Where Americans Live: A Geographic and Environmental Tally

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1. Introduction

The United States is a suburban nation. Though sizable populations live in urban areas, the trend over the last several decades in the U.S. has been toward increasing suburbanization. Normative views on this trend, though passionate, are varied, and the evidence is often interpreted in light of the advocates' values. Urbanists refer to an ever-rising tide of new urbanites moving back to the central city. Libertarians and free market enthusiasts conversely claim that the public has long voted with its feet to live in areas with less noise and less congestion. Fierce debates continue to rage about the role of federal policies and subsidies -- such as for highways, urban transit, and home ownership -- in driving the location choices of households.

We argue that current land use in the U.S. is the result of households locating where they can secure the greatest personal benefit given their budget constraints. But households do not make their decisions in a vacuum. Economic and political contexts loom large as influences on these decisions. Government policies at all levels can alter the costs and benefits of location choices. Households face a given development pattern, given land uses, and given transportation networks. All such conditions affect their choices. Moreover, the set of options available to them at any point is limited and location characteristics are bundled, preventing optimization on all attributes. For example, in many center cities high quality public schools can be scarce. Each household responds to these legacy circumstances, and its choice further locks in certain patterns into the future.

This essay reviews the current geographic profile of the American metropolitan space and analyzes what we know about household location choices. We avoid using the imprecise characterization "sprawl," as it tends to be used as a "powerful polemical tool" rather than a term to clarify an urbanization trend (Bruegmann 2005). After examining what has been documented about the current land use patterns in the U.S. and the determinants of household location choices, we briefly discuss what justifications, if any, there could be for adopting policies to affect those choices.

The paper proceeds as follows. In Section 2, we present information on the current land use patterns in the United States and how they have evolved over recent decades. We demonstrate that the primary pattern has been decentralization and the rise of polynodal metropolitan areas. In Section 3, we review the largely economic literature on the determinants of household location choices, explaining why people locate where they do. We discuss how the drivers of location choices have produced the current land use patterns we observe. In Section 4 we ask whether there are substantial reasons to be concerned about current location choices and patterns of land use. We discuss consumer sovereignty, externalities, and constraints on choice. Section 5 concludes.

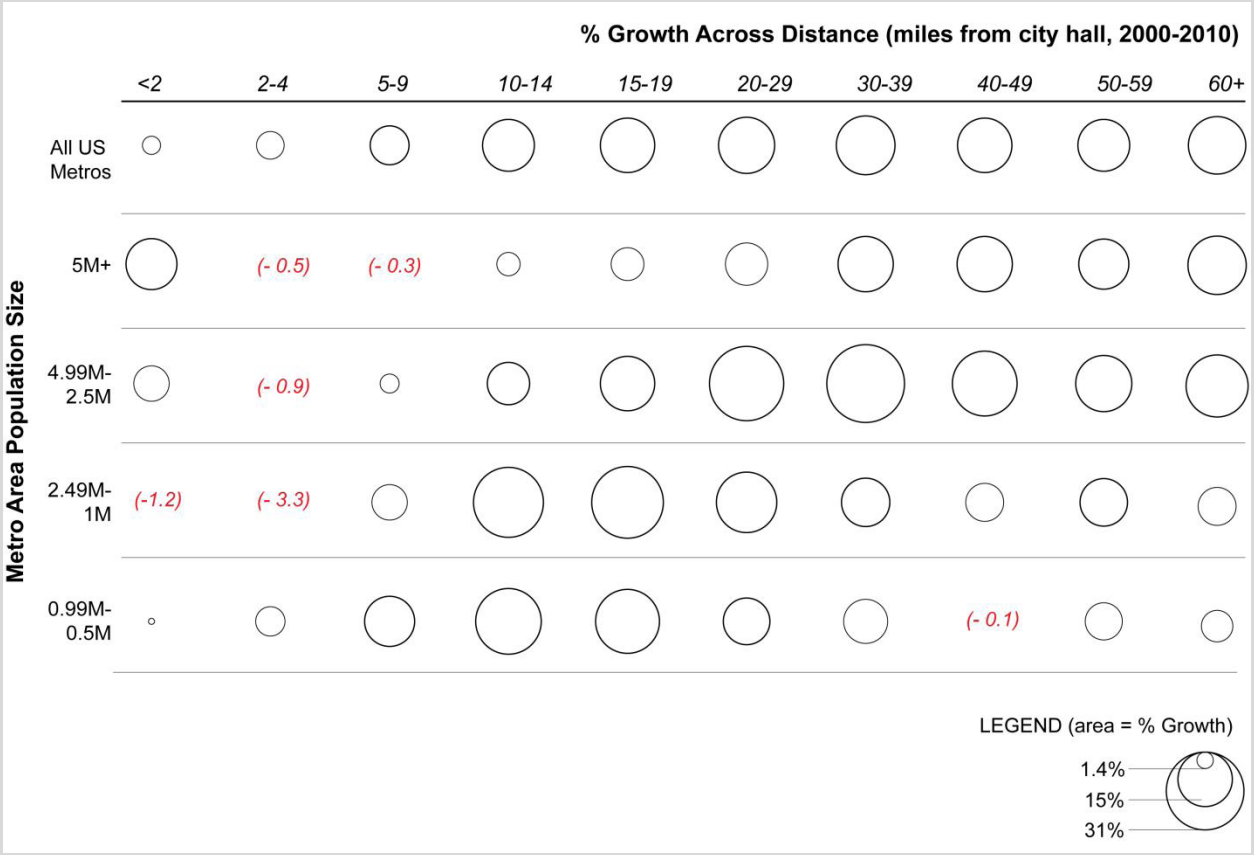
2. Patterns of Land Use in the United States

By the year 2000, over 50 percent of the total U.S. population resided in the suburbs of metropolitan areas (Hobbs and Stoops 2002). Examining 2010 census data reveals that almost three quarters of housing units are single-family or mobile homes. This trend toward horizontal urbanization—development that is more likely to spread laterally than vertically—in the United States has been occurring over many decades. Less than a quarter of the population lived in the suburbs in 1950, while more than half did by the end of the century (Pisarski 2006). More recently, population has been spreading beyond the suburbs (see Fig. 1), as people search for suburban amenities at affordable prices. The downtowns of large metropolitan areas (> 1 million population) have experienced low or negative growth except for the very largest metro areas. Over the same decadal time period, zones more than ten miles from downtown experienced consistent double-digit growth. Exurban areas grew twice as fast as their metropolitan areas between 1990 and 2005 (Berube et al. 2006). The trend toward the periphery, however, appears to have slowed in recent years (Glaeser and Kahn 2004; Angel et al. 2010). While the nationwide average growth rate of suburbs still exceeds that of center cities, the gap has been narrowing since 2005 (Frey

2009). It is as yet still unclear how much of this recent slowdown in movement toward the suburbs is explained by the subprime mortgage crisis, a major jolt to all housing-related decisions. The Brookings Institution recently found that population growth in counties near metropolitan fringes experienced a large decline between 2005/2006 and 2009/2010, while growth rates in cities and inner suburbs rose over the same period (Frey 2012).

This process of suburbanization is not a simple one where households spread out from a central urban node. Indeed, a quite different pattern has emerged. In the highest growth areas of the country, multiple nodes of employment and commercial development have been established following the population migration. The result is a polynodal landscape, where multiple concentrations of employment and urban services dot the metropolitan space. The resulting pattern is sometimes referred to as polycentricity in the literature. Unfortunately, it has received little metrically-informed research (Yang et al. 2012). Polynodal urbanization patterns reduce the traditional magnetic employment pull of the central city, a process generally referred to as decentralization in the literature. For example, only 28 percent of the total metropolitan area employment still resided within the city limits of Cleveland by 1992 (Bogart and Ferry 1999). Data from 1998-2006 further document declining central city employment nationwide, revealing a decrease in share of total employment within three miles of downtown for 95 of the top 98 metropolitan areas (Kneebone 2009). In short, the traditional city center is often no longer the focus of employment or development.

That is not to say that there are not strong urban centers in the US—there are—but most new development and growth has occurred beyond the traditional downtowns. The high-growth areas of the country tend to be in the south and west, outside of well-known cities, with little identifying



them to those outside their immediate region (Lang and LeFurgy 2007). For instance, 20 percent of the 50 fastest growing counties in the U.S. between 2000 and 2009 were located in the suburban periphery of Atlanta. The two fastest growth areas between 2010 and 2011 were Kennewick-Pasco-Richland, Washington and Austin-Round Rock-San Marcos, Texas, hardly famed metropolitan areas (US Census Bureau 2012).

Just as expanses of suburban neighborhoods and multiple nodes of higher job and residential density form new and relatively unknown metropolitan areas in the U.S., these areas are spilling into each other to produce so-called megapolitan areas. Megapolitan areas are clusters of metropolitan areas that exceed ten million people. As of 2005, ten identified megapolitan areas contained over two-thirds of the U.S. population, while 70 percent of future U.S. population growth is expected to locate in megapolitan areas (Lang and Dhavale 2005). These trends pose a complex policy quandary, not just in what should be done, but also in terms of who should do it, as these places stretch across multiple metropolitan and state jurisdictions. Current governmental entities are ill-prepared to handle the geographical size and the interconnections megapolitan areas create. For example, who should determine and who should pay for the cross-jurisdictional infrastructure that they require?

The drift away from center cities by the U.S. population is mirrored by the suburbanization of employment. The decentralization of jobs and the decentralization of the population reinforce each other; in areas where one gets concentrated, the other gets attracted and vice versa (Glaeser and Kahn 2004). This phenomenon, like patterns in residential suburbanization, varies regionally: employment is more concentrated in the northeast and more spread out in the south (Glaeser et al. 2001). However, six of the top ten most-decentralized metropolitan areas were in the midwest and west regions in 2006. All six had over 55 percent of their employment share more than ten miles from downtown (Kneebone 2009).

Transportation patterns also relate closely to land use patterns in the U.S. The most striking fact about U.S. transportation is the complete dependence of the vast majority of households outside of city centers on the automobile. Automobile use both accompanies suburbanization and enables it. Between 1977 and 1995, household ownership of at least one vehicle became very widespread, and the proportion of multi-vehicle households also rose modestly (Pickrell and Schimek 1999). By 2001, 93 percent of all U.S. households owned at least one vehicle (National Research Council 2009). Only about 5 percent of the working population in the U.S. uses public transit to get to work, and this percentage has moved little between 1995 and 2009 (Santos et al. 2011). The automobile is particularly dominant in the fastest-growing, scaled-up metropolitan regions of the south and west. Moreover, the suburban and exurban dwellers drive somewhat more than their urban counterparts: about five more vehicle miles per day per household, according to Krizek (2003).

Automobile ownership does drop as population density increases, but not appreciably until densities are very high. Above densities of 10,000 or more persons per square mile (such as New York City, San Francisco, and Boston, for example), almost 30 percent of households had no vehicle in 2009 (down from 35 percent in 1990), whereas at densities of 4,000 to 10,000, a little over eight percent owned no vehicle in 2009 and at densities below 2,000, only a little over four percent owned no vehicle (Santos et al. 2011). Only two metropolitan areas in the U.S. show levels of public transit usage at or above 15 percent—the New York metropolitan statistical area at 31 percent and the San Francisco metropolitan statistical area at 15 percent (McKenzie 2010). Of note, focusing solely within city boundaries expands the list of places where transit ridership reaches higher levels, such as Washington, D.C., where 33 percent of commuters use transit, although for the entire metro area of D.C., it is closer to 13 percent (Pisarski 2006). This is not surprising as transit use and service increase appreciably with increases in population density; heavy transit use is almost always found within city boundaries. This U.S. dependence on the automobile stands in stark contrast to that of other countries. National Geographic surveyed residents

of 17 countries in 2012 and found Americans used public transit less than anywhere else. Only 15 percent of Americans reported using public transit at least once a week or more, whereas in Russia it was a high of 69 percent. Canada, though much less dense than the United States, had 23 percent of its citizens using public transit (National Geographic and Globescan 2012).

While land use has been shown to influence transportation choices, the impacts found are generally small, such that any non-negligible decrease in vehicle miles traveled or car choice would require substantial changes to many aspects of urban form (Brownstone 2008; National Research Council 2009; Ewing and Cervero 2010). The U.S. is an outlier in this respect. For example, a recent study of the effects of transport policies in the U.S. and Germany found that adding 1,000 more people per square kilometer would decrease the probability of driving by about 3 percent in Germany but only 0.5 percent in the U.S. (Buehler 2010). For the majority of the U.S. population, travel without a car is not an attractive option. Automobile usage is, and will remain, largely inelastic to most viable policy changes in the near future.

This low level of responsiveness to policy in the future does not imply that matters were always this way. Cars need roads, and reviewing empirical studies, Handy argues that historically, highway construction was at least a strong enabler, if not the prime causal force, of suburbanization (2005). An unintended consequence of the increased mobility around cities provided by highway programs was the development of technology centers, office parks, and other infrastructural nodes near airports that entirely bypassed the central business district. With the development of a polynodal, largely suburban, matrix for these new employment centers, a new pattern of transport became embedded. A substantial proportion of trips now start and end in suburban or exurban areas. Between 1990 and 2000, for example, about 64 percent of the growth in commuting in metropolitan areas was suburb-to-suburb trips (Pisarski 2006). Another unintended consequence of automobile usage, contrary to popular belief, may be decreased spatial fragmentation of the population. A large-scale, global study of 120 cities found that higher levels of automobile ownership are associated with lower levels of fragmentation, pointing to the possibility that cars create an infill effect across an open geography (Angel et al. 2010).

Land use choices create legacy effects for future residents, making dramatic changes from current landuse patterns expensive, hence unlikely, in the near term. Infrastructure and buildings live for many decades, and are very costly to move. This means that decisions made in the past regarding the siting of new roads, buildings, and other facilities constrain the options available today, just as our choices today will constrain options in the future.

It is not just physical infrastructure that is difficult to alter. By adding long-standing governmental policies to this decision matrix, a larger picture emerges of a choice set highly limited by legacy effects, hysteresis exemplified. Beyond the cost of changing or replacing physical structures, communities have adopted zoning laws and other ordinances that influence the type of building and density levels that can occur. Most such regulations tend to foster keeping in place the uses that are currently there. Further, vested interests (financial and socio-economic) develop around maintaining the status quo. Neighborhood groups, city councils, and various other stakeholders would likely resist large changes in land use. Interestingly, this was not true in the wake of WWII for areas that are now suburbs. Many of those locations were largely rural, but once roads, communities, and employment locales got established in a moderately dense pattern, they became features difficult and expensive to change.

3. Why Do People Locate Where They Do?

We have undertaken an extensive review of the academic literature examining the prime drivers of residential location choice to further clarify how the current geographic profile was produced. The major determinants of residential location decisions can be grouped into three sets of factors:

1. Aspects of the property,

2. Features of the neighborhood in which the property is located, and

3. characteristics of the household making the decisions.

The first set of determinants includes things like square footage, number of bedrooms, lot size, proximity to highways and transit, and location of the house in relation to household members' jobs or schools. The second set includes factors such as the quality of the public schools, the crime rate, and the tax rate. Finally, the third group includes things like income, age, presence of children, and lifestyle preferences.

When households choose where to locate, they seek to optimize their preferences subject to their budget constraint, as well as the choices that are available on their market. This requires households to make trade-offs among different attributes of a property. Since property characteristics come as a bundle, households cannot optimize on all attributes. A lower mortgage will compete with a larger backyard, a better school, or a shorter commute to work.

While it is clear that an enormous range of factors may influence a household's decision of where to locate, our review of the research on this topic found that three appear to be dominant, on average:

1. Property characteristics, most specifically number of bedrooms, cost, and size,

2. Commuting costs; and

3. School quality for households with children.

First, property characteristics tend to be the most important determinants of residential location choice. They also drive the decision to move (Schachter 2001; US Census Bureau 2011). Of all property characteristics, the size of the house and number of bedrooms have often been found to be among the most important in affecting decisions, along with the price of the home (e.g., Sirmans et al. 2006; Lee et al. 2010). In general, people want as much housing as they can afford. This finding is more likely to hold for certain households, such as larger households, and those with children. This preference has also been found to decline with age, with more senior and elderly homeowners more likely to choose smaller residences. These critical location determinants are clearly linked to "life cycle" events, such as getting married, having children, or having grown children move out of one's home.

Second, commuting costs (particularly time) matter significantly once people decide to move, but rarely drive the decision to relocate (Schachter 2001; US Census Bureau 2011). Households prefer, other factors equal, to reduce their commuting time, and many households are willing to sacrifice other amenities to lower commute costs (e.g., Bhat and Guo 2004; Pinjari et al. 2007; Lee and Waddell 2010). In part this is because if households are spending more in time -- which can often produce dollars -- on commuting, they can spend less on other expenditures, including housing.

A third well-supported finding is that for households with children, school quality can play a dominant role in neighborhood choice (Bayoh et al. 2006; Brunner et al. 2012). Many other neighborhood factors have been found to be determinants, at some level, of the choice of location. They include the crime rate, access to open space, and tax rates, among others (e.g., Dowding et al. 1994; Cullen and Levitt 1999; Knapp et al. 2001). Of all of these, however, school quality is often the strongest predictor of location decisions among households with children.

As this last point highlights, preferences across the population will vary greatly. What is the most important driver of one household's location decision may not be significant for another. Preferences differ according to many observable factors, such as household size, income, age, and region of the country (e.g., Bina and Kockelman 2009; Morrow-Jones and Kim 2009; Lee and Waddell 2010; Kim 2011). There are also unobservable drivers of location choices, such as preferring certain aesthetic qualities, or one's proclivity toward use of non-motorized transportation options, such

as walking and biking.

These findings from the academic research on household location choice provide several explanations for the dominance of the suburban landscape in America. First, it is often the case that cheaper housing -- i.e., more housing for the same dollars, similar housing for fewer dollars, or indeed both -- is available further from center cities and secondary nodes of higher density. This helps to explain why a majority of Americans choose to locate in the suburbs or exurbs, since they perceive having larger homes and paying less for them to be important attractors. Unlike the much smaller countries in Europe, the U.S. has no comprehensive national policy or heavy tax subsidy to protect peripheral agricultural lands. This has allowed for continued development at the urban edge, as farms get converted into residential developments. Second, as jobs drifted to the suburbs across the country, many households were able to reduce commute times by locating in the suburbs (or exurbs). Third, in many areas, school quality is perceived of as better, on average, in the suburbs than in their accompanying city. This explains the finding that families with children often show a preference for the suburbs.

4. Externalities, Ethics, and Choice

Economists commonly assume that individuals make decisions that are best for them, given their options and constraints. If this is the case, individuals should be freely allowed to make their own choices. There are some situations, however, when individuals may not choose what is best for them—for instance, due to lack of information—or when their choices may inflict costs on others, such that it may be in the interest of society as a whole to restrict or influence certain choices. In these cases, free market choices will not lead to social optima.

There are several arguments that our current land-use patterns, and thus current household location choices, may generate negative externalities. We briefly consider the arguments here for the negative externalities of land consumption, energy use and emissions, and carbon footprints. A thorough empirical analysis would be needed to guide any policy changes. One concern with growing suburbanization and exurbanization is land consumption. The average exurban census tract has 14 acres of land per home, whereas the national average is only 0.8 acres per home (Berube et al. 2006). Khan (2000) finds, using American Housing Survey data from 1995, that suburban-dwellers consume twice as much land as urban-dwellers. Concerns about loss of land, however, appear to be largely unfounded in that agricultural production is not threatened by horizontal urbanization, nor is the U.S. generally in danger of running out of land (Heimlich et al. 1991; Glaeser and Kahn 2004). That said, it could be that we are breaking up habitats and ecosystems, imposing costs on the survival of threatened species survival, or even the function of full ecosystems (e.g., Faulkner 2004). Land consumption for housing at the periphery could also be eliminating open space for recreation near population centers, which imposes a different class of cost.

Other concerns about suburbanization relate to higher energy use and emissions, an area that has not to date received substantial research attention. Of the few studies on the topic, findings are mixed regarding energy use and density. One study finds that suburbanites do not, on average, consume more energy in the home than those in center cities (Kahn 2000). Kahn (2000) suggests this could be because those in the suburbs tend to have newer homes with more efficient technologies. This technology advantage could outweigh the other forces that would lead to greater consumption, such as having larger homes. One estimate suggests that those in center cities have an average of 496 square feet per person and those in the suburbs have 570 square feet per person (Glaeser and Kahn 2004). Those in less dense areas are also subject to greater efficiency losses as electricity must be transmitted for longer distances, for instance, and homes further apart cannot buffer each other from extreme temperatures. And indeed, other research finds that residents in less dense counties have higher residential energy use associated with being more likely to live in detached and larger homes (Ewing and Rong 2008). This is further supported by a 2009 working paper which finds that per capita, residents

in large metropolitan areas consume less residential electricity than the average U.S. resident (Brown and Logan 2008).

There appears to be agreement that suburbanites also have higher carbon footprints than their center city counterparts. One account suggests suburbanites produce roughly 10 percent greater carbon emissions (Glaeser and Kahn 2004). Partly this is due to increased driving. One study found that suburbanites drive 31 percent more than those in the city (Kahn 2000). On average across the country, over 10 percent of the population in center cities use transit, but under 3 percent do in the suburbs; for large metropolitan areas, the percent using transit in the city jumps to over 23 percent in the center city but only to 5.5 percent in the suburbs (Pisarski 2006). A more recent regression analysis found that higher population densities reduce residential carbon footprints; specifically, an additional person per acre of developable land is correlated with an 8 percent reduction in carbon footprint (Brown and Logan 2008). However, this research did not account for commercial buildings, industry, and other travel modes. A complete picture of the carbon footprint of denser cities versus fringe areas would require a life-cycle analysis, accounting for products delivered and carbon sinks from forested or grassland areas.

The question is then what, if anything, we should do as a society about negative externalities associated with land use patterns if they prove consequential. Many commentators have argued that promoting higher density is the way to address these negative externalities. This argument is based on studies suggesting a link between density and auto use, such as one that found that a 10 percent increase in metropolitan area density would reduce driving by around 3.5 percent (Kahn 2000). It may be the case, however, that other options are more effective and/or cheaper at reducing the negative externalities of suburbanization. Instead of moving suburbanites into dense areas in the hopes they will then use transit and reduce driving, investments could be made in energy efficient vehicles or renewable electricity sources. These might well generate larger reductions in emissions at lower cost than seeking to increase residential density. Producing a separate, renewable electric grid, using varying sources (photovoltaic, biofuels, etc.) depending on regional differences, for electric vehicle usage could significantly reduce carbon emissions with minimal land use change. Of course, if the policy concern is that energy is underpriced (i.e., the environmental costs of carbon emissions are not included in prices consumers pay), then a more direct and less coercive method to improve outcomes would be to impose a tax on that externality and thus raise the price of energy.

Similar alternative policies could be developed to address externalities from land consumption. At the urbanizing edge of metropolitan areas, agricultural land is often the land use that is converted to housing and other developed uses. If these lands are marginally productive and homogenous, then attaching ecological performance requirements to new planned development could actually improve the overall diversity. Integrating ecological corridors, habitats, and hydrological catchments could buffer the impact of land consumption and produce positive externalities such as recreational opportunities, passive water treatment, habitat expansion, and carbon sequestration.

Finally, recent research has demonstrated that far from being fixed, preferences are often ill-formed and malleable (e.g., Kahneman, 2011, and earlier work, Kahneman et. al., 1982). This has led to recent suggestions drawing on behavioral economics that we can "nudge" people to make choices that are better for society (Thaler and Sunstein 2008). Nudging choices would make good sense if we thought large numbers of suburbanites simply did not recognize the benefits of urban living, or that housing choice was as malleable as being a default organ donor. However, the empirical evidence strongly indicates that individuals are actively choosing to live in the suburbs. We posit they are producing current patterns of land use because it caters to their considered preferences. And they have millions of role models whose experiences influence their own choices. Nudges, in this context, are thus unlikely to generate substantial changes.

Conclusion

Three major lessons emerge from this review. First, there has been a dramatic flow of population to the suburbs in recent decades due to households making sensible location decisions, and the consequences (often unintended) of government policies, such as highway construction and the deductibility of mortgage interest. Though slowing in some areas, this process is still in progress and even growing in other locations. Second, this flow has been accompanied by the movement of both commercial real estate and employment opportunities, ultimately producing polynodal metropolitan areas. The resulting matrix of locations will be extremely difficult to alter significantly, even if the government policies that helped promote this pattern are reversed. There is simply too much capital in place, with over 60 million occupied homes in metropolitan suburbs (U.S. Census Bureau, 2009). Third, there is little evidence that household location decisions are ill advised or that homeowners are making poor decisions given the context in which they can choose their location. If significant externalities from location choice can be identified – and carbon emissions would be a prime candidate – they should be thoroughly documented before any policy measures are taken. Moreover, options beyond density increases should be thoroughly explored.

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