Gender-Sensitive Low-Carbon Transport in Indian Cities

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OPTIMISM Project (India)

Policy Brief 3

India's transport sector is globally the fourth largest GHG emitter, making low-carbon transport in India a top priority. Low-carbon transport strategies being promoted in the Indian context include encouraging a shift to public transport, accelerating adoption of alternative fuels and EVs, and enhancing energy efficiency in vehicles. Low-carbon and sustainable transport has a very strong gender dimension, yet most low-carbon policies and proposals tend to be "gender-blind". Gender inequality in urban transport is evident in Indian cities in terms of longer trip lengths, unaffordability, time poverty, impoverished health and compromised personal and sexual safety among women. Even public transport- a conventional low-carbon mode- largely perceived as "gender-neutral" often overlooks gendered needs and mobility concerns of women. Hence, there's a dire need to redesign transport plans and policies to suit women's travel behavior and solidify their claims to "right to the city" by maximizing their mobility and safety.

A gendered assessment of the current transport situation is essential to move towards gender-responsive low-carbon transport. Grounding the assessment in cities provides a more holistic understanding of the interplay between gender and transport. Hence in this piece, we use the case of two Indian cities, Surat (an industrial city with a large migrant population) and Udaipur (a tourist and heritage city). Based on the Sustainable Development Goals (SDGs) framework, we first analyze the relationship between gender and transport, followed by an assessment of existing transport scenario through the lens of gender equity, and conclude with proposals for a more engendered approach to low-carbon transport planning.

Women tend to travel with dependents

Women tend to chain their trips

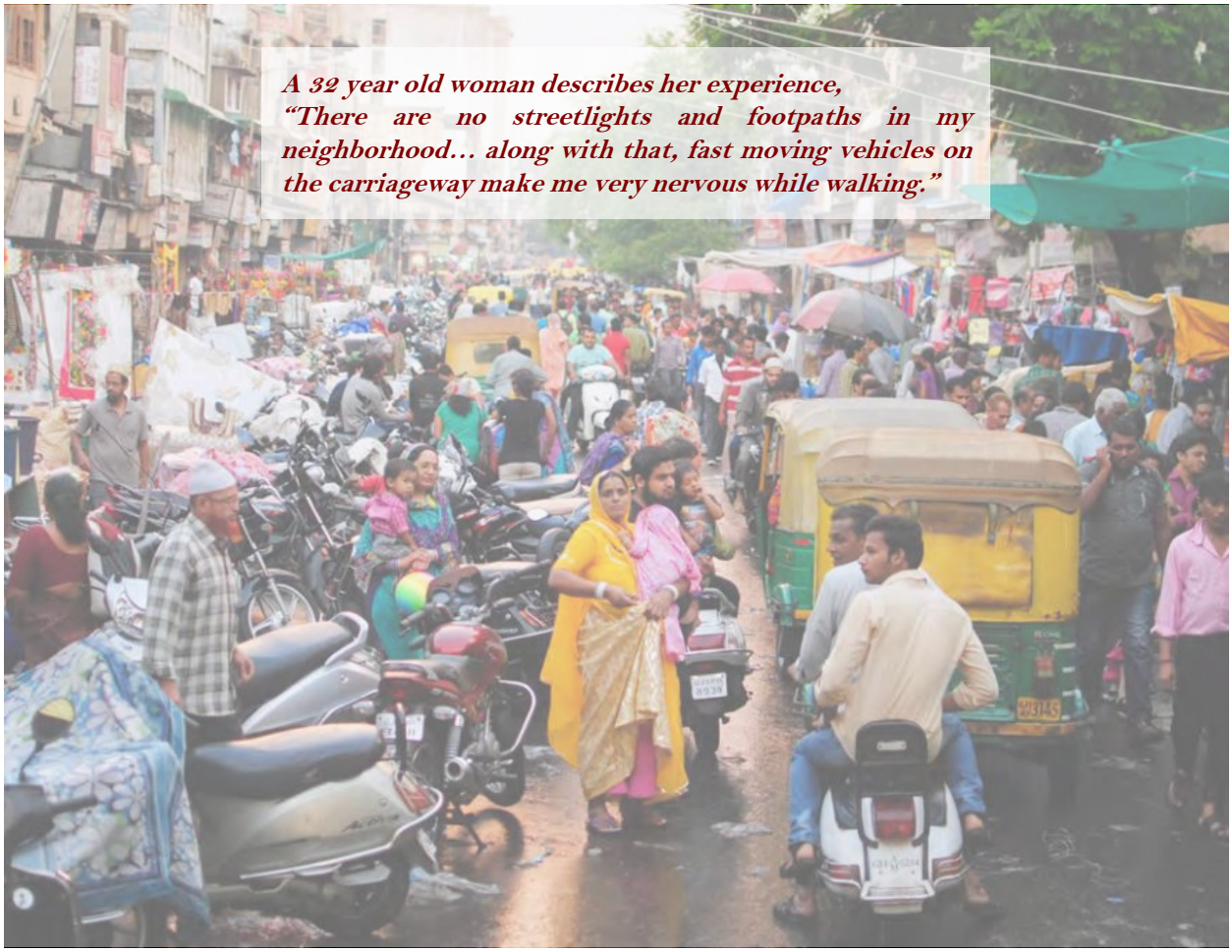
Gender & Urban Transport through SDG Framework:

The SDG 5, Gender Equity, has 9 targets that aim to eliminate all forms of discrimination and violence against women and girls, recognize value of unpaid care and domestic work, ensure women's participation in decision making, enable access to health and economic opportunities, and strengthen policies that promote gender equality and women empowerment. Their links with the urban transport sector are:

1. Access to economic and civic opportunities: Transport is crucial to women's empowerment, helping them access opportunities and challenge constraints imposed by patriarchy. It also enables women to participate in public life, politics and social interaction (SDG 5.5). Moreover, in low-income households, women's mobility enhances access to jobs, thereby increasing their respective family's chances of escaping poverty. In countries across the world, women are abandoning traditional domestic roles and entering the workforce, educational institutions and public life, either to follow their dreams or to improve their economic situation (SDG 5.2 and 5.5). A lack of affordable and convenient transport options continues to hinder many women in achieving these goals. A mobility study in 11 Indian cities indicates that 75% women stated a dire need for more affordable and more accessible public transport.

2. Women safety: Safe transport options and preventive measures enhance personal security of women and girls, and is essential to enable access to opportunities. Women in developing countries often rely on public transport or walking, and are more vulnerable to street harassment, stalking, and sexual assault in public sphere. Experiences of harassment and violence while using public transport affect women's mobility, leading to a restricted public life and economic opportunities. Underused or deserted, under-lit and poorly maintained road infrastructure cause women discomfort, increase their fear of violence and curbs their mobility (SDG 5.1 & 5.2). In Bhopal, 88% of the surveyed women reported facing harassment while using Public Transport (PT) and Intermediate Public Transport (IPT).

3. Time Poverty: The percentage of women who walk to work in India is higher as compared to males, irrespective of trip lengths. Women, especially from low-income groups tend to walk, as they face greater cultural barriers (dressing, and other) to cycling and often cannot afford public transport. One important component of women's unpaid work is time spent on walking to work (especially for low-income women) due to lack of affordability for public transport (SDG 5.4). Hence, women's time allocated to unpaid work increases due to lack of affordable, convenient and safe transport (SDG 5.1, 5.2, 5.4 and 5.5) and they experience a greater time poverty than men.



Source: https://smartnet.niua.org/sites/default/files/resources/UNEP_Gender_Report_For_Upload_Med_Rez.pdf

Is the Current Transport Scenario Gender Equitable?

We review three core components of transport- Non-Motorized Transport (NMT), Public Transport (PT) & Intermediate Public Transport (IPT). Both the cities serve a residential as well as a large floating population. Increased urbanization in both cities has led to a steep increase in motorization and 2.5 times increase in traffic levels. Traffic composition, prioritization of vehicular movement, absence of lane segregation and the current state of infrastructure lead to local sustainability issues. Private vehicles- two-wheelers (2Ws) and four-wheelers (4Ws) - make up a majority of the traffic composition and total trips in both cities. PT in Surat consists of city-bus running with regular traffic and BRTS (Bus Rapid Transit System) running in dedicated corridors. Udaipur has public buses operating at very low frequency and mini-buses operated by informal private providers. IPT consists mainly of three-wheelers or locally called auto-rickshaws, largely used as a shared-mobility mode. The NMT consists of bicycles (predominantly used by men) and walking. Lack of a robust and affordable PT network results in low PT ridership, leading to reliance on the IPT and NMT, especially in Udaipur, by vulnerable groups. There is a high dependency on private motorized vehicles, especially 2Ws, on the one hand, and close to half the trips are made on foot, on the other hand, in both cities.

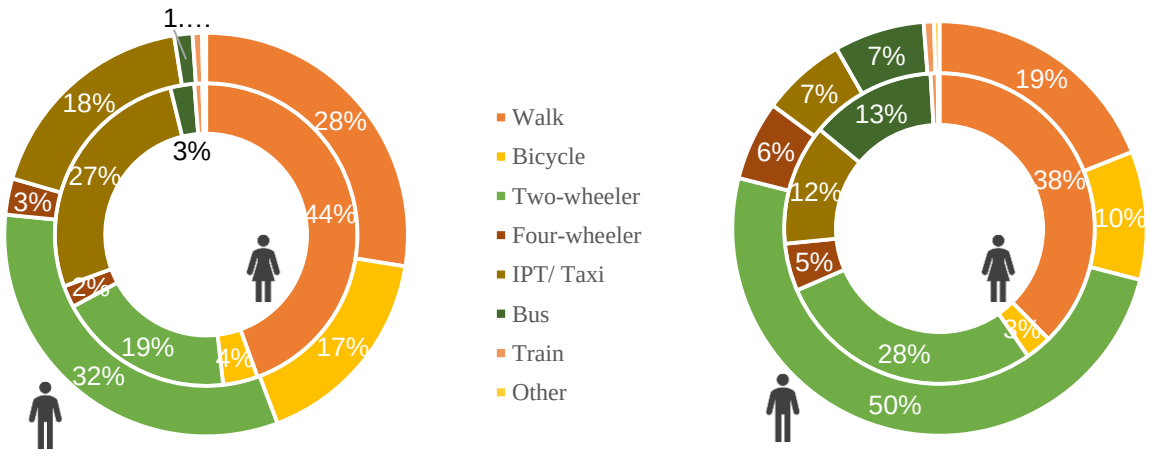
73% Of streets in Udaipur lack street lighting.

93% Women feel unsafe while commuting via NMT modes in both cities

1. **NMT**: In Surat, 85% of non-work purpose trips are undertaken by foot, yet the city has inadequate coverage of NMT. Only 20% and 7.6% of the total road network has footpaths and cycle tracks respectively. The NMT networks exclude low-income neighborhoods in Surat, creating a dire need for accessible transport infrastructure. Similarly, 54% of pedestrian trips and 89% of cycling trips in Udaipur are undertaken to access economic opportunities. Only 1%-4% of Udaipur's road network has any form of pedestrian or cycling infrastructure. Both cities lack supporting NMT infrastructure, like street-lights, signalized junctions, pedestrian crossings, shade, benches, etc. As per the Government of India's service level benchmark, the level of service of NMT infrastructure in Surat is 3 and Udaipur is 4 (poorest on the scale). Despite the poor state of NMT infrastructure in both cities, ~70% of total trips of women are walking trips. Women opted to walk in both cities due to unavailability of personal vehicles (21%), lack of affordability and reliability of PT and IPT (32%). 40% of women responded with issues related to road safety, followed by 29% women stating the far inaccessible distance (as women in both cities walk unusually long distances of 4-7 km). 23% women expressed the inconvenience and discomfort (due to lack of NMT infrastructure). 93% women walking in both cities reported feeling unsafe (personal & sexual safety) while making a trip. Poor NMT infrastructure results in greater time poverty, compromised safety and discomfort.

NMT forms a crucial component of low-carbon transport, as it enables a switch from private motorized modes to NMT for shorter trips and functions as a vital last-mile mode (to PT) for longer trips. Hence, both cities must focus on large-scale improvement of NMT to foster low-carbon transport.

Mode characteristics between men and women



Surat District (Urban)

Udaipur District (Urban)

More women are dependent on walking, PT and IPT as compared to men.

Women do not cycle as much as men due to various cultural barriers

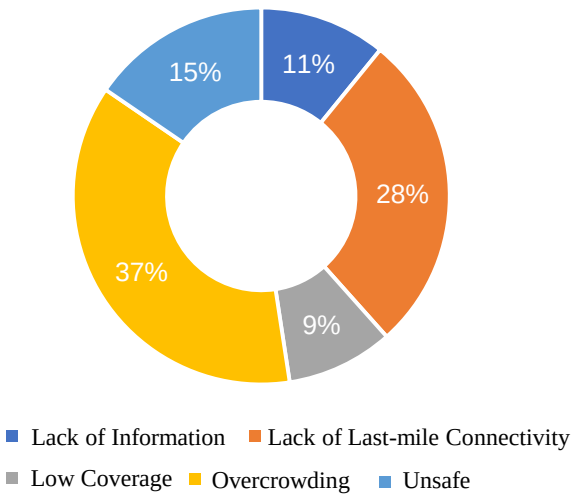
2. **PT:** Among PT women users, less than 15% in Surat and 4% in Udaipur actively choose PT. Udaipur's poor City Bus coverage leads to low ridership, while Mini Bus's wide coverage in impoverished areas makes it favorable for majority trips. 25% of IPT trips and 33% of 2W trips have a trip length of 5 km or more, making them most suitable via PT. Yet the lack of a robust PT network caps the PT mode share in Udaipur at 3%. Surat has a wider City Bus & BRTS network, yet unaffordable fares and poor supportive NMT network restrict the ridership to only 2%. Women users in both cities report longer waiting duration for the buses, discomfort while waiting on the carriageway due to lack of bus stop/ station, and inconvenience of using PT due to its limited routes and lack of route information. Despite this, all women report PT as the 'safest' mode of transport. All PT women users wish to own a private vehicle to improve their access to healthcare and economic opportunities. Current PT network and infrastructure pose a trade-off with access to opportunities and healthcare for women, curbing their experience in both cities. PT forms the backbone of low-carbon transport; hence both cities must focus on improving PT mode shares. For this, Surat must focus to ensure PT is accessible to and affordable for the women, especially low-income women, and Udaipur must focus on expanding its coverage.

3.0 Surat's Level of Service (LOS) for PT

4.0 Udaipur's Level of Service (LOS) for PT

"Although the buses are cheap, I find commuting via buses very inconvenient due to its limited coverage."

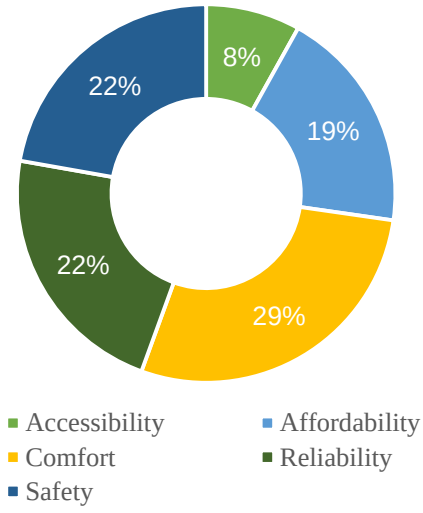
Service quality of PT, as described by users.



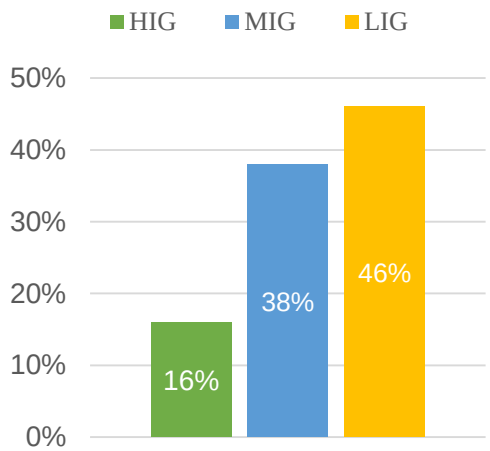
"I don't use the city bus/ BRT services as the nearest bus-stop is 2-3 km away and I have no means of reaching there."

3. **IPT:** In Udaipur, with fixed routes and fares IPT functions as PT. There are 27 fixed IPT routes providing a much wider coverage (55%) than PT. In Surat, the IPT network acts as a feeder to PT in some parts of the city, but otherwise is largely chaotic. Despite costing almost double than PT, IPT is the most preferred mode for women owing to flexibility in route and wider coverage compared to PT. Lack of IPT infrastructure in both cities leads to unsafe on-boarding conditions for women amidst heavy vehicular traffic. 67% women IPT users report concerns of sexual and personal safety using IPT, especially during the night. Although not viewed traditionally as a low-carbon mode, IPT forms a vital part of low-carbon transport in developing countries as they are a sustainable alternative to personal motorized vehicles due to high demand (among women), higher vehicle occupancy and sustainable fuel. Surat must focus on mainstreaming IPT to work as feeder services to PT, while Udaipur must focus on enhancing IPT infrastructure and quality of services.

Service quality of IPT, as described by users.

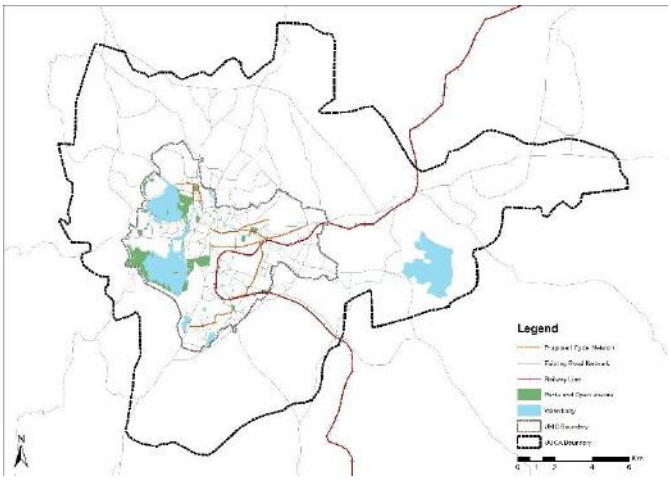


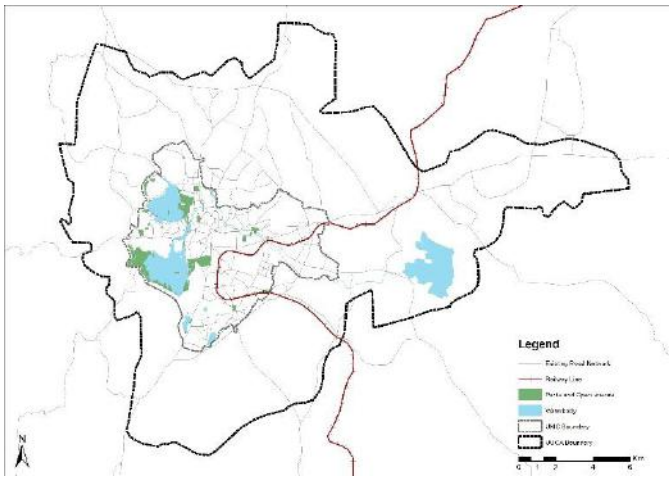
Most users prefer IPT over PT, despite its high costs (almost double than PT).



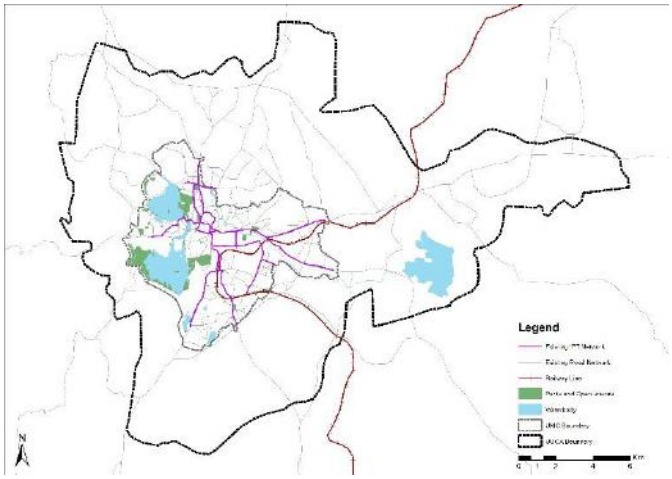
IPT users by Income Groups.

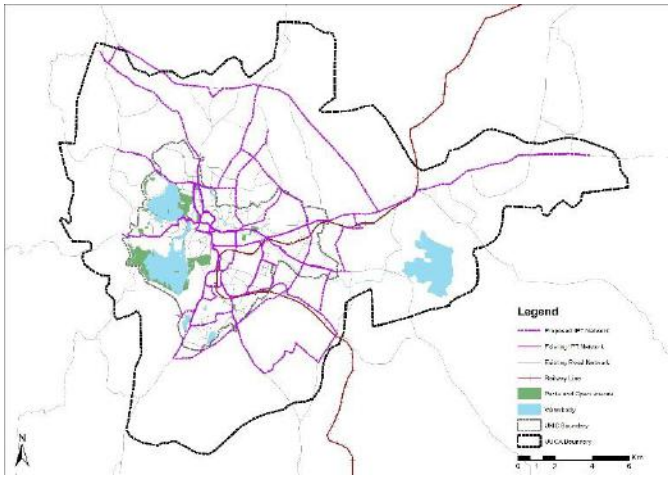
Existing Transport Networks (Udaipur) **Proposed Transport Networks (Udaipur)**



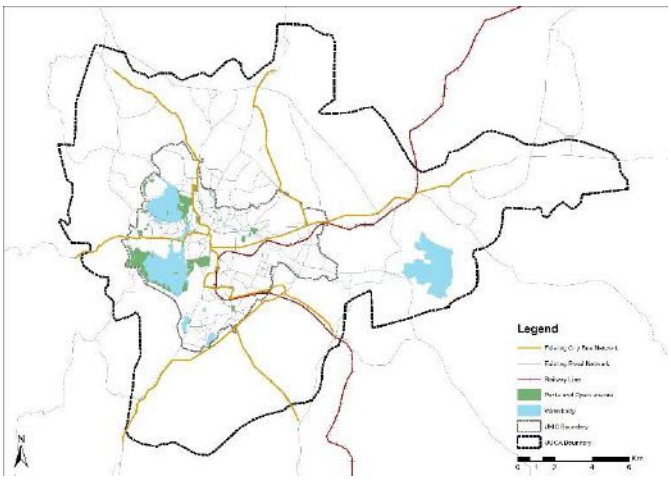


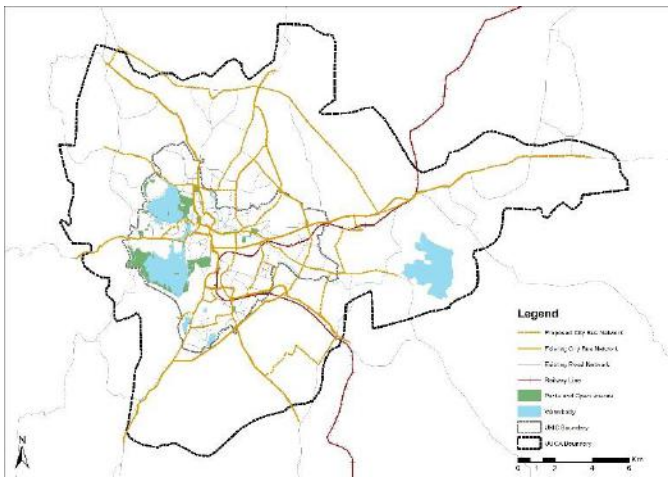
NMT network coverage





IPT network coverage





PT network coverage

SDG Interactions in the Existing Situation

Non-Motorised Transport	Surat			Udaipur		
	Safety & Comfort (SDG 5.1 & 5.2)	Access to Opportunities (SDG 5.4, 5.5 & 5.B)	Access to Healthcare (SDG 5.6)	Safety & Comfort (SDG 5.1 & 5.2)	Access to Opportunities (SDG 5.4, 5.5 & 5.B)	Access to Healthcare (SDG 5.6)
1. Network Coverage						
2. Infrastructure Quality						
3. Mode Share						

Intermediate Public Transport	Surat			Udaipur		
	Safety & Comfort (SDG 5.1 & 5.2)	Access to Opportunities (SDG 5.4, 5.5 & 5.B)	Access to Healthcare (SDG 5.6)	Safety & Comfort (SDG 5.1 & 5.2)	Access to Opportunities (SDG 5.4, 5.5 & 5.B)	Access to Healthcare (SDG 5.6)
1. Network Coverage						
2. Infrastructure Quality						
3. Service Quality						
4. IPT Affordability						

Public Transport	Surat			Udaipur		
	Safety & Comfort (SDG 5.1 & 5.2)	Access to Opportunities (SDG 5.4, 5.5 & 5.B)	Access to Healthcare (SDG 5.6)	Safety & Comfort (SDG 5.1 & 5.2)	Access to Opportunities (SDG 5.4, 5.5 & 5.B)	Access to Healthcare (SDG 5.6)
1. Network Coverage						
2. Infrastructure Quality						
3. Service Quality						
4. IPT Affordability						

Synergy Mixed Impact Trade-off

How Can Low-Carbon Transport Proposals be More Gender-Responsive?

Revising the existing notion of low-carbon transport planning (focused on environmental sustainability) to include social aspects of sustainable mobility (like gender equity) is crucial to achieve sustainable development. Hence, learnings from assessment of current transport situation in Surat and Udaipur paves the way to design a more gender-responsive low-carbon transport in developing countries.

Transport authorities must conduct comprehensive gender audits for institutionalizing gender equity. Cities must prioritize transport supply to increase women's safety and mobility. For this, large-scale infrastructure improvement in NMT and PT are required to achieve a LoS of 1 (highest). To ensure women's safety regular safety audits of transport infrastructure must be conducted, including that of footpaths, bike lanes, metro-stations and bus-stations, and other elements of transport system. Gender-action plans should be altered based on the learnings from the safety audits. Network specific interventions for each component include-

1. **NMT:** improving street lighting and other street infrastructure to enhance safety of women, introducing a well-constructed and wide footpath network with no obstructions or encroachments for safe and convenient movement, improving the bicycle network throughout the city with supporting infrastructure to increase women ridership, largely pedestrianizing walled city areas in both cities to enhance presence of women of all ages on streets, and introducing speed limits throughout the city to minimize road crash fatalities.

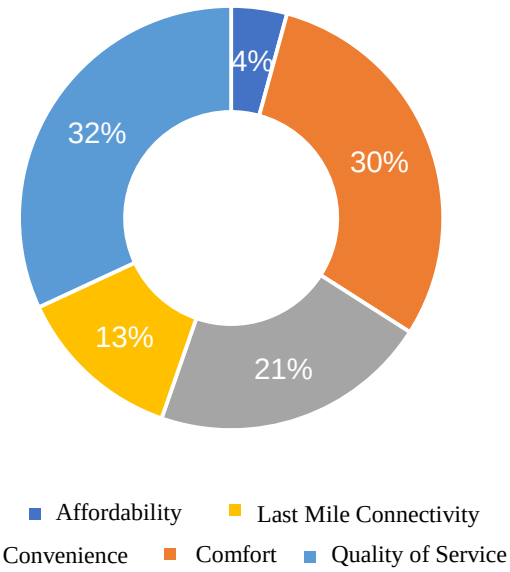
"We know women travel very differently than men; they chain their trips…So the transport systems need to be designed in a way that is affordable for women to stop three times (if needed)."
- An FGD participant working on Gender-Sensitive Development

2. **PT:** enabling Transit Oriented Development (TOD) with mixed use development to enhance safety of women while using PT, redesigning streets with Complete Street guidelines for enhanced last mile, gender-responsive routing of buses (to vulnerable areas) to serve more low-income women, implementing efficient infrastructure for safety (bus stops, on-boarding), subsidizing PT for women commuters to make it more affordable, and re-purposing mini-buses as feeder buses along high-demand routes in Udaipur to enable a higher access and transit ridership among women.

3. **IPT:** formalizing IPT by proposing IPT stations, fair fare structures and routes, strengthening the operations of Pink Autos in Surat (& propose the same in Udaipur) to enable greater employment opportunities for women in the transport sector, formulate stricter regulations and implementation to avoid overcrowding (& subsequent harassment) in vehicles, and introduce subsidies in IPT for women commuters to make it more affordable

4. **Electric Mobility:** develop EV infrastructure in residential spaces to enable wider reach of EV among women, encourage women drivers to own E-rickshaws through heavy subsidies and run awareness programs on benefits of electric mobility

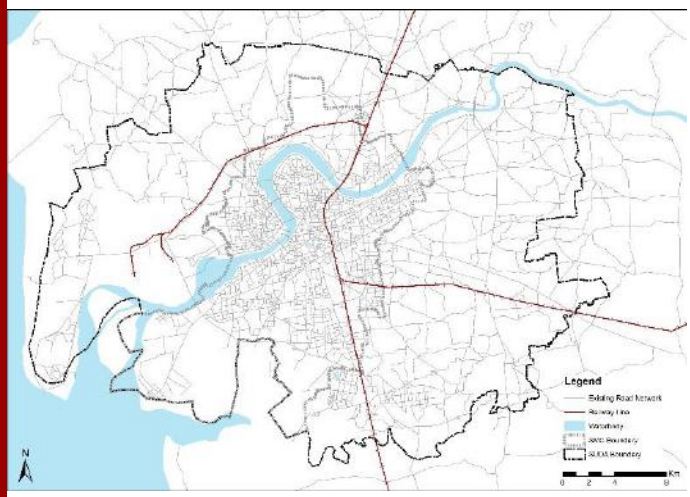
Responses of women PV users when asked what would make them shift to PT

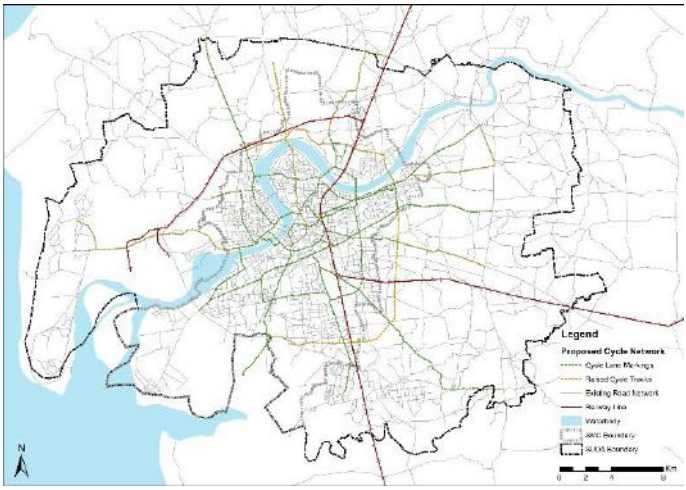


80% PV users are willing to shift to NMT if there is superior quality of infrastructure

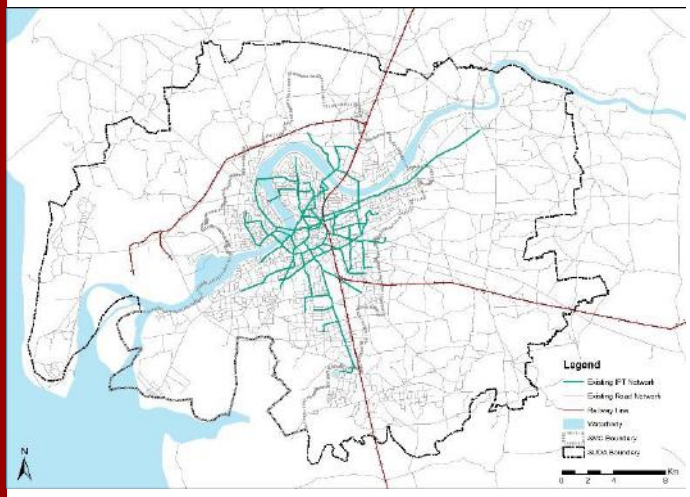
Existing Transport Networks (Surat)

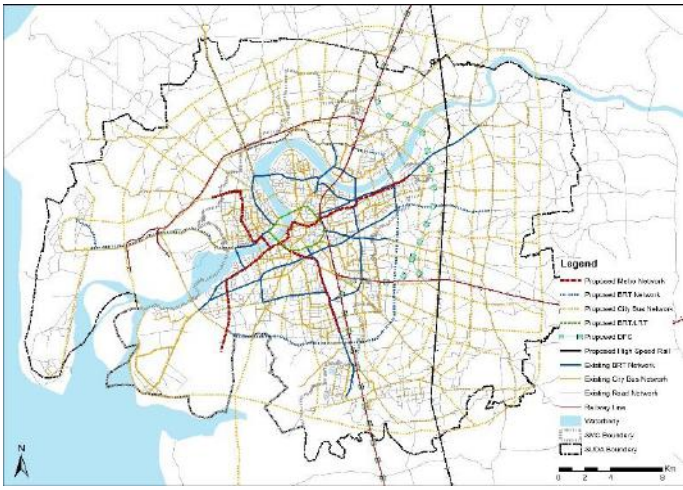
Proposed Transport Networks (Surat)



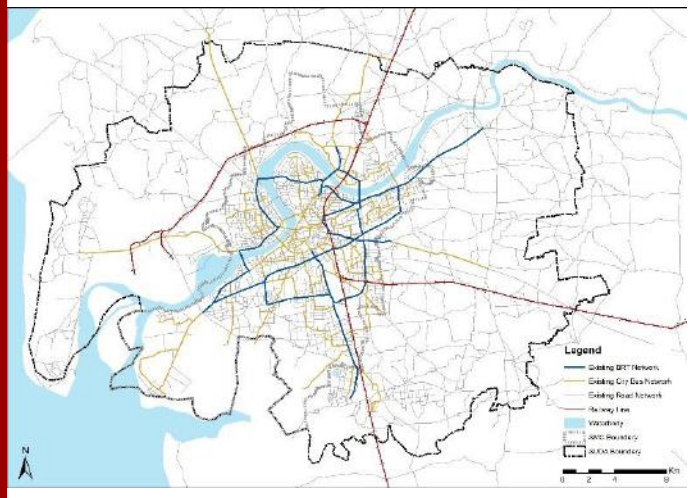


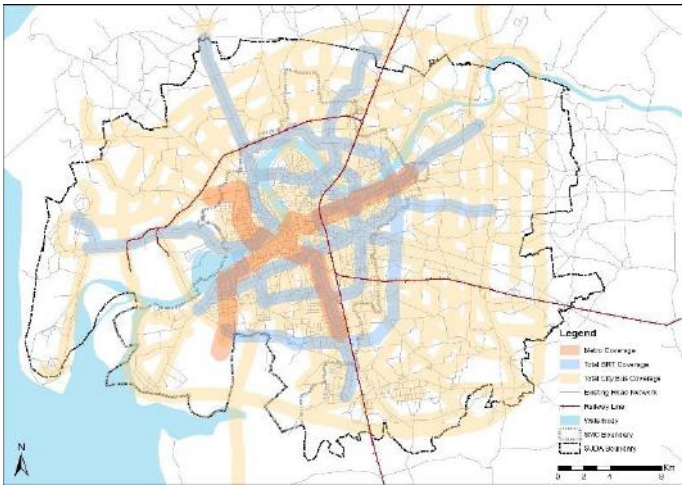
NMT network coverage





IPT network coverage





PT network coverage

SDG Interactions in the Proposed Scenario

Non-Motorised Transport	Surat			Udaipur		
	Safety & Comfort (SDG 5.1 & 5.2)	Access to Opportunities (SDG 5.4, 5.5 & 5.B)	Access to Healthcare (SDG 5.6)	Safety & Comfort (SDG 5.1 & 5.2)	Access to Opportunities (SDG 5.4, 5.5 & 5.B)	Access to Healthcare (SDG 5.6)
1. Network Coverage						
2. Infrastructure Quality						
3. Mode Share						

Intermediate Public Transport	Surat			Udaipur		
	Safety & Comfort (SDG 5.1 & 5.2)	Access to Opportunities (SDG 5.4, 5.5 & 5.B)	Access to Healthcare (SDG 5.6)	Safety & Comfort (SDG 5.1 & 5.2)	Access to Opportunities (SDG 5.4, 5.5 & 5.B)	Access to Healthcare (SDG 5.6)
1. Network Coverage						
2. Infrastructure Quality						
3. Service Quality						
4. IPT Affordability						

Public Transport	Surat			Udaipur		
	Safety & Comfort (SDG 5.1 & 5.2)	Access to Opportunities (SDG 5.4, 5.5 & 5.B)	Access to Healthcare (SDG 5.6)	Safety & Comfort (SDG 5.1 & 5.2)	Access to Opportunities (SDG 5.4, 5.5 & 5.B)	Access to Healthcare (SDG 5.6)
1. Network Coverage						
2. Infrastructure Quality						
3. Service Quality						
4. IPT Affordability						

Synergy Mixed Impact Trade-off

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