Exploring new methodological approaches to mapping socio-spatial mobilities

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Abstract
This paper highlights mobility as a methods paradigm by reviewing mobile methods from a theoretical and empirical perspective, i.e., adopted for a study focused on socio-spatial mobilities of urban marginalised women (UMW) in peri-urban areas of New Delhi, India. The article discusses the approach and design of mobile methods for this case study, including mobile ethnography using new technologies like GPS. We highlight that mobile methods enable the study of significant elements like scale and everyday mobilities. We discuss the challenges and opportunities for researchers that come with the use new technologies within mobile methods. By doing so we highlight the significance of using mobile methods to explore new research techniques that present a holistic perspective towards understanding mobility.

Keywords: Mobile methods, Socio-spatial mobility, Scale, New technologies, GPS

Introduction
It can be said that the peripheries of society hold the capacity to transform their limited resources and barriers into settings for various kinds of opportunities. Despite the social and economic problems of the peripheral segment of the society, this study highlights their capability of self-organisation towards the potential to activate the mobility of women especially, towards more equitable mobilities. However, this discussion on opportunities of peripheries includes theorising and must offer a point of view. It is important to understand how this opportunity of peripheries for (urban marginalised) women in terms of spatial and social mobility be approached in scientific terms. In this context, what kind of methodology is suitable to facilitate the conformation of social connections and to recognise them for urban systems?

Mobilities are understood as a mesh of movement, meaning and practice (Salazar, Elliot and Norum, 2017). This complex juxtaposition opens the dialogue toward the multiple effects and approaches to understanding mobilities. Several scholars describe mobility as polymorphic and diversified concept that requires reaffirmation of theories related to culture, identity and transnational relationships (Salazar and Smart, 2011; Glick Schiller and Salazar, 2013). Besides mappable and calculated geographical movements, mobility is about interpretations and meanings that highlight ethical and political concerns along with certain practical issues. Mobility, as a concept

cuts through and links across various scales of movement, namely, from small-scale bodily movements to infrastructure or transport-related movements, to a non-physical type of movement such as global flows of finance or labour. Mobilities research considers the movement of not only people but also information and goods along with their impact on each other (facilitate or hinder).

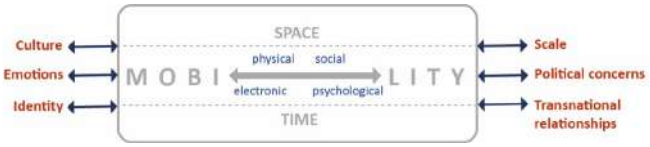

Figure 1: Mobility as a mesh of various types of movements.
Source: Adapted from Salazar et al.(2017); Svašek (2013); Ziegler & Schwanen (2011)

Mobilities research is multi-dimensional and interdisciplinary in nature that intersects with theoretical, social, technical and political constructs (Cresswell and Uteng, 2016). Most studies focusing on mobilities have dealt with different aspects of mobility separately. Several theorists argue that considering mobility in separate spheres may lead to a lack of interdisciplinary approaches (Sheller and Urry, 2006). The research on mobilities has generated links across different scales that connect different disciplines of humanities with sciences to produce a holistic and meaningful analysis, which is possible through an investigation of experiences created while moving (Sheller and Urry, 2016). This paper highlights mobility as a methods paradigm in a study investigating daily survival mobilities of urban poor women who are at social and spatial peripheries of the society and the city. The existing research methods do not do justice to the studies relating to the aspects of everyday mobility (Law and Urry, 2004). To understand the complexities of social, economic and political relations it is critical to not only investigate the movement of people, objects, information and ideas but also how they get mobilised when they interact with others (Garfinkel, 1967; Wittgenstein, 2009). This paper presents an in-depth understanding of the methods adopted in a study related to social and spatial mobilities of UMW residing in the peri-urban areas of New Delhi i.e., mobile methodology including mobile ethnography wirth new technologies like GPS. By doing so this paper highlights the significance of using mobile methods to explore new research techniques that present a holistic perspective towards understanding mobility.

Mobile Methodology

A growing interest in everyday life practices and their further investigation has brought mobility from merely being limited to a research field to the methods paradigm. According to Law and Urry (Law and Urry, 2004), the existing research methods do not do justice to the studies relating to the aspects of everyday mobility. To understand the complexities of social, economic and political relations it is critical to not only investigate the movement of people, objects, information and ideas but also how they get mobilised when they interact with others (Garfinkel, 1967; Wittgenstein, 2009). According to Laurier and Philo (2003), within the broader spectrum of society, relationships and networks emerge while people are on the move. They emphasise on the study of these micro-worlds that crop up as an impact of automobility on social relations and activity (Laurier and Philo, 2003; Laurier *et al.*, 2008). Various studies on mobility underpin the fact that there is a difference in the kinds of interactions that happen when a person is in motion than when stationary. Moreover, being mobile

brings about a different set of knowledge and identities to people who experience it (Hein, Evans and Jones, 2008). Thus, to understand and analyse the consequences of socio-spatial mobilities and its multi-disciplinarity, the following sections discuss the methodological considerations adopted for this research.

Weisner (1996) argues that research questions that engender the complexity pertaining to multi-disciplinary (mobility studies, urban informality, gender studies) research areas cannot be dealt with in one single method. In studies related to understanding the mobility of people, the strengths of both types of approaches (quantitative as well as qualitative) would provide to be beneficial in covering the width and depth of the research area. Moreover, Johnson et al. (2007) state that an effective mixed methods approach enhances the basic principle of validity of research findings. This concept of validation is termed *methodological triangulation* by Denzin (1989). Using a combination of multiple methods helps in utilising the strength of each method while overcoming their deficiencies (Denzin, 1989).

This research uses a combination of new technologies along with mobile methods and ethnography to reveal the inter-relationship between social and spatial mobility of UMW. According to Law and Urry (2004), the existing research methods reflect their insufficiency to understand the social aspects of movement particularly those characterised with complexity and elements of multiple chaos. To address this gap, it becomes essential to develop research methods that are 'on the move' and allow the researcher to focus on the social organisations that appear during various kinds of movements (Büscher and Urry, 2009). Combining mobile methods with new technologies allows researchers for applying cutting edge theory in geography and social sciences (Christensen *et al.*, 2011). Besides being of interest to academics, the mobile methods present their relevance to various public organisations in policy planning (Hein, Evans and Jones, 2008).

The methods are chosen considering the objectives of the study, i.e., to understand the consequences of relationship between social and spatial mobility of UMW. The research analyses the social structures or networks formed while performing the act of travel as a part of the daily routine of the UMW. It involves the study of everyday life or daily mobilities of these women in diverse social contexts. Following the elements of qualitative research, this study analyses the construction of social realities along with the social relationships that connect people. According to Miller and Dingwall (1997), social structures are a consequence of the 'bottom up' processes that take place within the society. Thus, to analyse these bottom-up processes, the research demands an in-depth investigation into the participants' daily mobilities. Moreover, the issues pertaining to scale and ethics, geographical boundaries and social imagination, class and gender, material culture and interdisciplinarity are all revealed through innovative mobile methodologies (Tarrius, 2000).

Understanding scale in mobility studies

In the studies related to mobilities, the scale does not only span across the geographic and demographic boundaries but incorporates all other macro-processes that describes the interconnectedness and visible and hidden networks of the society. These phenomena are termed *glocal ethnography* (Salazar, 2010), *global ethnography* (Burawoy, 2000*)* or as D'Andrea (2007) defines as *nomadic ethnography*. D'Andrea's (2007) further description of the concept elaborates upon the

nomadic approach that is required for the journeys and activities performed along the routes. According to Molland (2013), the methodology needs to accommodate the switch between the policy and the social world and terms it *tandem ethnography*. Multi-scalar ethnography addresses the issues related to change and focuses on the interfaces between mobility and institutions (society). It does this by understanding the concerns that people may have, by making certain interconnections and strategies between various aspects related to the daily activities of the people.
For studies that are concerned with following the patterns of movement (and not fixed to a particular site), it calls for *deterritorialised ethnography* (Merry, 2000) which entails a set of collaborative and interdisciplinary research methods producing a complex web for analysis (Coleman and Von Hellermann, 2012). The majority of mobility-related studies have focused on qualitative methods with a few examples of quantitative or mixed-method studies (Hein, Evans and Jones, 2008).

Mobility of UMW in New Delhi, India

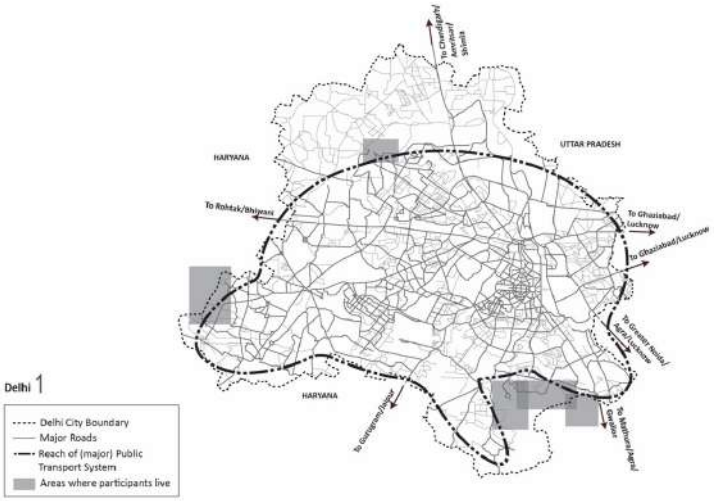

Figure 2: Context map of Delhi showing the area where the participants live. These areas lie on the periphery of the metropolitan region of Delhi and fall outside the limits of the planned transportation system.

This study focuses on urban marginalized women 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. Among 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 and Tiwari, 2006).

Besides experiencing exclusions at a household level, women from marginalized communities also face several other challenges at the city level. Among the many cities in India, Delhi's reputation with respect to crimes against women is the lowest. 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. These women are primarily employed in the semi-formal or informal sector[1] 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 and 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), 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. Thus, through the study of daily mobilities of UMW, this paper presents insights to inform the designing and planning of street experiments that facilitate enhanced access.

Methods

This research uses mobile methods like digital and mobile ethnography to focus on the daily mobilities of UMW. The study is divided into two main phases (Study I and Study II). The first part of Study I requires understanding the socio-demographic conditions of the participants through the means of unstructured ethnographic 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 inquiry. Along with this, travel diaries were also filled out for each participant[2]. These methods would help to identify the characteristics, motivations and barriers that affected the movement patterns of the participants. This

[1] 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; Kelsall, 2011) may be called the informal sector, informal arrangements or informal economy.

[2] 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.

process gave the researcher a broad idea of the different journeys performed by the participants.

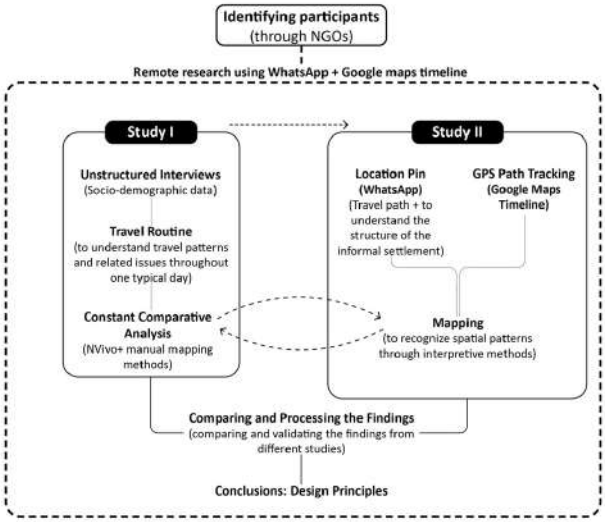

Figure 3 Methods adopted for the study.

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. 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, based on the availability and knowledge of the participants, appropriate tools (WhatsApp and Google Maps Timeline) were used for the ethnographic research[3].

The participants for the study were recruited by establishing contacts with two NGOs in Delhi that work with issues related to women or women empowerment[4]. Data collection was conducted through both face-to-face interviews and voice calls using WhatsApp[5]. 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.

[3] 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).
[4] 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.
[5] 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.

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).

Reasons for adopting mobile ethnography

Based on the objectives of the research it is required to gather data that reports about issues related to accessibility, skills or competence and appropriation of the resources by the participants. It is suggested by Srinivasan (2008) that to measure accessibility it is required by the planners and designers to collect data that focuses on individual travel patterns. It is difficult to collect such data as it is not routinely collected in most countries. There is also a general understanding that to avoid relating mobility to fixity, it is required to focus on empirical mobilities that in turn calls for mobile theorisation and mobile methodologies (Büscher & Urry, 2009; Büscher et al., 2011; Cresswell, 2006; Urry, 2007). This research focuses on the investigation of social phenomena along with the movement through the lens of gender. Several scholars from the field of the mobilities paradigm advocate the use of atypical research methods that, along with the subject of research, are 'on the move' to capture intermittent mobility patterns (Cresswell, 2006; Urry, 2007; Büscher and Urry, 2009; Büscher, Urry and Witchger, 2011). According to Sheller (2010), these methods include analysis of people's interactions and conversations along their journeys, a mobile ethnography that involves movement with people and objects, observing transfer points, time-space diaries, textual or pictorial diaries, cyber research methods and cyber ethnography, and so forth. In recent years, mobile ethnography has been adopted in several studies related to mobilities. Transfer points, passages, stations, waiting rooms and baggage systems are a few examples of such sites of movement (Andersson, 2017). Although Sheller and Urry (2006) describe transfer points as immobile places that are necessary for mobility which include waiting rooms, cafés and airports. However, it would be suitable to situate other types of waiting areas like bus stops and other inter-change stations or places in this category. An important component of this research is the study of such 'places of in-between-ness' or 'inter-spaces' that are created through multiple mobilities while travelling, in-between events or in-between points of origins and destinations (Hulme and Truch, 2005). According to Watts and Urry (2008), travelling with the subjects of study and being a part of their routine journeys characterises the basic elements of mobile ethnography. This type of study that elaborates upon tracing the path travelled by the individuals is termed multi-sited ethnography (Marcus, 1998).

In-depth unstructured interviews

This research develops an understanding through the daily travel experiences of the participants to reveal the factors that have an impact on the mobility of UMW. It did so

by generating in-depth insights into participants' descriptions of their daily travel patterns (pre-Covid times) along with their socio-demographic information. Data collection was conducted through voice calls using WhatsApp (remote research). In-depth interviews were used as a primary method to understand the socio-demographic characteristics of the participants living in informal settlements of New Delhi.
Although remote research can be used as alternative to traditional data collection methods, it needs to be understood that it is heavily dependent on access and availability of technology to the participants and researcher. In this study, the socio-economic status of the participants did not allow them to make use of certain online methods such as emails or online surveys. Thus, the selection of the relevant technology that was available and easy to use for the participants became an important and challenging criteria (Ardévol & Gómez-Cruz, 2012). Based on this aspect, WhatsApp was selected as a research tool to conduct unstructured ethnographic interviews. During the first stage of research, it was found that not all women belonging to the studied marginalised group owned a smartphone. Hence, for the purpose of the study only those women were contacted and recruited who either owned or had access to a smartphone (along with internet and WhatsApp). However, that meant leaving certain women out of the study group either because of their inaccessibility to smartphones or technological handicaps or unavailability of internet data for using WhatsApp.

To recruit participants for the study, contacts were established with two NGOs in Delhi that work with issues related to women or women empowerment. With the initial reference from the two NGOs and through engaging in conversations in their local language (which is the same as that of the researcher herself), it became possible for the researcher to build connections and rapport with the participants which led towards conducting more interviews within a short period. This also meant that at the end of it the researcher might find herself overwhelmed with the amount of empirical data collected. Thus, it becomes important for the researcher to patiently sort and catalogue this data.[6] This approach to data collection revealed that the digital medium provided the participants with more confidence and control over what they wanted to share and discuss. If some participants did not feel comfortable using typing function, they had an option to send voice messages, which some of them found easy to use and less time-consuming. It was observed that due to the low literacy level of the participants, in some cases, the typing function acted as a barrier and thus required multiple rounds of communication using a combination of voice calls and voice messages, screenshots, and so forth. Also, in the case of text and voice messages, the digital medium provided them with an option to reply at their own pace. These factors gave them more control and privacy. This aspect enabled the researcher to establish a social bond with the participants without having any physical meetings with them even once.

GPS data collection
To obtain information that is based on the actual movement of the participants, GPS tracking was used in this study. According to Schlich and Axhausen (2003), a minimum

[6] This process of handling and processing the raw data eventually became very time consuming. Thus, it becomes important for the researcher to not get disoriented in the process of collecting data through digital means.

survey period of two weeks is required to have a longitudinal perspective focusing on the spatial behaviour of individuals. It is argued that for a survey that needs information on habitual and repetitive activities and travel patterns, a shorter period may yield appropriate data (Christensen *et al.*, 2011). The data recorded through GPS will be objective; however, it may have an objective or subjective meaning ascribed or that can be derived from it.

Hence, the second part of the study required collection of data about the path travelled by the participants for two weeks continuously. Conducting remote ethnographic surveys with marginalised communities through digital means presents other challenges, such as dealing with technology handicaps. Depending on the nature of the research and the type of data to be collected, the researcher may need to explain to the participants how to use certain functions or share certain data through digital means. For instance, in this study, this issue was specifically experienced while obtaining information about their daily travel paths. 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. The participants were reassured by the researcher about maintaining their privacy at any given time during and after the research. Besides challenges like building trust and maintaining the privacy of the participants, there appeared many other factors that made collecting this data remotely very difficult or limiting. For instance, many participants did not own a smartphone by themselves and were sharing the phone within their household. This meant that certain participants did not carry a mobile phone with them all the time (wherever they went) and thus it was not possible to get information on their travel patterns. Second, in some cases where the researcher was successful to educate and make specific settings on their personal mobile phones, there was no way for the participants to share their two-week travel data with the researcher due to the inaccessibility of a computer or laptop. Due to these limitations posed by the Pandemic and remote research, it was not possible to collect GPS data for all participants.

Figure 4: Google Maps Timeline data of two participants for one day.Source: Data extracted by Author

The participant data for each day was extracted separately as individual files. The data was extracted in KML (Keyhole Markup language) format for further analysis. During the process of GPS data collection, certain flaws and limitations also came to the forefront. For instance, for one participant the data for a particular day was missing. After following it up with her, it was found that the GPS location was unknowingly turned off for that particular day. In another incidence, an unusual travel path revealed that one of the family members had carried the participant's mobile phone on that day. It is understood that GPS data has certain shortcomings and at times may not provide a true picture of actual movements performed. Thus, the acquisition of data through other methods (ethnographic interviews, in this case) helps in overcoming these deficiencies and helps in data triangulation.

Mapping for visualisation of GPS data

Maps help in presenting a holistic picture of the case and are a great means of visual representation. Shadon and Dudek (2013) mention that maps help to reveal answers to how and what questions. After plotting the movement pattern on maps, the study followed up further by using ethnographic methods to get a better explanation of why questions. Mapping can help to recognise spatial patterns through its interpretive practice and provoke context-based questions. According to Hsu (2014), maps can introduce a completely new line of inquiry by making invisible patterns visible. For this research, QGIS will be used to visualise the collected data. GIS has the potential to respond to a more critical and qualitative research method. With the help of GIS, it is possible to visually represent the spatial nature of social processes, facilitate critical thinking and construct a theory based on qualitative and quantitative data (Kwan and Knigge, 2006). However, Pavlovskaya (2006, 2016) argues that although GIS holds the capacity to deal with complex relationships, non-quantifiable properties, unprivileged ontologies, and fluid human worlds, they cannot be used to represent either quantitative or qualitative studies.

The next step involved the mapping of the travel patterns of the participants using QGIS, understanding the context and their motivations. The purpose of the data generated through GPS is to scaffold or frame the ethnographic interviews, travel diary data and the interpretative analysis of the participants' movements. With the help of the GPS data, two kinds of maps are generated- the itinerary map showing the continuous movement of the participants and the sojourn map that highlights the places where most or least time is spent. In this study, the itinerary map generated by using GPS data was used for follow-up questions as an object of further enquiry into participants' everyday mobility that includes the places they visited and any additional information or experience they want to share related to their travel journeys.

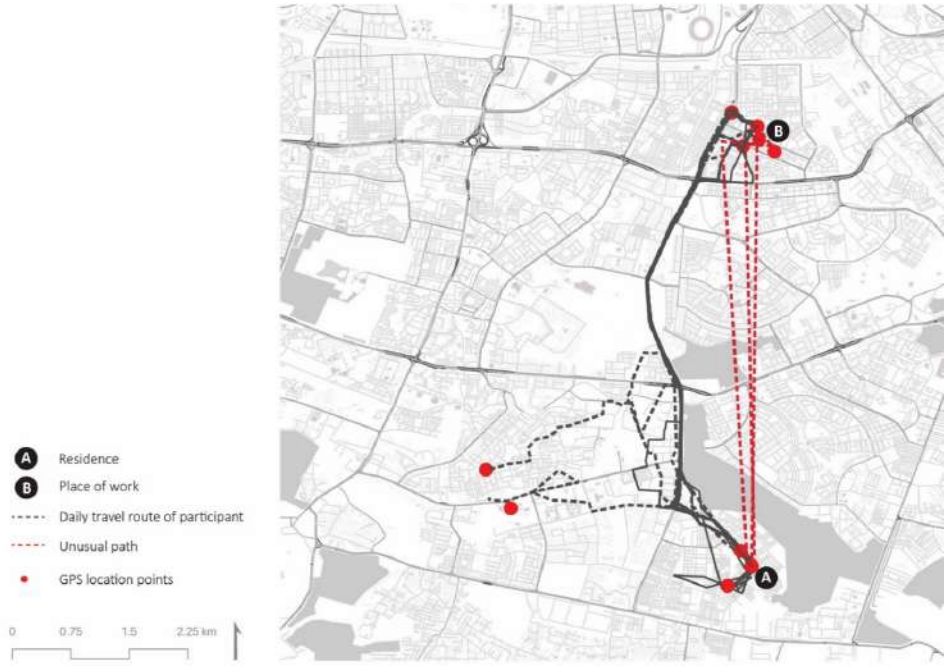

Figure 5: Map representing the two-week GPS data from Google Maps Timeline of one of the participants

The next step that followed the initial interviews with the participants involved getting to know specificities about their daily travel patterns. Time-geography diagrams were developed based on the mapped survey information which formed a layer over the base map of Delhi (Figure 6). Time geography refers to the representations of the paths travelled through space and time that are plotted along two spatial axes and one temporal axis. Time-geography is often used as a tool to explore mechanisms of societal change (1970). Developing on the work of Hägerstrand (2005), Thrift (2005) reflects upon the existence of human action in time and space. Thrift (Gell, 2021) highlights the relevance of time-geography within the realm of social theory. Time-geography is considered to be a strong visual representation of 'thereness'. Moreover, time-geography goes beyond social constructionism to highlight the physical constraints on human activity (2020). An overview of the variation in the movements of the participants is depicted through these time-geography diagrams.

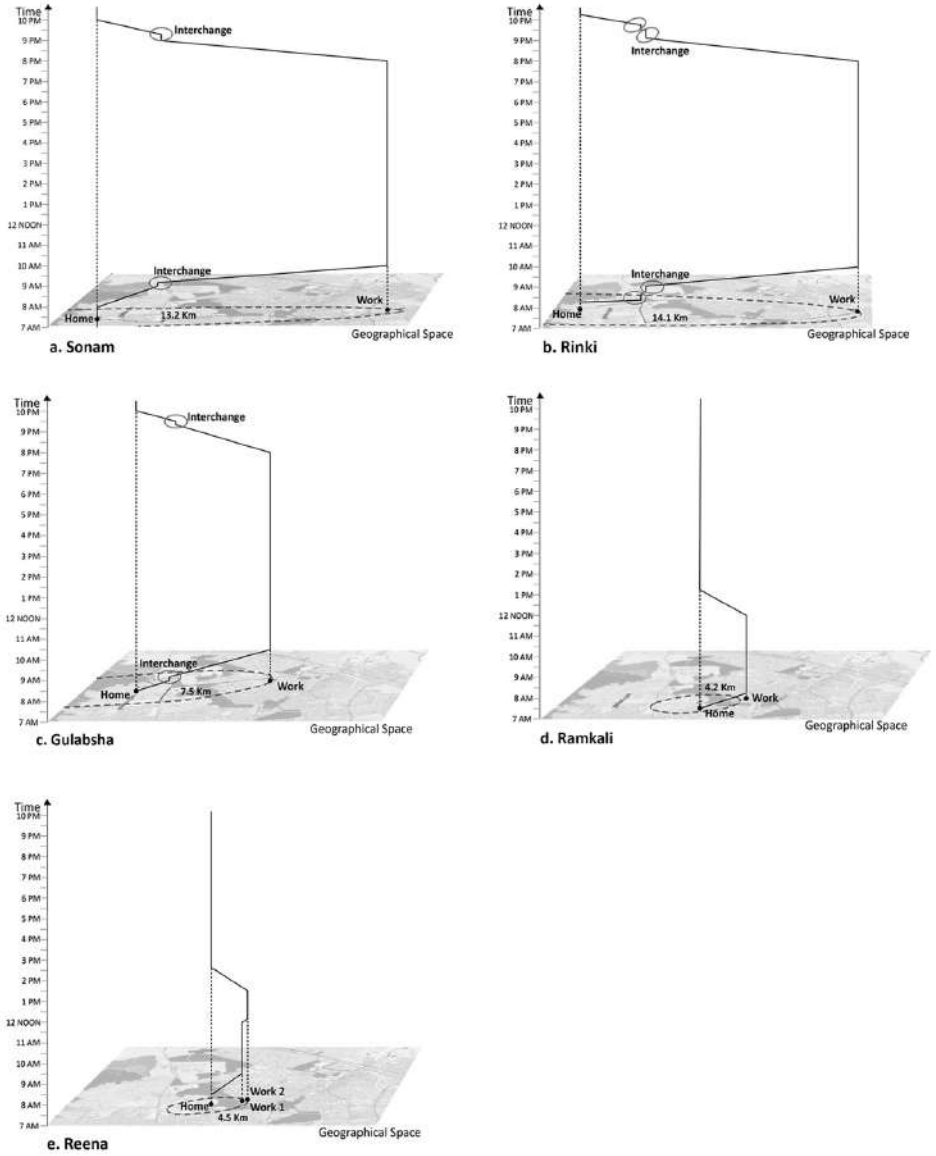

Figure 6: Travel patterns of the five participants are shown with the help of time geography diagrams. These are exemplified with elementary events, such as, travel; inter-change; arrive; stay; leave. Source: Gera & Hasdell (2020)

Discussion

More recently, there has been a focus on studying different types of mobility in reference to the society itself. This brings attention to investigating hidden meanings

associated with mobility that are related to socio-cultural factors, identities, informal networks within specific contexts. Mobile methods help Using mobile methods for a study related to mobility focusing on urban marginalised women and urban informality helps to highlight these concepts and presents a holistic perspective towards mobility. Supported by the literature the mobile methods approach for data collection helped to understand the interconnected socio-spatial factors that impact (enable or hinder) the overall mobility of UMW / people. Mobile methods enable to investigate and understand small and mundane everyday mobilities or immobilities that otherwise are ignored or taken for granted. Moreover, feminist researchers also highlight the importance of the analysis of daily mobility patterns (Hanson and Johnston, 1985; Butler and Bowlby, 1997; Law, 1999; Hanson, 2010).

These methods help to reflect on new perspectives that include socio-political inquiries besides focusing on spatial environments. Studying everyday mobilities using mobile methods presents a relational perspective by considering 'scale' as a significant factor. That is, it enables to understand the relationship of micro-level movements associated with the actor itself to those associated with mobile and immobile co-travellers and infrastructures. Besides 'scale' mobile methods bring attention to the aspect of temporality in mobilities study. For example, studying an actor on the move will also highlight other activities, conversations and non-movements and thus enables the researcher to discard the notion of linearity in studies on mobility. Mobile methods go beyond understanding mere spatial mobilities. They reveal interconnected factors which may occur on the move and help them to form temporal connections with social and spatial infrastructures to gain knowledge which may impact their mobility. It opens a dialogue towards multiple effects of mobilities.
Mobile methods enable the use of new technologies like the GPS to study and analyse mobilities of different entities. It enables to scale-up the investigation to reveal common patterns. Conducting the field study with a traditional ethnographic approach, the researcher is constrained by the physical fact that she can only be present in one place at a time. There may be instances when critical interactions take place at a time when the researcher is not around. Mobile methods help to take care of such situations and enables data collection with multiple participants at the same time. Using mobile methods also enables active participation of people within the process which gives them agency to share the required information with the researcher. Besides GPS, the use of ICT and social media platforms enable sharing of reliable data (from the participants) in real-time. These tools used as a part of mobile methods give a sense of trust and control to the participants. The participants feel more comfortable using these tools as compared to a device given to them by the researcher to carry with them. However, using new technologies within mobile methods present a challenge to engage and study mobilities of marginalised groups such as socio-economically weaker groups, especially women and children. Although the case study presented in this paper has used mobile methods with UMW, it highlights that there exist barriers in terms of ownership of new technology research tools, such as smartphones due to financial and social exclusions with respect to such groups. Also, a lack of technological know-how among these groups impacts data collection and sharing with the researchers. Thus, it is required to conduct more comprehensive mobility studies using mobile methods with marginalised populations to understand the potential of new technologies within this context.

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