Re-examining TOCs through the Lens of Differential Responsibilities: Role of Street Network Structure on Effective Availability

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Center Name: Center for Transit Oriented Communities (CETOC)

Research Priority: Preserving the Environment

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Project Description: Recent literature suggests that households in transit-oriented developments (TODs) spend less on the combined cost of housing and transportation (Zhou & Zolnik 2013, Dong 2021). Other research suggests that TOD residents engage in more physical activity due to the built environment factors than people living in other areas (e.g., suburbs) (Langlois et. al. 2016, Appleyard et al. 2019).

In this research project, we start by asking the question what it means for a TOD to be effective and available for people of all abilities. We will then investigate and quantify the relationship between the street network structure and different users' ease of access to destinations in a variety of built environment combinations. We will consider a variety of destinations related to educational facilities, healthy food, health care facilities, and job opportunities. Instead of assuming an average user and commuting trip purpose, we will examine availability of transit through the lens of users with different abilities and travel needs. This approach is based on the hypothesis that person-level attributes strongly affect real availability of transit and the lack of available research on this topic. For example, even when seemingly adequate transit is available, some users may avoid transit at night if the bus stop or the first/last mile travel does not feel safe (Chowdhury and Van Wee, 2020). The reason for including trip purpose is that our previous research has shown that people value trips differently depending on the purpose. In other words, people might be unwilling to take transit with certain trips such as a medical appointment due to concerns over reliability.

We propose to adopt the framework and protocols suggested by Ewing et al. in their article 'Identifying and Measuring Urban Design Qualities Related to Walkability' (2006). We will use

a similar framework for measuring transit availability for a sample of stops within a few selected Regional Transit District (RTD) bus and train routes. The transit stops will be selected based on propensity score matching of neighborhoods on certain qualities like tree cover, number of schools, employment and residential density etc. to understand their impact on ridership. Routes will be selected based on whether they lie on or in close connectivity to the proposed BRT corridors in the Denver Metro so that preemptive policies and measures can be designed to support and boost ridership post launch of the BRT services.
The proposed project is also tied to a transit design class that will be offered at CU Denver in Fall 2024. Through projects, students will get hands-on experience of identifying urban design elements that support and promote universal availability of transit to reach desired destinations.

USDOT Priorities: *Transformation:* The proposed project provides differential need-based assessment for transit availability within TOC and supports rethinking transit availability metrics based on connectivity and service qualities. As Denver prepares to launch multiple BRT services, this project provides the required guidance in making the BRT effectively available for people with different needs and requirements. Thus, the proposed project addresses the USDOT goal of transformation by supporting 'scenario planning and robust decision-making around policy decisions and investments to address future opportunities…'.

Outputs: The proposed outputs of this research are: 1. At least one conference paper to be submitted to Transportation Research Board Annual Meeting 2. At least two peer reviewed journal publications 3. An open-source map of the walkability metric for the routes and stops so that users can change different parameters of the metric and visualize the change in outcome 4. Design project reports with recommendations from the class which will be hosted on the class website in the future

Outcomes/Impacts: The outcomes of this research are to: 1. Understand how different current and potential transit users experience access to transit, and 2. Identify design and infrastructure features that can be remedied to improve transit ridership and user experience.
The findings from this research are relevant for infrastructure as well as transit operation and facilities related investment decision at the local and regional level. Our aim is to understand the gap between what people hope to achieve by living in a transit-oriented communities and actually achieve, and how it can be addressed. Our project underscores the importance of understanding that transit users have different abilities and needs, and any measure of transit availability should start with the ability to reach the transit stop itself. Furthermore, definition of transit availability should also include measures on perceived reliability and quality of service, and the ability to reach preferred destinations with minimum and reliable transfers. Because the project delves into design and infrastructure features, it also can generate recommendations for the maximum return on transit investment, as measured by potential increase in ridership for the investment made.

Final Research Report: (Link to be provided after project completion).