new ideas and practices present in Britain could not immediately be transferred to the colony and so they started influencing the Cyprus planning system only some years or decades later.

Local planning officers in the 1940s and 1950s, while they still had a pre-war mentality, were at the same time aware of post-war planning challenges in Britain. Britain was trying to come to terms with pre-war planning ideas set out by the 1932 Country and Town Planning Act and its relevant reports (Greed, 1991) while starting the post-war reconstruction of the country. The garden city was a keystone concept of British planning, which enabled harmonious urban living with green spaces and nature and also stressed the need for boundaries to city expansion. However, modern principles of movement and the need to boost the economy, especially after the recession of the 1930s, inspired a looser control over planning. The garden city was losing ground (Hardy, 1991, p. 120).

The main idea that the 1932 Act introduced was that planning should be applied everywhere and not within a specific boundary, leaving the areas at the periphery of the city uncontrolled or controlled in a limited way. This idea matured in the reality of Cypriot planning just after the fifties. Also present in the Act were ideas about the increasingly permissive powers of planning and the emphasis on the control of development, which was proposed for Cyprus at the end of fifties. The last main concept of the Act was the need for detailed approval of plans and planning regulations by the state, thereby restricting the powers of planning authorities. This last idea seems to have been bypassed by the Cyprus planning reports, which adopted a more effective approach, similar to the approach of the Town and Country Planning Act of 1947. The 1947 Act tried to correct some crucial weaknesses of the 1932 Act by, for instance, limiting the authority of the lower levels of local authorities (districts) to overprovide land for development, and creating stronger, larger bodies with less parochial attitudes. Another feature of the new act was the recognition that development rights and infrastructure are commons that can boost land development so the developer must return to the public a levy or betterment charge.

From a general point of view, pre-war planning in the UK had a more neoliberal flavour of *laissez faire* while post-war planning at its beginnings was more "positive"

and rational, trying to balance between the market and society (Cullingworth & Nadin, 2006, p. 10).

3. The Planning Report of 1959

Planning legislation in Cyprus was first approved in 1972, but only enacted in 1990 due to the military events of 1974: the Turkish invasion and the division of the island. The "Streets and Buildings Law" of the 1940s and its regulations first established restrictive planning principles, i.e. how to divide land into urban plots, how to design streets, where to build in terms of the water supply network etc. In 1949 the colonial government established the Department of Town Planning and Housing as the relevant public authority. From 1951 the Department worked on the preparation of the key Report, which aspired to lead to the first planning legislation on the island. The Planning Report consisted of a series of spatial indicators and descriptions, which related to problems and conflicts, and resulted in policies and legislation aimed at the remedying of uncontrolled practice.

The Report begins with a quote from Professor Antonio Kanayan (who was possibly a mentor of the author but who had no clear relation to Cyprus) underlining that public participation and democratic planning might not be effective in developing countries. There could be two reasons for beginning with this. The first might be to excuse the divergences of the report from the mainstream visions of planning in the UK, and the second might be to enhance public interventionism in order to enable the real estate free market and restrict speculation by local landowners.

After explaining why planning is necessary, in order to inform unfamiliar readers, the Report moves on to explain the land economics of Cyprus at the time. One of the first ideas expressed in the text is the need for Cyprus to become an attractive place for foreign investors. The first concern was the high value of urban land to a degree, which would prevent international businesses from investing in Cyprus. The high distribution of land ownership in almost every social group and cultural attitudes that encouraged the keeping of land prevented the development of a typical real estate free market. The Report (Morris, 1959) suggested that the discrepancy between suburban land values and the actual building demand made the island exempt from global real estate principles. In 1959, the island counted 1,675 ha of urban built land and 849 ha of unused plots served by the already constructed road network. The Report indicated that the roots of urban sprawl, uncontrolled city expansion, and land waste were related to land speculation and the absence of any kind of control by the state. Paradoxically "overparcellation" did not reduce plot values and certainly increased far beyond the rate of growth in the population. Since the distribution of private land included almost every social group, it was clear that speculation and real estate distortions benefitted a large proportion of the population (Morris, 1959). There was loose money in the market to invest and the only reliable investment seemed to be urban land. Additionally, there was no taxation on unbuilt land and there was, already in that period, a general feeling that cities would always continue to grow. These factors led to an artificial demand for urban land which was beyond the actual development needs.

The increase of private car ownership (it tripled between 1955 and 1957) and Building Regulation provisions boosted suburban development by introducing a "garden city—suburban cottage lifestyle" as the ideal. This was a relatively recent option for the lower and middle classes at this time (Ioannou, 2016). The Report underlined the high average housing floor space per person (compared to the international standards of that period), which had reached 18m^2 in 1959, and suggested a reduction to 13m^2 per person in order to conform to the British standards of that period (Morris, 1959, p. 10). This trend has continued into the contemporary period with an average floor space per person of 58m^2 in 2011, the highest among the European Union states (Eurostat, 2014).

The Planning Report also pays significant attention to the "ribbon" development along the main roads leading out of towns which "stands out in the octopus-like shape of the spread" (Morris, 1959, p. 22). Ribbon development was seen as an important problem at the beginning of the 20th century in Britain, where the 1932 Act tried to confront this issue drastically. The Act included a general proposal for the creation of green belts around the main towns, the preservation of which again became crucial in post-war Britain. A green belt proposal was seen as totally inappropriate for Cyprus, and it is not mentioned at all in the Report. It is clear that the ownership distribution pattern and the development aspirations of a large part of the population would have been very negatively affected by the idea.

Another point in the Planning Report that links it to the planning debate in the UK and the 1947 Act relates to the problem of the inefficiency of small scale Local Communities as effective planners. The Report emphasized their inability to increase green space and update the image and quality of their residential areas, noting that the lack of interest in public open spaces was related to increased maintenance costs. The Report promoted tree planting in all streets, "to give shade to the cars and amenity to the citizens" (Morris, 1959, p. 23).

The Planning Report had a clear vision for the establishment of a new planning system in Cyprus, including the creation of planning authorities which could remove power from local politicians and municipalities, following the model of the British 1947 Act. A hierarchical planning system based on planning schemes (both general and detailed), publication, the right to objections, and modification through appeal to the Supreme Court was designed to produce reasonable and rational urban development which was, if possible, free of speculation. The central government could also control or manage the development pressures or weaknesses through Development Orders.

4. Economic Growth and Real Estate in the Post-Colonial Period. Contemporary Weaknesses of Suburban Development

The British management of the Cyprus economy aimed at making the best of the country. As a colony Cyprus exported primary goods and imported industrial products from the UK. In 1960, the rural economy of the island showed symptoms of underdevelopment and fundamental structural weaknesses (Orphanides & Syrighas, 2012). Cyprus gradually turned into a services sector economy over the next 30 years.

Actual economic growth started between 1961 and 1973. Construction has played a significant role in growth, driven by tourism, manufacture and, of course, the increasing housing needs and supply. The construction sector received high investment for infrastructure projects, residential units, rented offices, shops, and tourist accommodation (Orphanides & Syrighas, 2012). In 1960, the percentage of the workforce employed in the construction industry was 20%, while by 2010 this percentage had increased to 35% (Statistical Service, 2016). Real estate and construction are also important from the point of view of foreign investment. Strategies for attracting foreign investment for real estate and the construction industry were introduced as early as the 1950s (Morris, 1959). In 2009, 33% of foreign investments were concentrated in the real estate sector, particularly the rental and business activities (33%) (Orphanides & Syrighas, 2012, p. 62). Domestic demand continued to expand, especially after 1974. Easy access to credit for property purchases and the relatively low mortgage rates encouraged many Cypriots to increase their investment in real estate (Orphanides & Syrighas, 2012, p. 573).

Social welfare in Cyprus relies on the distribution of land ownership, the small scale of enterprises, and the strong family ties between people (DTPH [Department of Town Planning and Housing], 2007). There was no clear boundary between the "investor" and "society", and the absence of planning and rational development control helped this figure gain a status of social legitimacy. Until 2000, the main cause for the extended urban sprawl was the oligopolistic structure of the real estate market as opposed to the need for low-cost land and affordable housing (Constantinides, 2014). Owners did not frequently sell their property, while first-time buyers (e.g. young couples) preferred to build their houses on family land rather than purchase on the secondary market (Orphanides & Syrighas, 2012, p. 574).

In 1959 the Planning Report had already stressed the urgent need for planning legislation. Despite this, the legislation was approved by parliament thirteen years later and only came into force in 1990 due to the irregular political conditions that followed.

(i) Participatory procedures: The Cypriot state followed Prof. Kanayan's advice in restricting participatory planning procedures almost until the accession to the EU in 2004. Planning focused more on making land use plans and planning zones with no transparency or accountability. Prior to 2004 the only access a citizen had to the planning process was through public hearings, appeals and applications notwithstanding the provisions of the development plans. The scheduling, chosen locations, and publicity actually prevented the public from participating instead of facilitating its active involvement. Limited participatory practices, for example a two-stage public consultation and unrestricted, transparent processes, have only been introduced over the last decade (Ministry of Interior, 2008).

(ii) City expansion and sprawl: Uncontrolled city expansion, "overparcellation", and sprawl were attributed to the absence of planning legislation (DTPH, 2007), one of the causes of the overprovision of development areas in the official land use plans. The provision of more and more development zones was not supported by any kind of population forecast or based on any other measured indicators. Parcellation is the process of constructing local road networks, subdividing agricultural land into residential plots, and disposing of them through the real estate market. In some cases, the sale of the land takes decades. In many districts, the presence of large numbers of vacant plots is very common. The high prices of land held in Development Areas have caused lower income groups to search for residential land at a distance from the city centre, again contributing to the urban sprawl.

The planning system has consistently failed to preserve the periphery of urban areas and the countryside, a need discussed in the UK during the 1930s and highlighted in 1959 by the Cyprus Planning Report. The Urban Guard Program (DTPH, 2007) showed that, almost two decades after the implementation of the Planning Law, new suburban areas were scattered, subdivided plots and isolated residential units. Land fragmentation, assisted by the strong legal protection of ownership, remained a substantial obstacle to detailed planning and the implementation of a plan. The power of small landowners was increased by their access to local politicians and public officials. Additionally, private vehicle ownership increased and the priority was to construct main road arteries from the city centre to the suburbs, which was accompanied by a downgrading of the importance given to public transport. This in turn contributed to the prevalence of private automobiles with negative consequences on road congestion (DTPH, 2007). The Report underlined the need to prioritise street design in order to support existing needs, instead of creating new development opportunities and speculation.

The layout of the new neighbourhoods is usually incomplete because owners of specific parcels have the rights to fragmented developments without even the preparation of a basic master plan. For many years the only priorities of layout design were to maximize profit for the landowner and facilitate the movement of cars. Public green space constitutes only 10–15% of every

property larger than 2,000m^2. The absence of any kind of provisions for urban land consolidation has created scattered and dysfunctional pocket parks. The inadequacy of public open spaces (DTPH, 2007) and networks for providing safe and pleasant pedestrian movement is evident in all urban areas, and is linked to their lack of substantial size or any rational distribution and management of green spaces and equipment.

(iii) Taxation and betterment levy: The idea of taxation, a betterment levy, and the regulation of the free real estate market are not new concepts for Cyprus. They are not, of course, neoliberal ideas; instead, they fit the vision of a socially responsible state that merely through its actions (planning regulation and infrastructure construction) creates surplus value for private landowners. This surplus, if seen as a common resource, is unequally distributed in society because of the nature of planning. Therefore, the state legitimately expects a part of this profit in return. The Planning Report outlined this need and since then it has been highlighted in a number of planning documents (DTPH, 2011). Recently, a Ministry of Interior Report (2008) clearly suggested the application of such a levy but suspiciously no such action has been taken since then (Nanos, 2015).

(iv) Ribbon development: The Nicosia Local Plan notes that during the fifties, but mainly after 1960, the building plot ratio was rapidly increasing for the satellite settlements, attracting mainly the lower and middle classes (DTPH, 2011, p. 1.4.3). Over the following decades, the new socioeconomic conditions activated and prolonged a process of unplanned, spatially unstructured and uncontrolled ribbon development along the main road network. Ribbon development creates negative conditions that were already described in the 1959 Report. The absence of structured and properly equipped walkable neighbourhoods, the dominance of car usage, and the wider city structure encouraged ribbon development, especially for hosting services and commercial uses. In recent years, street widening, in order to increase the carrying capacity of roads and to enable private vehicle circulation, has affected the existing land use. Such designs, combined with periods of economic recession, reduced the vibrancy of these streets and turned them into ghost facades (Andreou, 2014).

5. Neighbourhoods and Suburban Blocks: Building Typologies, Sizes, and Green Spaces

(i) Neighbourhood layout: Pallouriotissa district is a suburb which developed early in close proximity to Nicosia's city centre. It expanded at the beginning of the 20th century around an old core of irregular urban fabric (See Figure 1). The suburban block layout uses some of the British mid-war design standards, of course in a local

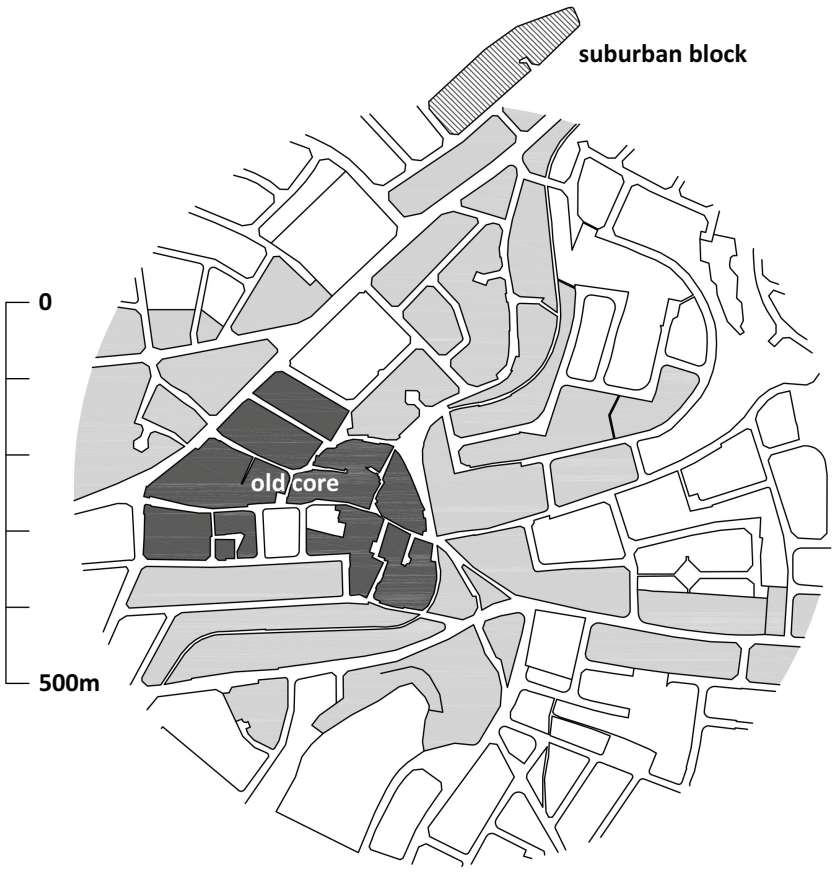

Figure 1. Pallouriotissa—Nicosia suburban development: old core (dark grey), early developed area—up to 1963 (light grey), case study block (hashed).

interpretation, which facilitate vehicle movements and prevent pass-through traffic. The new neighbourhoods have no distinct design concept or any kind of general layout that was defined prior to their full realization. Neither are there any visible boundaries to the district, which expanded continuously in a patchy and additive manner throughout the decades. It is possible that any feature of functional neighbourhood design should be seen as a restriction to maximizing the number of urban plots for the benefit of landowners.

Since the beginning of the 20th century, suburban development regulation has restricted the model of continuous frontage in the urban fabric, apart from in the traditional city centre cores, and has allowed only freestanding buildings in plots of a minimum size of around 520m^2. The only concept of suburban block design is the maximization of development plots in a given parcel configuration. No provision was made for public or green spaces and the design was characterized by the lack of a sense of orientation or any sense of neighbourhood structure. It is clear that the only concern is vehicle access to every plot, while walkability is lost from the outset of the implementation.

Plot division and land development provisions, both in this area and in general, allowed a large number of plots to lay dormant for a long time. As the distance from the core increased, empty and undeveloped plots increased and density decreased. Greater development rights and real estate demands over the last 25 years have generated dense areas within this early-developed suburbia (Ioannou, 2016). A typical plot of around 520m^2 has been the general standard for plot division all across the island for more than seventy years.

(ii) Building Typologies: The building typologies vary according to the period, both generally and specifically in the Pallouriotissa district. According to Ioannou (2016), three major building types can be observed:

- Prior to 1970: Free-standing single houses of about 150m^2, masonry units with timber roofs of an architectural style quite similar to the British colonial cottage, with approximately 70% of the plot left unbuilt and covered by soil and Mediterranean gardens. (Figure 2, top right)
- 1970s to early 1990s: Modernist, concrete, flat-roof versions of free-standing buildings of one to four residential units with a significantly larger footprint, increased hard surfaces for parking, and only around 10% of the plot covered by soil and greenery. (Figure 2, bottom right)

Figure 2. Suburban block images: Top right—prior to the 1970s; Bottom Right—1970s to early 1900s; Left—Mid-1990s until today.

- Mid-1990s to today: Multi-storey blocks of flats on pilotis, with hard ground surfaces over its totality, usually for parking places. (Figure 2, left)

The suburban block illustrated here lies at the periphery of the urban expansion boundary of 1963. It is suitable as an illustration of a number of the issues discussed above. The shape of the plot division reveals that its original design was actually for two separate blocks, modified by the inclusion of a cul-de-sac and the suppression of a possible transversal street. It is obvious that this modification was undertaken in order to maximize the total number of plots. The northern part of the block was totally developed before 1963 while the southern part, as can be seen in the aerial photos archive in the land registry, had no access to the road network at that time. This area appears as a developed island in the middle of fields of grain. Even in this single block there was no idea of gradual expansion in continuity with the already developed urban boundary. Developments could move in any way inheritance or family issues suggested, thereby disrupting any sense of a compact or continuous fabric.

The analysed block area is approximately 1.5 ha and was partially developed in 1963. According to the 1959 estimation of floor area per person, the block was supposed to house 281 inhabitants with a net density of 187 inhabitants per ha, which today is considered sustainable (UN Habitat, 2013). Of course, these figures were hypothetical as the block was only partially built and the real inhabitant density in 1963 was 58 inhabitants per ha, which is low but similar to the densities of recently established suburbs on the outskirts of the city.

(iii) Densities and building processes: Today, it is estimated that the block houses 213 inhabitants, which gives a density of 143 inhabitants per ha. This density is again very close to global sustainability guidelines (UN Habitat, 2013) and of course close to but below the desired density when the block was initially developed in the 1950s. More than sixty years were necessary to approach the desired densities for which the city expanded. What would the real density be if all the plots had been developed according to the maximum building plot ratio permitted in the Local Plan? The total number of inhabitants would increase to 370, which would give a density of 246 inhabitants per ha. It is certainly a sustainable size, but unusual. In this case local people would surely experience such densities as high. In such an instance, they would choose to move from the area, land values would be affected, and new social groups would move in, changing its status from a district with a mix of social classes to one of predominantly middle to lower classes.

This kind of transformation procedure is already emerging through gradual, plot-by-plot demolition and rebuilding. From a total number of 14 "cottage style" houses, two were demolished three and eight years ago, leaving their plots to be used as parking spaces while they await larger developments. Another four have been progressively demolished since the 1980s and replaced by newer buildings, and one has been partially demolished and modified (Figure 3). From this point of view, any kind of compactness or identity in this small group of flat-roof houses of the same age has been lost. It is quite obvious that the block has been continuously developed at least during the last six decades. The oldest and the newest buildings were built sixty years apart. There are no gaps, as plots continue to develop gradually, one every 3 to 5 years. Pallouriotissa district, and of course all similar cases, can be called an "early" suburb but it is not an "old" one. Plot developments are proceeding at the same rate as in new peripheral suburbs, where of course the percentage of empty, dormant plots is far above the 8% observed in this case.

Figure 4 shows that the height of the buildings varies from one to four floors and roof cover (not included) also varies. There are flat concrete slabs as well as wooden tiled roofs. In this broad sense, uniformity cannot be achieved, except in the similarity of plot size, which gives a common scale to almost all suburban areas in Cyprus.

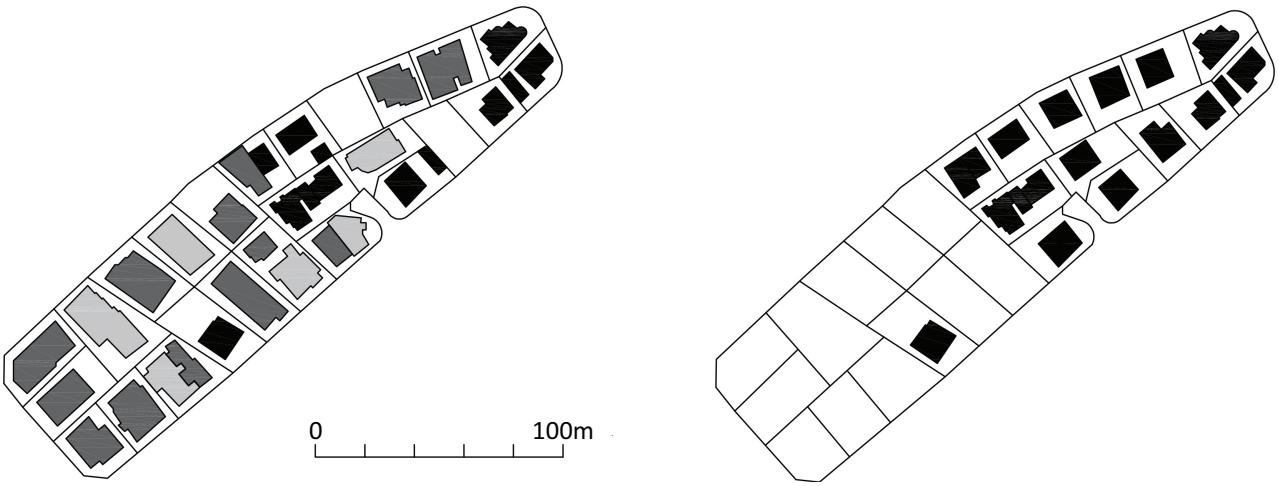

Figure 3. Left—Suburban block construction phases today: prior to 1963 (black), 1970s to early 1990s (grey), less than 20 years old (light grey). Right—Suburban block in 1963.

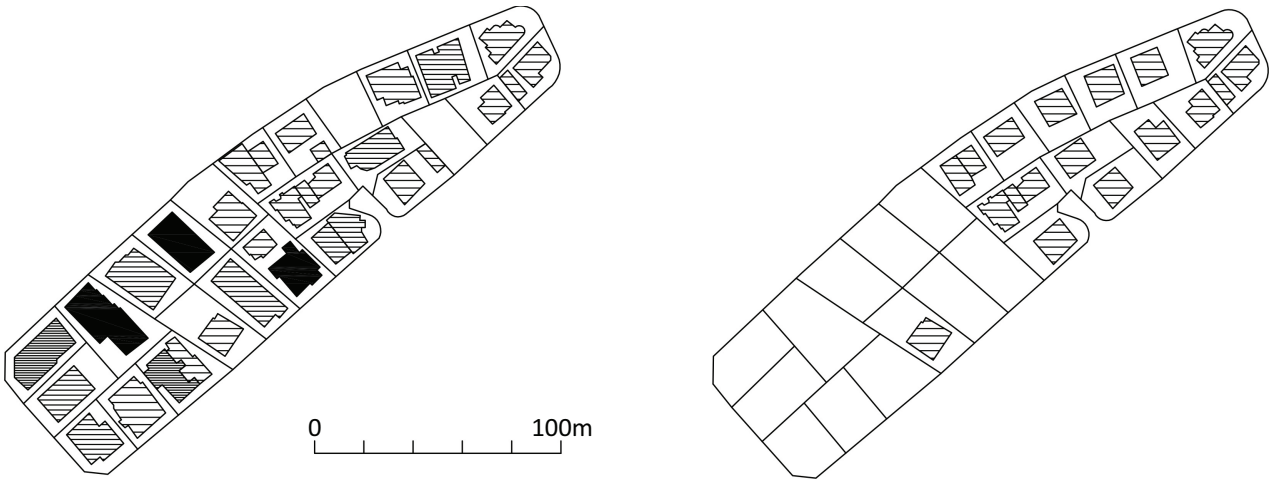

Figure 4. Suburban block heights—from lighter to darker hatch: 1 to 4 floors. Today (left), 1963 (right).

Neighbourhood identity is essential for building the idea of a community and sustainable living places (Gutiérrez, 2013). Character and identity are lacking in this case because of the slow rate of filling the empty plots in the block and the periodical changes in the building regulations on the same block (legal height and density), combined with the absence of design guidelines or restrictions. It is very difficult to distinguish any kind of neighbourhood character. The images in Figure 2 could have been taken from completely different areas but in fact they were all taken from the same suburban block.

(iv) Urban Green Spaces: Green space is a feature of urban development which has been generally neglected both by planning legislation and the reality of development. There is a lack of functional, shaded, properly equipped local green public spaces in most of the urban districts (DTPH, 2007). Early suburbs are provided with even fewer public green spaces, but at least at the beginning of their development they were full of Mediterranean orchards and flower gardens surrounding the freestanding housing units. Private gardens are an essential feature of suburban neighbourhoods, in terms of both their aesthetic and environmental value. Plot development models and new building typologies gradually limited the proportion of greenery and gardens in most of the suburban districts. The images in Figure 2 are indicative of the processes that decrease the quality of the neighbourhood and worsen living conditions. If the case study block were completely built in the pre-1970 typology, 60–70% of its area could be covered by unsealed soil and vegetation. Today this percentage, excluding the unbuilt plots, is around 25%. There is no rule or regulation preserving this percentage, which could fall to 0% if further reconstruction occurs. Merely the transformation of the building in the bottom right image in Figure 2 into the one in the top left would constitute a severe alteration.

The framework for land development used prior to 1960 produced a neighbourhood typology that, despite its weaknesses (in particular the initiation of urban sprawl), created liveable conditions on its microscale. The fact that the foundations of this model are of course unsustainable from today's perspective does not eliminate its positive features. Sometimes there is a conflict between compactness on one hand, and green spaces and a low scale on the other (Farr, 2011) but there are also development models trying to achieve both. The benefits of the early typology (scale, green space etc.) were not evaluated or protected by planning. Instead, the densification process of increasing the building ratio was only designed for speculation and not actually to increase compactness. It is clear that from a sustainability viewpoint, layout design, densities, character and identity, and finally green spaces have been negatively affected by the planning decisions of the past sixty years.

6. Conclusions

The aim of the paper was to increase understanding of the evolution of early suburbia in Cyprus. Planning and development control proved flexible in allowing a continuous transformation of their development features and character. This flexibility could have benefited the city if it had been targeted and allowed to completely transform a district according to urban development trends and the city's needs. An opportunity to use this flexibility to reduce city expansion and sprawl has been lost. Instead, a scattered-city model has been generated. In fact, the power of the local land market and the pressures from many individual owners, have formed a quasi-neoliberal *laissez faire*. As a result, overprovision of development land has become the key feature behind the failure of planning to maintain decent standards in living environments.

An assessment of densities on a macroscale has also been absent since the 1959 Report. Early suburban areas were developed in close proximity to the city centre. Initially the model of the "cottage style", car-oriented garden city was in line with the trends and style of that period. Planning failed to project the size of today's suburban development and city expansion, as well as to re-

Table 1. Relation of the shortcomings of 1959 Report to contemporary planning and suburban development in Cyprus.

Sustainability Indicators	1959 Report	Contemporary Planning and Urban Development in Cyprus
Participatory and Democratic Planning	*Centralized planning, less power to communities*	*Centralized planning, small steps to transparency and open procedures after 2008*
City Expansion and Sprawl	*Problem highlighted, no specific remedies suggested*	*Problem highlighted, no specific remedies suggested*
Taxation and Betterment Levy	*Problem highlighted, betterment levy suggested*	*Problem highlighted, no specific remedies suggested*
Commercial Streets Ribbon Development	*Problem highlighted, no specific remedies suggested*	*Consolidated through planning zones after 1990s*
Attractiveness of Place	*Specific observations made regarding new developments*	*Generic references. No actual policies proposed with the exception of the historic/ preserved areas*
Building Typologies	*No significant reference*	*Policies and regulations to promote diversity in building types*
Densities and Sizes	*Problem highlighted, no specific remedies suggested*	*Not audited or assessed in any way*
Green Spaces	*Extensive highlights and proposals for actions*	*Generic references. No substantial provision of green and public spaces for neighbourhoods*

alize the central future location of these low-density areas. Flexibility to increase density and renew the building stock seems rational but it has been caused by speculative interests. Consequently, it has not been strategically applied in order to facilitate change for the city, but rather to maximize the benefits to owners and developers. Systematic urban audits and quantitative documentation might have been a tool for safeguarding the planning against these speculation powers. It was a legacy of the Report that was abandoned over time.

If character and identity can be seen as subjective, the reduction of green spaces, random densities, and spot densifications led to an unplanned and degraded city. It is obvious that, because of the expectations of consolidated land development, the use of public land, transportation, and social infrastructure are very hard to plan and provide on a long-term basis. Suburban developments in Cyprus are highly unsustainable, since urban commons—land and other spatial resources—are always used for the benefit of the developer, whether big or small, and not for the benefit of the local community. Table 1 proves that the guidelines or intentions of 1959 Report were actually more sensitive and sustainable than the later evolution.

Planning documents from more recent periods have led to sprawl as well as the other main problems of specific land development in Cyprus, and to the lack of efficient planning legislation. Planning legislation and a complete planning system exist and have already been in place since 1990, but they do not seem to be efficient. Public Planning Authorities are well aware of both the shortfalls and the possible remedies. What seems to be missing is the political will to introduce firstly reasonable and then sustainable urban development. The key for motivating political will could be to transform micro-enterprises and micro-owners with their own "neoliberal" or "oligopolistic" interests into a society of common values. The flexibility of the early suburbs over time could still have the potential to achieve sustainable and compact neighbourhoods.

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Conflict of Interests

The author declares no conflict of interests.

References

Allmendinger, P. (2009). *Planning theory*. Hampshire: Palgrave.

Andreou, E. (2014, December 13). Tseri avenue residents protest against 'outdated' plans. *Cyprus Mail*.

Constantinides, G. (2014). *Reasons for and consequences of urban sprawl* (Working Paper). Retrieved from http://www.academia.edu/26597385/Reasons_for_and_Consequences_of_Urban_Sprawl_Case_Study_of_Nicosia

Cullingworth, B., & Nadin, V. (2006). *Town and country planning in the UK*. Oxon: Routledge.

Drilling, M. (2013). Planning sustainable cities: Why envi-

ronmental policy needs social policy. In I. Wallimann (Ed.), *Environmental policy is social policy—Social policy is environmental policy* (pp. 103–119). New York: Springer.

DTPH. (2007). URBANGUARD—Capacity building for enabling the incorporation of sustainability parameters in urban spatial development and planning policies and practices through the use of indicators in Cyprus. Retrieved from http://www.moi.gov.cy/moi/urbanguard/urbanguard.nsf/dmlproject_en/dmlproject_en?OpenDocument

DTPH. (2011). *Nicosia local plan*. Nicosia: Ministry of Interior—Department of Town Planning and Housing.

Eurostat.

(2014). *Housing conditions*. Retrieved from http://ec.europa.eu/eurostat/statistics-explained/index.php/Housing_conditions

Farr, D. (2011). *Sustainable urbanism: Urban design with nature*. Boston: Wiley.

Gutiérrez, F. R. (2013). City, urbanism, social sustainability and the right to the city. In D. Henckel et al. (Eds.), *Space–time design of the public city, urban and landscape perspectives* (pp. 217–225). Dordrecht: Springer.

Hardy, D. (1991). *From garden cities to new towns. Campaigning for town and country planning 1899–1946*. Oxford: Alexandrine.

Harvey, D. (2001). *Spaces of capital: Towards a critical geography*. Oxon: Routledge.

Healy, P. (2010). Making Better Places—The Planning Project in the Twenty-First Century Patsy. Basingstoke: Palgrave MacMillan.

Greed, C. (1993). *Introducing town planning*. London: Longman.

Ioannou, B. (2016). Town planning, development patterns and the reduction of private gardens in the suburbia of Cyprus. In *Growing in Cities—COST-Action 1201 Urban Allotment Gardens in European Cities Conference*. Basel: University of Applied Sciences and Arts Northwestern Switzerland.

Ministry of Interior. (2008). *Revision report of the Minister of Interior on the Nicosia local plan*. Nicosia: Ministry of Interior. (In Greek)

Morris, W. (1959). *Planning report*. Nicosia: Department of Planning and Housing.

Nanos, K. (2015, January 25). Bubble plans of four new cities. The mammoth ... eat Pafos. *Politis*, p. 1. (In Greek)

Orphanides, A., & Syrighas, G. (2012). *The Cyprus economy. Historical review, prospects, challenges*. Nicosia: Central Bank of Cyprus.

Statistical Service. (2016). *CYSTAT: Industry & construction*. Retrieved from http://www.mof.gov.cy/mof/cystat/statistics.nsf/industry_construction_62main_en/industry_construction_62main_en?OpenForm&sub=2&sel=1

UN Habitat. (2013). *Planning and design for sustainable urban mobility: Global report on human settlements 2013*. Oxon: Routledge.

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Article

City Labs as Vehicles for Innovation in Urban Planning Processes

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Abstract
This paper assesses the role of urban experiments for local planning processes through a case-based analysis of the city lab of Maastricht. In conjunction with this, the article offers three contributions, as additional elements. Firstly, the paper develops a set of defining characteristics of city labs as an analytical concept which is relevant for discussions about (collaborative) planning. Secondly, it refines the literature on collaborative planning by drawing attention to experimentation and innovation. Thirdly, the paper assesses the potential of city labs to contribute to the innovation of urban governance. The work draws from the literature on experimentation and learning as well as the literature on collaborative urban planning. In the conclusions, we discuss the potential of city labs as vehicles for learning about new urban planning approaches and their limitations as spaces for small-scale experimentation. The paper is based on research for the URB@Exp research project funded by JPI Urban Europe.

Keywords
boundary work; city labs; co-creation; experimentation; Living Labs; public value creation; urban planning

Issue
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1. Introduction

Cities face challenges of increasing urban complexity (European Union, 2011). At the same time, high hopes are projected on the role of cities in addressing pressing (sustainability) issues "because they are inclined naturally to collaboration and interdependence" (Barber, 2013; see also Kenniscentrum Stedelijke Vernieuwing [KEI] & NICIS, 2012). This has fostered a renewed interest in the city as a site of experimentation. Whereas some scholars use the term laboratories rather metaphorically to describe cities (Waste, 1987), others see cities as sites for specific experimentation to test novel approaches (Karvonen & van Heur, 2014). More recently, experimentation has even been conceptualized as a mode of urban governance (Bulkeley & Castán Broto, 2013; Evans, Karvonen, & Raven, 2016; McGuirk, Dowling, Brennan, & Bulkeley, 2015). Especially, in the field of sustainability transitions, experimental approaches have gained prominence as a way to explore possible solutions for urban contexts (Evans, 2011; Sengers, Berkhout, Wieczorek, & Raven, 2016). However, the role of experiments as a new approach to innovation in urban planning has not been sufficiently assessed.

This paper assesses the role of urban experiments for local planning processes through a case-based analysis of the city lab of Maastricht. The central question is how city labs contribute to the innovation of local planning processes. City labs are a special type of a lab in that the city administration is either the initiator or an important party to it. The term city lab is not a well-defined term and one of the aims of this paper is to better define it. A

good starting point for this is the descriptions of city labs themselves (Figure 1). From the descriptions, it is clear that the term is used for different types of labs.

In the past decade, there has been a proliferation of labs outside the traditional domain of science and business: living labs, design labs, policy labs, innovation labs, etc.; virtually any aspect of society seems to be suited for a lab. In the urban context, recently the term "urban living lab" has gained traction (Schliwa & McCormick, 2016; Voytenko, McCormick, Evans, & Schliwa, 2016). However, there is still no consensus on how to define urban living labs as it is being used as an umbrella term for a broad variety of arrangements.

In this paper, we want to examine *city labs* as a distinct analytical category to look at urban labs and urban experiments from a planning perspective. The term city lab, as a specific type of urban living lab, emerged from discussions with city lab practitioners involved in our research project and the literature review, both of which showed the need for a new concept. Likewise, the characteristics of city labs became gradually defined (as shown by the graph produced at the first workshop).

City labs are set up for different purposes. They may be used to generate ideas for city projects and explore visions (of sustainability, democracy and devolution of public tasks and responsibilities) or oriented towards actions (with the idea generation and evaluation element as a precursor). And they may be used to experiment with new forms of urban planning. This makes them different from urban living labs in that city labs explicitly involve the local administration and that their goal is not just product or service improvement, but also innovation in planning processes. Technological solutions and scientific expertise play a much less prominent role in city labs than in (urban) living labs. So the term *urban living lab* does not exhaust the diversity of lab forms in the urban realm, but nevertheless points to an important precursor: living labs.

With their focus on user-centered innovation, living labs are an important inspiration of city labs. By involving potential users in real life settings, user feedback can be integrated and emerging problems of prototypes addressed before bringing a refined product to the marketing stage (Almillal & Wareham, 2011; Bergvall-Kareborn & Stahlbrost, 2009; Leminen, Westerlund, & Nyström, 2012). This approach has spread rapidly with more than 170 active living labs registered in the database of the European Network of Living Labs (ENoLL). However, there is no consensus on how to define a living lab (Veeckman, Schuurman, Leminen, & Westerlund, 2013); some commonly recognized core characteristics of living labs are that they constitute: (1) long-term environments/platforms with (2) user-centred perspectives using (3) co-creation approaches and (4) local experiments

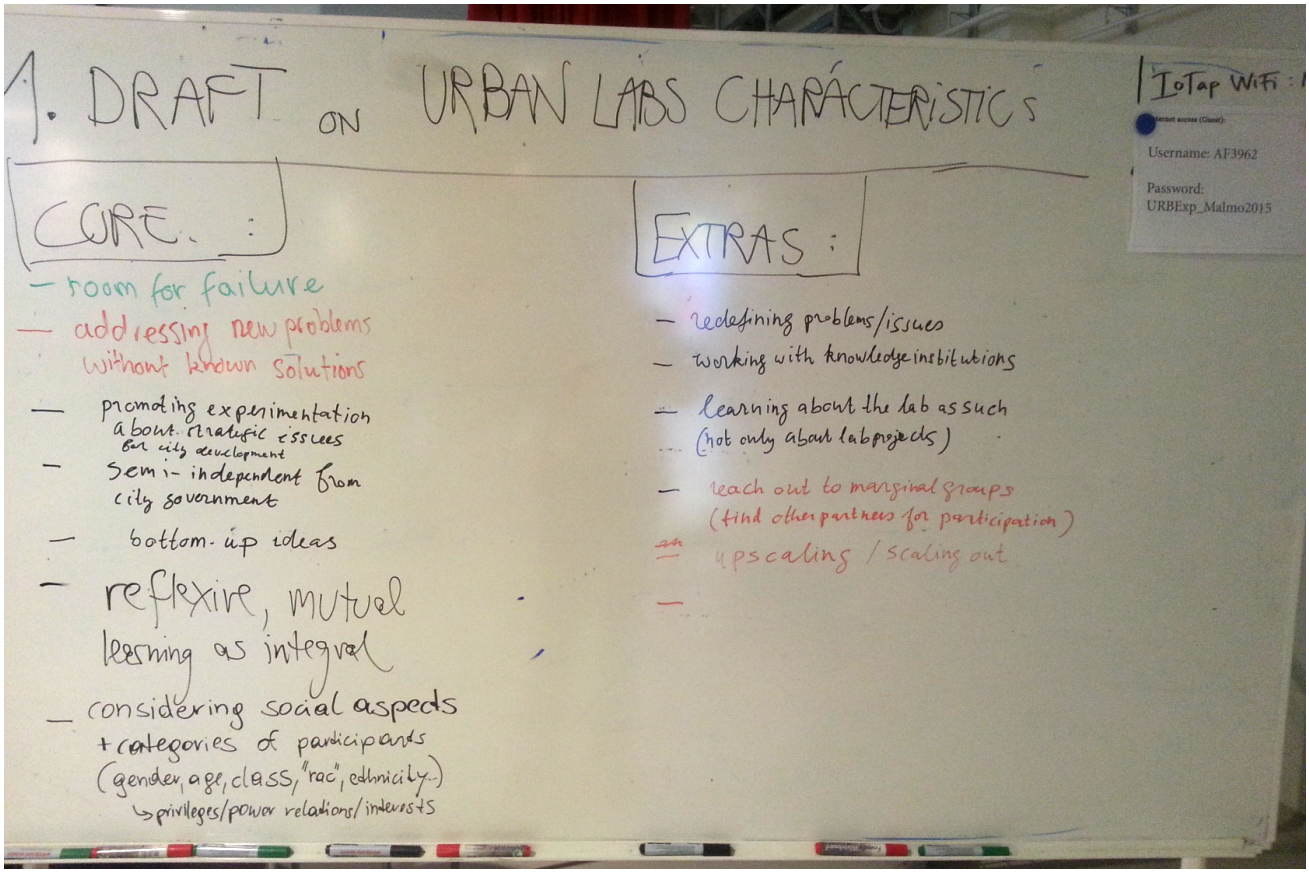

Figure 1. An early collective attempt at defining Urban Lab characteristics by URB@EXP researchers and practitioners. Picture from the URB@Exp project meeting in Malmö, March 2015.

in real-world contexts (Hellström Reimer, McCormick, Nilsson, & Arsenault, 2012; Hillgren, 2013).

Another precursor of city labs are design labs. In being less technology-oriented than living labs, design labs are highly relevant to local planning processes, as they apply design-oriented approaches and often focus on urban sustainability. More recently, design labs tend to direct their focus towards broader publics and multiple types of value creation (Björgvinsson, Ehn, & Hillgren, 2012; Botero & Saad-Sulonen, 2013; Westley, Goebey, & Robinson, 2012). Labs relating to the research field of participatory design have focused on power issues and democracy, highlighting the need to include marginalized stakeholders in innovation processes—not only as participants but also as collaborators (Björgvinsson et al., 2012). City labs could be a way forward to learn about the challenges in creating more reciprocal and mutual relationships between citizens, researchers, and public and private sector agents. To achieve this, they are also much more focused on institutional innovation than living and design labs.

City labs are also different from innovation hubs where the generation of new ideas and practices is much more central than learning about planning processes. Moreover, innovation hubs do not necessarily aim to address an urban challenge or social problem, but rather aim to unleash the creative and innovative potential of their participants (Gabriel, 2014).

In this paper, we are especially interested in the influence of experimental learning in city lab projects on urban planning. The paper is based on an explorative investigation which looks at the role of experimentation and the use of boundary work in overcoming resistance to innovation and fostering changes in urban planning. The question of investigation is examined for the case of the city lab of Maastricht. M-LAB (Maastricht-LAB) is considered by the authors of this paper to be a good choice for investigating the influence of experimental learning on urban planning since M-LAB was set up with the express purpose of innovating and changing city planning. Investigation of the M-LAB as a research case is facilitated by the close cooperative relationship between the authors of the paper and city lab officials, which allows for a transdisciplinary analysis.

The city lab of Maastricht was set up in 2012 by the department of spatial planning of the municipality of Maastricht as a temporary platform for local experimentation and learning by doing. Since the start of the economic crisis in 2007, the urban planning and development landscape has changed rather dramatically in Maastricht (and other cities in the Netherlands) with the breakdown of several large public-private partnerships as a result of both demographic and economic stagnation. To safeguard the urban quality of Maastricht in the absence of new large-scale plans and projects, the municipality wants to stimulate a transition towards novel modes of urban development. Official elements of this transition are the repurposing of empty buildings, incremental and small-scale development, temporal use, flexibility, sustainability, co-creation, and bottom-up initiatives (Gemeente Maastricht, 2012).

The influence of M-LAB on the spatial planning system in Maastricht is investigated with the help of a set of questions regarding outcomes and mechanisms which are structured into 5 rubrics:

1. Lessons learned: To what extent did the project learn lessons about new forms of urban planning? What did the lessons consist of? What role did the city lab play in obtaining and disseminating such lessons? Did the city lab learn important lessons about its own functioning?
2. Co-creation[1]: What did the co-creation consist of? Who was involved in the co-creation process (and who was not)? What problems did the actors encounter in the co-creation process? How were such problems overcome?
3. Boundary work: Were boundaries of policy and knowledge production being crossed? Was policy making and knowledge production a joint task? Did some people act as boundary workers? Did the city lab act as a boundary organization between policy and practice/society, and if the city lab did act as a boundary organization, in what way did it do that?
4. Public value creation, openness and reflexivity: How open and reflexive was the process. How was the public interest maintained?
5. Overcoming resistance to institutional innovation and innovation achieved: Was the city lab instrumental in helping societal actors do something innovative (in the form of an urban development project)? What did the innovation in urban planning consist of?

The research answers to those questions are used to address critical issues in relation to the functioning of city labs such as:

- How to maximize the contribution of lab-projects for innovation in urban planning?
- How to secure and maximize public value for the city in city lab urban development projects? How to make city labs more inclusive and socially responsive?

The findings presented in this paper are an outcome of the URB@Exp project on urban labs as new forms of ur-

[1] In this paper, the term "co-creation" instead of the term "collaborative planning" is preferred because of the prominence of the co-creation element (doing something novel through a co-development partnership), and because the collaborative element is circumscribed and project-specific (it is high for those officials who actively contributed to the co-creation process and low for others). Collaborative planning is a valuable concept but like any concept it has its limitations (a discussion of "cracks within collaborative planning" is provided by Brand and Gaffikin (2007).

ban planning. In this three-year research project funded by JPI Europe, one foresight company, four universities and five city partners (Antwerpen, Graz, Leoben, Maastricht and Malmö) jointly engage in transdisciplinary action research to establish guidelines for urban labs. The findings are based on regular interactions with the members of M-LAB consisting of interviews with M-LAB coordinators, participants in the lab projects, research by a Master's student on M-LAB projects, participant observation, a workshop with organizational experts who reviewed the M-LAB, discussions about lessons that were learned and the role of boundary work. Lab participants came to our project meetings and engaged in discussions about issues of definition (what is a city lab) and were actively involved in exercises to learn more about their own lab. In the project, there were special sessions about this. The research for this wasn't based on strict methodological rules but was conducted in the spirit of transdisciplinary research (as defined by Pohl & Hadorn, 2008): descriptively rich, with exercises to learn more about their own lab attention to perceptions and actor-specific understandings, and with interpretations being discussed with those who are researched, in particular, Tim van Wanroij of M-LAB.

Boundary work, reflexivity and public value creation were not part of the framework but were added on the basis of the action research. Boundary work seemed to be a useful concept for making sense of knowledge integration and interest integration. It refers to the management of institutional junctions through a co-production process in which formal responsibilities are de-emphasised in the direct cooperation process and re-emphasised towards the outside world and at critical moments in the cooperation process (cf. Hoppe, 2010; Kemp & Rotmans, 2009). Boundary work helps to overcome institutional boundaries between science and policy, between city administration and societal actors, and between different types of knowledge holders by accepting different types of knowledge as relevant. By de-emphasising that one is a public administrator, lab-officials were able to be actively involved in the creation of actor's networks, the improvement of lab projects whilst serving as gatekeepers with respect to the city administration and policy (by partially taking over this task from stakeholders). The importance of reflexivity (learning about the Lab as such) was shown to be an important topic together with public value creation (which was approached too implicitly). This shows the power of an inductive approach but also the importance of theory (analytical concepts for empirical phenomena).

The structure of the paper is as follows. In section 2, we present our theoretical perspective combining theories on experimental learning with the literature on (collaborative) urban planning. Section 3 starts with a short description of the case of the Maastricht-LAB and then discusses its contribution to the innovation of local planning processes by looking at the five aforementioned issues. In the last section, we return to our main argument, i.e. that city labs have potential to be vehicles for learning about new forms of urban planning and how the potential for innovation in local urban planning processes can be enhanced. We also stipulate a research agenda for examining and maximizing their impact in terms of added public value.

2. Innovation in Urban Planning Processes by City Labs

From the literature on innovation and experiments we know that innovation requires knowledge (possessed by different actors), financial resources and cooperation among actors with different interests, resources and perspectives (Dyer & Singh, 1998; van de Ven, 1986). Innovation is a journey of learning and discovery in which setbacks are frequently encountered, in which projects may cohere towards new ideas and partners, and in which the environment—is not just something external but something conducive to re-interpretation and manipulation—offers constraints and opportunities (Van de Ven, Polley, Garud, & Venkataraman, 1999). In innovation studies, co-creation is used as a general term for a co-development approach and as a specific term for innovation projects based on co-design by users (Prahalad & Ramaswamy, 2004). In this paper, the term co-creation refers to an approach in which city officials are actively involved in the design and implementation of city projects in a creative (co-development) way, and not just in a procedural way.

Experiments are special innovation projects whose goal is to learn something rather than to achieve a predetermined outcome (Kemp & Van den Bosch, 2006). In reality, however, success is an often hoped for outcome of an experiment. An advantage of labelling something as an experiment is that it provides room to fail. Failure, in the sense of unmet expectations, can contribute as much to social learning about new approaches as success. Experiments through real projects generate a unique type of knowledge—experiential knowledge—for stakeholders and a strategic choice of experiment allows them to learn about issues they are interested in (Kemp, Schot, & Hoogma, 1998; Thomke, 2003). What is being learned (or can be learned) depends on their design: a well-planned experiment helps to avoid common mistakes, such as insufficient user involvement and an overemphasis on learning about technical aspects (technology testing) (Hoogma, Kemp, Schot, & Truffer, 2002). In M-LAB, lessons were actively sought regarding the temporary use of buildings and the flexible use of regulations, through the use of projects that facilitated learning about those issues. If insufficient attention is given to mechanisms and to special conditions, learning is likely to be superficial. We should also note that real-life experiments based on stakeholder's interests differ from scientifically controlled experiments.[2]

An interesting category of innovation is the creation of institutional vehicles for innovation ("innovation for

[2] Non-controlled experiments are called quasi-experiments (Babbie, 2008, p. 397).

innovation"). City labs fall into this category. Apart from stimulating urban development projects, city labs can use co-creation to perform experiments which mirror their ambition to learn about new approaches to local planning processes. This is a highly distinctive feature since local governments do not usually engage in experiments but develop and apply procedures that deliver guaranteed results. In this paper, the role of the city lab of Maastricht in fostering changes in local planning processes through urban development projects will be studied.

Innovation projects may be divided into those in which the aim is to produce a material product and those in which the aim is a new social practice. In the context of urban planning the innovations are less about a product or service for consumers but about public-private community issues such as the use of public space and regulations, citizen or expert tables to discuss urban futures, devolution of government responsibilities to non-government bodies, and the creation of space for citizen initiatives. Exemplary innovations are the repurposing of a building combining multiple functions, the flexible use of regulation, the temporary private use of public space (by and for the local community), and new forms of citizen participation in urban planning. Acceptability is an important element of urban innovation projects and is more easily gained through cooperation when there is an interdependency of interests than through technocratic decision. Dialogue and cooperation build credibility more than expert models which often run into problems of non-acceptance, by disregarding the communities' desire for consultation and co-creation (as shown by several cases in Grönlund, Bächtiger, & Setälä, 2014 and Innes & Booher, 2010). The literature on collaborative planning offers important insights on this matter.

Urban planning is not only a technical but also a political process including the planning of the built environment, the use of land and environment, public welfare, and the design of the urban environment (Levy, 2016). It is about the practices of urban planners, but the formal planning process is part of a bigger planning process: In the larger context of different realities and rationalities of actors, "formal planning becomes only one component of the whole planning process…a broader, more evolutionary notion of the planning process is needed to account for different realities" (Reich, 1975, p. 11). To deal with the limitations of 'traditional' (urban) planning based on prescription, Healey (2006) and Meadowcroft (2007) propose more relational and reflexive forms of governance and planning. Relational forms of planning are based on co-governance arrangements. Reflexivity has different interpretations. Meadowcroft links reflexivity to the transformation of the governance system itself and the search for innovative solutions to social problems by moving beyond surface manifestations to uncover structural and systemic underpinnings. Healey (2007), in her work on relational planning, stresses that transformations in governance have a discursive element: of actors creating meaning to issues and possible intervention strategies, which such meaning depending on frames and people's experiences and, as she puts it, "transformation of governance landscapes thus involves struggles over materialities and meanings, over access to material resources and to regulatory authority, over creating frames of reference which shape governance attention and mould practices" (Healy, 2007, p. 24).

These experts do not propose that traditional forms of governance are stripped down, but rather propose more reflexive modes of decision-making in which each case is considered on its own merit, to create public value through innovative solutions and policy strategies. The public value may lie in economic, social and ecological benefits, both in public and private spheres. Relational and reflexive forms of urban governance have drawn considerable attention in planning theory and practice, emphasizing deliberative and participatory processes. However, many exercises in collaborative planning turn out not to be so collaborative at all (Brand & Gaffikin, 2007). They run into similar problems as the well-known dilemma of "participation as window-dressing" (Arnstein, 1969).

The use of regulation is a form of planning, as is the use of informal consultation in conjunction with formal procedures. Planning practices are based on planning theories but are very much open to other influences. In collaborative forms of planning (Healey, 1997, 2003; Innes & Booher, 2010), actors (of government and stakeholders outside government) engage in dialogue to produce innovation in the policy system and the urban environment, to co-create solutions that are acceptable and credible for those involved (Figure 2).

The collaborative forms of planning resemble innovation projects in that no actor is in full control of the process, and in that the actions are based on dialogue which is oriented towards learning (about substantive issues but also about acceptability and people's frames), and the integration of knowledge and mediation of interests in a non-coercive way. What makes innovation in urban projects different from innovation for consumers is that public interest needs to be safe-guarded (as well as the interests of those involved) and that the government still assumes an important role as a regulator, funder and authority with veto power. For reasons of public accountability and legal requirements, cities and towns have developed bureaucratic ways for dealing with built environment issues that constitute the basis for decision-making and thinking. Many administrators and policy-makers see the need for a different model of urban governance, but they are struggling to determine how this can be achieved.

Most planners know very well that the requirements they adhere to for reasons of law and equal treatment may; stand in the way of innovation, be a source of conflict with external actors, and give rise to internal discussion and interpretations. City labs are a way of getting around the formal bureaucratic system in a quasi-formal

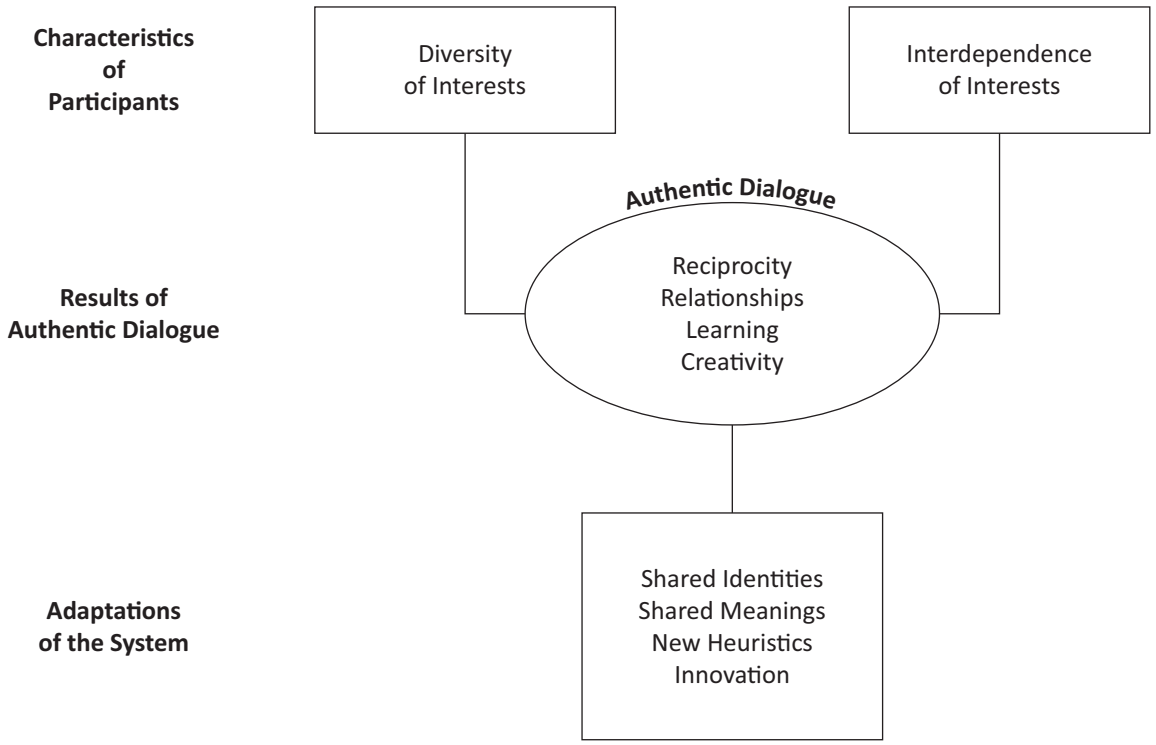

Figure 2. The integration of the diverse, interdependent interests through authentic dialogue as a way to achieve change in the policy system and urban environment (Innes & Booher, 2010, p. 35)

way, by allowing certain deviations. The lifting or softening of requirements may be done by the participants in the city lab themselves or by the formal authorities on the basis of advice from city lab practitioners. In the case of city labs, new forms of urban planning may even be actively investigated for strategic reasons, as happened in the case of Maastricht.

This is why a city lab can be seen as a collaborative form of planning alongside other forms of planning, with which it has an intricate relationship. Its position vis-à-vis the policy system allows it to be instrumental in having an influence on the policy system and on projects that are being carried out. The influence of the city lab on the policy system and local planning procedures increases when the projects are done with the aim of learning about new forms of urban planning. The influence also depends on the lesson drawing activities of the city lab and the receptiveness of the urban policy system to change.

To investigate the role of city labs as being mediating organizations between urban development projects and the policy system, we will use the term *boundary work*. Boundary work refers to the management of boundaries. What happens in boundary work is that "the demarcation of something against something else" is either emphasized or de-emphasised. The knowledge of a scientific report or testimony of a scientist may be emphasized as "knowledge from science" by the scientist or government who wants to rationalize a certain choice, or de-emphasised in recognition of (expert) knowledge of business actors and (situational) knowledge and life-world concerns of citizens.[3] The notion of *boundary work* has proven its value for understanding practices of meaningful interaction between actors in different domains (Gieryn, 1983; Hoppe, 2010). Applied to science policy interactions, the concept assumes that the boundaries between science and policy are not fixed, but continuously discursively determined and negotiated by the actors in, and in between, both domains. It is also suggested that the interface between science and policy may be bridged by boundary workers or boundary organizations with the help of boundary concepts. Boundary work can be done by individuals acting in an ad hoc capacity in policy settings and by institutionalized boundary organizations (Cash et al., 2003; Guston, 2001). In our analysis of urban processes of co-creation we will investigate to what extent boundary work is assisting the integration of knowledge, concerns and interests in city projects, planning processes and practices.

3. The Maastricht-LAB's Contribution to the Innovation of Local Planning Processes

In this section the city lab of Maastricht is introduced and then discussed with reference to five analytical dimensions—experiments and learning, co-creation,

[3] An empirical description of boundary work—in the form of the co-production of a new strategic framework for energy innovation policy in the Netherlands—is provided in Kemp and Rotmans (2009). A discussion of critical conditions for joint knowledge production can be found in Hegger, Lamers, Van Zeijl-Rozema, and Dieperink (2012) and Hegger et al. (2013).

boundary work, social responsiveness and criticism—to illustrate how city labs can contribute to the innovation of local planning processes. Since M-LAB's way of working was quite different in its first (2012–2014) and second phase (2014–2016), we flesh out the differences where necessary.

3.1. The Maastricht-LAB (M-LAB)

Maastricht is a medium-sized Dutch city (120,000 inhabitants), and the capital of the Province of Limburg, close to the borders with Belgium and Germany. For decades, urban development in Maastricht was growth-driven by public-private partnerships and large-scale master-plan projects. Since the start of the economic crisis in 2007, the municipality has wanted to stimulate a transition towards new modes of urban development focusing on repurposing of empty buildings, incremental, small-scale development, temporal use, flexibility, sustainability, co-creation, and bottom-up initiatives. Having lost a number of key partners for large-scale master-plan projects, there was greater space and need for more participatory approaches mobilising citizens and local organisations for concrete urban development initiatives and projects. These plans were set out in a new long-term strategy for spatial planning (Gemeente Maastricht, 2012), briefly announcing the creation of Maastricht-LAB (M-LAB) as an experimental space and temporary governance platform with the aim of learning about new modes of urban development and planning.

M-LAB has a hybrid position and is placed partially outside of the municipality: institutionally, by the fact that it has an external partner as one of the two project leaders, and physically, with temporary office spaces being outside the municipality buildings. The alderman responsible for spatial planning and environmental issues holds the political responsibility; the manager of spatial planning is involved from a policy perspective and gives managerial back-up. The activities of M-LAB are built upon three pillars: the development of new coalitions (connecting), implementation of local experiments (acting) and the creation of a broad knowledge infrastructure (learning).

In the first phase (2012–2014), M-LAB conducted eight experiments, seven of which were initiated by the municipality. Every experiment addressed different challenges and specific research questions. The results were documented in so-called *Lab-journals* publicly accessible on M-LAB's website. In the second phase (2014–2016), M-LAB acted as a facilitator and transferred the initiative to the public and local (professional) organisations through a "permanent open call." Project proposals had to meet four criteria:

1. The project had to be innovative and contribute to a new way of urban development (*content*);
2. The project had to result in value creation in the broad sense (economic, spatial, social) (*value*);
3. The project had to be an example for the city and transferable to elsewhere in the city (*exemplary character*);
4. The initiator had to be able to carry the final responsibility for the project (*clear project owner*).

At the time of writing this paper, M-LAB is completing the second phase and preparing for a third one, again with a slight shift in focus.

3.2. Lessons Learned

M-LAB was explicitly set up by the municipality to experiment with new forms of urban planning and development. The Structure Vision 2030 for spatial planning and urban development in Maastricht announced the creation of the city lab: "In the Maastricht-LAB, the municipality of Maastricht will actively search for new (spatial and financial) instruments. We do so together with all parties who are shaping the city" (Gemeente Maastricht, 2012). This was a remarkable choice. Bureaucratic administrations usually stick to established rules and procedures in order to produce secured (relatively certain) results in a legitimate way. Experimenting means that the outcome is uncertain and that there is potential for failure, but on the other hand, there is the potential to discover something highly innovative.

During the first phase, M-LAB conducted 8 experiments, seven of which were concluded. For most of them, a so-called LABjournal was written to describe what had been done and to record the main lessons that had been learnt. The topics of these experiments varied widely but always had a connection to spatial planning practices and/or real estate development. The experiments were either chosen by the M-LAB team or proposed by the municipality. The Guideon's group, an advisory group of 17 urban professionals with varying backgrounds discussed each experiment with the M-LAB team in advance and afterwards. Through this practice, they also contributed to the learning process in the first phase. Another instrument for learning and sharing the lessons of M-LAB experiments is the *StadAcademie* (City Academy) set up towards the end of the first phase, formalised through its own foundation, run by the external project leader of that time and co-funded by the department of spatial planning.

For the last experiment of the first phase, M-LAB invited citizens of Maastricht to propose their own ideas. The sheer quantity of proposals received (49) and the overall quality of the incoming proposals was one of the reasons for changing the way of working in the second phase. From that point onwards neither, M-LAB nor the municipality initiated experiments. The work of the Guideon's group was discontinued (in part because of negative publicity in the local newspaper about this being an urban development clique). A new, more open network was established: with *citymakers* providing input to the M-LAB team. Through a "permanent open call" citizens were

encouraged to submit their own proposals. Selection of proposals by the M-LAB team was based on the four criteria aforementioned: *content*, *value*, *exemplary character* and *clear project owner*. Out of several dozen proposals, M-LAB facilitated 14 experiments throughout the second phase. Several of the non-selected projects were helped by redirecting them to other units of the municipality.

The topics to learn about remained the same in the second phase: re-purposing of empty buildings, flexible and temporary use, incremental, small-scale development, sustainability and co-creation. The character of the experiments, however, changed significantly from the first to the second phase. During the first phase, the M-LAB team defined a number of questions and issues that were to be investigated in an experiment, beforehand. For the very first experiment with a potential park in an old industrial area of the city being re-developed, the following questions provided guidance: What is the role of a park in the 21st century? How can policy participation take place through an open process with stakeholders involved in the design phase? Who is the end user of this area and which responsibilities would they be willing to take? How can connections be made, for example between the past and the future? This way, it was clear, what the experiment was about, and also the learning could be moved in a clear direction.

During the second phase, these questions were formulated as soon as a project proposal came in. However, the outside party's focus is not necessarily to learn, but certainly to get their project proposal implemented. The solution for a problem was thus pre-defined and not always open for debate and investigation. This shift was reflected by a change in terminology, for example, M-LAB's website no longer talked about *experiments* but about *projects*. Much more than learning about novel forms of urban development (such as the temporary use of vacant space), M-LAB was learning now more generally about steering local planning processes in the role of facilitator and partner of projects, run by other organisations and individuals. Finally, by helping outside parties to implement their project proposals, M-LAB became more focused on having an added value for an initiative. Since value added by M-LAB can be rather small, it becomes more difficult to tell when an experiment with the role as facilitator actually failed and when it did not.

3.3. Co-creation

Co-creation was the main starting point for every experiment and was based on a process in which multiple organisations and stakeholders participated on an equal basis throughout the whole process. Throughout both phases, M-LAB's approach to co-creation never really became scripted but was conducted on a case-by-case basis. Co-creation consisted of two types: the use of transdisciplinary knowledge production, and a new form of policy-making and implementation in which active citizens and shared ownership of the process are crucial elements.

Transdisciplinary knowledge production in M-LAB's first phase consisted of many types of interaction between city officials from various departments, e.g. cultural heritage and permission with various groups of citizens, from young entrepreneurs to cultural organizations, architects, project developers, academics and people from the cultural sector. In the second phase, after the discontinuation of Gideon's group, transdisciplinary knowledge production was taking place in the meetings with the network of *citymakers*, where also some topics for future experiments were explored, in multi-disciplinary workshops related to specific projects, in public events organized by M-LAB, in the Dutch *Cities in Transition* network and through participation in research projects such as URB@Exp.

Two examples cases of co-creation are the repurposing of the old fire brigade station and the creation of a plan for the future transformation of the limestone mine at the border of Maastricht. In the case of the fire brigade station, the co-creation process consisted of a reversal of the planning process: instead of first developing a concept for the building and then finding a user who wants to exploit that concept, M-LAB invited a potential group of users to collaboratively develop a concept for the building with them. This turned out to be a combination of flexible and partly collaborative office spaces, with a café and a multi-use space for neighbourhood and citizen initiatives. Hence, the experiment and learning took place in a multi-stakeholder constellation and the municipality had an entirely different role than it usually has in such re-purposing projects. Many, but not all, of the external participants decided to also participate as users of the re-purposed fire-station.

In the case of the transformation of the limestone mine into an area of recreation and nature, different stakeholders were brought together in a workshop to establish a plan for the temporary use of a specific zone during the time where the mine was to be transformed. Participants consisted of neighbours and a citizen association protesting against the mine and a number of experts from the world of architecture, planning, geology and ecology. In the workshop people were split up into three groups to create concrete proposals, with each group consisting of a mix of people. The proposals were used by a team of responsible architects to create transformation plans. In a feedback workshop, all participants expressed satisfaction about the way their input was incorporated into the plans.

During the second phase, the second form of co-creation received more attention owing to the decision of the M-LAB to take a less active role in the formulation and initiating of projects. Discussions with transdisciplinary researchers of the URB@Exp project resulted in the identification of 4 roles: advisor, broker, partner, and accelerator. We had conversations with the external project initiators and they confirmed the ideas that the M-LAB team already had about their role.

3.4. Boundary Work

M-LAB sees itself quite explicitly as a municipal project with a hybrid organizational form that works at the interface of the municipal apparatus and society in order to investigate how the separation between both can be bridged. Indeed, M-LAB can be seen as an institutionalized boundary organization enabling new ways of thinking and new practices by bridging different domains. During the first phase, for example, the M-LAB team examined the idea of organic and preparatory planning. Experiments with two potential parks in a former industrial area to be redeveloped were used as sites to explore possible functions of these parks and of these sites for the re-development of the entire area (the experiment was called "Park of the Future"). To do so, interested cultural organizations were connected to the knowledge realm of urban planners to inspire the further planning process. This was new for the cultural organisations and the city, each of which took on a new role as an example of boundary work. The result was a new concept which made the idea of organic planning more concrete and is now feeding into another planning process of the municipality: start-up image planning. Instead of having a clear image of the final result, a start-up image is created that invites to start exploring the potential of an area.

Another case of boundary work took place around the creation of a creative hub (called Caracola) in an old school. The idea for this came from squatters; M-LAB liked the idea but foresaw problems with the city administration because of a big difference in culture between the creatively minded people who lacked business knowledge and respectability, and the administrators who wanted the proposal to fit with the administrative rules. In one of the meetings it was even said by a city official that the proposal had to be "in the form of a parcel which fitted the drawers of the administration". To bridge the different worlds, M-LAB organized several meetings and talked to each of the parties independently. It also was instrumental in finding a creative solution consisting of an affordable temporary space and permission to use using an abandoned school building for 2.5 years. However, when the Caracola initiators said they wanted to receive money for the 'publicly orientated services' they would provide (e.g. social events, collaborating with citizens and neighbourhood teams), the M-LAB refused because Caracola was not part of the city organization, but a private initiative.

The decision to place M-LAB in a separate building marked a boundary with the city administration. It signalled to external parties the special status of the Lab. Formally, however, M-LAB is part of the city organization and some parties were very surprised to learn this. It is telling that after two years of working for the municipality, the internal M-LAB coordinator still gets asked whether he is working for the municipality by colleagues from the city administration. This situation has arisen as a direct effect of working in a separate building, a decision about which they are happy. The blurring of responsibilities is perhaps strongest in the *stadsnatuurvisie* project, a platform to discuss the future of nature in the city. In this project, initiated by the local nature and environmental organization IVN, the city is involved both via the steering group and as funder. The usefulness of such an arrangement remains to be seen.

In general, boundary work arrangements and activities have helped to create space for new projects, new ways of working and new forms of collaboration. However, a boundary work approach also has disadvantages, as demonstrated by a failed experiment which attempted to provide a local school with sustainable energy. In this specific case, the blurring of roles and responsibilities proved to be a problem. It was unclear whether the M-LAB or the school was the project leader. In the second phase, M-LAB takes a clearer line on this: they do not assume a role of project owner. Their main role is that of matching. Matching requires listening well to the needs of initiators, potential partners and certain administrative units. It also requires a good overview of the field and other initiatives. These are quite different qualities than the ones of the expertise-based city official who operates on the basis rules. The role of M-LAB as boundary organizations hence strongly hinges on the two project leaders as facilitators and boundary workers. Having two coordinators, one from the municipality and one from outside (in the second phase, from the world of business) has proven to be useful to accomplish the task of boundary work. Whereas the internal M-LAB coordinator often makes the matches with respective municipal departments and services, the external project coordinator draws on their network in the local business and development world. In contrast to the internal coordinator, the external coordinator usually emphasizes that they are a person of business, rather than a civil servant. The accessibility of the M-LAB (low threshold) and quick action are highly valued.

3.5. Public Value Creation, Openness and Reflexivity

From the start, the Maastricht-LAB followed a procedural approach to social responsiveness and included social and urban stakeholders in order to remain alert regarding unaddressed social needs. In the first phase, this was accomplished mainly via the Guideon's group who discussed possible new experiments with the M-LAB team (introduce), and helped them to evaluate those which had been completed. However, M-LAB was also socially responsive in a more ad hoc manner, by reacting to repeated questions about the possibility of establishing a creative hub for start-up enterprises in the city. This led to the co-creation of the first of such hubs in a former fire station that has been unoccupied for some years. Most of the time, however, the topics that were addressed in the experiments during the first phase were selected, in a rather top-down manner, involving the municipality and the respective alderman of spatial planning.

This changed in the second phase when M-LAB launched an open call to all inhabitants of Maastricht to submit their project proposal to be selected as a possible experiment (henceforth referred to as a project). One of the four selection criteria explicitly states that such project proposals need to create more than just economic value. For example, they should also create less tangible value such as social value. However, this criterion, as well as the others, was never clearly stated. As a result, the promised and actual resulting added value is hard to determine. The M-LAB team also experienced difficulties in identifying specific values to be assessed. Research by the URB@Exp project revealed that in the eight cases studied, initiators were more critical about the impact in terms of added public value than M-LAB was. For example, in the artist project of working with traditional ceramics techniques, the first and most important outcome was a cheap space for the artists. The added value for the surrounding neighbourhood, an old industrial neighbourhood being redeveloped, was acknowledged to be rather small.

Reflexivity was stimulated through the creation of the Guideon's group in the first phase, and the network of *city-makers* and public events in the second stage. Members of this network were invited by M-LAB, approximately twice a month, to a lunch meeting where presentations were given around specific topics relevant to urban development and planning in Maastricht. Often, these presentations were given by members of the network and sometimes they resulted in concrete experiments being initiated up by M-LAB. As a result, the network of *city-makers* also functioned as a breeding ground for project initiators. However, as the M-LAB team admitted, most of the approximately 60 members of this network, and certainly the most active ones, have a professional background related to urban development (but do not come from the world of large-scale real-estate development). One may wonder then, how effective the network was as a useful mechanism for stimulating openness since it reflected the interest and values of a relatively small group of Maastricht's urban society. Discussions with researchers from URB@Exp also inserted reflexivity into the project by drawing attention to boundary work and the need to find ways to better safeguard public value.

3.6. Overcoming Resistance to Institutional Innovation and Innovation Achieved

In analyzing the resistance to innovation by city labs, we have to distinguish three levels against which resistance can be directed: the city lab itself, specific experiments of the city lab (or the way they are done), and the institutional embedment of lessons of the city lab. In the following text, we address each of them.

According to the external project leader of M-LAB's first phase, scepticism about the newly created city lab was higher in the local society than in the municipal apparatus:

> "I presented the plans for the Maastricht-LAB to a group of local architects and asked them to join the projects. They were very sceptical and immediately reacted in an old-fashioned way by wanting to know about money. They even did not want to consider the idea."

Resistance may also come from citizens, especially those with established stakes in local urban politics. M-LAB experienced a major conflict with a neighbourhood platform which resisted during the process of the experiment and rejected the proposal of the M-LAB experiment for repurposing a former fire station. Neighbourhood platforms have existed since the 1980s and the city officials have argued on various occasions that they have now become an inadequate instrument for participation that has led to small circles of participation elites in each neighbourhood. Their resistance shows the limits of M-LAB's role as mediator when different parties are fighting for use of a building. The M-LAB team proceeded with the experiment and developed a new concept of repurposing the building. One of the last collective meetings led to an unexpected voting with all potential users of the building. Almost all of the users did not want to collaborate with the neighbourhood platform. M-LAB advised the public administration and alderman to proceed with realizing the developed concept without the neighbourhood platform, which was approved.

In taking a more facilitative role and actively supporting the projects of initiators, M-LAB encountered some resistance to innovation from bureaucratic municipal organization units. For example, the real-estate department was not too happy with the development of a new rental contract based on turnover rent, or for a new creative hub for start-ups in a temporarily vacant school building (Caracola). These demonstrate moments in which the experimental character of M-LAB projects aiming for new approaches can clash with the bureaucratic apparatus designed to deliver predictable (and legitimate) results without creating an exemplary exception. Nevertheless, this kind of experiences have resulted in a more continuous exchange within the department of spatial planning about the possibility of being less strict with the application of regulatory frameworks.

M-LAB experiments impacted urban planning practices in several ways. Here, the role of the manager of the physical planning department working part-time for the M-LAB was crucial. The manager, first, made facilitating skills part of the profile to be used by the human resource policy, and secondly, initiated a regular meeting to exchange experiences with facilitating projects from outside parties. In addition to receiving training, a group of 20 people of the city meet to discuss concrete projects they were dealing with as city administrators. Process management has become a new competence for city administrators (reflected in the creation of a process manager and the boosting of such competences amongst city administrators. M-LAB member and director of physical

planning Jos Simons played an important role in this. In terms of policy impact, the M-LAB experiments with co-maker spaces fed into the current plans to establish a policy for creative hubs in Maastricht. More generally, the M-LAB activities helped to put the topic of temporary use on the agenda of the department of spatial planning, specifically in connection to organic pre-development, a phase that has not yet been systematically included and exploited by urban planners. The experiment with the gasometer, which was re-opened for special events during a 2-month period, resulted in the idea of developing the whole area. For this, an "area programmer" will be contracted, who will not only investigate the potential of the gas station with experimental events but also of the entire area.

4. Conclusions

This paper discusses city labs as a new lab phenomenon in the urban realm. A primary result of the paper is the identification of city labs as a distinct analytical category for looking at urban labs and urban experiments from a planning perspective.

A first characteristic is that city labs are *hybrid organizational forms* purposefully positioned at the border of local administration and society. Their boundary position helps them to partially evade the established bureaucratic logic of the local administrative apparatus, which is necessary to gain space for experimentation with new approaches. This can be expressed by shared ownership of a city lab by the municipality and other stakeholders. Through their hybrid position, somewhat inside and somewhat outside the local administration, city labs can act as boundary organizations, facilitating interaction between actors from different domains and mediating, but in the best case integrating, the different languages, interests and values of the world of policy, science, local business and citizens.

A second characteristic is that city labs are places of experimental learning and are *learning environments* for new forms of governance. Regardless of the specific thematic focus within urban development that is chosen, city labs are able to generate insightful lessons into how to reorganize local urban governance arrangements and transcend specific barriers to change. Usually, this learning process is formalized to some extent, for example through periodic evaluation sessions involving actors from the municipality.

Third, city labs are *multi-stakeholder settings* including the local administration and focus on co-creation. This is a crucial aspect for working in a hybrid organizational setting. Moreover, it connects to a fundamental realization shared by city officials across Europe, namely that municipalities, while acquiring more and more responsibilities throughout the recent decades, lack sufficient resources, capacities, skills and knowledge to address complex urban challenges. Therefore, municipalities have come to a greater realization that they cannot deal with these challenges alone. Hence, the search for enabling multi-stakeholder co-creation processes through city labs stems from the necessity and desire to find integrated solutions.

Fourth, city labs use *co-creation* in conducting experiments. This is a highly distinctive feature since local governments usually do not engage in experiments but develop and apply procedures that deliver guaranteed results. In the case of experiments, there is potential for failure. From the point of learning, a project has failed if nothing is learned, casting failure in a new light. Failure in terms of expected or wished outcomes can contribute as much to social learning about new approaches as success can. How to structure and implement the learning process as an inherent part of an experimental approach is a vital challenge for city labs.

Fifth and finally, city labs approach complex problems in a *multi-disciplinary* way, by drawing on knowledge from different disciplines. This may be done in a deliberate way, or simply be the result of opting for a co-creation approach. Mobilizing and integrating different types of knowledge is often a key part of an experiment. In city labs, stakeholders form various domains work together, in an attempt to create value for all those who are involved: city officials, local NGO's, SME's and researchers.

The second result of this paper is a new perspective on collaborative planning in the form of city labs as a vehicle for collaborative planning. The case of M-LAB suggests that experimenting can be a useful way forward for finding practical arrangements for multi-stakeholder collaboration in urban planning. At the same time, city lab experiments can help to keep the focus of collaborative planning on substantive results.

The third result is a better (empirically grounded) understanding of the potential of city labs as experimental learning vehicles for a paradigm shift in urban planning. The potential depends on the setup and circumstances within which a city lab approach is used. We are not suggesting that the experience of Maastricht is representative of and equally applicable to other cities. In the case of Maastricht, useful lessons were learned about the following issues: the temporary use of buildings, the need for co-makers spaces, the benefits of direct engagement with the city, the advantages of a hybrid arrangement of the Lab, the positive value of brokering between the city and urban actors, and the limits of a co-creation approach in case of conflicts of interest. City labs can be a tool for local governments to learn together with other stakeholders in a systematic way about new approaches to urban planning. Beyond being simply an appeal to participation, city labs are practical places for multi-stakeholder co-creation processes. With their hybrid position at the boundary of local government and society, they are well-equipped to bring top-down and bottom-up initiatives together.

However, our case study also points to some limitations of city labs. In its four years of existence, M-LAB

has initiated and participated in many experiments, but they usually do not address large-scale urban challenges, such as urban sustainability. Public value creation needs to be better secured. Labs constitute an interesting and valuable approach to urban development and planning especially if:

- They are based on strategic learning goals;
- They involve explicit lesson-drawing activities about co-creation and alternative forms of planning;
- Public value creation is an explicit consideration of the projects;
- City planners are involved in the Lab configuration and Lab projects.

More case studies are needed to corroborate the innovative potential of city labs. Comparative research would be useful in this regard. It seems that city labs which are set up with the express purpose of experimenting with new forms of urban planning will achieve more than those that merely stimulate local projects in urban development. For M-LAB the term boundary work is a new concept which appears useful, but which had proven to be a difficult concept. Further work on the nature of boundary work and its usefulness as a theoretical concept is desirable. An additional topic for research could be: how to make city labs more inclusive and socially responsive?

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References

Almirall, E., & Wareham, J. (2011). Living labs: Arbiters of mid- and ground-level innovation. *Technology Analysis & Strategic Management*, *23*(1), 87–102.

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Planning Association*, *35*(4), 216–224.

Babbie, E. (2008). *The basics of social research* (4th ed.). Belmont, CA: Thomson Learning.

Barber, B. (2013). *If mayors ruled the World*. New Haven, CT: Yale University Press.

Bergvall-Kareborn, B., & Stahlbrost, A. (2009). Living lab: An open and citizen-centric approach for innovation. *International Journal of Innovation and Regional Development*, *1*(4), 356–370.

Björgvinsson, E., Ehn, P., & Hillgren, P. A. (2012). Agonistic participatory design: Working with marginalised social movements. *CoDesign*, *8*(2–3), 127–144.

Botero, A., & Saad-Sulonen, J. (2013). Peer-production in public services: Emerging themes for design research and action. In E. Manzini, & E. Staszowski (Eds.), *Public and collaborative—Exploring the intersection of design, social innovation and public policy* (pp. 1–12). Milan: DESIS Network.

Brand, R., & Gaffikin, F. (2007). Collaborative planning in an uncollaborative world. *Planning Theory*, *6*(3), 282–313.

Bulkeley, H., & Castán Broto, V. (2013). Government by experiment? Global cities and the governing of climate change. *Transactions of the Institute of British Geographers*, *38*(3), 361–375.

Cash, D. W., Clark, W. C., Alcock, F., Dickson, N. M., Eckley, N., Guston, D. H., . . . Mitchell, R. B. (2003). Knowledge systems for sustainable development. *Proceedings of the National Academy of Sciences*, *100*(14), 8086–8091.

Dyer, J. H., & Singh, H. (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review*, *23*(4), 660–679.

European Union. (2011). *Cities of tomorrow: Challenges, visions, ways forward*. Brussels: European Commission Directorate General for Regional Policy.

Evans, J. (2011). Resilience, ecology and adaptation in the experimental city. *Transactions of the Institute of British Geographers*, *36*(2), 223–237.

Evans, J., Karvonen, A., & Raven, R. (2016). The experimental city: New modes and prospects of urban transformation. In J. Evans, A. Karvonen, & R. Raven (Eds.), *The experimental city*. Oxon and New York: Routledge.

Gabriel, M. (2014). *Making it big. Strategies for scaling social innovations*. London: NESTA Foundation.

Gemeente Maastricht. (2012). *Structuurvisie Maastricht 2030: Ruimte voor ontmoeting*. Maastricht: Gemeente Maastricht.

Gieryn, T. (1983). Boundaries of science. In S. Jasanoff, G. E. Markle, J. C. Peterson, & T. Pinch (Eds.), *Handbook of science and technology studies* (pp. 393–443). Thousand Oaks, CA: Sage.

Grönlund, K., Bächtiger, A., & Setälä, M. (Eds.). (2014). *Deliberative mini-publics. Involving citizens in the democratic process*. Colchester: ECPR Press.

Guston, D. (2001). Boundary organizations in environmental policy and science: An introduction. Science, *Technology & Human Values*, *26*(4), 299–408.

Healey, P. (1997). *Collaborative planning: Shaping places in fragmented societies*. Basingstoke: Palgrave.

Healey, P. (2003). Collaborative planning in perspective. *Planning Theory*, *2*(2), 101–123.

Healey, P. (2006). *Urban complexity and spatial strate-*

gies towards a relational planning for our times. New York: Routledge.

Healey, P. (2007). *Urban complexity and spatial strategies: Towards a relational planning for our times*. London and New York: Routledge.

Hegger, D., De Boer, Y., Offermans, A., Merkx, F., Dieperink, C., Kemp, R., . . . Cörvers, R. (2013). Kenniscocreatie-naar productieve samenwerking tussen wetenschappers en beleidsmakers. Maastricht: Datawyse Universitaire Pers.

Hegger, D., Lamers, M., Van Zeijl-Rozema, A., & Dieperink, K. (2012). Conceptualising joint knowledge production in regional climate change adaptation projects: Success conditions and levers for action. *Environmental Science & Policy*, *18*, 52–65.

Hellström Reimer, M., McCormick, K., Nilsson, E., & Arsenault, N. (2012). Advancing sustainable urban transformation through living labs: Looking to the Öresund region. In *Proceedings of the Third International Conference on Sustainable Transitions* (pp. 29–31). Copenhagen: DTU.

Hillgren, P. A. (2013). Participatory design for social and public innovation: Living labs as spaces of agonistic experiments and friendly hacking. In E. Manzini, & E. Staszowski (Eds.), *Public and collaborative—Exploring the intersection of design, social innovation and public policy* (pp. 75–88). Milan: DESIS Network.

Hoogma, R., Kemp, R., Schot, J., & Truffer, B. (2002). *Experimenting for sustainable transport. The approach of strategic niche management*. London: E. & F.N. Spon.

Hoppe, R. (2010). From "knowledge use" towards "boundary work": Sketch of an emerging new agenda for inquiry into science-policy interaction. In R. J. Veld (Ed.), *Knowledge democracy. consequences for science, politics, and media* (pp. 169–186). Berlin: Springer.

Innes, J. E., & Booher, D. E. (2010). *Planning with complexity: An introduction to collaborative rationality for public policy*. London: Routledge.

Karvonen, A., & van Heur, B. (2014). Urban laboratories: Experiments in reworking cities. *International Journal of Urban and Regional Research*, *38*(2), 379–392.

Kemp, R., Schot, J., & Hoogma, R. (1998). Regime shifts to sustainability through processes of niche formation. The approach of strategic niche management. *Technology Analysis and Strategic Management*, *10*(2), 175–195.

Kemp, R., & Rotmans, J. (2009), Transitioning policy: Coproduction of a new strategic framework for energy innovation policy in the Netherlands. *Policy Sciences*, *42*(4), 303–322.

Kemp, R., & van den Bosch, S. (2006). *Transitie-experimenten: Praktijkexperimenten met de potentie om bij te dragen aan transities*. Utrecht: Kenniscentrum voor Duurzame Systeeminnovaties en Transities (KCT).

Kenniscentrum Stedelijke Vernieuwing, & NICIS Institute. (2012). *Essay: Stedelijke vernieuwing op uitnodiging* [*Essay: Urban renewal on request*]. Wormerveer: Zwaan Printmedia.

Levy, J. M. (2016). *Contemporary planning*. London & New York: Routledge.

Leminen, S., Westerlund, M., & Nyström, A. (2012). Living labs as open–innovation networks. *Technology Innovation Management Review*, *2*(9), 6–11.

McGuirk, P., Dowling, R., Brennan, C., & Bulkeley, H. (2015). Urban carbon governance experiments: The role of Australian local governments. *Geographical Research*, *53*, 39–52.

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

Pohl, C., & Hadorn, G. H. (2008). Methodological challenges of transdisciplinary research. *Natures Sciences Sociétés*, *16*(2), 111–121.

Prahalad, C. K., & Ramaswamy, V. (2004). Co-creation experiences: The next practice in value creation. *Journal of Interactive Marketing*, *18*(3), 5–14.

Reich, M. (1975). A noisy tale of two cities. *Planning*, *41*(8), 8–11.

Schliwa G., & McCormick, K. (2016). Living labs: Users, citizens and transitions. In J. Evans, A. Karvonen, & R. Raven (Eds.), *The experimental city* (pp. 163–168). Oxon and New York: Routledge.

Sengers, F., Berkhout, F., Wieczorek, A., & Raven, R. (2016). Experimenting in the city: Unpacking notions of experimentation for sustainability. In J. Evans, A. Karvonen, & R. Raven (Eds.), *The experimental city* (pp. 15–31). Oxon & New York: Routledge.

Thomke, S. H. (2003). *Experimentation matters. Unlocking the potential of new technologies for innovation*. Harvard Business School Press.

Van de Ven, A. H. (1986). Central problems in the management of innovation. *Management Science*, *32*(5), 590–607.

Van de Ven, A. H., Polley, E. E., Garud, R., & Venkataraman, S. (1999). *The innovation journey*. New York: Oxford University Press.

Veeckman, C., Schuurman, D., Leminen, S., & Westerlund, M. (2013). Linking living lab characteristics and their outcomes: Towards a conceptual framework. *Technology Innovation Management Review*, *3*(12), 6–15.

Voytenko, Y., McCormick, K., Evans, J., & Schliwa, G. (2016). Urban living labs for sustainability and low carbon cities in Europe: Towards a research agenda. *Journal of Cleaner Production*, *123*, 45–54.

Waste, R. J. (1987). *Power and pluralism in American cities. Researching the urban laboratory*. Westport, CT: Greenwood Press.

Westley, F., Goebey, S, & Robinson, K. (2012). *What is a change lab/design lab for social innovation; a thought piece for the development of a new approach for building capacity for social innovation in Canada*. Waterloo: Waterloo Institute of Social Innovation and Resilience. Retrieved from http://sigeneration.ca/documents/Paper_FINAL_LabforSocialInnovation.pdf

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Article

Climate Change: Implications for the Assumptions, Goals and Methods of Urban Environmental Planning

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Abstract
As a result of increasing awareness of the implications of global climate change, shifts are becoming necessary and apparent in the assumptions, concepts, goals and methods of urban environmental planning. This review will present the argument that these changes represent a genuine paradigm shift in urban environmental planning. Reflection and action to develop this paradigm shift is critical now and in the next decades, because environmental planning for cities will only become more urgent as we enter a new climate period. The concepts, methods and assumptions that urban environmental planners have relied on in previous decades to protect people, ecosystems and physical structures are inadequate if they do not explicitly account for a rapidly changing regional climate context, specifically from a hydrological and ecological perspective. The over-arching concept of spatial suitability that guided planning in most of the 20th century has already given way to concepts that address sustainability, recognizing the importance of temporality. Quite rapidly, the concept of sustainability has been replaced in many planning contexts by the priority of establishing resilience in the face of extreme disturbance events. Now even this concept of resilience is being incorporated into a novel concept of urban planning as a process of adaptation to permanent, incremental environmental changes. This adaptation concept recognizes the necessity for continued resilience to extreme events, while acknowledging that permanent changes are also occurring as a result of trends that have a clear direction over time, such as rising sea levels. Similarly, the methods of urban environmental planning have relied on statistical data about hydrological and ecological systems that will not adequately describe these systems under a new climate regime. These methods are beginning to be replaced by methods that make use of early warning systems for regime shifts, and process-based quantitative models of regional system behavior that may soon be used to determine acceptable land uses. Finally, the philosophical assumptions that underlie urban environmental planning are changing to address new epistemological, ontological and ethical assumptions that support new methods and goals. The inability to use the past as a guide to the future, new prioritizations of values for adaptation, and renewed efforts to focus on intergenerational justice are provided as examples. In order to represent a genuine paradigm shift, this review argues that changes must begin to be evident across the underlying assumptions, conceptual frameworks, and methods of urban environmental planning, and be attributable to the same root cause. The examples presented here represent the early stages of a change in the overall paradigm of the discipline.

Keywords
climate change; ecological planning; planning theory; sea level rise; urban environments

Issue
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1. Introduction

Anthropogenic climate change is already causing measurable effects in regional and local environments (Boon & Mitchell, 2015; DeConto & Pollard, 2016; Hannaford, 2015; Kelley, Mohtadi, Cane, Seager, & Kushnir, 2015). There is increasing evidence that these changes are forcing urban environmental planners to gradually alter their

epistemological assumptions, conceptual frameworks, goals, and methods. A paradigm shift in an applied discipline such as planning involves precisely these types of changes, in everything from philosophical assumptions to applied methods. This paper will use examples to argue that the phenomenon of entering a new climate era is producing a paradigm shift in urban environmental planning. However, like climate change itself, this shift is still in its early stages.

In this review, I argue that the goals and concepts, methods, and philosophical underpinnings of urban environmental planning are beginning to shift. A broad literature of examples is available, many of which have emerged from the demands of current practice rather than from a theoretical position. An emerging literature proposes new frameworks and methods for urban planning generally to respond to the implications of climate change (Hodson & Marvin, 2009; Jabareen, 2015; Stone, 2012). Like these authors, I contend that the implications of climate change require us to shift some of the fundamental assumptions of planning. However, while they address more general planning practices, I will focus specifically on theories and plans that address the biophysical conditions of the city and its region. I intend for this review to serve as an original contribution by categorizing and synthesizing emerging patterns in theory and practice. Its focus on examples from North American cases and literature in urban environmental planning allows my claim of an emerging paradigm shift to remain grounded in a network of academics and practitioners who are aware of and influenced by each other's work. Throughout, I will argue that a coherent paradigm shift can only be said to exist if changes are occurring simultaneously in the key assumptions, conceptual frameworks, and methods of a discipline, and that these changes must be driven by the same root cause.

2. Urban Environmental Planning and Biodiversity: The U.S. Context

My observations of a paradigm shift in environmental planning are rooted in novel planning efforts over the last fifteen years that were intended to protect biodiversity from urbanization, as well as planning efforts that originate in a desire to establish resilience to flooding events, or—more recently—to adapt to permanent trends such as rising sea levels. For that reason, it is important to briefly note two key U.S. Federal laws, the expansion and enforcement of which led U.S. urban environmental planning to change under different conditions and with different timing than in Europe and Asia.

Since the late 1960s, urban environmental planning in western North America has paid increasing attention to biodiversity (Thomas, 2003). Like South America, Australia, India and Africa, western North America was industrialized relatively late, developing cities in the modern sense only after 1850 (Otterstrom, 2004). Large wild animals with strong cultural associations continue to exist within many urban ecosystems—not just in rural areas. Cities across the North American west include small but visible populations of mountain lions (*Puma concolor*), black bears (*Ursus americanus*), bald eagles (*Haliaeetus leucocephalus*), and Chinook salmon (*Oncorhynchus tshawytscha*), among other species (Beatley, 2000). The US Endangered Species Act (ESA) of 1973 was initially focused on conserving populations of species, rather than on maintaining a network of protected habitats, as in the European Union's Natura 2000 legislation (Verschuuren, 2004). Large animals with extensive ranges often pass through urban and suburban areas during migrations or in search of resources, and the US Endangered Species Act protects these species even from the indirect effects of urbanization, such as pollution in stormwater runoff. For these reasons, urban environmental planning in the United States, particularly the western U.S., has been challenged to plan and design urban areas to accommodate large wildlife species whose populations are in decline, such as the Chinook salmon (Simenstad, Tanner, Crandell, White, & Cordell, 2005), which was listed as threatened under Federal law in the Puget Sound region of Washington State in 1999 (National Oceanic and Atmospheric Administration, 1999).

Similarly, the U.S. Clean Water Act of 1972 now strictly regulates pollution loads in urban stormwater runoff that originate in dispersed, non-point sources such as motorized vehicle traffic (Craig, 2005). Cities must not exceed established maximum loads, or they face penalties. This extension of the Clean Water Act to set standards for urban runoff prompted widespread experimentation with landscape-based methods for detaining runoff and filtering pollutants, significantly expanding the technical role of urban environmental planners. Together, these two Federal laws led to significant changes in urban infrastructure design and urban environmental planning since the 1990s, particularly in regions that discharge urban runoff to ecosystems with high biodiversity, such as the Puget Sound in the Pacific Northwest (Feist, Buhle, Arnold, Davis, & Scholz, 2011; Simenstad et al., 2005), and the Chesapeake Bay in the mid-Atlantic region.

It would be impossible to describe the recent trend towards a paradigm shift in North American urban environmental planning without noting these regulations. The efforts of urban planners to optimize the pattern and performance of cities to support aquatic habitat and higher levels of water quality are important points of origin for the paradigm shifts we confront today in relation to climate change (Ward, Anderson, Beechie, Pess, & Ford, 2015).

In the first section of this paper, I will present changes in the conceptual frameworks of urban environmental planning as a result of extreme weather events and climate trends. The second section of this paper will contain a review of key methods that are changing as a result of the same phenomena. The third and final section will suggest changes that are beginning to occur in the philo-

sophical assumptions that underlie urban environmental planning, which I argue is the final component necessary to identify a coherent paradigm shift.

3. Changing Concepts: From "Suitability" to "Sustainable Development" to "Resilience" to "Adaptation"

Over the last thirty years, the stated goals and associated conceptual frameworks of urban environmental planning in the U.S. have changed, and these changes have occurred with increasing speed. Before the 1980s, the dominant framework was driven by the search for "suitability," defined as a good match between the physical characteristics of a location and its land use, or the type of design that is used (Hills, 1974; McHarg, 1969; Steinitz, 1990). Since that time, the broad goal of urban environmental planning has shifted to an effort to manage "sustainable development" (World Commission on Environment and Development, 1987), which recognized that there are limits to development that involve temporal patterns of resource use and availability, as well as spatial patterns. More recently, the goal of many cities and regions has been to achieve "resilience," or, an ability to recover quickly from disasters such as earthquakes, hurricanes, river flooding, fires, and terrorist attacks (Chelleri, Waters, Olazabal, & Minucci, 2015). Barely a decade old, the concept of "resilience" to temporary events has already begun to be subsumed under the need to engage in permanent adaptation to climate trends. The concept of "adaptation" refers to reducing the vulnerability of an area to permanent, incremental trends such as higher sea levels, reduced regional rainfall or snowfall, new geographic patterns of disease transmission as a result of warming winters, and extended heat waves—along with the secondary and tertiary effects of these trends on urban regions (Hill, 2015).

These changes in the rationales and concepts of planning represent underlying changes in our understanding of the complexity of inter-related environmental patterns in space and time. They also represent shifts in the goals and rationales for planning. Ian McHarg's lectures and writing in the 1970s strongly emphasized the need to restrict negative human impacts on the environment (see for example his lecture titled, Man, Planetary Disease, [McHarg, 1971]). In contrast, the Brundtland Report emphasized the potential for human cities and expanding resource uses to be successfully integrated into the natural systems of the planet (World Commission on Environment and Development, 1987). Shortly after, symposia were held that recognized global climate trends as a challenge to sustainable resource use, although optimism was still high that global climate change could be avoided through careful planning (DeFries & Malone, 1989).

Since the late 1980s, the concept of sustainable development has been used widely in urban environmental planning (Wheeler & Beatley, 2014). In North America, it has often been applied by adopting the goal of sustaining pre-development processes (particularly hydrological flow regimes and species movement patterns) and the biodiversity that is characteristic of a geographic region (Bixler et al., 2016). This overall goal of sustaining pre-development processes and biodiversity led to the development of a set of concepts and methods within the patchwork of local land-use and infrastructure authorities that limit the scope of U.S. urban planning. Together, the goal itself and the concepts and methods associated with it might be called the "sustainable development conceptual framework" in American urban environmental planning.

As it developed in the U. S., sustainable development relied on the ability of planners and ecologists to describe historical ecological relationships, inferred from soil patterns and other markers of past processes, and track the effects of contemporary resource uses on the health of those historical relationships (Kerans & Karr, 1994; Rapport et al., 1998). Similarly, the concept of a "native species" in North America relies on a determination that a species has been present in a region over thousands of years, and implies an assumption of relative stability in species distributions (Goodenough, 2010). The concept of "native" is fundamentally historical and ignores the scientific knowledge that species have moved as climates have changed throughout the Holocene. The concept doesn't consider whether or not a species is well suited to a particular region as its climate changes. This makes the central concept of "native species" vulnerable to becoming completely outdated in the next few decades (Baker et al., 2013; Sorte, 2013). It also points out limitations in the way that the concept of sustainable development has been applied in U.S. urban environments, because of its conceptual dependency on the idea of sustaining pre-development processes (Hobbs et al., 2014; Palmer & Ruhl, 2015). The concepts of a "reference condition" and a "native species" both need significant re-consideration, along with the assumption that the scale of processes that underlie both biodiversity patterns and cultural landscapes, such as hydrologic flows, will continue to resemble the patterns of the last 1,000–3,000 years (Rockström et al., 2014). To the extent that the concept of sustainable development in North American urban regions became synonymous with the goals of sustaining native species and pre-development hydrologic processes, the concept is not robust in an era of rapid climate change.

The newer term that has already replaced "sustainable development" as a goal and framework in North American cities, particularly coastal cities, is "resilience" (Coaffee & Lee, 2016). This goal refers to the ability of a system to recover its functions quickly after a major disturbance. The very frequent use of this term in the last decade reflects a heightened awareness of the potential for extreme weather to produce destructive events in North American cities. Hurricane Katrina in New Orleans (2005) and Superstorm Sandy in the New York region

(2012) were important events that drove the adoption of resilience as the highest-priority goal of these coastal cities (Weisz, Blumberg, & Keenan, 2015).

In post-hurricane New Orleans, a series of workshops sponsored by the Dutch Embassy brought Dutch engineers and urban planners to the U.S., working alongside American planners and engineers (Waggonner & Meyer, 2010). These workshops eventually led to the development of a new water management strategy for the New Orleans region (Waggonner and Ball Architects, 2013) which emphasizes strategies for managing stormwater runoff from an extreme rainfall event. In New York, federal agencies sponsored a design/planning competition called "Rebuild by Design" that emphasized strategies for that region to recover from the types of storm surges and extreme rainfall related to large hurricane events (Hurricane Sandy Rebuilding Task Force, 2013). "Resilience" was used frequently to describe the desired capacity to recover more quickly from a disastrous event.

Yet it is important to note that the shift in goals and framework from "sustainable development" to "resilience" occurred because of a focus on disastrous single events, not on the incremental trends (such as higher sea levels) that are expected as a result of climate change (Shi, Chu, & Debats, 2015). Initially, the use of the term "resilience" could be seen as an extension of the sustainable development framework, because it marks planners' recognition that sustaining cities requires that those cities must be prepared for major disaster events—from hurricanes to terrorist attacks. But as media news sources, academics and professional planners in some regions of the United States have converged on a general level of acceptance that climate change is happening, the term "sustainable" has frequently been replaced by the term "resilience" as public agencies present their planning goals. This represents a significant shift, and often implies an unstated recognition that some of the land and infrastructure cities administer today may not be sustained into the future (Wang, Tang, & Wang, 2014). The poignancy of this reality is palpable in urban neighborhoods that are unlikely to ever fully recover from an extreme storm, such as the still largely depopulated Lower Ninth Ward of New Orleans (Landphair, 2007).

Even more recently, a framework is emerging that recognizes the goal of incremental, permanent environmental change in urban planning. This became evident in 2009, when one of the leading public agencies of the San Francisco Bay area sponsored a design competition called "Rising Tides" (King, 2009). In this competition, the San Francisco Bay Conservation and Development Commission (BCDC) called for urban and environmental planning strategies to address the permanent sea level rise associated with climate change. The competition was followed by a planning program that is working county-by-county to identify needs for adaptation in public infrastructure, called "Adapting to Rising Tides" (http://www.adaptingtorisingtides.org). The concept of using adaptation to adjust to permanent changes while building in resilience to extreme events is now embedded in planning conversations in the San Francisco Bay Area. In other parts of the U.S., political affiliation seems to affect the perceived need for adaptation in addition to resilience (Botzen, Michel-Kerjan, Kunreuther, de Moel, & Aerts, 2016). Terms like "recurrent flooding" are used instead of referring to adaptation to sea level rise in regions where climate change is not an acknowledged phenomenon (Huler, 2012). But this is a special case of language being limited by regional politics, not by the knowledge or goals of the planning discipline.

My argument that a paradigm shift is occurring in urban environmental planning relies on the conclusion that these changes in terminology for goals and conceptual frames are more than just semantic. The change from "sustainability" to "resilience" to "adaptability" reflects changes in the underlying goals of urban environmental planning, driven by a growing comprehension of the types of significant changes cities are experiencing. Pursuing the goal of "resilience" operates as a kind of half-step between the paradigms of sustainability and adaptation, since resilience to extreme events will be needed in the future as much as it is needed today. In that sense, the change in conceptual frames is really a change from the "sustainability framework" to the "adaptation framework," while retaining the goal of resilience (meaning, the ability to recovery quickly from a disaster event) into the new climate future.

4. Changes in Methods for Urban Environmental Planning

If a paradigm shift is indeed occurring in urban environmental planning in response to our awareness of global climate change, this shift should be evident in the methods of planning as well as in its goals and conceptual frameworks. In fact, some methods are changing. This is evident in several areas of planning work, from physical and social vulnerability assessments to typological design methods and statistically-based methods of sizing systems for flood protection. This section will present examples of these methodological changes.

The first area of methods that are changing might be referred to broadly as vulnerability assessments (Füssel & Klein, 2006). Many communities in the United States are engaged in what is currently a somewhat chaotic effort to define the appropriate scope and analytical methods for vulnerability studies (Berke et al., 2015), sometimes assisted by guidance from state and county jurisdictions (see for example, California Coastal Commission, 2015). These may be studies of vulnerability to physical phenomena such as sea level rise and freshwater flooding, earthquake liquefaction, fire, or drought, as well as new public health hazards or social inequality drivers. Terms such as exposure, risk, vulnerability, and hazard are not standardized, nor are the timeframes that should be used in order for the assessments to reflect future conditions. Generally, only primary exposures are stud-

ied, which excludes the study of secondary network impacts such as traffic congestion caused by fire or flooding effects on roadways (Biging, Radke, & Lee, 2012). Potential changes in ecological conditions that might be considered tertiary exposures are also rarely considered in vulnerability plans, such as harmful algal blooms driven by nutrient inputs and warming temperatures that affect the use and value of coastal property, along with human health (Glibert et al., 2014).

Moreover, there are new questions about the methods that are appropriate for assessing social vulnerability in vulnerability plans. The index of social vulnerability was developed in relation to events, not long-term permanent adaptation processes (Cutter, Boruff, & Shirley, 2003). This index includes variables such as income, family size, languages spoken, and race, which have been correlated with vulnerability in emergency events in the US southeast. But the current need is for methods that will allow us to predict the ability of different adaptation proposals to increase social equity, rather than maintain the status quo. The term "vulnerable" itself is becoming contested in new ways, as communities that are relatively wealthy but physically vulnerable use the term to justify new funding that could help them adapt to changes such as sea level rise (see for example the vulnerability study for affluent coastal communities that serve as vacation rental properties most of each year, in Marin, California—Marin County Community Development Agency, 2015).

The second category of changing methods is the statistical methods that are deeply embedded in the epistemological assumptions of environmental planning and risk management, such as calculating the statistical recurrence interval of rainfall, flood or fire events. These methods rely on the concept of stationarity, which assumes that variability in natural systems occurs within a consistent envelope or range of values over long periods of time. As one author in the recent method debates has noted, "In view of the magnitude and ubiquity of the hydroclimatic change apparently now under way, however, we assert that stationarity is dead and should no longer serve as a central, default assumption in water-resource risk assessment and planning. Finding a suitable successor is crucial for human adaptation to changing climate," (Milly et al., 2008). While there is currently an active debate about what methods can be used to compensate for climate change, it is clear that methods will need to change, particularly as the statistical signal of climate change becomes stronger (Milly et al., 2015; Stedinger & Griffis, 2011; Stroup, 2011). If stationarity is "dead," the loss of its associated methodological assumptions represents a very significant shift from past methods in urban environmental planning as well as ecosystem management, water resources and civil engineering.

The third area of change is in the development of so-called "early warning systems." New methods are emerging that attempt to track the statistical dynamics of system behavior in order to identify and eventually to predict abrupt changes in state. Some researchers are looking for so-called regime shifts using moving-window calculations as an analytical tool with large datasets, tracking the range of variability in those data over time, among other variables (Dakos, Carpenter, van Nes, & Scheffer, 2014). These new methods are being used to forecast changes in the ecosystem or population-level status of conditions in lakes, wetlands, housing markets, and human biomedical assays associated with epileptic seizures. The difficulty is in identifying the right variables to track, according to some authors (Pace, Carpenter, & Cole, 2015). The intention of these new methods is to allow managers and planners to make adjustments in systems before they shift to a less-desirable state, as in a lake that becomes eutrophic or filled with toxic algae, or a tidal wetland that collapses to a mudflat because of repeated storm surge events. One of the most interesting theoretical observations that has come out of these new methods with respect to urban environmental planning is the observation that habitat connectivity may be less desirable in a changing climate (Scheffer et al., 2012). Redundancy may preserve more biodiversity under conditions of stress than connectivity. This research on regime shifts is in early stages as it relates to urban planning, but it is likely to generate a suite of new methods associated with the adaptation framework in planning.

Fourth, there is also a need for generative methods that help planners identify appropriate spatial strategies for coastal protection and urban district design. It seems likely that new typologies will be needed that serve to organize the range of possible physical strategies (Hill, 2011, 2015). These can allow planners to assess current conditions and gain new insights about the spatial variability of vulnerability and change. For example, it is likely that logical pairings of urban district types with shoreline types will be needed, such as pairing floodable urban districts with wetland and beach/dune systems, rather than selecting a shoreline strategy independently. Typologies can also help to assess whether suitable strategies are being overlooked, perhaps unintentionally (Hill, 2015).

Finally, the use of an "adaptation conceptual framework" in urban environmental planning is prompting new uses of regional process models. Whether planners are using two-dimensional models of change in wetland response or sediment erosion, or more complex models of hydrodynamics and flooding (P. L. Barnard, Jaffe, & Schoellhamer, 2013; Holleman & Stacey, 2014), the change is in how the models are used. In a sustainability framework, the models would be used to optimize spatial configurations. In an adaptation framework, they are more likely to be used iteratively to gain successive approximations of what adaptations are likely to work well or cause problems. For example, the US Geological Survey has developed a hydrodynamic model of the San Francisco Bay that allows planners to estimate tidal flooding depths at different locations around the shoreline (P. Barnard, 2015). Early studies using similar models have shown that in some parts of the San Francisco Bay, building walls on shorelines as an adaptation mea-

sure will increase the depth of flooding in nearby areas (Holleman & Stacey, 2014). In only a few years, planners will be able to insert proposals for coastal adaptation into the model and predict whether those adaptation projects will make another property owner's situation worse. They could use that information to alter the design and re-test it, or to allow or deny a permit. As adaptation changes occur, they will have to be recorded in the physical descriptions within the model so that new predictions would continue to reflect current conditions.

5. Changes in Philosophical Assumptions: Epistemology, Ontology, and Ethics in Environmental Planning

One of the key assumptions that underlies urban environmental planning is an epistemological assumption that the processes and patterns of the past can serve as a guide to the future. We have been able to know what is "good" and therefore in need of conservation by comparing our present conditions to the conditions of the past (Steinitz, 2012). The past has been, in a philosophical sense, a source of authority for environmental planning (Spirn, 1984, 2002). We have treated the relatively new practices of industrial agriculture and urbanization as destabilizing forces which must be countered by planning. The goal was to retain and protect elements of an earlier landscape. Our assumption has been that biodiversity, ecosystems, air and water quality, and human health can all be protected most effectively if we retain the framework of a long-standing landscape mosaic (Forman, 1997; Forman & Godron, 1986; Marsh, 1991).

In an effort to define and mimic a stable set of fundamental processes within urban regions, urban environmental planners have tended to represent the past as relatively stable. Yet studies from the 1960s demonstrated that American plants and animals experienced dramatic changes in range as a result of the last glaciation of North America, and that they returned individualistically to their current communities—not in the associations we have seen them occupy in over the last hundred years and more (Terasmae, 1970). In spite of that evidence, most environmental planners still tend to think and speak of these plant and animal communities as if they have been stable, and can be maintained as stable units of ecosystems. Given certain temporal scale assumptions, this was reasonable. But given current predictions for rapid climatic change, it is now necessary to let go of this epistemological assumption that the past should be our primary source of authority on how to prioritize the components of present and the future ecosystems (Davis & Shaw, 2001). Presumably, it should be replaced with a heavier reliance on predictive models that represent the dynamics of systems, in spite of their uncertainties.

The second philosophical issue raised by global climate change is ontological, or related to how we conceptualize our larger world and its interactions. Scholars and planners have come to recognize that local regions are deeply affected by global trade and financial investment patterns (Harvey, 2000; Sassen, 2014), but nevertheless, professional planners are often put in the position of working as if their jurisdictions are coherent regions with development trajectories independent of global systems. This is an ontological assumption in the sense that policy makers and citizens may think the degree to which we live in a globalized system can be reduced, using new laws, policies and/or physical border walls (Porter, 2016). But in fact, we live in an unprecedented situation of simultaneous environmental and economic changes that continue to occur and produce cascading effects on a global scale.

A third philosophical issue involves the ethical assumptions that influence environmental planning. It has been accepted as reasonable in the United States for each generation to conserve some land from development, and pass this legacy on to future generations as a form of inter-generational inheritance; a legacy of natural resources that are represented by the proxy of geographic space (see for example, the dedication of a very large marine reserve by President Obama off the coastline of the US State of Hawai'i in September of 2016 [Hirschfeld Davis, 2016]). This act of reserving large areas of land has been the primary way in which American environmental planners fulfill their perceived obligations to future generations. For example, a renowned American biologist has recently called to set aside half of the earth to sustain biodiversity (Wilson, 2016). Other forms of contemporary resource use, such as fossil fuel use, have received less attention in an inter-generational context because the assumption is that technology will change and allow future humans to use other energy sources (Nicholson, 2015).

But climate change is forcing new, uncomfortable reflections on the scale and cost burden of the structural adaptation projects current generations should assume (Moellendorf, 2009; Moellendorf & Schaffer, 2016). Should the generations that enjoyed the use of fossil fuels invest more of their resources to prepare for the future dynamics of flooding, drought, and fire that are the consequences of their unrestricted use of carbon-based fuels? In other words, should we build big adaptation projects now, before the seas rise much more rapidly, or should we defer that cost to future generations who will do it when it is needed (Grasso, 2010)?

Most planners, scientists and geographers who reflect on the onset of an Anthropocene era focus on defining the threshold at which that new era has begun or will begin (Braje, 2016; Waters et al., 2016). But from an ethical reasoning perspective, we could also interpret our current era as the last few stable decades of an 8,000–10,000 year period (the Holocene). What is an ethically appropriate use of the last few decades of a long, stable period? Should we continue to optimize our investments to a lowest-cost, least-disruption adaptation pathway in the near future (Reeder & Ranger, 2011) or are

we ethically bound to do all we can for future generations, given that they will bear most of the costs of our past use of cheap fossil fuels (Grasso, 2010)? Seen in that light, the transition to the Anthropocene creates an urgent need to re-evaluate the goals of urban environmental planning projects, even if the effects of trends such as sea level rise may not be acute until after 2050. As a result, a wide range of new ethical questions are starting to be asked during discussions of appropriate goals and methods of planning for the Anthropocene (Graham & Roelvink, 2010).

In summary, my argument in this section has been that three key philosophical assumptions are changing that underlie urban environmental planning: the epistemological assumption that the past is the key to knowledge about the future, the ontological assumption that regions can choose to become more independent from global systems; and the ethical assumption that we can defer the costs of urban adaptation to a changed climate to future generations.

6. Conclusions

The examples presented here provide evidence that pressures are mounting to drive a genuine shift in the concepts, methods and underlying assumptions of urban environmental planning in the United States, and more broadly in North America. Table 1 summarizes the examples presented under each category of praxis. This summary demonstrates that a series of changes have occurred in the concepts and goals of environmental planning over the last 30 years. My argument is that it is the

Table 1. Summary of a paradigm shift: how is our encounter with climate change beginning to change planning?

	A *Paradigm Shift* involves changes to:
Philosophical Assumptions	**Epistemology**—How do we know what sources of knowledge will be sufficient, given our uncertainty about the magnitude and complexity of future change? We are coping with the loss of the past as a guide to what is good or sufficient.
	Ontology—How can we conceive of our new inter-scalar relationships? What is local and global, when simultaneous changes in global processes are expressed locally, and local changes impact regional dynamics? We need to re-define the dependence/independence of local and regional choices, in both environmental and economic contexts.
	Ethics—How much should we do now, and for whom/where?
Goals/Conceptual Frameworks	**Suitability**—Goal was to put things in the right place, given long-term historical conditions.
	Sustainability—Goal was to keep what we have, while mitigating/reducing carbon emissions.
	Resilience—Goal is to recover more quickly and with fewer losses after disaster events.
	Adaptation—If we can't sustain some things in a new world ("native" species example), then the new goal is to accept new forms for cities and new characteristics of ecosystems that are adapted to new conditions, that are resilient to extreme events, and that reduce carbon emissions.
Methods	**Vulnerability Assessments**—Problematic to determine how to do this, when there are so many inter-related variables and processes, many changing simultaneously (uncertainties and scale interactions). Also problematic to do them in a way that defines/identifies particularly vulnerable communities, in an unequal social context (ethics).
	End of Stationarity—We can no longer rely on statistical methods of the past. We need new ways of estimating sufficiency in plans, particularly regarding acceptable levels of risk.
	Early Warning—We need to anticipate regime shifts. New statistical methods and interpretations seem to be emerging but are still unreliable.
	Building Urban Districts—We can't use traditional types in traditional locations, and markets seem unlikely to supply the solution quickly. Typological approaches to search "solution spaces" may be most useful now.
	Managing Complex Models—Regulators need to model and predict new regional dynamics, not just rely on patterns of the past. For coastal areas, new methods are available for quantitative regional models to support the regulatory process, but using them will also change that regulatory process.

rapid turnover from sustainability to resilience to adaptation during the last 25 years, coupled with changes in methods and philosophical assumptions, which provides the evidence for a genuine paradigm shift.

Perhaps the greatest change as a result of climate trends is occurring in the rationale for urban environmental planning itself. The need to make strategic plans immediately to guide the interactions of communities with their environments—in the context of ethical arguments, contested financial investments, and predicted environmental changes—is more urgent than ever. If we accept the scientific evidence that we are currently enjoying the last stable decades of an 8,000–10,000 year period, 20–30 years from now we can expect to be in a state of perpetually responding to extreme conditions. Urban environmental planning has never been more urgently needed as a strategic planning approach, anticipating future change, rather than as a rear-guard effort to protect resources from development. We urgently need to expand and strengthen the concepts, methods and assumptions of urban environmental planning to incorporate predictions of rapid, permanent environmental change and prepare cities for the immediate future.

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References

Baker, L., Dove, M., Graef, D., Keleman, A., Kneas, D., Osterhoudt, S., & Stoike, J. (2013). Whose diversity counts? The politics and paradoxes of modern diversity. *Sustainability*, *5*(6), 2495–2518. doi:10.3390/su5062495

Barnard, P. (2015). *CoSMoS: Coastal storm modeling system*. Reston. VA: United States Geological Survey. Retrieved from https://walrus.wr.usgs.gov/coastal_processes/cosmos/

Barnard, P. L., Jaffe, B. E., & Schoellhamer, D. H. (2013). Preface for special issue of *Marine Geology*. *Marine Geology*, *345*, 1–2. doi:10.1016/j.margeo.2013.09.010

Beatley, T. (2000). Preserving biodiversity: Challenges for planners. *APA Journal*, *66*(1), 4–20.

Berke, P., Newman, G., Lee, J., Combs, T., Kolosna, C., & Salvesen, D. (2015). Evaluation of networks of plans and vulnerability to hazards and climate change: A resilience scorecard. *Journal of the American Planning Association*, *81*(4), 287–302. doi:10.1080/01944363.2015.1093954

Biging, G., Radke, J., & Lee, J. H. (2012). *Impacts of predicted sea level rise and extreme storm events on the transportaiton infrastructure in the San Francisco Bay region* (No. CEC-500-2012-040). Sacramento, CA: California Energy Commission.

Bixler, R. P., Johnson, S., Emerson, K., Nabatchi, T., Reuling, M., Curtin, C., . . . Grove, J. M. (2016). Networks and landscapes: A framework for setting goals and evaluating performance at the large landscape scale. *Frontiers in Ecology and the Environment*, *14*(3), 145–153. doi:10.1002/fee.1250

Boon, J. D., & Mitchell, M. (2015). Nonlinear change in sea level observed at North American tide stations. *Journal of Coastal Research*, *316*, 1295–1305. doi:10.2112/JCOASTRES-D-15-00041.1

Botzen, W. W., Michel-Kerjan, E., Kunreuther, H., de Moel, H., & Aerts, J. C. (2016). Political affiliation affects adaptation to climate risks: Evidence from New York City. *Climatic Change*, *138*(1), 353–360. doi:10.1007/s10584-016-1735-9

Braje, T. J. (2016). Evaluating the Anthropocene: Is there something useful about a geological epoch of humans? *Antiquity*, *90*(350), 504–512. doi:10.15184/aqy.2016.32

California Coastal Commission. (2015). *California Coastal Commission sea level rise policy guidance: Interpretive guidelines for addressing sea level rise in local coastal programs and coastal development permits*. San Francisco, CA: California Coastal Commission. Retrieved from http://documents.coastal.ca.gov/assets/slr/guidance/August2015/0_Full_Adopted_Sea_Level_Rise_Policy_Guidance.pdf

Chelleri, L., Waters, J. J., Olazabal, M., & Minucci, G. (2015). Resilience trade-offs: Addressing multiple scales and temporal aspects of urban resilience. *Environment and Urbanization*, *27*(1), 181–198. doi:10.1177/0956247814550780

Coaffee, J., & Lee, P. (2016). *Urban resilience: Planning for risk, crisis and uncertainty*. New York: Palgrave Macmillan.

Craig, R. K. (2005). Urban runoff and ocean water quality in Southern California: What tools does the clean water act provide. *Chap. L. Rev.*, *9*, 313.

Cutter, S. L., Boruff, B. J., & Shirley, W. L. (2003). Social vulnerability to environmental hazards. *Social Science Quarterly*, *84*(2), 242–261.

Dakos, V., Carpenter, S. R., van Nes, E. H., & Scheffer, M. (2014). Resilience indicators: Prospects and lim-

itations for early warnings of regime shifts. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *370*(1659), 20130263–20130263. doi:10.1098/rstb.2013.0263

Davis, M. B., & Shaw, R. G. (2001). Range shifts and adaptive responses to quaternary climate change. *Science*, *292*(5517), 673–679.

DeConto, R. M., & Pollard, D. (2016). Contribution of Antarctica to past and future sea-level rise. *Nature*, *531*(7596), 591–597. doi:10.1038/nature17145

DeFries, R., & Malone, T. (1989). *Global change and our common future: Papers from a forum*. Washington, DC: Committee on Global Change, National Research Council, National Academy Press.

Feist, B. E., Buhle, E. R., Arnold, P., Davis, J. W., & Scholz, N. L. (2011). Landscape ecotoxicology of coho salmon spawner mortality in urban streams. *PLoS One*, *6*(8), e23424. doi:10.1371/journal.pone.0023424

Forman, R. T. T. (1997). *Land mosaics: The ecology of landscapes and regions*. Cambridge, UK: Cambridge University Press.

Forman, R. T. T., & Godron, M. (1986). *Landscape ecology*. New York: Wiley.

Füssel, H.-M., & Klein, R. J. T. (2006). Climate change vulnerability assessments: An evolution of conceptual thinking. *Climatic Change*, *75*(3), 301–329. doi:10.1007/s10584-006-0329-3

Glibert, P. M., Icarus Allen, J., Artioli, Y., Beusen, A., Bouwman, L., Harle, J., . . . Holt, J. (2014). Vulnerability of coastal ecosystems to changes in harmful algal bloom distribution in response to climate change: Projections based on model analysis. *Global Change Biology*, *20*(12), 3845–3858. doi:10.1111/gcb.12662

Goodenough, A. E. (2010). Are the ecological impacts of alien species misrepresented? A review of the "native good, alien bad" philosophy. *Community Ecology*, *11*(1), 13–21.

Graham, J. K. G., & Roelvink, G. (2010). An economic ethics for the Anthropocene. *Antipode*, *41*, 320–346. doi:10.1111/j.1467-8330.2009.00728.x

Grasso, M. (2010). *Justice in funding adaptation under the international climate change regime*. Berlin: Springer.

Hannaford, J. (2015). Climate-driven changes in UK river flows: A review of the evidence. *Progress in Physical Geography*, *39*(1), 29–48. doi:10.1177/0309133314536755

Harvey, D. (2000). *Spaces of hope*. Berkeley, CA: University of California Press.

Hill, K. (2011). Climate-resilient urban waterfronts. In J. Aerts, W. Botzen, M. Bowman, P. Dircke, & P. Ward (Eds.), *Climate adaptation and flood risk in coastal cities* (pp. 123–144). Abingdon, Oxon: Routledge.

Hill, K. (2015). Coastal infrastructure: A typology for the next century of adaptation to sea-level rise. *Frontiers in Ecology and the Environment*, *13*(9), 468–476. doi:10.1890/150088

Hills, G. A. (1974). A philosophical approach to landscape planning. *Landscape Planning*, *1*, 339–371.

Hirschfeld Davis, J. (2016, August 26). Obama to create World's largest marine reserve off Hawaii. *The New York Times*. Retrieved from http://www.nytimes.com/2016/08/26/us/politics/obamas-action-will-create-largest-marine-reserve-on-earth.html

Hobbs, R. J., Higgs, E., Hall, C. M., Bridgewater, P., Chapin, F. S., Ellis, E. C., . . . Yung, L. (2014). Managing the whole landscape: Historical, hybrid, and novel ecosystems. *Frontiers in Ecology and the Environment*, *12*(10), 557–564. doi:10.1890/130300

Hodson, M., & Marvin, S. (2009). "Urban ecological security": A new urban paradigm? *International Journal of Urban and Regional Research*, *33*(1), 193–215. doi:10.1111/j.1468-2427.2009.00832.x

Holleman, R. C., & Stacey, M. T. (2014). Coupling of sea level rise, tidal amplification, and inundation. *Journal of Physical Oceanography*, *44*(5), 1439–1455. doi:10.1175/JPO-D-13-0214.1

Huler, S. (2012, June 12). Et tu, Virginia? Again with the sea level rise. *Scientific American*. Retrieved from https://blogs.scientificamerican.com/plugged-in/et-tu-virginia-again-with-the-sea-level-rise

Hurricane Sandy Rebuilding Task Force. (2013). *Rebuild by design: Hurricane Sandy regional planning and design competition design brief*. Washington, DC: US Department of Housing and Urban Development. Retrieved from http://portal.hud.gov/hudportal/documents/huddoc?id=REBUILDBYDESIGNBrief.pdf

Jabareen, Y. (2015). *The risk city: Cities countering climate change*. Dordrecht, The Netherlands: Springer Netherlands.

Kelley, C. P., Mohtadi, S., Cane, M. A., Seager, R., & Kushnir, Y. (2015). Climate change in the Fertile Crescent and implications of the recent Syrian drought. *Proceedings of the National Academy of Sciences*, *112*(11), 3241–3246. doi:10.1073/pnas.1421533112

Kerans, B. L., & Karr, J. R. (1994). A benthic index of biotic integrity (B-IBI) for rivers of the Tennessee Valley. *Ecological Applications*, *4*(4), 768–785. doi:10.2307/1942007

King, J. (2009, July 15). Designers answer call to fight rising seas. *San Francisco Chronicle*.

Landphair, J. (2007). "The forgotten people of New Orleans": Community, vulnerability, and the Lower Ninth Ward. *The Journal of American History*, *94*(3), 837–845.

Marin County Community Development Agency. (2015). *Marin ocean coast sea level rise vulnerability assessment*. San Rafael, CA: Marin County Community Development Agency .

Marsh, W. (1991). *Landscape planning: Environmental applications*. New York: Wiley.

McHarg, I. (1969). *Design with Nature* (1st ed.). Garden City, NY: Natural History Press.

McHarg, I. (1971). Man, planetary disease. *Vital Speeches of the Day*, *37*(20), 634–731.

Milly, P. C. D., Betancourt, J., Falkenmark, M., Hirsch,

R. M., Kundzewicz, Z. W., Lettenmaier, D. P., . . . Krysanova, V. (2015). On critiques of "Stationarity is dead: Whither water management?" *Water Resources Research*, *51*(9), 7785–7789. doi:10.1002/2015WR017408

Milly, P. C. D., Betancourt, J., Falkenmark, M., Hirsch, R. M., Kundzewicz, Z. W., Lettenmaier, D. P., & Stouffer, R. J. (2008). Stationarity is dead: Whither water management? *Science*, *319*(5863), 573-574.

Moellendorf, D. (2009). Justice and the assignment of the intergenerational costs of climate change. *Journal of Social Philosophy*, *40*(2), 204–224.

Moellendorf, D., & Schaffer, A. (2016). Equalizing the intergenerational burdens of climate change—An alternative to discounted utilitarianism. *Midwest Studies In Philosophy*, *40*(1), 43–62.

National Oceanic and Atmospheric Administration. (1999). Endangered and threatened species: Threatened status for three chinook salmon evolutionarily significant units (ESUs) in Washington and Oregon. *Federal Register*, *64*(56), 14308–14328.

Nicholson, S. (2015). The birth of free-market environmentalism. *Journal of Interdisciplinary History*, *46*(3), 421–433. doi:10.1162/JINH_a_00870

Otterstrom, S. M. (2004). *A geographical history of United States city-systems: From the frontier to the urban transformation*. Lewiston, NY: Edwin Mellen Press.

Pace, M. L., Carpenter, S. R., & Cole, J. J. (2015). With and without warning: Managing ecosystems in a changing world. *Frontiers in Ecology and the Environment*, *13*(9), 460–467. doi:10.1890/150003

Palmer, M. A., & Ruhl, J. (2015). Aligning restoration science and the law to sustain ecological infrastructure for the future. *Frontiers in Ecology and the Environment*, *13*(9), 512–519. doi:10.1890/150053

Porter, E. (2016, September 6). The crumbling case for a Mexican border wall. *The New York Times*. Retrieved from http://www.nytimes.com/2016/09/07/business/economy/the-crumbling-case-for-a-mexican-border-wall.html

Rapport, D. J., Gaudet, C., Karr, J. R., Baron, J. S., Bohlen, C., Jackson, W., . . . Pollock, M. M. (1998). Evaluating landscape health: Integrating societal goals and biophysical process. *Journal of Environmental Management*, *53*(1), 1–15.

Reeder, T., & Ranger, N. (2011). *How do you adapt in an uncertain world? Lessons from the Thames estuary 2100 project* (World Resources Report Uncertainty Series). Washington, DC: World Resources Institute. Retrieved from www.worldresourcesreport.org

Rockström, J., Falkenmark, M., Allan, T., Folke, C., Gordon, L., Jägerskog, A., . . . Varis, O. (2014). The unfolding water drama in the Anthropocene: Towards a resilience based perspective on water for global sustainability. *Ecohydrology*, *7*(5), 1249–1261. doi:10.1002/eco.1562

Sassen, S. (2014). *Expulsions: Brutality and complexity in the global economy*. Cambridge, MA: The Belknap Press of Harvard University Press.

Scheffer, M., Carpenter, S. R., Lenton, T. M., Bascompte, J., Brock, W., Dakos, V., . . . Vandermeer, J. (2012). Anticipating critical transitions. *Science*, *338*(6105), 344–348. doi:10.1126/science.1225244

Shi, L., Chu, E., & Debats, J. (2015). Explaining progress in climate adaptation planning across 156 U.S. municipalities. *Journal of the American Planning Association*, *81*(3), 191–202. doi:10.1080/01944363.2015.1074526

Simenstad, C., Tanner, C., Crandell, C., White, J., & Cordell, J. (2005). Challenges of habitat restoration in a heavily urbanized estuary: Evaluating the investment. *Journal of Coastal Research*, *SI*(40), 6–23.

Sorte, C. J. B. (2013). Predicting persistence in a changing climate: Flow direction and limitations to redistribution. *Oikos*, *122*(2), 161–170. doi:10.1111/j.1600-0706.2012.00066.x

Spirn, A. (1984). *The granite garden: Urban nature and human design*. New York: Basic Books.

Spirn, A. (2002). *The authority of Nature: Conflict, confusion, and renewal in design, planning, and ecology. in ecology and design: Frameworks for learning*. Washington, DC: Island Press.

Stedinger, J. R., & Griffis, V. W. (2011). Getting from here to where? Flood frequency analysis and climate. *Journal of the American Water Resources Association*, *47*(3), 506–513. doi:10.1111/j.1752-1688.2011.00545.x

Steinitz, C. (1990). A framework for theory applicable to the education of landscape architects (and other environmental design professionals). *Landscape Journal*, *9*(2), 136–143.

Steinitz, C. (2012). *A framework for GeoDesign: Changing geography by design*. Redlands, CA: ESRI.

Stone, B. (2012). *The city and the coming climate: Climate change in the places we live*. Cambridge, UK: Cambridge University Press.

Stroup, L. J. (2011). Adaptation of US water management to climate and environmental change. *The Professional Geographer*, *63*(4), 414–428.

Terasmae, J. (1970). Quaternary Palynology: Its scope, problems and potential uses. *Proceedings of the Annual Meeting. American Association of Stratigraphic Palynologists*, *1*, 23. doi:10.2307/3687299

Thomas, C. (2003). *Bureaucratic landscapes: Interagency cooperation and the preservation of biodiversity*. Cambridge, MA: MIT Press. (Original work published 1997)

Verschuuren, J. (2004). Effectiveness of nature protection legislation in the European Union and the United States: the habitats directive and the endangered species act. In M. Dieterich & J. Van Der Straaten (Eds.), *Cultural landscapes and land use* (pp. 39–67). Springer. Retrieved from http://link.springer.com/content/pdf/10.1007/1-4020-2105-4_4.pdf

Waggonner and Ball Architects. (2013). *Greater New*

Orleans water management plan. New Orleans, LA: GNO, Inc. Retrieved from www.livingwithwater.com

Waggonner, D., & Meyer, H. (2010). *Dutch Dialogue 2*. Retrieved from http://dutchdialogues.com/2010/05/03/dutch-dialogue-2/

Wang, F., Tang, Q., & Wang, L. (2014). Post-Katrina population loss and uneven recovery in New Orleans, 2000–2010. *Geographical Review*, *104*(3), 310–327.

Ward, E. J., Anderson, J. H., Beechie, T. J., Pess, G. R., & Ford, M. J. (2015). Increasing hydrologic variability threatens depleted anadromous fish populations. *Global Change Biology*, *21*(7), 2500–2509. doi:10.1111/gcb.12847

Waters, C. N., Zalasiewicz, J., Summerhayes, C., Barnosky, A. D., Poirier, C., Gałuszka, A., . . . Wolfe, A. P. (2016). The Anthropocene is functionally and stratigraphically distinct from the Holocene. *Science*, *351*(6269). doi:10.1126/science.aad2622

Weisz, C., Blumberg, A. F., & Keenan, J. M. (2015). Design meets science in a changing climate: A case for regional thinking to address urban coastal resilience. *Social Research: An International Quarterly*, *82*(3), 839–857.

Wheeler, S., & Beatley, T. (2014). *Sustainable development reader*. New York: Routledge.

Wilson, E. O. (2016). *Half Earth: Our planet's fight for life*. New York: W. W. Norton.

World Commission on Environment and Development. (1987). *Our common future*. Oxford, UK: Oxford University Press.

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