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Creating Pedestrian Connectivity and Continuity of Fabric in Transit-Oriented Communities: Applications to Tren Urbano Station Areas

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Abstract

The city of San Juan, Puerto Rico, is currently constructing Phase I of Tren Urbano, a heavy rail transit system whose promise is to provide relief from interminable gridlock, improve air quality, and provide transportation options in a city with more cars per mile of road than any other city in the world. The Tren Urbano planners have a grave concern for the quality of pedestrian access to the station areas from surrounding communities. San Juan is a vast, sprawling city of 1.5 million people, and current design and development practice has resulted in an increasingly fragmented and disjointed urban fabric. The consequence of this disconnectivity is a very pedestrian *unfriendly* environment where the transit station will not be seamlessly woven into the grain of the community and gain the mutual advantages that transit-oriented mixed-use provide.

This research proposes to establish a set of design guidelines and regulatory controls for shaping new development to ensure high levels of connectivity and/or establish criteria and planning strategies for the retrofit of existing development to achieve a more connective pedestrian environment and cohesive development pattern. A set of urban design criteria integral to shaping such environments will be culled from existing research, literature, and other sources. Employing these criteria, an evaluation of the physical outcomes (intents and results) of recent transit station area developments in the United States will assess how varying levels of connectivity were or were not achieved in integrating station development to its surrounding communities. Lessons learned from these cities struggling to shape transit-oriented communities will pay special attention to the efficacy of zoning and design regulation as a tool for shaping

environments and the successes of various planning strategies toward issues of pedestrian connectivity. These lessons will inform a recommended course of action, either guidelines and potential regulation or strategies for retrofit for communities along Tren Urbano, specifically station areas along the highly suburban Carolina corridor, which is still in initial planning phases.

Motivation

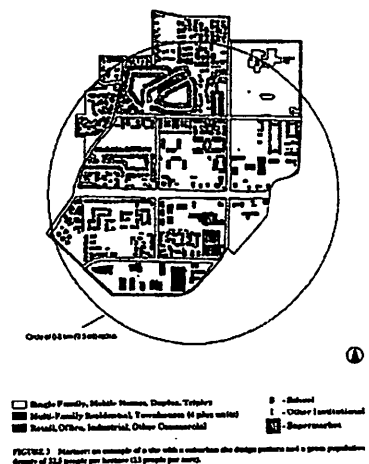
Discussion of development around transit stations often focuses exclusively on the built landscape immediately adjacent to or abutting stations. Many city officials see their commitment to creating "transit villages" fulfilled with one project approval -- as if a singular, albeit large scale and dense, clustered development will fundamentally alter movement patterns, modal choice, or quality of life and built environment for the population of the wider area. The wider area must be considered, well beyond the unrealistically narrow 1/4-mile radius, to create truly transit-oriented communities and begin to shape the population's sensibilities of Tren Urbano's role in their lives. Overall, there are three critical levels of connectivity and continuity that must be improved -- the station to its abutters, the abutting development to the surrounding communities, and surrounding communities amongst themselves. This research will focus on the latter two.

Successful transit-oriented development is acknowledged by academics, planners, and architects to comprise three alliterative ingredients: Density, Diversity, and Design (Cervero, 1997). The achievement of sufficiently high densities and critical mass of population has garnered the lion's share of attention as the primary obstacle to creating transit-oriented communities. It is often the case that new development is indeed chosen for its potentially transit supporting densities, including much current residential development in San Juan, Puerto Rico. However, good Design is the forgotten member of the trio, and development often ends up as insular enclaves or "chunks" of development with limited pedestrian and transit-unfriendly layouts and environments. The "mixtures" of Density and Diversity criteria are often executed in rigid, blocky fashions and modes that are inward-looking, suburban residential "communities" with circuitous cul-de-sacs, gates, limited access, and no relation to surrounding development. Anne Vernez Moudon and Paul Hess at the University of Washington identified suburban "clusters" around Seattle which exhibit many of the rough statistical characteristics of a potentially successful transit-supportive



community, but little of the qualitative structure that would allow to function properly as such: “At the neighborhood level, the clusters offer a compact land use program that approximates that of established neighborhood planning models. However, their burgeoning forms remain primitive versions or imperfect realizations of neighborhoods, preventing them from fully realizing their potential” (Moudon and Hess, 2000). Merely inserting transit services into an auto-based environment is not likely to reap the benefits it might if mutually supported by highly coherent and connective environments. The morphology of neighborhoods truly has an impact on their function as transit-supportive and cohesive units, especially as the pedestrian network is affected (Handy, 1996; Cervero and Radisch, 1996).

Connectivity of access and continuity of development are vital to creating successful transit-oriented communities. Pedestrian and bicycle access and circulation are often stymied by circuitous routes, obstacles, and internally oriented subdivisions. In an earlier paper Moudon and Hess entitled, “Site Design and Pedestrian Travel,” they demonstrate that “suburban neighborhood site design (as opposed to land use distribution and intensity) falls short of supporting pedestrian travel because suburban pedestrian travel routes are notably less direct than those in urban sites.” The intensity, completeness, and complexity of the pedestrian network determines how many destinations a person can reach in a reasonable distance. Fragmented and enclave-like environments produce fewer pedestrian trips and generate less activity (Hess, 1997). A quick glimpse at a street map of the Carolina area of San Juan, planned to receive the phase II Tren Urbano alignment, reveals a blocky pattern of isolated “developments” of closed-loop cul-de-sac streets and little continuity between adjacent areas.



If the character, fabric, and scale of a station area neighborhood are fragmented the neighborhood will fail to capitalize on the synergistic and "whole-is-greater-than-the-sum" potential that transit-based communities can create. Ridership will not likely grow as it might in more supportive environments and the transit system and stations themselves will not grow to become considered seamless and integral parts of the community. It is incumbent upon planners to “address the deficiencies in the infrastructure and site design of existing clusters to allow them to function properly as mixed-use areas” and that guidelines and strategies are needed both to

retrofit existing areas and improve the design of new development (Moudon and Hess, 1999, 2000).

Methodology

I will primarily employ a case study methodology. First, I will establish criteria that characterize development connectivity and continuity, largely culled from the design literature. There are numerous quantitative techniques suggested in the design literature for assessing the connectivity of pedestrian access and grain of street networks. They include such measures as sidewalk completeness, mean distances between neighborhood or development entry points, route directness, the “ped-shed,” block size, cul-de-sacs per road-mile, number of intersections per square mile, and more. Some of these measures address the quality of development in terms of its continuity and formation of a coherent network of “paths” and “places,” but this area is more subjective and there is less literature that speaks to this. I will possibly formulate my own criteria for what formulates “continuity” of development in terms of site design and relationships between structures or neighborhoods.



Based on my selection of a study area in San Juan, I will select appropriate case studies that either address the retrofit of existing environments or the influence of significant new development after the introduction of a transit station, whichever is more appropriate to the situation of the San Juan study area. I will look at three transit station communities in the United States, around which a significant amount of development matured in conjunction with or after the introduction of the station and evaluate the stations in terms of their connectivity of access and continuity of development (the extent to which development is inward-oriented and “chunky,” or more blended and integrated). Not only will I assess the physical environments, but also interview key figures knowledgeable in the development of these areas, such as planning and urban design directors from those given case study cities, who can shed light on the planning, regulatory, and design processes of the developments in these areas. From these lessons, I hope to apply these lessons to a specific station area case in San Juan, Puerto Rico, and recommend a course of design control action or inaction (and potentially other measures) or set of strategies in order to help shape development in those areas.

Current Questions and Future Directions for Research:

The direction the thesis takes will depend on the specific study area chosen in San Juan in January. Two tacks are currently foreseeable: 1) focussing on affecting the quality of new development; 2) emphasizing retrofitting existing development. The former will likely necessitate a deeper look at the impacts of zoning, standards, and regulatory control over the form of neighborhoods, while the latter will focus on guidelines and active strategies for retrofit of poor site design.

Should the emphasis turn to regulations for new development, I will focus Zoning and urban design guidelines/controls are not inert regulations, they actively shape physical development outcomes and can be powerful tools if used wisely. These case studies will shed light on how design regulation influences, inhibits, and promotes connectivity and continuity. Lessons learned from these examples will be applied to create a rough zoning and design regulatory framework useful to officials in San Juan in shaping development along the Carolina corridor. I will select one station area in Carolina and develop a build-out scenario which would be possible under the proposed framework and that would be possible under exiting regulations.

Possible Outline

Chapter

- I. Introduction -- The issue, the rationale, the relevance to San Juan and Tren Urbano
- II. Connectivity and Continuity
 1. Review of design/transportation literature re: impacts of connectivity on pedestrian travel
 2. Ways to measure connectivity and continuity
 3. Assembly of relevant criteria
- III. Case Studies
 1. Rationale for selection of chosen case studies
 2. History and qualitative description of each case study area
 3. Evaluation of case study areas against selected criteria/measures
 4. Discussion of Intents and results of case studies vis-à-vis connectivity and continuity
 5. Presence and impacts of guidelines and regulations re: connectivity and continuity
 6. Non-regulatory determining factors/processes affecting design
- IV. Design Guidelines and Regulation
 1. Review of Literature on impacts of regulation on neighborhood form
 2. Ways regulation inhibits connectivity
 3. Ways regulation promotes connectivity
 4. The efficacy of regulation and guidelines in promoting good design
 5. Differences between new development and retrofit
- V. Application to San Juan Study Area
 1. Evaluation of current community design
 2. Examination of current design regulations and guidelines
 3. Proposal for new set of guidelines which address connectivity in new development or retrofit
 4. Possible build-out scenario of study area under existing and proposed guidelines

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