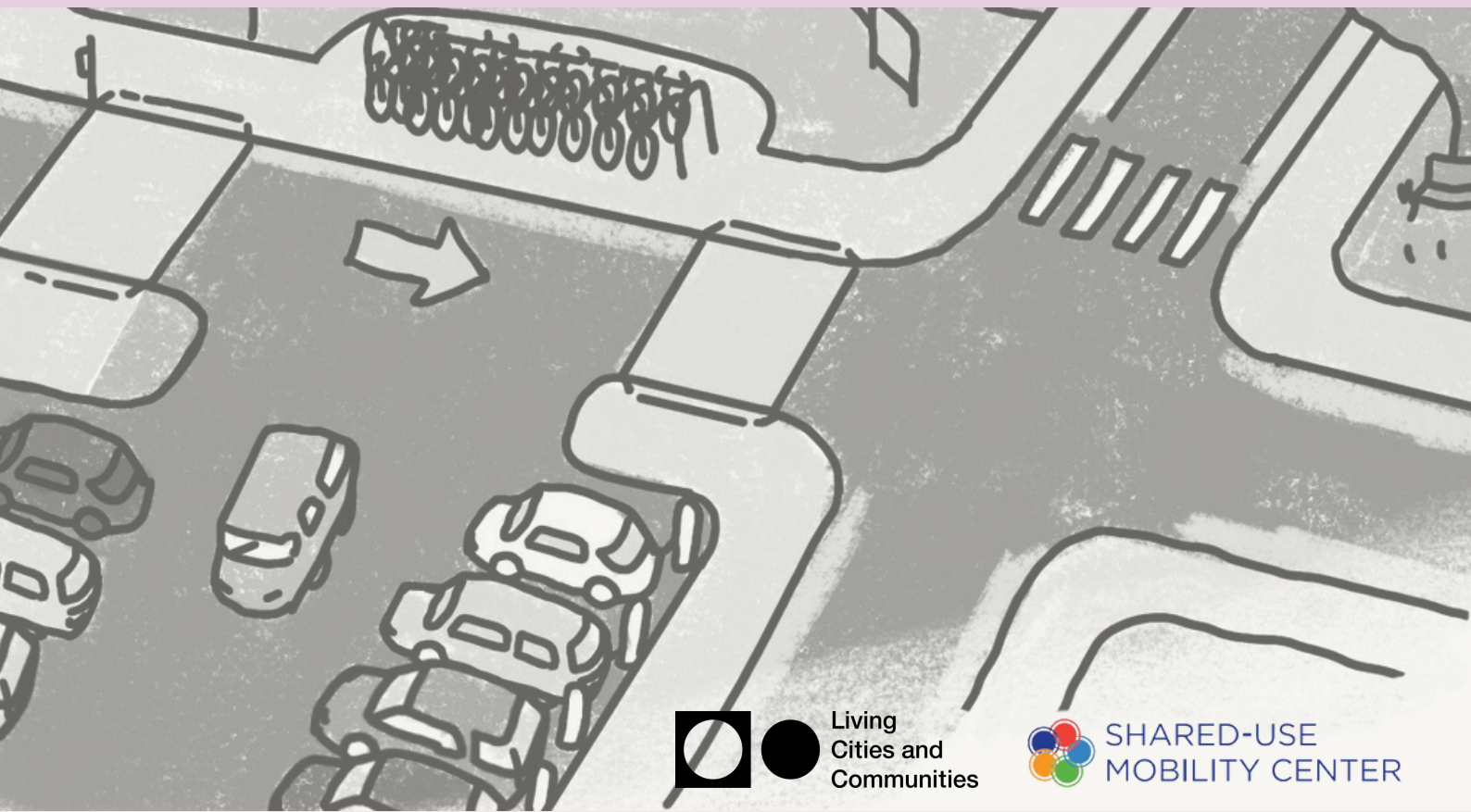


A CONCEPTUAL DESIGN FRAMEWORK FOR WOMEN-CENTERED MOBILITY HUBS

PROJECT REPORT, JANUARY 2025



Living
Cities and
Communities



SHARED-USE
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Introduction

This report presents a design framework for mobility hubs with the needs of women and caregivers guiding the planning and design of the place and its features. The report summarizes the findings of the project “A design framework for women-centered mobility hub”, funded by the Vinnova agency under its program Future Mobility, with additional funding from the Equitable Transportation Fund. The project was carried out in collaboration between the US based non-profit Shared-use Mobility Center (SUMC) and the Swedish micro-enterprise Living Cities and Communities (LCC).

SUMC is a public-interest organization founded in 2014. SUMC has unique expertise in all forms of shared mobility and is a trusted partner to public sector agencies, private companies, and community-based organizations.

LCC is a knowledge-driven company that offers support and partnership in strategy, analysis, communication and idea development, often linked to place, community, and life in the urban landscape.

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Executive summary

The idea of mobility hubs came about because of the growing number of mobility options in cities. We can choose to take the bus, train or subway, or we can use our smartphones to hail a ride or book a shared bike or scooter. The hub would be a physical location where people can get off from one service and get on to another. For example, they could get off a bus or train and get on a bike. Or, they could get off a ride-hail and get on a bus. They could pick up and return a shared car.

Mobility hubs would make all these options easier to find and more available and accessible. Cities and metropolitan areas have started planning and designing hubs and networks. There are research papers and design guides that show how mobility hubs could work. However, in our preparatory research, we could not find any papers or guides that looked at how mobility hubs could work better for women and caregivers.

We've designed and operated most of our public transportation services and infrastructure to serve regular commuters (mostly men) who travel to their workplaces on a regular schedule during regular work hours. But, the way women and caregivers travel is different. Women typically make shorter, more frequent trips that don't happen during peak travel hours. Rather than a home-to-workplace commute, they may need to travel in the neighborhood or to nearby destinations. They may have to drop off or pick up their children at school. They may need to pass by the grocery or the pharmacy. They may be traveling with strollers, bags, wheelchairs, older people, or young children. Women are also more likely to be harassed in public spaces and public transportation. We need to make sure our transportation system feels safe and is safe. If we design, build and operate mobility hubs with the needs of women and caregivers in mind, mobility hubs could make our transportation system work better for everyone.

Recognizing these challenges, the Shared-Use Mobility Center (SUMC) and Living Cities and Communities (LCC) joint team developed a Design Framework for Mobility Hubs centered on women and caregivers. The framework prioritizes these groups and introduces seven design principles that cities and operators can use in their projects to better support women and caregivers' daily journeys in cities.

We started by reviewing research publications on the travel needs and patterns of women and caregivers and on the design of mobility hubs. Then, we ran workshops with transportation and planning experts—especially women transportation leaders. We worked through community-based organizations in Chicago and in Gothenburg to meet and listen to women and caregivers, from 11 to 95 years old. We held focus groups and interviews with these women. Finally, we had a cooperative design process within the project team, which included both an in-person workshop, online meetings and individual design work.

In the co-design process developing the design framework we identified some - often unspoken - themes that formed our ethos for the design framework.

- The labor of weaving: of connecting to kin and friends, to the fabric of the city and community, to daily needs, to amenities.

- The labor of hosting: of making people feel welcome, of building familiar and personal relationships, of being good neighbors, of being a place for celebration and marking of seasons.
- The labor of nurturing: of helping and assisting, teaching and learning, informing, play, amusement, and entertainment.
- The labor of enabling: of making things easier, of empowering, of supporting.
- The labor of safeguarding: of protecting, of stewarding, of ensuring health.
- The labor of mending: of responding to hurts, of comforting, of righting wrongs, of keeping the peace, and of amending injustice.

The design framework consists of a mobility hub statement, based on our findings in the knowledge harvesting and dialogues, and seven guiding design principles.

Our [mobility hub statement](#) identifies the mobility hub as a civic and community space.

A mobility hub is a shared community space that enables people to get access to qualities and services in the surrounding city. Furthermore, it facilitates different forms of connectivity, to other persons as well as their communities. A hub that centers on the travel needs of women and caregivers responds to their requirements and makes it easy to travel with a variety of transportation services. It is also a place for resting, gathering, shopping, eating and other everyday errands.

A mobility hub is a recognizable and attractive place in a local community. It is designed space that facilitates safe, accessible, and convenient transportation by seamlessly integrating multiple modes of transportation: bus, rail, bikeshare, carshare, scooter share, and enhanced pedestrian amenities both in a physical space and digitally. The services and amenities at the mobility hub should adapt and respond to the changing needs of its users (variety of services, quality, reliability)

The [seven design principles](#) are:

- Design for trust and security
- Design for convenience
- Design for comfort
- Design for access & ease of use
- Design for care & belonging
- Design for safety & health
- Design for options & affordability

We hope that this project opens the door for people to more easily understand and communicate about designing for the needs of women, and caregivers. We hope that our [design framework](#), presented in the format of [an open-source slidedeck](#) is used by community leaders, to frame advocacy and help engage their community and government agencies, by planners or designers, to help them consider needs and requirements they may have missed, and teachers or students, to give insights of how to make our systems work better for women and caregivers.

We recognize this work could and should be expanded upon. We encourage others to broaden this work to include more quantitative, geographic analysis that compares several regions along with more focus groups and interviews in other areas to increase our sample size.

1. Introduction

The boom in shared mobility modes over the last decade offers an opportunity to create transportation systems built on the provision of more options. Expanding shared mobility can lower carbon emissions, address equity, and increase access, especially when paired with visible and accessible infrastructure such as mobility hubs. Mobility hubs are co-located centers that offer various shared mobility options such as public transit, on-demand micro-transit, micro-mobility (bike and scooter) with physical docks, pickup and drop-off zones for ridesharing services, shuttles, ride-hail and taxis, secure parking for car sharing, EV chargers, and delivery lockers and mini-logistics hubs. They provide a concrete and visible display of the availability of transportation options, making the network easier to use.

Mobility Hubs offer an innovative solution for creating a robust transportation system while providing their users a convenient place to connect, and change to another mode of transportation. However, while there have been several recent publications on the design of mobility hubs published in Sweden, in the US, and globally, in our preparatory work for the project we did not find studies that centered on the specific needs of women and caregivers.

Women face transportation challenges and often undertake more caregiving trips than men. Women typically make shorter, more frequent trips and are more likely to juggle strollers, bags, and young children. The International Labor Organization (ILO) globally defines a quarter of all women as 'unpaid contributing family workers' (International Labor Organization 2016). As well as other inequalities, women do at least twice as much unpaid care work as men, often on top of any paid work. This includes tasks such as cooking, cleaning, and looking after children and other family members, including people who are sick or elderly (Heather Allen, Module 7a: Approaches for gender responsive urban mobility, 2018:11). Women and caregivers also face additional financial and time burdens in mobility (Kaufmann, et. al. 2018).

However, transportation system designers and planners have traditionally designed their public transportation networks to cater to the home-to-work, downtown commute, hence the existing services and networks often fail to serve women and caregivers' trip-chaining travel patterns despite women often being more likely than men to use public transportation in cities.

Unfortunately, transit schedules, stations, and facilities that don't account for these factors result in added costs and delays for women and their dependents (LADOT, 2021; Kauffman et al., 2018; Ceccato, V, 2017; Ortiz Escalante, S. et al., 2021).

Recognizing these challenges, the Shared-Use Mobility Center (SUMC) and Living Cities and Communities (LCC) joint team developed a Design Framework for Mobility Hubs centered on women and caregivers. The framework prioritizes these groups and introduces seven design principles that

cities and operators can use in their projects to better support women and caregivers' daily journeys in cities.

The design framework proposed by SUMC and LCC takes transportation access seriously as a critical means of women's self-determination. It draws on significant studies and geography, linking the concepts of gender, caregiving trips, and structural barriers in transportation (Massey, 1994; Sanchez de Madariaga, 2020; Sheller, 2022). Centering women's and caregivers' needs can help increase access to education, employment, healthcare, and other essential quality-of-life options (Berg et al., 2019; Jang et al., 2022) and create a more inclusive, supportive and efficient environment for all.

2. Our roots of thinking: policy framing and core concepts

The project goals align with the UN Agenda 2030, which prioritizes equality (Brussel et al, 2019). Transportation does not have a standalone SDG but several relevant SDGs, including targets, will be considered in designing a mobility hub, e.g. the SDG Target 11.2 to “provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons”. Other relevant SDGs address e.g. road safety (Target 3.6) and end all forms of discrimination against all women and girls everywhere (Target 5.1).

Further, the design framework refers to a framework for sustainable transportation developed by the international, multi-stakeholder partnership SLOCAT (Sustainable, Low-carbon Transport), and in particular the “equitable” and “healthy” strands of the framework, stating that “a just transition to equitable, healthy, green and resilient transport and mobility systems is central to socio-economic prosperity for the people and the planet” (SLOCAT, 2024). The framework is apt when pinpointing the challenges associated with caregivers and women’s travels.

While we acknowledge the potential environmental benefits of well-functioning mobility hubs, and wrote a brief paper on the benefits of e-mobility hubs and microgrids for women and caregivers, this report and slidedeck does not specifically address environmental and climate issues such as the potential reduction of greenhouse gas emissions.

2.1 Core concepts

Several critical notions and concepts frame our position towards mobility, accessibility and transportation for women and caregivers. The concepts have guided our knowledge harvesting, dialogues and design principles.

Community public space/Civic space: Viewing a mobility hub as a community/public space, it is useful to explore the basic qualities of urban public spaces introduced by the Danish city planner Jan Gehl: security, comfort and enjoyment (see e.g. Life between buildings, 2011). The three qualities are structured in the form of a staircase, where the first step is safety, a basic quality that

should be considered a requirement. The next step is comfort, which only has any significance whenever the safety quality is met. Comfort is a factor that makes users, and other visitors want to stay at the site. The final step when both safety and comfort are met is enjoyment (in a broad sense of the notion, it includes a **sense of belonging**, or, “this is my space”) which makes users want to spend some time, meet with friends and perhaps buy a few things at the hub.

Sense of belonging, or “this is my space”: Belonging is tied to people’s ability to lead meaningful lives, to be connected to the place they live in, and the people they live among, and to feel a part of something larger than themselves. Mobility hubs can foster a sense of belonging by creating inclusive and accessible spaces, with respect to cultural diversity and addressing the specific needs of women and caregivers, including equitable racial, cultural, and socio-economic conditions for self-expression, mutual respect, empathy, and acceptance (Allen, K-A, et al, 2021).

Intersectionality: Taken together, women and caregivers constitute a heterogeneous group with diverse socio-economic backgrounds but usually with several socially marginalized features. The characteristics are captured by means of the social science method called intersectionality: the complex, cumulative way in which the effects of multiple forms of discrimination (such as racism, sexism, ageism and classism) combine, overlap, or intersect, especially in the experiences of marginalized individuals or groups (Merriam Webster online Dictionary).

The notion was coined by Crenshaw who introduced “the theory of intersectionality, the idea that when it comes to thinking about how inequalities persist, categories like gender, race, and class are best understood as overlapping and mutually constitutive rather than isolated and distinct” (2024, Wingfield in <https://www.merriam-webster.com/dictionary>). In other words, this is a framework apt to explore how different aspects of a person’s identity intersect to create unique experiences and challenges.

Accessibility is a description of the proximity of destinations of choice and the facilitation offered by the transport systems (including public transport and non-motorized modes) to reach them. Accessibility is “often understood as the ease of access to destinations, amongst other parameters it (accessibility) encompasses ideas of costs in time and money; extent, comfort and frequency of the public transport system; and the distance to be negotiated to reach destinations such as shops, workplaces and schools” (Ross in Thynell, 2009).

Universal Design is the focus to ensure an area and an agency’s service is accessible to all, regardless of any physical or cognitive disabilities. This includes considering the facilities, so the physical structures and architecture and operations, or the features and characteristics of an individual trip. It includes providing ramps, elevators, automatic doors, curb cuts, accessible parking spaces, payment features, and other features to allow people with disabilities to access buildings, streets, and other public areas independently and safely. This requires a collaborative team to consider the riders journey holistically (Shared-Use Mobility Center, 2024).

Mobility is both the ability to travel to destinations of choice, and the amount of movement necessary to do so (Thynell, M., et al, 2009). **Sustainable mobility** refers to activities that enable the movement of people and goods that are efficient, healthy and climate-neutral, and accessible to all road users.

Mobility justice means making transportation fair and an equal possibility for everyone. It highlights that mobility isn't just about getting from one place to another but is tied to various social aspects and inequalities.

It aims to change the way different forms of transportation are distributed to ensure that everyone has fair access. The notion of mobility justice is not simply focused on the need for a fairer distribution of material resources between genders (as in transport equity approaches) but it critically underscores the need for responsibility, accountability, repair, and diversity of epistemic approaches (Sheller, 2018).

Mobility of Care: The concept mobility of care, developed by an urban architect, Ines Sánchez de Madariaga, provides a perspective for recognizing and revaluing care work. The notion helps to better appreciate the trips that women and men make when caring for others, as the data reveals significant travel patterns otherwise concealed in data collection variables (Allen, 2018:31). Sánchez de Madariaga & Zucchini (2020) describe mobility of care as travel associated with care tasks, or “activities performed by adults for children and other dependents and home maintenance”.

Trip Chaining combines multiple stops in one journey to complete a range of activities. Trip chaining is the recognition that ‘trips’ are often more than just origin and destinations, but a chain of related trips. Women are known to perform complex journeys and handle challenges of various kinds while managing complicated schedules and multiple activities at the same time. The notion of trip-chains is used to map out multiple activities, and the way in which women from different socio-economic groups handle local challenges will inform the design of the mobility hub. ‘A better understanding of the factors that influence individual travel behavior can reveal changes in preferences and attitudes, provide insights to existing travel patterns, improve transport planning, prepare for future infrastructure needs and services, and help better design and implement sustainable and inclusive transport policies that will meet emissions reductions goals and improve gender equity’ (Ng and Acker, 2018).

3. Project implementation and methodology

The project was implemented as a learning and design process with three main methods. The three methods were:

- knowledge harvesting through an overview of research publications, “grey literature” and interviews with researchers and other experts
- dialogues with women and caregivers through focus groups and interviews on-site in Chicago and Gothenburg, and
- a cooperative design process within the project team, which included both an in-person workshop, online meetings and individual design work.

3.1 Personas

To better define our users and ensure we center their needs, we developed a set of seven personas that represented a wide variety of women, spotlighting those who are systematically more

vulnerable and less considered in design choices from an intersectional perspective. This list was compared and confirmed with similar reports that colleagues have published. The personas include “older woman”, “paid care worker”, “everyday or occasional unpaid caregiver”, “woman with disabilities”, “woman moving safe and free”, and “child or young girl”.

Table 1. Personas used in the project methodology

Everyday or Occasional Unpaid Caregiver	This persona takes on caregiving responsibilities for one or more people without financial compensation.
Paid Care Worker	Professionals providing paid care services. Individuals whose workforce may be composed of young migrants who might not master wayfinding or language.
Older Woman	Older women with reduced mobility. Women that consider technology don't answer their needs. May have a slower navigation.
Woman with Disabilities	A person with reduced mobility and with functional, sensory and cognitive diversity.
Woman Moving Free and Safe	A persona whose use of mobility is a means of self-determination, yet it can be limited due to experienced or perceived gender violence, sexual harassment and other.
Child or Young Girl	A persona that is underage but still needs to move from point A to point B in a small radius safely and feely.

3.2 Guiding questions for the knowledge harvesting

The knowledge harvesting was guided by the following questions around women and caregivers’ specific mobility needs and challenges:

- What specific transportation needs and preferences of women and caregivers are currently underserved?
- How do travel needs vary across different demographics and the various socio-economic groups (age, income, occupation, etc.)?
- Which are the primary barriers (financial, physical, cultural, temporal, social etc.) that make it difficult for women and caregivers to reach the preferred transportation and the destination?
- Which are the critical safety and security concerns for women and caregivers in public space, and on shared/public transportation?

Further, the knowledge harvesting, and the dialogues included a review of mobility hubs, as a concept and a selection of implemented hubs, guided by the following questions:

- How can mobility hubs address the barriers identified in the review of women’s and caregiver’s mobility needs and travel behaviour?

- What design elements and features are essential in creating women-centered mobility hubs to serve women’s mobility needs?
- How can these elements enhance safety and security, accessibility, and convenience for women and caregivers?
- How shall women-centered mobility hubs be designed to ensure long-term sustainability in terms of environmental impact and financial impact?
- What role can technology and shared mobility innovations play in enhancing the effectiveness of women-centered mobility hubs?
- How can digital tools be used to improve user experience and accessibility? Are they needed?
- Specifically, about urban space and “where to locate a mobility hub”: What factors - based on literature about women’s and caregivers’ specific travel needs - can/should be used to identify the best places to implement a mobility hub that responds to the travels of women and caregivers?
- How can a design framework be adapted to suit the varying contexts? Recognizing that different cultures/urban spaces have different needs. How to make a framework adaptable to different cultures and needs, rather than prescriptive?
- How can women-centered mobility hubs have a positive impact on travelers from lower socio-economic status, in terms of reducing transportation costs and time burdens for women and caregivers? Will such positive results vary from one location to another?

4. Summary of findings from knowledge harvesting and dialogues

4.1 Knowledge harvesting

We examined 30 references including peer-reviewed articles and grey literature. The following keywords were analyzed: gender, mobility, accessibility, safety, social justice, women and mobility, gender justice, electrification, childhood mobility, mobility patterns, feminism and mobility justice.

Studies of mobility needs and travel behaviors by women in cities is an established area of research. However, published sources of studies and evaluations of mobility hubs are relatively few, and they rarely specifically consider women’s and caregiver’s needs, or mobility hubs as public places, serving needs for people beyond just transportation.

4.1.1 Women’s travel needs and travel patterns

The literature review showed that an important share of urban journeys is made by women and caregivers. Due to continued urban growth, the number of individual service journeys are believed to keep on growing. But transportation services and networks often fail to serve the travel needs of women and caregivers (LADOT, 2021; Kauffman et al., 2018; Ceccato, 2017; Ortiz Escalante et al., 2021).

Housing and infrastructure have historically been planned by men, and largely respond to the needs of the commuter journeys often taken by men. Even when women are involved in design processes, traditional planning directions together with gender roles and norms can be entrenched or reproduced (Baker, 2018).

Whereas men tend to commute more, and for longer distances, women make more complex trips for services and caregiving. The difference in travel pattern refers to the fact that women in general spend more time for services and shopping than men do (Ng, 2018, McGuckin and Murakami, 1999, Hensher and Reyes, 2020).

We found some differences between socio-economic groups concerning accessibility. Firstly, the travel conditions in marginalized or less planned areas are seldom well documented and thus, the conditions of such mobility are largely invisible and unknown. Secondly, the travel needs of women and caregivers and the kind of challenges they encounter are usually not mapped out. But it is a well-known fact that poor households enjoy less urban access due to the locations where they live and navigate daily (Lucas, 2012, 2015).

When it comes to transportation behavior it is known that women tend to prefer public transport whenever the standard is acceptable from the point of view of safety, cost, reliability, and comfort. Women use taxis and other kinds of shared motorized mobility services more often than men do. In other words, it is a win-win strategy to upgrade public transportation and to respond to the needs of crucial user groups because it is most likely that more women than men will make use and benefit from it. Gender is one of the most important variables for mode choice (Bhat and Srinivasan, 2005).

4.1.2 Women and caregivers, mobilities of care

A caregiver is a person who has responsibility for the care of another person and can be paid, or not. It is known that people aged 60+ are the ones that usually carry out an important part of the caregiving for both persons aged 80+ in their capacity of daughter, or daughter-in-law and younger persons, as grandmothers. Sanchez de Madariaga & Zucchini claim that the activities are performed by women in the US as unpaid work (2020). For example, in 2016, women made up 75% of caregivers in the U.S., according to the Family and Caregiver Alliance. Globally, over 70% of caregiving work is done by women or girls. The statistics for paid care workers are similar (Sanchez de Madariaga & Zucchini, 2020: 100).

Sanchez de Madariaga & Zucchini found that travels associated with caregiving tasks have not been described in depth as part of the transportation literature, or considered in transportation policy agendas (2020). Thus, unpaid trips are understood as informal and not at all accounted for in studies of work environment. Caregivers, while travelling with clients, are doing important work which is not recognized by the authorities or by-passers. Another closely related aspect is that caregiving is a work, and/or a service, that is carried out in public space and often inside of houses, or on buses that are not planned or understood as working spaces, but as spaces to rest, travel and perhaps socialise (Sánchez de Madariaga & Zucchini, 2020: 93).

In other words, caregiving journeys are not considered in transportation statistics which largely address journeys to work or studies and other formal economic and leisure activities. Over 80% of paid care workers worldwide are women and the sector is known for low wages, job vulnerability as

well as high job insecurity (Zhiyuan et al., 2024). The conditions for caregivers in public spaces are simply not taken care of.

In an article Fong and Shaw write “a striking difference in subjective well-being is observed during caregiving travel: only women tend to experience increased stress, decreased happiness, and decreased sense of meaning during caregiving. We find that heightened time pressure among women may explain some of these differences, [...]”. Fong and Shaw conclude their study of wellbeing implications of mobility of care in the following way: “Thus, gender-sensitive planning should prioritize infrastructure and services that facilitate the independent travel of care recipients, including children, disabled adults, and older adults” (Fong and Shaw, 2024).

4.1.3 Mobility hubs

Arnold et al stated that “a Mobility Hub is a recognizable place with an offer of different and connected transport modes supplemented with enhanced facilities and information features to both attract and benefit the traveller” (Arnold et al, 2023) Mobility Hubs Guidance. [https://como.org.uk/wp-content/uploads/2019/10/](https://como.org.uk/wp-content/uploads/2019/10/Mobility-Hub-Guide-241019-final.pdf) (Mobility-Hub-Guide-241019-final.pdf).

Aspects of women's and caregiver's travel needs and how mobility hubs are experienced by these groups are largely lacking in the literature we examined. The limited amount of studies of mobility hubs that we found focused on the way in which hubs may facilitate urban trips in general.

We identified some key features of mobility hubs in response to the question “What travel needs is the hub going to serve?” The answer lies both in the needs of the travelers and the location. Whenever located near a train station or a city square, the travelers expect certain issues to be met by the hub (bike parking facilities, certain shops, or services). In case it is located in the margins of a city, other needs will be served, such as connectivity by means of long-distance buses, trains or boats.

Fig 1. Key Features of mobility hubs

Key features of mobility hubs identified in our review

Enhanced Connectivity: Implementing directional kiosks, real-time transit information, and expanded park-and-ride facilities improves connectivity and facilitates seamless travel experiences for residents and visitors. A functional mobility hub may serve travelers that rely on ‘chauffeur’ and turn such individuals into independent travelers that manage on their own.

Integration of Services: Integrating various transportation services, such as bike share, car share, and micro mobility options, within mobility hubs creates comprehensive and convenient transportation networks. Parking spaces for bikes, scooters and cars allow travelers to quickly shift from one mode to another. The so-called park and ride-services can be added to the mobility hub.

Safety Features: Incorporating safety features like emergency call buttons, designated passenger zones, and enhanced pedestrian infrastructure increases safety and encourages active transportation.

Community Engagement: Engaging with the community and considering neighborhood contexts when designing mobility hubs ensures solutions that are tailored to local needs and preferences. What is needed to turn a mobility hub into an attractive urban space for socializing?

4.2 Dialogues in Chicago and Gothenburg

We reached out to community-based organizations (CBOs) that work with community members aligning with the women and caregivers personas that we developed in the project. In Chicago, SUMC, with support from the Chicago Metropolitan Agency for Planning (CMAP) partnered with Northwest Center, Access Living, National Association for the Advancement of Colored People (NAACP), Evanston Chapter, and Equiticity. In Gothenburg, Living Cities and Communities partnered with the Swedish Lutheran Church in the district of Tynnered, Västra Frölunda, and with the organization Tikitut in the district Angered Lövgärdet in the city of Gothenburg. By collaborating with these organizations, we were able to gather valuable experiences, travel insights and perspectives from families living in the urban areas.

We held eight focus groups and conducted about 13 interviews with 66 women and people of non-conforming gender. Participants' ages ranged from 11 to 95.

Our study addressed the way in which women and caregivers move around, using both quantitative and qualitative sources; numbers and personal stories. The women shared their travel trends with us and the popular words they use when talking about travelling were also revealed together with perceptions related to their daily trips as caregivers.

Fig 2. Photos from a Focus group with the parent mentor program at the North Star Child Development Center. Contact facilitated by the Northwest Center. Source: North Star Child Development Center

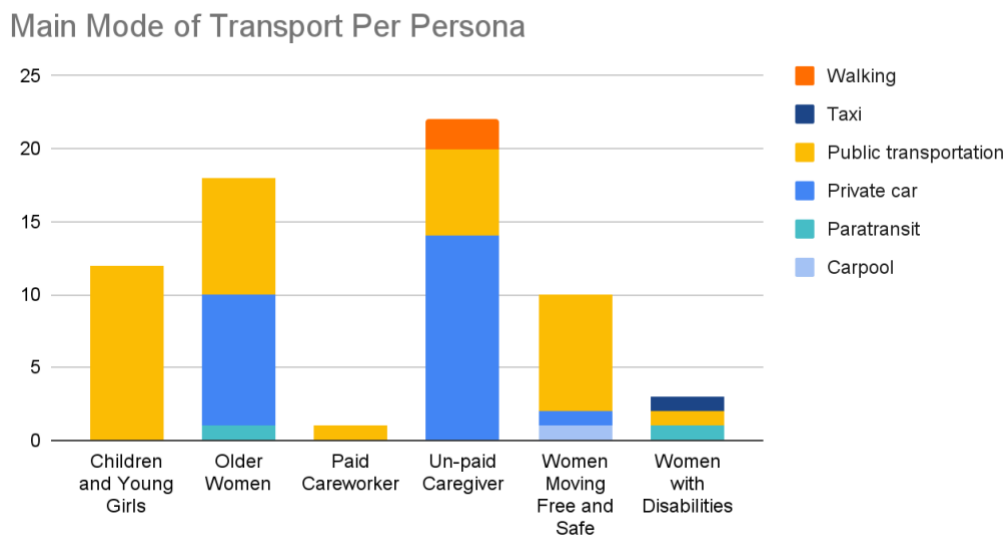




4.2.1 Transportation Modes

Women and caregivers choose a mode of transportation based on the destination, cost of trip, age and the aim of the journey. For instance, to bring someone to see a doctor or to buy food. Women in Chicago and Gothenburg who take care of children often use private cars more often than women that travel alone. Girls, teenagers, and older women tend to rely on public transportation. Swedish respondents use public transportation more often than those in the US.

Fig 3. Main Mode of Transport Per Persona in Both Chicago and Gothenburg.



4.2.2 Daily Travel Concerns

Participants in both Chicago and Gothenburg often reflect on their daily travels. We created a word cloud from the responses in focus groups and interviews, revealing that the main concerns revolved around safety, reliability (like waiting times and schedules), traffic, accessibility, and different modes of transportation (walking, biking, Uber, Lyft, trams and buses).

Fig 4. Word cloud representing the main concerns expressed in focus groups and interviews.



We reviewed the points of view of the participants and areas for potential improvement in public transportation systems. Overall, participants expressed mixed experiences about their daily travels; some positive, some negative, but only very few were neutral.

Many participants indicated that their travel habits have evolved over time. They used to rely more on trains and buses for frequent journeys but now prefer using private cars for shorter trips. Several conveyed negative experiences, especially regarding safety, a significant concern mentioned in nearly half of the comments. Other common issues included the need for more accessible, frequent, and reliable transportation, with a particular emphasis on buses.

Many others expressed concerns about the **safety and cleanliness of public transportation**, citing dirty conditions, encounters with drug addicts, and incidents of muggings and assaults. Women felt especially unsafe waiting for buses and trains at night, in bad weather, and near streets under train tracks. Concerns were repeatedly documented about navigating crowded buses. Another common

concern was about the distance between stops, which adds to discomfort, leading to a general reluctance to use public transit.

There were also some positive views on transportation safety and convenience, especially in Gothenburg. Installing surveillance cameras near schools was seen as a security boost. Some considered car travel the safest, while others valued the safety and reliability of trains and trams, if they have security personnel to ensure passenger security. The frequency of buses and real-time information were appreciated.

4.2.3 Key themes in dialogues

The review, including meetings with experts in the field, interviews and focus groups made it possible to identify key themes to guide the design of mobility hubs. The findings were grouped into seven categories, providing an overview of the basic transportation challenges of women and caregivers:

- a. **Personal Security:** Which are the worries and harassments during journeys? A common concern are potential unpleasant or frightening encounters with bypassers, or other passengers. Several women reported that they felt unsafe on trains due to drug use, harassment, and lack of security across all types of transportation. Traveling in the evening and at night is particularly concerning, especially in poorly lit areas. Desolated spaces are often perceived as uneasy, and a mobility hub should never be idle or dominated by men, when possible. In this respect, the location of the hub is important. A sense of belonging and ownership in the public space is important for the perceived security.
- b. **Convenience:** Reliable transportation is very important. Transportation services need to be predictable, preferably according to a timetable, or real-time information. Synchronization of arrival and departure time to address the needs of all users can improve the journey experience as well as reduce the travel time for caregivers who travel together with several care users. Information must always be easily accessible for everyone, and preferably in several languages serving the local users. Whenever there is a change in services the passengers shall be informed in a language they speak. Is it fast and easy to find required information about directions, and the vehicles and where to go and so on? In Chicago, unpredictable bus schedules often cause delays and overcrowding. It was stressed that a bus trip taking up to 2 hours in Chicago can be completed in just 50 minutes by car. Connecting walkways and bicycle infrastructure need to be well thought out and carefully planned. Mobility hubs should be well-connected to other well-visited places in the nearby city (workplaces, residential areas, schools, services of all kinds as well as parks and qualities).
- c. **Comfort:** Passengers shall feel reasonably comfortable while traveling. Travel comfort is affected by issues like traffic congestion, bad roads, and weather, but also by supporting services: elevators, electric stairs, toilets, lightning, waiting spaces of different kinds, etc. Respondents in dialogues suggested adding covered bus stops to protect against rain and storms and called for more considerate drivers. In Gothenburg, people desired free toilets, better seating, improved pedestrian crossings, and affordable cafes to make travel more pleasant. Another wish was to have small playgrounds at bus stops for impatient children to

- be distracted while waiting for the bus. In this way mothers could relax and not worry about minors running into the busy streets.
- d. **Care:** We talked to 22 caregivers, primarily mothers and close family. Twelve of them mainly use cars, followed by public transit. Comfortable seatings are perhaps the single most important issue to solve, including seats reserved for caregivers in waiting areas. Many caregivers avoid using baby strollers due to bad street conditions, crowded buses, and a lack of respect for priority seating. The disrespect for priority seating also for older people was repeatedly an issue. Seats for elderly people are located at the front of trams and buses, but they are often taken by young travelers.
 - e. **Accessibility:** Physical barriers like poor road and sidewalk conditions, broken escalators and elevators, and issues with Uber and cab services are barriers that make travel difficult. Paratransit services were praised as a good option for women with limited mobility, but the high costs and delays were concerns. Changing transport mode between buses, ferries, trams, and active transport modes should be smooth and without physical barriers or extreme distances. A mobility hub should be located on the street level and if possible, without steps and stairs. It is well-known that the so-called human scale works well and that there needs to be suitable places to spend waiting time between connections.
 - f. **Traffic Safety:** Passengers shall not be exposed to traffic dangers. Participants suggested installing barriers between train platforms and tracks to prevent accidents. They also recommended better pedestrian crossings and more information about where to walk to be safe.
 - g. **Costs (Affordability):** Transportation costs and strategies to manage expenses were discussed. Some women opt for trains or carpooling to save on parking fees, while others find the safety of cars worth the higher fuel and parking costs. Women with disabilities often rely on Uber for long distances, which can be expensive. In Sweden, many women use public transit cards provided by schools or municipalities. The retired persons take advantage of free travel on public transportation during off-peak hours.

4.3 The mobility hub as an attractive place and a civic space

The social values of the mobility hub were indicated in the literature and came out strongly in the dialogues. Mobility hubs may provide services and fulfill social and other needs beyond just transferring between transportation modes. They can become safe, secure and comfortable places to spend some time to rest, and meet with friends. A mobility hub can be a nice destination, and a place to visit.

A public mobility hub can serve as a meeting point with cafes or a reading room where children can do their school homework with the help of others. Suitable activities for small children and green spaces on the outside is a nice way to reduce stress and turn mobility hubs into attractive places for young mothers. Mobility hubs will also benefit from providing services such as shopping, doctors/dentists, working spaces and pop-up stores. A variety of low-cost or free-of-charge services at the mobility hub turn them into comfortable places where spending money is not a prerequisite for staying more than 10 minutes.

Design features, decorations and paintings that address the local user groups can contribute to a sense of belonging/identification. A nice hub with possibilities to create additional social values could benefit from beautiful designs, perhaps temporary art exhibitions with contributions from the neighborhood as one way to create the sense of 'belonging'.

We noted that the challenges to be dealt with in mobility hubs vary between different cities and parts of cities. The features of a mobility hub in a peri-urban location will be different from a hub in the city center, since the needs and interests of the users vary in tandem with the users' socio-economic conditions and requirements.

So-called station communities in Japanese cities along the Shinkansen trajectory are examples of travel hubs/centres as community spaces. Station communities are hubs that facilitate both commuter travels and urban accessibility. The station communities provide a huge number of commercial and social services. with high levels of convenience and comfort, e.g. for people with walking difficulties, and have emphasis on being an attractive destination for the locals to socialise.

5. Design Framework

The review of literature, the focus groups and interviews with women and caregivers, and the conversations with stakeholders, researchers and other experts, together with discussions at project team workshops resulted in a comprehensive map of challenges, needs, considerations, views and suggestions for how to design a mobility hub which centers women and caregivers.

Using the findings from the knowledge harvesting and dialogues as a point of departure, we developed the design framework in a co-design manner, with a series of on-line workshops and an in-person collaborative workshop. We continued to iterate and fine-tune through a combination of individual deskwork and project team meetings. The design framework presented here is the result of a collective design process characterized by co-learning between peers.

The design framework consists of our Mobility Hub Statement, based on our findings in the knowledge harvesting and dialogues, and our seven guiding design principles.

Our main idea behind the framework is that If we center the needs of women and caregivers when we design, build and operate mobility hubs, we can make our transportation system work better for everyone, including the most vulnerable people in our communities.

In the co-design process developing the design framework we identified some - often unspoken - themes that formed our ethos for the design framework.

- The labor of **weaving**: of connecting to kin and friends, to the fabric of the city and community, to daily needs, to amenities.
- The labor of **hosting**: of making people feel welcome, of building familiar and personal relationships, of being good neighbors, of being a place for celebration and marking of seasons.
- The labor of **nurturing**: of helping and assisting, teaching and learning, informing, play, amusement, and entertainment.

- The labor of **enabling**: of making things easier, of empowering, of supporting.
- The labor of **safeguarding**: of protecting, of stewarding, of ensuring health.
- The labor of **mending**: of responding to hurts, of comforting, of righting wrongs, of keeping the peace, and of amending injustice.

Fig 5. Mobility Hub Statement: The Mobility Hub as a Civic and Community Space

A Mobility Hub is a shared community space that enables people to get access to qualities and services in the surrounding city. Furthermore, it facilitates different forms of connectivity, to other persons as well as their communities. A hub that centers on the travel needs of women and caregivers responds to their requirements and makes it easy to travel with a variety of transportation services. It is also a place for resting, gathering, shopping, eating and other everyday errands.

A mobility hub is a recognizable and attractive place in a local community. It is designed space that facilitates safe, accessible, and convenient transportation by seamlessly integrating multiple modes of transportation: bus, rail, bikeshare, carshare, scooter share, and enhanced pedestrian amenities both in a physical space and digitally. The services and amenities at the mobility hub should adapt and respond to the changing needs of its users (variety of services, quality, reliability).

5.1 Design Principles

The seven design principles are:

- Design for **trust and security**
- Design for **convenience**
- Design for **comfort**
- Design for **access & ease of use**
- Design for **care & belonging**
- Design for **safety & health**
- Design for **options & affordability**

Each principle is described below with a statement, relevant questions and considerations in the design of a mobility hub, and an illustrative visualization of the principle.

5.1.1. Design for trust and security

Statement: Make the hub a place that fosters trust, where women and caregivers feel safe and secure.

Questions and considerations:

- How might we make it easy to find **help and assistance**? Is there a live human on the premises that people can run to for help? Are there multiple ways to call for help and assistance? Is the staff trained to help in emergencies? Consider emergency call boxes so people can call for help.

- How might we make **schedules and services that are predictable and reliable**? Is there a live human on the premises that people can run to for information? Are announcements of **service** interruptions easy to hear or read? Are the schedules and instructions easy to read and are they regularly updated? Consider providing free wifi access.
- How might we promote a **sense of protection but not over-policing**? Are operators and staff trained to be friendly and reassuring, especially for people who need help? Is most of the inside of the hub visible from the street? Consider the use of lighting that is warm, clear but not harsh. Are the facilities welcoming? Are the services reliable? Consider the visibility of public uses.
- How might we connect to the **systems of protection and rapid response**? Is there a protocol in place for staff to address sexual harassment and crime? How are things kept in order? How is order kept?
- How might we connect to systems and places of **medical care**? Are there first aid stations and are they visible? Are there clear directions to the nearest medical facility? Consider first aid kits, make them available and visible. Consider locating medical services nearby or adjacent (clinics, urgent care, pharmacies).
- How might we foster **familiar faces** and the assurance of “people I’ve seen and know”? Are there “familiar people” who are reliably in the hub? Is there a way to stay connected and in communication with others? Consider how you assign and rotate staff so people become familiar with the operations people. Consider creating co-servicing contracts with nearby businesses for cleaning and maintenance.

Fig 6. Illustration of the principle Design for trust and security



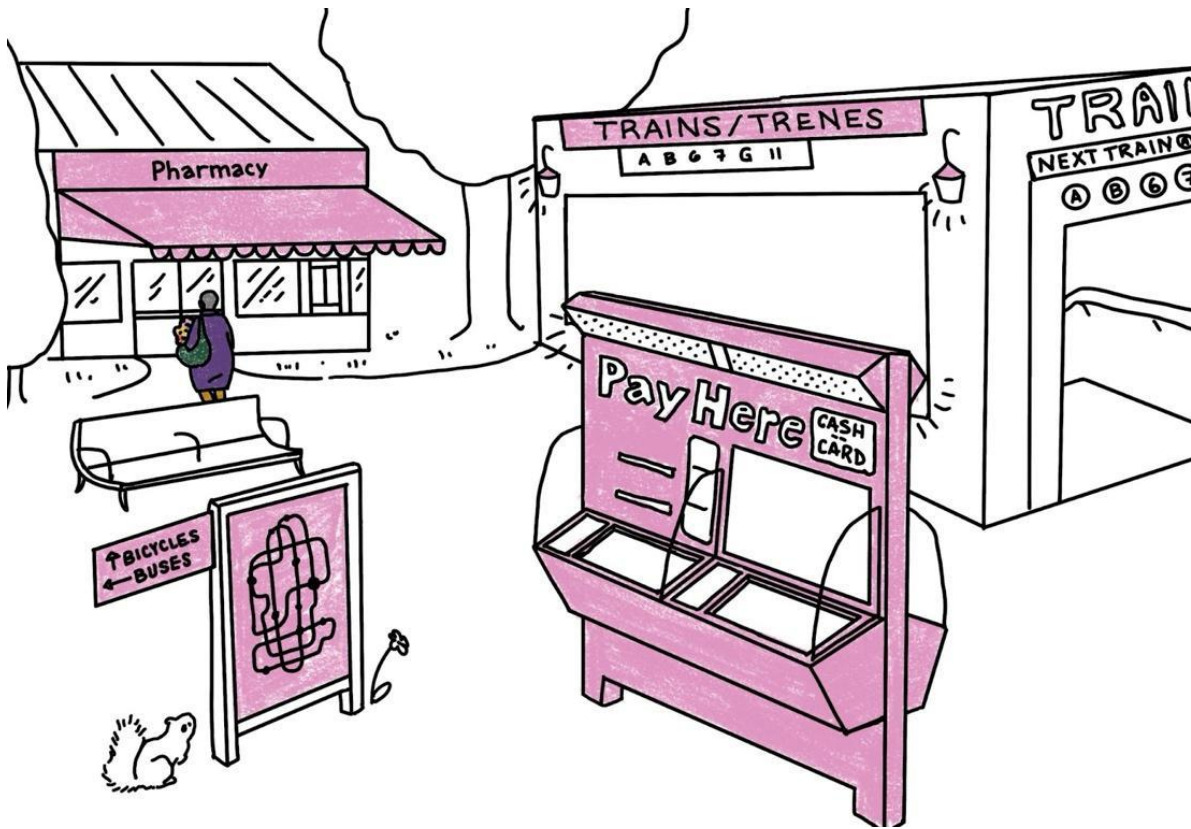
5.1.2. Design for convenience

Statement: Make the hub a place that is easy to get to, has reliable services, and is free of clutter.

Questions and considerations:

- How might we **connect to the fabric of the city and the community**? Is the hub connected to a pedestrian network with safe crossings and safe, well maintained sidewalks?
- How might we **connect to daily needs and amenities**? Are there convenience stores where people can pick up daily necessities? Consider food trucks and street vendors. Consider spaces for community clinics. Are the hubs near to or do they help to easily get to amenities such as:
 - grocery stores and markets?
 - community centers, theaters or playhouses?
 - government or public utility offices?
 - entertainment and amusement venues?
 - churches, mosques, temples, and other places of worship?
 - parks and recreation centers?
 - schools, libraries and bookstores?
 - daycares, nurseries, or kindergartens?
 - senior centers?
- How might we **support trip chaining**? Is there clear information about the transportation options and how to use them? Consider screens that show real time transit schedules and the status of services.
- How might we help women and caregivers **reduce the amounts of stops and trips** they need to take?
- How might we use mobility hubs to connect disadvantaged communities to opportunities? Consider creating opportunities for small businesses, with smaller spaces for startup enterprises. Consider flea or holiday markets. Consider locating next to government offices that have public facing services or using some hubs as branches to access government services. Consider co-locating services where people can pay their household bills (utilities, taxes, fees, government registration).
- How might we make it **easy to choose and use other transportation options**? Are there easy to read maps that show nearby destinations and amenities? Consider technology for audio announcements.
- How might we **connect to regional and longer range modes**? Consider connections to airports, ferries, suburban and regional trains, etc.

Fig 7. Illustration of the principle Design for convenience



5.1.3. Design for comfort

Statement: Make the hub a place where it is pleasant to wait and easy to transfer from one mode to another.

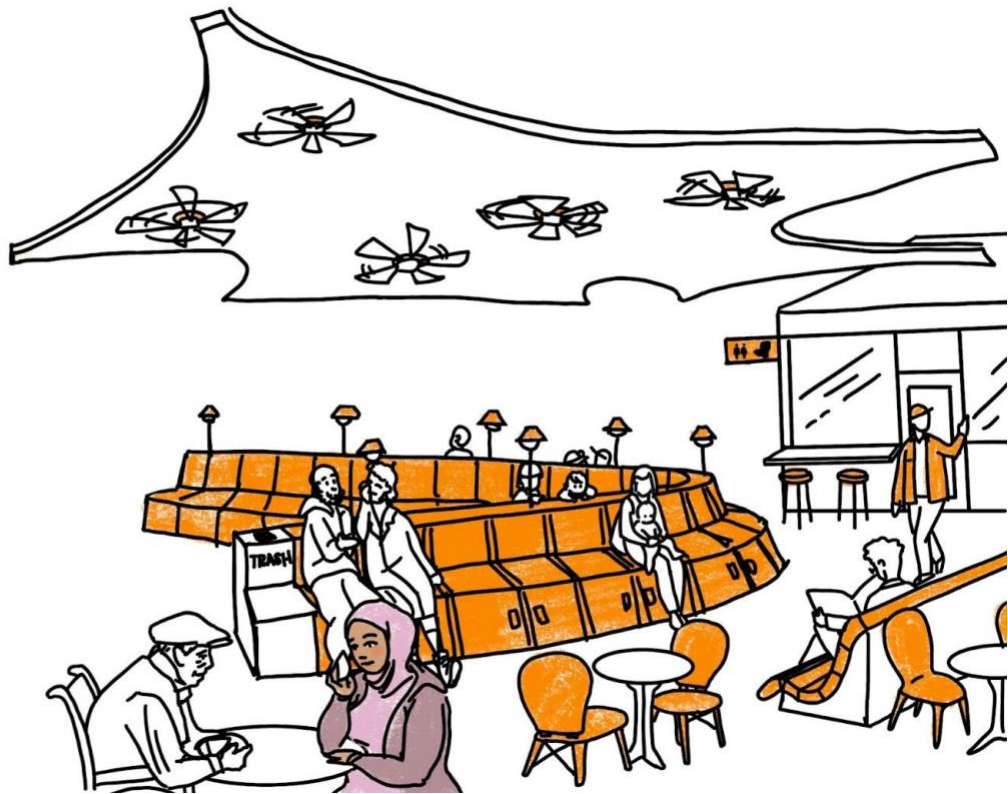
Questions and considerations:

- How might we **make people comfortable**? Is there good natural lighting? Is there good lighting in the afternoon and the evenings? Consider taking advantage of daylight and natural lighting. Are there comfortable places to sit? Is there shade and protection from the weather? Are there flexible adjustments for the seasons? Shade, cooling and fans in the heat and summers, warmth and shelter in the rain and winter?
- How might we **make the space inviting and friendly**? Are there provisions for the differently abled? Are there plants and greenery? Are there places for children to play or rest? Make sure the facilities have good lighting, especially the rest rooms, especially when it is dark. Provide lighting for reading or and electrical outlets where people can charge their devices. Make sure restroom stalls have handholds for the disabled and the elderly.
- How might we make sure there is always some activity that draws people even if they are not using the hub? Are there **activities around (shopping, eating, meeting) that bring more**

people into the space even if they are not using transportation? Consider sharing cleaning services with nearby establishments. Consider giving spaces to street and food vendors.

- How might we keep the place **clean and orderly**? Are the restrooms available and kept clean? How do you prevent bad odors? How are you reducing the noise levels?
- How might we **encourage people to keep the place clean (stewardship)**? Are there trash cans in the restrooms, and are they regularly cleaned and emptied? Consider ways to get regular feedback from people on how comfortable and how clean the hub is. Act on the feedback and report on improvements.

Fig 8. Illustration of the principle Design for comfort



5.1.4. Design for access & ease of use

Statement: Make the hub a place where it is easy to move around especially for people with physical challenges.

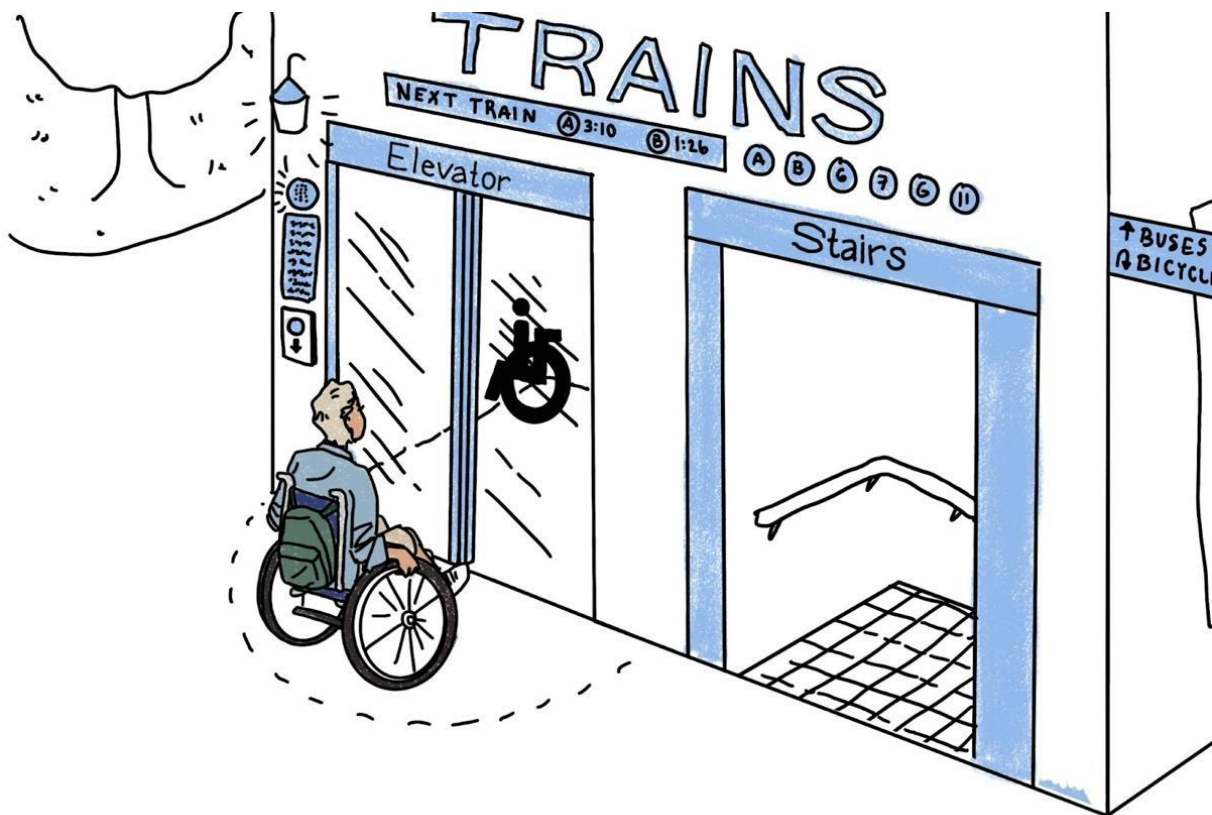
Questions and considerations:

- How might we make services and facilities **easier to use for children and seniors**? Consider simple explainers for children and put them at their eye level.
- How might we make it **easy to move around the hub and access the services if you're in a wheelchair or have to use a cane or walker**? Are there places for wheelchairs and strollers? Are there places to sit? Is it easy to get up from the seat if you use a walker or a cane? Where

you can, keep the essential services on the same floor or level. If this is not possible, make sure you have well designed, comfortable ramps and well-maintained and clean elevators and escalators. Make sure stairwells are visible to the general public. Make passages wide enough for people using assistive devices, walkers or wheelchairs, and for strollers.

- How might we make it easy for people **carrying children or heavy bags** or groceries? Would it be easy to get around if you had a stroller or if you were carrying bags in both hands?
- How might we provide **useful information for people who are deaf or hard of hearing, or are blind or visually impaired**? Can people access useful information even if they do not have digital devices? Consider transit screens with real time travel information.
- How might we make it **easy for people who cannot read well or do not read or speak the majority language**? Are the signs and directions easy to read? Are they in large fonts? Consider audio based information interfaces. Is the information you provide available in various languages? Use multilingual signs and directions.

Fig 9. Illustration of the principle Design for access & ease of use



5.1.5. Design for care & belonging

Statement: Make the hub a place where everyone feels welcome and anyone can find help when they need it.

Questions and considerations:

- How might we **make people feel welcome**? Are there places for children to play with seating so their caregivers can keep an eye on them? Are there activities for children and youth?
- How might we help **neighbors meet neighbors**? Are there places for people to gather in small groups? Consider how the space would serve as a “living room” for the community.
- How might we encourage **neighborliness and stewardship**? Consider displaying artwork from school children. Consider displaying artwork from local artists. Consider stalls for fruit and vegetable vendors. Consider showing old pictures showing the history of the neighborhood.
- How might we **mark the seasons and celebrate community events**? How does the design of the hub celebrate the seasons? How does the hub mark and celebrate holy days and holidays? Consider decorating for major holidays of all the cultures represented in the neighborhood. Does it allow people to see outside and admire nature? Are there trees on the streets? Are there flowering plants that bloom in certain seasons?
- How might we **help first time users of the hub and of the services**? Are there tools to help people learn how to use the mobility services? Make sure there are brightly lit, easy to read signs that identify the mobility hub.
- How might we provide **useful information apart from travel directions**? Is there space for public health advisories and community announcements? Are there easy to read maps and directions that help people to get to where they need to go or to find new interesting places? (In the city and in the neighborhood). Consider spaces for school announcements. Consider job boards.

Fig 10. Illustration of the principle Design for care & belonging



5.1.6. Design for safety & health

Statement: Make the hub a clean and healthy place where children, elders, and the people who care for them can be safe.

Questions and considerations:

- How might we **minimize risks**? Does it give shelter and respite from inclement weather?
- How might we **ensure the physical safety** of everyone? Is it well lit inside and outside? Are there water fountains?
- How might we **prioritize the safety of people on foot and people with physical and cognitive challenges**? Are the sidewalks clear and well maintained? Are the pedestrian crossings well-marked? Are you slowing down the vehicle traffic around the hub? Design and reconfigure the surrounding roads to slow down vehicular traffic. Do the design of the stairwells and steps encourage more activity? Are the wheelchair ramps wide and safe? Include pedestrian only or pedestrian priority roads in the design and plans. Connect to protected bike lane networks designed for all ages and abilities.
- How might we use **healthy, environmentally safe materials**? Use clean energy sources for vehicles and for the facilities. Favor natural materials, avoid plastics or the use of high VOC/toxic chemicals. Avoid toxic cleaning chemicals. Favor adapting existing buildings or structures over building new ones. Are there healthy food choices? Are the facilities kept clean? Are the food providers regularly inspected?
- How might we **reduce air pollution**? Is it well ventilated?

Fig 11. Illustration of the principle Design for safety & health



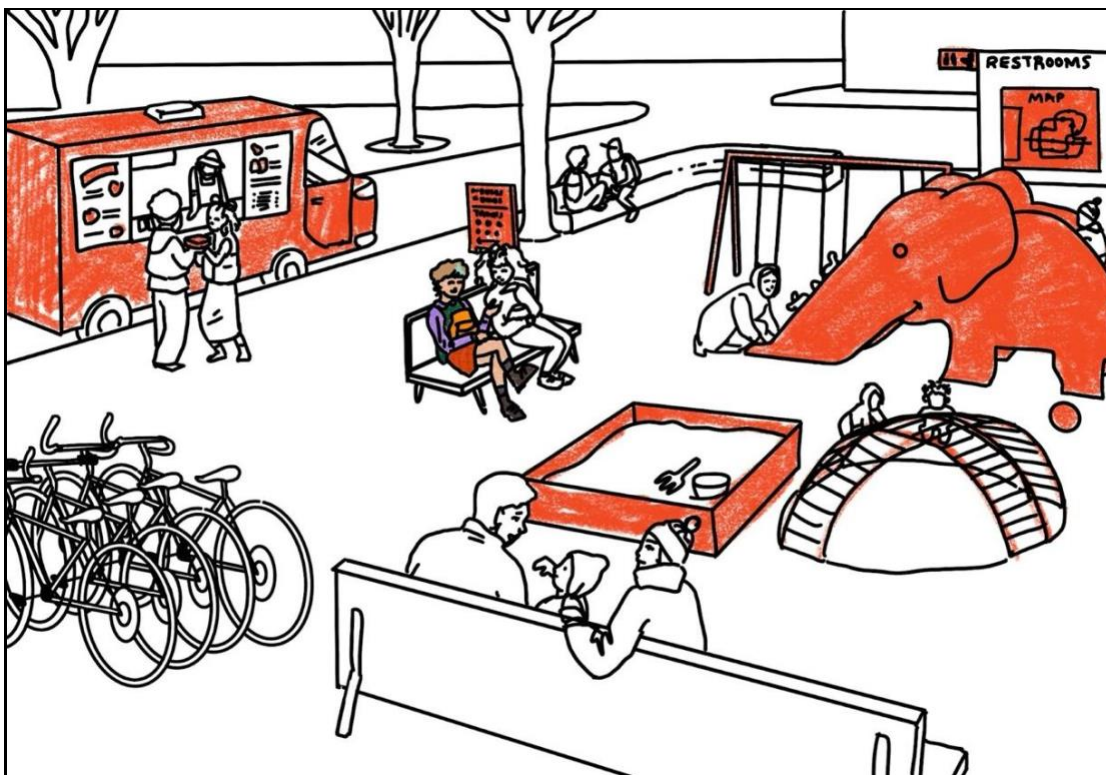
5.1.7. Design for options & affordability

Statement: Make the hub a place with different and flexible options, not just for travel but also for food, shopping, and enjoyment.

Questions and considerations:

- How might we provide **affordable options for travel**? How might we incentivize more frequent use through pricing? Are the fares and user fees affordable? Are there affordable options? Consider discounts for the elderly and their caregivers. Are there mobility options that work for different tasks? (e.g. - a shared bike or e-scooters for sunny days, ride hail for the elderly or for women traveling with children). Consider electric cargo bike shares.
- How might we provide **affordable options for food and for enjoyment**? Does the network connect to wet markets and produce centers? Are there places to sit at tables even if you are not buying anything? Consider stalls for fruit and vegetable vendors. Consider vending machines with healthy and affordable food options. Consider incentive discounts to patronize nearby restaurants or stores
- How might we **reduce prices for lower income households**? Are there incentives or discounts for people with lower incomes? Consider book exchanges (like the Little Free Libraries). Consider providing free feminine products. Consider free public wifi.

Fig 12. Illustration of the principle Design for options & affordability



6. Reflections, discussion

This project aims to create a foundation for better understanding and communication around designing mobility hubs that meet the needs of women and caregivers. Prioritizing the needs of women and care-givers can create inclusive, adaptable transportation systems that benefit all users and foster community. We envision the open-source slide deck being a valuable tool for various stakeholders: community leaders can use it to shape advocacy efforts and engage their communities and government agencies; policy-makers, planners and designers can use it to identify overlooked needs and requirements; and educators and students can draw insights to improve transportation systems for women and caregivers. We encourage all users to adapt the framework to their local context and prioritize listening to the voices of women and caregivers within the communities they serve.

We acknowledge that this work is not exhaustive and should be expanded upon. We focused mainly on the social aspects of travel and mobility, whereas climate and environmental aspects were not addressed explicitly, rather we regard these as embedded benefits of well-serving mobility hubs; if the infrastructure and adjoint services for public transport and other forms of shared mobility works well for all users, more road-users will choose to travel by these modes of transport. In turn such travel changes will lead to less private motorized travel and thereby reduced carbon emissions. Further, we did not look into specific modes of transport. Further studies could analyze how the design principles facilitate the use of different modes, e.g. buses, trams, mini-scooters, biking and walking.

One of the most valuable aspects of the project was collaborating as an international team, which enriched the process with diverse perspectives and manifold experiences. However, working across multiple time zones presented challenges, and we believe the project would have benefited from more in-person collaboration, given sufficient resources and time.

Our methodology, with its combination of literature review and dialogues, resulted in a comprehensive map of challenges, needs, considerations, views and suggestions for how to design a mobility hub which centers women and caregivers. Some of them might be contradictory, and some might not be very different from what all travelers would highlight, but we definitely see a pattern of aspects and factors of specific importance for women and caregivers moving around in cities.

A key priority of our approach was to center our research methodology around a qualitative approach and to listen to the women and caregivers and share their stories. The qualitative stories enriched the personas we developed and aimed to center across the entire project. Because of this qualitative approach, our funding and availability limited how many women and caregivers we could meet with and this is something we hope to expand on. We also encourage others to broaden this

work and to include more quantitative, geographic and local analysis that compares several cities along with more focus groups and interviews in other areas to increase the sample size.

It has been a pleasure to research this important topic and further our understanding of the travel patterns of women and caregivers, and to provide a tool to guide, inspire and challenge mainstream design habits and choices. The study calls mobility hubs that ensure safety, security, reliable information, accessibility spaces and seamless connections between transport modes. In the big picture, the outcome of the project is a paradigm shift of how we think about mobility and design for all, leaving no one behind.

7. List of products from the project

The project resulted in the following publicly available products:

- [Open-source slide deck presenting the design framework developed in the project: “Mobility Hubs for Women & Caregivers” \(2025\)](#)
- Final project report: “A Conceptual Design Framework for Women-Centered Mobility Hubs” (2025)

Additional resources:

- [Blog post: “Changing Focus: Mobility Hub Design Centered on Women and Caregivers” \(2025\)](#)
- The Case for E-Mobility Hubs and Microgrids for Women & Caregivers (2025)

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