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# HSR as Transit: The continuing transportation-driven evolution of metropolitan form

**Ryan J. Westrom**
(corresponding author)
2014 Graduate
Master of Science in Transportation
Massachusetts Institute of Technology
Cambridge, MA USA
Email: westrom@mit.edu

**Joseph M. Sussman**
JR East Professor of Civil and
Environmental Engineering and
Engineering Systems
Massachusetts Institute of Technology
Cambridge, MA USA
Email: sussman@mit.edu

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# HSR as Transit: The continuing transportation-driven evolution of metropolitan form

Ryan J. Westrom
Master of Science in Transportation, 2014
Massachusetts Institute of Technology
77 Massachusetts Avenue, Building 1-151
Cambridge, MA 02139
Phone: (312) 515-1276
Email: westrom@mit.edu
Corresponding author

Joseph M. Sussman
JR East Professor of Civil and Environmental Engineering and Engineering Systems
Massachusetts Institute of Technology
77 Massachusetts Avenue, Building 1-163
Cambridge, MA 02139
Phone: 617.253.4430
Email: sussman@mit.edu

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## ABSTRACT

With high-speed rail (HSR) now often fulfilling a commuting function within an hour's travel time from principal metropolitan cities, it becomes the latest in a long line of transportation technologies to elicit change in the metropolitan form of these cities. This paper explores this history, and then the potential for this shifting form in the era of HSR. Viewing HSR as transit, its ramifications on metropolitan form are reviewed. Via a closer look at four case cities home to potential future HSR systems—Coimbra and Leiria in Portugal and Champaign-Urbana and Kankakee in Illinois within the U.S.A.—that will move within a principal city's commuting reach—Lisbon and Chicago, respectively—implications for transportation and land use planning are discussed. The unique discontinuous nature of these new potential forms presents fresh opportunities to implement planning best practices, providing sustainability and quality of life returns. These speak well to the potential for HSR to serve this new function, and provide support for the consideration of HSR as a transportation alternative for these settings.

# I. HIGH-SPEED RAIL AS TRANSIT

Historically, high-speed rail (HSR) has been considered an interurban form of transportation. Its competitors are seen as air and auto, and to some extent slower trains and buses.[1] However, as will soon become clear, we now can also consider HSR as a form of "urban transit", but between cities. The functional role HSR plays in the transportation system varies depending on the trip taken by its user. The speed of HSR, along with its typical city-center to city-center routing, has served to blur the line between intercity and intra-city travel.

Intraurban transit is typically used largely for commuting purposes and other daily activities. And the amount of time people typically spend traveling to and from work each day is amazingly consistent, across time and geography.[2] This constant travel-time budget[3] suggests that people will commute up to approximately one hour in each direction, allotting time in their day for an uncannily constant portion spent commuting. While there are outliers, often referred to as *super-commuters*, this again remains surprisingly consistent across place and cultures. As transport ease and speed has increased, the distance people travel has also increased, while the time remains constant. With that being the case, one would suspect that, for HSR users, the potential for commuting daily on this new mode will be real within this one hour travel window. And indeed, Naomi Stein observes:

> *HSR commuting would no longer necessarily refer to the tail-end of the distribution of willingness to travel, but rather (assuming adequate station accessibility, a significant assumption) to a set of travel times within the normal range of commuting behavior, even if distances are in the range of "super-commuting".*[4]

Therefore, any city, regardless of its distance from a metropolitan area, can move into the commutable realm of a central city if the travel time resulting from a HSR improvement moves to below one hour. In this paper, we will focus in Section V on the cases of HSR systems proposed extending from the Chicago and Lisbon metropolitan areas, with potentially connected cities of Coimbra and Leiria and Champaign-Urbana and Kankakee, respectively. For all four of these connected case cities, commuting time would move below one hour, and in fact is one of the driving forces behind our selection of these projects and communities.

Figure I.1 depicts the transformed regions resulting from the development of HSR between particular metropolitan centers. As can be seen, a new commuting region is formed on the HSR line out to the reasonably commutable distance, as, measured by time.

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[1] Taylor, "Selling the Value of High-Speed Rail".
[2] Schafer and Victor, "The Past and Future of Global Mobility".
[3] Sometimes called Marchetti's constant, after the work on this topic of Italian physicist Cesare Marchetti.
[4] Stein, "Spatial Dimensions of High-Speed Rail".

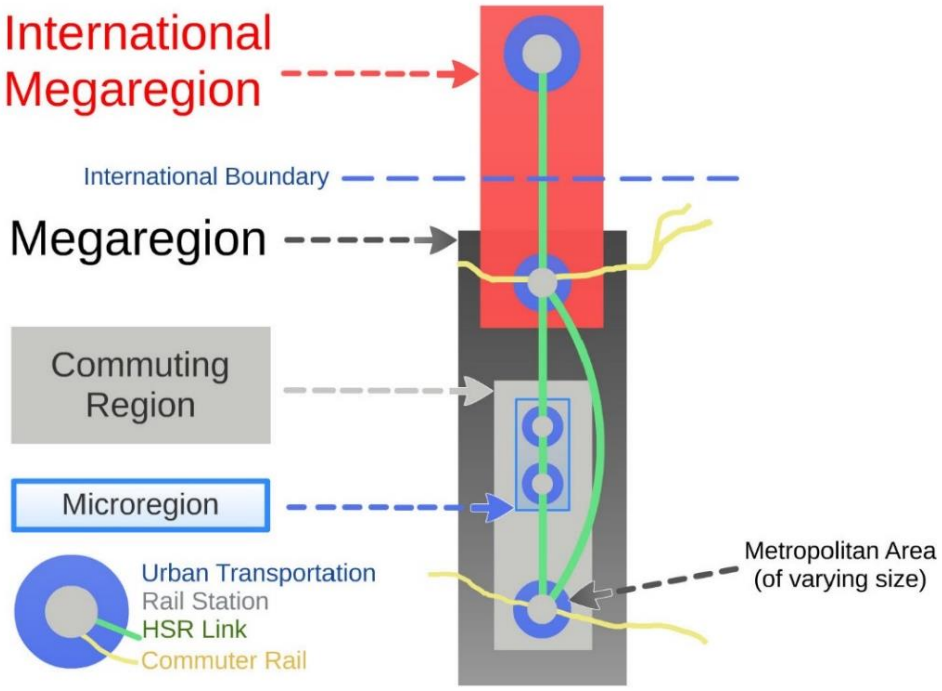



*Figure I.1. HSR and Regions (Source: developed jointly by Andrés F. Archila, and the authors)*

It is within these newly formed commuting areas this paper largely focuses effort on providing a fuller picture of the impacts and magnitude of effects the new HSR line brings, specifically to the metropolitan form of the principal metropolitan center at the system hub.

## II. THE RISE OF URBANIZATION: TRANSPORTATION AND METROPOLITAN FORM

Cities formed to allow collaborative benefits to society. Quantification of these has recently been shown more robustly than ever before possible.[5] Meanwhile, urbanization globally has continued in various ebbs and flows. Looking at the United States, specifically, after a half-century of increasing dispersal, there is a return to the central core underway. But whatever their shape, cities have always been shaped by their transportation. Economist Edward Glaeser observes, "Transportation technologies have always determined urban form."[6]

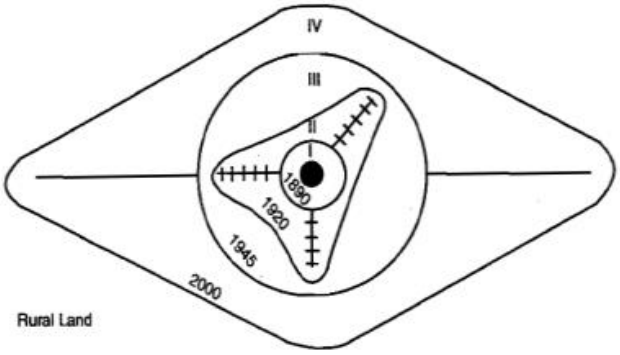
As congested centers of human activity, cities can face challenges due to their inefficiency, crowding, pollution, and a resulting unsatisfactory quality of life. A city's success is in constant tension with the consequences of such success. In fact, the agglomeration that underlies the benefit of city life also has intrinsic costs. The ability for agglomerative benefit to grow, and outweigh costs, is largely a result of the metropolitan area transportation network's ability to provide mobility and accessibility. The built environment in a city thus both generates the need and provides opportunity for travel.[7]

Historically, villages grew up around wells, and then grew to the size a 20-minute walk to the well would allow. Thus, the villages were typically about one mile apart.[8] Villages at transportation crossroads grew further to become cities. Cities continued to grow around vital marketplaces where agricultural products could be traded. Cities served as gathering places, centers of government, and

[5] Westrom, "The Agglomerative Role of Transportation Investment".
[6] Glaeser, *Triumph of the City*.
[7] *Driving and the Built Environment*.
[8] Larson, "Brilliant Designs to Fit More People in Every City".

protected havens. Then industrialization came, which brought the advent of networks, from social to transportation to utilities. And with it came the incentive for cities to grow. Agglomeration benefits of resource sharing and knowledge spillovers were accrued by residents. And the possibility for division of labor grew as well.[9] Cities have changed significantly and rapidly since that point. Populations exploded and the labor force began to shift from being agriculturally-based to factory-based.

Transportation continued to transform the urban form, as new technologies allowed further expansion. Beginning in the 1830s, railroads were built to transport people and goods. In cities, first came horsecars (animal-powered streetcars) in the 1830s, then cable cars in the 1870s, and electric trolleys and transit lines by the 1880s when electrical power spread through urban areas. Ultimately, intraurban transportation largely transitioned to automobiles by the 1920s, and by the 1950s, most trolleys transitioned to buses. Only heavy transit typically remained of the prior rail-based urban transportation networks. Following the advent of autos, the form of American cities especially became bifurcated along development date lines, with an inner zone matching the boundaries of the old industrial city and farther out areas developed and designed with the automobile in mind. This ever-changing pattern of metropolitan growth can be categorized into eras of changing urban form. Muller captures these intraurban transport eras and metropolitan growth patterns in Figure II.1, further dividing the automobile era and highlighting the "freeway era" that has dominated American development since the 1960s.[10] Locally, neighborhood forms match the move through these eras as one moves from the urban core to its fringe. And many regard the growth of automobile use in America as having led to a successful "suburban experiment" (although many will debate the success of the experiment).[11] Therefore, cities have grown in area significantly and into metropolitan regions, with densities of development generally declining.




Intraurban transport eras and metropolitan growth patterns: (I) Walking-Horsecar Era, (II) Electric Streetcar Era, (III) Recreational Auto Era, and (IV) Freeway Era. Source: Adams (1970, p. 56). Copyright 1970 by The Association of American Geographers. Adapted by permission.

*Figure II.1. Intraurban Transport and Metropolitan Growth (Source: Muller, 2004)*

Mieszkowski & Mills observed[12] that as cities grew to sprawling metropolitan regions, much of this growth was a natural evolution as people grew to desire less density but also a "flight from blight." They further assert that, "If suburbanization is largely the result of natural evolution, and technologically- and income-induced changes in the demand for land, then it is appropriate for the public sector to accommodate these demands." Advocates such as Joel Kotkin applaud the spread of cities, as just such a natural evolution.[13] Recently, however, even in areas previously suburbanizing, there has been the return towards center-centric growth, and areas around the world are relearning the importance of city core business districts.[14]

[9] Glaeser, "Why Humanity Loves, and Needs, Cities".
[10] Muller, "Chapter 3: Transportation and Urban Form".
[11] Hall, *Cities of Tomorrow*.
[12] Mieszkowski and Mills, "The Causes of Metropolitan Suburbanization".
[13] Kotkin, "The Triumph of Suburbia".
[14] Ehrenhalt, *The Great Inversion and the Future of the American City*.

## III. HIGH-SPEED RAIL AND METROPOLITAN FORM

Whatever one's opinion of the most appropriate development styles, it is clear that transportation has shaped the land use in cities globally. This is because development styles typically reflect the available technology of the era. Our focus is on anticipated impacts from high-speed rail (HSR) in areas where such systems are anticipated but not yet in place. Using case studies of four communities planning for potential HSR access, and based on the thesis work of author Westrom[15], we examine the potential influence of HSR on metropolitan form.

Past literature indicates that added high-speed rail access results in shifting and broadening labor markets[16] and job growth[17], increased business productivity or expanded markets[18], changing population distribution[19] and commuting shifts[20], or real estate price increases[21]. The largest effects originate from the center metropolitan core and extend to the connected outlying cities, due to the magnitude of these principal places. As described in Section I, these types of impacts have historically brought evolution to the metropolitan form, which is an impact worth assessing further.

### Metropolitan Form

HSR is expected to bring additional outlying areas into closer contact with the central city. As we saw in Figure I.1, this manifests itself in an expanded commuter shed. Real physical transformations can be expected to match this expanding zone, resulting from the new network brought by these HSR systems.

This expanded commuting region for the metropolitan area will lead to a spatial restructuring, by which the region's space will be shifted by the travel time along the HSR spokes. Past literature has observed that this time-space transformation in effect creates "a different social and economic space"[22] within which the HSR travel has "significantly altered economic geography".[23] For example, Ciudad Real in Spain has, via HSR access, become a commuting origin for Madrid.[24] Globally, the potential for this phenomenon can be found repeatedly. As Westrom shows[25], searching for cities of a certain size and distance from a principal city returns several likely commuter origins comparable to Ciudad Real from around the world, similar to the case communities discussed in this paper. This phenomenon, shown in Figure III.1, whereby outlying cities will become closely connected into the center metropolis while unconnected in-between areas are passed over, has been coined a *discontinuous region*.[26] Cities on the HSR line are brought closer together while bypassed areas don't see the same benefit[27]; this may also serve to counteract sprawl as development focuses around the connected locations.

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[15] Westrom, "The Agglomerative Role of Transportation Investment".
[16] Haynes, "Labor Markets and Regional Transportation Improvements".
[17] Loukaitou-Sideris et al., "Tracks to Change or Mixed Signals?".
[18] *The Economic Impacts of High-Speed Rail on Cities and Their Metropolitan Areas*.
[19] Stanke, "High Speed Rail's Effect on Population Distribution in Secondary Urban Areas".
[20] Elhorst and Oosterhaven, *Effects of Transport Improvements on Commuting and Residential Choice*.
[21] Zheng and Kahn, "China's Bullet Trains Facilitate Market Integration and Mitigate the Cost of Megacity Growth".
[22] Givoni, "Development and Impact of the Modern High-Speed Train: A Review".
[23] Chen and Hall, "The Impacts of High-Speed Trains on British Economic Geography".
[24] Gutiérrez, "Location, Economic Potential and Daily Accessibility".
[25] Westrom, "The Agglomerative Role of Transportation Investment".
[26] Stein, "Spatial Dimensions of High-Speed Rail".
[27] Some have described the result on these passed-over communities in between HSR stations as a "*tunnel effect*".

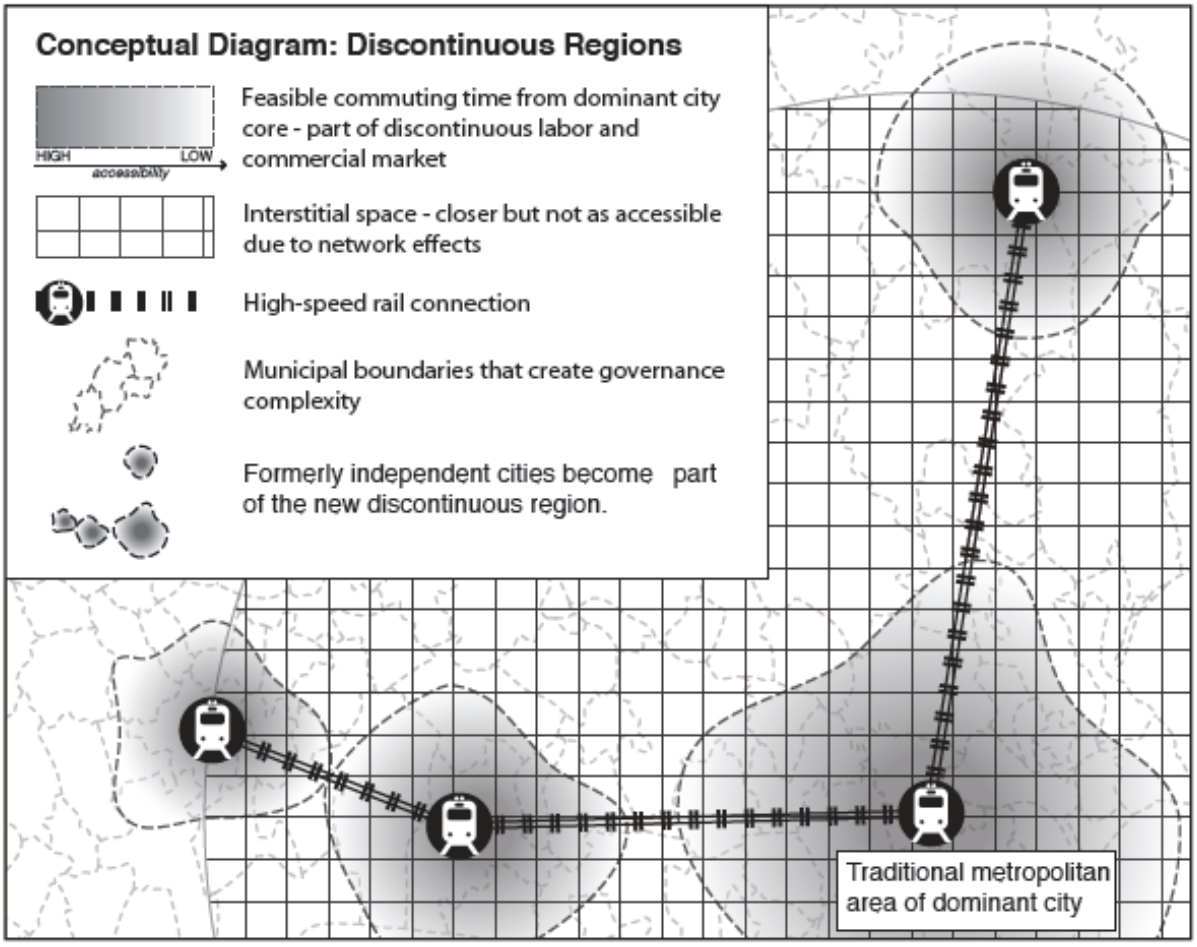


*Figure III.1. Discontinuous Regions (Source: Stein, 2013)*

Thus, we see the resulting physical transformations as impacting the connected principal metropolitan area as well as corollary changes at the intermediate city level and in the region as a whole. The alterations to the feasible commuter shed can be clearly seen. Hence, the economic effects are especially felt in these connected areas newly within reach of the principal city, and effects are especially present with HSR due to its direct city center to city center trips. Stein observes:

> *In some ways HSR is unique: it enables a continuity of daily lived-experience across geographic distances which are greater than those that could be integrated by the automobile or conventional rail, in effect creating social and economic relationships within discontinuous regions.*[28]

The metropolitan center thus grows not contiguously, but in leaps along transportation networks. And it appears the positive externalities from the urban center are dispersed along these transport lines.[29] These effects may lead to corporate and residential clustering at these nodes, all reliant on a now shortened access time to the center of the metropolis. Together, these nodes are propelled further towards functioning as polycentric nexuses comprising the region as a whole that more than ever relies on the transport link now connecting its major centers of economy. These trends in growth repeat patterns we

[28] Ibid.
[29] Graham and Melo, "Assessment of Wider Economic Impacts of High-Speed Rail for Great Britain".

have observed throughout history.[30] Therefore, it seems clear HSR has potential for again shifting metropolitan form.

### 21st Century Garden Cities?

In some respects, this discontinuous regional form hearkens back to a much earlier urban concept. Near the end of the 19th century, Ebenezer Howard outlined his version of optimal urban development form. Calling his concept a *garden city*, he envisioned central cities surrounded by a greenbelt, connected by rail with outlying cities.[31] This network of connected cities would function as a garden city-based metropolitan area. Despite its potential promise, "…the garden suburb had a short-lived history in the U.S., where it was nudged aside by the automobile in favor of today's cul-de-sac plus strip-mall-plus-highway-interchange model of conventional suburban sprawl that covers most of our landscape."[32]

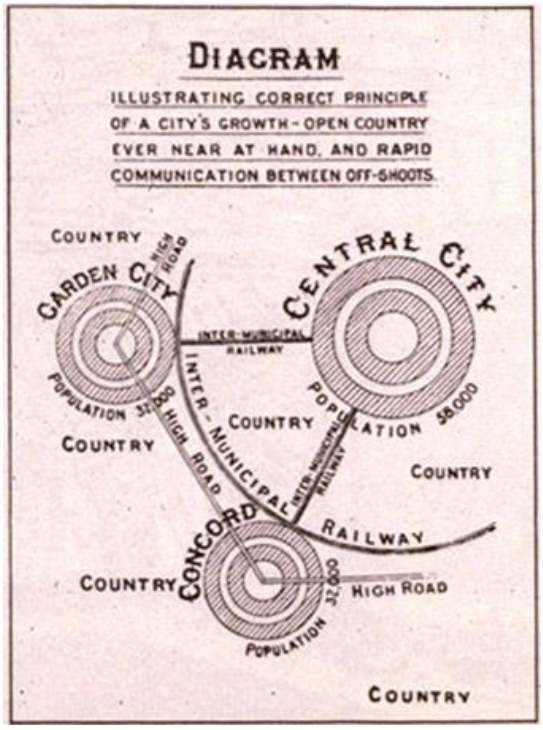


*Figure III.2. Garden Cities (Source: Howard, 1902)*

HSR, however, could naturally lead to new opportunities for creation of emerging centers in the notion of the garden cities movement, as shown in Figure III.2. One envisions neighborhood clusters of density around local HSR stations, with the overall city form bowing to the center of density around the historic downtown area and the new HSR stations. Even further, consideration for greenbelts around these clusters could help control sprawling growth not conducive to the development sought. This sounds like the sort of growth several of the case communities have discussed in seeking to capitalize on HSR development. Coimbra, for instance, has developed a concurrent plan for urbanization around the proposed new HSR station. But this also emphasizes the importance of station location. A city center station will be much more strongly suited to enable this developmental approach.

This garden city movement from over a century ago noticeably exhibits unique characteristics similar to current thinking on urban development best practices of the 21st century. Key to such development, of course, are other related urban design concepts discussed in the following sections.

### Transit-Oriented Development

Attempts to capitalize on the high access provided at transit stations have been commonplace across urban areas. Mixed-use higher density development in proximity to transit stations or intermodal transfer facilities has been dubbed *transit-oriented development* (TOD). As we consider the linkages a HSR system will have, this style of development fits, especially for those HSR stations located within the commuting region of a central city. The greater the density of development adjacent to such stations, the more people who have direct access to the HSR network. In the cases of our case cities, the potential for such development is clear. When the HSR station proposed is located within or adjacent to an existing downtown (e.g. Coimbra, Champaign-Urbana, and Kankakee), some of this density is already present. In all cases, additional development can be added. But in cases where the station is located at the edge of

[30] Muller, "Chapter 3: Transportation and Urban Form".
[31] Howard, *Garden Cities of To-Morrow*.
[32] Gallagher, "Paradise Lost? How Garden Suburbs Can Save Detroit".

town (e.g. Leiria), dual centers of density may develop. And additionally, fewer existing local residents may be able to take advantage of the HSR development in that scenario.

TOD provides additional benefits beyond greater mobility for nearby residents. Such communities also reduce the amount of driving some residents undertake, since they use transit in lieu of driving more frequently.[33] Freight deliveries can be streamlined, and mixed uses joined well. This leads to positive environmental externalities, and often reduced costs for transport. The desirability of such places shows in the declining rent gradient as one moves away from transit stations.[34]

Historically, prior to automobiles, most cities naturally developed in this fashion. Clusters of development formed around transit hubs, with growth occurring along the transportation networks. Throughout history, the pattern of metropolitan development has been heavily influenced by mass migrations of people to cities and ongoing changes in technology—especially for transportation. To some extent, as was discussed earlier, the automobile was just another such technological advance, for which the effect on metropolitan form was large. However, many practitioners have begun to recognize the vitality that prior transit cluster development provided. As shown, the higher densities and urban form in these types of places provide additional benefit to dwellers and their cities. Thus, movements to regain these past design best practices have developed.

**New Urbanism**

The desire to bring back the urban form of yesteryear has led to the rise of an urban planning movement described as *new urbanism*. The goal of this movement is to return new development to the historic urban form prior to the advent of auto-oriented development, and has been brought to public attention by the formation of the Congress for the New Urbanism founded in 1993. Adherents seek to encourage walkable mixed-use neighborhoods with a range of housing and business types. It embraces principles of TOD and sometimes is more broadly connoted by the term *smart growth*. The Smart Growth movement grew to prominence in the late 1990s, and practitioners improved urban planning through renewed foci on efficiency, mixed use, and density. At the core of these urban design considerations is an aim to prevent development form seen as inefficient and ill-conceived, with a return to design principles shown to be successful over centuries of urban development.

It seems possible for our subject cities to begin learning from mistakes others have made. By leapfrogging[35] developmental eras that are harmful, they can potentially move directly into the future of transportation and land use best practice, avoiding environmentally, economically, or socially harmful stages of development by not following the development trajectory others, including much of the United States, have followed. Thinking back to the eras of development[36] perspective, there is relevance for our cities today. As outlined, most metropolitan areas have experienced spreading growth in the automobile era. Furthermore, the evolution in neighborhood form through that time as well, from traditional to grid to suburban, matches a move through those development eras. But the future can be different. Now, why couldn't cities with a new HSR linkage, taking hints from these planning movements, move quickly past the freeway and cul-de-sac era, to a 21st century era of urban revitalization?

[33] Renne and Ewing, *Transit-Oriented Development: An Examination of America's Transit Precincts*.
[34] Bartholomew and Ewing, "Hedonic Price Effects of Pedestrian- and Transit-Oriented Development".
[35] The concept, now used in the context of sustainable development, based on Joseph Schumpeter's notion of 'creative destruction'. from Schumpeter, *Capitalism, Socialism and Democracy*.
[36] As discussed in Section II via Muller, "Chapter 3: Transportation and Urban Form".

## IV. QUALITY OF LIFE AND HSR

Growing awareness of the importance of design in quality of life has led to the "mainstreaming of livability and sustainability concepts into … transportation planning."[37] This focus allows one to assess the potential for HSR to promote livable and sustainable lifestyles, which would improve the quality of living for users and stakeholders. Transportation projects are increasingly being weighed on their ability to facilitate accessibility to the agglomerative center, and thus on their capacity to deliver sustainable livability. HSR provides a step towards increasing a city's functional potential.

HSR technology helps reduce commuting times into major cities, thus easing congestion in those metropolitan areas by reducing auto commuting while also bringing greater access to the principal city for the connected smaller cities. This helps stimulate real estate development, and makes additional markets attractive to people in the regions. Some have suggested that this creates a "safety valve" of expansion potential without the traditional limitations of congestion for metropolitan areas.[38] Additionally, access is a quality of life improvement. The access brought by HSR could bring added productivity in smaller connected cities, more balanced real estate prices, and a more sustainable economic profile. Table IV.1 shows the effect improved transportation has on travel[39], the critical component in these productive connections, which has resulted in the metropolitan form changes outlined earlier.

*Table IV.1. Effects of Technological Innovations on Travel Speeds and Times (Source: Pickrell, 1999 and authors)*

| *Technology* | *Approximate date introduced* | *Typical door-to-door speed (mph)* | *Travel time per mile (minutes)* |
|---|---|---|---|
| Walking | Early | 3 | 20 |
| Horse-drawn omnibus | 1827 | 4 | 15 |
| Horse-drawn streetcar | 1835 | 5 | 12 |
| Cable car | 1875 | 8 | 7.5 |
| Electric streetcar | 1890 | 10 | 6 |
| Rail rapid transit | 1910 | 15 | 4 |
| Motor bus | 1915 | 20 | 3 |
| Automobile | 1920 | 30 | 2 |
| High-speed rail | 1964 | 120 | 0.5 |

Furthermore, HSR as a transportation network fits well the design form of communities aspiring to be livable communities. The types of compact development sought have come to be characterized by "five D's": density, diversity, design, destination accessibility, and distance to transit.[40] The ability to create clusters of development at station locations inherently allows the fulfillment of these requisite features. Design around a HSR station has the potential to bring the density, diversity, and walkability that inhabitants find livable and allows accessibility. Meanwhile vehicle miles traveled (VMT) and their associated negative externalities can be reduced.[41] The notion of garden cities of the 21st century formed via clusters along a string of HSR stations feels like a sustainable transportation and land use match.

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[37] Miller, Witlox, and Tribby, "Developing Context-Sensitive Livability Indicators for Transportation Planning".
[38] Zheng and Kahn, "China's Bullet Trains Facilitate Market Integration and Mitigate the Cost of Megacity Growth".
[39] Pickrell, "Chapter 12: Transportation and Land Use".
[40] *Driving and the Built Environment*.
[41] Ibid.

## V. LEARNING FROM CASE COMMUNITIES

In both Portugal and Illinois, significant international-quality HSR systems are proposed. These new HSR systems are envisioned to move from each geography's major economic force, Lisbon and Chicago respectively, providing high-speed access ultimately to Porto and St. Louis (as well as potentially Indianapolis).

We have chosen to focus on four communities along these proposed HSR systems, two in Portugal and two in Illinois. The genesis of our focus on these communities arises, as aforementioned, due to their movement from outside commuting distance of the principal metropolitan area in their geography to being within the commuter shed for these cities via the reduced travel time brought by HSR. The effects of this transition are an area worth further study, and offer the potential to illustrate additional wider benefits of the proposals.

In Portugal, Coimbra is the country's fourth largest metropolitan area. Home to an esteemed university, University of Coimbra, and the country's best hospitals, it is an intellectual center, and a picturesque river city. Leiria is smaller, more centered on manufacturing and light industry, and the second most important proposed stop between Lisbon and Porto. In Illinois, Champaign and Urbana are twin communities home to the state's flagship public university, the University of Illinois, and the area is a significant state intellectual influence. Kankakee is smaller and grew as an industrial river town, and is the only substantial town between Champaign-Urbana and the Chicago metropolitan region. Lisbon and Chicago are the main economic and political centers of Portugal and Illinois, respectively (despite Chicago not being the state capital). As significant metropolitan areas, they bring influence that stretches far past their own geographic boundaries, with substantial gravitational pull over the entire Iberian Peninsula and Midwest, respectively.

As we initially assess our case cities, we can see at first glance there is an uncanny similarity between the analogous Portugal and Illinois municipalities. In addition to all representing communities that will move within commuting time thresholds, the four cities are a similar distance from the metropolitan areas of Lisbon and Chicago and house comparable populations. In particular, Champaign-Urbana and Coimbra are an almost identical distance from the principal city in their region. Furthermore, there are striking parallels between the communities.

Both Coimbra and Champaign-Urbana are "university towns" that serve as an intellectual center and source of knowledge within their geography, and their populations are relatively similar as well. We see in both cases key intermediate cities with potential to be transformed by the proposed transportation upgrade. Both feature relatively extensive local bus systems, and most of each community's culture is heavily influenced by the major local university. In both cases, key industries include the universities, healthcare providers, and technology firms. This combination leads to a culture of innovation and entrepreneurship. These are clear markers of the importance of the knowledge economy in both communities, and indication of the high proportion of white collar workers found in both.

Both Leiria and Kankakee are smaller communities more focused on light industry, and again with relatively similar distances from the urban centers of Lisbon and Chicago, respectively. As the HSR station stop before the larger nodes of Coimbra and Champaign-Urbana, they will face their own similar battles for relevance and profile. Both Leiria and Kankakee feature manufacturing as a main source of community support as well as also having smaller universities and healthcare centers. They are thus home to a higher proportion of blue collar workers than Coimbra and Champaign-Urbana. Both feature a smaller bus system providing local mobility, but offer proportionally lesser service than their larger counterparts. Both are better connected via highway travel than on other modes to the major hubs of Lisbon and Chicago, respectively.

It turns out that both proposed HSR systems are creating very comparable linked city pairs, at similar distances from the major metropolitan hub from which the HSR extends. All these towns are ones

that aspire to greater regional connectivity and networking beyond their own metropolitan area. As Stein observes about the Portuguese cities, "In the same way that at the national level Lisbon is seeking to network with its surrounding cities and so become more competitive at an international scale, Leiria and particularly Coimbra are interested in networking at the more regional scale so as to not lose out within the national (and to a more limited degree, international) arena."[42] With these shared aspirations and the noticeable similarities amongst communities, it becomes clear that these analogous situations are a useful set of cases for comparing and contrasting effects from these two HSR proposals. In each system's case, we can envision a newly-formed discontinuous region composed of these cities along with Lisbon and Chicago, respectively. Westrom provides further explanation of these case systems and the resulting metropolitan and land use ramifications. [43]

These types of linked communities may be harbingers of the type of regional development more commonplace in the 21st century. The type of clustered dense development we have reflected fits well with HSR development and matches the vision for future growth some experts foresee. Observers predict that "…the suburban tract house and the shopping mall will have gone the way of the dinosaurs, and a generation of workers in the knowledge-based economy will flock to high-density, walkable urban mixed-use neighborhoods."[44] Much of this growth will come in principal metropolitan areas, but some will also occur in "…lower-density 'micro urban' communities [where people can] enjoy the same economic opportunities and cultural amenities of urban areas while savoring the pleasures of living close to nature."[45] These different settings have the common theme of densification and walkable communities, whether they take the form of megacities or dispersed micro-urban centers.

Places such as our case cities, especially Coimbra and Champaign-Urbana, have the opportunity to serve as regional micro-urban prototypes located at the new growing discontinuous edge of larger metropolitan areas. In an uncertain future with ongoing societal shifts featuring social and demographic changes such as the urbanization we have noted, along with a transformative millennial generation and global aging, there are further trends pointing to demand for this type of progression.[46] Advances in technology continue to transform business and government while growing concerns over climate change drive pursuit of sustainability. Advocates claim "…we will see that small cities offer many assets for sustainable living… population density (and the capacity for more); fertile, nearby farmland available for local agriculture, windmills, and solar farms; and manufacturing infrastructure and workforce skills that can be repurposed for the production of renewable-energy technology." They believe these places should position themselves as "…appropriate to the low-carbon twenty-first century: [with] compact, transit-oriented, pedestrian-friendly urbanism…" and surrounding land preserved reminiscent of the Garden Cities design form.[47]

[42] Stein, "Spatial Dimensions of High-Speed Rail".
[43] Westrom, "The Agglomerative Role of Transportation Investment".
[44] Kiger, "Imagining Land Use in 2063".
[45] Ibid.
[46] Klein, "The Inevitable, Accelerating Rise of Urbanization".
[47] Tumber, *Small, Gritty, and Green*.

## VI. CONCLUDING THOUGHTS

The outlying cities in any region have always played a key role in the overall region's success. Scottish biologist Patrick Geddes introduced the idea of a regional transect that suggests each place in a region is dependent on the others, and the city on the hinterlands. He stated, "In short, it takes the whole region to make the city."[48] New urbanists have adopted this transect zone idea to illustrate the range of development form across areas. Figure VI.1 shows this concept.

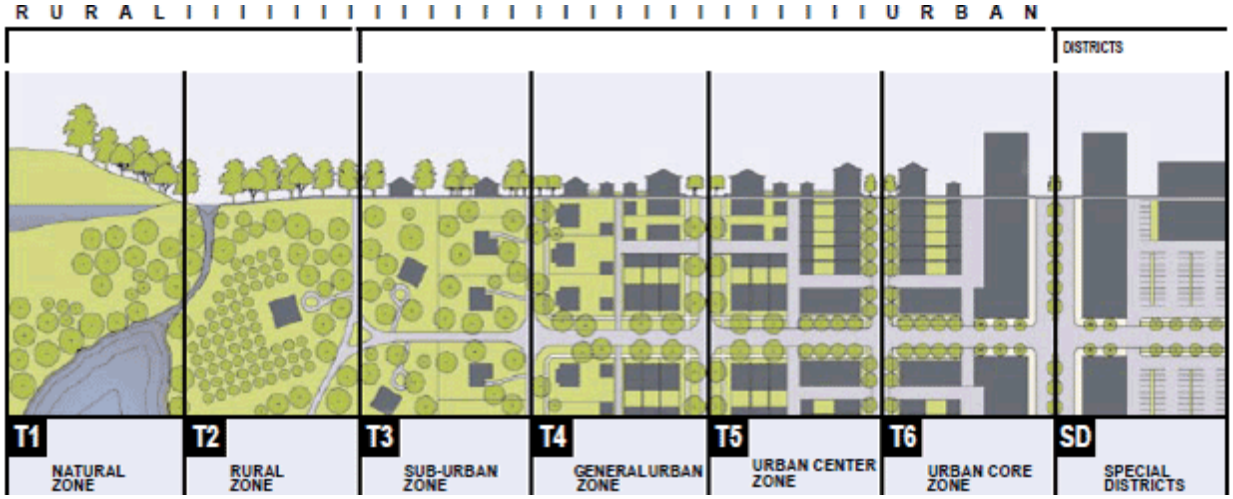


*Figure VI.1. Urban Transect Zones (Source: Duany Plater-Zyberk & Company)*

Interestingly, recent research has indicated that part of the reason[49] many megacities in developing countries may not be realizing the agglomerative growth one might expect is due to the broken link between these places and a supportive hinterland.[50] In essence, they have grown despite not having the appropriate surrounding natural resources to support them. This again affirms the important role the areas of agriculture, decentralized manufacturing, and knowledge hotspots lying outside Chicago and Lisbon have. An added HSR link that reinforces these symbiotic relationships will support the development essential to continued metropolitan growth, and can transform the planning perspective leaders take. Therefore, HSR links will transform the existing metropolitan form, and also allow for new growth via the linked communities in newly discontinuous functional metropolitan areas.

Thus, metropolitan planning remains critically necessary. Especially because, although the addition of a HSR station would induce some redevelopment on its own, HSR alone would not bring the change needed to transform these communities as envisioned. In other words, "…the mere presence of the train is not enough to promote significant economic and territorial improvements."[51] Any HSR implementation must be coupled with land and development policies supportive of the growth anticipated in these areas. Various such policies or bundles of policies will exert differing effects on the regions. The case communities must choose their focus wisely, then implement proper goals and policies to meet this vision. As Stein observes, "High-speed rail's integration with local land use and mobility systems is critical if HSR is to be successful in supporting network-based agglomeration economies."[52] Lessons

[48] Ibid.
[49] Another important reason may be the insufficient intracity transportation available in many of these places.
[50] Glaeser, *A World of Cities*.
[51] Bellet, Alonso, and Casellas, "Transport Infrastructure and Territory".
[52] Stein, "Spatial Dimensions of High-Speed Rail".

from past learning in the realm of regional transportation planning are critical for this new regional metropolitan perspective.[53]

Given the importance of easy access to HSR stations, a shared planning vision between developers, each city, and the HSR planners must be attained. The policies implemented locally, within each connected city, are important. Best practices here point to integration of the HSR within the area comprehensive plan, with zoning and development incentives pointed towards promoting compact central development with efficient mobility patterns. And this could even mean collaborative measures between the HSR operator and communities to promote a new image that can help bring added tourism and the promotion of new industry can be valuable.[54] In the end, we do not invest in infrastructure as an end in itself. We do it for the benefits it brings, and with the benefits shown for these HSR systems[55], planners must accommodate this investment in a fashion that further leverages their potential. Doing so may again shift metropolitan form, now to a regional scale, while also bringing corollary growth, but without the sprawl inherent in conventional megacities.

[53] Sussman, Sgouridis, and Ward, *A New Approach to Transportation Planning for the 21st Century*.
[54] Bellet, Alonso, and Casellas, "Transport Infrastructure and Territory".
[55] Westrom, "The Agglomerative Role of Transportation Investment".

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