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THE URBAN CATALYSTS

FINAL REPORT: Moving towards gender equitable public transport operations in a post COVID-19 world

COVID-19 Response & Recovery Transport Research Fund

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Abstract
While public transportation systems are being resumed with curtailed services, lower occupancy, disinfection of vehicles, contactless ticketing, online reservation of seats and fare increases post COVID-19 lockdown, there is limited data on the effect that these measures have had on women's access, safety and perception of safety. This research aims to understand the impact of COVID-19 on the mobility of women with respect to bus-based transportation and provide emergency as well as long-term recommendations for gender responsive, safe and secure public bus transportation in Delhi, with relevance for other cities in India and LICs in South Asia.

Keywords	Public transport, urban transport, paratransit, COVID-19, gender, South Asia, Delhi, India
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Cover Photo Credit: The Urban Catalysts

CONTENTS

APPENDICES

TABLES

FIGURES

ACRONYMS

AC	Air conditioned
AFD	Agence Française de Développement
ATM	Automated teller machines
BPL	Below Poverty Line
BRTA	Bangladesh Road Transport Authority
CAD	Canadian Dollar
CANN	Clean Air Network Nepal
CCC	Command and control centre
CCTV	Closed-circuit television
CEN	Clean Energy Nepal
CSOs	Civil Society Organisations
DDCD	Dialogue and Development Commission of Delhi
DIMTS	Delhi Integrated Multi Modal Transit System
DTC	Delhi Transport Corporation
EMI	Equated Monthly Instalment
ETA	Expected time of arrival
FCDO	Foreign, Commonwealth & Development Office
FNNTE	Federation of Nepal National Transportation Entrepreneurs
GDP	Gross Domestic Product
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GPS	Global Positioning System
GNCTD	Government of the National Capital Territory of Delhi
GTFS	General Transit Feed Specification
HVT	High Volume Transport Applied Research Programme
ICT	Information and communications technology
ILO	International Labour Organisation

IMC	IMC Worldwide Ltd
INR	Indian Rupee
IPT	Intermediate Public Transport
ISST	Institute of Social Studies Trust
ITS	Intelligent Transportation System
ITDP	Institute for Transportation and Development Policy
IUT	Institute of Urban Transport
JICA	Japan International Cooperation Agency
JJ bastis	Jhuggi Jhopri bastis
KfW	KfW Development Bank
KML	Keyhole Markup Language
LIC	Low-income country
LMICs	Low- and lower-middle-income countries
LOV	Low occupancy vehicle
MBO	Membership based organisations
MoPIT	Ministry of Physical Infrastructure and Transport, Nepal
NCT	National Capital Territory
NUTP	National Urban Transport Policy
OSR	Online survey respondents
PCTR	Per Capita Trip Rate
PGMS	Public Grievance Monitoring system
PIS	Passenger Information System
PMGPK	Pradhan Mantri Garib Kalyan Package
PMJDY	Pradhan Mantri Jan-Dhan Yojana
PNT	People near Transit
PTS	Penn Thozhilalargal Sangam
RPW	Resource poor women
SC/ST	Scheduled caste/ Scheduled Tribe

SEWA	All India Federation of Self-Employed Women's Association
SMS	Short Message Service
SOP	Standard operating procedures
ToT	Training of Trainers
VGF	Viability gap funding
WFPR	Workforce participation rate
WIEGO	Women in Informal Employment: Globalizing and Organizing
WRI	World Resources Institute

GLOSSARY

Informal sector	As defined by the international Labour Organisation "all remunerative work (i.e., both self-employment and wage employment) that is not registered, regulated, or protected by existing legal or regulatory frameworks, as well as non-remunerative work undertaken in an income-producing enterprise. Informal workers do not have secure employment contracts, workers' benefits, social protection or workers' representation" (148). Poor women workers in the informal sector as referred to as resource poor women in this study.
Intermediate public transport / Paratransit	Intermediate public transport (IPT) or paratransit refers to demand-driven, often unscheduled and flexible public transport services provided by small operators in small to medium-sized motorised or non-motorised vehicles, generally under the lack of effective regulatory frameworks (149). Paratransit in Delhi includes auto-rickshaws, Gramin Sewa, Phat Phat Sewa, and e-rickshaws among others.

1 United States Dollar = 73.56 Indian Rupees

EXECUTIVE SUMMARY

Purpose

The pandemic and the subsequent lockdowns implemented by governments across the world had severe economic and social repercussions. World over, women are grappling with a triple burden of loss in incomes, increased care and domestic work and an escalation of domestic violence (1). COVID-19 has disproportionately affected women workers in the informal economy (2).The International Labour Organisation (3) reports that 1.3 billion people work informally in Asia and the Pacific, which constitutes 65% of the world's informal employment. 7 in 10 workers in developing Asia are in the informal economy. Over 92% and 84.5% of women in low- and lower-middle-income countries (LMICs), are in informal employment.

In South Asia, countries such as Afghanistan, Bangladesh, Pakistan, and Nepal announced lockdowns that restricted public transportation services. The nature of public transportation permitted during the lockdown differed by state and country. For example, while Kabul, Afghanistan announced a lock down, they permitted public transport vehicles carrying less than four passengers (4). In India, all modes of transport - road, rail and air were suspended except for the transportation of essential goods. Post lockdown as restrictions eased, public transport resumed with curtailed services, reduced passenger capacity to encourage physical distancing and fare increases in private buses and paratransit.

Mobility is vital for the economic recovery of resource poor women (RPW) workers, as they are dependent on public transport, paratransit, and walking. The loss in incomes due to the pandemic, need to sustain their households has compelled RPW to resume work. However, there is limited awareness of the impacts of COVID-19 on women's mobility amongst decision makers and transport policy influencers in LMICs. The impact of modified bus operations, increased fares on RPW's mobility and access are not understood. Similarly, digitalisation of public transport has not acknowledged the gender divide in the access to ICT technology.

Our research aims to fills this gap. We provide evidence and fast track knowledge uptake to understand the impacts of COVID-19 on RPW's mobility, inform policy guidance and responses on addressing gender equity in public transport. The research includes a deep dive in Delhi (India), with learnings for LMICs in South Asia.

Methodology of research

A mixed methods approach with qualitative and quantitative data was used for this study. We conducted a review of grey and published literature on women's mobility and public transportation in the pre- and post-COVID-19 scenario in Delhi (India), Kabul (Afghanistan), Dhaka (Bangladesh), Kathmandu (Nepal) and Lahore (Pakistan). Due to the paucity of information, this was supplemented with an online round table with 18 participants from feminist networks, unions and collectives from the above-mentioned cities in South Asia.

The literature review and online round table indicated that paratransit is a dominant mode of public transport in the four South Asian cities of Kabul, Dhaka, Kathmandu, and Lahore. Buses were crowded, with poor connectivity in the periphery of cities, and sexual harassment was a major deterrent in women's use of public transport. Afghanistan, Bangladesh, India, Nepal, and Pakistan had launched women only buses, but received poor patronage.

During the lockdown and post lockdown phases, the curtailed bus services and restricted carrying capacity resulted in no assurance of seat availability, crowding and reduced physical distancing at bus stops, and inability to board. Fare hikes in private bus services and paratransit in Bangladesh, Nepal and Afghanistan created affordability concerns for RPW. Women experienced longer waiting times for buses and were compelled to use paratransit, even if it is more expensive.

These findings from the literature review and online round table were used to conduct ten key informant interviews with decision makers, transport policy influencers, academics and women's unions in India. The aim was to increase awareness of the impact of the lockdown on women, as well as obtain their perspectives on the challenges and opportunities of COVID-19 in ensuring gender equity, safety and security for RPW in public transport.

The key informant interviews encouraged us to explore RPW's dependence on paratransit due to their travel in off-peak hours of bus services, inadequate bus fleets and occupational specificity. Women suffered from a

pink tax - the additional cost incurred due to their travel during off peak hours of public transport services. The perimeter of RPW's employment opportunities was limited by their access [or lack of] to public transport, in the absence of a personal motor vehicle. Additionally, the mobility pattern of a woman working in the formal sector was different from that in the informal sector, as the latter may optimise her trip in terms of cost. These findings informed our survey design.

We conducted telephone surveys (822) and online surveys (400) to understand how RPW and other women workers travelled and the impact of COVID-19 on their employment and mobility. The telephone surveys were conducted from 23 locations across different types of settlements (urban villages, JJ clusters, informal settlements, resettlement colonies) across Delhi. Additionally, thirty face-to-face surveys were conducted with male paratransit operators to understand their operations in the pre- and post-COVID scenario. These surveys were validated with published literature sources (5). Bus counts were also conducted in 22 locations in Delhi to assess women's ridership in public transport.

We partnered with Self Employed Women's Association (SEWA), a membership-based organisation with 1.9 million members across 17 states in India, to conduct eight in-depth interviews with RPW workers. The goal was to understand their travel in buses after the introduction of the free ride scheme, experiences during the lockdown and after. SEWA also facilitated in-depth interviews with five female e-rickshaw operators (or Vahinis), who are part of their pilot to encourage women owner-operators.

The findings from the surveys were situated within Delhi's and national context to suggest recommendations. Our recommendations were refined with feedback from social policy, finance and technology experts, and public transport operators.

Key findings from in-depth study of RPW in Delhi

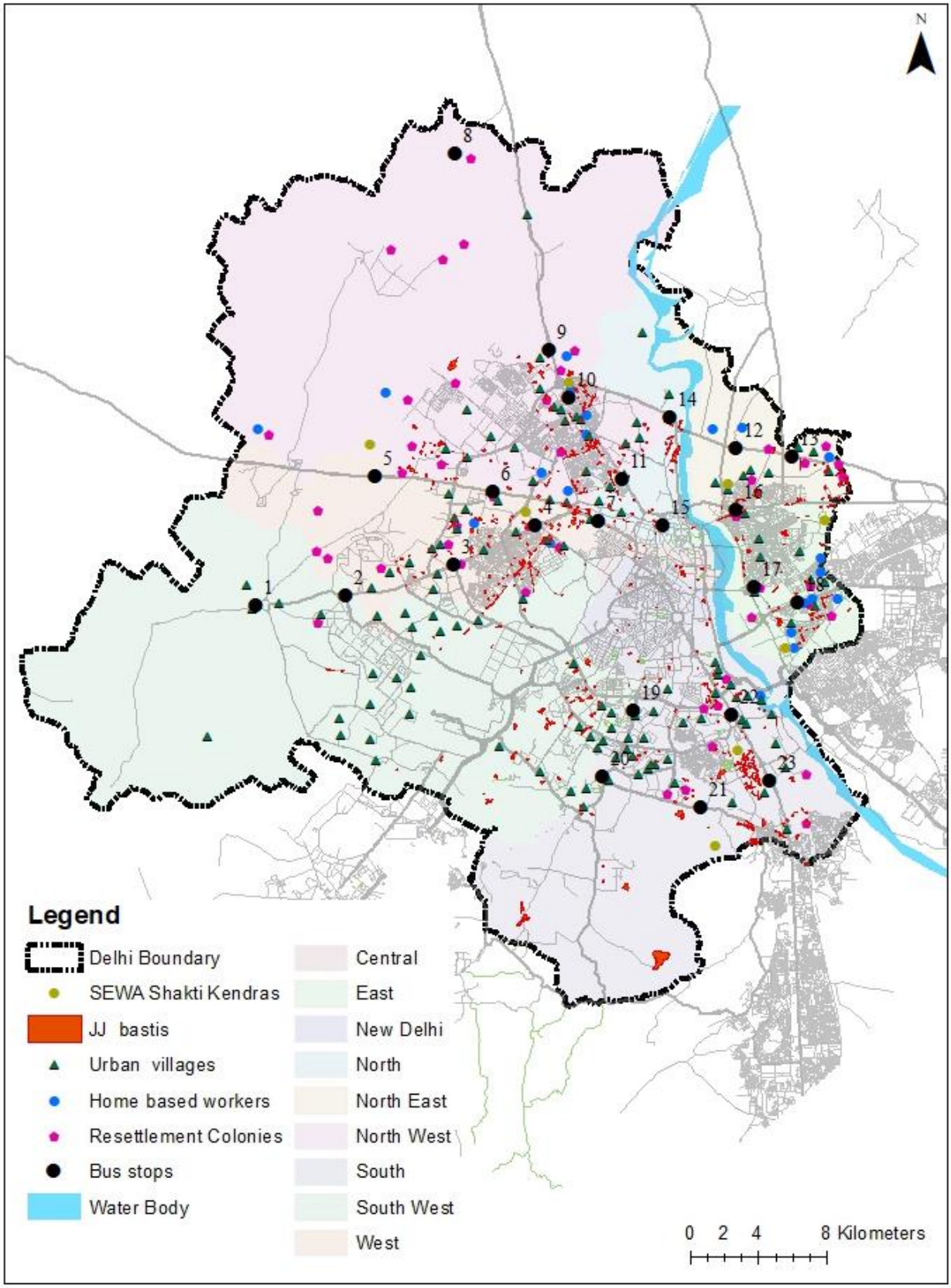
Women's workforce participation, public transport connectivity and bus services

Delhi has a lower female work force participation rate (WFPR) (13.9 %) compared to the rest of urban India (16.1 %) (6). A spatial analysis of female WFPR overlapped with bus routes revealed a lower WFPR with reduction in public bus connectivity. This could suggest a relationship between the two, among other factors, indicating a further line of research inquiry. According to DTC and DIMTS, Delhi witnessed increase in female bus ridership from 21 % in 2011 to 29 % in 2019. This increased further to 37 %-40 % after the introduction of the free bus ride scheme.

Lockdown and mobility restrictions in Delhi due to the COVID-19 pandemic

Between 24th March 2020 and 31st May 2020, the Government of India declared a national lockdown, grounding all public transportation networks and restricting the outdoor movement of people. By May 17th, as restrictions eased in the third phase of lockdown, Delhi began operating buses at 50% fleet strength. By November 2020, during the fourth phase of lockdown, all buses began plying with full seating capacity.

Figure 1: Survey locations, SEWA Shakti Kendras, and locations of home-based workers



Data sources: JJ Bastis (7); Urban villages (8); Resettlement colonies (9); SEWA Shakti Kendras (10) Home based workers (11); District boundary (12); Ward boundary (13)

79% of RPW in Delhi did not work in the 68 days of the lockdown and have lost an estimated INR 754 crores in incomes

The literature review indicates that 83% of RPW workers in Delhi suffered a major loss in income (15). Domestic workers reported a decline in the number of houses they are able to work in, street vendors reported drop in earnings due to closure of markets and reduction in customers (11). Our surveys among RPW workers indicate that while 79% of them did not work during the lockdown, the daily hours they spent on household and care activities increased by 28%, from 3 to 5 hours daily. Overall, we estimated a loss of INR 754 crores during the 68 days of lockdown for RPW in Delhi.

Travel patterns of women indicate that they make negligible or few non-work trips currently

The per capita trip rate (PCTR) of RPW in December 2020 was 1.9, with 99% of trips for work purposes. Similarly, 97% of all trips undertaken by online survey respondents were also work related. This indicates that working women in Delhi were not travelling for leisure or other purposes in the current pandemic.

Travel patterns of resource poor women differ from women of other income groups, highlighting the need for differentiated strategies to achieve equity in gender responsive public transport

Bus travel accounts for 81% of trips made by RPW. The peak travel time for RPW is between 11am-12pm in the morning and 2-3pm in the afternoon, accounting for 11.8% and 11.6% of their daily trips, respectively. This differs for online survey respondents (OSR), whose peak travel hours are between 9-10 am and 5-6 pm. Paratransit accounts for 57% of trips by RPW during these peak hours. This could imply either poor bus frequency during off-peak hours, or that the destinations to which RPW travel are not served by buses. Paratransit is the next preferred mode for 86% of RPW, with over two-thirds preferring shared Intermediate public transport (IPT)/ e-rickshaws/ Gramin Sewas.

RPW's concerns regarding bus-based travel (in December 2020) persisted from a pre-COVID-19 scenario (November 2019). Their three major concerns currently were that buses did not halt for them (21%), no enforcement of reserved seats for women (17%) and poor frequency of services (16% currently). While there was an increase in women's bus ridership, RPW also stated that buses did not stop for them after the free ride scheme. The biggest difference was that 7% of RPW expressed crowding in buses as a concern compared to 21% pre-COVID-19.

Conversely, the major concerns for the online survey respondents in the December 2020 were lack of information on the real time arrival of buses (21%), poor frequency of services (20%) and long queues at bus stops and inability to board the bus (18%). This was also consistent with their concerns regarding bus-based travel pre-COVID-19.

The surveys suggest that safety concerns, related to physical distancing and sexual harassment were not as significant as those mentioned above.

COVID-19 technology responses in public transport leave resource poor women behind

The Delhi government has initiated multiple applications like One Delhi and Chartr to provide real time information on buses and enable contactless ticketing. However, only 10% of RPW have access to a personal or shared smartphone. Around three-fourths of RPW use phones to make and receive calls and/or send SMS. Only five percent use phones to browse the internet, while nine percent access social media/ WhatsApp. Further, only 2% of them know how to make digital payments, in contrast to 58% of online survey respondents. This indicates a substantial impediment in improving RPW's access to public transport in a post-COVID-19 world, where real time information (RTI) and contactless ticketing are being initiated to maintain physical distancing.

Fall in number of passengers result in severe economic loss for IPT service providers

Male paratransit operators witnessed a reduction in passengers in the current pandemic. We estimated a loss of INR 1,741 crores in revenue for 200,000 registered vehicles in the nine months from 24th March 2020-24th December 2020. Their operating expenses in December 2020 ranged from 28 to 56% of their gross revenue, which was higher than their pre-COVID-19 reported operational expenses (24 to 51% of their gross revenue).

Female e-rickshaw owner-operators (Vahinis) earn less than their male counterparts due to a safety, household and care tax

The surveyed Vahinis began operations during the pandemic with support from SEWA and SMV Green Solutions. We observed that their routes were 46% shorter, worked at least 2.5 hours lesser in a day due to household and care work, had 27% fewer passengers and earned 28% lesser than male paratransit operators. The reduced operating hours and passengers can be attributed to a safety, household, and care tax, which must be addressed through policy interventions.

Recommendations for gender equitable transport in Delhi

The recommendations include cross-cutting themes, followed by a focus on bus-based public transport and paratransit.

Partner with women's unions and membership-based organisations (MBOs)

MBOs, unions and civil society organisations have played a critical role in advocating for affordable housing, basic services and safer public spaces for resource poor women. Transport departments must create and maintain a database of these organisations and collaborate with them when devising transport policies. Simultaneously, these groups can also become effective channels to disseminate information across a wider network of women and facilitate effective implementation of public transport schemes and initiatives.

Improve digital literacy of resource poor women

A Training of Trainers (ToT) model can be adopted where transport think tanks can partner with membership-based organisations to train community mobilisers and volunteers on using the Chartr application, navigating Google Maps, making digital payments amongst others. These mobilisers and volunteers can teach resource poor women and girls (with access to a smartphone) in their communities.

Create a dedicated team for women's safety in the command-and-control centre (CCC)

The Transport Department is in the process of inaugurating a command-and-control centre (CCC) for women's safety. It will address all complaints related to SOS buttons in buses and monitor CCTV footage in buses and at bus stops. The CCC can integrate multiple channels (helplines, websites, SOS alerts) for registering and responding to women's complaints, such as buses not halting at scheduled stops, enforcement of seat reservation, sexual harassment in buses, bus stops and in paratransit (17).

Provide a multimodal mobility subsidy for resource poor women

Resource poor women lose a considerable amount of their daily income as they are engaged in household and care activities. COVID-19 has amplified their economic loss and research suggests that women are disproportionately affected during economic crises. Resource poor women have consistently highlighted the issue of poor frequency of bus services and seat availability. While the Delhi Transport Department is in the process of augmenting its bus fleet, we propose a multi mobility subsidy for resource poor women workers in the interim to enable their mobility through multiple modes. A monthly cash transfer of INR 600 is recommended based on their travel for work trips. The resource poor women beneficiaries can be identified based on multiple proxy databases, starting with Pradhan Mantri Jan-Dhan Yojana[1] (PMJDY) bank account holders, registered construction workers, street vendors and eventually expand to all women with ration cards.

Improve reliability and seat availability in buses

A free SMS based real time information (RTI) system for buses must be created, which can co-exist with the proposed passenger information boards at bus stops and the Chartr application. Such a system will allow 90% of resource poor women (without access to smart phones) to receive information on the estimated arrival time of buses.

The Transport Department should consider implementing a policy for women-only-doors, such that women can board from the front doors and access reserved seats. Additionally, it can increase awareness on the presence of bus marshals.

Increase adoption of electric vehicles amongst resource poor women

[1] PMJDY was launched by the Government of India under the national mission for financial inclusion to ensure universal access to banking facilities

Women-operated e-rickshaws can be encouraged as a gender and climate sensitive mode of paratransit to improve the reach and connectivity of public transport, create employment for resource poor women, and support the Delhi government in achieving its goals of the Electric Vehicle (EV) policy.

We collaborated with SEWA and SMV Green Solutions to propose financial and procedural reforms to Delhi's EV Policy (2020) to increase adoption of e-rickshaws amongst resource poor women. We recommend that the Delhi Government implement a pilot project in partnership with MBOs and their financial institutions to mobilise resource poor women. The pilot project can include financial incentives such as providing an upfront subsidy and increasing the amount to INR 50,000[2]. This will reduce equated monthly instalments (EMIs) by 53%, with estimated savings of around INR 130,000 over a 34-month loan period for each Vahini. Additionally, we recommend the following actions by different agencies:

- The Transport Department can introduce targeted skilling opportunities for resource poor women, waive license fees and subsidise charging fees for Vahinis at public parking lots. The license process for women drivers can be eased through a single window system at the Regional Transport Office;
- The Delhi Metro-rail Corporation can reserve spaces for Vahinis in well-lit and visible locations at metro-rail stations, and mandate that first and last mile connectivity paratransit fleets include a share of women-operated vehicles;
- Traffic Police must reconsider e-rickshaw restrictions on major roads in Delhi;
- The Delhi Development Authority must plan, develop creches/ Integrated Child Development Service centres within the framework of the multi-purpose centres recommended by the Main Bhi Dilli Campaign, for the Master Plan of Delhi 2041;
- Finally, MBOs can initiate partnerships with schools and aggregators such as SmartE to augment ridership.

Learnings for cities in South Asia

These recommendations, while framed within the context of Delhi are relevant for the urban local bodies and the provincial/ state-level transport departments in LMICs in South Asia. These include:

- Partnerships between women's membership-based organisations, unions and transport authorities;
- Provision of a mobility subsidy as direct cash transfers to resource poor women;
- A dedicated team to address sexual harassment complaints across different modes of transport in relevant urban local bodies;
- Encourage women paratransit owner-operators through financial and procedural reforms and safety mechanisms;
- Frame equitable mobility as a constitutional right;

Capacity building of women's departments, membership-based organisations and unions, urban development and transport authorities and increasing number of gender experts.

Conclusion

Gender inequities in public transport became more acute with the advent of the pandemic. However, it also represents a unique opportunity to build back better. In the context of the pandemic, we need to acknowledge the most vulnerable voices, work from a ground up and top-down approach to create a more inclusive, and green recovery model for urban transport.

[2] The additional amount could be provided by the Women and Child Development Department.

1. Introduction

There are approximately two billion informal workers in the world (18) of which 37% (740 million) are women (19). While 58% of women in the labour force are in informal employment globally, a higher share of women (92%) in developing countries are in informal employment. In India, 90% of women workers are informally employed compared to 88% of men (20). Women's participation in the labour force is hampered by socio-economic constraints such as gender role conformity, work-life balance, marital status and lack of transportation (21).

The transport imperative

In emerging countries, the lack of access to transportation is the biggest barrier lowering women's probability of labour force participation by 16.5 percentage points (21). A study in Lima found a positive correlation between proximity to public transportation systems, employment rates, increased earnings and work hours (22).

Women's travel patterns tend to be more complex, involving trip chaining and multiple purposes(23). The gendered differences in mobility are starkly apparent in low-income countries (LICs) (24). Urban marginalised women often do not own private vehicles as family vehicles are traditionally for the use of male members in resource constrained settings (25). Women thus tend to walk or are dependent on public transportation such as buses and informal transportation such as shared auto-rickshaws and e-rickshaws (26).

Lower income women prefer public transport and prioritise better coverage, affordability and frequency, in contrast to higher income women, for whom public transport is the least preferred mode of transport(27). Affordability (26) and increased transportation costs are likely to restrict the geographic range of employment opportunities (28). As the earning capacity of informal workers is by and large lower than those in the formal sector (20), higher transportation costs may disproportionately affect them. For example, inhabitants residing in informal settlements at the periphery of the city tend to spend a larger share of their income on transportation. They restrict their trip distances to minimise travel expenditure, suggesting a linkage between mobility and livelihoods (26). Studies suggest that the per capita income savings of informal settlements inhabitants is more sensitive to accessibility with respect to transportation than employment opportunities (26).

A study in Delhi observed that women bear a higher burden of unpaid household and care work, in addition to using slower modes of transport, compelling them to seek flexible employment opportunities closer to home (25,29). Lack of access to public transport due to the above mentioned issues combined with the threat of sexual harassment in public transportation translates to lack of access to social, recreational and economic activities for women (25). As information availability, dissemination and payments are shifting to digital platforms, women are being left behind due to the gendered digital divide and women's lack of access to mobile phones (30).

Within this context, the COVID-19 pandemic has significantly impacted over 1.6 billion informal workers (31), and imposed a triple burden on women - loss in incomes, exacerbation of time poverty due to increased household and care work and domestic violence (19). Globally, women informal workers not only witnessed a decline in earnings by 60% in the first month of the pandemic (19), but were also overrepresented in high risk sectors with respect to COVID-19 (31). World over, close to three-fourths of domestic workers, a majority of whom are women, lost employment. Post lockdown, the ability to work has decreased significantly for women informal workers compared to their male counterparts (32), due to the burden of increased household and care work (33). Gender poverty gaps are expected to widen as a result of the pandemic, with half of the projected new poor in South Asia (34).

In South Asia, Afghanistan, Bangladesh, Pakistan, and Nepal announced lockdowns that brought public transport and paratransit services to a halt. However, the nature of public transportation permitted during the lockdown differed by country. In Bangladesh and Nepal, the lockdown brought all public transportation to a standstill (35,36), whereas in Pakistan, the lockdown periods differed by region (37). In Kabul, public transport vehicles were permitted to carry less than four passengers during the lockdown (4). In Delhi, India, the national lockdown enforced between 24th March 2020 and 31st May 2020, resulting in a complete halt of

public transport services. Metro-rail services were closed and only buses requisitioned for use by governmental agencies and health workers functioned during this time period (38,39).

As cities transitioned out of the lockdown, bus-based public transport operations resumed with curtailed services, lower occupancy, and regular disinfection of vehicles. Efforts were made to encourage contactless ticketing. In cities across South Asia, buses operated at 50% seat capacity with no standing passengers. Many cities permitted fare increases by private bus operators to compensate for reduced occupancy and revenues. Bangladesh permitted public transport to resume at 50% capacity with public bus fares to be increased by 60% (40). In November 2020, Nepal permitted public transport to resume with no restrictions (36). By September 2020, most cities in South Asia resumed bus services with full seating capacity, no standing passengers, and compulsory face masks. As of March 2021, Delhi is in the final phase of trials for contactless ticketing, an initiative to ensure minimum contact between people inside buses (41).

The COVID-19 pandemic has transformed the landscape of urban mobility in low-income countries. Public transportation systems are facing unprecedented stress, caused by curtailed services and falling revenue (42). With physical distancing norms in place, the shortage of public buses has led to a gap between demand and supply (43,44). However, there is a dearth of research and understanding on how the physical mobility of resource poor women informal workers (RPW) has been affected by the COVID-19 pandemic and their expectations from public transport services. Our research will be critical to ensure that this group of women workers, most affected by the COVID-19 pandemic, are enabled to participate effectively in the workforce.

Project aims and objectives

Our action-oriented empirical research aims to provide evidence and insights that can fast track knowledge uptake to guide policy reforms and responses by LICs in addressing gender equity in high-volume transport. Specifically, our objective is to understand the impact of COVID-19 pandemic and lockdown on women's mobility, the gaps between their expectations and public transportation strategies by LICs, and provide recommendations for gender responsive, safe, and secure public transportation. Our research lies within the broader framework of an economic recovery plan to achieve multiple sustainable development goals – climate change, sustainable cities, and gender equity.

Low-income country (LIC) beneficiaries

We focus on the city of Delhi with learnings for other cities in India and LICs in South Asia: Afghanistan, Bangladesh, Pakistan, and Nepal. Our primary audience in LICs are organisations advocating for sustainable transport and women's right to public spaces in LICs in South Asia, development banks, and corporate agencies. Our secondary audience are consulting organisations, professionals, and students in LICs, working on gender, urban mobility, public transportation, and paratransit.

1.1 Alignment with HVT and FCDO research themes, priorities, and programme objectives

Our research is aligned with the priorities of the High-volume Transport (HVT) Programme and the broader priorities of the Foreign, Commonwealth and Development Office (FCDO), UK.

Alignment with HVT Programme priorities

- **Climate change adaptation and mitigation:** Encouraging use of public transport and especially EV-based paratransit, to offset poor air quality in Delhi and other cities in LICs;
- **Inclusion, gender, and road safety:** Identifying mobility challenges faced by RPW in their use of public transport, and recommending actions to improve their access, usage, and travel experience;
- **Policy and regulation:** Examining Delhi's Electric Vehicle Policy (2020) for gaps in enabling gender equity among IPT operators, and providing suitable recommendations;
- **Technology and innovation:** Improving access and gender-inclusivity of digital platforms for public transport related services, especially for RPW;
- **Research uptake and capacity building:** Sensitise, increase awareness, and build capacity amongst transport policy influencers and decision makers.

Alignment with FCDO priorities

This research aligns with FCDO's priorities of strengthening resilience and response to crisis, promoting global prosperity and tackling extreme poverty, and helping the world's most vulnerable (45), by aligning planning, design, and implementation of public transport and IPT services towards the needs of RPW, increasing their access to the city, agency over their public life, and choice of livelihood, resulting in an overall improvement in their quality of life and economic prosperity.

2. Methodology

2.1 Summary of approach and innovation

Our approach and innovation builds on existing research on gender, mobility and livelihoods (21), lack of access to personal vehicles for RPW (25), reliance on buses and paratransit (26), affordability, transportation costs (26), impact of household and care work on women's economic opportunities (25,29), and the digital gender divide (30).

Sustainable development goals underpin our research

Women's access and mobility has been enshrined in the Sustainable Development Goal 11.2: By 2030, provide access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations; women, children, persons with disabilities and older persons (46). This forms the background of our action-oriented research.

Provide evidence for CSOs and MBOs to advocate for better public transport and increase women's participation in the transport sector

Civil society organisations (CSO), membership-based organisations (MBO), and feminist collectives have filled the gap in pandemic responses by government authorities, by providing food, rations, and employment to the urban poor (47). They also have a history of organising and advocating with governments for improving housing, employment conditions, and basic services for RPW. Our research design built on their experience, included their perspectives in the inception stage, and partnered with them to access RPW. We aim to provide evidence for CSOs and MBOs to advocate for better public transport and increase women's participation in the transport sector. For this research, we worked with Self-Employed Women's Association (SEWA), a MBO with 1.3 million informal women workers in India[3].

Adopt a mixed methods and differentiated approach for data collection

We have adopted a mixed methods approach (48) using quantitative and qualitative data to provide a statistical and nuanced understanding (49) of RPW's lived realities. It improves the accuracy and reliability of data through triangulation and examination from various standpoints (49,50). The quantitative data and analysis are used to estimate the scale and degree of impact of the COVID-19 pandemic on women's travel behaviour, prioritise recommendations for public transportation, and make an economic case for policy recommendations. The qualitative data substantiated and provided context to the findings.

Simultaneously, we adopted two different modes (telephone and online forms) of survey data collection, recognising the digital divide across income groups of women. This assisted us in understanding the similarities and differences in the travel behaviour of different income groups of women and craft targeted policy response for RPW.

Use qualitative data to understand opinions, attitudes, beliefs, views, and preferences

Qualitative research methods allow us to capture perspectives, opinions, attitudes, and beliefs from different standpoints – public transport and paratransit users, advocacy groups, decision makers and policy influencers. This was done through multiple forms: an online round table, key informant interviews (KIIs) and in-depth interviews. While the online round table allowed us to aggregate perspectives of feminist networks, MBOs and CSOs, individual KIIs created a safe space for participants to reflect and remove social desirability bias. In-depth interviews allowed RPW to speak freely and openly. The methodology is described further in this chapter.

[3] SEWA Delhi Union includes 40,000 informal women workers across its 8 community centres in Delhi. It works with women informal workers in these communities through strategic interventions such as organising, social security, health, education and skills development, livelihoods, and community microfinance services.

Use reflexive learning as a process to increase awareness

Our action-oriented research used reflexive learning as a process to increase awareness amongst transport policy influencers and decision makers. Reflexive learning is a process by which one critically examines a decision or practice and consciously analyses it with new information, it encourages questioning assumptions, prejudices and habitual actions (51). We conducted KIIs before commencing the data collection to assess initial opinions and shared the project findings later. Research uptake has been a continuous part of our process, thereby increasing avenues for advocacy and policy adoption.

2.2 Methodology and activities undertaken

Building on our approach, the research followed a two-phase process. The first phase aimed at understanding the gaps in grey and published literature, aggregating grassroots perspectives from MBOs and CSOs, assessing awareness amongst transport practitioners and decision-makers on the specific issues faced by RPW, and their perspectives. These informed our survey questionnaires. Research process and activities are summarised in Figure 2: Research Methodology and detailed in Appendix A.

COVID-19 cases were increasing during the data collection period, making direct face-to-face surveys in buses and public spaces risky. Hence a combination of telephone and online surveys were used as alternatives. In the case of paratransit surveys and bus ridership counts, the survey team took adequate measures to ensure physical distancing, wearing masks, and regular hand sanitising as per WHO guidelines (52).

Figure 2: Research Methodology

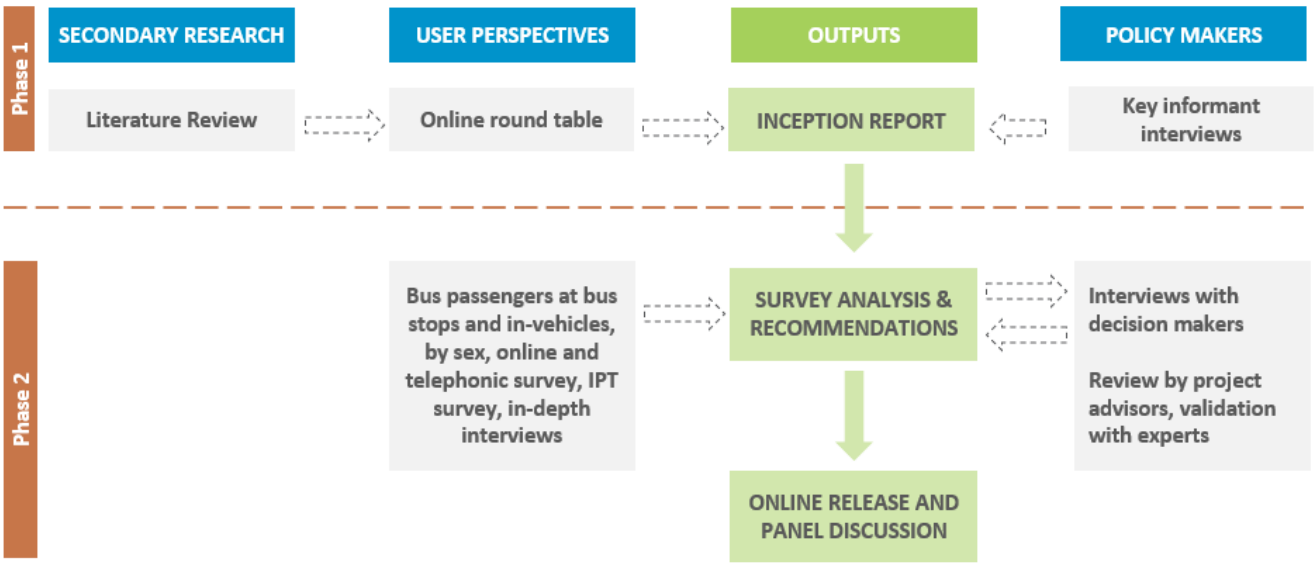


Table 1: Research activities

Activity	Time frame	Cumulative timeline (weeks)
Phase I		
Literature review	28th October - 9th November 2020	3
Online round table (17 participants)	11th November 2020	4
Key informant interviews (8)	17th November - 2nd December 2020	7
Inception report	18th December 2020	9

Activity	Time frame	Cumulative timeline (weeks)
Phase II		
Online and telephonic surveys	7th December 2020 - 5th January 2021	13
Bus passengers at bus stops and in-vehicles, by sex	17th December 2020 - 6th January 2021	13
IPT surveys	7th December 2020 - 5th January 2021	13
In-depth interviews	28th December 2020 - 9th January 2021	13
Survey analysis and recommendations	7th January 2020 - 25th February 2021	20
Review by project advisors, validation with experts	26th February - 22nd March 2021	23
Virtual workshop	30th March 2021	24

Literature review

The literature review focused on transport data and women's mobility in four South Asian cities; Kabul (Afghanistan), Kathmandu (Nepal), Dhaka (Bangladesh) and Lahore (Pakistan), followed by a deep dive in Delhi (India), our main research site. Keywords such as "mobility, women, bus, COVID-19, city name" were used in Google Scholar and Google search portals.

Online round table

An online roundtable was conducted on 11th November 2020 with international organisations, South Asian and Indian feminist networks, unions, and collectives to aggregate grassroot perspectives of the impact of COVID-19 and lockdown on the access and mobility of different groups of women.

Table 2: Online round table participants

No	Name	Organisation	Country
1	Anosha Ejlasi	UN-Habitat, Afghanistan	Afghanistan
2	Roshan Mashal	Afghan Women's Network	Afghanistan
3	Nasheeba Seleem	Asian Development Bank	Bangladesh
4	Nazma Akter	Awaj Foundation	Bangladesh
5	Riti Ahsan	Bangladesh Mohila Samity	Bangladesh
6	Selina Ahmed	Bangladesh Rural Advancement Committee	Bangladesh
7	Sharmin Nasreen	University of Asia Pacific	Bangladesh
8	Sitara Ahsanullah	Bangladesh Mohila Samity	Bangladesh
9	Gunjan Bihari	Centre for Catalysing Change	India
10	Kalpana Viswanath	Safetipin	India
11	Namita Malik	All India Federation of Self-Employed Women's Association (SEWA) Bharat Union	India
12	Premila V	Sampark	India
13	Sujata Mody	Penn Thozhilalargal Sangam (PTS)	India

No	Name	Organisation	Country
14	Supriya Jaan	CORO India	India
15	Maheen Arif	Karachi Urban Lab	Pakistan
16	Rukhsana Rashid	Independent Development Consultant (Gender Specialist)	Pakistan
17	Seher Afseen	Oxfam Pakistan	Pakistan

Key informant interviews

Key informant interviews (KIIs) were conducted with ten transport operators, and representatives of development banks, agencies and think tanks in India to gauge their awareness of the impact of COVID-19 and lockdown on women's mobility and obtain perspectives on the challenges and opportunities for ensuring gender equity, safety, and personal security in public transportation in a post COVID-19 scenario.

Table 3: Key informant Interviewees

	Name	Organisation
1	Gerald Olivier	World Bank
2	Kanika Kalra	Institute of Urban Transport (IUT)
3	Laghu Parashar	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ)
4	O P Agarwal	World Resources Institute (WRI)
5	R Minhas	Delhi Transport Corporation (DTC)
6	Rajnish Ahuja	Agence Française de Développement (AFD)
7	Ranjit Gadgil	SUMNet
8	Samir Sharma	Delhi Integrated Multi-Modal Transit System (DIMTS)
9	Shiney Chakraborty	Institute of Social Studies Trust (ISST)
10	Shreya Gadepalli	Institute for Transportation and Development Policy (ITDP)

Bus passenger counts

Bus and sex-disaggregated passenger counts were undertaken every 15 minutes, over 16 hours from 6am-10pm at 22 bus stop locations (both sides of the road, hence 44 bus stops in total) to measure the ridership in Delhi's public bus transport system. The bus stops selected were located along major radial roads and the inner and outer ring roads, dispersed across the centre and periphery of the city, with bus routes connecting the centre of the city to the periphery, and vice versa. The second selection criteria was their proximity (within two kilometres) to resettlement colonies, urban villages, jhuggi jhopri (JJ) bastis, informal settlements, and home-based worker clusters (Section 2.2.5). Since buses halted for less than a minute at the stops, the survey team counted female passengers and vacant seats to arrive at the total number of passengers[4].

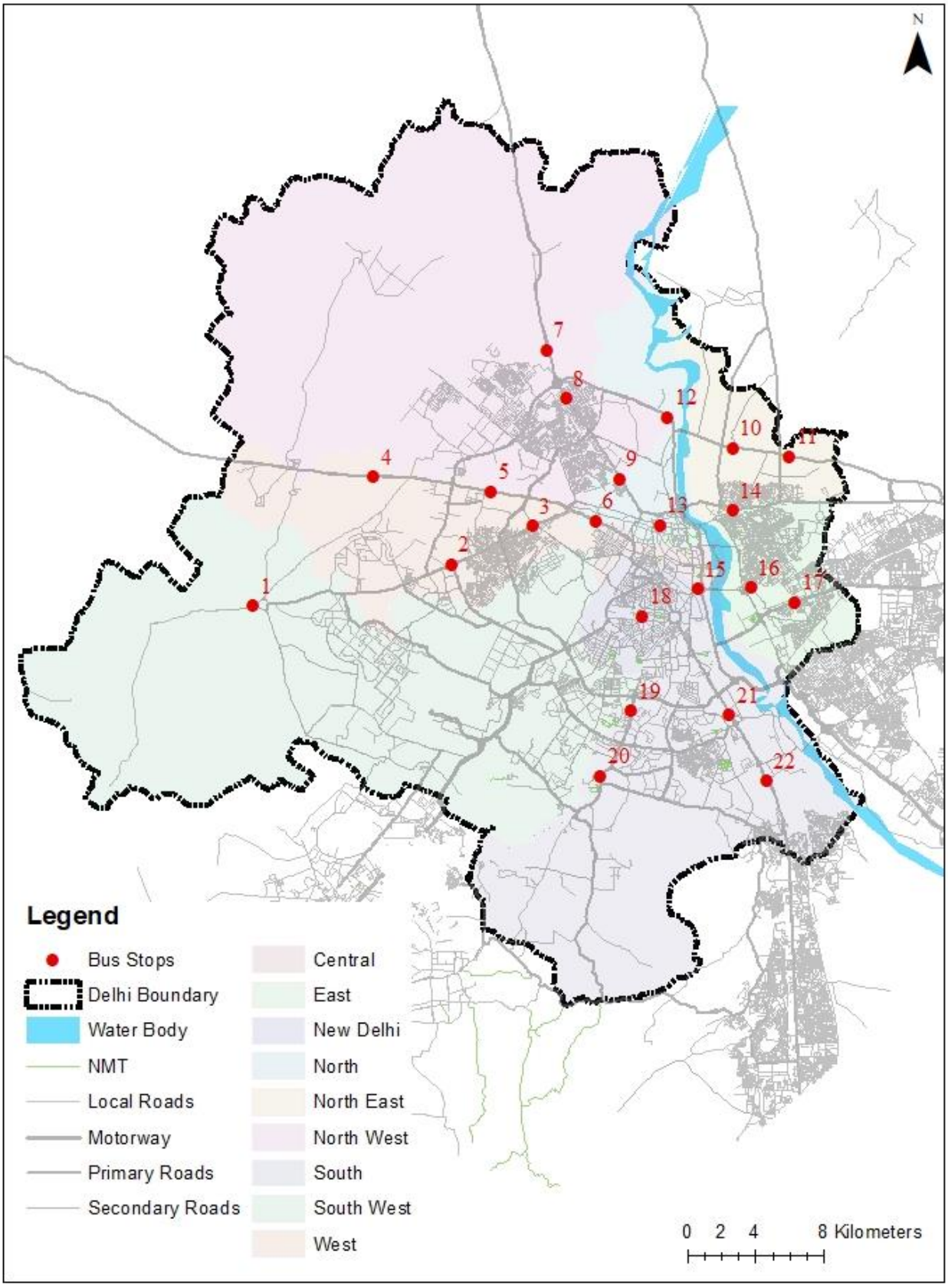
Table 4: Bus stops for passenger counts

Bus stop number	Bus stop (both sides)
1	Telephone Exchange Najafgarh
2	Tilak Nagar
3	Moti Nagar
4	Rajdhani Park

[4] There are 35 seats in DTC and DIMTS buses.

Bus stop number	Bus stop (both sides)
5	Madipur Jj Colony
6	Sarai Rohilla
7	Libas Pur GT Road
8	Jahangirpuri
9	Gur Mandi
10	Bhajanpura
11	Meet Nagar
12	Gopal Pur
13	Novelty Cinema
14	Dharampura
15	ITO
16	Laxmi Nagar
17	East Vinod Nagar
18	Udyog Bhavan
19	Yusuf Sarai
20	Lado Sarai Crossing
21	Mata Mandir New Friends Colony
22	Madanpur Crossing

Figure 3: Bus stops for passenger counts



Telephone surveys with RPW workers

The telephone surveys were conducted with RPW workers in the age group of 18-59 years across 23 locations in Delhi. The settlements selected were located within a two-kilometre radius of the 22 bus stops. These were spatially mapped to ensure geographic distribution across the districts of Delhi, and at least 35 surveys

conducted per location to achieve statistical significance. We focused on informal settlements, resettlement colonies, jhuggi jhopri (JJ) bastis, urban villages, locations of home-based worker clusters, and low-income neighbourhoods around SEWA's Shakti Kendras (empowerment centres). Each settlement type was identified from numerous government databases and grey and published literature and mapped in a Geographic Information System (GIS). For example, the list of urban villages and notified informal settlements were taken from the Delhi Government's website (8) and Delhi Urban Shelter Improvement Board (DUSIB) (7) respectively. The clusters of home-based workers were identified from reports by WIEGO (53), resettlement colonies were identified from a report by the Displacement Research and Action Network (9), and the SEWA Shakti Kendra addresses[5] were provided by SEWA (10) (Figure 6: Survey locations).

An agency was appointed to conduct the surveys. A Keyhole Markup Language file (KML) file was provided to the survey agency with the sample locations, and their enumerators obtained phone numbers from these locations. A draft survey form was first created and tested amongst RPW workers through telephonic conversations, then subsequently revised based on their responses. Amongst RPW, we focused on those who were working (as of December 2020), and who were bus and paratransit users (Table 5).

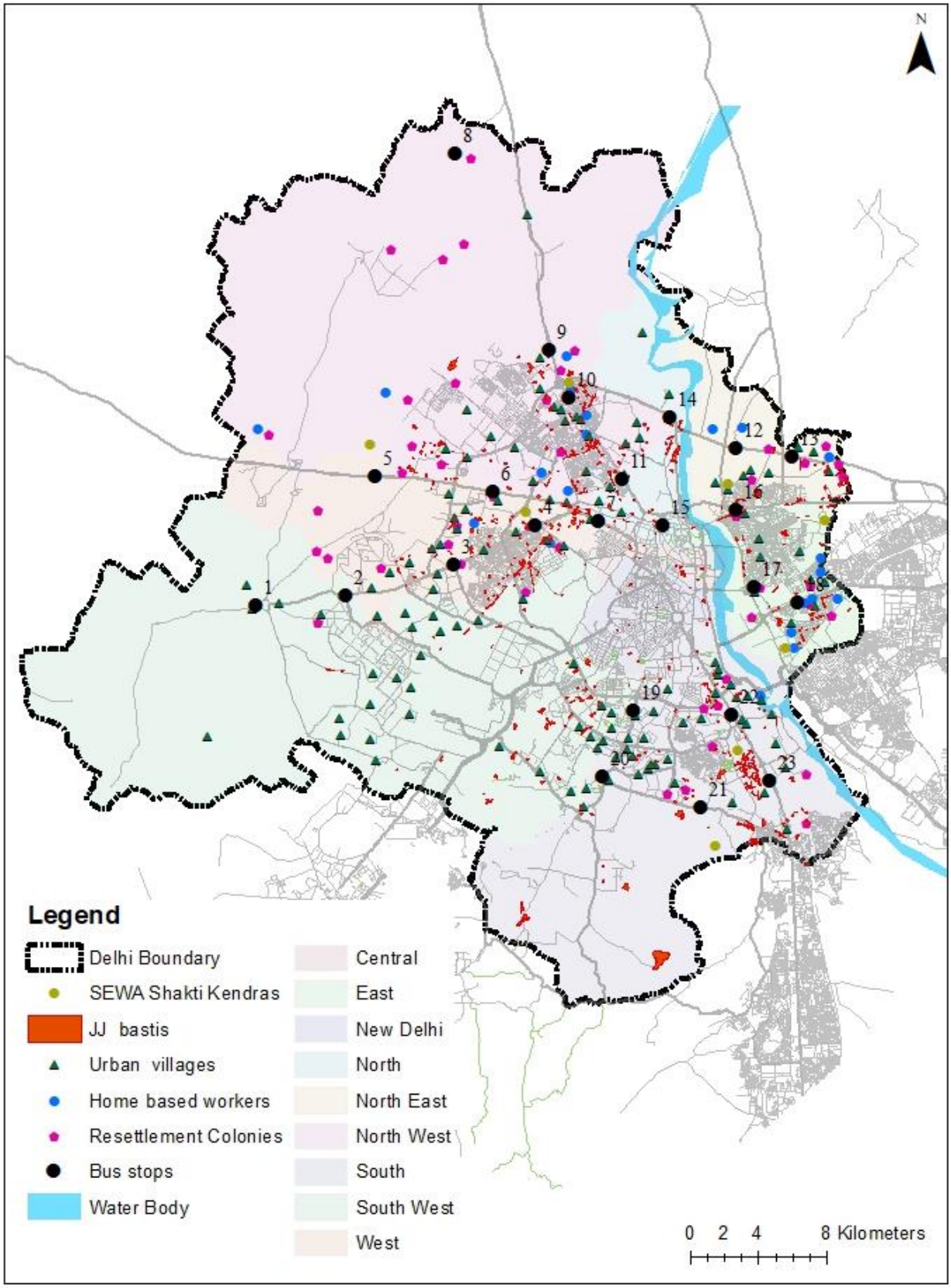
The survey questions aimed at assessing the socio-economic conditions of RPW, paid and unpaid household and care work performed, and individual incomes pre COVID-19, during the lockdown, and in December 2020. Travel diaries were created for each respondent by asking them to recall their daily travel activity for the past week from interview date. Broader questions were asked about the travel scenario pre COVID-19 to resolve memory recall issues. We also included specific questions about the impact of the Delhi Government's free bus ride for women scheme on RPW's travel behaviour, persisting issues, and new barriers impeding their access, safety, security, and affordability in transportation.

Table 5: Sampling and stratification for telephone surveys

No.	Parameter	Stratification
1	Sampling	Our target was 800 telephone surveys at a confidence level of 95% and a confidence interval of 2.85. We were able to collect 822 surveys.
2	Location	Jhuggi jhopri (JJ) bastis (non-notified slums), resettlement colonies, urban villages, SEWA Shakti Kendras, and home-based worker clusters within two kilometres of 22 bus stops distributed across Delhi.
3	Age	18-59 years. 60% of women in Delhi belong to this age group (54).
4	Use of public transport	Respondents must use bus or IPT and travel at least once in two weeks. Travel companions to be avoided i.e., those accompanying respondents on the journey.
5	Number of surveys in a location	Minimum 35 surveys per location as 30 is the minimum number of surveys required for statistical validity.

[5] SEWA Shakti Kendras are located in Jahangirpuri, New Ashok Nagar, Mustafabad, Raghuveer Nagar, Rajiv Nagar, Sunder Nagri, Anand Vihar, and Mullah Colony (10).

Figure 4: Locations for telephone surveys



Data sources: JJ Bastis (7); Urban villages (8); Resettlement colonies (9); SEWA Shakti Kendras (10); Home based worker clusters (11); District boundary (12); Ward boundary (13)

Table 6: Selected bus stops and settlements for survey of RPW

Bus stop number	Bus stop	Settlements
1	Telephone Exchange Najafgarh	Najafgarh, Najafgarh Village
2	Dwarka More Metro Station	Nawada, Kakrola, Matiala
3	Tilak Nagar	Nagli Jalib, Tilak Village, Chaukhandi
4	Moti Nagar	Basai Darapur, Moti Nagar Resettlement Colony
5	Rajdhani Park	Rajdhani Park
6	Madipur JJ Colony	Madipur, Madipur Resettlement Colony
7	Sarai Rohilla	Sadhorah Khurd, Punjabi Basti, Nai Basti
8	Saffiabad Crossing	Narela, Vijay Nagar, Narela Resettlement Colony
9	Libas Pur GT Road	Samyapur Village, Bhalswa
10	Jahangirpuri	Ramgarh Village, Shalimar Village
11	Gur Mandi	Rajpur Chawni,
12	Bhajanpura	Area within two kilometres
13	Meet Nagar	Saboli, Ashok Nagar
14	Gopal Pur	Wazirabad
15	Novelty Cinema	Area within two kilometres
16	Dharampura	Seelampur
17	Laxmi Nagar	Shakharpur Khas, Shakarpur Resettlement Colony
18	East Vinod Nagar	East Vinod Nagar, West Vinod Nagar, Khichripur
19	Yusuf Sarai	Yusuf Sarai
20	Lado Sarai Crossing	Lado Sarai
21	Sangam Vihar	Sangam Vihar
22	Mata Mandir New Friends Colony	Sarai Jullena, Masih Garh, Joga Bai
23	Madanpur Crossing	Madhanpur Khadar, Tekhand

In-depth interviews with RPW

Qualitative in-depth interviews were conducted across eight SEWA Shakti Kendras with 13 RPW workers; home-based workers, street vendors, domestic workers, construction workers, and health workers, to gather grassroots level data on the impact of COVID-19. The objective was to understand the lived experiences (with respect to mobility) of these women during the pandemic. The interviews were coordinated by SEWA Delhi Union. SEWA Delhi Union in partnership with SMV Green Solutions6, has enabled five of their women members to become e-rickshaw operators (henceforth referred to as Vahinis) over the past year. All Vahinis were interviewed about the process of becoming an operator and any challenges they faced, and their

[6] SMV Green Solutions is a Lucknow based organisation enabling women-operated e-rickshaws in Uttar Pradesh. Since 2019, they have supported 90 Vahinis (55).

operations (if any) during the lockdown and in December 2020. Due to the small sample size, our findings were validated by SMV Green Solutions.

Online surveys with women from other income groups (non RPW)

We used a snowball sampling technique to reach women with access to the internet. Four hundred women respondents were targeted, at a confidence level of 95% and a confidence interval of five. A Google link to the survey form was shared through WhatsApp. The survey questions were in English and aimed to understand the socio-economic status of the respondents, quantum of paid and unpaid household and care work, individual incomes pre COVID-19, during the lockdown, and in December 2020. We included specific questions about the impact of the free bus ride for women scheme on their travel behaviour, persisting issues, and new barriers impeding their access, safety, security, and affordability in transportation. The travel activity diary was not used in this instance as quality assurance could not be ensured. Further, the responses on pre COVID-19 travel were limited to the number and purpose of daily and weekly trips.

Semi-structured interviews with male paratransit service providers

Semi-structured interviews were conducted with 30 male paratransit operators: auto-rickshaws, e-rickshaws, Gramin Sewas and Phat Phat Sewas (Table 7). Interviews were distributed across 22 locations in Delhi, in proximity of the bus stops selected for passenger counts (Figure 6). No more than two operators were interviewed at each location, with each vehicle operating on a different route. The interviews included questions related to demography, operational details, costs, and revenue pre COVID-19, during lockdown and in December 2020. We also asked qualitative questions on the challenges faced by them, experience with female passengers, their perspectives on installing GPS devices in their vehicles (a mandatory requirement by the Government of India), and adoption of COVID-19 safety protocols.

We validated our findings with experts and with surveys conducted with 250 male e-rickshaw drivers in 2018, through the CapaCITIES project in Delhi (5).

Figure 5: Survey distribution

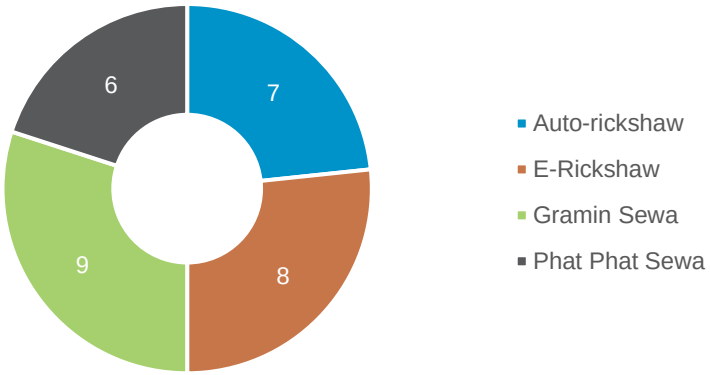


Table 7: Paratransit vehicles in Delhi

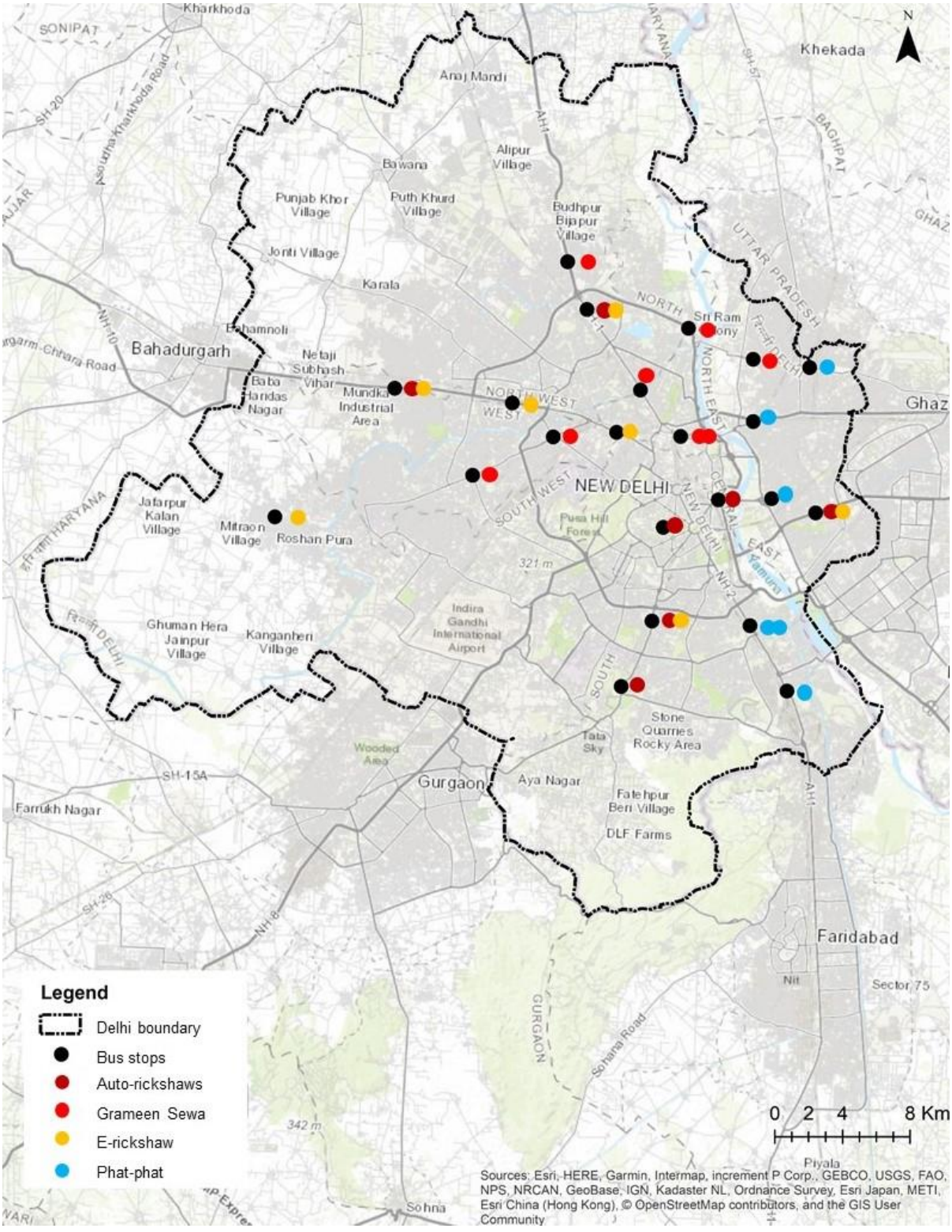
Vehicle Type	Fuel Type	Maximum seating capacity (excluding driver)	Fare stages as per the Transport Department
1. Auto-rickshaw  Source: (56); (57)	Compressed Natural Gas (CNG)	Three, excluding the driver	Rs. 25: <1.5 km + Rs. 9.5 per additional km Night charge: 25% extra (11pm to 5 am) Waiting charges: Rs. 0.75 per minute
2. E-rickshaw[7]  Source: (58)	Electric	Four, excluding the driver	Rs.10: <3 km Rs.15: 3-5 km Rs. 20: >5 km
3. Phat-Phat  Source: (59); (60)	CNG	7-12, excluding the driver	Rs 5: <3km Rs. 10: 3-7km Rs. 15: >7km
4. Gramin SEWA  Source:(61); (62)	CNG	Six, excluding the driver	Rs 5: <3km Rs. 10: 3-7km Rs. 15: >7km

[7] E-rickshaws are granted permits without a fare meter. Thus, the fares stated by the e-rickshaw operators is used.

Data analysis and recommendations

The primary (both qualitative and quantitative in nature) and secondary data were analysed to understand the spatial and social disadvantages to RPW arising from revised public transportation and paratransit operations.

Figure 6: Survey locations for paratransit vehicles



3. Findings from the literature review, online round table and key informant interviews

Table 8: City populations and main modes of transport

City	Population	Main mode of public transport
Dhaka, Bangladesh	4,55,68,835 (2011) (63)	Buses and minibuses
Kabul, Afghanistan	48,60,880 (2018-19) (64)	Small vans, minibuses
Lahore, Pakistan	1,11,26,285 (2017) (65)	Mini vans
Kathmandu, Nepal	17,44,240 (2011) (66)	Micro buses, minibuses
Delhi, India	1,67,87,941 (2011) (54)	Buses, Shared rickshaws

3.1 Literature review

The rapid review of secondary research revealed gaps in the availability and accessibility of published and grey literature on gender and transport in cities in South Asia. While there was some literature on the perception of safety and experience of sexual harassment in public transport and paratransit, there was limited research on affordability, accessibility, spatial disparity, and the mobility of women and girls across different socio-economic groups. This was in the pre-COVID-19 scenario, lockdown and after.

Public transport consists of a variety of vehicles such as standard buses, minibuses, microbuses, minivans, tempos, auto-rickshaws, e-rickshaws. The city of Delhi had the largest fleet size of publicly and privately-operated buses. Across the cities, literature highlighted the insufficiency of buses, with infrequent services, poor geographical coverage, and overcrowding. They are perceived to be unsafe, and men often occupied seats reserved for women. Paratransit services, while more expensive than buses, are commonly used in Kabul, Lahore and Kathmandu due to their coverage, connectivity and seat availability.

Women-only buses have been launched in all the selected cities without much success. Insufficient fleet size, poor frequency, lack of awareness of these services are a few reasons for low patronage. There is a lack of attention to the context, as women in Afghanistan generally do not travel without a male escort. In cities like Lahore, the women-only bus services do not operate in the late evening and night. This indicates that tokenistic measures at introducing sex-segregated bus services may not be useful, without considering women as public transport users.

A detailed review of the focus city, Delhi and other cities in South Asia such as Dhaka, Kabul, Lahore and Kathmandu is provided in the following sections.

Delhi, India: Focus city

Delhi, also known as the National Capital Territory (NCT) of Delhi, has an urban population of 16 million as per the 2011 census. In 2011, urban women constituted 46.47% of the total urban population (54). Delhi possesses a combined fleet of over 6,100 buses under the Delhi Transport Corporation (DTC) and cluster buses managed by Delhi Integrated Multi-Modal Transit System (DIMTS) (42). As 80% of all trips undertaken in Delhi are less than 10 kilometres, bus-based transportation is the most practical form of public transportation (67).

A study conducted on the mobility pattern of women workers employed in the informal sector in Sangam Vihar, an unauthorised colony located at the urban edge of Delhi highlighted the difference in work and travel patterns of married and unmarried women in Delhi (25). Married women, who bore a larger share of domestic responsibilities were more likely to work closer to home, with flexible timings, and shorter hours. Unmarried women travelled longer distances, spent more money, and were willing to compromise in terms of safety and comfort for better job opportunities as compared to married women. The participants of the survey spent between 6% to 36% of their income solely on travel related expenses (25).

Gera and Hasdell argue that the public transportation system in Delhi is planned for point to point travel patterns, that is from residential areas to city centres (25). This caters to the travel needs of the formal sector (25). Women's travel needs often fall outside of the regular schedule time of buses (29). In Delhi, a percentage of buses are deployed as school buses in the off-peak hours, thus reducing the frequency of public transportation in the off-peak hours (68). The pandemic presents an opportunity to examine and restructure the routes of public transport to improve connectivity and better integrate and connect schools, markets, essential services and residential areas (69).

The free ride bus scheme for women launched in late 2019 by the Delhi government facilitated women's access to public transport and saw female ridership share increase from 33% to above 40% (70,71). Several issues remain unaddressed. Buses in Delhi are found to have poor frequency, run overcrowded and women face sexual harassment (25,72,73).

On 24th March 2020, the Indian Government declared a national lockdown which also restricted movement and curtailed public transportation services to 50% of the DTC fleet (2,000 buses) (74). A survey conducted by ISST (2020) revealed that this presented a multitude of problems for women informal workers, primarily loss of income due to loss of jobs (21%), inability to commute because of the lockdown (68%), or fear of contracting the virus (55%) (15). Further, 32.4% of women informal workers found transport the essential service was most difficult to access during lockdown (15).

The Government of India addressed the economic security of women through measures such as utilising the existing cash transfer mechanism, Pradhan Mantri Jan-Dhan Yojana (PMJDY).[8] Under the Pradhan Mantri Garib Kalyan Package (PMGKP), the Government of India announced a direct benefit transfer of INR 500[9] to 200 million women who held a PMJDY account (75,76). However, a survey conducted by ISST (2020) revealed that many of the beneficiaries were unable to access automated teller machines (ATM)/ banks due to the lack of public transport (15).

In the fourth phase of lockdown beginning 18th May 2020, public transport services were resumed with a maximum capacity of 20 passengers per bus in an alternate seating arrangement, to maintain physical distancing (77). This resulted in increased waiting times for passengers to as high as three hours in some instances (78). Delhi, which has only half the number of required buses to cater to its population, faces immense crowding at bus stops; the situation worsens when a bus arrives, and people rush to board the bus (77). Not only are physical distancing norms flouted in these situations, but women find it difficult to board buses by jostling their way in ahead of male passengers. Regardless of the free rides for women scheme and 25% reserved seats in DTC buses, the pandemic resulted in a situation where women had to be among the first 20 passengers to board the bus to be assured passage. DTC officials estimated that Delhi would require five times its fleet to ensure access to public transportation with the current carrying capacity, following physical distancing norms (44).

Transport think-tanks and organisations released standard operating procedures (SOPs) for bus-based transportation in the wake of the pandemic. These SOPs include guidance for bus and transport authorities, passengers, drivers, conductors, bus shelters, and terminals, as well as communication of information with staff and passengers (79), fare payment, financing, and fleet expansion (80)(81). While some have no gender sensitive measures (82), others take into consideration the needs of elderly, differently abled, and pregnant women, by prioritising their boarding and seating (80). SOPs for bus based public transport have also suggested measures such as equipping retail stores to sell bus passes and act as customer information centres, advertising bus schedules through newspapers and other media, setting up helplines through phones, short message service (SMS), WhatsApp, etc. (80).

The pandemic has sharpened the inequalities among different groups of public transport users, namely men, women, differently abled, pregnant women, and the elderly (83). The Government of the National Capital Territory of Delhi (GNCTD) permitted buses to run with full seating capacity and no standing passengers from 1st November 2020 (84). GNCTD plans to launch contactless ticketing for DTC and cluster buses. A second trial

[8] PMJDY was launched in 2014 by the Government of India under the national mission for financial inclusion to ensure universal access to banking facilities

[9] One United States Dollar equals 73.56 Indian Rupees

run conducted over a period of 14 days in September resulted in 51,644 tickets sold over the app, Chartr, which constituted six percent of all tickets sold during the period. Of the tickets purchased online, 79.4 % were pink tickets (tickets denoting free travel for women)(85)[10]. A user can access route details and schedule of the bus as well as the expected time of arrival (ETA) of the bus. However, these tickets and facilities can only be utilised via the app, which necessitates access to a smartphone (85).

Other cities in South Asia

Dhaka, Bangladesh

In Dhaka, 5,000 buses and mini-buses operated in the city and neighbouring districts pre COVID-19. These were supplemented by long distance buses from Gabtoli, Mohakhali inter-district terminal etc. (86). Bangladesh Road Transport Authority (BRTA) provides route permits and requires that at least nine seats are reserved for women in buses (40+ seats) and six seats in mini-buses (30 seats) (87,88). However, these rules are rarely implemented in practice (89).

Public transport was suspended on 26th March 2020, at the onset of the national lockdown. Restrictions were lifted 67 days later, on 30th May 2020, and BRTA allowed buses to operate with 50% carrying capacity and a 60% fare hike. However, fare rules were often flouted, passengers claiming that bus operators increased fares by as much as 90% (40). From 1st September 2020, BRTA allowed full seating in buses without standing passengers at pre COVID-19 fares (90). However, fare rules continued to be flouted (91). In the post lockdown scenario, no seats were reserved for women (92).

Women in Dhaka face long waiting times at bus stops, overcrowded buses, and sexual harassment (89). Reports suggest that during peak hours women are not allowed to board buses by conductors and drivers (87). BRTA launched women-only buses in Dhaka in the 1980s when it began to witness an increase in women workers. The female labour force participation increased from 18% in 1999 to 58.5% in 2016 (87,93). BRTA's initiative was unsuccessful however, due to a variety of reasons including a lack of awareness of their existence among women (87). It was relaunched in 2004 and again in 2008, however, only a few women-only buses continue operating today (87). Now, private bus services, such as Dolonchapa launched in 2018, have taken up running women-only buses in Dhaka. These buses have closed-circuit television (CCTV) cameras; however, their capacity is a maximum of 34 seats and the city road transport authority has capped the number of such buses at 30 (94). Due to a lack of awareness among the general populace, the low number of buses, and lack of distinct features that mark it as a 'women only' bus, Dolonchapa women-only buses run at a loss (95).

Kabul, Afghanistan

Public bus service in Afghanistan is primarily composed of Millie buses in urban areas such as Kabul, administered by the Ministry of Transportation. At present only 110 Millie buses (gifted by countries such as India and Italy) of the original 1,600 are in operation (96,97). Millie buses can carry 50 passengers. Other means of transport include small vans, which have a seating capacity for seven individuals, and mini buses that carry 20 persons (98). The private sector in Afghanistan accounts for 90% of public transport operations (99). 71% of motorised trips are by public transport in Afghanistan (100), with all public transport operating at 1.5 times their carrying capacity (98).

There are very few women who drive cars, motorbikes, or bicycles in Afghanistan. Between 2012 and 2016, 1,189 women obtained driving licenses and this number is steadily increasing (101). In the first half of 2019, 275 licences for women were approved (101,102). Women in Afghanistan tend to pay more for informal public transport and are also subjected to harassment and assault (102). Women constitute 25% of commuters and are predominantly in the age group of 6-14 years (102). In 2019, the pilot phase of the Pink Shuttle-Bano Bus (all-female transportation service) was launched by Nove Onlus, an Italian NGO. During the first phase, four women were trained to drive minivans for 100 preselected clients. The second phase was initiated post lockdown on 1st September 2020 (103).

Between 27th March and 21st May 2020 when lockdown was imposed in Kabul, public transport carrying more than five passengers was banned in the city (104). According to the United Nations Office for the Coordination

[10] This is counter intuitive as our counts suggested that women constituted around 30% of all passengers in buses in December 2020.

of Humanitarian Affairs, on 26th May 2020, vehicles in Kabul were only allowed to travel on alternate days depending on the last digits of their number plates (105). However, by July 2020, though government imposed COVID-19 lockdown measures were officially still in place, they were no longer being enforced (106).

Lahore, Pakistan

In Lahore the majority of public transport trips are by minivans (18-seater) (107,108). A survey of women and transportation in Lahore revealed that although overall women in Lahore travel lesser, they are 30% more likely to be dependent on public transportation such as buses, and 150% more dependent on paratransit such as auto-rickshaws than men (109). Women are further constrained by cultural norms that restrict their use of personal two-wheelers (109). Harassment of women is common in public transport, as is overcrowding, especially in wagons (a form of paratransit) which have only two front seats reserved for women. Pakistan runs women-only pink bus services in different regions (Lahore has three pink bus routes). However, they remain limited in number and geographical coverage. This makes the service infrequent and less accessible to a majority of women (109). Further, the service is unavailable in the evening and at night, which necessitates a different mode of transport for women at later hours (109). Around 40% of women felt that more pink buses are required together with measures to increase awareness on their service schedules (109).

The pink bus service in Mardan and Abbottabad comprising 14 buses donated by the Japanese government shut down in 2020 due to poor ridership and financial loss suffered by the contractors. Women in Pakistan, who are mostly accompanied by male family members, could not travel in the pink buses and opted for other means of transport (110). 'The Safe Women,' a mobile application launched in conjunction with the pink bus, shares bus routes, schedules, ETA, and allows GPS tracking of the user by pre-approved individuals. The app first introduced in 2018, was relaunched in 2020 after modifications. Adoption rate remains low due to a lack of awareness of the application, combined with women's lack of familiarity with smartphones (111).

Lockdown was imposed on 24th March 2020 by different regional governments (37). On 19th May 2020, the Punjab government released a notification directing buses to run with up to 20% reduced fares and keeping seats adjacent to passengers older than 65 years vacant (112). Public transport resumed in Balochistan on 8th June 2020 with reduced capacity (10 passengers in a 18 seater van) (113), and in Sindh on 3rd June 2020 (114).

Kathmandu, Nepal

Major modes of public transportation in Kathmandu valley include 5,305 buses and 2,000 tempos (10-15 passengers). most bus-based transport comprises micro-buses (15-20 passengers), mini and standard buses (20-35 passengers). Small private operators often run a single bus and belong to the Federation of Nepal National Transportation Entrepreneurs (FNNTE) (115). According to a study conducted by the Ministry of Physical Infrastructure and Transport, Nepal (MoPIT) and Japan International Cooperation Agency (JICA), low occupancy vehicles (LOV) account for 94% share of public transport, with large buses accounting for the remaining six percent (116). In Kathmandu, public transport accounts for less than three percent of total registered vehicles, while catering to 27.6% of the trips (116).

Overcrowding and sexual harassment are common challenges women face in public transport. A survey conducted by Clean Air Network Nepal (CANN) and Clean Energy Nepal (CEN) found that 61.7% of female respondents found buses to be uncomfortable due to overcrowding (117). Though four seats are reserved for women in buses, men often occupy these seats (118). In 2015, the Bagmati Federation Transport Union launched a women-only bus service on a single route in Kathmandu but received low patronage (119).

The Government of Nepal announced a lockdown from 24th March to 22nd July 2020. During this period public transport came to a standstill (36). The lack of public transport severely affected many farmers who were dependent on it to ferry vegetables from the suburbs to the city (120). After lockdown was lifted, buses in Nepal were permitted to carry passengers at 50% seating capacity with a 50% permissible fare hike (121). On 12th October 2020, the government decided to lift restrictions on the carrying capacity of buses.

3.2 Online round table

A brief introduction to the project was provided followed by a presentation on the findings from the literature review. The participants were then invited to share their views, opinions, and experiences regarding women and girls' mobility in the respective LMICs

The round table respondents observed that while there are differences in socio-cultural norms across the selected South Asian cities, women and girls face similar issues in public transport related to service frequency, comfort and accessibility, infrastructure, safety and sexual harassment. For RPW, the availability of transport, freedom to choose their livelihoods and earned incomes were interconnected. This necessitated differential strategies for women across income groups and work sectors. Further, the loss of incomes due to the COVID-19 pandemic made RPW financially dependent on other members of the family.

Resource poor women must be enabled to participate in the transport sector as service providers and digital technologies could be leveraged to create new avenues for income generation. There is a need to expand the dialogue from women's safety to reclaiming access to public spaces. The emphasis should be on increasing women's rights, access to opportunities, and public spaces in all South Asian countries.

Gender inequities in public transport and paratransit in South Asia, pre-COVID-19

For women, the availability of transport, freedom to choose their livelihoods and earned incomes are interconnected

Infrastructure and service challenges are due to insufficient and unorganised nature of public transport. Buses tend to be heavily crowded as the fleets are inadequate to meet the needs of the population they serve. This also results in increased waiting times. The situation is exacerbated in rural areas where public transport has lower coverage and frequency. Women are more severely affected by these deficiencies as they primarily depend on public transport for their mobility needs and on male members of the family for shorter commutes. The access to and efficiency of public transport often decides training and employment opportunities for women and therefore their incomes. For women, the availability of transport, freedom to choose their livelihoods and earned incomes are interconnected. Women also spend a higher share of their wages on transport due to lower earned incomes than men.

Reservation of seats for women in buses are rarely enforced

The limited seating capacity for women in public transport emerged as a consistent theme. In Pakistan for example, only a third of seats are reserved for women in buses. While most cities have reserved seats for women in buses, these are rarely enforced in practice as men often occupy these seats and refuse to vacate them for female passengers. Vans or shared taxis account for a major share of public transport in countries like Afghanistan. These vehicles tend to operate beyond their carrying capacity. If women do not want to sit near men, they are forced to pay double the fare.

Sexual harassment hinders women's use of public transport and is exacerbated by women's lack of affordability

Sexual harassment is the most significant issue that hinders women's use of public transport, along with other infrastructural issues such as the lack of lighting at bus stops, waiting areas not designed for caregivers and lack of pedestrian walkways and safe crossings.

Patriarchal social and cultural norms limit the geography of women and girls' access to opportunities

Social and cultural norms play a major role in restricting women's mobility in all South Asian countries, especially Afghanistan. Families and often women themselves forego employment opportunities due to late travel in the evenings and a lack of access to public transportation. This is compounded by a prevalence of stereotypical gender roles that expect women to perform most of the household and care work. Accordingly, women "choose" to work close to their homes or in areas easily accessible by public transport.

Differentiated strategies are required for women across income groups and work sectors, especially informal women workers

Even among resource poor women (RPW), the challenges in mobility vary across groups. In Delhi, street vendors are often forced to use expensive IPT as bus conductors do not allow them to board with their goods. While domestic workers usually find employment close to their residence, public transportation services for short trips are not available, thus these women tend to walk or use e-rickshaws. Public bus connectivity from residential areas to markets are also poor. This negatively affects home-based workers in Delhi. RPW also suffer when their colonies are relocated (often to peripheral areas). Loss of employment is usually accompanied by a loss of mobility due to increased travel costs and poor public transport at the peripheries.

Effect of the pandemic on the mobility of resource poor women

The loss of incomes due to the COVID-19 pandemic made RPW financially dependent on other members of the family

A significant number of informal women workers, such as construction workers, domestic workers, street vendors, and sex workers have lost their jobs due to the pandemic. The loss of incomes has resulted in these women becoming financially dependent on other members of the family. This lack of financial independence combined with the high cost of transportation in countries like Afghanistan has further restricted the mobility of women.

"Availability of transport, livelihood for women, income, freedom to choose their livelihood work, and bargain for higher pay are all complicatedly intertwined. It is a big challenge for women workers all together."- Representative of a trade union

In Mumbai, India, as the lockdown lifted and transportation resumed, women were only permitted to travel on local trains in the off-peak hours. As a result, they were forced to opt for more expensive alternate modes of transport. Primary health care workers and sanitary workers in Mumbai were expected to report for duty on time even during the lockdown and were penalised if they failed to do so. No consideration or travel cost reimbursement was provided, even when restrictions on public transport forced them to resort to expensive alternate modes. In Bangalore, India, a few private garment factories continued to provide transportation to their workers post -COVID-19.

"*In Bangladesh, workers in the garment sector[11] were forced to give up their jobs due to the lack of company provided transportation, public transportation or were laid off (primarily single women) due to problems in the global supply chains.*" *- Representative of a labour union.*

Digital technology can be leveraged to create new avenues for income generation for RPW

On the other hand, COVID-19 created new opportunities to interact with women, especially in rural and semi-rural areas. Oxfam, Pakistan explored this opportunity by experimenting with digital models of training and digital platforms to impart knowledge on life skills, vocational training, and micro-business skills. Women involved in e-commerce have flourished due to access to national, provincial, and global markets. Among women a shift from public transport to paratransit and private vehicles also occurred during the pandemic due to health and safety considerations.

Good practice approaches in enabling women's mobility and livelihoods

Various initiatives had been implemented across cities in South Asia before the COVID-19 pandemic to improve women's access to mobility and livelihoods. Travel subsidies can be provided for women or disadvantaged groups of women. In India, the Karnataka government's construction welfare board provided free annual bus passes for 1,000 workers, including 200 women workers. A free bus pass would enable saving of Rs 12,600 (172 dollars) in a year per person individually. This practice could be extended across India, as all the states have welfare boards. The Delhi government has also initiated free bus travel for women and the reservation of a compartment in the metro for female passengers.

[11] The garment and textile industry in Bangladesh accounts for 80% of the country's exports (122).

Women must be enabled to participate in the transport sector as service providers

Many countries in South Asia including India, Pakistan, Afghanistan, and Bangladesh have reservation of seats for women and women-only bus services. However, these women-only bus services suffer from poor ridership due to multiple factors including low frequency, poor coverage and poorly designed time schedules. A redesign of women-only bus operations with a large fleet of smaller buses that have drop off points close to travel destinations may improve ridership. A similar initiative is the pink rickshaws in Lahore, which are owned and operated by women. They enable women's mobility, while at the same time providing a source of income. Women can be encouraged to participate in the transportation sector in various roles such as drivers and conductors. Concurrently, they must be provided with facilities such as public toilets to enable their participation.

Task forces on women's mobility can provide bottom-up perspectives to transport operators and government officials

Task forces on women's mobility, which include representation from women workers and civil society can provide bottom-up perspectives to transport operators and government officials. There is a need to advocate the mobility challenges faced by women and concrete action taken to increase public awareness. An example is the Varan buses in Rawalpindi, Pakistan, which were painted with messages on women empowerment by a female cartoonist. There is a need to collect data on women's mobility, travel patterns, and their use of public transportation but also infrastructure and service-related issues related to public transport.

"Women can increase their rights to the city by reclaiming public transport and spaces. Access to mobility must considered a rights-based issue, rather than a protection-based issue."- Representative of a social enterprise.

3.3 Key informant interviews

The respondents of the key informant interviews were aware of the gendered inequities in transport. They underscored the disproportionate impact of public transport deficiencies and improvements on women and girls, and the need for disaggregating gender identity by age and income for a nuanced understanding of travel behaviour and constraints.

However, the notion of trade-offs between efficiency of public transportation and equity emerged, reflecting a false dichotomy. Women's access to transport was perceived as a social issue rather than exploring avenues to increase their ridership and acknowledging women's contribution to the economy through paid and unpaid work.

The concept of the pink tax was highlighted, i.e., the additional cost incurred by women in using paratransit in off-peak hours of bus schedules and the restrictions on their mobility due to patriarchal gender stereotypes and roles. We were also encouraged to explore the next preferred mode of transport for women bus users and explore which parameter affected this decision. The digital divide across gender and income can exclude marginalised groups by denying them access to information.

Differences in mobility between men and women

Improving the accessibility of public transport benefits women more than men

The differences in women's mobility, travel behaviour, and access needs are significantly different from men and can be attributed to women's role as caregivers for children and the elderly and bearing the burden of household work resulting in less work trips, low ownership and access to private vehicles, safety concerns while travelling, and less disposable income for travel expenditure.

These factors explain women undertaking more complex trips involving trip chaining, consistent travel in the off-peak hours, their mode choices and preferences for working within walkable distance of their residences. Therefore, improving the accessibility of public transport will benefit women more than men. The perimeter of employment opportunities for women is limited by access to mobility. However, it must be noted that the use of 'women' as a homogenous category is misleading. The travel behaviour and mobility of women vary across age groups and income groups.

"Women bear a pink tax, which is the extra cost borne because she is travels during off-peak hours. This often means that she must use a rickshaw instead of a cheaper alternative like a bus."– Representative of a development bank.

Mode choice is a trade-off between three categories, value of time, value of cost and value of comfort

The degree of priority of these parameters changes according to socio-economic profile. The value of time and comfort might be higher for middle and higher-income groups than the value of cost, whereas for lower-income groups, the value of cost is higher than others.

"In Delhi's context, where bus services are free, the value of time is greater than the value of comfort and convenience for women."– Representative of a development corporation agency.

Informal women workers often face additional challenges while travelling, anecdotal evidence suggests that women street vendors are often not allowed to board buses or metros with their wares. The shortfall in the public transport system is so severe that tackling the issues of marginalised sections of society within the ambit of public transport is a difficult task.

While an appreciation of the difference in travel behaviour of men and women is important, the challenge is responding to these differences in terms of policy or operational responses. It is also important to measure whether any solution implemented to promote inclusivity in services is effective in effecting the desired change.

Impact of COVID-19 on the mobility of resource-poor women

Patriarchal gender roles have exacerbated the economic and social fallout of COVID-19 on women

Evidence from past pandemics and epidemics suggests that women suffer more, because of their role as caregivers within the household as well as the type of jobs performed by women such as health care, hospitality, tourism, retail, etc. are harder hit by an infectious disease driven economic crisis. COVID-19 has amplified women's unpaid work burdens. With the widespread closure of schools and childcare facilities, the amount of time women spend on childcare has increased. While some women have had to give up their work for household and care responsibilities, many resource-poor women, especially domestic workers, have lost their jobs because of the employers' fears of transmission of the virus during their commute to work.

When there is a deficiency in bus-based transportation, vulnerable sections of the population are the first to bear the brunt. COVID-19 has had much more impact on the mobility of women than of men. Women have limited access to mobility services as public transport services are plying with restrictions since the lockdown lifted, further compounded by a lack of access to personal motor vehicles. Women usually do not have an alternative to public transport; thus, they are faced with longer waiting times. The access to public transport in a city generally has more impact on the mobility of women than men. For example, if a route is discontinued, a drastic change is seen in the workforce participation of women in that area, and it also affects their expenditure pattern.

"In Delhi, the available data suggests that the current bus ridership of women has declined to 33% from 37% in a pre-COVID-19 scenario." – Representative of an urban transport and development infrastructure company.

Walkability gained more importance during COVID-19 as it is the most feasible mode of transport since bus services are less accessible due to a combination of factors including, physical distancing, lowered frequency, perceived safety, crowding at bus stops, etc. Along with improving public transport operations, walkability factors, safety and infrastructure of the bus shelter also need improvement. Resource poor women, especially street vendors were unable to access bus-based public transportation in Delhi immediately after lockdown. Buses did not halt at bus stops where women vendors waited. Neither did they allow women to board as conductors and drivers felt they would not get paid for these trips. These findings are counterintuitive considering that bus operators get reimbursed for free pink tickets issued to women passengers.

"In the wake of COVID-19, trip distances for men have also decreased, due to the work from home scenario. However, our public transport systems are not equipped to serve short trips. Bus services are

usually designed to cater to long distance trips. Thus, it is important to think of public transport systems which are more local in nature to cater to shorter trips, such as circulators. The circulators will serve short trips within the neighbourhoods. They will benefit women as a large portion of short trips are taken by women." – Representative of a think tank.

Overcoming the digital divide

Reliability of public transport trumps availability of RTI for shorter trips

Ideally, public transport services must be frequent and reliable enough that commuters need not depend on digital information. Additionally, commuters usually do not track buses for a short commute of around 5-7 km. Intelligent Transport System (ITS) and Global Positioning System (GPS) are not useful if the waiting time of the system is longer than 30 minutes. In such situations, people may shift to paratransit which are more frequently available.

"The digitalisation of public transport can enable large scale communication to the public and reduce the risk of the virus spreading through physical contact. However, this will require commuters to have access to smartphones or some other digital device. The digital divide is not unique to gender but plays out across age and income levels more radically than across gender." – Representative from a development bank.

Improve reach of smartphones among RPW and explore dissemination techniques beyond mobile applications for wider reach

"Women's collectives must be empowered to facilitate resource-poor women's access to mobility through an approach that focuses on economic upliftment (alternatively the provision of subsidised smartphones) and subsequent imparting of technical know-how on the use of smartphones. The ownership of smartphones is a vital cornerstone of social inclusion, enabling access to information, opportunities, and entertainment."– Representative of a development bank.

Software applications can convert digital information into real time general transit feed specification (GTFS) data to a more conventional form readable on a basic phone. Real time information on local buses, the availability of seats on the bus, and the level of crowding can be shared through mobile applications. However, it is a reality that a section of the population, including RPW, do not have access to smartphones. Real-time information about public transport can be communicated through other means such as radio channels, the by-line on local TV news channels. Short message services (SMS) updates (regional language) in the basic phone can also be a useful medium. However, it is important to spread awareness about the available means of communication among commuters.

Another solution proposed was the evolution of the Aadhar card[12] or the metro card to function as a national common mobility card. This card could be used across different modes of public transport including IPT. Its functions can include the facilitation of digital transport fare payments as well as targeted subsidies to specific sections of the population. However, studies suggest that many informal women workers do not have bank accounts, ration cards, or even identity cards.

Safety at bus stops and boarding points

Explore stop gap measures to improve women's accessibility to public transport till universal accessibility is achieved

Suggestions to ensure safe boarding of passengers include defining either the front door or the back door solely for the use of women passengers with reservation of seats (up to 60%) for women near the women-only door in buses. Social distancing circles defined by gender were also proposed to ensure women are not crowded out. Increasing not only the number of women-only buses, but also the participation of women in the transport sector with more women drivers and conductors in buses is another proposal.

[12] Aadhar card (issued by the Unique Identification Authority of India) is an identity card that serves as proof of identity and proof of address for residents in India

The practice of men and women boarding from separate doors has been implemented in multiple cities in India. It will require the dissemination of information among commuters. Reservation of seats for women must be strictly implemented; seats can be reserved close to the women-only door to ensure maximum comfort for women, as well as reduce the chances of men appropriating these seats.

At present, 28 women-only buses are running during peak hours in Delhi. Women-only services are helpful if there are major issues related to women's safety. Travel with men does not seem to be an issue from a cultural perspective in Delhi. The reservation of seats and similar initiatives can only be a stopgap and public transport must get to a point where a woman or a senior citizen is safe anywhere within the bus.

Increasing fleet size is the best way to ensure universal accessibility of bus-based public transport. Possible alternatives include bringing in private bus operators on board through a public-private partnership, acquiring private buses from private operators who have shut down, and optimising the use of buses on school duty.[13] The current situation provides a window of opportunity to consider providing upgraded services in the form of premium buses with a better quality of service at a higher price, or increased capacity by providing a larger number of small buses. Premium services could attract choice users towards public transport.

Delhi government is in the process of implementing initiatives for women's safety in buses, and augmenting its fleet

Delhi needs about 6,000 more buses. DTC currently operates 3,700 buses and there are 2,000 buses operating in 17 clusters. DTC is expecting an additional 1,300 buses to join its fleet in the next six months. DTC has initiatives aimed at women's safety and security such as 28 women-only bus services, eco vans staffed by a marshal, and two traffic supervising staff with a direct communications link with the control room. DTC is also in the process of equipping all buses with panic buttons, closed-circuit television (CCTV) cameras, and Global Positioning Devices (GPS). The control room will alert the nearest eco van, as well as any other concerned department such as fire services in case of an emergency.

"The ridership of women in cluster buses rose from 21% in 2011 to 29% in 2019 and further increased from 29% to 37% after the implementation of the free bus ride scheme, indicating that affordability was one of the reasons that restricted women's mobility. However, this does not indicate an increase in the number of women travelling. Rather it could denote a modal shift among women already travelling." - Representative of an urban transport and development infrastructure company.

Mobility of resource poor women in the urban periphery

Subsidise last mile connectivity trips for RPW to compensate for poor public transport coverage

"Resource-poor women living in the periphery of cities face double isolation i.e., physical isolation compounded by a lack of transport. Coverage by public transport is low in peripheral areas, likely due to the insufficient number of buses. The problem of access to last mile connectivity and public transport is a major concern. One solution is the provision of free last mile connectivity services for resource-poor women. Travel grants and subsidies can be provided to women informal workers." – Representative of a development corporation agency.

One such option is to provide pink tickets to women to avail free rides on e-rickshaws or auto-rickshaws. Operators of these services can be reimbursed either weekly or monthly. These tickets can be provided at ration shops, milk booths, post offices, or any other government institution easily accessible to all. This will make sure the grant is utilised solely by women for travel, as direct cash transfer schemes might not be appropriately utilised or benefit women in male-headed households.

The extension of fare benefits can be across different modes. This will necessitate digital means to avoid misuse. The Aadhaar Card or ration card[14] can also be used to implement a scheme for the targeted segment. The digitalisation of services like integrated online payment, card system, etc. can open new opportunities for this extension. Similarly, the existing metro card (which can be used in buses as well) can be integrated with

[13] In Delhi, buses are diverted to perform school trips during off-peak hours

[14] Ration card entitles the holder to a ration of subsidised food, fuel and goods with respect to their household income; It also serves as a form of identification (123).

IPT, including Gramin Sewa[15], auto-rickshaws, and e-rickshaws to provide subsidies to women. The government can provide these smart cards to potential beneficiaries with the travel subsidy amount already added to it. Provision of viability gap funding (VGF) to transport operators to run services in unserved or under-served areas is another alternative. These transport operations can act as catchment service that connects to the major arterial roads to create a collector system that connects to the main artery. Alternatively, VGF can be provided by the government to IPT drivers to reduce the fare for women.

A shift from walking to cycling can potentially increase travel radius by three times

Cycling can be promoted as an alternative to public transport. Census data itself reveals a significant gender difference (Male: 20%; Female: 4% in urban India) in the use of bicycles. Initiatives that can be taken to improve women's access to bicycles include schemes to provide subsidised bicycles for girls and women in conjunction with bicycle training camps. A shift from walking to cycling can potentially increase the travel radius of women by three times.

Data for evidence-based decision making

Optimising public transport operations may amplify inequity

It was argued that the planning of bus systems involves a trade-off between efficiency and equity. The optimum utilisation of buses is dependent on whether the intention is to maximise revenue or fulfil other objectives. In case the objective is social in nature, the question arises of who will pay for the deficit generated in fulfilling such objectives.

In situations where there is a limited number of buses, they will usually be deployed in a way that makes maximum financial sense to the bus company. The level of utilisation of buses must be gauged to check if they are well used, based on which it can be decided whether to adjust bus routes to serve underserved areas.

Thus, when defining the cost of service, it is important to consider whether the city can afford this level of service as well as understand the likely demand for the service, to optimise the network. Isolated areas in the city must be surveyed for unknown or latent demand, with targeted surveys for understanding the quantum of demand and travel behaviour.

Evidence based data essential to drive reforms in public transport operations

"While planning a bus system, revealed preferences must be prioritised above stated preferences." – Representative from a development bank.

Data to enable evidence-based decisions must include information on the mode choice, and secondary mode choice in the absence of their preferred mode. This data can be substantiated with information on public transport ridership and metro card ownership. Data on generation points for buses would prove invaluable to bus service providers. With respect to data that can inform initiatives to improve female ridership, information can be collected on the perception of safety in public transport along with perception surveys and qualitative assessments of the mobility needs of women. Access to mobile phones may prove essential as many transport related services move to a digital platform. In terms of public transport operations post COVID-19, data on sex-disaggregated mobility pattern, which includes information on journey time, travel cost, work profile can be used to inform both short term and long-term measures in response to the pandemic. Surveys should also capture the preferences of women on their preference for the type of incentives. Evidence based data is required to inform transportation reforms and influence decision makers.

[15] They are high capacity three-wheelers and similar other vehicles with seating capacity of six passengers which ply in the Rural areas, unauthorised, resettlement colonies and informal settlements of Delhi (124).

4. Quantitative data findings

4.1 Survey analysis of resource poor women

Summary of research findings: difference in mobility between resource poor women and other income groups

Online survey respondents (OSR) earn 2.7 times the income of RPW

The telephone and online surveys targeted women who use public and paratransit in Delhi. Our group of RPW workers were domestic workers, street vendors, home-based workers, health and construction workers, or those who worked in grocery stores. The OSR included data entry personnel and teachers. A majority of RPW belonged to Scheduled Castes (45%), whereas OSR were predominately from the general category (46%). Most of the RPW were illiterate (65%), whereas all the OSR respondents were literate with the majority pursuing or having completed their bachelor's degrees. The average monthly income of OSR was 2.7 times that of the RPW. RPW also belonged to larger households with fewer earning members as compared to OSR who had an average household size of 4.9 with two earning members.

More than four-fifths of RPW households are dependent on public transport; travel pattern of RPW differ significantly from that of OSR

Over 84% of RPW households did not own a vehicle. Of those that did, less than two percent of RPW had access to a vehicle compared to one third of OSR, making this group of women workers disproportionately vulnerable to public transport deficiencies.

The travel patterns of RPW differed significantly from those of OSR. The current per capita trip rate (PCTR) for RPW was close to their PCTR before the pandemic[16]. For OSR, the PCTR before the COVID-19 pandemic was 2.07, which reduced by 20% currently. The reduced PCTR can be attributed to the occupation profile of OSR, who can work from home or make fewer work-related trips, compared to RPW. Pre-COVID-19, 20% of all trips made by OSR were for non-work-related travel, compared to 10% for RPW.

The peak travel time for RPW was between 11-12 am in the morning and 2-3pm in the afternoon. This was different compared to the overall peak times for the OSR and other bus passengers, which were between 9-10am and 5-6pm. During morning and afternoon peak hours, paratransit catered to 57% of trips by RPW workers. The average trip distances for RPW varied from 6-8.5 km by buses and 6.3 km by paratransit. However, 40% of trips by paratransit were less than 2.5km. This could imply that these women workers used paratransit due to the lack or poor frequency of buses to their destinations. Tellingly, paratransit was the next preferred mode for 86% of RPW workers.

The different travel patterns of RPW and OSR may also be explained by their type of work. While RPW worked seven days a week compared to six days a week for OSR, they both worked similar hours per week (46 hours). This indicates more dispersed work hours for RPW compared to the OSR, who were likely to have 9am-5pm jobs. Over 99% of the trips by RPW were for work purposes, compared to 97% for the OSR. This implies that in December 2020, working women in Delhi did not travel for leisure or any other purpose.

Walking is the primary mode of first and last mile connectivity for both groups of women. RPW also travelled shorter distances at 8.5km compared to the OSR who on an average travelled 10.5km, either due to their occupation profile or that their perimeter of work opportunities was limited.

Buses failing to halt and lack of enforcement of reserved seats are among the major concerns for RPW

RPW's concerns regarding bus-based travel persisted before COVID and in December 2020. They stated that buses did not halt for them after the free ride scheme was introduced (21%), followed by lack of enforcement of reserved seats for women (17%) and poor frequency of services (16%). The only difference from the pre-COVID-19 scenario was crowding in buses (21%) was not a concern post-COVID-19 (7%). Conversely, the major concerns for the OSR in the December 2020 were lack of information on the real time arrival of buses (21%),

[16] There may be an underreporting of trips in the pre-COVID scenario due to recall issues.

poor frequency of services (20%), long queues at the bus stops and inability to board the bus (18%). This was also consistent with their concerns regarding bus-based travel pre-COVID-19.

The high levels of illiteracy have potential ramifications for RPW workers when it comes to accessing information about public transport, especially when considering that one-fourth of RPW did not own any phone, and 10% had access to a shared or personal smart phone. This is in direct contrast to the OSR, 94% of whom possessed smart phones. This implies that policies and strategies aimed at providing real-time information (RTI) on public transport or disseminating information need to consider the low penetration and knowledge of using smart phones. Moreover, a majority of both RPW and OSR are unaware of the Chartr application indicating the need for a dissemination policy targeted towards (different groups of) women.

In Delhi, 79% of RPW did not work during the lockdown, and their time on household and care activities increased by 55% (to an average of 5 hours per day) during the lockdown. Overall, we estimated a loss of INR 754 crores during the 68 days of lockdown. The comparison between RPW workers and OSR indicates that the former are more vulnerable and requires differentiated and targeted post-COVID-19 mobility support. Thus, the next section focuses solely on RPW workers.

4.1.1 Demography

Age, marital status, and head of households

In our sample, 63% of the respondents were between the age groups of 18-39 years (Figure 7: Age groups). In 2011 69% of women in urban Delhi fell in this age bracket (54).[17] Additionally, 96% of our sample were married (Figure 8), compared to 51% for urban Delhi (54). Around 9% of the households identified as headed by a female member (Figure 9), compared to 10% for urban Delhi. Most households (27%) have 5 members (Figure 10) with an average of 1.83 earning members, whereas the average household size in urban Delhi was 4.9 (54).

Figure 7: Age groups

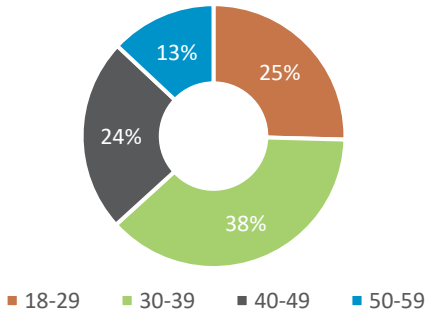


Figure 8: Marital status

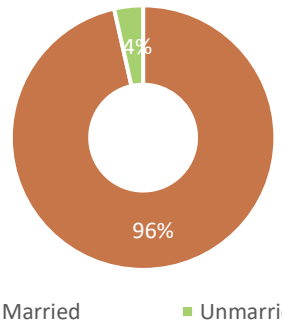


Figure 9: Head of household

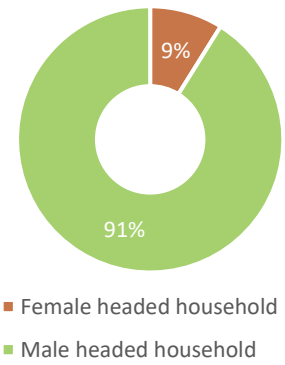
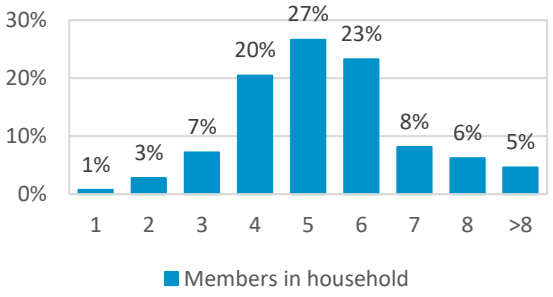
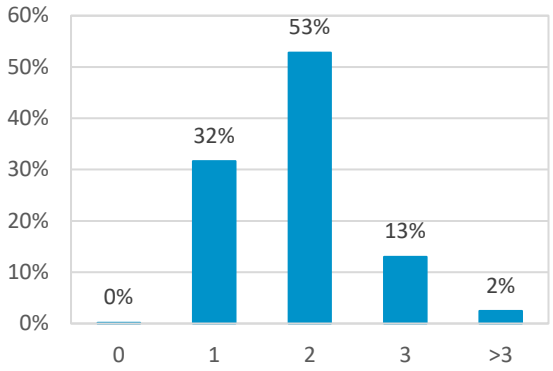


Figure 10: Number of members in household



[17] All data for Delhi is taken form the 2011 census

Figure 11: Number of earning members



Religion, caste, education and occupation

Of the overall respondents, 90% identified as Hindu and 10% as Muslim (Figure 12), whereas urban Delhi has 81% of individuals identifying as Hindus and 13% as Muslims (54). Those belonging to Scheduled Castes (SC) account for 45% of our sample (Figure 13), which is significantly higher than the SC population in the slums in Delhi (27%) (54) and in urban Delhi (17%) (54). In our sample, 65% of respondents identified as illiterate (Figure 14), compared to the female literacy rate in Delhi slums (59%) and urban Delhi (80.9%) (125). More than half (56%) RPW identified as regular salaried employees[18] and 21% as own account workers (Figure 15). Most of the women are in the following professions: domestic workers (49%), street vendors (12%), home-based workers engaged in bangle-making (6%). Some of the other professions include shop workers, daily wage labourers, tailors, waste collectors.

Figure 12:Religion

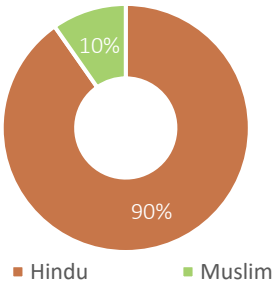


Figure 13: Caste

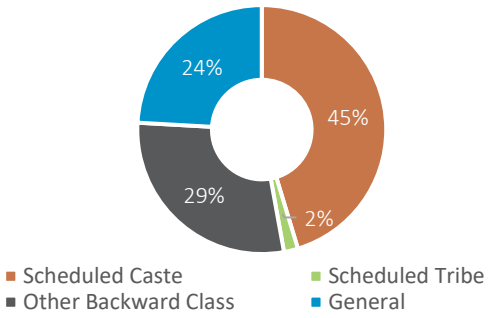


Figure 14: Education

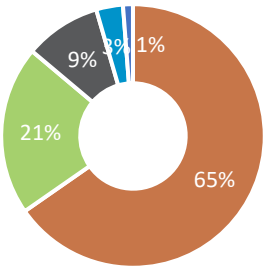
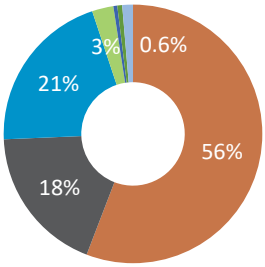
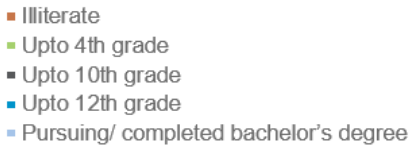
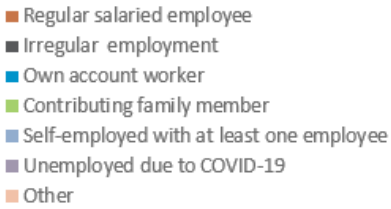


Figure 15: Occupation



[18] Most domestic workers have identified as regular salaried employees.





Possession of ID cards and bank accounts

Over 99.9% of respondents possess Aadhar cards, which is an identity card that serves as proof of identity and proof of address for residents in India (126) (Figure 16). The percentage of RPW who possess Below Poverty Line (BPL) cards is low at 9%. About 88% of respondents have personal bank accounts while 1% have both personal bank accounts and joint bank accounts (Figure 17).

Figure 16: Possession of ID cards

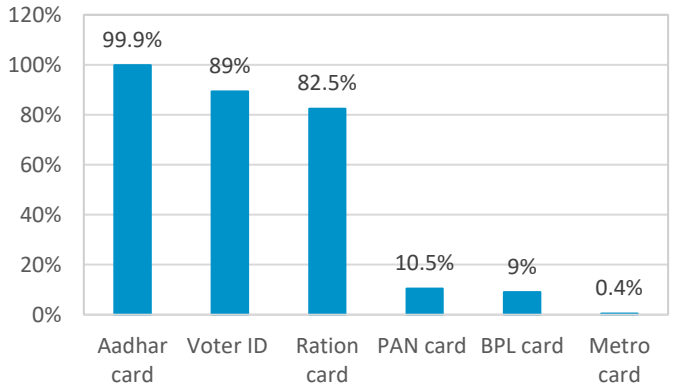
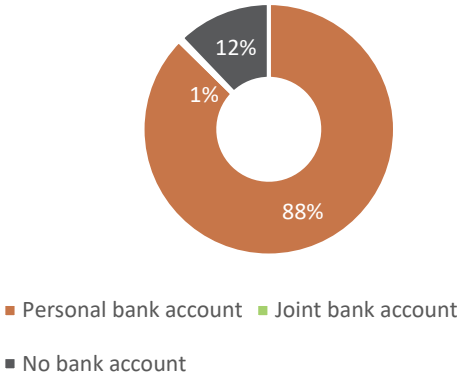


Figure 17: Possession of bank accounts



Individual and household income

The average income of RPW is INR 6,180 per month, while the median income is INR 6,000. About 60% of respondents earn between INR 5,000-7,499 (Figure 18). At the household level, the average income is INR 12,135 per month. One fourth of the RPW reported monthly household incomes between INR 10,000 to 12,499 (Figure 19).

Figure 18: Individual income (INR)

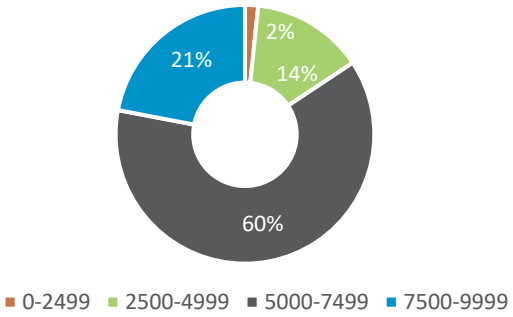
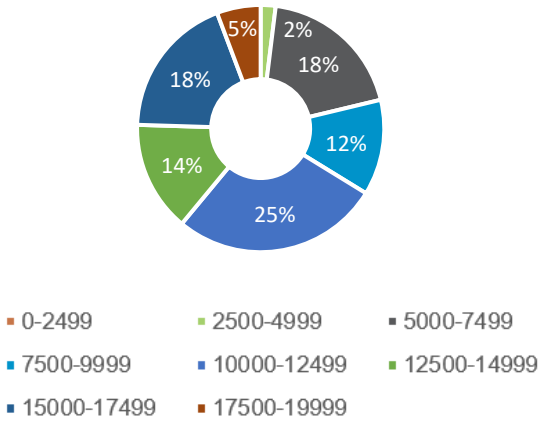


Figure 19: Household monthly income (INR)



Household vehicle ownership, possession of driving license and personal use of household vehicle

Over 84% of households do not own a vehicle (Figure 20), and only 0.4% of RPW possess a driving license. The lack of ownership and access to personal vehicles(Figure 21) along with exceptionally low registration for driving licenses, makes RPW disproportionately dependent on public transport and paratransit.

Figure 20: Household vehicle ownership

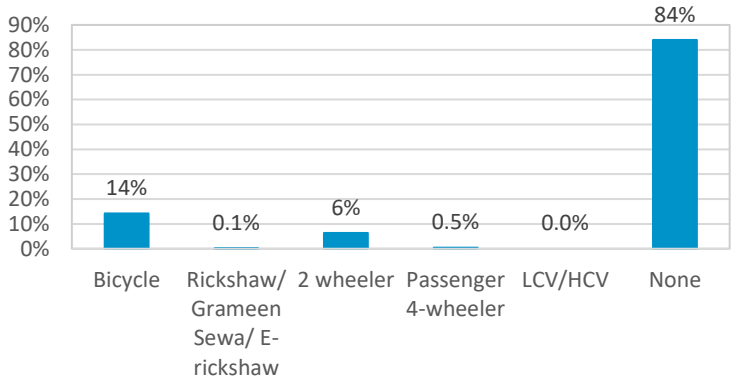
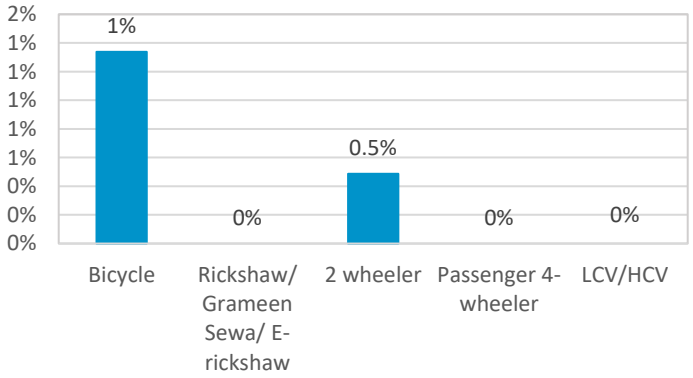


Figure 21: Household vehicles for personal use



Working hours and days

During the lockdown in May 2020, 79% of the RPW did not work and we estimated a loss of INR 754 crores during the 68 days of lockdown. At the time of the surveys, RPW were working close to the same number of hours as in a pre-COVID-19 scenario (Figure 22). However, six percent more women were working between 3-5 hours currently as compared to the pre-COVID-19 scenario.

Figure 22: Working hours

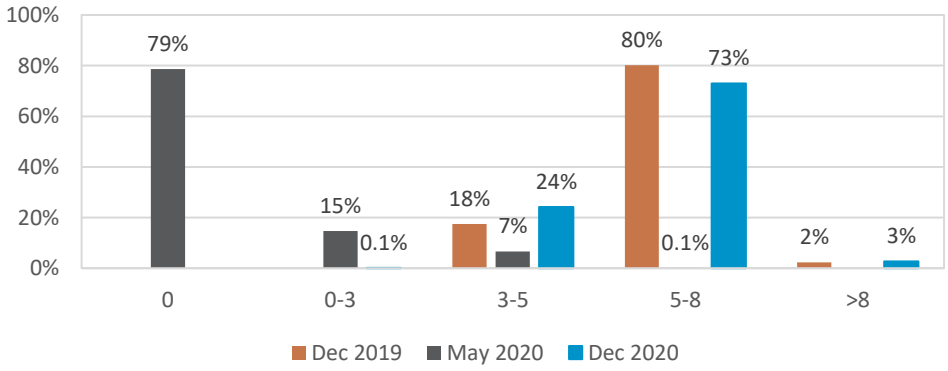
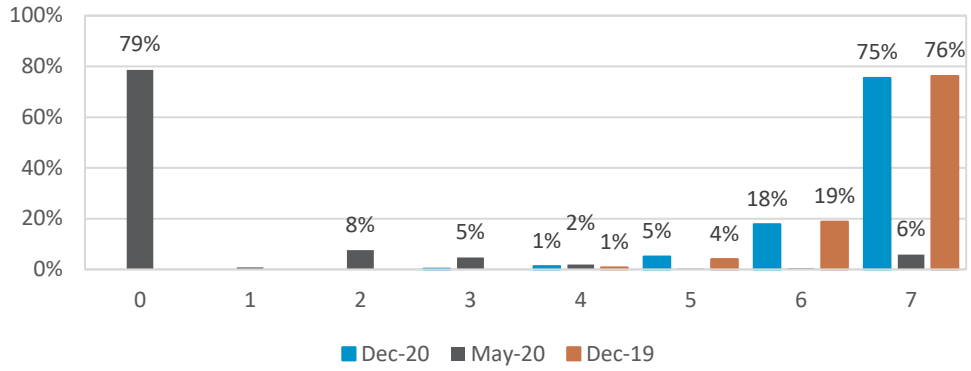


Figure 23: Working days



Household and care work

RPW spent an average of five hours in May 2020 in household and care work, which had reduced to three hours in December 2020. Over 95% of RPW bore the responsibility of household and care work seven days a week across all time periods (Figure 24,Figure 25).

Figure 24: Hours spent on household and care work

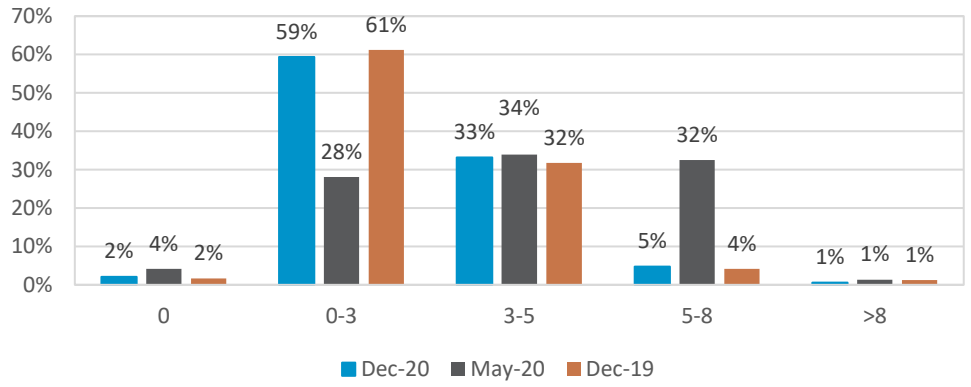
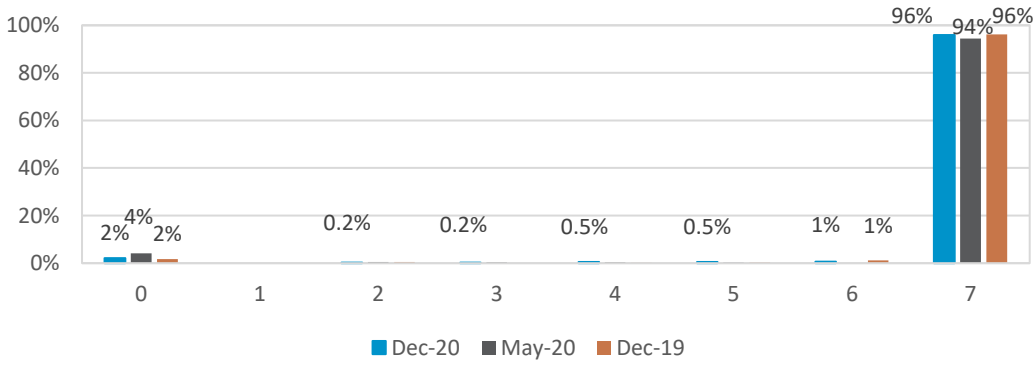


Figure 25: Days spent on household and care work per week



4.1.2 Phone ownership and usage

Over 76% of RPW had access to a phone, with 38% having access to a basic personal phone (Figure 26). Only 10% of RPW had access to a smart phone either personal or shared. Around 75% of RPW used phones to make and receive calls/ SMS (Figure 28). Only 2% of RPW knew how to make digital payments on their phone and 7% were familiar with installing applications and using them (Figure 29).

Figure 26: Type of phone

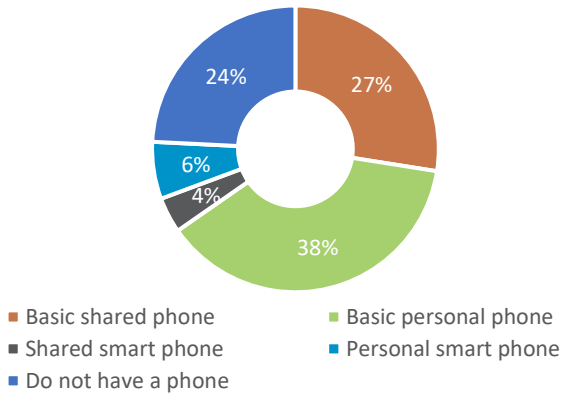


Figure 27: Switch off data while travelling

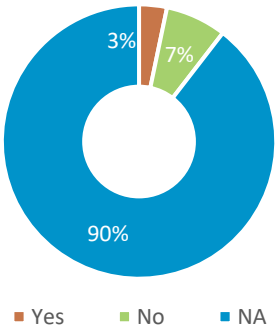


Figure 28: Phone usage

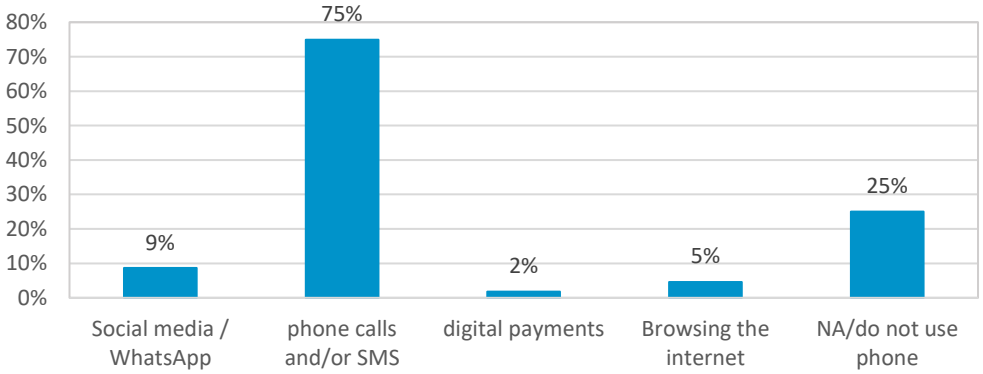
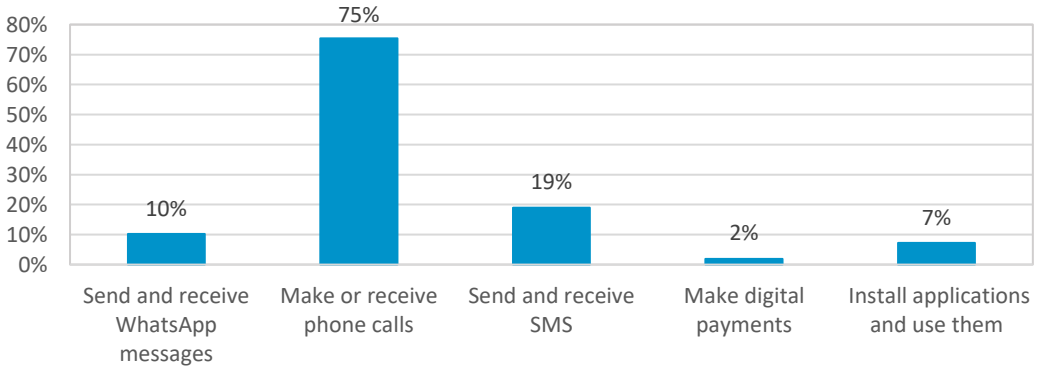


Figure 29: Phone usage and know how



Frequency of use of DTC and Chartr applications

Over 71% and 72% of RPW are unaware of the DTC application and Chartr application respectively, indicating the need for targeted dissemination of information.

Figure 30: Frequency of use of DTC app

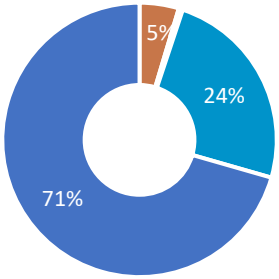
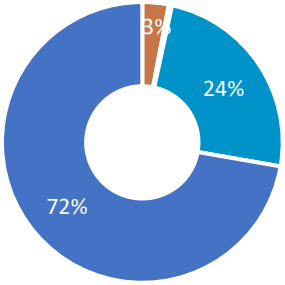
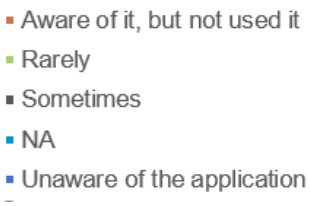


Figure 31: Frequency of use of Chartr app





4.1.3 Travel Behaviour

Travel behaviour for the month of December 2020 has been described in the section below:

Per capita trip rate, trip frequency and travel purpose

The per capita trip rate (PCTR) is 1.9. About 72% of all trips are made seven days a week (Figure 32). While 99% of all trips made are work related trips (Figure 33). The RPW did not make any household and care trips during this period. This could be attributed to the household and care trips being performed by men because of the pandemic. Due to majority of trips being work related, the data has been categorised as work and non-work trips.

Figure 32: Frequency of trips by days per week

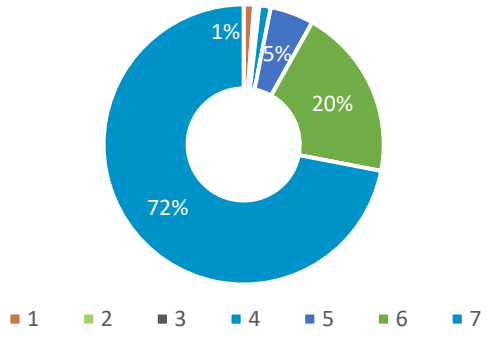
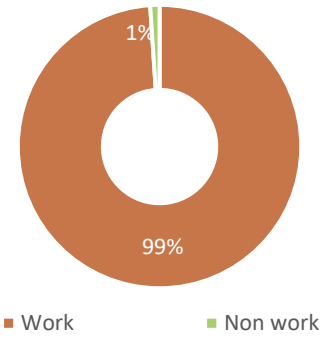


Figure 33: Travel purpose



Travel mode and first and last mile connectivity

One of the criteria for the selection of RPW for the survey was that they were public transport users. Thus, the predominant mode of transport is bus-based transport, that accounts for 81% of all trips followed by shared autorickshaw/e-rickshaw/Gramin Sewa at 16% (Figure 34). A travel purpose disaggregated analysis of travel modes indicates that 80% of work trips are undertaken by bus and 19% by IPT. Most RPW walk to access their primary mode of transport with walk trips accounting for 93% of all first/last mile connectivity trips (Figure 35).

Figure 34: Travel mode

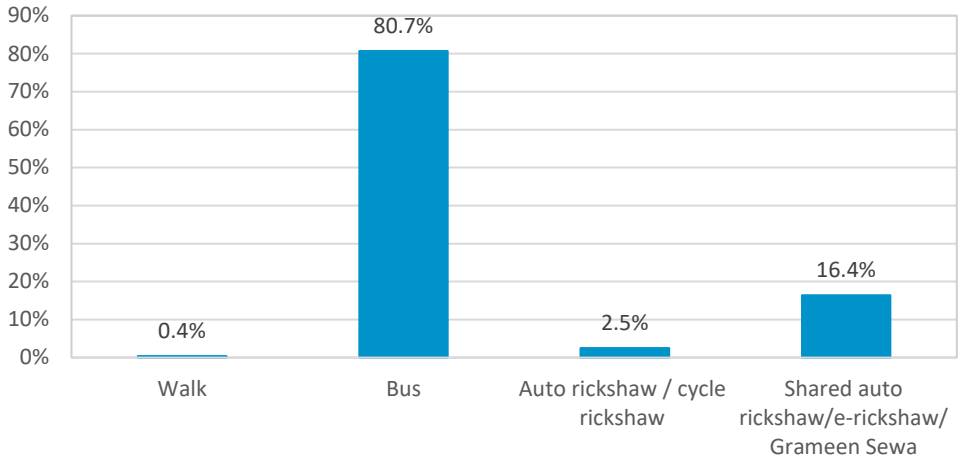
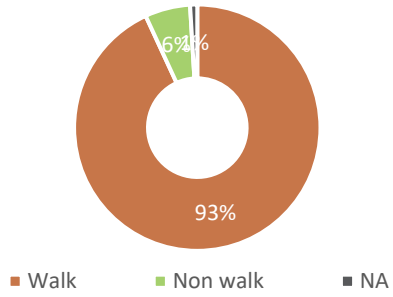


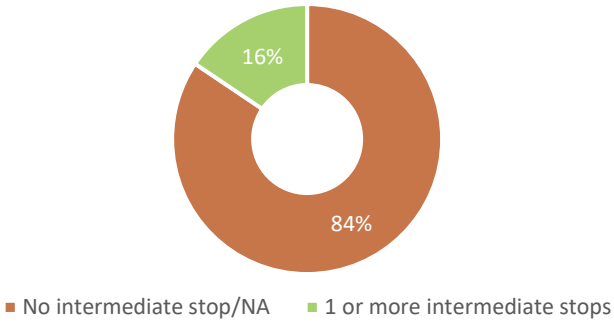
Figure 35: First/last mile connectivity



Intermediate stops

RPW report 16% of trips with one or more intermediate stops (Figure 36). While this number may be considered low, a plausible reason could be that the RPW do not make many household trips as stated earlier.

Figure 36: Intermediate stops



Trip timings

Approximately 12% of women travel between 11am-12pm in the morning and 11.6% between 2pm-3pm, making these the peak travel times for women (Figure 37). However, the peak hours of female bus passengers were observed between 9am-10am and 4pm-6pm for routes traveling towards the city and 9am-10am and 2pm-3pm for routes operating away from the city.

DTC and cluster buses have 35 seats in AC buses and 40 seats in non-AC buses, of which 25% are reserved for women. Therefore, nine seats in air conditioned (AC) buses and 10 seats in non-AC buses are reserved for women. There were 7 female passengers between 9am-10am and four to six pm for routes traveling towards

the city. On the other hand, there were six passengers between 9am-10 am and eight passengers between two-four pm for routes operating away from the city. However, it must be noted that reservation of seats was not strictly enforced after bus services were resumed and women expressed inability to board buses once the seating capacity was full.[19]

Figure 37: Trip mode by time and RPW passengers

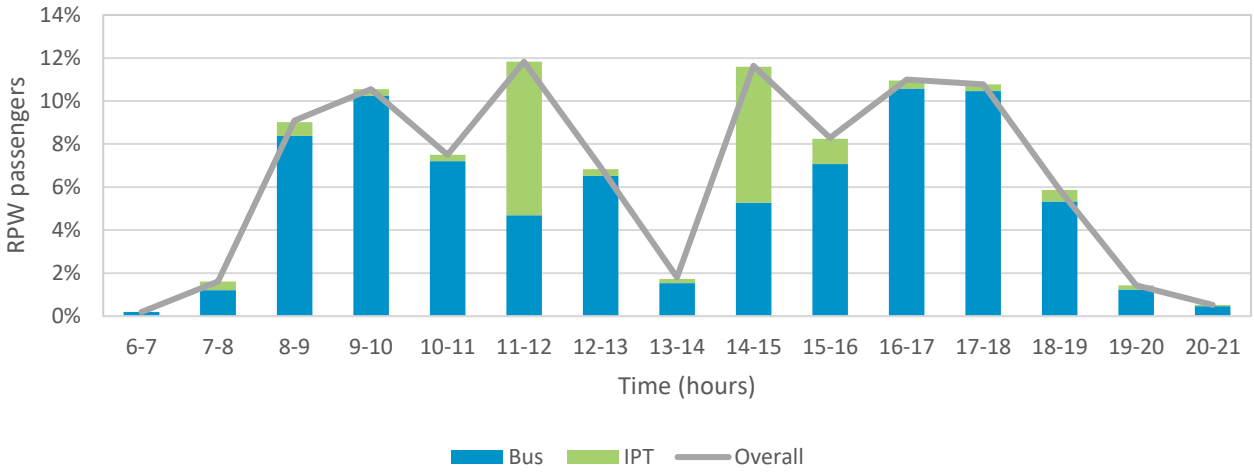
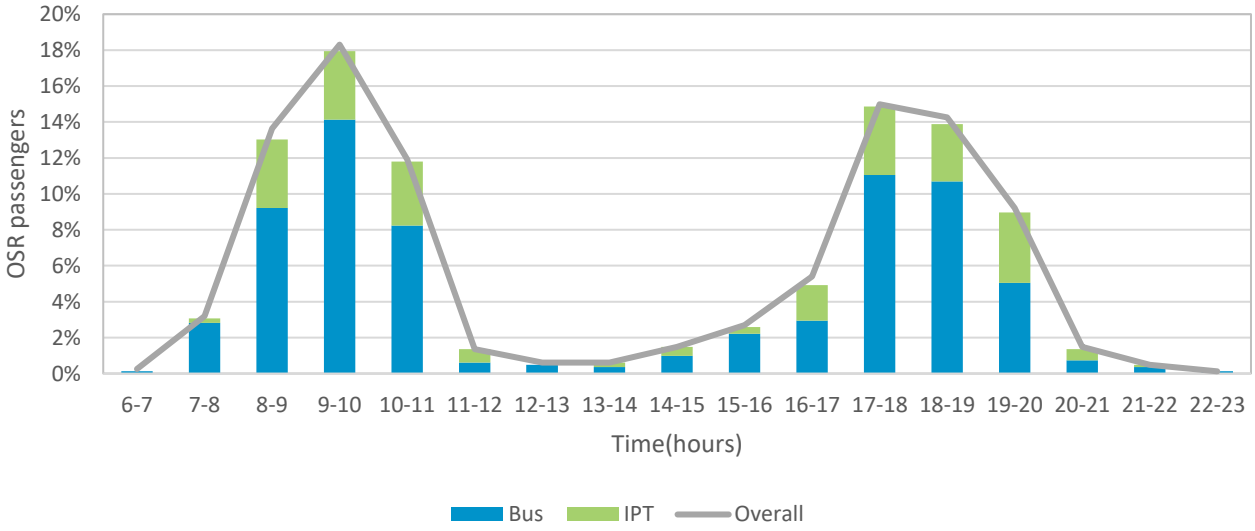


Figure 38: Trip mode by time and OSR passengers

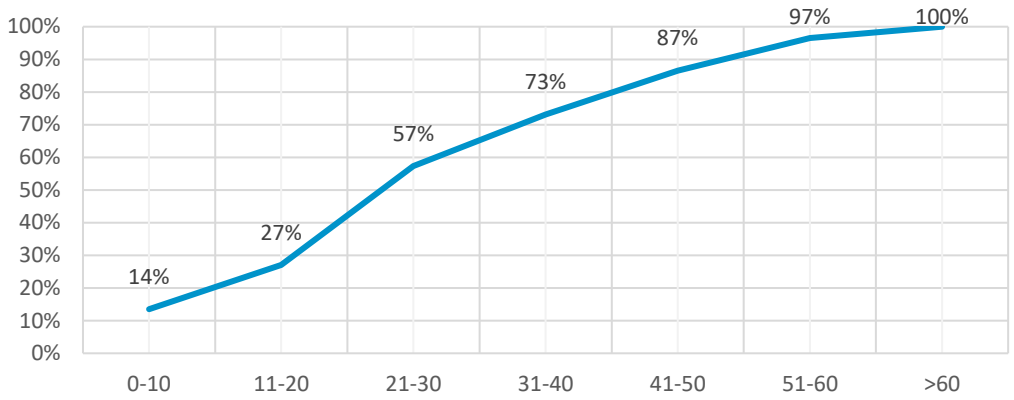


Travel duration of trip

Around 73% of the trips have a travel time of 31-40 minutes (Figure 39). The average trip time is 34 minutes, which is lower than the mean trip time for OSR. This indicates that RPW prefer to work closer to home either to reduce travel cost or travel time.

[19] Buses permitted full seating capacity and no standing passengers.

Figure 39: Travel duration (minutes)



Travel cost

In December 2020, 79% of RPW did not incur any cost for travel (Figure 40), which could be attributed to Delhi's free bus ride scheme for women. Considering the share of travel cost as a percentage of individual monthly income: 10 % of the RPW spent between 0.1 and 4% of their monthly income on travel (Figure 41). Around 36% of paratransit users spent INR 10 per trip.

Figure 40: Travel cost per month (INR)

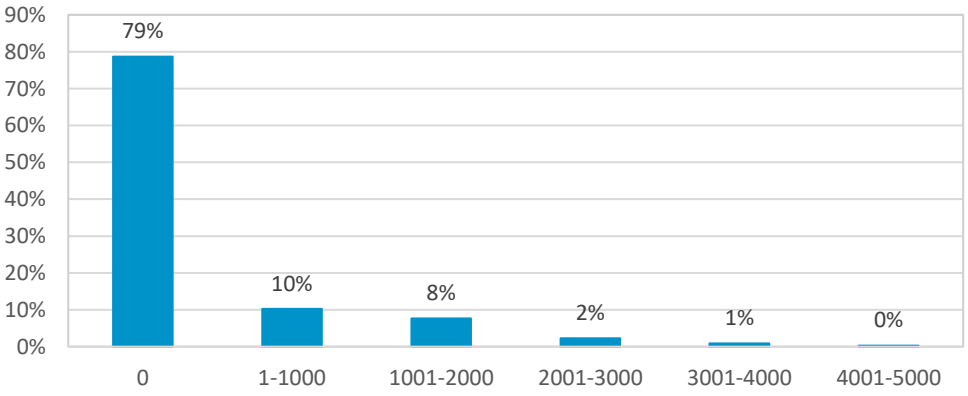
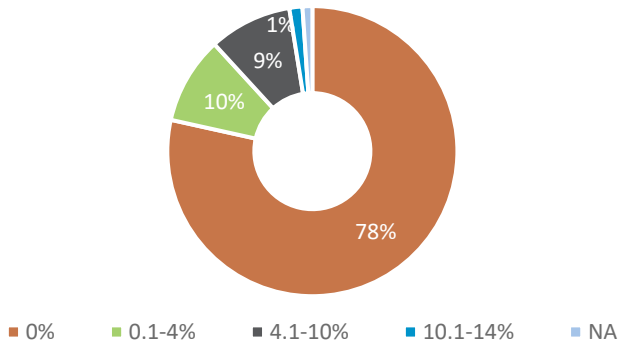


Figure 41: Share of travel costs as a percentage of monthly income



4.1.4 Travel behaviour pre-COVID-19

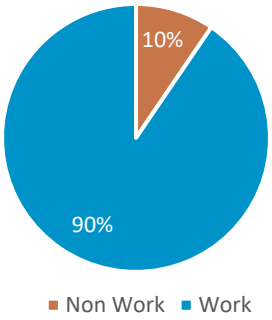
Travel behaviour of RPW in the period of December 2019 is analysed in the following section

Trip purpose and PCTR

Pre-COVID-19, RPW made twice the number of work trips per day when compared to household and care trips. On a weekly basis, 90% of all trips made by RPW were work trips, whereas household and care trips accounted for eight percent of all trips (Figure 42). This implies that while work trips are a daily occurrence, other trips are not. A more serious implication is that women in Delhi make very few non-work-related trips, restricting their travel to essential purposes.

The PCTR for RPW pre-COVID-19 was 1.88[20], which was marginally lower than their current travel PCTR of 1.90. This could be attributed to our sample, wherein 49% are domestic workers. In-depth interviews suggests that domestic workers who have lost previous employment were working multiple jobs to make up the loss in incomes. In December 2020, RPW worked 44 hours per week, which was 5% lower than pre-COVID-19.

Figure 42: Trip purpose pre-COVID-19

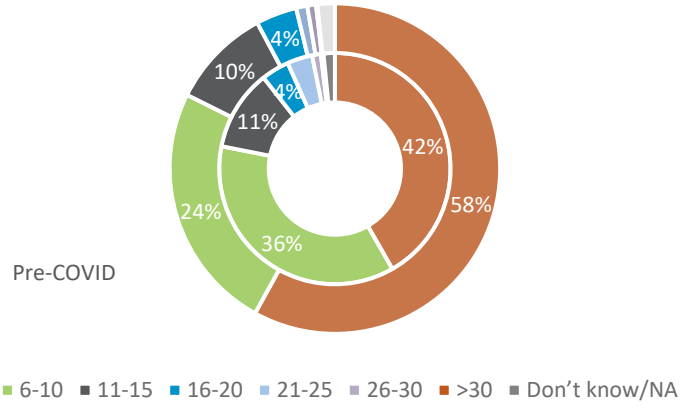


4.1.5 Waiting time

Waiting time for bus pre-COVID-19 and currently (December 2020)

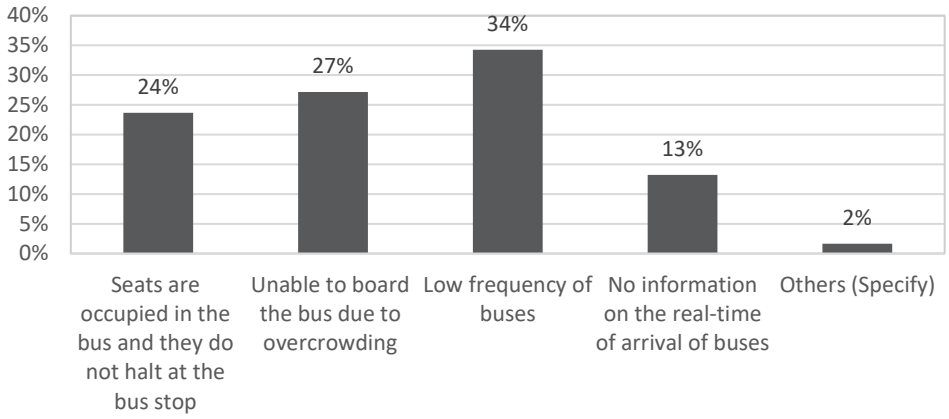
About 22% of the RPW reported waiting for more than 10 minutes for a bus (Figure 43). RPW cited low frequency of buses (34%), inability to board buses due to overcrowding (27%) and buses not halting at the stops (24%) as the reasons for the increased waiting time (Figure 44).

Figure 43: Waiting time pre-COVID-19 and currently (minutes)



[20] This could be underestimated by the respondents due to recall issues.

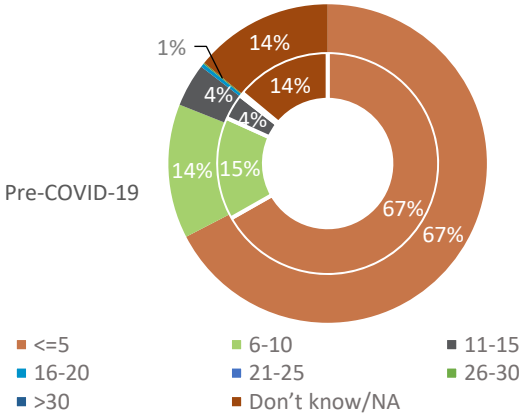
Figure 44: Reasons for increased waiting time for buses



Waiting time for paratransit pre-COVID-19 and currently (December 2020)

RPW reported marginal variations in the waiting times for paratransit before and after the COVID-19 pandemic (Figure 45).

Figure 45: Waiting time for paratransit (minutes)



4.1.6 Next preferred mode of transport

An overwhelming 86% of RPW preferred paratransit as their next mode of travel after buses (Figure 46). The waiting time and availability of service emerged as a critical parameter as 70% of RPW reported waiting less than five minutes for paratransit compared to 42% for buses (Figure 47). Over 13% of RPW did not select another mode, suggesting that they may not consider another alternative to buses (perhaps due to affordability concerns). However, 25% of RPW spent less than INR 10 per trip, with 21% paying between INR 11-20 (Figure 49). Travel costs could emerge as a barrier in using paratransit, as 79% of RPW do not incur any travel costs and may continue to (walk and) travel by buses.

Figure 46: Next preferred mode

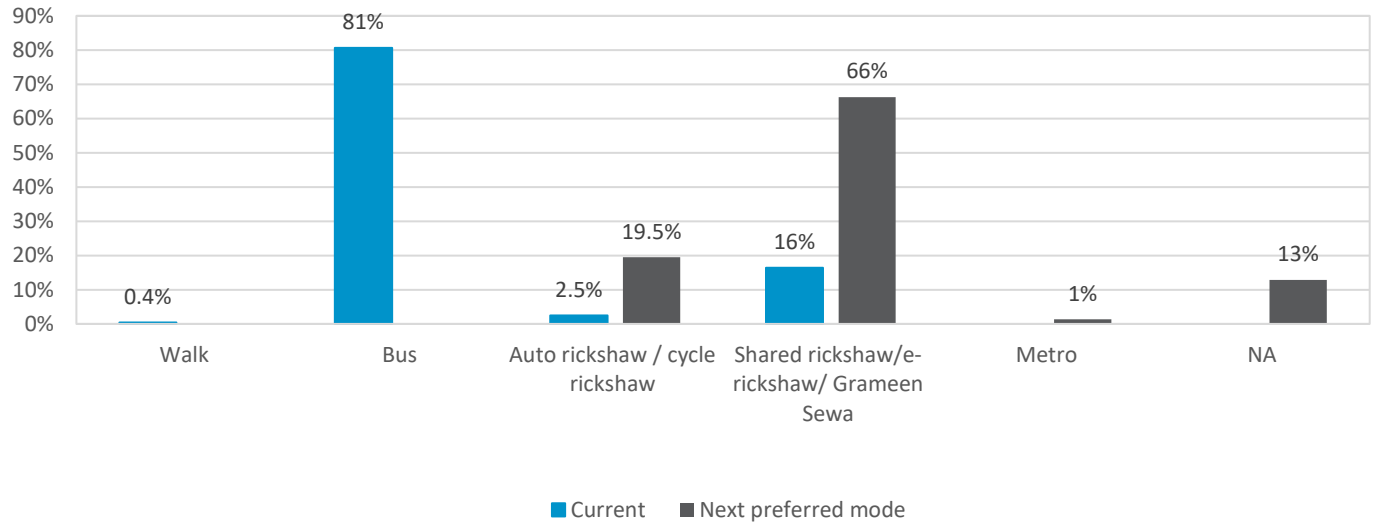


Figure 47: Waiting time (minutes)

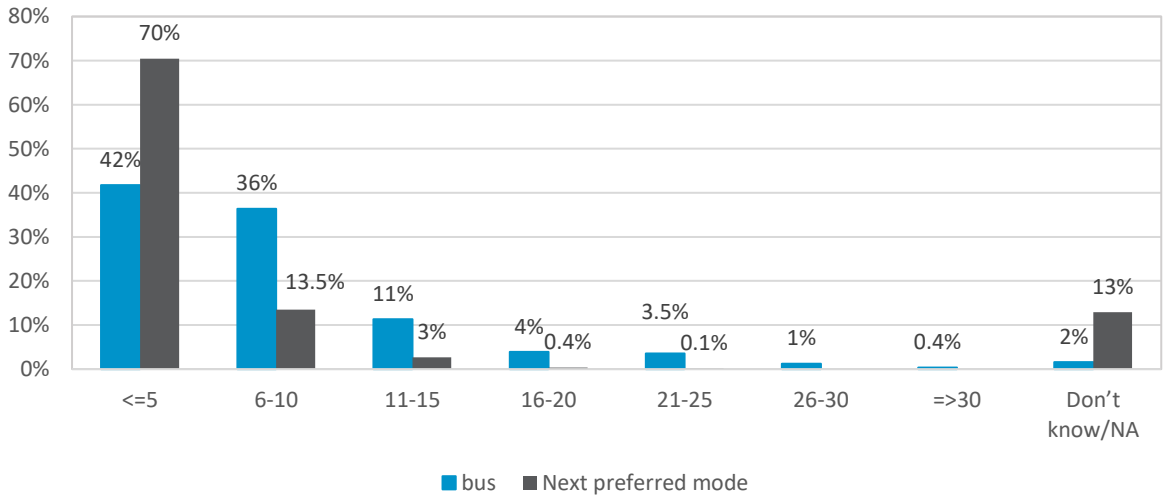


Figure 48: Average travel time per trip (minutes)

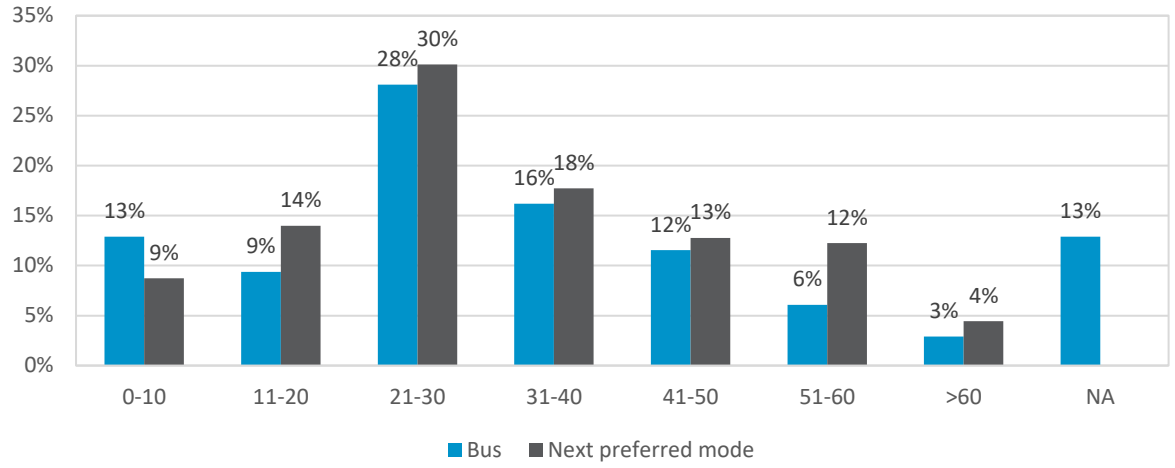
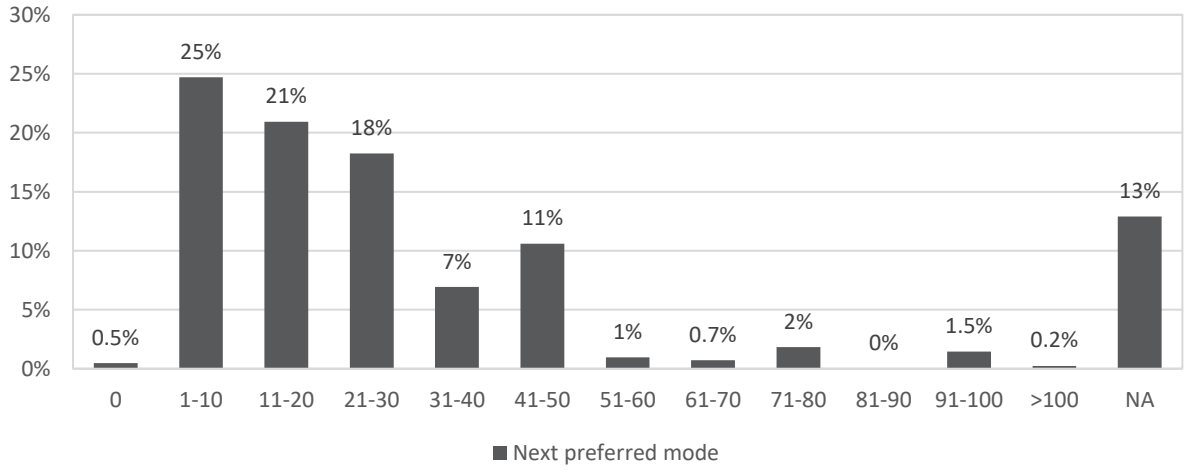


Figure 49: Average travel cost per trip (INR)



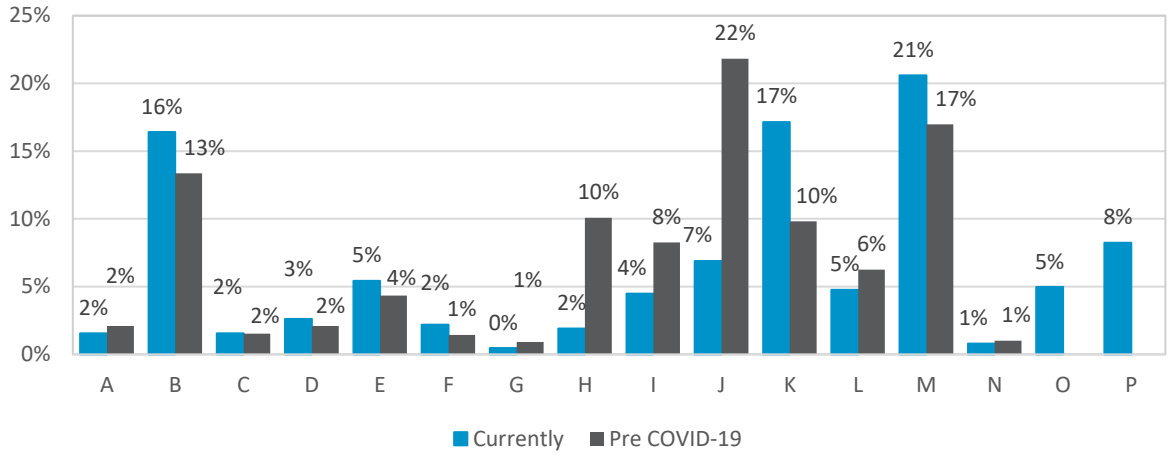
4.1.7 Concerns regarding travel by buses and paratransit

There was a continuum in the concerns expressed by RPW regarding bus and paratransit travel before and after the COVID-19 pandemic. The three major concerns in December 2020 were that buses did not halt for women (21%), reserved seats for women were not enforced (17%) and poor frequency of bus services (16%). These persisted from before the pandemic, with one exception: crowding in buses Figure 50,Figure 51).

The concern around buses not halting for female passengers was attributed to the free bus ride scheme. A street vendor said, "*bus drivers don't allow us to board the bus with your bundles. He doesn't even halt the bus for us. We have to go very early in the morning because the buses remain vacant in the morning. That is why we get seats. If we get late and try to take a bus after 12, the bus drivers won't allow us to board. Bus drivers don't allow us to board buses for long distances.*"

A counter-intuitive observation was that more women expressed their inability to board buses pre-COVID-19. This could be linked to their concerns regarding crowded buses in general, and a possible shift to paratransit in their peak hours, currently. Similarly, rash driving was expressed as a major concern by RPW, followed by the low availability of shared services and overcrowded shared rickshaws/ Gramin Sewas.

Figure 50: Concerns regarding bus-based travel



A: Buses do not serve my area

B: Buses have poor frequency

C: Safe pedestrian access to and from the bus stop

D: Availability of first and last mile connectivity options

E: No information on the real-time arrival of buses

F: No bus stops or poorly maintained bus stops with inadequate lighting

G: Sexual harassment faced at the bus stop

H: Long queues at the bus stops, and inability to board the bus

I: Insufficient or unavailable clean hygienic toilets in proximity to bus stop

J: Buses are crowded/filled to seating capacity

K: Reserved seats for women are not enforced

L: Sexual harassment faced inside the bus

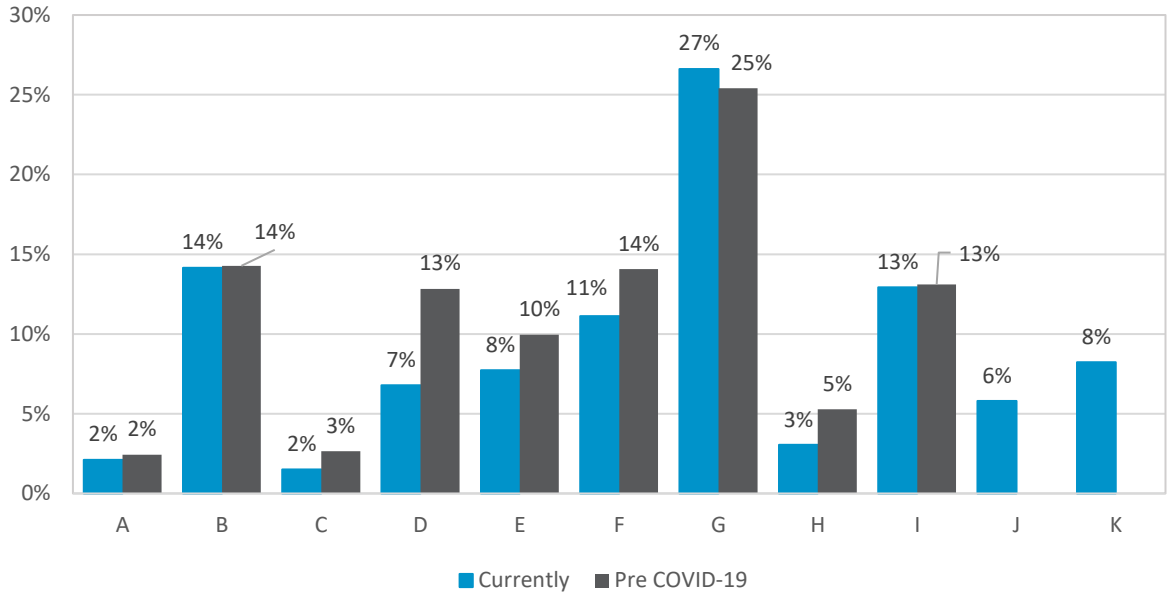
M: Driver does not stop the bus for women passengers due to free service

N: Na/other

O: Driver/ conductor does not wear a mask

P: Co-passengers do not wear a mask

Figure 51: Concerns regarding paratransit travel



A: IPT does not serve my area
B: Low availability of shared IPT
C: Poor quality pedestrian infrastructure access to and from the shared IPT stand
D: IPT drivers do not follow the meter
E: Increased rickshaw/ Gramin Sewa fares due to the pandemic
F: Shared rickshaws/ Gramin Sewas are overcrowded
G: Rash driving by the shared IPT vehicle driver
H: Sexual harassment in the shared IPT vehicle
I:NA
J: Co-passengers do not wear masks
K: Driver does not wear a mask

4.2 Survey analysis of paratransit drivers

Summary of survey with paratransit service providers

Paratransit operators predominantly belong to marginalised castes (47% belong to OBC) and are all married with more than half of them being the sole earning members in their household. Their current monthly income is between INR 17,700 - 35,000. In December 2020, they were earning three-fourths of their income before the COVID-19 pandemic which was between INR 23,000 - 45,000.

The COVID-19 pandemic had severe repercussions on the operations of IPT service providers. While they had resumed working for 11-13 hours per day and operating kilometres had increased by 11%, their daily ridership was 75% of pre-COVID-19 scenario. We estimated that paratransit operators lost around 240-260 working hours in a month during the lockdown. The number of passengers reduced by 13% compared to pre COVID-19 numbers. An estimated two lakh registered paratransit vehicles lost approximately INR 1,741 crores in nine months since 24th March 2020.

Comparison of male and female e-rickshaw operators

The comparison of male and female e-rickshaw drivers revealed that Vahinis' routes are 46% shorter, they work at least 2.5 hours lesser, serve 27% fewer passengers and earn 28% less than male operators (Table 10). Vahinis make 72% of what a male e-rickshaw operator earns in a day. This loss can be attributed to a safety, household, and care tax i.e., women are constrained by unremunerative household and care work, and are often constrained in carrying four passengers due to misbehaviour by male passengers, sitting in the front with the driver. This amounts to a loss of approximately INR 5,000 per month.

Findings related to qualitative analysis

The compliance to COVID-19 safety protocols was found to be poor as the IPT operators found it expensive to sanitise their vehicles after every ride. Plastic sheets separating the driver from the passengers were not installed and drivers generally wore masks below their noses. While male e-rickshaw operators maintain that women feel safe in their vehicle, they admit to rash driving. This corresponds to the survey finding that rash driving is the most pressing concern for women passengers. Conversely, Vahinis report facing sexual harassment from male passengers sitting in the front. While a few Vahinis possess smartphones, these are shared with household members and used for online classes for their children. Two of the Vahinis have registered on an app-based e-rickshaw booking platform called Oye!

Table 9: Current operational characteristics of male paratransit operators

	Average	Ranges
Route length (km)	13	8.5 - 15.5
Details (Per day)		
Vehicle trips per day	14	11 – 20
Passengers per day	53	25 – 70
Female passengers per day	15	11 – 19
Working hours in a day	12	10 - 13.5
Distance travelled in a day (km)	182	145 - 270
Revenue per day (INR)	903	580 - 1,160
Operating expenses per day (INR)	425	165-649
Details (Per trip)		
Passengers per trip	4	1-6
Revenue per trip (INR)	63	34-90
Operating expenses per trip (INR)	30	10-47
Distance travelled per hour (km)	15	12-23
Details (Per month)		
Revenue per month (INR)	27,400	17,700 - 35,000
Operating expenses per month (INR)	13,000	5,000 - 19,700

Table 10: Comparison of male and female operated e-rickshaws

	Female	Male	Average Difference
Route length (km)	4.5	8.5	-46%
Details (Per day)			
Vehicle trips per day	20.0	16.0	
Passengers per day	37	51	-27%
Female passengers per day	48%[21]	31%	
Working hours in a day	7.5	10	-24%
Distance travelled in a day (km)	90	136	
Revenue per day (INR)	420	580	-28%
Operating expenses per day (INR)	325	165	
Details (Per trip)			
Passengers per trip	1.9	3.1	
Revenue per trip (INR)	21.0	36.0	

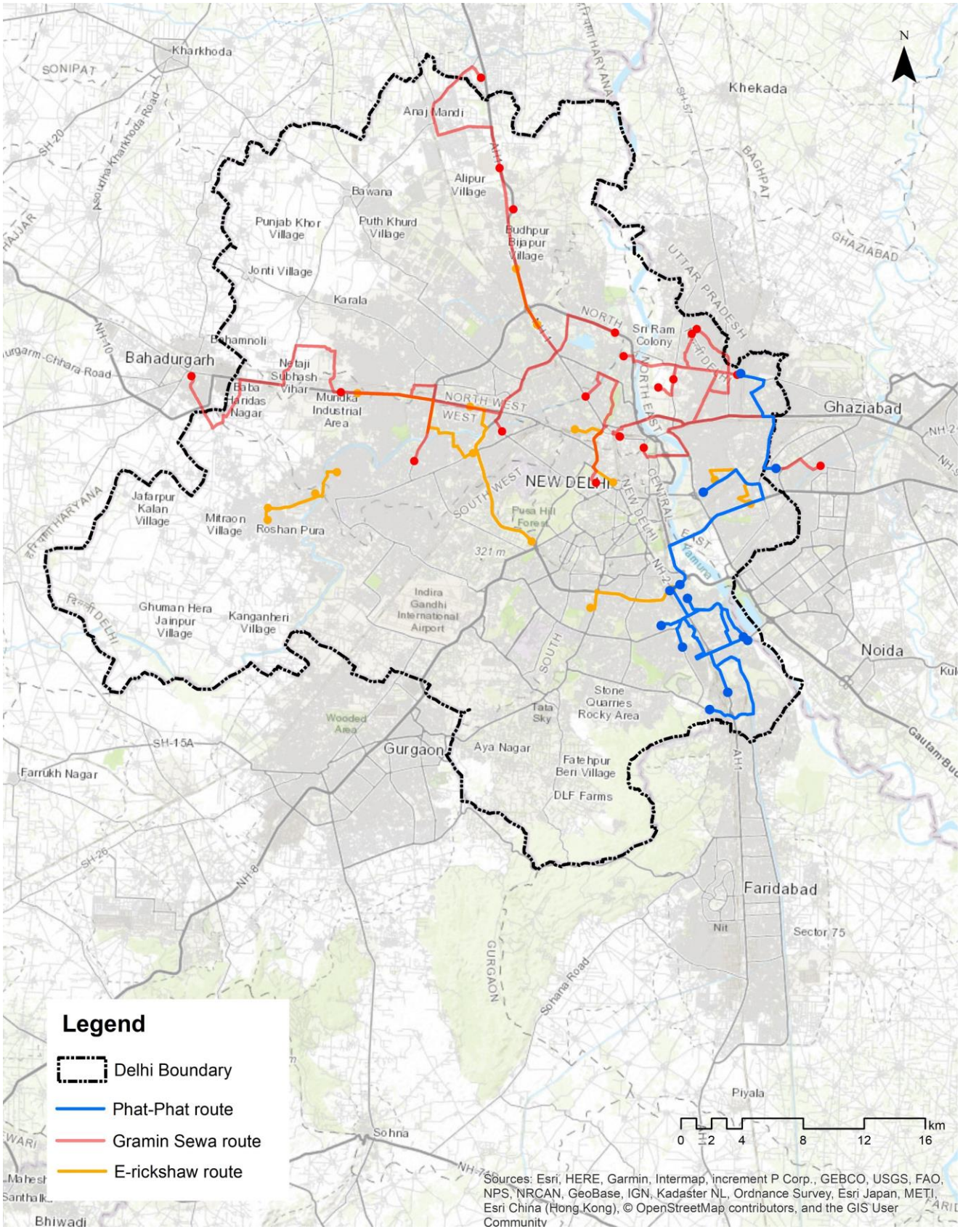
[21] As a %age of total passengers.

Operating expenses per trip (INR)	16.0	10.0	
Distance covered per hour (km)	12.0	14.0	-12%
Details (Per month)			
Revenue per month (INR)	9,100-15,200	15,200-21,200	-28%
Operating expenses per month (INR)	9,000-12,100[22]	4,200-5,900[23]	+49%

Note: The numbers are rounded off to the nearest decimal

[22] The operating expenses are higher due to EMIs paid for the vehicle.
[23] Male operators have reported defaulting on EMIs, resulting in lower operational expenses.

Figure 52: Paratransit vehicle routes



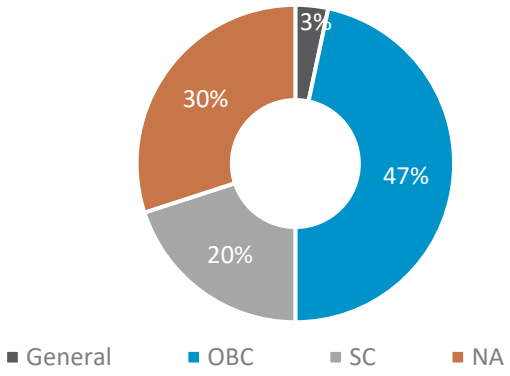
Note: These are indicative and have been created based on the stages identified by the drivers.

4.2.1 Respondent characteristics (Male operators)

Age, caste and education

About 97% (29) of the IPT drivers were in the age group of 26-59. IPT operators predominantly belonged to Other Backward Class (47%) (Figure 53). The highest level of education attained by the IPT operators is 10th grade. Among IPT operators, 27% have studied up to 4th grade.

Figure 53: Caste



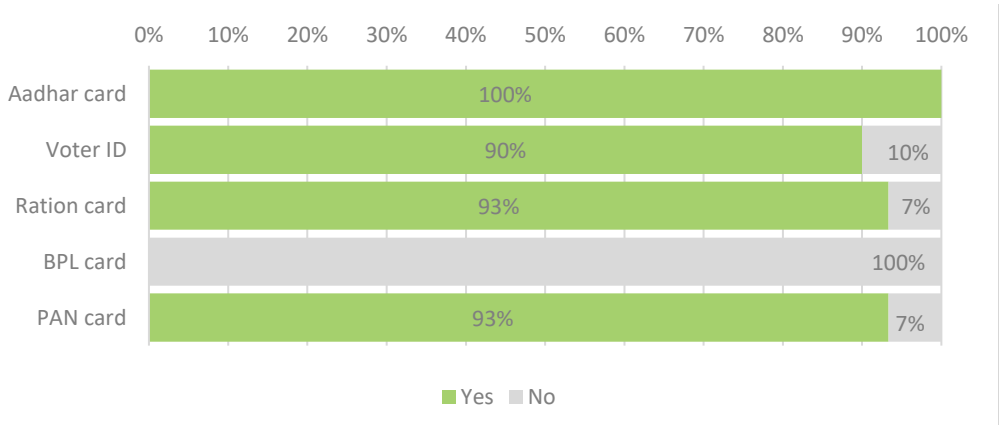
Head of the household and earning members

All respondents were married. Approximately 93% (28) of the respondents identified as the head of their household. The average household size of the respondents was seven, which is higher than Delhi's average household size of 5.02. More than half (53%) of them were the sole breadwinners of their family, 43% reported a second earning member. On an average, each IPT operator supported three dependents.

ID cards and bank accounts

All the IPT operators possessed an Aadhaar Card (Figure 54). None of the respondents possessed a BPL card. Among the IPT drivers 29 out of 30 had personal bank accounts.

Figure 54: Possession of government ID cards



4.2.2 Operating characteristics

Approximately 70% of the paratransit drivers were working during the lockdown and their data was analysed to understand their operational details during that period.

Vehicle ownership

The drivers tended to own their vehicle, except auto-rickshaw drivers (7). The respondents did not own any other vehicle. All auto-rickshaws, Gramin Sewa vehicles and Phat-Phats run on CNG.

Route length

The average route length ranged from 8.5 km-15.5 km, with 145 km- 270 km operated per day depending on the type of vehicle. Paratransit drivers are operating 9-11% longer distances than in 2019 (125km- 237km). Currently (December 2020), paratransit drivers were operating on the same route as they were pre-COVID-19. Gramin Sewas operated longer distances as compared to the other vehicles.

Working hours and days

Paratransit drivers have resumed the same number of working hours (10-13.5 hours/ day) as the pre-COVID-19 (Figure 55). However, their working hours decreased by 63-73% during the lockdown (Figure 55). Phat-Phat and Gramin Sewa operators worked for longer hours as compared to e-rickshaw and auto-rickshaw operators.

All e-rickshaws ply in shifts. They work from 7.45am to 12.45pm and 5.30pm to 10.15pm, while other IPT operators work continuously between 7.20am to 8.00pm throughout the day. The current operating schedule is the same as in 2019.

Currently, the morning peak hours reported are from 9.50 am to 11.00 am and evening peak hours from 5.00pm to 6.30pm. IPT operators noted that women tend to use IPT predominantly during the off-peak hours - from 11.00 am to 1.00 pm.

While the respondents went out to work every day during the lockdown, the effective number of working days ranged from eight to ten days cumulatively[24] (Figure 56). On an average, each driver lost around 240-260 working hours in a month during the lockdown.

Figure 55: Working hours per day

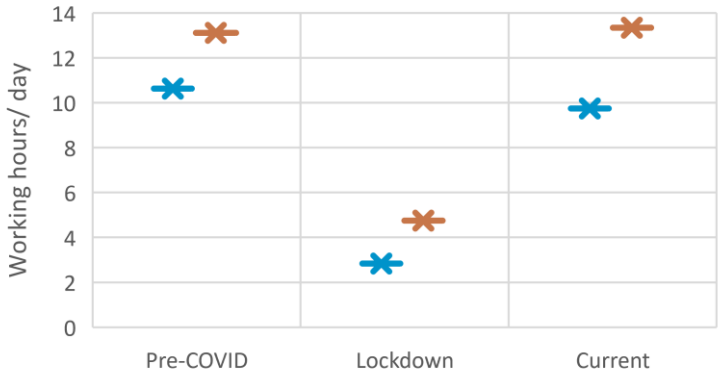
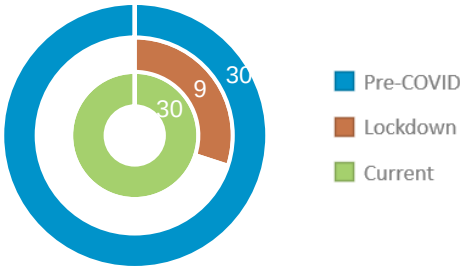


Figure 56: Effective working days in a month

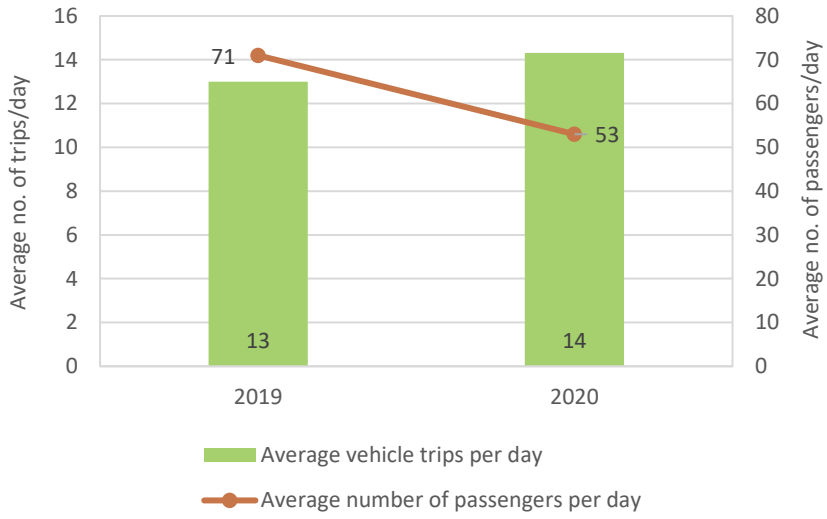


Passengers

While paratransit drivers had resumed working for the same number of hours before COVID-19 (Figure 57), their ridership was 70% that of pre-COVID-19 (Figure 57). However, a marginal increase in female ridership (from 28% to 29%) was reported. The drivers noted that women used auto-rickshaws and e-rickshaws more than Gramin Sewas and Phat-Phats.

[24] Considering 12 working hours in a day.

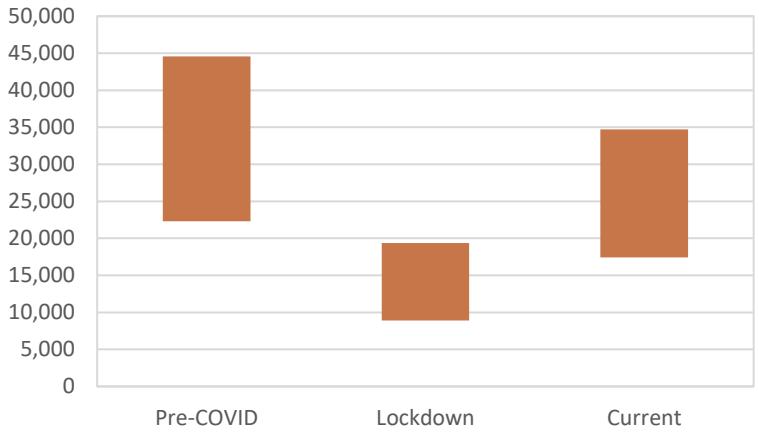
Figure 57: Change in vehicle trips and ridership per day



Gross earnings

The drivers continued to operate during the lockdown; their monthly earnings contracted by 52%-59% during this time[25]. They reported earning 1.2-1.7 times more per hour during the lockdown (Figure 58). This could be attributed to fare increases during this period to compensate for the lower working hours. In December 2020, more than half of the operators had increased their fares at an average rate of INR five per stage. The average monthly revenue in December 2020 ranged between Rs. 17,500- 35,000, which was three-fourths of the pre-lockdown period (Figure 58).

Figure 58 Average revenue per month (INR)



Note: The monthly earnings calculated using daily incomes

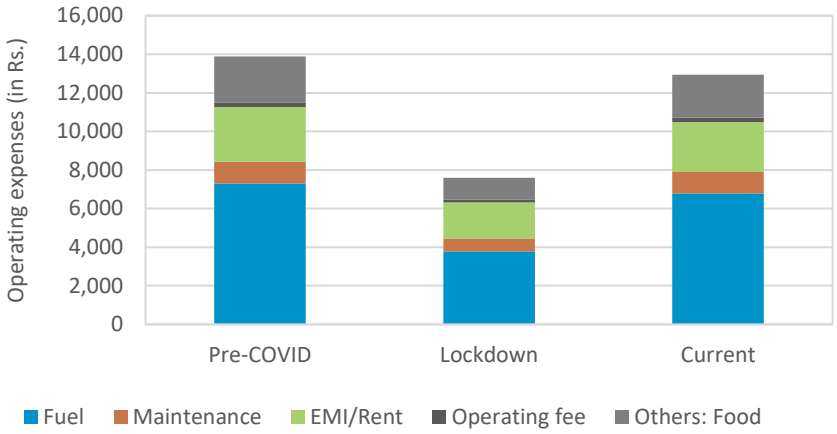
Operating expenses

In December 2020, operating expenses ranged between INR 5,000- INR 19,700 per month, which was seven percent lower than before the pandemic (Figure 59). Lower vehicle rents and decreased fuel prices[26] could account for this difference. However, operating costs constituted a higher share of their earnings in December 2020 (28 to 56%) compared to 24 to 51% pre-COVID-19.

[25] This was counterintuitive as a stringent lockdown was implemented in the NCT of Delhi.

[26] The price of CNG has declined from INR 45.2/kg in 2019 (127)to INR 42.7/kg in 2020 (128).

Figure 59: Average operating expenses per month (INR)



Loss in revenue due to COVID-19

We estimated a cumulative loss of INR 1,741 crores for 200,000 registered vehicles in the nine months since 24th March 2020 (Table 11).

Table 11: Revenue lost due to COVID-19 (INR)

Type of IPT vehicles	Number of vehicles (2020)	Revenue lost (in INR crores)
Auto-rickshaws	121,140	
E-Rickshaws	74,441	
Gramin Sewa	6,153	**1,741**
Phat-Phats	320	
Total	**202,054**	

Source:(129); (16);(130)

Note: It is assumed that the growth rate of Gramin Sewas and Phat-Phats is negligible from 2018.

4.2.3 Female e-rickshaw operators (Vahinis)

Female e-rickshaw operators are known as 'Vahinis". SEWA supports five Vahinis in Delhi and all of them were interviewed. Our findings were validated with organisations such as SMV Green Solutions, which works towards improving women's participation as e-rickshaw drivers in India.

Demography and household information

All the Vahinis belonged to marginalised socio-economic groups. They owned their vehicle, were married, and were educated up to 10th grade[27], with three of them identifying as Dalits. Three of the five Vahinis considered themselves as the head of their household along with their husband because of their contribution to household expenses. All the Vahinis had Aadhaar cards, ration cards, voter ID cards and PAN cards, and personal bank accounts. Only one respondent had a BPL card. There were two earning members in their household including themselves.

4.2.4 Operational characteristics of Vahinis

Travel distance

The average route distance of female operators was 4.5 km, and they primarily operated between Jahangirpuri and Azadpur. They covered approximately 90 km per day over five to nine hours and made over 7.5 hours and made 20 trips per day. They work between 8.45am-1:15pm, take a break of around four hours and resume work between 4.00 p.m-7.00 p.m. The in-depth interviews highlighted that Vahinis start working late and finish early because due to cooking and other household responsibilities.

[27] Where education levels were provided.

Passengers

The average ridership per day for female operators was 37 passengers. Vahinis carried 27% fewer passengers than male operators. They stated that passengers hesitate to ride in their e-rickshaw due to gender stereotypes of women being poor drivers. "*Once I asked some girls that why don't you sit in my e-rickshaw. I am also going to the same place. They answered that they are scared to travel in my vehicle. We do not trust lady drivers."* In spite of this, women constituted close to half of the Vahinis' passengers (49%).

Incomes

The average monthly income of Vahinis ranged between INR 9,100-15,200. They earned INR 5,000 less than male e-rickshaw operators due to a household, care work and safety tax. Women have the added burden of household and care activities; in general, this resulted in them working approximately 2.5 hours less than men in a day. As one Vahini observed "*I start around 8.30 am or 9am after cooking food for my children. Then, I come back home at 12 p.m. and spend some time with my children. Then, I work from 4 p.m. to 7p.m. in the evening".*

Women in India are stereotyped as bad drivers. Vahinis noted that passengers avoid their e-rickshaws as women are stereotyped as bad drivers. Also, while men allowed five passengers in their e-rickshaw (four in the back and one in the front next to the driver), women drivers often carried four passengers at a time because of passenger misbehaviour.

Operating expenses

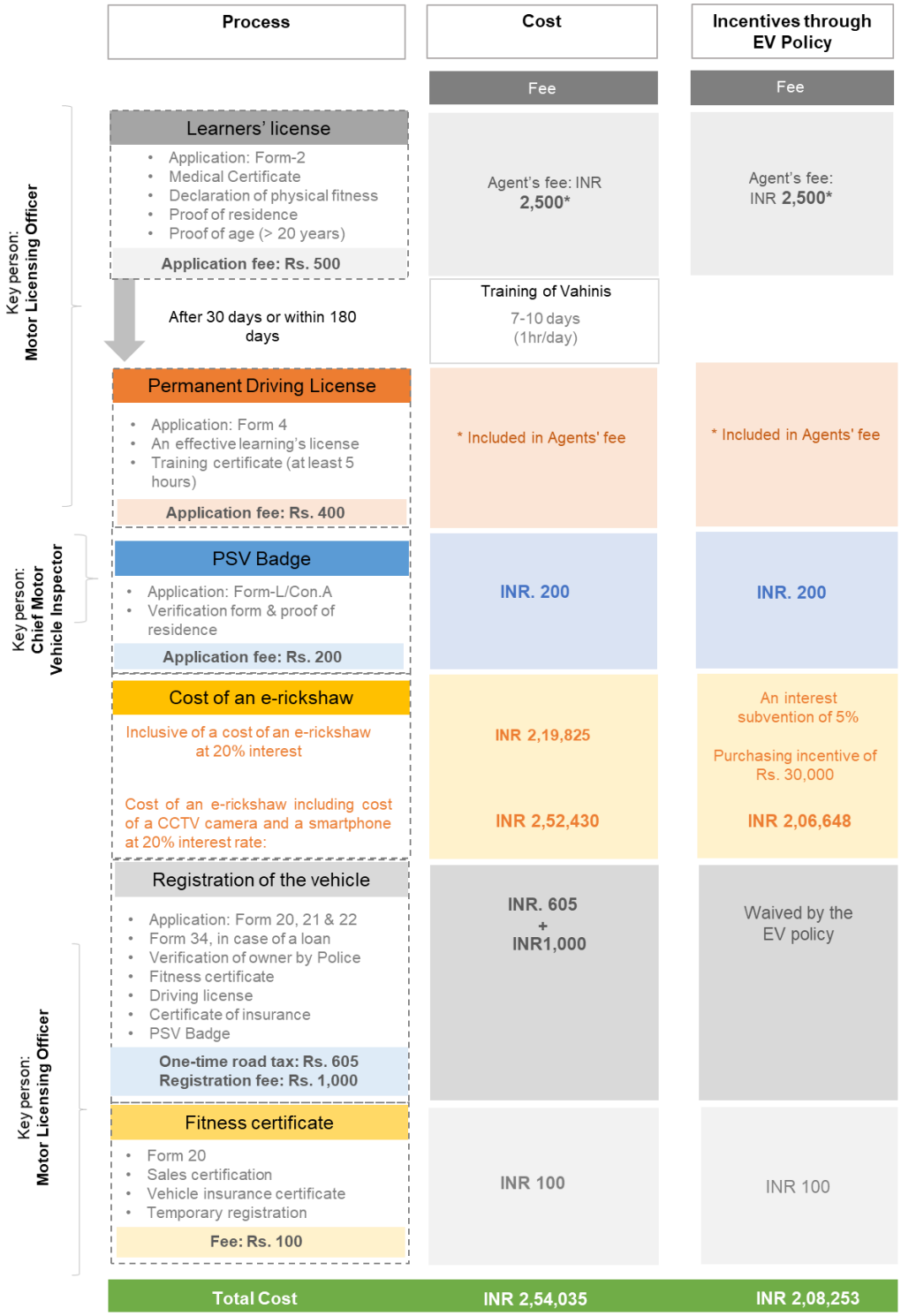
Women spent around 77% of their income on operating expenses. Our in-depth interviews observed that e-rickshaws are prone to technical issues especially regarding the battery. *"There is an issue with my battery since starting. It only worked fine for some days and then suddenly the mileage went down to 30-35 km. I complained about the battery. They fixed it and told me that it will work fine. But again, it worked well for some days. I usually face an issue with my battery every month."* Thus, maintenance costs are high for e-rickshaws.

Due to space constraints, Vahinis often utilise public parking and charging facilities which further amount to INR 70 -130 per day. One Vahini noted *"I give INR 70 per day for charging. I have an instalment of INR 250 per day for the loan of this rickshaw. My savings are only INR 30-40 in a day. I buy groceries for home and milk for my youngest daughter. After these expenses, if I do not save enough money to pay for parking, then I have to cover that next day by working more."*

Process of becoming a Vahini

To become a Vahini, a prospective applicant is required to attain both the learner's and driver's license as well as a PSV badge. A prospective Vahinis generally pays INR 2,500 to an agent to navigate the process of obtaining these licences. Under the new EV policy, a purchase incentive of INR 30,000 is provided to the registered owner of the e-rickshaw, who is also eligible for an interest subvention of five percent (131). On purchase of the e-rickshaw, the Vahinis must register the vehicle and obtain a fitness certificate. To become a Vahini, a prospective applicant is required to attain both the learner's and driver's license as well as a PSV badge. One of the major issues that prospective Vahinis face in obtaining the necessary clearances, is navigating various sections in the regional transport office (RTO).

Figure 60: Process and cost of becoming a Vahini



4.2.5 Perception of male and female drivers

COVID-19 safe behaviour

All the male drivers claimed that they wore masks and used hand sanitisers while working. However, enumerators revealed that only a few had a sanitiser on hand. Vahinis on the other hand, covered their faces with a piece of cloth. Two-thirds of the male respondents claimed that they sanitised their vehicle at least twice in a day, while all Vahinis reported that they sanitise their vehicle regularly. The rest found the cost of sanitising a vehicle- approximately INR 400 in a month (equivalent to half a day's earnings) too expensive. Additionally, none of the surveyed vehicles had a plastic shield separating the driver from the passengers.

The interviewees suggested that the government could distribute free COVID-19 safety kits, consisting of masks, hand sanitiser and vehicle disinfectants, and offer the plastic shields and a thermal device at subsidised rates. They were willing to pay around INR 100-150 for a thermal device (actual cost of which is INR 1,000-2,000).

COVID-safe behaviour among passengers

The respondents highlighted that all passengers did not follow COVID-19 safety rules. However, it was unclear if they refused passengers without masks. They suggested that the government enforce the COVID-19 safety rules strictly as some commuters were afraid to use paratransit.

Women's safety

Male IPT operators considered their vehicle safe for women but admitted to driving rashly to reach their destination quickly. However, there was little to no mention of safety concerns from the perspective of sexual harassment. An e-rickshaw operator stated he ensured that women passengers sit together so that they feel more comfortable.

Female e-rickshaw operators reported facing sexual harassment from male passengers. One of them explained that she faced harassment when she allowed a fifth passenger to sit in the front of the vehicle. She said, *"So, four passengers sat in the back and one took a seat next to me. He started to touch himself inappropriately. I told him to sit properly quite a few times. But he continued doing the same."* Vahinis had not observed *many* instances of sexual harassment of female passengers in their vehicle and claimed to act proactively if they "*sensed that something was not right".*

Free-bus ride scheme

The respondents highlighted that their female ridership had decreased when the Delhi government launched the free bus ride scheme and felt that the government should roll back the scheme. They noted that female passengers have started using paratransit again after the lockdown due to safety concerns.

Free-bus scheme for women in IPT

Respondents were asked to provide their feedback on a potential scheme to subsidise travel for women in IPT by issuing pink tickets and they can be compensated on a monthly/ weekly basis for these rides. Female e-rickshaw operators felt that this might help increase their ridership as women might start using their e-rickshaws for shorter trips. Both male and female drivers were sceptical of timely reimbursements from the government.

Digital payment

Three-fifths of the male operators were sceptical about digital payments as it could be time-consuming in areas with slow network. None used digital payments since their passengers used cash and did not make digital payments for small amounts.

Global Positioning System (GPS)

While all surveyed IPT operators knew that the government has made GPS compulsory in IPT vehicles and think that it can help them gain trust of their passengers, only 10 of the 30 male operators have a GPS in their vehicle as they considered it an expensive investment at INR 3,000.

All female e-rickshaw operators have a GPS device installed in their vehicle. Vahinis had also paid for CCTV cameras, but their installation was delayed due to the COVID-19 pandemic. Female operators feared that the size of the CCTV cameras may make them susceptible to theft.

Ownership and use of phones

Two of the female operators owned smartphones, while one had a basic phone. Female operators shared their phones with their children. They do not carry their phone with them while working as their children need it to attend online classes. Women primarily used their smartphone for calls and WhatsApp. Two of the Vahinis had also registered with the 'Oye Rickshaw' platform, which provides an app-based e-rickshaw booking facility. Women were taught how to use the Oye rickshaw application and to accept or reject rides.

5. Recommendations and policy implications

Both desk research and survey findings have consistently highlighted that RPW were inordinately affected by the pandemic than any other section of society. Reports suggest that male informal workers have been recovering at a faster pace than their female counterparts (32). Further, our survey findings highlight the transport needs of RPW and gaps in accessibility and safety for women in public transport and paratransit. The Taskforce for Safety of Women in Public Transport created under the aegis of the Dialogue and Development Commission of Delhi (DDC) can be leveraged for implementing the recommendations of this research (Table 12).

Table 12: Recommendations to improve mobility and access for RPW

Recommendation	Years	
	0-1	1-3
A. Cross thematic recommendations		
1. Partner with women's unions, membership-based organisations		
2. Improve digital literacy of RPW		
3. Create a dedicated women's safety team at DTC's command-and-control centre		
4. Provide a multi-modal subsidy for RPW		
B. Recommendations for bus-based transport		
5. Improve reliability and seat availability in buses		
C. Recommendations for paratransit services		
6. Increase electric vehicle adoption amongst resource poor women		

5.1 Partner with working women's unions and membership-based organisations (MBOs)

Women's unions have a long history of advocating for women's rights and working with governmental organisations to improve their access to resources. For example, in India, the Mahila Housing Trust and SEWA work with RPW to organise and empower them to improve their surroundings by facilitating access to public housing and services (132).

The Delhi government can create and maintain a database of working women's unions and MBOs who can facilitate effective uptake of public transportation schemes by disseminating information across a wide network of RPW. Simultaneously, they can bridge the gap between transport policy makers and RPW by providing bottom-up perspectives, to co-create inclusive transport polices.

5.2 Improve digital literacy of resource poor women

Real time of arrival and departure of buses allows passengers to plan their travel efficiently. In addition to passenger information system (PIS) boards at bus stops, ETA is usually relayed though websites and mobile phone applications. Moreover, in the wake of COVID-19, cashless transactions have gained importance to help maintain physical distancing. It is thus imperative to impart digital literacy to RPW as it will not only help streamline their mobility patterns but also expedite participation in a fast-digitising world. Transport think tanks can partner with MBOs, unions and civil society organisations and adopt a training of trainers (ToT) model to train community mobilisers and volunteers on using the Chartr application, navigating Google Maps, making digital payments amongst others. These community mobilisers and volunteers will in turn teach RPW in their localities.

5.3 Create a dedicated team for women's safety in the Command-and-Control Centre (CCC)

The Delhi Government plans to set up a CCC for women's safety[28]. Buses will include features such as CCTV cameras, display for the driver, GPS devices, audio communication devices for the driver and conductor, hooter, strobe, and 10 SOS buttons. The CCC will monitor buses through video surveillance and an automatic vehicle tracking system. When a passenger, driver or conductor presses the SOS button, an alert will be sent to the CCC, where the first responder will forward the alert to the respective agency (police, fire, ambulance), along with the GPS coordinates of the bus via SMS and email alerts (133). The Transport Department has also initiated a project to install SOS buttons and GPS devices in auto-rickshaws, which will be tracked by the Police control room or the CCC. The CCC presents an opportunity to integrate multiple channels of registering complaints and helplines.

At present, complaints regarding public transport in Delhi can be reported online through the government's Public Grievance Monitoring System (PGMS), or by calling DTC's central control room. In 2019, DTC launched the DTC app[29] that also allowed passengers to lodge complaints, following which an alert is sent to the depot manager. Necessary action will be taken and the complainant will be informed of the same (134). DIMTS also has a separate phone number and system.

Learnings can be drawn from Goa's Transport Department that launched an SMS based complaint system. An individual can register a complaint by sending an SMS to the specified number with a brief description of the grievance and the registration number of the public transport vehicle. The person will receive regular status updates on the complaint via SMS. Codes associated with the jurisdiction of each assistant director of transport will be provided so that the complaint may be filed with the appropriate body (135). Another example is the SMS and phone call complaint mechanism launched by the Dakshina Kannada Regional Transport Authority to address complaints made with respect to autorickshaw or bus services/ fares (136).

A dedicated safety team can be set up at the CCC to receive SOS alerts and complaints related to women's travel in buses and paratransit. Standard operating protocols can be set up to ensure timely response depending on emergency or other complaints.

5.4 Provide a multimodal mobility subsidy

The major concerns reported by RPW with respect to bus-based transit are poor frequency and seat availability. While the Delhi Government has implemented the free bus ride scheme for women to improve their access to bus based public transport our survey findings suggest that at least 19% of their trips are by paratransit. Thus, while the Delhi Transport Department expands bus fleet, a multi mobility subsidy of INR 600 per month for RPW workers can be considered in the interim to give them the choice of traveling by different modes. This amount was calculated based on the percentage of monthly work trips undertaken by paratransit and percentage of bus-based trips with waiting times greater than 10 minutes.

There are 4.0 lakh female home-based workers (137), 1.05-1.2 lakh female street vendors (138) and 5.0 lakh domestic workers (139) in Delhi. The identification of beneficiaries can begin with RPW enrolled in the PMJDY. Subsequent beneficiaries can be identified through proxy databases such as those created for construction workers, databases of MBOs and eventually expanded to all women with ration cards etc. The total subsidy would amount to INR 62 crores per month for informal women workers in Delhi.

5.5 Improve reliability and seat availability in buses

Along with the proposed passenger information boards at bus stops and the Chartr application, a free SMS based real time information (RTI) system for buses must be introduced[30]. This will benefit the 90% of RPW without access to smart phones.

Several initiatives aimed at improving the safety of women in buses have been implemented in Delhi. These include deploying 11,000 bus marshals in DTC and cluster buses during the evening and night shifts to prevent

[28] A project management unit is expected to be set up within a quarter.
[29] The authors found the DTC app difficult to navigate
[30] A SMS system was first proposed in 2011, where a passenger could register to receive push SMS for specific bus routes.

and address harassment of women (141), reservation of 25% of seats for women, ladies special buses, display of women's helpline number in buses, encouraging female conductors (484 in DTC) and bus drivers (one in DTC) (140). Other recent initiatives are outlined in Section 5.3.

Our survey findings revealed that RPW expressed concerns regarding crowded buses (22%) and enforcement of seat reservation (10%) before the COVID-19 pandemic. As the Delhi government increases the number of buses it is essential to ensure safer and comfortable travel for female passengers.

A policy for women and differently abled only doors can be implemented. This will restrict the boarding/alighting by men to the middle section of the bus. This system has been implemented in Indian cities in Kerala and Bangalore. The goal is two-fold: reduce sexual harassment by segregating boarding and alighting as well as enable women to access the reserved seats directly.

Buses have 25% of seats in the front reserved for women. One of the responsibilities of the bus marshals[31] is to ensure that reserved seats are not appropriated by men. A dedicated seat for the bus marshal can be provided in the middle of the bus, making it easier for women to approach the bus marshal. Safety in buses need not be restricted to safety from sexual harassment. A street vendor noted "*We face a lot of issues in boarding and deboarding with our bundles. Sometimes we fall from the buses and injure our legs."* Simultaneously, there is a need to create an effective complaint and redressal system as detailed in Section 5.3.

5.6 Increase electric vehicle adoption amongst resource poor women

One of the major concerns reported in the survey was poor frequency of buses and paratransit. Our research has shown that only 65% of developed area in Delhi is served by buses. Globally research has shown that paratransit often is the main mode of public transport in the periphery of cities and in small and medium sized cities (142).

Vahinis or female e-rickshaw drivers can be encouraged as a gender and climate sensitive mode of transport. This will improve the reach and connectivity of public transport, create employment for RPW, support the Delhi government achieve its goals of the EV policy and provide a safer mode of transport for women. As one passenger observed "*Sometimes male rickshaw operators may misbehave. Vahinis will understand the issues and problems faced by women."*

Organisations like SEWA in partnership with SMV Green solutions, are encouraging women to take up the profession. SEWA advocates and negotiates on behalf of informal women workers in addition to organising them into co-operatives and helping them apply for government benefits. They extend financial assistance in the form of loans and provide them a framework to build up savings. SMV Green Solutions provides capacity building and training to Vahinis and guides them through the licensing process.

We partnered with SEWA and SMV Green Solutions to propose financial and procedural reforms to Delhi's EV Policy (2020) to encourage RPW to consider becoming a Vahinis as a viable occupation. The Delhi Government[32], Delhi Finance Corporation (DFC) can implement a pilot project in partnership with MBOs and their financial institutions[33]. The pilot project can consider the following incentives.

Financial subsidies

The driving license fee must be waived to encourage more woman commercial drivers. The subsidy for Vahinis should be provided as a down payment and the amount increased to INR 50,000. This can be transferred to the financial institution instead of the potential owner. The down payment along with the 5% interest subvention will reduce the EMIs by 53%, and result in estimated savings of around INR 130,000 over 34-months for each Vahini. After the Vahini has completed the driving test, DFC with support from the

[31] Bus marshals are deployed in buses to facilitate enforcement of reservation of seats and as first respondents to crimes such as sexual harassment and theft.

[32] Especially the Department of Women and Child Development and the Transport Department.

[33] The financial institutions should register with the Delhi Finance Corporation (DFC).

financial institution can pre-approve the down payment, and the financial institution can extend the reduced loan amount.

Streamline the licensing process

The introduction of a single window clearance system, preferably manned by a female employee, can streamline and fast-track the process of obtaining licences. This will enable savings of INR 1,500 that the applicant must otherwise pay for the agent's fee.

Reservation of parking spaces for Vahinis at metro stations

The Delhi Metro Rail Corporation (DMRC) has partnered with SmartE to provide an e-rickshaw services at 29 metro stations for first and last mile connectivity. They plan to extend the service to more metro stations in the future (143). At present, DMRC has a fleet of over 1,000 e-rickshaws operating at subsidised rates from metro stations. Passengers can pay digitally for these rides (143). However, parking spaces for unorganised e-rickshaw operators in the vicinity of the metro stations are largely informal. Designated spaces can be provided to Vahinis in well-lit locations close to the entry/exit points of the metro stations to create visibility and ensure safety for both the Vahini and female passengers. For future contracts, DMRC should mandate that 25-33% of the fleet be operated by Vahinis.

Institute creches to increase the agency of Vahinis

Delhi is home to 10,757 Anganwadis, which are operational between 9am to 1:30pm (144). Anganwadis were established in 1975 under the Integrated Child Development Services Programme (ICDS) of the Ministry of Women and Child Development (MWCD) to reduce childhood and maternal malnutrition (145). Today, the programme has since been expanded to include children up to six years of age.

The Anganwadis could cater to children up to 14 years of age, and the timings extended to 4pm to encourage RPW to resume work. Most Anganwadi buildings are rented (144), and a needs assessment must be undertaken to gauge the efficacy of the existing facilities.

The Main Bhi Dilli campaign proposes decentralised multipurpose community centres ranging from community level (for a population of 0-5,000) to ward level (for a population 50,000-100,000). One of the functions of these community centres is supplementary services for children up to 14 years (146), which could also include creches.

Waive parking/charging fees for Vahinis

As part of its EV policy, the government has directed energy operators to set up charging stations in public parking zones in Delhi. A subsidy for parking and charging facilities in public parking zones can be provided to the Vahinis during the loan period of 34 months[34].

Review rickshaw bans on major roads

The Traffic Police has banned e-rickshaws from plying and parking on 236 roads (147) in the capital city in a bid to reduce congestion and traffic jams. These need to be reconsidered as an e-rickshaw serves 14 passenger trips/sqm/day compared to 0.2 passenger trips/ sqm/ day by a car.

Safety of Vahinis

At present, SEWA installs CCTV cameras in the e-rickshaws. However, this may not ensure immediate response during an emergency. An alternative would be to instal a SOS button and connect it to the CCC in the Transport Department. The mechanism detailed in section 5.3 can be used for SOS alerts raised by Vahinis and passengers.

Skills development of Vahinis

[34] Average time taken to repay loan on an e-rickshaw.

The Transport Department can organize targeted skills development training for Vahinis on traffic rules, e-rickshaw repairs, battery health and management, self-defence and gender rights.

Partnership with schools and aggregators

MBOs can initiate partnerships between Vahinis and primary schools to provide a stable source of income. Partnerships with aggregators (such as SmartE) can also be initiated to facilitate more rides and passengers.

5.7 Learnings for cities in South Asia

Private buses and paratransit are the predominant modes of public transport in LICs such as Afghanistan, Bangladesh, Pakistan and Nepal. Public buses in these cities do not have the capacity to cater to travel demand, leading to poor frequency of service, crowding, sexual harassment, lack of seat availability, and use of more expensive paratransit services.

The research findings and recommendations in Delhi are relevant to other cities in India and South Asia. Peer to peer learning between cities can fast track gender responsive mobility measures in the wake of the current COVID-19 pandemic.

The partnerships between women's MBOs, unions, and urban transport authorities can go a long way in implementing gender equitable public transport. The respective governments can consider providing a mobility subsidy as direct cash transfers to RPW in cities in South Asia, thereby improving their affordability and mode choice. Further, a dedicated team for registering sexual harassment complaints across different modes of transport and providing immediate redressal must be considered within urban local bodies/mobility departments.

Increasing women's role as paratransit owner-operators will improve asset ownership, incomes, and provide safer travel for women across cities in South Asia. However, targeted policy responses, including financial, procedural reforms and safety mechanisms will need to be created.

Finally, equitable mobility must be framed as a constitutional right. Methods to ensure implementation include capacity building of Women's Departments, MBOs, unions, urban development and transport authorities along with increasing gender experts in the latter.

6. Research uptake and next steps

6.1 Project outputs

Project outputs include the final report, an online opinion editorial in a leading publication in India, and an academic paper published in Transportation Research Record Journal.

6.2 Research uptake and dissemination activities

Research uptake and dissemination has been an integral part of our project.

- A round table (Table 2) was convened during the inception stage with 18 participants from feminist networks, unions, and collectives from 4 South Asian countries: Afghanistan, Bangladesh, Pakistan, and India. The goal was to introduce the research objectives, share literature review findings, and gain insights on the pre- and post-COVID-19 mobility context and impact on RPW in South Asia;
- Ten key informant interviews (Table 3) were conducted with transport operators and think tanks, development banks and corporation agencies in India to increase awareness on gender inequity in transport, share preliminary findings on the impact of COVID-19 pandemic and lockdown on RPW's mobility;
- Review of project findings and recommendations by six experts - our project advisors, social policy, transport, and technology experts;
- A virtual workshop was organised on 30 March 2021 to disseminate research findings and learnings for cities in India and South Asia. The workshop included 11 discussants (Table 13) and 55 attendees.
- We will also explore publishing the report on the website of the Dialogue and Development Commission, Delhi, the think tank of the Delhi government.

Table 13: Virtual workshop panellists

	Name	Organisation	Role
1	Anosha Ejlasi	UN Habitat-Afghanistan	Panellist
2	Laghu Parashar	GIZ India	Panellist
3	Maheen Arif	Karachi Urban Lab	Panellist
4	Ranjit Gadgil	SUMNet	Panellist
5	Smita Premchander	Sampark	Panellist
6	Sujata Mody	Penn Thozhilalargal Sangam (PTS)	Panellist
7	Supriya Jaan	CORO India	Panellist
8	Jasmine Shah	Dialogue and Development Commission, GNCTD	Speaker
9	Amandeep Jhangra	SEWA	Speaker
10	R Minhas	Delhi Transport Corporation	Speaker
11	Kalpana Vishwanath	Safetipin	Speaker

APPENDIX A: REFERENCES

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APPENDIX B: WORK PLAN

SNO	TASK TITLE	OCTOBER			NOVEMBER				DECEMBER					JANUARY				FEBRUARY				MARCH				
	TOTAL WEEKS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	Date	16	23	30	6	12	20	27	4	11	18	25	31	8	15	22	29	5	12	19	26	5	12	19	26	31
1	**Inception Report**																									
1.1	Rapid desk-based research																									
1.1.1	Literature review																									
1.1.2	Creation of document:literature review Monthly report																									
1.2	Small group discussion with feminist networks and collectives																									
1.2.1	Prepare invitee list																									
1.2.2	Preparation of closed online round table programme and agenda																									
1.2.3	Send out invites with brief literature review																									
1.2.4	Closed online round table with feminist networks and collectives																									
1.2.5	Transcription of meetings: Preperation of short document																									
1.3	Key informant interviews with transportation practitioners and influencers																									
1.3.1	Prepare invitee list																									
1.3.2	Preparation of one on one meeting programme and agenda																									
1.3.3	Send out invites with brief literature review attached																									
1.3.4	One on one meetings																									
1.3.5.	Transcription of meetings: Preperation of short document																									
1.4	Key informant interviews with decision																									
1.4.1	Prepare invitee list																									
1.4.2	Preparation of one on one meeting programme and agenda																									
1.4.3	Send out invites with brief literature review attached																									
1.4.4	One on one meetings																									
1.4.5	Transcription of meetings: Preperation of short document																									
1.5	**Submit the Inception Report**																									
2	**Evidence collection**																									
2.1	Conduct sex-disaggregated passenger counts and IPT vehicle counts																									
2.1.1	Select locations for counts																									
2.1.2	Conduct survey																									
2.2	Survey design and testing																									
2.2.1	Creation of online and telephonic survey																									
2.2.2	Online and telephonic survey testing																									
2.2.3	Design of in depth interview																									
2.3	Conduct telephone surveys																									
2.4	Conduct online surveys																									
2.5	Conduct in-depth interviews																									
3	**Analysis and recommendations**																									
3.1	Data analysis and preliminary recommendations																									
3.1.1	Data cleansing																									
3.1.2	Data analysis																									
3.2	Conduct an online focus group meeting																									
3.2.1	Send invities with brief on data analysis and findings																									
3.3.2	Preparation of online focus group programme and agenda																									
3.2.3	Online focus group meeting																									
3.3	Interviews with decision makers																									
3.3.1	Send invities with brief on data analysis and findings																									
3.3.2	Preparation of meeting programme and agenda																									
	Interviews with decision makers																									
3.4	Revise the recommendations, edit and compose the report																									
	First draft of recommendations report																									
	Review and edit recommendations report																									
	Composition of report																									
4	**Outreach**																									
4.1	Online release of the publication																									
4.1.1	First draft of publication report																									
4.1.2	Edit and compose publication report																									
4.2	Publish an opinion-editorial in a leading publication																									
5	**Project Completion Report**																									
5.1	Compile and submit a project completion report																									
5.1.1	First draft of project completion report																									
5.1.2	Review and edit project completion report																									

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