Elevated Highways and Evolutionary Theory

Has Buffalo, NY stalled out on a local maximum at its outer harbor?

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Abstract. A land use (LU) mismatch exists when a LU that was established in a given environment is unsuccessful, or even harmful, when relevant environmental factors are changed. In deindustrialized urban spaces, this tension between past and present is regularly manifested in scenes of decaying or functionally obsolete transportation infrastructure. Efforts to replace these conditions signal urban reprioritizations away from formerly productive patterns of socioeconomic activity. This paper focuses on one such reprioritization: the movement to replace elevated urban highways with at-grade boulevards. Specifically, the paper employs a LU mismatch framework, which is grounded in evolutionary theory, to study recent political conflicts over how to manage a mid-20th Century elevated highway along the waterfront in Buffalo, NY, USA. The case study reveals important barriers to the implementation of highways-to-boulevards projects. In doing so, it demonstrates how an evolutionary perspective can explain outcomes in, and contribute new insights to, LU policy discourses.

Keywords: *highways-to-boulevards; evolutionary urban geography; urban policy; elevated highways; land use mismatch*

The "highways-to-boulevards" stream of the New Urbanism literature critically examines the issue of elevated highways in urban places (Mohl 2012). Contributors to this discourse reiteratively find that, in the post-industrial city, replacing divisive embanked roadways with at-grade boulevards produces sociospatial and economic benefits (Norquist 1997; Cervero 2009; Mohl 2012). Indeed, such projects have been shown to catalyze patterns of land use (LU) adjustments that, over time, positively influence patterns of land values across a city (Cervero 2009; Cervero, Kang & Shivley 2009; Kang & Cervero 2009).

In this context, highways-to-boulevards projects can be thought of as strategies for managing a specific variety of *LU mismatch* that concerns underperforming transportation infrastructure. A LU mismatch is said to exist "when a LU…that was [established] in a given prior environment becomes dysfunctional when the sets of contextual variables from the prior and active environments are nonequivalent" (Weaver & Knight, Forthcoming). Stated another way, a LU mismatch occurs when the conditions that led to the institution of a particular LU in the past are no longer available in the same qualities and/or quantities in the present. For the case of highways-to-boulevards, urban reliance on auto-dependent economic activities related to manufacturing and shipping has declined dramatically in the U.S. since the latter part of the 20th Century. This trend has been accompanied by corresponding shifts in the priorities of urban managers and planners, including a renewed commitment to planning cities for people as opposed to vehicles.[1] Collectively, these changes to the U.S. urban environment have softened the demand for, and undermined the functional utility of, elevated highways in many post-industrial cities (e.g., Cervero 2009). In other words, mid-20th Century elevated highways are increasingly seen to be *mismatched* to their 21st Century urban environments. As a result, New Urbanists and other stakeholders are actively entering into urban policymaking spaces to advocate for reform to these seemingly maladapted transportation LUs (Norquist 1997; Sommer 2010).

That being said, modifying the ways in which people use land is never politically neutral (e.g., Saint, Flavell & Fox 2009; Berke, Godschalk & Kaiser 2005). When a LU mismatch is perceived to exist, interested parties frame that mismatch according to their desired outcomes, and, by extension, their preferred strategies for arriving at those outcomes (Kaufman & Smith 1999). As the term is used here, *framing* is "the process of making sense of the world and putting forward and naming preferred ideas and meanings" with regard to how things are and (or) how they ought to be (Walker 2012, p. 14). It is rarely the case that heterogeneous stakeholder *frames* share focal elements or causal understandings of the relevant LU issues (e.g., Saint, Flavell & Fox 2009). Consequently, LU mismatch discourses are highly competitive and prone to political "turbulence" (Berke, Godschalk & Kaiser 2005). For this reason, even though empirical research suggests that highways-to-boulevards projects can have positive impacts on cities (Cervero 2009; Cervero, Kang & Shivley 2009; Kang & Cervero 2009), attempts to implement these strategies in practice are not always successful (e.g., Weaver & Knight 2012). The current paper presents an example of one such case. Specifically, the paper draws on an evolutionary framework of LU mismatch (Weaver & Knight, Forthcoming) to study recent political conflicts over how to manage a mid-20th Century elevated highway along the waterfront in Buffalo, NY, USA. The case is of interest to the extent that, in spite of what seemed to be sufficient public and [local] political support to replace the controversial elevated highway with a surface boulevard (Esmonde 2008a, 2008b; Weaver & Knight 2012), institutional decision-makers ultimately elected to reinforce, not remove, the ostensibly mismatched road system. This outcome became the subject of a protracted political and legal battle (Esmonde 2008a, 2008b). On this backdrop, I use the Buffalo case to argue that evolutionary theory can provide the highways-to-boulevards movement with both: (1) a toolkit for critically analyzing situations of LU mismatch; and (2) a relatively nonpartisan discursive frame to help moderate what otherwise tend to be animated political debates.

[1] See, for instance, Richard Register: http://voices.mckinseyonsociety.com/lets-build-cities-for-people-not-cars

Study Context: The Buffalo "Outer Harbor Parkway Project"

Locational advantages along the shores of Lake Erie and at the terminus of the Erie Canal made Buffalo, NY a major hub of shipping and manufacturing during the early and mid-20th Century (NYSDOT 2006; Glaeser 2007; Goldman 2007). Consequently, the city dedicated significant portions of land—especially waterfront land—to the heavy industrial and shipping related LUs that contributed to its economic prosperity (NYSDOT 2006). Nevertheless, while institutions such as LU systems tend to be persistent over time (e.g., Lindblom 1959; Lustick 2011b), Buffalo's economic strengths in industry and shipping proved to be temporary (Glaeser 2007; Goldman 2007). In the contexts of globalization and deindustrialization, Buffalo's manufacturing sector collapsed, and previously large volumes of industrial ground and water traffic to, from, and through the Buffalo harbor became comparatively negligible (Weaver & Knight 2012). This change in circumstances left Buffalo with ample vacant and undeveloped land on its waterfront, which is held in place by dysfunctional industrial LUs and infrastructure (NYSDOT 2006).

In response to decades of pressure from local stakeholders, the "Buffalo Outer Harbor Parkway Project" was undertaken as an intergovernmental venture to reconfigure and revalorize the lands along the city's waterfront (NYSDOT 2006). The project was, and still is, under the purview of the New York State Department of Transportation (NYSDOT), and it focuses on three waterfront roadways (Figs. 1 - 2). First is Fuhrmann Boulevard, a one-way street heading sout-

Figure 1. The existing Buffalo outer harbor waterfront road system (source: esri World Imagery)

hward from the city. Second is New York State Route 5, an elevated/embanked four-lane highway that connects to a 1.4-mile-high Skyway Bridge. The Skyway acts as a point of entry and exit for the city, and it is a remnant of bygone industrial water traffic (i.e., the height enabled ships to pass below the bridge). Third, but of less concern hereafter, is Ohio Street, a local two-way, four-lane road that runs along the east side of the Buffalo River. These roadways are mapped out in Figure 1, and Figure 2 depicts a bird's eye view of the area to highlight the large swaths of undeveloped waterfront land that are effectively separated from the city by the existing road system.

Figure 2. Bird's eye view of the Buffalo outer harbor waterfront (source: Google Earth)

An historical narrative of the Buffalo Outer Harbor Parkway Project is beyond the scope of this paper, and interested readers should consult the Environmental Impact Statement (EIS) produced by the NYSDOT (2006), as well as the reports and accounts of various stakeholders (CNU 2007; Esmonde 2008a, 2008b; Sommer 2010). For present purposes, the project's dynamics and politics can be summarized roughly as a competition over two possible LU outcomes (e.g., CNU 2007; Weaver & Knight 2012). The first alternative is known as the "Modified Improvement" (MI). The MI retains the industrial era transportation footprint at the harbor, though it converts Fuhrmann Boulevard (Figs. 1-2) from a one-way southbound road into a two-way landscaped parkway that offers scenic views and improved access to Lake Erie (NYSDOT 2006). At the same time, the MI reinforces the elevated Route 5 to support existing traffic patterns, and it represents the lowest-cost "build"—as opposed to "null"—alternative (NYSDOT

2006). The second option is known as the "Boulevard", and it replaces the existing waterfront sections of Fuhrmann Boulevard and Route 5 with a single, at-grade, four-lane bidirectional roadway (NYSDOT 2006; CNU 2007). This alternative follows from the post-interstate highways-to-boulevards movement (Mohl 2012), and it reflects an "urban reprioritization" that deemphasizes automobility (Cervero, Kang & Shivley 2009: 49). It is thus the preferred choice of many prominent New Urbanists (CNU 2007; Sommer 2010), and it is held in high regard by a diverse and sizeable community of local stakeholders (see Weaver & Knight 2012 at Table 2). Moreover, a series of public hearings during the planning phase of the Outer Harbor Parkway Project seemed to suggest that the Boulevard was the most popular and demanded alternative among the general public at the time (Esmonde 2008a). Hence, many observers questioned the eventual institutional decision to implement the MI over the Boulevard (Esmonde 2008b).

While the extant explanations for this decision involve project funding and politics (e.g., Esmonde 2008a, 2008b), the remainder of this paper uses the concept of a LU mismatch to demonstrate that the observed outcome is in fact consistent with evolutionary theory. This evolutionary perspective is then put forward as a means for depoliticizing conflicts over competing LU alternatives, both in the Buffalo case and in policy discourses similar to it.

Evolutionary Theory and Land Use Mismatch

Prior research has established that LU satisfies the necessary conditions for being subject to evolutionary forces (e.g., Weaver & Knight 2012). Namely, location-based attributes vary across a city, and at any point in time this variation works to make some LUs more productive than others in their environments (e.g., Verburg et al. 2004). To put it another way, parcel-level variation in land characteristics plays an important role in shaping a territory's population-level LU system. Over time, more productive LUs tend to replace, or spatially outcompete, their less productive counterparts.[2] Thus, LU is not a static *property* of the land, but rather a dynamic *process* in which there are constant adjustments.

Importantly, then, LU systems are fluid (Berke, Godschalk & Kaiser 2005; Verburg et al. 2004; Veen & Otter 2001), whereas policies and political institutions, including LU regulations, tend to be rather rigid and persistent over time (Garnett 2010; Lustick 2011a, 2011b). The implication is that inter-temporal changes within a given geographic unit can render certain LUs ineffectual, superfluous, or even injurious following their institutionalization (Walker & Heiman 1981). Hence, instead of mitigating harmful externalities, as LU regulations are intended to do, these leftover LUs have the propensity to *decrease* social welfare in contemporary contexts (e.g., Platt 2004). Contrary to the common (but erroneous) practice of conflating evolutionary change with "progress" (Lustick 2011a), this implies that as patterns of socio-ecological interactions are adjusted over time, extant LUs can [evolve to] become *maladapted* to new environ-

[2] See the work of Wilson (2007, 2011) and Lustick (2011a, 2011b) to better understand why these characteristics of land and LU make LU systems *evolutionary* systems.

mental circumstances (Weaver & Knight 2012). This is precisely the situation defined previously to be a *LU mismatch* (Weaver & Knight, Forthcoming). As expressed above, managing a LU mismatch is a turbulent political process in which various stakeholders frame and reframe the situation so as to advocate for their preferred LU changes (Berke, Godschalk & Kaiser 2005; Saint, Flavell & Fox 2009). What is more, frames in this debate commonly make use of different concepts, and/or they define similar concepts in altogether different ways (Kaufman & Smith 1999). For these reasons, it is useful to seek out means for standardizing these heterogeneous viewpoints, for the purposes of comparatively and critically analyzing them. The LU mismatch concept's grounding in evolutionary theory offers a step in this direction.

Drawing on tutorials for how to deal with cases of *evolutionary mismatch*—which, according to evolutionary theory, are detrimental outcomes or consequences that arise when organismal traits that are selected for in one environment presently exist in another (Lloyd, Sober & Wilson 2011)—Weaver and Knight (Forthcoming) submit that diagnosing a *LU mismatch* requires, at minimum, the following information. First, (1) a dysfunctional LU (LU_T) must be unpacked in (2) the context of the environment (E1) in which it adapted. Specification of LU_T requires one to identify (3) the population, or LU system, in which it is found. Contextualizing LU_T within E1 entails explicating (4) the function or purpose it served in E1 (its *ultimate cause*), as well as (5) the E1 mechanism(s) that facilitated its development (its *proximate cause*). Finally, it is critical to present (6) evidence that LU_T is "correlated with detrimental outcomes" (Lloyd, Sober & Wilson 2011: 16) in its present environment (E2). This step demands attention to (7) the relevant environmental factors found in E2 and, finally, (8) the mechanism in E2 that links LU_T to a detrimental outcome therein. When political LU mismatch frames are systematically broken down into these elements, it is possible to reveal whether or not critical diagnostic information is missing from a frame, thus indicating that it does not fully capture the evolutionary dynamics of the relevant LU issue. Put differently, it is possible to uncover weaknesses in causal reasoning (Weaver & Knight, Forthcoming). In this sense, the LU mismatch information requirements provide a standard set of elements into which any political LU mismatch *frame* can be deconstructed. Such critical analyses can plausibly facilitate comparisons between otherwise dissimilar and competing LU issue frames.

Next, while the preceding diagnostic elements aid in understanding a given LU mismatch, a second concept from evolutionary theory, a *fitness landscape*, situates this understanding within a political environment (Weaver & Knight, Forthcoming). Consider that the observed LU profile for a particular city at any point in time is only one of a vast number of possible profiles (i.e., outcomes) that could be realized in that space-time. Indeed, there is a seemingly endless constellation of LU-parcel combinations. The complete set of all imaginable LU profiles that can be constructed from these combinations forms what can be thought of as an "outcome space". Every outcome or LU profile in that outcome space is in turn associated with a particular level of *fitness*, or welfare, in the environment. For instance, citizens in a city where heavy industrial LUs are mixed in with single-family residential LUs might be less well-off than they would be under an alternative LU profile or outcome in which industry and residences are better separated.

When all outcomes in a given outcome space are linked to their corresponding levels of environmental fitness or welfare, this gives shape to what evolutionists call a *fitness landscape* (Lustick 2011a, 2011b). A fitness landscape is simply a cognitive device used to "map" the variation in social welfare associated with possible social outcomes, where higher "elevation" represents higher social welfare. Very rarely, if ever, is the terrain or extent of the fitness landscape known to actors in the environment. Rather, individual-level interactions dynamically lead the population to a particular outcome. When any one outcome is realized, its associated level of (dis)benefits from the fitness landscape accrues to the environment. Once this information is revealed to and processed by actors in the environment, their further interactions can cause the population to migrate to nearby, marginally "fitter" outcomes over time (Lustick 2011a, 2011b). Notwithstanding this tendency toward fitter outcomes, populations often find themselves locked into disadvantageous or relatively unfit states of nature. This is frequently the result of an *evolutionary mismatch* in which the outcome from the ancestral environment (E1) is a *local maximum* on the fitness landscape (Lustick 2011b).

The mismatch scenario is illustrated graphically in Figures 3 and 4, where a hypothetical fitness landscape is spatialized for two environments: E1 and E2, respectively.[3] Suppose that in

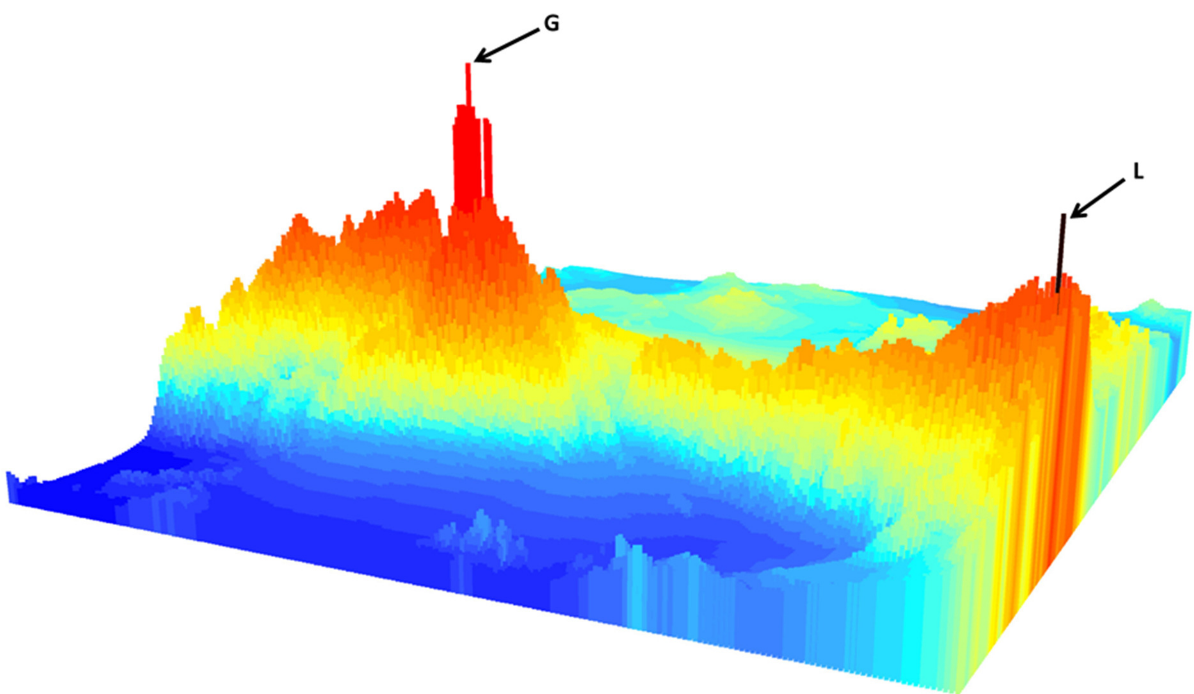

Figure 3. Hypothetical fitness landscape and outcome in the ancestral environment (E1)

[3] It should be clear that a fitness landscape does not exist in geographic space. Figures 1 and 2 merely use the medium of space in the abstract to communicate the fact that not all outcomes are "accessible" from society's current position (Lustick 2011b). Indeed, policy and institutional change tends to build incrementally on existing foundations (Lindblom 1959).

the ancestral environment (E1), interactions within society, and between society and its environment, gradually leads to outcome L in Figure 3. Outcome L is a *local maximum* on the fitness landscape, meaning that all nearby (i.e., *accessible* or incremental) outcomes accrue lower benefits to the environment than L, as is visualized by comparatively short vertical bars surrounding L. Once again, the overall terrain of the fitness landscape is unknown to members of the population, and given the context of E1, the population interprets L to be the fittest possible outcome at the time it is realized. This is a reasonable conclusion in the short run, for moving off of point L (a local maximum) in any direction triggers immediate losses in welfare (e.g., Lustick 2011b). Continuing with the hypothetical example from above, L might represent a mixed industrial-residential LU profile, and E1 might be a past environment in which there are no viable non-walking transport alternatives. Thus, mixing where people live with where they work is suitably matched to the environmental context. A “fitter” outcome, such as installing public transportation systems, is perhaps not currently *accessible* in the context of society’s existing technology and political climate (e.g., consider the distance and terrain between point L and the higher points surrounding the *global maximum* at point G).

Consider now an environmental change that causes the fitness landscape to shift in one or more places. Such a scenario is illustrated in Figure 4 for environment E2. Observe that point L in E2 is no longer a local maximum, but the nearby point of L’ is. That is, all outcomes surrounding L’ are associated with lower fitness levels than L’. To finalize the above example, suppose that a light rail system is now introduced to the environment from Figure 3, and this makes it possible for workers to live farther from polluting industrial workplaces. Moreover, all else being equal, all workers prefer to live farther away from polluting industrial workplaces.

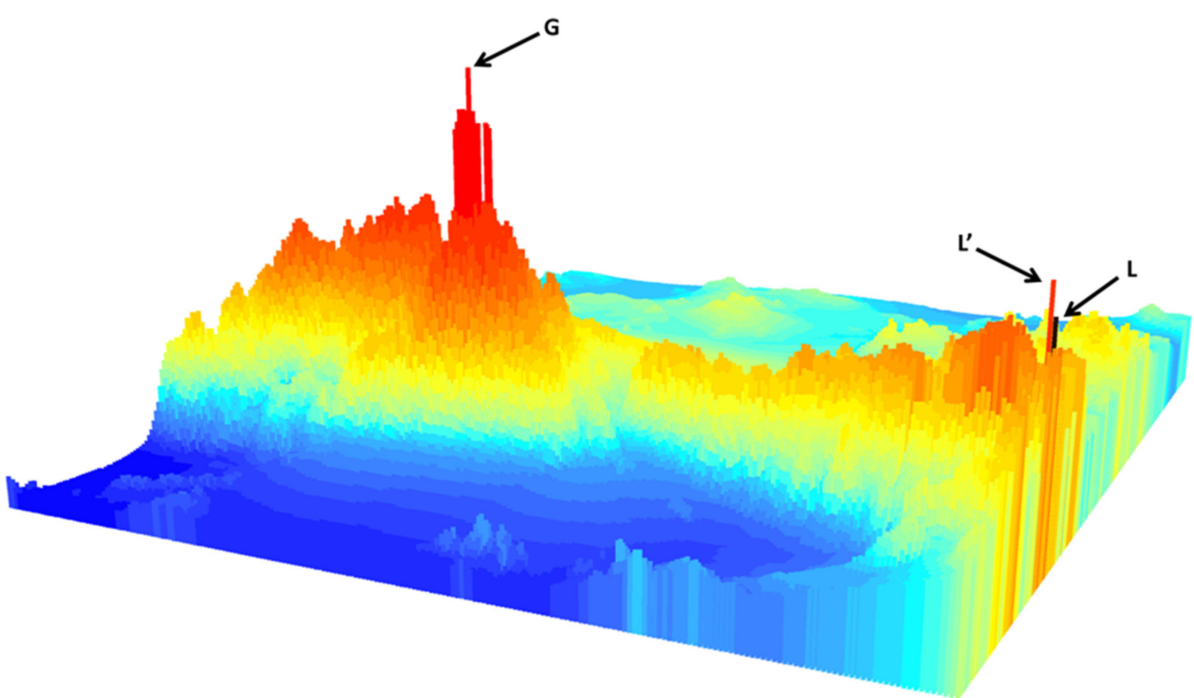

Figure 4. Hypothetical fitness landscape and outcome in the changed environment (E2)

Hence, mixed residential-industrial LUs are now largely *maladapted* to the changed, comparatively geographically mobile environment. Nevertheless, suppose that at the present point in time it is not feasible for planners to completely segregate all residential LUs from pollution and industry. Rather, only those workers who have sufficient means end up relocating to the new communities that are now reachable by rail, and, by extension, connected to the industrial centers. This new LU profile therefore represents a higher *accessible* outcome on the hypothetical city's E2 fitness landscape—say point L' in Figure 4. Significantly, despite the marginal increases to social welfare associated with moving from L to L' via these individual-level interactions, society as a whole is still *worse off* in E2 than it was in E1. To be sure, compare the vertical height of point L from Figure 3 to that of point L' in Figure 4. The latter is visibly shorter (i.e., smaller in magnitude) than the former. Such welfare losses are likely to disquiet actors in the environment, potentially leading to calls for reform. Yet, moving off of outcome L' in any direction means even greater losses in current welfare. If decision-makers are unwilling to bear these additional costs, then outcome L' remains the best short run solution. Even though better outcomes are available in the fitness landscape, including the global maximum at point G, these outcomes (LU profiles) are not immediately *accessible* from society's current position. In other words, society is "trapped on a local maximum" (Lustick 2011b).

The Buffalo Outer Harbor Road System as a LU Mismatch

The preceding section offers an abridged look at a framework for studying LU mismatches from an evolutionary perspective (Weaver & Knight, Forthcoming). The framework leverages two key concepts from evolutionary theory. First, an *evolutionary mismatch*, or a situation in which a selectively advantageous trait becomes maladaptive in a new environment (Lloyd, Sober & Wilson 2011), provides the theoretical underpinnings of the LU mismatch concept. Specifically, the information required to diagnose an evolutionary mismatch in a biological context can similarly apply to a LU context (Weaver & Knight 2012, Forthcoming). Table 1 demonstrates this for the case of mismatched transportation infrastructure and LUs along the Buffalo, NY waterfront.

Observe again that the Buffalo outer harbor road system was constructed during an era of booming industrial activity. Because of the city's successes in manufacturing and shipping, institutional decision-makers "*primarily designed* [*the outer harbor*] *for trucks* to serve" heavy industry (NYSDOT 2006: 2-3, emphasis added). This design included the high-speed, elevated Route 5 highway and the towering, 1.4-mile-high Skyway Bridge, which was constructed to accommodate tall incoming and outgoing ships (Graebner 2007). In light of Buffalo's economic base and major employers at the time, such a LU profile was reasonably well suited to the environmental context. In fact, the outcome enjoyed broad support in the forms of both public funding commitments, and popular buy-in on the "city of tomorrow" concept that the [then] futuristic road system represented (Goldman 2007: 286; Graebner 2007). Note, however, that the former of these mechanisms was almost certainly fueled by federal-level pressure to participate in contemporary interstate infrastructure and development projects (e.g., Mohl 2012).

Table 1. The Buffalo outer harbor road system as an evolutionary mismatch

Population	Tracts of waterfront land in Buffalo, NY
LU (LU_T)	Heavy industrial and shipping-related transportation LUs
E1 context	Booming manufacturing sector; substantial ground and water traffic to, from, and through the city
E1 function	Serve the economic base and major regional employers
E1 mechanism(s)	Public and private sector commitment to manufacturing and shipping, and buy-in on the "city of tomorrow" concept; Public funding for large-scale highway projects
E2 context	Deindustrialization and the collapse of waterfront industrial and shipping economic activities
E2 problem	Vacant and underutilized land along the waterfront
E2 mechanism(s)	**MI**: Insufficient connectivity between existing infrastructure and the waterfront
	Boulevard: Excessive and overly auto-dependent waterfront transportation infrastructure

Like many American "Rust Belt" cities, Buffalo's manufacturing sector collapsed under the weight of an increasingly globalized economy, thereby leaving significant portions of the waterfront underutilized or undeveloped (NYSDOT 2006: 2-3). In modern, deindustrialized settings, such an outcome is often accompanied by an "urban reprioritization that gives more emphasis to neighborhood quality and less to automobility" (Cervero, Kang & Shivley 2009: 49). In Buffalo, such attitudinal shifts have indeed followed economic restructuring. With respect to the second of the two evolutionary concepts referred to above, these inter-temporal changes transformed Buffalo's *fitness landscape* to make the erstwhile adaptive Route 5/Skyway LUs maladaptive in their present environment (Esmonde 2008a, 2008b; Sommer 2010).

For facility of exposition, suppose that this situation is the one that is depicted graphically in Figures 3 and 4, and that the mid-20th Century Route 5/Skyway transportation system is given by point L in both of these figures. It is evident from this that a *LU mismatch* exists on Buffalo's waterfront. Still, recall that in general stakeholders package evidence of LU mismatches into *frames* that are used to advocate for their preferred policy interventions (Kaufman and Smith 1999). In this case, the policy discourse came to be dominated by the *Modified Improvement frame* and the *Boulevard/New Urbanist frame* (Weaver & Knight 2012). Taking cues from the context of reports and other writings (e.g., NYSDOT 2006; CNU 2007), these frames roughly problematized the outer harbor LU mismatch as, respectively: (1) poor connectivity between the existing outer harbor transportation infrastructure and vacant waterfront land; and (2) too much (auto-dependent) transportation infrastructure on the outer harbor.

This was not, however, how the situation was always argued in the political discourse. Instead, occasionally inflammatory rhetoric reframed the debate using tensions such as, among others, 'obstructionist' versus 'expedient'; 'walkable' versus 'auto-oriented'; and 'urban' versus 'suburban' (CNU 2007; Esmonde 2008a, 2008b; Weaver & Knight 2012). Contrary to these seemingly partisan and isolating positions, deconstructing the *MI* and *Boulevard frames* into the LU mismatch information requirements reveals several points of consensus among both "sides" of the conflict (e.g., rows 1-7 in Table 1). Using the terminology from above, the two frames effectively differed only in their views of the *mechanism* by which—or, alternatively, that which *proximately causes*—the 1950s Route 5/Skyway road system to be maladapted to present-day Buffalo. These two competing mechanisms correspond to the two problem definitions articulated in the preceding paragraph. Namely, is there too little connectivity between existing infrastructure and the waterfront? Or, is there too much infrastructure occupying land at the waterfront? The upshot here is that *when all the elements that factor into a LU mismatch diagnosis are explicitly specified, the purported proximate cause of a LU mismatch becomes transparent to all actors in the policy arena*.

It must be noted that deconstructing frames via the LU mismatch information requirements (Table 1) is not in and of itself an evaluative exercise; rather, it lays the foundations for asking empirical questions that are evaluable with appropriate data and methods (e.g., refer to the questions just posed at the end of the foregoing paragraph). Employing the LU mismatch concept therefore has the capacity to transform a complex political problem into an arguably more dispassionate debate about the relative explanatory power that alternative mechanisms have over a specific detrimental LU outcome (Weaver & Knight, Forthcoming).

Beyond its potential utility for identifying mechanisms or leverage points for environmental intervention, an evolutionary perspective has value for explaining why evidence of a LU mismatch does not always result in transformational change. For example, despite a wide, diverse, and outspoken coalition of Boulevard proponents (CNU 2007; Esmonde 2008b; Sommer 2010), as well as a "process of public hearings that seemingly supported" the Boulevard alternative (Esmonde 2008a), the MI was eventually selected and implemented. While factors such as political capital and funding might well have factored into this process (Esmonde 2008a, 2008b; Weaver & Knight 2012), evolutionary theory offers additional insights that can constructively reframe the policy discourse. In the first place, it is reasonable to assume that the outer harbor transportation system reached a *local maximum* in industrial Buffalo. As Graebner (2007: 77) points out, 1950s public opinion held that the Route 5 Skyway was "the finest public improvement the community had received in decades", and "the start of a new era". What is more, federal programs at the time made substantial amounts of funding available for freeway and interstate construction, thereby creating pressure to participate in large-scale transportation infrastructure projects (e.g., Mohl 2012). Nonetheless, as illustrated in Figures 3 and 4, the contextual factors that made an elevated highway adaptive to mid-century Buffalo eventually disappeared, though the elevated highway outcome persisted (persists) in the successive environment. Recall that the MI keeps the elevated highway intact. Thus while the MI improves on the current state of nature (NYSDOT 2006), it presumably does so only in a marginal way. That is, it is an *accessible local maximum* on the fitness landscape, and not necessarily the "fittest" outcome (see the relationship between L and L' in Fig. 4). This is certainly implied by New Urbanists and Boulevard proponents, who point to large gains in developable land, should the Boulevard have been implemented over the MI (CNU 2007).

Significantly, evolutionary theory imparts that navigating off of a local maximum in search of higher rewards (e.g., more developable land) involves bearing additional short term welfare losses (Lustick 2011b). Sometimes these losses are relatively great in magnitude or duration, and can require moving through deep chasms on the fitness landscape (Figs. 3-4). In this respect, although cost-cutting and political gamesmanship are thought to have influenced the outcome of the Buffalo Outer Harbor Parkway Project (e.g., Esmonde 2008a, 2008b), the most important explanatory factor is conceivably the close proximity of the MI to the status quo on the fitness landscape. For, in Buffalo—a city that has been called the "poster child for deindustrialization"—decision-makers are assumed to be [justifiably] averse to trading-off short term losses for long-term gains (Bluestone, Stevenson & Williams 2008: 195). Yet such a position fails to see the evolutionary picture, and will keep society trapped on a local maximum.

Conclusions

Only by traversing the rough terrain of a fitness landscape can a trapped population reach outcomes that generate greater social welfare than a local maximum (Lustick 2011b; Figs. 3-4). In the particular case of highways-to-boulevards, Cervero and his colleagues have found that removing elevated roadways from urban spaces—despite the long time delays and cost overruns involved (Mohl 2012)—triggers patterns of LU change that yield "net positive benefits without seriously sacrificing transportation performance" (Cervero 2009; Cervero, Kang & Shivley 2009: 49; Kang & Cervero 2009). In light of such evidence, it is not a stretch to imagine that a boulevard along the Buffalo waterfront might indeed represent a higher peak on the city's fitness landscape relative to an elevated highway. That being said, New Urbanists in Buffalo can potentially find value in the evolutionary lens of this paper. As cities such as Boston, San Francisco, Seoul, and Portland have found out, both political and public buy-in are necessary conditions for moving off of a local maximum (Cervero 2009; Mohl 2012). Buffalo has made significant progress in meeting the public criterion (e.g., CNU 2007; Esmonde 2008a, 2008b; Sommer 2010), and an evolutionary perspective is a valuable asset for attending to the political condition. By understanding that the short term welfare losses from converting highways to boulevards are met by selective pressures on existing LUs, which over time tend to weed out those that are unsuited to the changed environment so as to produce higher-value LU systems (Cervero 2009), evolutionary-minded planners, researchers, and other stakeholders can meaningfully reframe the political discourse on the outer harbor, and campaign to set and manage public expectations about the path to a "fitter" outcome.

As a closing matter, consider that evolutionary theory is increasingly being taken up as a general framework for studying phenomena in the social sciences because of its integrative nature (Wilson 2007, 2011; Wilson & Gowdy 2013). That is, far from competing with existing theoretical contributions in relevant disciplines, evolutionary theory is supplementing or operating in conjunction with them (e.g., Hodgson & Knudsen 2010; Weaver 2014; Weaver & Bagchi-Sen 2014). Along these lines, the LU mismatch framework taken up hereinbefore is not intended to supplant established perspectives on LU policy change (see, for instance: Platt 2004). In stark contrast, it serves as a meta-theoretical toolkit that is thought to be compatible with extant scholarship. Future efforts to implement the framework in practice—both in empirical research and in policy discourses—will reveal the parts of the toolkit that are presently understocked. Over time, much like the evolutionary systems studied in this paper, these engagements and interactions within and between disciplines are expected to increase the "fitness" of the framework in the broader multidisciplinary fields of LU planning and politics.

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