

# Learning from informal gendered mobilities: Towards a holistic understanding for experimenting with city streets

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## ABSTRACT

This paper argues that the right to access public spaces and streets is impacted not only because of automobility but also by socio-spatial factors of the urban environment. This paper presents insights towards a holistic understanding for street experiments (with a focus on stationary and slow travel modes) by highlighting the factors that impact the conditions of mobility and access through the lens of gender. By adopting a combination of new technologies, such as GPS, along with mobile methods, like ethnography, this research centres around the everyday travel experiences of urban marginalized women (UMW) from peri-urban areas of New Delhi who contest their right to access public spaces on a day-to-day basis. This study examines the socio-spatial environment comprising the daily mobilities of UMW to reveal the conditions of mobility and access to public spaces. The findings highlight that the issues faced by these women while travelling, mainly guided by aspects of gender, act as barriers to their mobility and access to public spaces (streets) in urban informal conditions. The study also reveals elements of urban informality (socio-spatial elements) enhance as well as negatively on the daily mobilities of UMW. These socio-spatial factors were found to be interconnected to one another and thus cannot be implemented as individual or isolated factors. The results of the study support the proposal of a more inclusive and accessible public space.

## Introduction

In recent years street experiments have emerged as a way of trying out temporary possibilities with providing a 'one-day' vision of how the citizens of the city could reclaim streets for future well-being. Repurposing parking spaces in 2005 (Parking Day, 2021), pavements to plazas started in 2007 in NYC (Sadik-Khan & Solomonow, 2017) and repurposing streets into play streets (Cowman, 2017; Lydon & Garcia, 2015) and open streets (Eyler et al., 2015; Sarmiento et al., 2017) are some examples. These temporary experiments open up the possibility for envisioned fundamental transformations without heavy investment and associated risk factors (VanHoose et al., 2022). Bertolini (2020) defines street experiments as intentional interventions that change the use, function or form of the streets temporarily, leading towards people-centric streets instead of traffic-orientated streets. However, in contexts, where marginalization and socio-economic factors are a prominent part of the context, such as in developing countries, the right to access is impacted not only because of automobility taking over pedestrian streets or public spaces but also because of prevailing

socio-spatial contexts, specifically concerning women (guided by gender issues) (Ceccato & Loukaitou-Sideris, 2022; Yu & Smith, 2014; Gera & Hasdell, 2020). The existing studies focus on walkability for sustainable transportation (Baobeid et al., 2021; Moayedi et al., 2013; Park et al., 2017), experiences of walking concerning perceptions of built environment (Calonge-Reillo, 2022; Dadpour et al., 2016; Villaveces et al., 2012) and fear of sexual harassment impacting walkability in case of women (Ceccato & Loukaitou-Sideris, 2022). Our research focused on the daily mobilities of urban marginalized women (UMW) residing in peri-urban areas of New Delhi, India. By doing so, this study incorporated intersectionality, that is, through the lens of gender and exclusions experienced by these UMW to highlight critical factors towards making public spaces more inclusive. Moreover, the purpose of this study was to identify and understand the socio-spatial factors, emerging from the conditions of urban informality, that impact the overall access and mobility based on the daily experiences of UMW.

This paper is composed of seven sections. After introducing the study as a part of the introduction, the second section we discuss the literature on street experiments and its relation to urban mobility, gender and

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mobility in developing countries, and cities and urban informality. For this study, it is crucial to understand the context and related conditions, and these are presented in Section 3 of the paper. In Section 4, we discuss the methods, followed by the findings (Section 5) of our empirical study. Section 6 comprises the discussion based on the findings. The article ends with conclusions (Section 7) which also includes suggestions for designers, planners and policy makers for inclusive and accessible public spaces and mobility.

## Theoretical background

### *Street experiments and urban mobility*

Urban experiments are becoming a recurring and popular phenomenon used for developing an understanding of the city and transforming it (Karvonen & Van Heur, 2014). With respect to the urban mobility paradigm, city streets present a complex manifestation of several challenges and tensions (Von Schönfeld & Bertolini, 2017). These challenges include considering different kinds of mobility that are constantly growing and competing with one another (Bertolini, 2020). By different types of mobility, it is meant mobility that is motorized as well as non-motorized, incorporates collective movements along with individual ones and accommodates different speeds of mobility (fast and slow) (Bertolini, 2020). The ever-growing dominance of the automobile in capturing the urban spaces in cities has highlighted the need to reclaim city street space for other modes of transportation, such as walking, cycling and public transport (Holden et al., 2019). City streets need to be understood as public spaces that allow for several day-to-day activities beyond mobility and focus on stationary space activities. These activities may include retail, play, social interactions, leisure, creativity and politics – which have been sidelined as a result of automobility (Norton, 2014). These are essential elements that initiate socio-political participation and instil a sense of ownership (of space). However, within specific contexts where women's mobility or access to public spaces is restricted by socio-spatial elements, considering this aspect within the planning process becomes crucial.

With respect to scientific experimentation, the laboratory and the field site have been considered the two 'truth-spots' that may help inform scientific claims (Gieryn, 2006). However, several scholars highlight the need for laboratory-orientated experimentation, which is understood to be related to a more controlled environment, and instead emphasize the criticality of social power and the laboratory's connection with the world outside the artificially created setup (Callon et al., 2011; Evans, 2016; Gieryn & Henke, 2008; Gieryn, 2006; Kohler, 2002; Latour, 1983, 1987, 1993, 1999). Contrary to lab-based experimentation, Gieryn (2006) discusses the importance of field-based research as an essential component of geography-related disciplines where it needs to include heterogeneous spaces, practices and sites (Gross, 2016; Kullman, 2013).

In urban policy, experimentation provides space for trying new ideas that may otherwise be radical to implement or have an uncertain impact/result. They fall under a "learning by doing" approach that may point towards possible and avoidable changes in the real scenario (Bertolini, 2020). Street experiments are also seen as a way for the planners to, if not meet, at least consider and try out various solutions based on the spatial as well as social needs of the city dwellers (Van Hoose et al., 2022). Street experiments have focused on areas related to economic activity (Littke, 2016), safety and well-being (Umstätt Meyer et al., 2019), physical activity (D'Haese et al., 2015) and focusing on social cohesion (Zieff et al., 2016). Besides this, long-term urban challenges related to air and noise pollution can be tested by employing such temporary setups. However, there is a void within the street experimentation for understanding and responding to the needs of women with equal rights to participate and access public spaces. Street experimentation is considered valuable within urban planning (Savini & Bertolini, 2019); however, some areas remain unexplored in research and

practice (Van Hoose et al., 2022). Moreover, a lack of understanding and knowledge exists on the impact these experiments have on urban mobility, leading towards a system-wide change (Bertolini, 2020). Large-scale changes or macro conditions present the possibility of bringing about transformations affecting policy-level decisions (Tilly, 1978) that mainly affect issues related to urbanization and socio-economic aspects of society (McAdam, 2010; Morris, 1984).

### *Gender and mobility in developing countries*

Although mobility may be understood as a symbol of independence (Sheller & Urry, 2016), it is differently accessed by different people. To be able to travel independently gives a sense of confidence to an individual. Mobilities research does not limit itself to time and space but demands an investigation into factors like connectivity, centrality, and empowerment, along with disconnection and social exclusion (Graham & Marvin, 2001). Cresswell and Uteng (2016) argue that women's mobility has not been given much importance, or rather, has been suppressed for a long time mobilities.

More specifically, in the constrained and patriarchic settings of marginalized communities within developing countries, the cultural aspects emphasize the contested meanings associated with women due to the reasons and consequences of their im(mobility) (Silvey, 2000) and well-being. Additionally, Tanzarn (2008) argues that the social exclusion of women is a result of gender inequalities and the interaction of gender with transport and related infrastructure reinforces these differences between men and women.

Several scholars have established the non-inclusive and gender-biased characteristics of transport policies (Bamberger & Lebo, 1999; Turner & Grieco, 2000). Usually, the planning and development of the cities lack the sensitivity toward including the travel requirements of women who, in a way, bridge the different spaces belonging to the private (home) and the public realms. The fear of sexual harassment in public spaces acts negatively on women's participation in socio-economic activities (Ceccato & Loukaitou-Sideris, 2022). Besides social factors, this fear is largely supported by spatial elements, such as perception of the built environment (Arellana et al., 2020; Larranaga et al., 2016; Moayedi et al., 2013; Villaveces et al., 2012). Specific to the context of developing countries, there are studies that highlight the issues and perceptions related to walking environments, such as in Mexico (Calonge-Reillo, 2022), Colombia (Villaveces et al., 2012) and Libiya (Abdulla et al., 2017). Several studies conducted specifically in the context of developing countries, reveal that the urban transportation system in cities is not gender-sensitive (Anand & Tiwari, 2006; Borja & Castells, 2001; Law, 1999; Uteng, 2009).

The urban transport planning policies have neglected to include the variety of journeys that women need to undertake in their routines, which includes walking. According to Nite Tanzarn, transportation structures create systemic differences in material circumstances between men and women, enhancing women's exclusion at various levels. Tanzarn (2008) argues that women's mobility can transform existing gender inequalities. Proper infrastructure and transport are critical in helping women fulfil multiple roles and perform various daily activities (Hamilton & Jenkins, 2000).

### *Cities and the urban informality*

In recent studies, the notion of peripheries signifies the physical space on the fringe of the megacities, the in-between, that is constantly evolving and lies between the urban and the rural, also referred to as the peri-urban interface that presents the space for making and remaking of urban life (Simone, 2010a). This implies that the notion of peripheries goes beyond the topographical space and also reflects the various discontinuities, hinges or relationships that emerge within the socio-urban territories (Simone, 2010a).

The cities establish links with individuals and groups of people not only in terms of their geographical location but also play an important role in the transformation of individuals with respect to their social,

economic and political identity (Robinson, 2006; Simone, 2010b). Cities are places of contestation where individuals and groups of people act in specific ways to access resources and opportunities like land, services and being a part of institutions (Abbink, 2005; Ceuppens & Geschiere, 2005; Lund, 2006; Freund, 2009). In the case of developing countries, a flexible model of governance, signifying the concept of political agency with respect to subaltern urbanism (Guha, 1982; Roy, 2011) is based on self-initiatives of the individuals gives rise to bottom-up solutions addressing various issues of the society. However, the recognition of such informal self-organisation models as a comprehensive social or political force is often doubtful, yet such actions present opportunities to the inhabitants of the city for negotiations, collaborations, exchanges and strategic planning (Brown, Lyons, & Dankoco, 2010; Lewinson, 2007; Lindell, 2010; Mohan, 2008). The daily work or activities allow the residents to be actively engaged in each other's lives to create and sustain relationships with their neighbours, co-workers and extended family members. These relationships with the city and other people enable the residents to create a map of their own whereby they identify and categorise safe and unsafe places, the belongingness of those spaces and the connection between different spaces (Simone, 2010b).

### Context

According to Dupont (2004), at a macro-level, Delhi presents itself like a tessellation of contrasting regions signifying discontinuity in its spatial character and flow. Due to rapid urbanisation, the traditional monocentric model of Delhi gave way to the formation of mixed spatial forms and is reminiscent of a polycentric metropolitan region (Dieleman & Faludi, 1998; Mookherjee et al., 2015). According to several scholars, these mini-cities lack self-sufficiency and thus rely on each other due to various social and economic processes that form the basic functional mechanism for these regions (Champion, 2001; De Goei et al., 2010). Within this process of metropolisation, the low-income population or people on the periphery of the society who are otherwise excluded from access to the city (Oviedo Hernandez & Dávila, 2016) search for employment opportunities throughout the metropolitan region with the help of transport connectivity.

This research focuses on one case, namely, New Delhi but it applies (with context-based adjustments) to any other city of a developing country with similar characteristics of urban periphery and informality. This research focuses on urban peripheral areas of New Delhi, specifically the unauthorised or informal settlements<sup>1</sup> (Fig. 1).

### Mobility of urban marginalized women (UMW) in New Delhi, India

This study focuses on urban marginalized women (UMW) living in the peri-urban areas of New Delhi in India. Most people living in the informal settlements of these peri-urban areas are migrant poor who have travelled from neighbouring states of Delhi like Uttar Pradesh and Haryana in search of employment opportunities. Amongst the various groups of women in India, the most vulnerable are the UMW. This group of women are marginalized from two perspectives. First, because they belong to the socio-economically weaker section of society and second, they are women. These are marginalized people whose rights have been violated and those who possess an insignificant amount of economic and political power (Massey, 2013). Due to various kinds of discrimination at socio-cultural and spatial levels, the UMW in Delhi face forced eviction with respect to the right to property and access to various other household assets. These exclusions, in addition to the greater share of household responsibilities, have a significant effect on their travel choices and status (Anand & Tiwari, 2006).

Within the context of New Delhi, India, the aspects of social

<sup>1</sup> Although this study considers New Delhi in India as a case example for megacities of developing countries, it is outside the scope of the study to cover the entire New Delhi because of its scale.

exclusion and inequality are quite evident with respect to the mobility of women. Indian women, especially those who live in urban peripheral areas, experience restrictions on their movement because of social, cultural and economic issues (Anand & Tiwari, 2006). Hamilton and Jenkins (2000) argue that existing socio-cultural ideologies and the ability of spatial infrastructure to include changing mobility patterns define gender constraints/barriers.

Besides experiencing exclusions at a household level, women from marginalized communities also face several other transit related challenges at the city level, such as, due to unsafe environment (and behaviours), and lack of supporting urban infrastructure<sup>2</sup> (Anand & Tiwari, 2006; Ceccato & Loukaitou-Sideris, 2022). Amongst the many cities in India, Delhi's reputation with respect to crimes against women is the lowest. Several incidents of violence and related to safety in public spaces are reported on daily basis (Bowles Eagle, 2015; Karusala & Kumar, 2017). Moreover, from a spatial perspective, the existing infrastructure of the city does not address safety concerns and thus restricts their movement to the interior of the house (Anand & Tiwari, 2006; Ceccato & Loukaitou-Sideris, 2022; Jackson & Gray, 2010).

These women are primarily employed in the semi-formal or informal sector<sup>3</sup> and often cannot afford to use any transport mode but walking. A study conducted by Bostock (2001) on low-income women also presents the numerous problems women face while walking, including fatigue, stress and psycho-social effects. According to Uteng (2012), the cultural aspect plays a crucial role in the positioning of gender with respect to mobility, namely, access to outer space and kinds of activities. Several studies highlight the impact of risks associated with travelling on public transport modes, such as sexual harassment and travel behaviour of women, where women tend to self-exclude themselves from certain activities hence limiting access to social, leisure and economic activities (Anand & Tiwari, 2006; Murray, 2016). Fear of space is one aspect of risk aversion that is related to the interaction of women with urban space (Pain, 1994). Due to this reason, they tend to return home early (to avoid risks like sexual harassment) (Ceccato & Loukaitou-Sideris, 2020, 2022; Loukaitou-Sideris, 1999), and thus they lose out on employment opportunities (Tanzarn, 2008). However, Tulloch (2000) states that many factors contribute to risk experience and depend on spatial and social contexts.

### Social exclusion and inequalities

Within the Indian society, gender inequality is prevalent in different areas and at different levels. It needs to be understood from three main perspectives, i.e., cultural, economic and spatial (Gupta, 2017) (Fig. 2). Moreover, the caste system, religion, class and ethnicity are mutually constituted social divisions that hold a strong position in the Indian society.<sup>4</sup> Several studies show that the mobility patterns of people are primarily guided by gender differences (Cattan, 2008; Hanson & Johnston, 1985; Villeneuve & Rose, 1988).

Women in India are bound by various socio-cultural aspects, which results in various sacrifices, including giving up their independence. In most parts of India, the families are patriarchal, patrilocal and patrilineal (Jejeebhoy, 2002, p. 300); and the society is inegalitarian

<sup>2</sup> The socio-cultural exclusion faced by Indian women at domestic and societal level, often spills over to public spaces resulting in acts of sexual harassment and exclusion in public spaces (see, Nirbhaya case, December 2012) (Bhattacharyya, 2015).

<sup>3</sup> The formal economy is marked by regular work, is legally sanctioned and is regulated through state intervention (Hart, 2006; Portes & Schauffler, 1992). Institutions that do not fall in the formal policy regulated environments and are more ephemeral and, not easy to categorise or define (Frederiksen, 2015; Kellsall, 2011) may be called the informal sector, informal arrangements or informal economy.

<sup>4</sup> This study does not focus on the aspects of religion and caste system as this would add to the complexity of the study. However, this may be taken up as a part of future research.

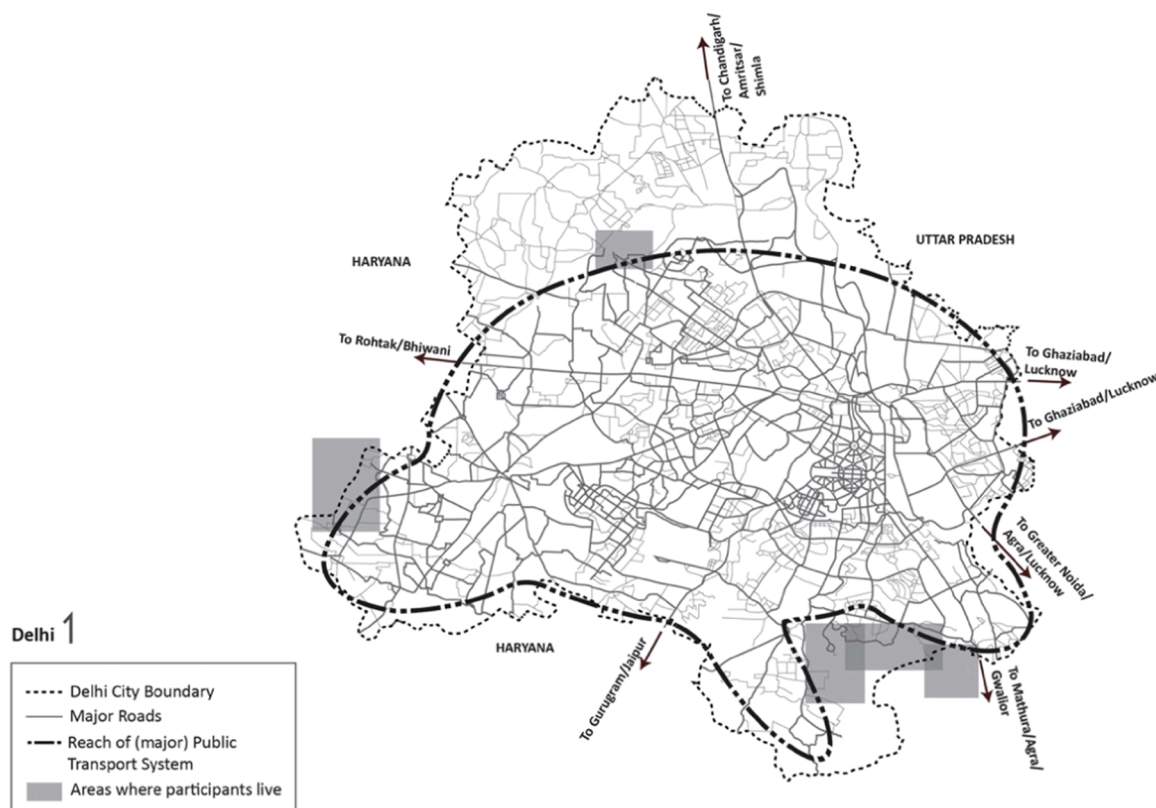


Fig. 1. Context map of Delhi showing the area where the participants live. These areas lie on the periphery of the metropolitan region of Delhi and fall outside the limits of the planned transportation system.

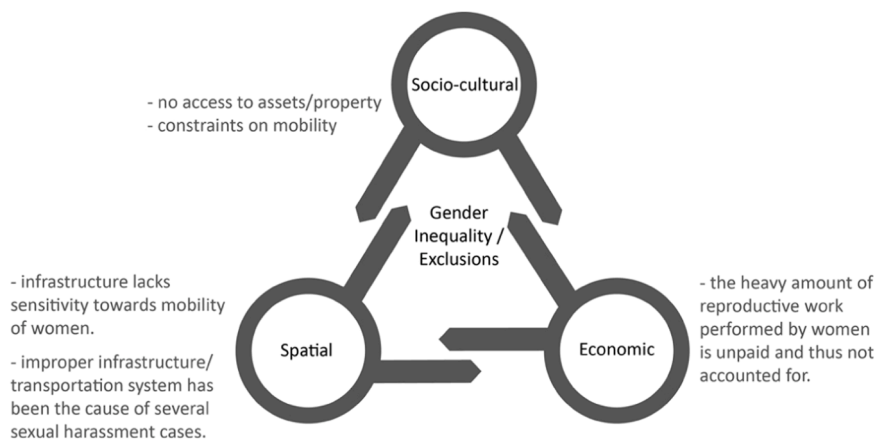


Fig. 2. Three important perspectives to understand the issues related to gender inequality and social exclusions: socio-cultural, economic, and spatial. Source: Derived from (Gupta, 2017).

(Altekar, 1956; Karve, 1965). The presence of inegalitarian gender relations results in several kinds of exclusions that include not allowing to participate in decision-making activities of the family, restrictions on mobility, denied access to material resources and even facing acts of violence at home (Jejeebhoy, 2002). The households within these societies, in informal settlements particularly, are characterised by co-residing of joint families. Although such a joint family structure sometimes helps the women with social and emotional support, the presence of patriarchy takes over the autonomy of women in these households (Debnath, 2015).

Many women are denied access to education or discontinue their studies as an effect of the existing socio-cultural norms that characterize a patriarchal society. It is understood as a social phenomenon that gives

priority to men over women, whether it is concerned with access to resources or right to space (Jejeebhoy & Sathar, 2001). Within the constrained and patriarchic settings of the marginalised communities in developing countries, the cultural aspects emphasise the contested meanings associated with women as a result of the reasons and consequences of their im(mobility), such as, ‘good girls’, ‘obedient daughters’, ‘virtuous women’ and as well as ‘respectable places’ (Silvey, 2000). Uteng (2012) defines moral geographies as the specific ways in which gender ideologies act and guides certain normative ways of behaving in place, making and shaping spatial mobility.

## Methods

This study engages with the daily mobility of urban marginalized women involved in semi-formal or informal employment activities within Delhi. The participants for the study were recruited by establishing contacts with two NGOs<sup>5</sup> in Delhi that work with issues related to women or women empowerment. The data collection method that took place during the Pandemic brought with it other socioeconomic and mental health issues affecting people and thus making the situation stressful. These issues presented different challenges to establishing new relationships with unknown (marginalized) people through digital communication only. With the initial reference from the two NGOs and through sustained and engaging in conversations in the local language of the participants (which is the same as that of the researcher herself), it became possible for the researcher to build connections and rapport with the participants.

A group of 30 women participants were recruited for this study. All participants reside in informal settlements towards the outer periphery of Delhi and belong to the lower-income section of the society. These participants belonged to different castes and religions.<sup>6</sup> Their age varies from 19 to 46 years. The study revealed that most participants were educated till class 9 and dropped out before or after appearing for class 10 exams. Others had completed their school education except for appearing for the final examination of class XII.<sup>7</sup> Another respondent aged 50, had completed her studies only till class VI because of financial instability that her family was going through. The preliminary study and supporting literature shows that besides discontinued education, early marriage leads these women towards greater restriction on their mobility at a young age because of increased burden of household work and childcare responsibilities (Jejeebhoy & Sathar, 2001).

In terms of occupation, 17 participants are employed full-time, and the rest are involved in either part-time or informal jobs or are pursuing education or some other course or training. The nature and type of jobs these women are employed in consist of beauty and sales-related work. Few other women are also associated with the NGOs where some of them work as 'mobilisers' (social workers) and others are taking driving lessons. Besides travelling for these purposes, for some women, their daily travel also includes attending to daily reproductive responsibilities such as picking up or dropping children at school, grocery shopping, etc. The daily mobility of these UMW is characterised by travelling long distances and therefore is accompanied by increased travel time and travel cost. In absence of direct connectivity between their home location and workplace, they need to include multi-modal trips within a single journey to accommodate for spending less money on travel-related activities. In most cases, the last mile of their journeys is completed with the help of informal modes of transport and walking.

To understand the daily mobilities of UMW, this research uses a combination of new technologies with mobile methods like ethnography. The design and construction of the study<sup>8</sup> highlighting the methodology and methods used are represented in Fig. 3 below. The study is divided into two main phases. The first part of Study I requires

<sup>5</sup> Azad Foundation is an NGO that mainly works towards the capacity building by providing driving training to women from resource-poor communities. It has its centres in north, south and east Delhi. The other NGO is CEQUIN India, located in southeast Delhi in Jamia Nagar and promotes equal rights for women and girls.

<sup>6</sup> Due to the socio-cultural complexity of the context, the caste and religion related factors were not considered for the study.

<sup>7</sup> According to the National Education Policy, India, 1992, The structure of the Indian education system is divided into four main stages: grades I-V = primary school; grades VI-VIII = middle school; grades IX-X = secondary school; grades XI-XII = higher secondary school (Ministry of Education, India).

<sup>8</sup> The research issue that has originated from personal motivations and reflexive interpretations was developed further with additional two elements, theory and context, to provide for an integrated and holistic approach.

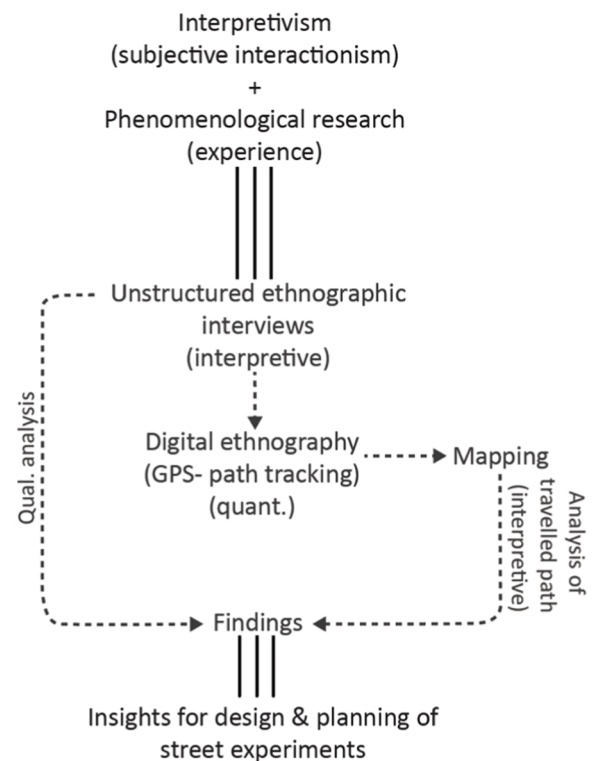


Fig. 3. Research design followed for the study.

understanding the socio-demographic conditions of the participants through the means of unstructured interviews. The second part of this study shifts the focus of the interviews towards developing a cohesive understanding of their daily routines. In-depth interviews were used as a preliminary method to understand the socio-demographic characteristics of the participants living in urban peripheral settlements of New Delhi. Subjective and experience-related questions, such as the description of their daily routines, travel experiences and incidents of sexual harassment, were asked during the ethnographic interviews. It was ensured that the interviews were conducted one-on-one and in private to make the participants feel comfortable so that they could share their experiences freely. These interviews also included a detailed explanation of their daily travel patterns. Through this description, information regarding their travel patterns was extracted for further enquiry. Along with this, travel diaries were also filled out for each participant.<sup>9</sup> These methods helped to identify the characteristics, motivations and barriers that affected the movement patterns of the participants. This process gave the researcher a broad idea of the different journeys performed by the participants.

Further, in Study II, mobile methodology is used for collecting information about the participants' daily movement through GPS technology. Hence, the second part of the study required collecting data about the path travelled by the participants for two weeks. The data relating to travel patterns were gathered for 14 participants through their Google Maps Timeline.<sup>10</sup> This study adopted the use of phone GPS and Google maps timeline. This study was conducted during the Pandemic, with restrictions on mobility and social gathering. Thus,

<sup>9</sup> In this case, there were limitations concerning the literacy level of the participants and thus the researcher filled out the travel diary during face-to-face interaction with the participants.

<sup>10</sup> Due to the limitations of remote research (as a result of the Covid restrictions) with respect to marginalized group of people, i.e., because of limited knowledge and accessibility of digital technology, GPS data could be attained for fewer participants.

based on the availability and knowledge of the participants, appropriate tools (WhatsApp and Google Maps Timeline) were used for the ethnographic research.<sup>11</sup>

Data collection was conducted through both face-to-face interviews and voice calls using WhatsApp.<sup>12</sup> The participants with smartphones were given detailed explanations about the entire process. Conducting remote ethnographic surveys with marginalized communities through digital means presents other challenges, such as dealing with technology handicaps. The researcher was required to educate the participants step-by-step with the help of screenshots along with voice calls on how to turn on the GPS location on their smartphones and how to share their current location on WhatsApp. Particular instructions and guidance were provided to them, such as keeping their location setting turned on at all times for two weeks. Travel diary, along with the GPS tracking method, helped in the data triangulation that allowed the study to investigate small but important factors related to the daily travel routines of the participants.

To identify underlying themes and categories abductive approach (where codes emerge gradually) to constant comparative analysis or coding is applied for unstructured interviews. However, manual mapping is integrated into the analysis method to avoid overshadowing the computer software, which may lead towards missing finer details of the data (Silverman, 2015) and specificities of the phenomena. Mapping is used as an interpretive analysis method for GPS travel path data. The interpretive evaluation of the mapping process can help to demonstrate spatial patterns and provoke contextual queries (Hsu, 2014).

## Findings

### Barriers to access and mobility

Within the context of mobility of UMW, despite the easy availability of transport modes, good road infrastructure and transit stations, easy accessibility remains an issue. The unsafe environment of Delhi highlights the problems related to women's safety, especially while travelling (also discussed in Section 3.1). Based on the conversations with the participants, it is revealed that travelling is considered an unsafe activity due to incidents of sexual harassment and eve-teasing.

*While waiting at the bus stop/station, I saw one man constantly staring at me, and then he tried to stand near me. I felt scared. I moved to the other side, where a couple of women were standing. Then he went his way.*

Rani, 26, social worker

Similar to the above quote, many women shared their experiences expressing safety concerns while waiting at transit stations. Moreover, walking is a significant part of UMW's travel that contributes towards the last mile of their daily journeys and is carried out within their informal home settlements or workplace locations (see Fig. 4 and Fig. 5). These UMW adopt walking as a travel mode, wherever possible, during their daily journeys primarily to take care of the cost issue. Even in situations where informal modes of transport are easily available, many women decide to cover as much distance by walking instead of spending money on last-mile connectivity. The below quote enunciates this:

<sup>11</sup> While conducting preliminary research it was found that not all UMW owned a smartphone. Thus, the selection of participants was based on the availability and access to smartphones (with Internet and WhatsApp).

<sup>12</sup> The data collection process began in February 2020 through face-to-face interviews. After interviewing fourteen participants and obtaining GPS data for five participants, the field study came to a halt in the second week of March 2020. During the total lockdown in New Delhi, India, people's mobility was affected the most and thus it was difficult to pursue data collection with the existing approach involving face-to-face interactions.

*To save that Rs 10 we prefer to walk that 1 km. We need to save money also. Today also I walked 3 km to save money.*

Madhushree, 46, social worker

Although in Delhi, bus travel does not involve any fare for women passengers, many of them decide to walk depending upon the availability of time and cost. Sometimes the decision to walk a certain distance may be because of the unavailability or inaccessibility of transport modes. At times, these women prefer to walk instead of taking public transport due to fear of sexual harassment.

*I find walking best because even if we go on the rickshaw, someone will often come and sit next to us. If I speak for myself, I find it a bit uncomfortable. I don't like it when someone is sitting next to us and touching us on purpose, but we can't do anything at that time. Because of this, I like walking more. And while you're walking, there will also be people with a gaze because there'll be a group, at a lot of places there'll be boys.*

Renu, 32, healthcare worker

Most informal settlements lie on the outskirts of the city and are surrounded by sparsely built structures characterized by the limited movement of people towards their peripheries. This aspect influences the accessibility to these informal settlements' entry and exit points in terms of safety. It is usually dark and lonely at these points, with only highway traffic movement, making it an ideal place for illegal activities. Walking through a deserted area at night due to fear of sexual harassment constraints the mobility of many women until the early evening hours. Therefore, due to the time-bound travel, their access to better employment opportunities remains limited.

*When we travel on foot, then the people around us pass bad comments on us. It has happened quite a lot. If the shops are shut, and the streetlights are off, one feels frightened on those roads because many intoxicated and drunk people roam freely in those areas after 10/11 at night.*

Rekha, 32, social worker

Though walking is considered safer compared to public transport, it is only so when it is characterized by a busy path and the presence of other women. Seeing other women performing travel activities within the same socio-cultural environment imparts confidence and a sense of security to other women. Some women do not possess the confidence or ability to walk alone due to prevailing socio-cultural aspects in addition to the unsafe city environment. Rutherford and Wekerle (1988) define this phenomenon where one is dependant on someone else for transport, as being a 'captive rider'.

*I usually go with everyone, or else with my father.*

Ayesha, 18, informal worker

*No, there is no problem. If it gets too late, then I call my father to get me. There are no streetlights so I get scared.*

Tanu, 21, schoolteacher

Poorly lit streets and the absence of or inaccessible footpaths for pedestrians are also emphasized by the participants as issues that pose a hindrance to walking.

*It's a market area with many hotels, so I go through that way. I feel uncomfortable there as well, quite a lot.*

Rekha, 32, social worker

*On the way, there was a liquor store which made me feel uncomfortable.*

Madhushree, 46, social worker

Additionally, the above quotes illustrate that the presence of culturally gendered buildings along the streets creates an uncomfortable environment for women and thus prohibits many women from using that specific street for walking. Liquor stores, construction sites, small

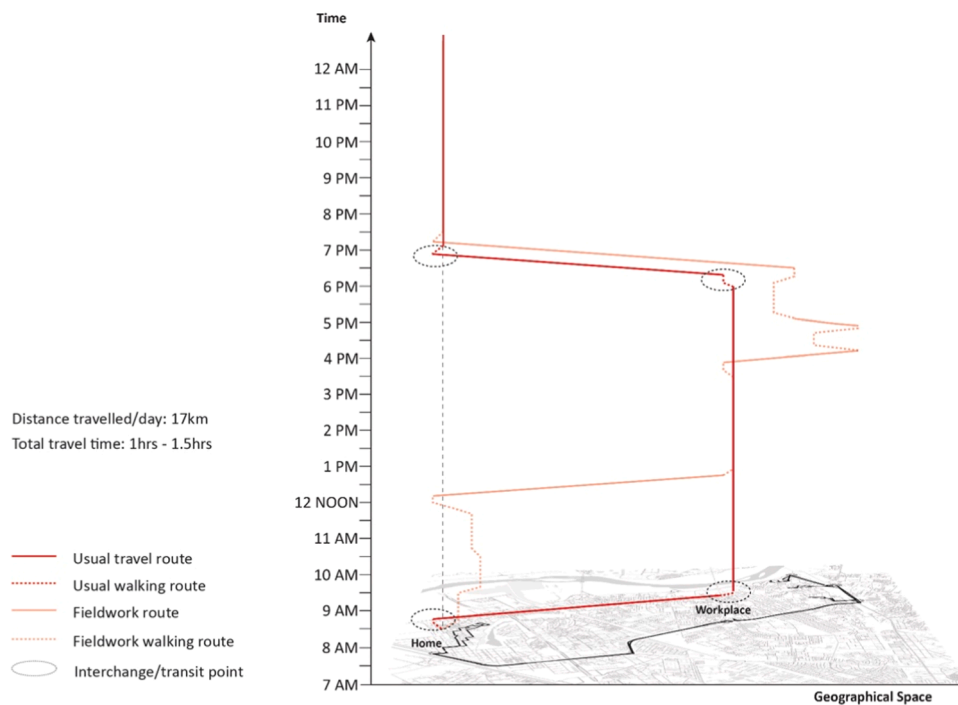


Fig. 4. Time geography diagram representing the travel pattern of a participant who works with an NGO. Besides her regular travel between her residence and workplace, she goes for fieldwork, which includes walking as the main component.

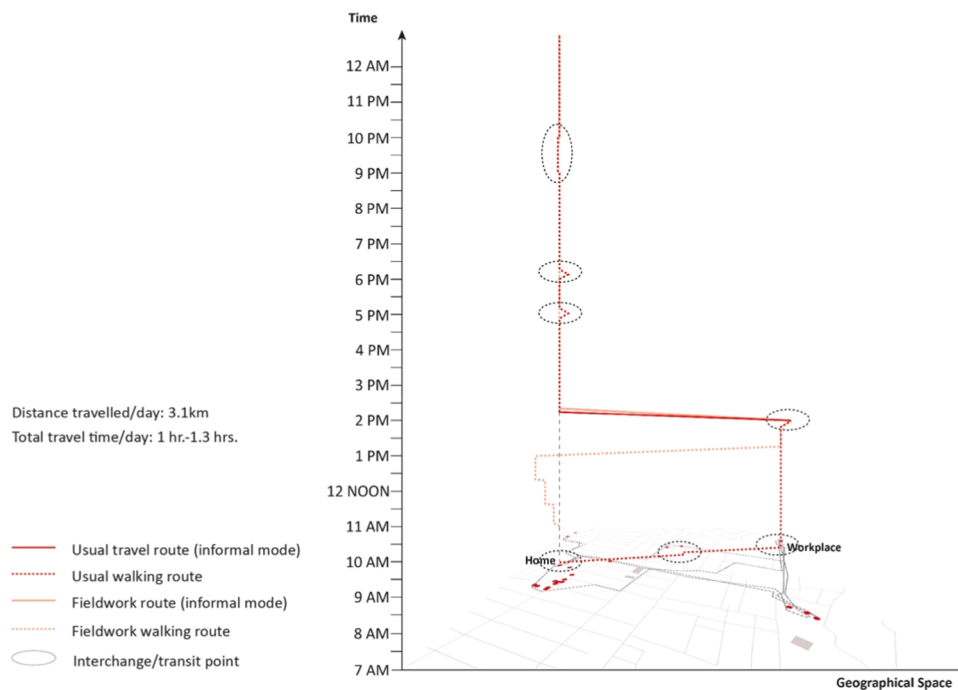


Fig. 5. Time geography diagram representing the travel pattern of another participant who works at the Delhi government-run health centre. Her workplace is close to her residence and she adopts walking as a travel mode on daily basis.

restaurants catering to (male) construction labourer and hardware stores are some examples of culturally gendered buildings (specific to the Indian context). The area surrounding these buildings is mainly distinguished by the presence of male citizens only. Thus, for UMW, accessibility to urban spaces and streets becomes restricted because of the absence of other people (including women). Consequently, the lack of physical urban infrastructure is highlighted as an important factor that impacts the accessibility of UMW to public spaces.

*Streets characterized by urban informality*

The internal streets of the informal settlements represent a diffused territory through the amalgamation of public and private spaces (Fig. 6). These intermediate spaces represent an essential infrastructure supporting the daily activities of these informal settlements. Although this area is primarily residential, several small shops in different parts of these settlements cater to the everyday needs of its inhabitants (Fig. 7).



Fig. 6. The streets are an extension of household and other social activities. Source: Participant.



Fig. 7. The mixed land use within the informal settlements ensures a variety of socio-economic activities and thus the constant presence of people on the streets. Source: Participant.

The weekly markets (see Fig. 8) also form an essential component of informal settlements, making the streets lively and dynamic with activities. Besides supporting commercial transactions, they also stimulate a range of social activities, thus transforming the street into a vibrant public space. Specifically, the daily needs shops or activities that mainly involve women's participation, such as buying vegetables and groceries, enable increased women's involvement in various socio-economic activities.

*I feel safe walking back home on Fridays because there is a Friday market on the way, and there are many people around.*

*Neelu, 23, beautician*

Although the internal streets present an environment that is always characterized by the movement of people, yet due to the restrictive socio-cultural environment (context-based), the streets are seen to be occupied mainly by male members of society. This phenomenon makes the streets uncomfortable for women to pass through.

*The street, too, is normal, but yes, boys would always be standing there with their friends.*

*At Batla House, where we go, the boys pass comments or say something terrible.*

*Falguni, 19, student*

The participants mentioned that it is common to see the junctions or corners of the streets occupied by casual groups of men, who pass interfering comments on them while they walk through that area. The impact of facing this personal intrusion influences them psychologically and lowers their confidence concerning access to public space in the city. Incidents like these illustrate that although the streets are walkable, the non-inclusive character informed by the socio-cultural norms prohibits women from being a part of the social and urban public space leading to the inaccessibility of these streets.

*Walking would be unsafe, in my opinion. If it is nighttime and there's no light, then there are people sitting outside on the street or the road, or they pass comments. These things have happened only while walking.*

*Ishu, 19, beautician*

For instance, it is mentioned by many participants (see above quote) that they find walking one of the most unsafe travel options. The study shows that it is quite common for women to experience incidents related





**Fig. 8.** Arising from the density of the urban and social infrastructure of the informal settlements, the internal streets act as lively spaces with a multitude of socio-economic activities taking place.

to sexual harassment or eve-teasing while walking. Moreover, these incidents take place mainly on the inner streets and are more common after dark, where there is presence of fewer people on the streets and inadequate lighting on the streets. Thus, social infrastructure forms a critical component that impacts the accessibility of UMW to public spaces.

To cater to the issue of travelling alone due to fear of sexual harassment and absence of urban infrastructure, these UMW prefer to take up employment in groups (of two more) and thus avoid travelling alone.

*I have a friend who goes with me. She lives nearby and we work in the same office.*

*Daksha, 20, tele-caller*

*Two of us go from this area. We meet in the morning at the nearby junction to travel ahead.*

*Rima, 24, social worker*

The access to walking within the neighbourhood is greatly supported by the urban infrastructure of the informal settlements and thus enables women to perform their complex daily activities (Jurczyk, 1998) that include taking care of the schedules of all family members along with their own.

*From there I have to take the alleyways, so I walk from there. Because I have to pick my son from his school, do some shopping, buy stuff for the house and then come home. The way for walking is through the alleyways.*

*Naina, 30, healthcare worker*

People living in these neighbourhoods know each other very well and there is thus a strong sense of community that prevails in the area. Often, in absence of support from their families, many women depend on their social connections such as neighbours, to help them with basic but necessary tasks, such as childcare, which enable them to participate in the socio-economic activities to contribute to the finances of their respective families.

*If I could not get back by 1.30, I'd tell my neighbour and she'd take her back.*

*Bitti, 33, driving lessons*

*Then I tell ma'am that I have to pick my child, then she says it's fine.*

*Tanu, 28, healthcare worker*

*I have such wonderful neighbours. He is like my brother who has a tailor shop. He keeps my shop's keys. So, whenever he opens his shop in the morning, he also opens my shop by 12 p.m. If there's a customer, he puts me in touch on the call. Otherwise, he'll say Baaji will come in the evening. So, I come by 3–4 p.m. as my kids return from school at 2 p.m.*

*Rubina, 34, entrepreneur*

The following section presents a discussion in the form of an overall summary of findings highlighting the factors that enhance the access and mobility of UMW and that are critical for the holistic understanding of design and planning of street experiments.

**Summary of findings**

Two main themes of 'travel issues' and 'urban informality' were derived from the relevant literature and qualitative analysis of the data collected. Each theme, its factors, their description and related concepts are presented in Table 1 and 2 below.

'Travel issues' illustrates different concerns, problems or obstacles faced by UMW during their daily travel journeys. The qualitative analysis of the collected data reveals four factors under 'travel issues' and are mentioned below (Table 1).

The below table (Table 2) presents a summary of findings categorised under 'urban informality'. Six factors that enhance the mobility and access to public spaces are mentioned below.

**Discussion**

The study highlights that the socio-cultural environment and the urban infrastructure restrict the walking ability of UMW by imparting a sense of discomfort in accessing different public spaces. Walking forms a major component of married women's daily travel routines because of the benefits of saving costs (Madhusree, Section 5.1) (Anand & Tiwari, 2006).

It is revealed that the factors classified under the category of 'urban informality' help to facilitate the mobility of UMW by taking care of the factors that act as barriers, i.e., those categorised under 'travel issues'.

Several significant aspects of informality emerging from the study inform the conditions of mobility and access for UMW. The factors identified and classified under this category include the informal arrangement of urban spaces and the focus on the sociality of the urban environment (Roy, 2011; Simone, 2010b). Besides spatial infrastructure, this study highlights the importance of social infrastructure that impacts the daily mobility of UMW. Active participation of the inhabitants is needed in this process for collaborating for a common cause, need or necessity which gives rise to peculiar and dynamic patterns of interactions through various social activities (Simone, 2014).

The continuous presence of people carrying out various socio-economic activities on the streets of these settlements makes the streets active and lively. Moreover, to maintain ascription to their communities it is required of the inhabitants to follow certain codes of

**Table 1**  
Travel issues that act as barrier towards access and mobility of UMW.

Factors	Description	Concepts
Travelling alone	Many women participants expressed their inability to travel alone. Many mentioned carrying out their daily journeys along with someone (friend/family).	<ul style="list-style-type: none"> <li>• Dark / poorly lit streets</li> <li>• Empty streets</li> <li>• Social restrictions</li> </ul>
Culturally gendered places	Within the socio-cultural context of the study, specific building uses can be identified as culturally gendered, such as liquor shops, hardware stores or restaurants catering to (male) construction labourers. Walking through streets characterized by such buildings causes discomfort to women with respect to safety.	<ul style="list-style-type: none"> <li>• Liquor stores</li> <li>• Construction sites, hardware stores</li> </ul>
Travelling at night	It usually gets dark when these UMW return from work. Thus, it becomes an issue concerning their safety due to several factors, such as lack of urban infrastructure (proper footpaths, streetlights etc.).	<ul style="list-style-type: none"> <li>• Presence of anti-social elements, behaviours</li> <li>• Social restrictions</li> <li>• Fewer people on streets</li> <li>• Unavailability and inaccessibility to transport modes (last-mile walking distance)</li> <li>• Lack of urban infrastructure (streets lights, walkable paths)</li> </ul>
Feeling unsafe	Women participants expressed their experiences where they had to face incidents of sexual harassment while performing their daily travel, especially during walking and waiting at transit stations.	<ul style="list-style-type: none"> <li>• Empty streets</li> <li>• Dark streets</li> <li>• Large open spaces with no people / shops</li> <li>• Stationary moments (waiting at bus stations)</li> <li>• Lack of presence of other women on streets / transport modes</li> <li>• Anti-social elements / behaviours</li> </ul>

conduct, especially in public spaces. Additionally, the societal values to which they conform also act as a safety net that deters any unethical actions to the safety of women. Thus, the presence of people acts as 'eyes on the streets' and ensures a sense of everyday security to these UMW while walking (Neelu, Section 5.2). This draws attention to the significance of the social infrastructure that arises from the density and reflects on an environment where things (people, spaces, activities, objects) are always acting on one another.

The closely-knit spatial infrastructure of the informal settlements presents a conducive environment for these women to walk through its streets. Many women use the interconnected street network as a short cut that saves time (Naina, Section 5.2) along with providing a safety blanket because of the multitude of socio-economic activities taking place on the streets (Neelu, Section 5.2). It is also highlighted through the findings that the participation of women in various socio-economic activities encourages other women to be a part of the public space without any fear and hesitation. Moreover, a mixed land use pattern ensures continuous activity on the streets by incorporating the participation of women in public spaces such as streets (Fig. 7). The built environment and socio-cultural aspects of the informal settlements create 'in-between' spaces (between the public and the private) (Fig. 6) and makes the presence of people evident on the streets (Arellana et al., 2020; Larrañaga et al., 2016). However, the findings also revealed that the absence of mixed land use or presence of culturally gendered places or buildings result in an unsafe thus inaccessible public space (street) which acts as a barrier towards the mobility of UMW (Rekha, Madhusree, Section 5.1). These findings are aligned to studies on perception of walkability and safety with respect to the built environment from

**Table 2**  
Factors identified under 'urban informality' that enhance the access and mobility of UMW.

Factors	Description	Concepts
Active streets	A continuous movement of people characterizes active streets. The constant movement can be achieved by their involvement in nearby spaces/buildings (mixed land use, functions of buildings lining the streets). Additionally, the spilling out of different socio-cultural and economic activities on the streets will make them vibrant and enhance social interactions amongst various members of society.	<ul style="list-style-type: none"> <li>• Continuous movement of people</li> <li>• Socio-economic activities</li> <li>• Presence of other women</li> <li>• Weekly markets</li> <li>• People sitting out on streets</li> <li>• Spill over of household activities onto the streets</li> </ul>
Interconnected streets / bottom-up emergence of public spaces	The juxtaposition of the built and the unbuilt should leave space for the actors/users to initiate certain activities based on the context, social interactions and their needs. Giving agency to the people (especially the marginalized) would enhance the sense of ownership and, thus, access.	<ul style="list-style-type: none"> <li>• Informal and compact urban environment</li> <li>• Multiple route options</li> <li>• Save time (short-cut)</li> </ul>
Mixed land use	Mixed land use or building function reduces rigid division between the various built forms based on their function, such as between residences and shops selling daily needs products, groceries, small shops making and selling pottery items, local tailoring boutiques etc. This aspect will make the streets lively and bustling with various activities. Considering this aspect will also take care of the culturally gendered building functions enabling enhanced access to the streets by the marginalized and thus will be more inclusive.	<ul style="list-style-type: none"> <li>• Shops in front of houses</li> <li>• Informal economic activities</li> </ul>
Sense of community	The sense of collective agency and the commons, visible in many aspects of informality, are essential factors that need to be considered for the design and planning of streets. Sense of community is referred to as the coming together of people for a common cause. It can be understood as a localized phenomenon primarily based on trust.	<ul style="list-style-type: none"> <li>• Closed community</li> <li>• Informal interactions</li> <li>• Code of conduct</li> </ul>
Social interdependence	People within the informal settlements consider themselves connected or dependant on others for various tasks without any economic benefits to any person, party or group.	<ul style="list-style-type: none"> <li>• Helping each other on day-to-day basis</li> <li>• Companions while travelling</li> <li>• Not based on economic benefits</li> </ul>
Enhanced participation of women in socio-economic activities	Encouraging enhanced participation of marginalized groups, such	<ul style="list-style-type: none"> <li>• Informal shops run by women</li> </ul>

**Table 2 (continued)**

Factors	Description	Concepts
	as, in this case, UMW, in socio-economic activities will allow increased access to the streets and other public spaces. This will also encourage participation for other women, which in a way, makes the streets more comfortable and safer to access.	<ul style="list-style-type: none"> <li>• Participation in informal (part-time) jobs in nearby areas</li> <li>• Picking and dropping children</li> <li>• Grocery shopping</li> </ul>

a global perspective (Ceccato & Loukaitou-Sideris, 2022; Dadpour et al., 2016) and specific to the context of developing countries, such as Barranquilla, Colombia (Arellana et al., 2020), Cali, Colombia (Villaveces et al., 2012) and Porto Alegre, Brazil (Larrañaga et al., 2016).

The findings indicate that the sense of community refers to belonging to a community by subscribing to its membership, which is based on trust, reciprocity as its existential components. The study reveals that sense of community has both, positive and negative influences on the overall mobility of women. Although the restrictions and norms arising as a result of ascription to the community restrict the mobility (Jejeebhoy & Sathar, 2001; Mehta & Sai, 2021), however these UMW appropriate this sense of belonging to a community towards enhanced mobility on a daily basis. This may include appropriating their casual social connections (Meagher, 2005; Putnam, 1993) to strategize informal arrangements by taking support for small but significant activities of their day-to-day life, such as, taking care of children (Bitti, Section 5.2), flexible work timings (Tanu, Section 5.2) and assisting in carrying out economic activities in case of lack of time due to household responsibilities (Rubina, Section 5.2). These compact and homogeneous arrangements enable UMW to make use of the existing resources and provide social support specifically in small and restrictive communities (Stack, 1975; Wellman & Potter, 2018).

The need to be dependant on others (because of the socio-cultural environment) is appropriated by UMW to carry out their daily travel activities that take care of issues related to their mobility such as safety and travelling alone. This is illustrated through their daily travel routines which demonstrate that most women prefer to travel in groups of two or more (Daksha, Reema, Section 5.2). The strategy of travelling together emerges from the aspect of social interdependence and acts as a factor that enhance the otherwise restricted mobility of UMW. Although it can be considered as a strategy used by women to carry out their daily mobilities, it cannot be denied that it is deeply rooted within the socio-cultural environment that does not permit these women to travel alone, be independent and make their own decisions. Thus, to further strengthen this aspect additional research is needed in this area to holistically understand the role of social interdependence as an asset.

Several studies point towards indicators of walkability comprising design and non-design determinants that include physical and social infrastructure (Arellana et al., 2020; Moayedi et al., 2013). Our study strengthens these indicators by highlighting that the socio-cultural environment along with the spatial infrastructure impacts the access to public spaces for women, i.e., it gives them a sense of discomfort to access these public spaces (Rani, Rekha, Section 5.1; Falguni, Ishu, Section 5.2). This imparts a sense of being an outsider who does not belong or does not have the right to use public space. This reflects upon the exclusions experienced by UMW and also highlights the non-inclusive nature of the socio-spatial environment that restricts access to public spaces for women. To facilitate access to public spaces, the participation of women in various socio-economic activities is a significant factor. It is connected to Lefebvre's idea of the right to the city, which refers to the aspects of appropriation of space by the people who inhabit that space (Lefebvre, 1996). Purcell (2014) elaborates that appropriation is 'how you consider something your own'. It is

understood as a way of rightful ownership and allows to rethink how the city, or any space is accessed. Thus, more efforts should be made to incorporate day-to-day socio-spatial aspects and interactions while planning for inclusive and accessible public spaces and mobilities.

The authors faced some limitations with the study. The study focuses on urban peripheral areas in New Delhi and so there may be limited generalisation of the findings to other cities and contexts. Besides this, concerning the methods adopted for this study, gathering information related to women's daily travel patterns through GPS (Google Maps Timeline), presented certain constraints due to participants' limited understanding of technology, which resulted in fewer travel pattern data as compared to the interview data. This resulted in leaving out certain women from the study.<sup>13</sup>

## Conclusion

The purpose of this study was to identify the social and spatial factors that impact the access and mobility of urban marginalized women (UMW). The study presented insights emerging from the daily mobilities of UMW within the context of peri-urban areas of developing countries (studying New Delhi, India as a case). Gender has been used as a lens in this study to highlight the non-inclusive character of existing urban infrastructure to reveal the boundaries of denied right to access public spaces. The existing research on street experiments does not include aspects related to these exclusions, and thus the vision for transforming the streets to inclusive and accessible public spaces for greater well-being remains limited.

The present study examined how social and spatial factors impacted the mobility of UMW. These socio-spatial factors were found to be interconnected to one another and thus cannot be implemented as individual or isolated factors. Some factors enhanced or constrained the influence of other factors on the overall mobility of UMW. Factors associated with travel issues, such as, travelling alone, culturally gendered places, travelling at night acted as barriers towards mobility. Feeling unsafe emerged as a result of the above-mentioned factors. Besides the lack of spatial urban infrastructure, these factors were found to have direct or indirect links with prevailing socio-cultural aspects that are specific to the study context (closed informal communities and patriarchal setting). The study found that the conditions of urban informality mostly acted as enabler of mobility of UMW. Factors like active and interconnected streets that led towards bottom-up emergence of public spaces (people using streets as an extension of their homes) were a result of social activities and spatial infrastructure acting on one another. Conditions like mixed land use could influence the nature and scale of social interactions making the streets bustling with different kinds of activities and thus ensure safe access. Social interdependence emerged as a positive aspect that gave a sense of safety and confidence to UMW to access public spaces. Sense of community acted as an enabler as well as barrier towards mobility. Enhanced participation of women in socio-economic activities emerged as an important factor that enhanced their access to public spaces and encouraged participation of other women, making streets more comfortable and safer to access.

The results of this study suggest some strategies to enhance the access to public spaces and mobility for UMW. These included consideration of social aspects, that are a part of day-to-day lives of UMW, and understanding their relationship with physical urban infrastructure. The participation of women in socio-economic activities and thus their increased presence on streets needs to be supported by city infrastructure to allow for various social interactions to take place making access to mobile and static public spaces more democratic. City infrastructure

<sup>13</sup> Considering the socio-economic background of the participants (marginalized women) it is recommended to complement this study with an investigation that is carried out using methods that involve face-to-face interactions with the participants.

needs to provide a safe environment to women. One of the ways to achieve this is by adopting an inclusive and mixed land use approach towards city planning, specifically avoiding formation of culturally gendered spaces. Secondly, encouraging the emergence of informal activities on the streets, with some guiding principles, would make them more active and lively and thus safe to walk through. This would provide space for other informal interactions to take place between the different members of the society (women and men) and encourage women to participate in various socio-economic activities and thus claim their right to access space.

This paper diverges from other studies by developing a holistic understanding for street experiments where it draws from gendered mobilities and the socio-spatial realm of informality to highlight significant factors for equitable, safe and inclusive public spaces/streets. This study provides essential touchpoints for city planners, designers, and social and the government organisations to consider the mobility of women as an important factor. By providing an enhanced quality of life through equitable and just mobilities, this could impact the overall societal transformation by the virtue of enhanced access.

It is recommended to carry out quantitative studies to find the impact of socio-spatial factors emerging from this study on the overall mobility of UMW. Further longitudinal mixed-methods studies are required for a more in-depth understanding of the interconnectedness between the social and spatial factors. It is also suggested to conduct an ethnographic study involving face-to-face interactions with the participants (which could not be done for this study due to Covid related limitations). This research opens up further avenues of conducting similar studies in other metropolitan cities that are morphologically self-contained and functionally dependant on other regions. Besides this, it is also relevant to extend this study (with context-based adjustments) to such regions where the gender-based exclusions and inequalities are experienced by women on day-to-day basis, such as, within the metropolitan regions of South Africa, Bangladesh, Pakistan, Sri Lanka, Nepal, Argentina, Colombia, Brazil and other Latin American cities, to name a few.

## Data availability and ethics statement

Besides the various advantages that the digital medium presents for conducting research, there also exist issues of privacy and ethics specifically with respect to the participant women. The women studied for this research belong to a closed community where everyone recognizes each other and where they live. Moreover, following the rules of the community, it becomes a critical aspect for these women to not reveal too much about their identity to strangers. Thus, it is the responsibility of the researcher to involve the participants in the research process by maintaining transparency with them. The researcher shared the consent form with the women (through the NGOs) to participate in the study. The information was shared with them in their local language, i.e., Hindi. Besides this, a very simple poster was also prepared (in Hindi language) for recruiting and providing them with the purpose of the study, which was shared with the women registered with the NGOs. The researcher ensured to maintain anonymity regarding the elaboration of data and presentation of results in different formats. Human Subject Ethics Approval (HSEA from the relevant university) was obtained for this study. The name of the university is not revealed due to the requirements of the submission. Application number: HSEARS20190521003

To preserve the privacy of the participants, the real names and other traceable information of the participants were modified in this research. For instance, for the GPS travel patterns, the location points of their respective residences and workplaces were displaced by few metres within that area to avoid revealing the actual locations.

## Declaration of Competing Interest

The authors declare that they have no known competing financial

interests or personal relationships with the participants that could have appeared to influence the work reported in this paper.

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