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## Mobility hubs and Transit-Oriented Development (TOD) – The urban morphology, public transport and shared mobilities

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Keywords: *Mobility hubs, Transit-Oriented Development (TOD), public spaces, urban morphology, shared mobility*

This work addresses the following topic(s) from the Call for Contributions:  
(Please check at least one box)

- Placemaking to integrate urban spaces and mobility
- Promoting sustainable mobility choices in metropolitan regions
- Governing responsible mobility innovations
- Shaping the transition towards mobility justice
- System analysis, design, and evaluation
- other: \_\_\_\_\_

### Extended Abstract

From here 700-1000 words, grouped by the following sections:

#### Problem statement

Many municipalities and public authorities seek to decarbonize transport and inspire a modal shift towards increased walking, cycling or public transport. However, the urban form poses a major obstacle. The sprawling highway infrastructure causes fragmentation of urban regions and wide roads act as barrier for pedestrians and cyclists. It is often impossible to walk, cycle or use public transport because of barrier effects caused by road infrastructure and neighbourhood design (Southworth, 2005). The problem of carbon-intensive car-oriented suburban developments can be addressed with combining mobility hubs and Transit-Oriented Development (TOD). TOD is an urban design alternative to transform car-oriented suburbs into walkable mixed-use neighborhoods that support public transport. Mobility hubs are new public spaces and transport infrastructure aiming to boost the accessibility (the so-called last mile) by offering on-demand mobility systems as shared bikes and electric cars at public transport stations and in surrounding neighbourhoods. Intelligent Transport Systems (ITS), Mobility as a Service (MaaS) and Intelligent Mobility (IM) links information technology with transport systems in various application areas: journey planning, sharing vehicles, smart parking, smart ticketing, etc. (Mulley et al., 2019). The mobility hubs seek to create a physical impact of on cities by materializing smart transport solutions as spaces on streets and in buildings, on sidewalks or parking lots. The cities responded by creating market packages for parking shared bikes, cars, scooters, etc. There is lots of research on implementation of carpools, shared bikes and shared electric cars under the MaaS paradigm (Hensher, et al., 2020), but few urban design studies of impact of mobility hubs and shared mobility systems on cities with morphological methods. The potential to implement and experiment with mobility hubs is high. Unlike TOD, that seeks to transform entire neighborhoods into transit-supportive walkable environments, the mobility hubs can be established as minor interventions as marking on sidewalks, at urban parking spaces and at suburban Park&Ride facilities that can be transformed into public spaces. Even though there is lots of focus on finding space on

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sidewalks or streets for shared bikes, cars, scooters, etc., the real potential lies in placemaking of suburban Park&Ride (facilities available for upgrading to mobility hubs). This is the motivation for TOD and mobility hubs urban design innovations and leitmotif to bring urban change and create social impact with mobility hubs.

### **Research objectives**

The mobility hubs create a new buzz as future mobility infrastructure. But to inspire a major change in travel there is a need to create conditions for seamless transfer to shared mobilities based on urban experience of high-quality public spaces. Only with urban design at human scale and establishing mobility hubs as attractive public spaces it becomes possible to inspire higher use of shared mobility systems. This paper will create visions and design guidelines how to strategically transform parking spaces and underutilized public spaces into working mobility hubs. The research objectives are:

1. Create new urban design knowledge by dissecting the design elements of mobility hubs, by characterizing and conceptualizing future public spaces with shared mobility systems. The quality aspects tangle public spaces and seamless mobility concerns, for example efficient interchange, user experience and access to public transport, pedestrian and cycling facilities, and well-designed mobility hubs for all user groups.
2. Enhance planning and urban design practices by developing new urban design guidelines on mobility hubs and TOD. There are lots of underutilized public spaces and parking lots that can be developed into working mobility hubs with placemaking initiatives, street experiments and introduction of shared mobility systems, but it requires coordination and urban design interventions that can be described through envisioning and good examples.

### **Methodological approach**

Typically, the research on mobility services (as ITS, MaaS or IM) focuses primarily on the distribution (i.e., sharing) of transport resources and developing information technology that supports real-time information, discrete choices of individuals, travel habits and passenger preferences, market segmentation and customer profiling, etc., whereas this project will use observations and urban design methods to look at mobility hubs as public spaces from the perspective of physical spaces and spatial requirements, urban design and human perception. The project will investigate morphological characteristics of station areas with mobility hubs in Swedish and American cities as well as mobility hubs initiatives to abstract good examples and create typology of mobility hubs based on several dimensions: integration with the morphological structure of cities, public-shared mobility transfer possibilities and physical link with the public transport stations, placemaking initiative (expert consultants or local initiatives), branding and types of shared mobility systems (including potentials for Shared Autonomous Vehicles (SAVs) and robo-taxis). The methodology includes literature review, field observations of mobility hub experiments and mapping the urban design elements (e.g., bike pools on Figure 1 and carpools on Figure 2). The typologies of mobility hubs that will be abstracted based on observation study will be structured based on dimensions (in a context of placemaking see Nativade, 2022), diagrammatized and organized into design guidelines (see Stojanovski, 2020, for typological methodology of analyzing integration of public transport stops and morphological elements, including barrier effects, frontages and segregation from streets).



**Figure 1:** The bike pool organized by Blekingetrafiken, the public transport authority in Karlskrona, Sweden with the branding “Cykla vidare” (“Bike further on”) showing a transfer from train to shared bike as a last mile solution at the central train station in Karlskrona.



**Figure 2:** The MoveAbout carpool of Blekingetrafiken at the central train station in Karlskrona, like the bike pool of the public transport authority in Karlskrona has branding and is assigned a specific place on the corner of the train station. The platforms of the train station and bus stops with its adjacent bike pool and carpool work like mobility hub, but there is no coherency thread and the quality of the public space is poor. There are no activities or anything that could contribute to placemaking.

In the end, the typology will be critically assessed to account for various user groups using segmentation of mobilities and mobility classes on Figure 3.

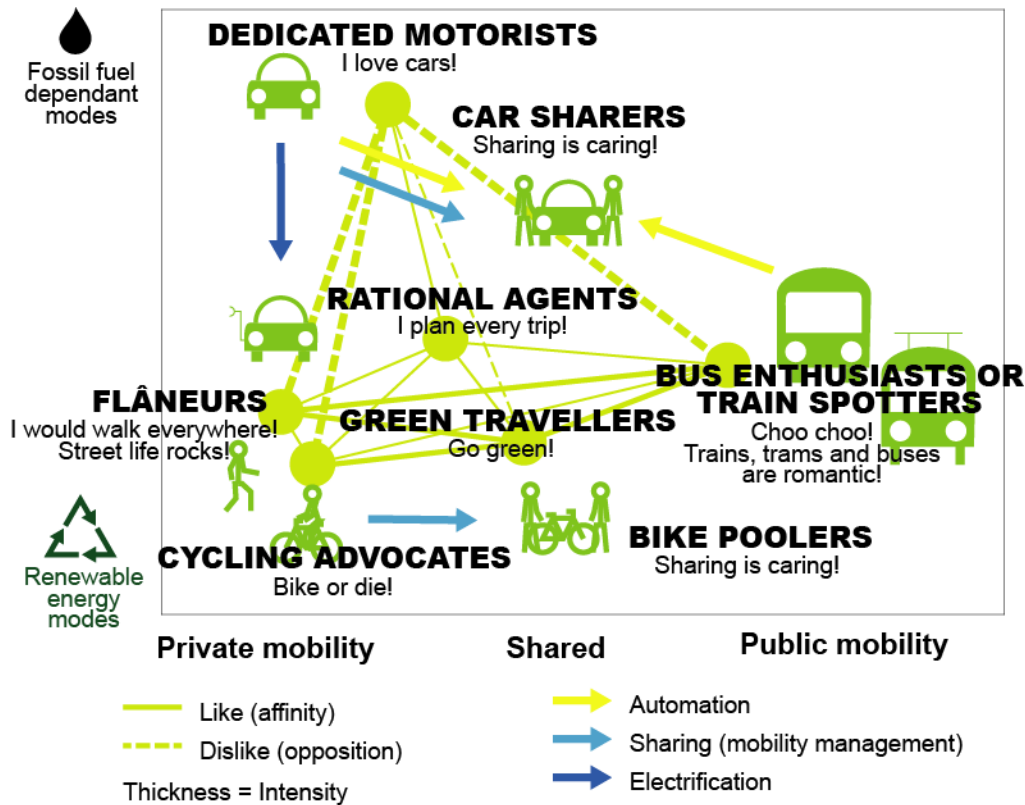


Figure 3: Mobility classes and shared mobilities

**(Expected) results**

This paper will deliver a morphologically characterized typology of mobility hubs that will be turned into diagrammatic urban design knowledge and design guidelines on how to integrate shared mobility systems with public spaces and TODs. The typology will be critically assessed to account for various user groups.

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