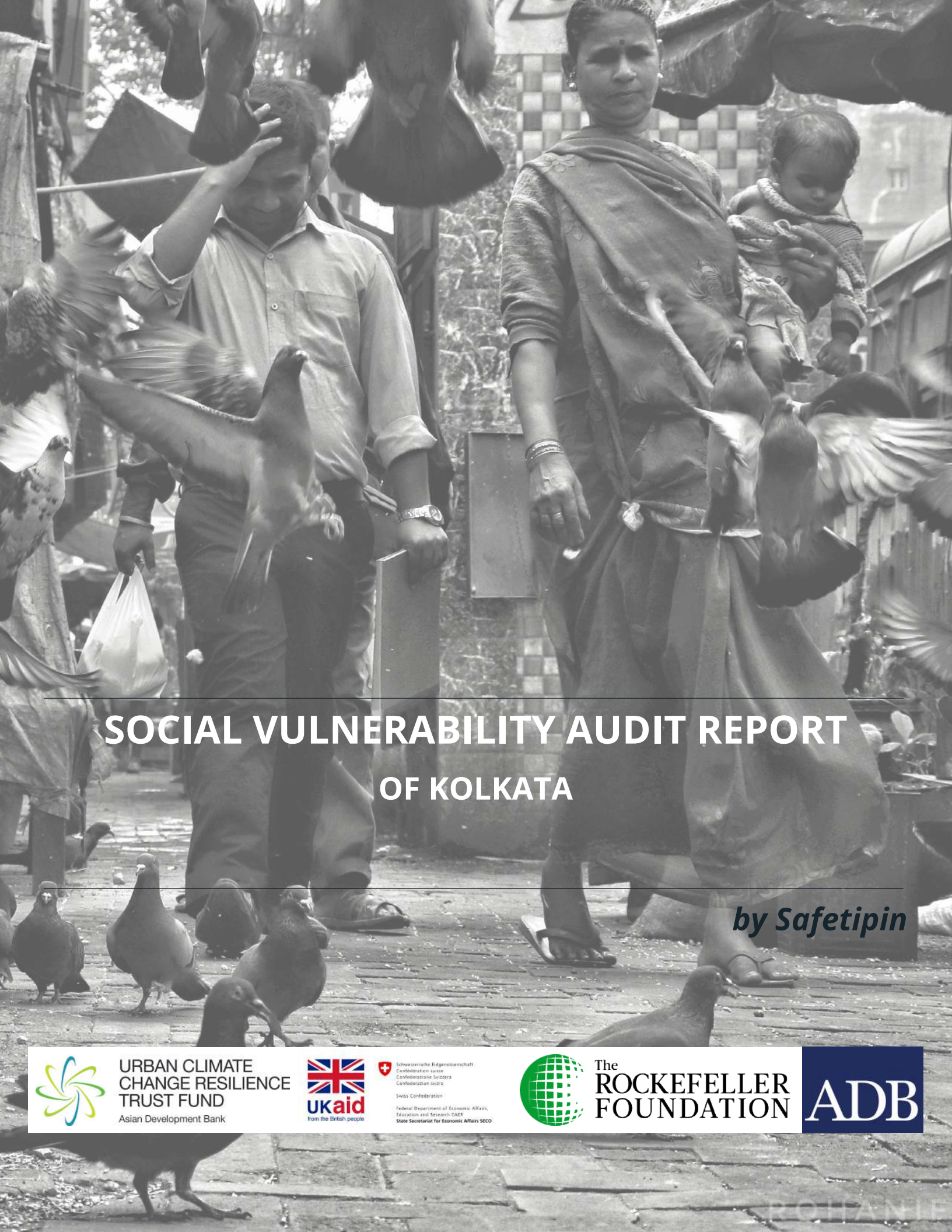




SOCIAL VULNERABILITY AUDIT REPORT OF KOLKATA

by Safetipin



URBAN CLIMATE
CHANGE RESILIENCE
TRUST FUND
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KOLKATA VULNERABILITY AUDIT

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SAFETIPIN

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♦

for the Social Vulnerability Audit project

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Cover Photo: <https://unsplash.com/subhasish-dutta-V4ZP3kBfvE4>

KOLKATA

SOCIAL VULNERABILITY

AUDIT OF PUBLIC SPACES

Accessibility for vulnerable users of public space

Kolkata, popularly known as the ‘City of Joy’ is the administrative capital of the eastern Indian state of West Bengal and was India’s first metropolitan entity. It has grown from a colonial port city, then Calcutta, to a giant megalopolis with a population of 14 million. The city stretches north–south along the eastern bank of river Hooghly (Ganga) in the deltaic Bengal basin. Most of the city area was originally a wetland and has been reclaimed over time to accommodate a burgeoning population. The administrative jurisdictions of Kolkata city district namely Kolkata Municipal Corporation (KMC) has 144 wards with a population of 4.5 million, covering an area of 205 sq.km.

Current urban patterns of transformation in Kolkata has a visible impact on its structure, its mobility and public space usage. These are mainly shaped by some prevalent urban forces of recent times. Some such forces that impact the usage of public spaces by pedestrians are:

- (a) increase in urban migration and high concentration of urban population density,
- (b) expansion and integration of transportation network, and
- (c) regularisation of urban informal businesses, like street vendors, small traders and temporary shops

Together these have added pressure on the already crumbling infrastructure and resources available in the public realm. A closer look at some of these urban transformations would reveal the current status of the city’s public realm and possible strategies could be adopted to improve its usability, especially for vulnerable groups. Poor maintenance of public spaces has disadvantaged accessibility for the disabled and elderly and lack of safety or security have disrupted accessibility for women and children.

VULNERABLE GROUPS USING PUBLIC SPACE

Vulnerable groups are groups of people who face certain disadvantages because of their gender, age, social, cultural and economic status. Broadly speaking, they comprise of women, children, elderly, disabled and the poor who live and work in cities. This study would be looking at how accessible are public spaces in Kolkata for these groups. As mentioned, public space usage in Kolkata is expected to increase because of certain trajectories seen in urban migration, transport network and informal livelihoods. Hence, more people, including the vulnerable groups, will be using public spaces such as streets, squares and green open spaces in order to fulfill their roles and responsibilities. But transport network expansion schemes typically do not account for the increase in pedestrian volume which is causal to such schemes. It usually focuses on widening the carriageways and improving heavy infrastructure to make the transport systems more efficient and robust. KMC’s Comprehensive Mobility Plan, 2025 is no exception and has been drafted without any pedestrian movement and accessibility plan to support the main scheme. This disregard disproportionately affects the vulnerable groups and puts them at risk while using the public realm.

Disabled: ‘Persons with Disabilities Act, 1995’ and ‘The National Trust Act, 1999’ mandated to collect information on eight types of disabilities as against five done in Census 2001. In India, as per Census 2011, about 2.68 Cr out of the total population of 121 Cr are ‘disabled’, that is 2.21% of the total population. In an age where ‘inclusive development’ is being emphasized as the way forward for sustainable development, focused initiatives for the welfare of disabled persons are essential. The issue gets compounded when injury and/or age makes any able bodied person disabled to such an extent that they may have difficulties with mobility. Hence, making public spaces inclusive, safe and accessible for the disabled is of primary concern to many cities and urban conurbations. According to Census 2011, West Bengal alone has 7.2% share of disabled persons of the total disabled persons in India and the city of Kolkata has to go a long way to meet universal access standards.

Elderly: Kolkata is a greying metropolis and is aging faster than other metros in the country. Studies show, Kolkata is home to more senior citizens than any other metro in India - most of whom live alone. Educated Bengalis have always moved out to other cities and countries, but in the last decade there has been an exodus of sorts of young people. Kolkata has the least number of 20 to 30-year-olds among metros. In a survey by the West Bengal government it was estimated that 9% of Kolkata’s population is currently aged 60 and above. The city which has such a high percentage of elderly people has to embrace Active-Aging strategies. Apart from good physical and mental health which elderly definitely need, social health and positive well-being is also needed. Continued involvement in one’s family, peer group and community throughout the aging process is essential and inclusion in city’s urban spaces plays a crucial role.

Women and children: According to Census 2011, Kolkata City District has a sex ratio of 908 females for every 1000 males and 47.6% of the total population of 4.5 million. Women’s presence in public spaces is indeed strong in Kolkata, but spotting an unaccompanied woman is still rare. Working class women and men access the public space for their daily activities. Though less women are seen loitering or using public space for leisure. Women and girls access public space for a purpose, while men and boys are seen generally loitering and enjoy the city more freely. Even though near equal participation of both women and men are seen in the city, it adds hardships to women’s lives because of its low maintained infrastructure and over-crowded streets and spaces. In does not feel particularly safe for a lone woman to walk the streets at night. Likewise, young children who are mostly accompanied by women in public spaces face similar challenges of access and support. Children (of 0-6 age group) make up 7.55% of the city’s population.

Pedestrian safety and accessibility are yet to receive the attention they require for serious up-gradation. Currently pedestrian walkways or footpaths are fully or partially encroached upon by informal establishments, hawkers, two-wheelers, four wheelers and various other forms of barriers. The footpaths are extremely hazardous particularly for the disabled, elderly and children as they have obstructing trees, electricity poles, sewer lines, broken or missing pavers and non-negotiable high curbs. Furthermore, general access and safety in public spaces remains a cause of concern

as the pedestrian movement network is not seamless – the crossovers have not been planned or designed mindfully for the vulnerable groups. It is known that the ease of accessibility and mobility in urban environments affect the city’s health in a positive way and impacts its liveability, sustainability and vibrancy. Therefore, improving the quality and experience of the pedestrian environment especially for the disabled, elderly, women and children, is matter of critical importance to make the City of Kolkata liveable, sustainable and inclusive.

SOCIAL VULNERABILITY AUDIT BY SAFETIPIN

The ‘social vulnerability audit of public spaces’ study seeks to address the issues of vulnerability and safety with a focus on accessibility from a vulnerable user’s perspective. Safetipin being a social vulnerability expert was asked to map the city’s public spaces to understand its current status within the given framework. UNESCO’s definition of public space refers to an area or place that is open and accessible to all people, regardless of gender, race, ethnicity, age or socio-economic level. These are public gathering spaces such as plazas, squares and parks. Connecting spaces, such as sidewalks and streets, are also public spaces. Within such reference, the study planned to collect data mainly on the streets and sidewalks to study accessibility, conduct analysis of the data and work with local governments on how to use the data to make streets and sidewalks more accessible. In addition, this project intended to work towards strategic partnerships with city stakeholders to influence and make city spaces accessible, safe and inclusive by responding to the priority issues identified through the use of the Safetipin application. Using the application - Safetipin Nite, the study mapped through images all the main roads of the city of Kolkata. It took three months (August - October, 2019) to collect data on the city. The app provided large scale data at the street level to investigate on the challenges on accessibility encountered by women, children, elderly and the disabled while using public spaces in the city. Further it conducted analysis of the data and provided recommendations for improvement to meet the current and future demands of the city exclusively for public space usability. This data could be valuable source of information for both citizens and governments. The details of how the applications were used and data was produced to give recommendations for improvement are given in the following chapters.

SAFETIPIN IMAGE ANALYSIS TECHNIQUE

Vulnerability mapping using Safetipin application

VULNERABILITY MAPPING WITH SAFETIPIN NITE

Safetipin Nite app generates data by clicking pictures across the city via a phone camera mounted on the windshield of a moving vehicle. Photos are taken to capture pedestrian’s vulnerability and safety conditions at regular intervals of 30-50 metres. Every picture is geo-tagged and uploaded on to a server and further analysed by a team of expert coders using Safetipin parameters and sub-parameters. These eventually are translated into data sets that appear as audit points on the Safetipin map. This image bank of GIS data is then shared with local stakeholders and government authorities in order to address and improve vulnerability and safety conditions in the city.

Image on right
Phone running Safetipin Nite App mounted on the windshield of a car



SAFETIPIN AUDIT PARAMETERS TO EVALUATE VULNERABILITY AND SAFETY IN PUBLIC SPACES:

Lighting – Availability of enough light to see all around you

Walkpath – Either a pavement or road with space to walk

Public Transport – Availability of public transport like metro, buses, autos, rickshaws

Visibility – Vendors, shops, building entrances, windows and balconies from where you can be seen

Security – Presence of formal police or private guards

People – Number of people around you

Gender Usage – Presence of women and children near you

Openness – Ability to see clearly and move in all directions

Parameter	Score 0	Score 1	Score 2	Score 3
Lighting (Night)	None	Little	Enough	Bright
	No street or other lights	Can see lights, but there is low visibility in the area	Lighting is enough for clear visibility	Whole area brightly lit
Openness	Not Open	Partly Open	Mostly Open	Completely Open
	Many blind corners and no clear sightlines	Able to see a little ahead and around	Able to see in most directions	Can see clearly in all directions
Visibility	No Eyes	Few Eyes	More Eyes	Highly Visible
	No windows or entrances of shops or residences overlook the point	Less than 5 windows or entrances overlook the point	Less than 10 windows or entrances and vendors overlook the point	More than 10 windows or entrances and vendors overlook this point
People	Deserted	Few People	Some Crowd	Crowded
	No one in sight	Less than 10 people in sight	More than 10 people visible	Many people within touching distance
Security	None	Minimal	Moderate	High
	No guards or police visible in surrounding area	Some private security visible in surrounding area but not nearby	Private security within hailing distance	Police / reliable security within hailing distance
Walk Path	None	Poor	Fair	Good
	No walking path available	Path exists but in very bad condition	Can walk but not run	Easy to walk fast or run
Public Transport	Unavailable	Distant	Nearby	Very Close
	No metro, bus, auto/rickshaw stop within 10 mins walk	Metro or bus auto/rickshaw stop between 5-10 mins walk	Metro or bus, auto/rickshaw stop between 2-5 mins walk	Metro or bus, auto/rickshaw available within 2 mins walk
Gender Usage	Not Diverse	Somewhat Diverse	Fairly Diverse	Diverse
	No one in sight, or only men	Mostly men, very few women or children	Some women and children	Balance of all genders or more women and children

THE RATING RUBRIC

Image on left
The ratings for each of the parameters are defined on a scale of 0-3

ACCESSIBILITY MAPPING WITH SAFETIPIN NITE

To gain a deeper understanding of vulnerability and safety in public spaces of Kolkata, a thorough investigation on accessibility was done. Safetipin Nite was used to map the city twice - during the day and after dark. An additional set of accessibility parameters apart from the standard Safetipin parameters explained before were applied to assess the status of physical accessibility in the city especially from a vulnerable user’s perspective. Since walking is a basic and common means of access in the city, footpaths which facilitate walking, become the crucial form of urban infrastructure. Day and night image mapping of footpaths were put together to analyse the ease of accessibility in the city. The accessibility parameters applied are as follows.

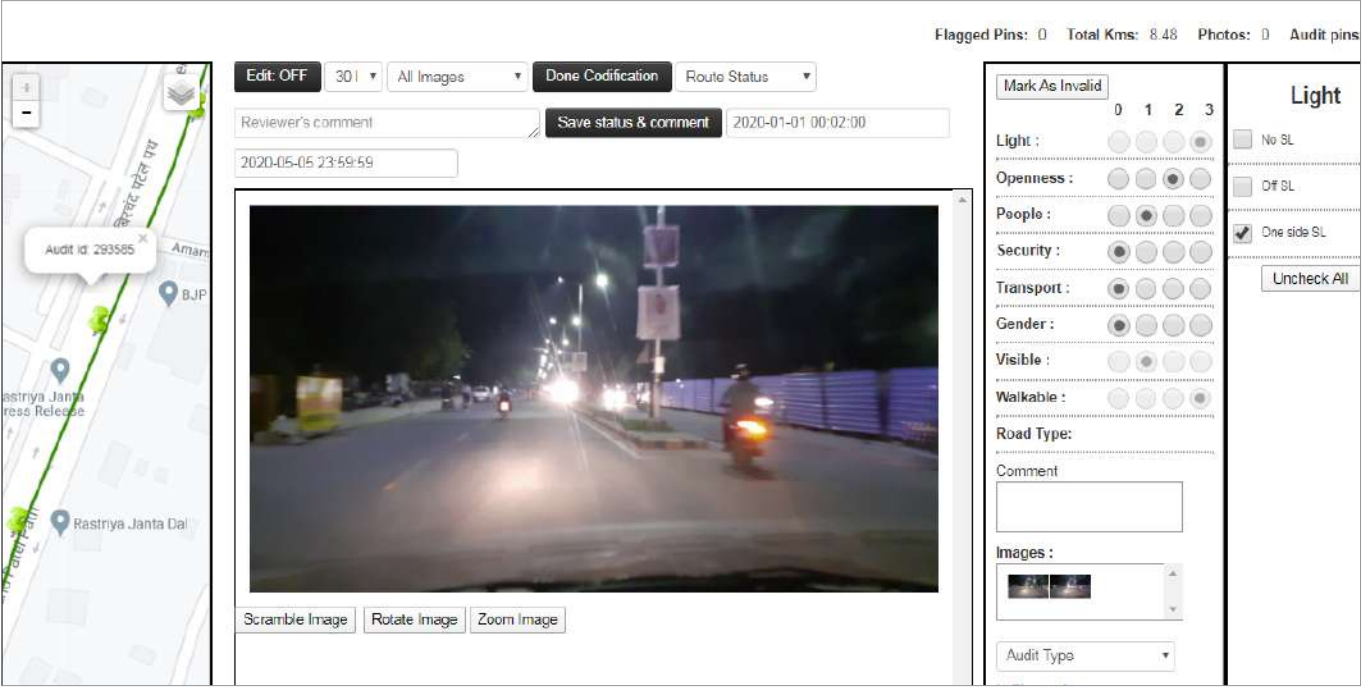
Footpath Conditions:

- Non-existent footpath
- Broken, dis-continuous footpath
- Availability of curb ramps, median breaks and zebra crossings

Footpath Barriers:

- Garbage dumped on footpaths
- Vehicles parked on footpaths
- House and shop extensions onto footpaths
- Temporary shops and vendors obstructing footpaths
- Light, electric, signage and advert poles obstructing footpath

Image below
Snapshot of the coding screen showing the parameters and sub-parameters



DATA CODING ON SAFETIPIN PORTAL

The photographs collected through Safetipin Nite get uploaded onto the Safetipin server. These are then accessed on the portal and analysed on a wide range of parameters linked to accessibility, safety and inclusivity of public spaces. For deeper analysis, a set of sub-parametres for the parameters of Lighting, Walkpath, Public Transport, Visibility and Security are used for recording additional information. The complete list of sub-parameters is given here. Google Maps are also used to identify the sub-parameters. Every 100 metres, an audit is generated at a point by using all the photographs collected around that point.

GENERATING MAPS, ANALYSES AND REPORTS

Based on the collected and coded data, the Safetipin team analyses and produces maps and reports that can be used for actual on ground responses and actions to work toward improving accessibility and safety on the streets and public spaces in cities. Maps are produced on each parameter with geo-tagged location of audit points, supported with images. Data is also analysed in terms of correlations and linkages with other possible data sets which further supports or reinforce the findings. Based on these analyses, a concrete set of recommendations are drawn out for key stakeholders for city improvement programs.

Lighting	Visibility	Walkpath	Security	Public Transport
No SL	50% Boundary Wall	No Pavement	Private Guards	Metro/Rail
Off SL	100% Boundary Wall	Broken Pavement	Police Van/Bike	Bus/Mini bus
Dim SL	Unused Land	Unpaved Pavement	Police Check	Auto/Shared Auto
High SL	Road side Vendors	Car Blocking	Police Booth	Cycle Rickshaw
Too Far SL	Temporary Stalls	Vendor Blocking	Police Station	Taxi
Leaves cover SL	Shops	Houses Extending	Other Govt.	Rental Bicycle
Other cover SL	Houses upto 4 Floors	Trees Blocking		
One side SL	Houses >4 Floors	Other Blocking		
		Walkable Road		
		On-street Parking		

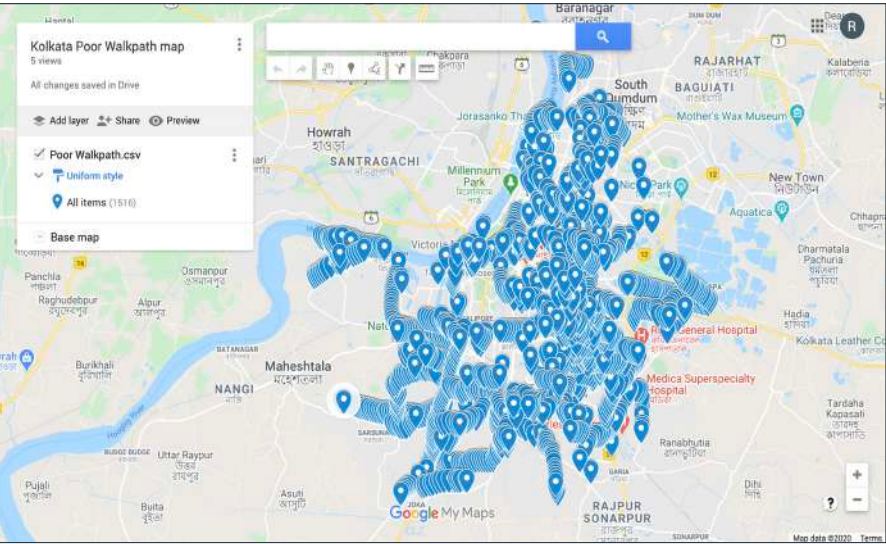
SUB-PARAMETER RUBRIC

Image on left
Rubric showing all the sub-parameters for the listed five parameters



KOLKATA POOR STREET LIGHTING MAP

Image on left
The map shows locations in the city where there is no or poor street lighting



KOLKATA STREET LIGHTING GIS LAYER

Image on left
GIS layer of street lighting on Google Maps with image links

CITY-WIDE DATA COLLECTION

Data collection using Safetipin Application

VULNERABILITY AUDIT IN KOLKATA

On receiving the Mayor’s approval and the letter of authorization from KEIIP to start data collection, Safetipin immediately conducted ‘Driver Training Program’ with the verified drivers or field investigators assigned by a resource agency in Kolkata. The agency - Market Xcel hired by Safetipin supported the Safetipin team to individually train every driver and volunteer to use ‘Safetipin Nite’ application on the smart phones provided by Safetipin.

Over the app training session, Safetipin Nite App was introduced to four volunteers and four drivers who were chosen for the work. The volunteers were introduced to the app and were even trained to use the app in their personal phones as well as the smart phones which were provided for data collection. Alongside, they were also trained on how to mount the phones on the windshields of the cars to do the image collection. Pre-assigned data collection routes were run on all their phones and hands-on training with the volunteers/drivers were done with the Safetipin team members driving around the city collecting data.

Data collection details:

Total Kilometers covered: 767 Km
Images collection time:
Day - 2:30 pm to 5:30 pm, Night - 5:30 pm to 9:30 pm
Total images collected: 89551 nos

Total data collection time: Three months (August to October, 2019)
Total data mapping and analysis time: Three months (November 2019 to January 2020)

DATA COLLECTION WITH SAFETIPIN NITE

767 km were covered by the drivers and their respective volunteers in Kolkata, collecting 89551 images of the city between 5:30pm to 9:30pm. Similarly, the city was mapped during the day between 2:30pm to 5:30pm. The quality of most of the images collected were certified good after an initial round of review by the Safetipin team and were processed for the main visual analysis. The volunteers and drivers worked efficiently in collecting data with the help of Safetipin Nite app.

However, in spite of having a good app training and data collection experience in Kolkata, couple of challenges as listed below were encountered.

Challenge: The routes which were assigned to the drivers for data collection by using Safetipin Nite app were made from the GIS road layers and google maps. There were issues in actually accessing few routes on ground. One reason for the inaccessibility was that the traffic changes made on ground were not reflected on the google map or GIS road layers. The other problem was that due to some construction work on few of the roads, drivers were unable to access it.

Challenge: The photographs are expected to be of a certain quality for having convenience in coding process. It was hard to maintain the quality of the images collected due to the constant shaking of the car, due to bad road condition and water logging in monsoons and rain water blurring the camera view.



DRIVER TRAINING

Image on left
Safetipin Nite app running on volunteer's and driver's smart phones



GOOD IMAGE

Image on left
Photo collected through Safetipin Nite app - an example of a good image



BAD IMAGE

Image on left
Photo collected through Safetipin Nite app - an example of a bad image

KOLKATA VULNERABILITY MAPPING FINDINGS

Parameter maps and safety ratings

In Kolkata, after analysis of the collected data, representational maps for each parameter were prepared for data visualisation. The following parameter maps represent the data as audit points generated through image analysis technique. This helps to read and compare the data geographically and understand where the gap lies in making public spaces accessible and safe especially for the vulnerable groups. Overall, 4119 audit points were generated for Kolkata.

The map below shows the safety audit points mapped by the Safetipin Nite application

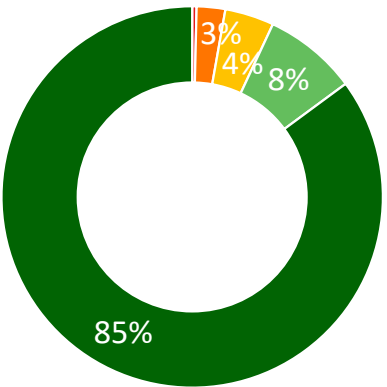
Kolkata:
Safetipin Nite Audits

- Legend
- Safety Audits
 - Kolkata
- Base: Google Map



3.7/5

SAFETY SCORE OF KOLKATA

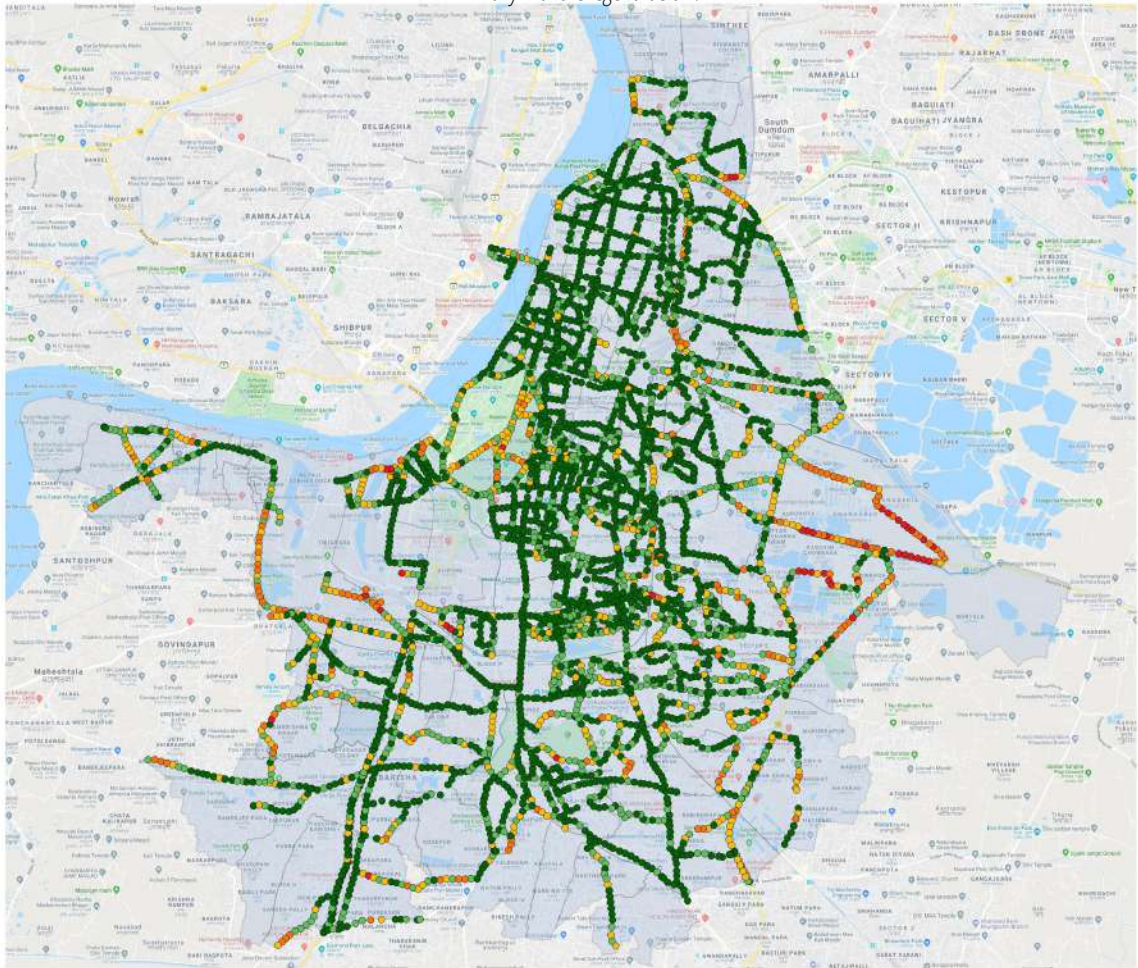


Based on the collected data, a safety score of 3.7 on a scale of 5 is given to Kolkata which evaluates Kolkata's status as 'above average' on vulnerability and safety. The safety score map below shows some areas across the city with poor physical infrastructure and poor usage of public space. This means that the condition of street-lighting, footpath, visibility, security and public transport needs improvement and would together contribute to make city areas accessible and safe. A thorough analysis of each parameter follows to understand which of the parameters need more attention to improve the overall vulnerability status of the city.

On the left, percentage distribution pie of the safety score map below. Tally with the legend below.

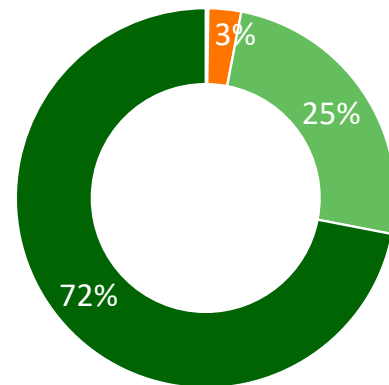
Kolkata:
Safety Score

- Legend
- Safety Audits
- Poor
 - Below Average
 - Average
 - Above Average
 - Excellent
 - Kolkata
- Base: Google Map



97%

OF THE CITY MAPPED HAS ADEQUATE STREETLIGHTS



97% of the city has adequate street lighting and only 3% scores poorly on the same. When this data is represented geographically (map below) it is seen that areas with lower ratings on street lighting are sporadically spread across the city in few locations. This means, either there are no or inadequate street lighting in these parts of the city. This geo-located data, provided as a GIS layer, could be used for improving street lighting in the city and making it fully functional.

On the left, percentage distribution pie of the parameter map below. Tally with the legend below.

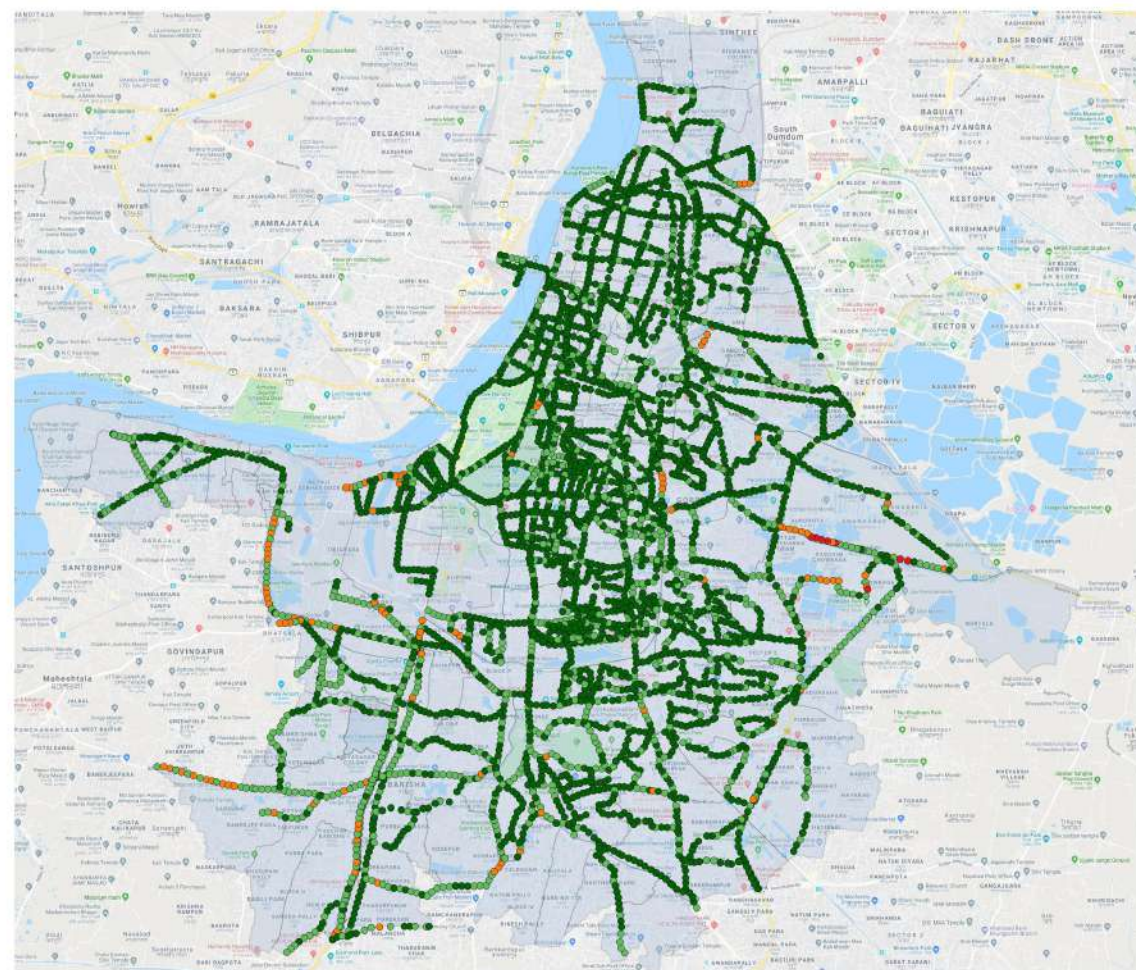
Kolkata: Parameter Lighting

Legend

Safety Audits

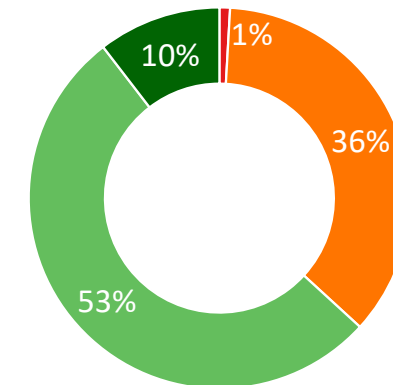
- Poor Light
- Some Light
- Enough Light
- Bright Light
- Kolkata

Base: Google Map



63%

OF THE CITY MAPPED HAS WALKABLE FOOTPATHS



63% of the city has walkable footpaths, rest 37% scores poorly on the same. When this data is represented geographically (map below) it is seen that areas with lower ratings on footpaths are in the southern side of the city and in clusters, in various other locations with an exception of a large part of the core where the rating is good. This means, either there are no or very poor quality footpaths in these parts of the city. A detailed footpath analysis follows to understand accessibility better.

On the left, percentage distribution pie of the parameter map below. Tally with the legend below.

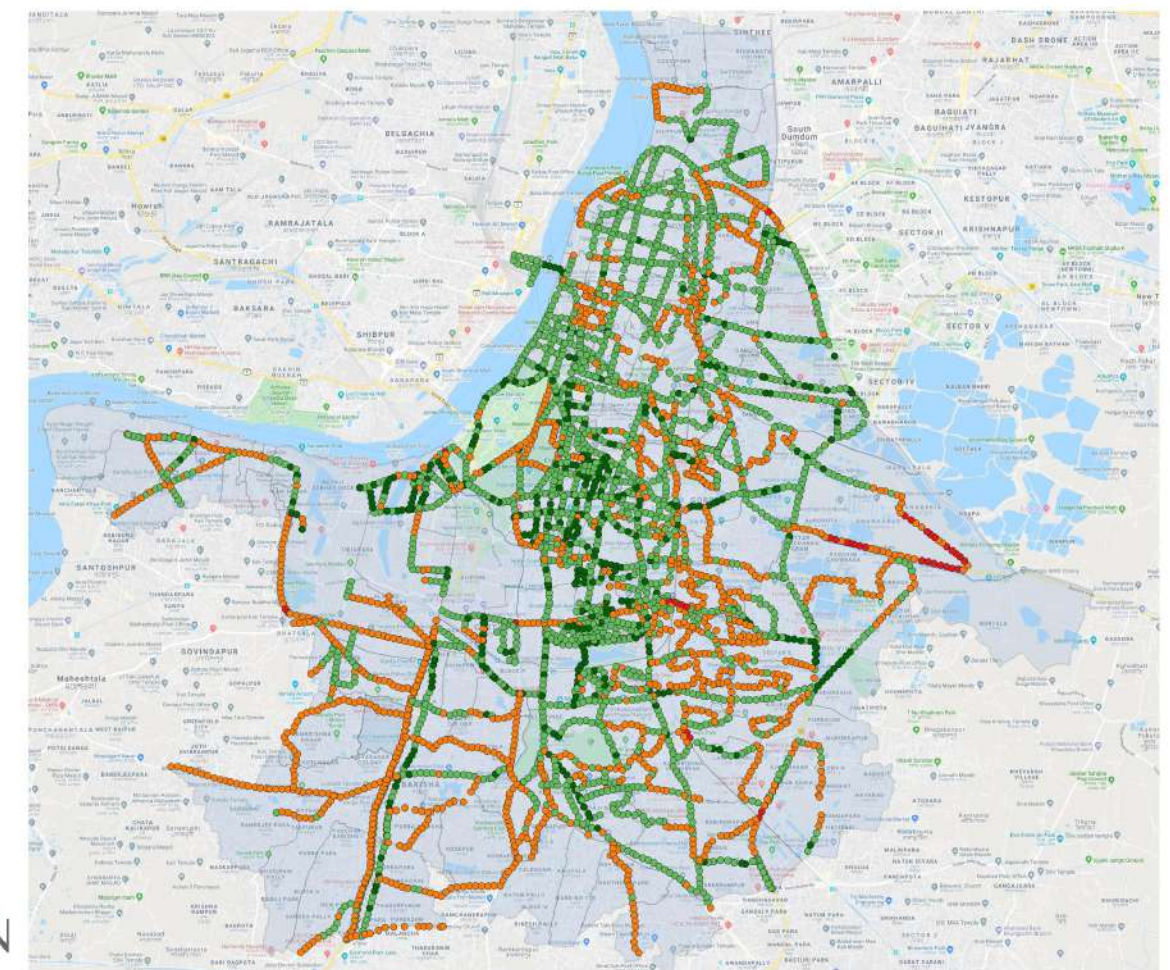
Kolkata: Parameter Walkpath

Legend

Safety Audits

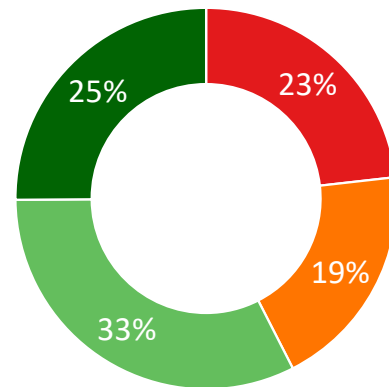
- None
- Poor
- Fair
- Good
- Kolkata

Base: Google Map



58%

HAS PUBLIC TRANSPORT STOPS WITHIN REACH



58% of the city has public transport stands/stops within 2-5 minutes walking distance, 19% can reach them in 5-10 minutes and the rest 23% does not have any formal or informal transport stands/stops reachable within 10mins. When this data is represented geographically (map below) it is seen that areas with lower ratings on public transport are spread in clusters across the city. This means, formal public transport stands/stops are either unavailable or not within reach in these parts.

On the left, percentage distribution pie of the parameter map below. Tally with the legend below.

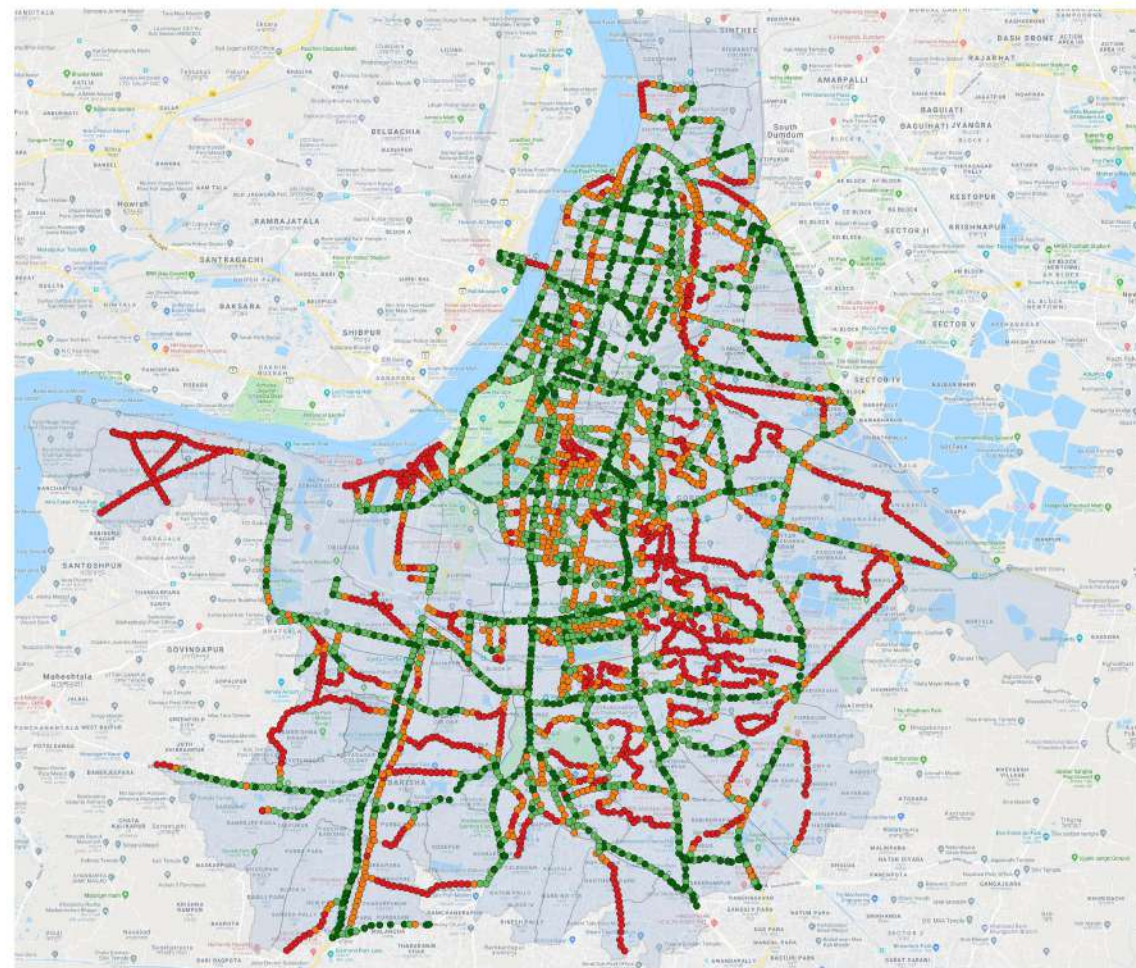
Kolkata: Parameter Public Transport

Legend

Safety Audits

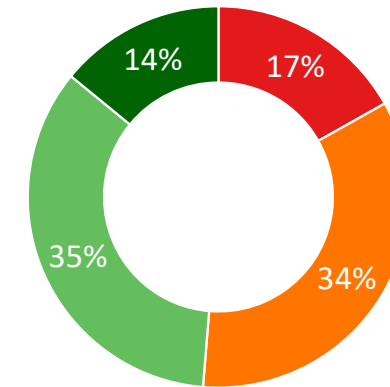
- Unavailable
- Distant
- Nearby
- Very Close
- Kolkata

Base: Google Map



49%

OF THE CITY MAPPED HAS GOOD VISIBILITY



49% of the city has good visibility or has active streets, i.e., these parts have less number of high boundary walls or blank facades facing the streets and have more people, vendors, shops on the streets. But 51% of the city still scores poorly on the same. When this data is represented geographically (map below) it is seen that areas with lower ratings on visibility are spread across the city with some long stretches on the western and eastern side. This means, either there are no or low visibility.

On the left, percentage distribution pie of the parameter map below. Tally with the legend below.

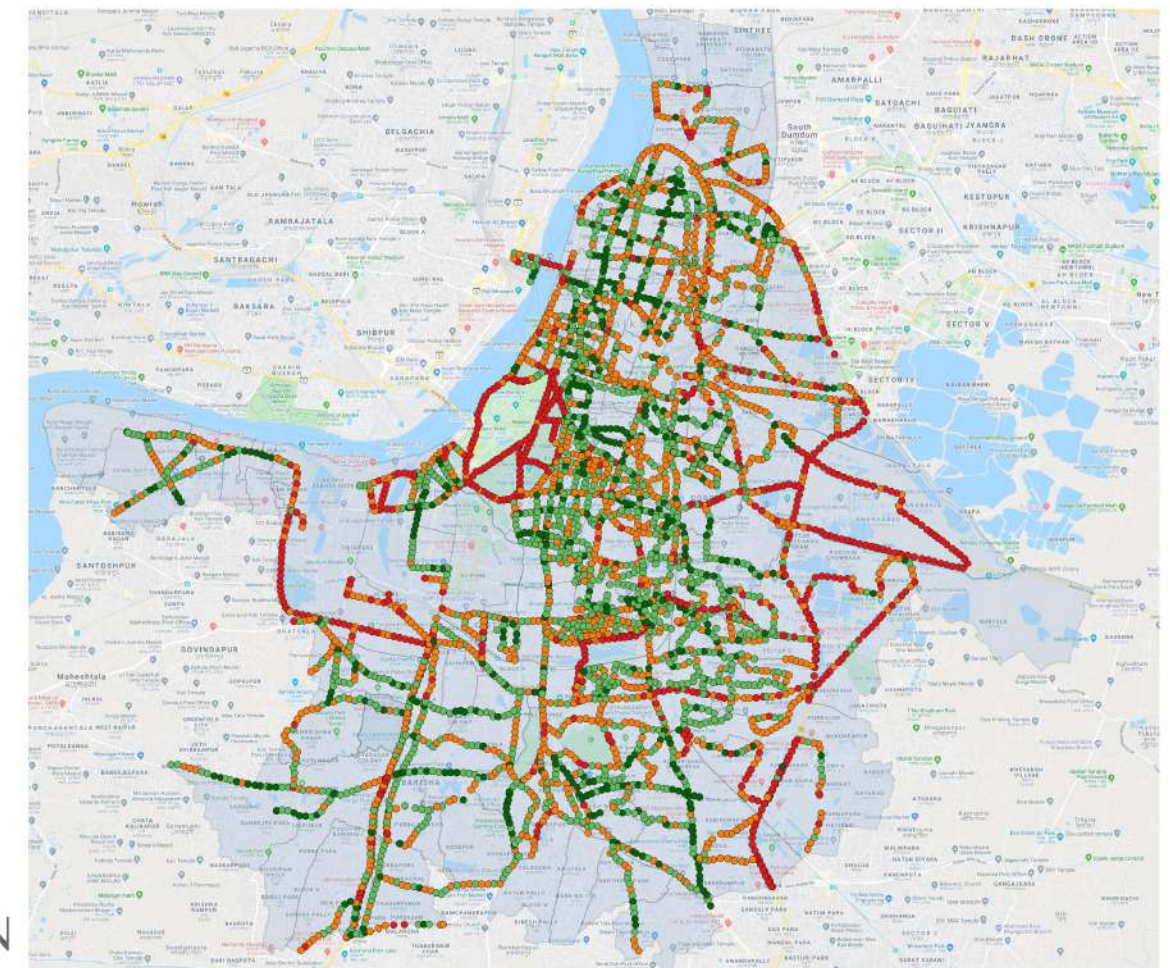
Kolkata: Parameter Visibility

Legend

Safety Audits

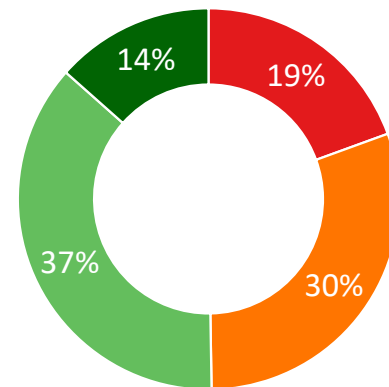
- No Eyes
- Few Eyes
- More Eyes
- Highly Visible
- Kolkata

Base: Google Map



51%

HAS GOOD PRESENCE OF PEOPLE ON THE STREETS



51% of the city had good number of people present on the streets during the time of the audit, while 30% had less than 10 people after dark and 19% were quite empty. When this data is represented geographically (map below) it is seen that areas with lower ratings on people are spread across the city at various locations. This means, either there were no or few people in these parts of the city. This data could be supplemented with other data sets to understand why these parts are underused.

On the left, percentage distribution pie of the parameter map below. Tally with the legend below.

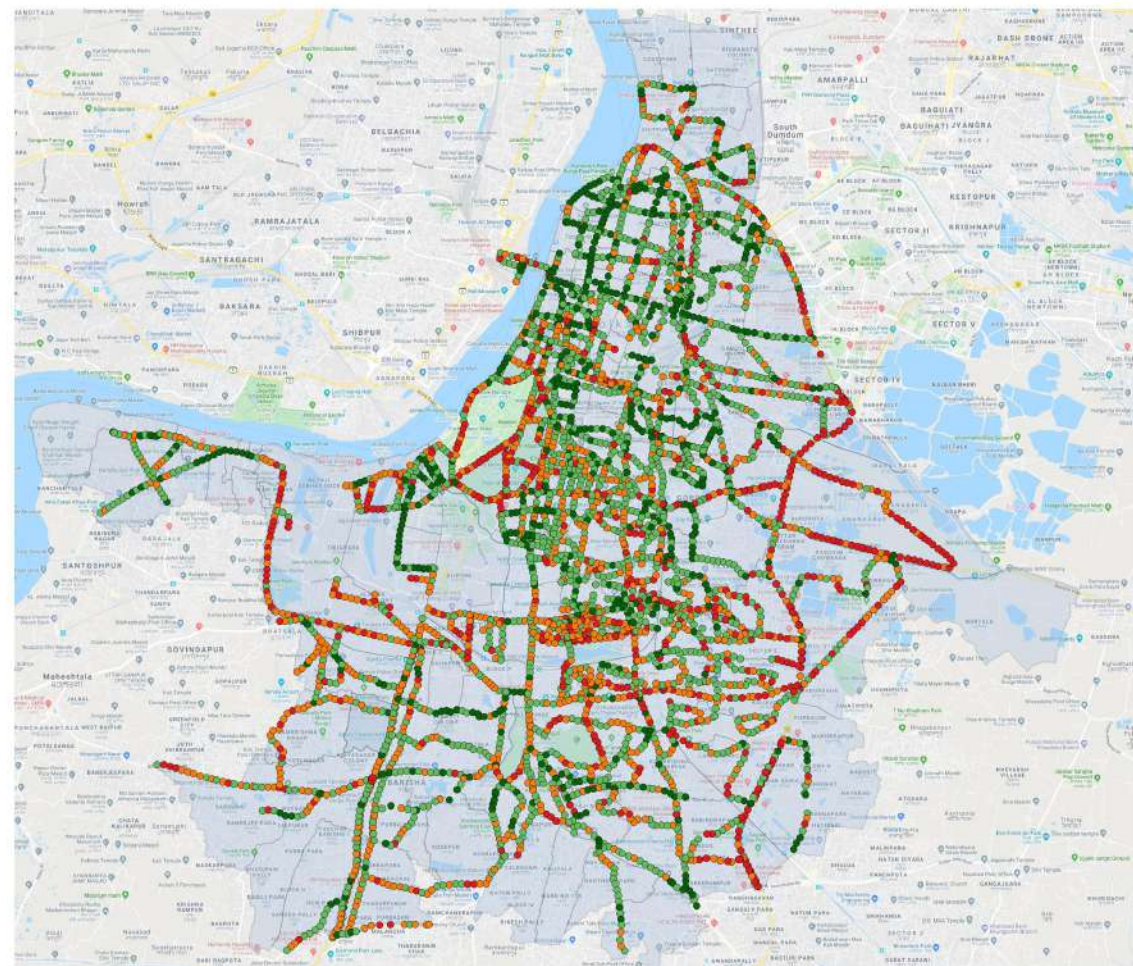
Kolkata: Parameter People

Legend

Safety Audits

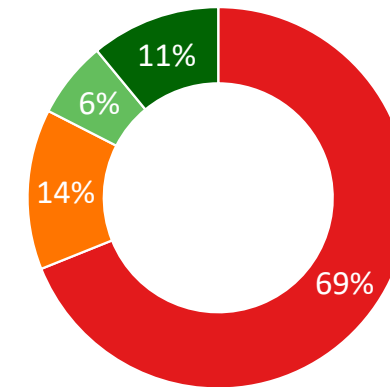
- Deserted
- Few People
- Some Crowd
- Crowded
- Kolkata

Base: Google Map



17%

OF THE CITY MAPPED HAS PRESENCE OF WOMEN



Only 17% of the city had women and children present in public spaces during the time of the audit, rest 83% had either no or very few women and children present on the streets. When data is represented geographically (map below) it is seen that areas with lower ratings on gender usage are spread across the city barring few pockets at the core and on the northern and southern side. This means, that there were no women and children present at night on most of the streets in the city.

On the left, percentage distribution pie of the parameter map below. Tally with the legend below.

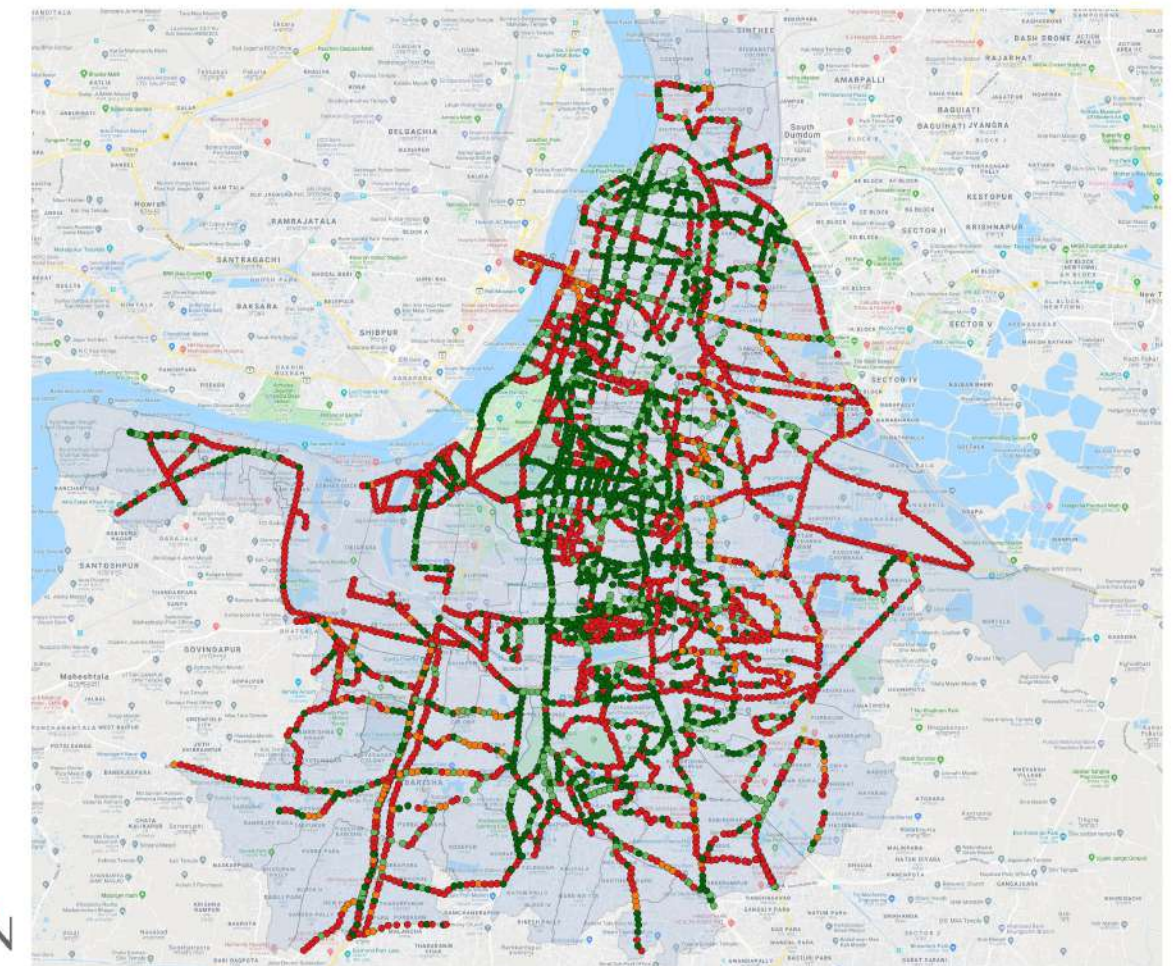
Kolkata: Parameter Gender Usage

Legend

Safety Audits

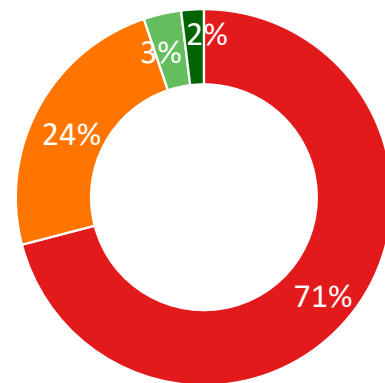
- Not Diverse
- Somewhat Diverse
- Fairly Diverse
- Diverse
- Kolkata

Base: Google Map



05%

OF THE CITY MAPPED HAS FORMAL SECURITY



The image analysis found only 5% of the city to have security i.e., presence of formal police or private guards, in rest 71% no police or guards were seen present and only 24% had few formal police and/or private guards visible in public spaces. When this data is represented geographically (map below) it is seen that areas with lower ratings on security are found all across the city. This security data collected could be supplemented with real time data on police patrolling or other formal security related data for further analysis.

On the left, percentage distribution pie of the parameter map below. Tally with the legend below.

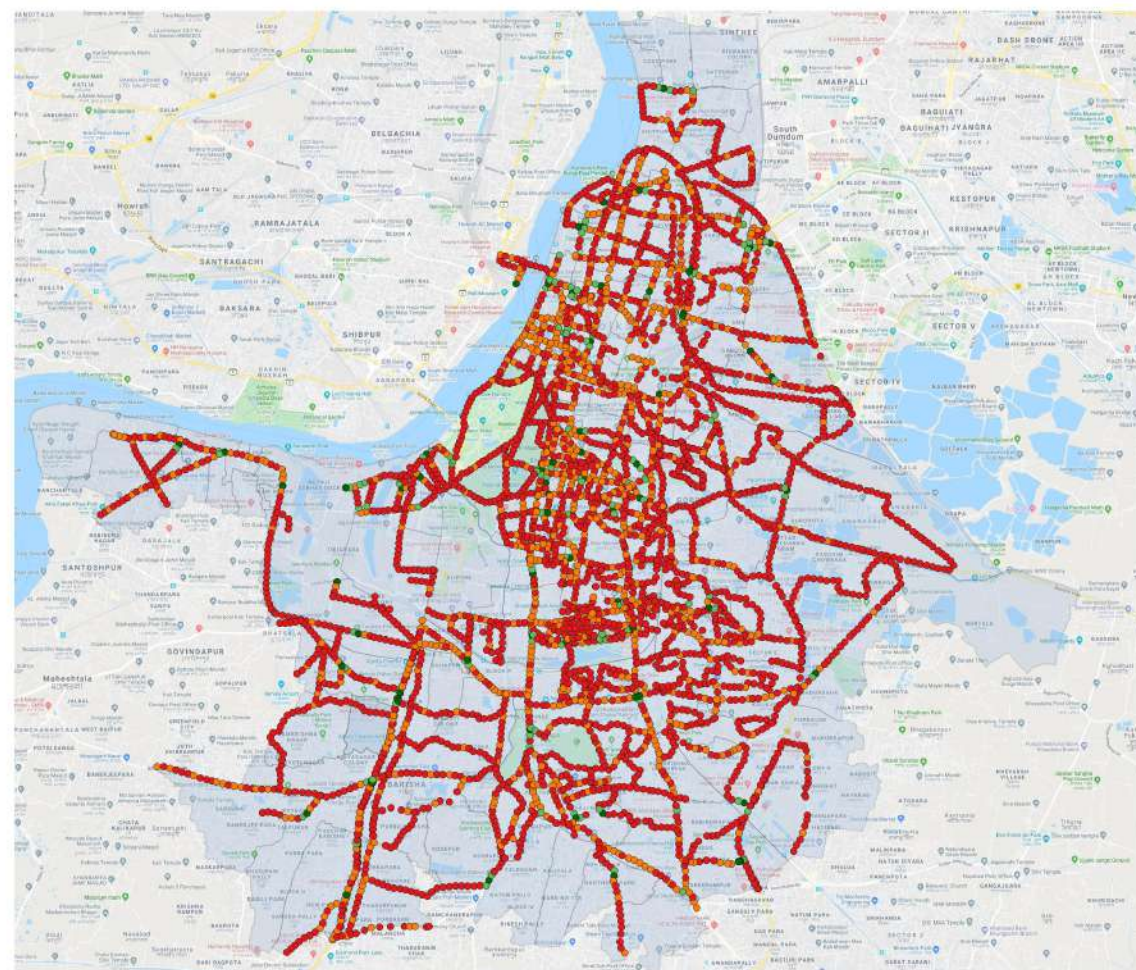
Kolkata: Parameter Security

Legend

Safety Audits

- None
- Minimal
- Moderate
- High
- Kolkata

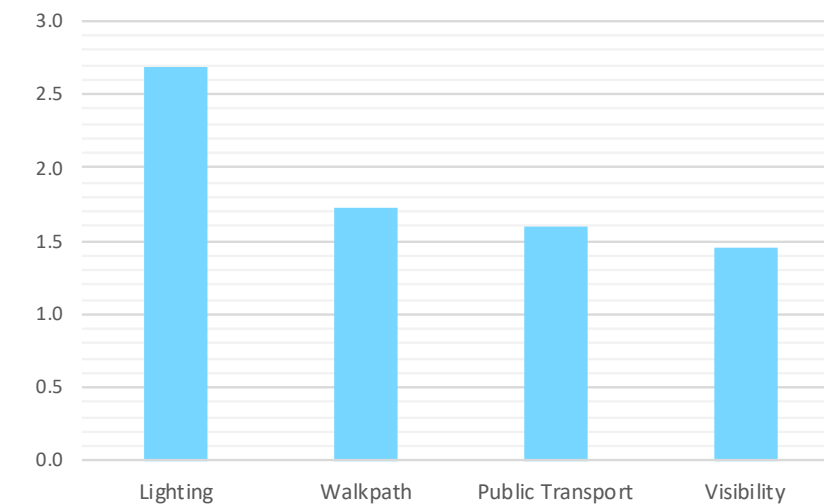
Base: Google Map



GRAPHIC INTERPRETATION OF KEY PARAMETERS

To further analyse, the parameters on which physical intervention is possible are put together and the data is compared for better analysis. The average parameter rating graph indicates the average rating for each parameter on a scale of three. Each of the four parameters are rated either 0, 1, 2 or 3, where 0 is poor and 3 is good. As seen on the graph, the Lighting parameter has been rated the highest, followed by other parameters such as Walkpath, Public Transport and Visibility which are rated much lower. The parameter wise pin distribution graph indicates the number of points rated as 0, 1, 2 and 3. The good ratings are taken as positive and poor ratings as negative. As shown on the graph, the parameters Public Transport and Visibility have almost half the audit point rated as below average and poor. Whereas, the parameters Lighting and Walkpath have very few audit points rated as poor and below average.

Kolkata: Average Parameter Graph

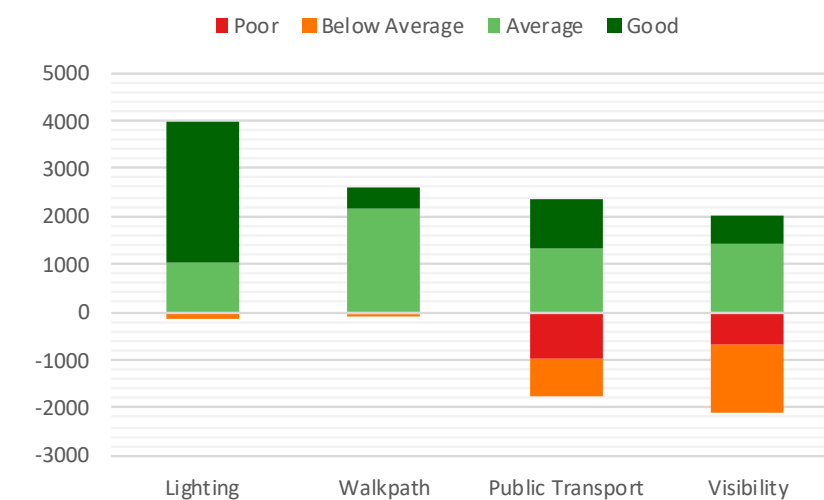


PARAMETER RATING

Graph top left

The graph shows average rating for each parameter on a scale of three.

Kolkata: Pin Distribution Graph



PIN DISTRIBUTION

Graph bottom left

The graph shows parameter wise pin distribution on a scale of three.

KOLKATA

ACCESSIBILITY MAPPING FINDINGS

Accessibility maps and specific findings

ACCESS FOR ALL

Everyone is a pedestrian. Walking is a basic and common mode of transport in all societies across the world. Virtually, every trip begins and ends with walking. Walking comprises the sole means of travel on some journeys, whether a long trip or running an errand. Therefore, footpaths are a fundamental form of urban infrastructure that facilitate walking, socializing and interacting with the public domain. In order to have a safe, barrier-free and successful trip, the street systems must be accessible to all pedestrians and especially to vulnerable users - women, children, elderly and people with disabilities using mobility devices such as wheelchairs and walkers, those who have vision, speech, hearing impairments or those with intellectual disabilities. The ease with which pedestrians can access and use streets influences their everyday life choices. A good street design which enables the user to seamlessly complete a trip from doorstep of origin to the doorstep of the destination is critical.

In the absence of accessible footpaths, pedestrians are forced to share the street with motorists which enhances the chances of pedestrian injuries, disablement and fatalities. Absence or poor condition of footpaths also drastically restrict access to public space especially for those with reduced mobility. It influences their ability to move around, connect to wider transport networks and access the opportunities present in the city. Therefore, footpaths impact the quality of their daily life.

Because streets are an important component of public space, designing them with people in mind is the key. Therefore, it is important to go beyond just having a footpath, it means that careful attention must be given to providing a comfortable, safe, engaging experience to all users of the street.

ACCESSIBILITY MAPPING OF KOLKATA

To map accessibility in public spaces of Kolkata, Safetipin Nite application was used to map the entire city twice - once in the day and once again in the night. An additional set of accessibility parameters apart from the standard vulnerability and safety parameters mentioned in the previous chapter were applied for better understanding of the status of accessibility in the city, especially for the vulnerable groups. Day time images revealed the actual condition and usage of the footpaths when in maximum use during the working hours. Night time images revealed the street lighting condition clearly in the evening hours apart from footpath condition and usage. Both sets of day and night images were then put together to analyse the ease of accessing the footpaths in the city, primarily used for walking as a mean to access the city and its resources.

To map this, two sets of factors were considered to assess ease of walking on footpaths. First - to map the present condition of the footpaths. Second - to see if the footpaths are clear of any barriers or not. Based on this, the accessibility parameters considered are as given below. A map was generated for each parameter with geo-tagged information which helps to assess the nature of the issues related to accessibility and locate the same for physical intervention to address them.

Accessibility parameters used for mapping:

Footpath Conditions:

Non-existent footpath

Broken, dis-continuous footpath

Availability of curb ramps, median breaks and zebra crossings

Footpath Barriers:

Garbage dumped on footpaths

Vehicles parked on footpaths

House and shop extensions onto footpaths

Temporary shops and vendors obstructing footpaths

Light, electric, signage and advert poles obstructing footpath



CURB RAMPS

Image on left

The image shows correctly designed, located and executed curb ramps.



ZEBRA CROSSING

Image on left

The image shows correctly designed, located and executed pedestrian crossings.



MEDIAN BREAK

Image on left

The image shows correctly designed, located and executed median breaks.

KOLKATA: FOOTPATH BARRIERS - COMPOSITE MAP
Assessment of Footpaths

Safetipin identified five type of physical barriers disrupting clear path of access for all pedestrians, especially the vulnerable users. These are namely parked vehicles, house extensions and temporary shops, electricity and advert poles, utility boxes and lastly dumped garbage. We mapped all of the above when found on footpaths during the image mapping and geo-tagged the information with their exact locations on GIS layers. The composite map below represents all the kinds of barriers found on footpaths and highlights the intensity of the issue. Separate maps for each type of barrier identified are discussed as follows.



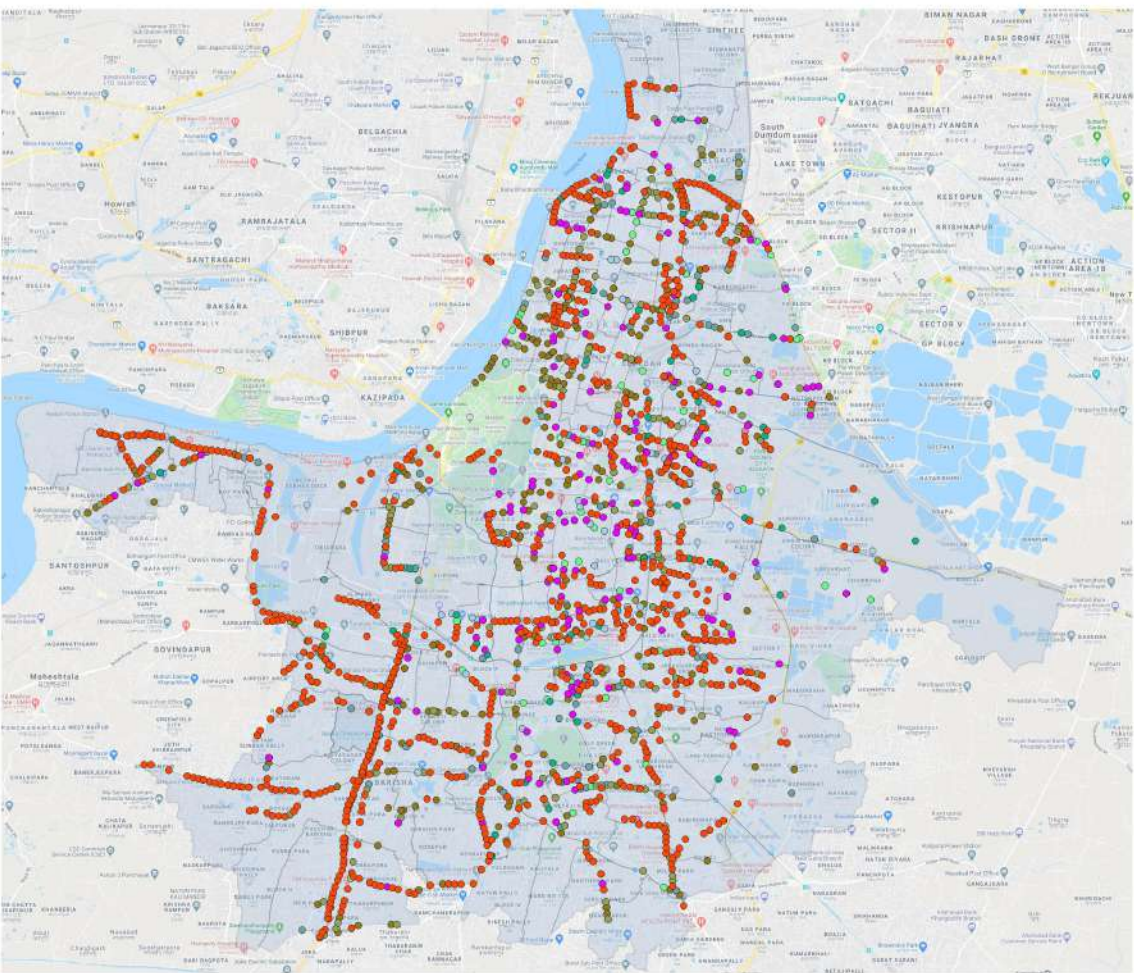
GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show barriers on footpaths

Kolkata:
Accessibility
Footpath Barrier

Legend

- Car Blocking
- Electricity Poles
- Garbage
- House Extension
- Light Poles
- Shop Encroachment
- Signages
- Vehicle Blocking
- Vendor Blocking
- Kolkata

Base: Google Map



KOLKATA: FOOTPATH BARRIER - PARKED VEHICLES
Assessment of Footpaths

Safetipin identified 'parked vehicle on footpaths' as a type of physical barrier disrupting clear path of access for all pedestrians. We mapped all two and four wheeler vehicles found parked on footpaths during the image mapping and geo-tagged the information with their exact locations on a GIS layer. The map below illustrates the intensity of the issue of having vehicles parked on footpaths. The GIS layer generated could be used for immediate public space intervention to upgrade these areas. The layer is provided as a CSV file and needs to be integrated with the city's existing GIS platform.



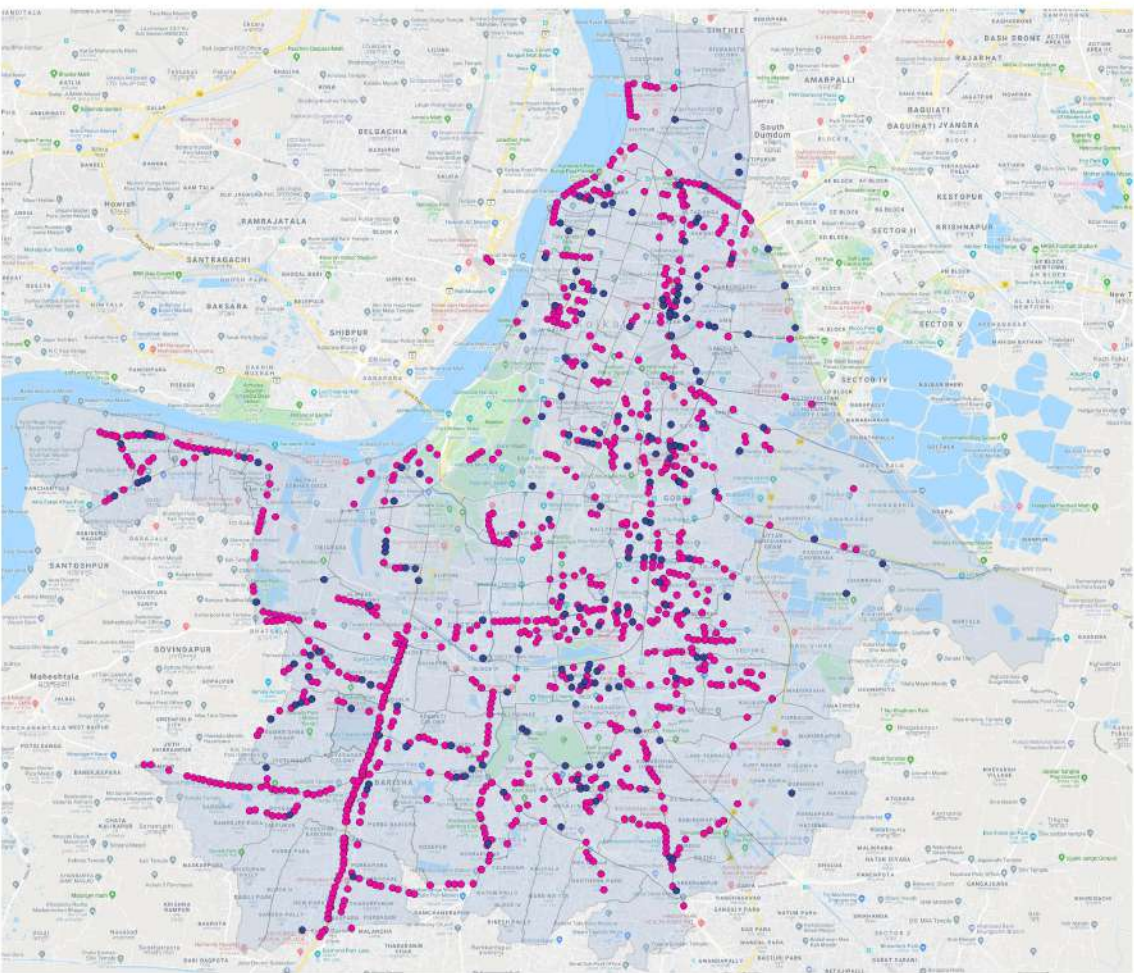
GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show vehicles parked on footpaths.

Kolkata:
Accessibility
Footpath Blocking

Legend

- Vehicle Blocking
- Car Blocking
- Kolkata

Base: Google Map



KOLKATA: FOOTPATH BARRIER - HOUSE EXTENSIONS, TEMPORARY SHOPS, VENDORS
Assessment of Footpaths

Safetipin identified 'house extensions, temporary shops, vendors on footpaths' as a type of physical barrier disrupting clear path of access for all pedestrians. We mapped all kinds of extensions and temporary establishments found on footpaths during the image mapping and geo-tagged the information with their exact locations on a GIS layer. The map below illustrates the intensity of the issue of having temporary structures onto footpaths. The GIS layer generated could be used for immediate public space intervention to upgrade these areas. The layer is provided as a CSV file and needs to be integrated with the city's existing GIS platform.



GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show temporary structures on footpaths.

Kolkata:
Accessibility
Footpath Blocking

Legend

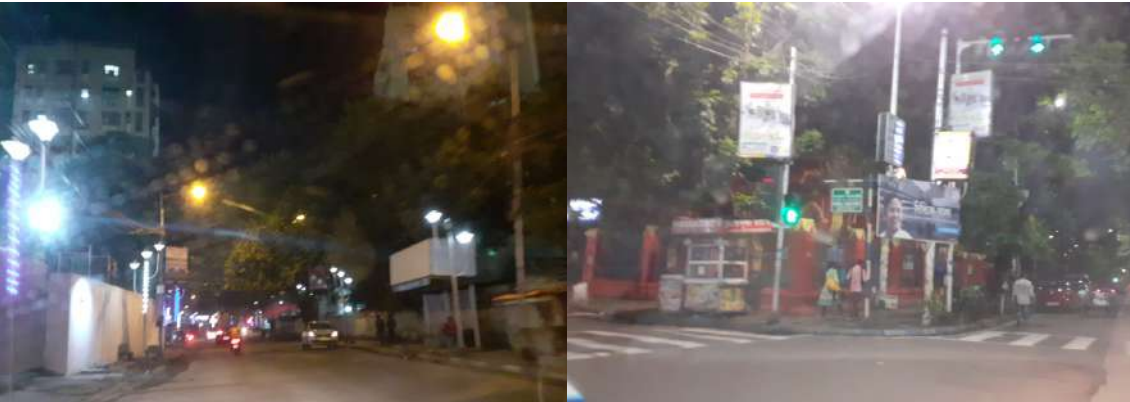
- House Extension
- Shop
- Vendor
- Kolkata

Base: Google Map



KOLKATA: FOOTPATH BARRIER - LIGHT, SIGNAGE & ADVERT POLES
Assessment of Footpaths

Safetipin identified 'streetlight, electricity, signal, signage and avert poles on footpaths' as a type of physical barrier disrupting clear path of access for all pedestrians. We mapped all types of poles placed inappropriately on footpaths during the image mapping and geo-tagged the information with their exact locations on a GIS layer. The map below illustrates the intensity of the issue of having these poles on footpaths. The GIS layer generated could be used for immediate public space intervention to upgrade these areas. The layer is provided as a CSV file and needs to be integrated with the city's existing GIS platform.



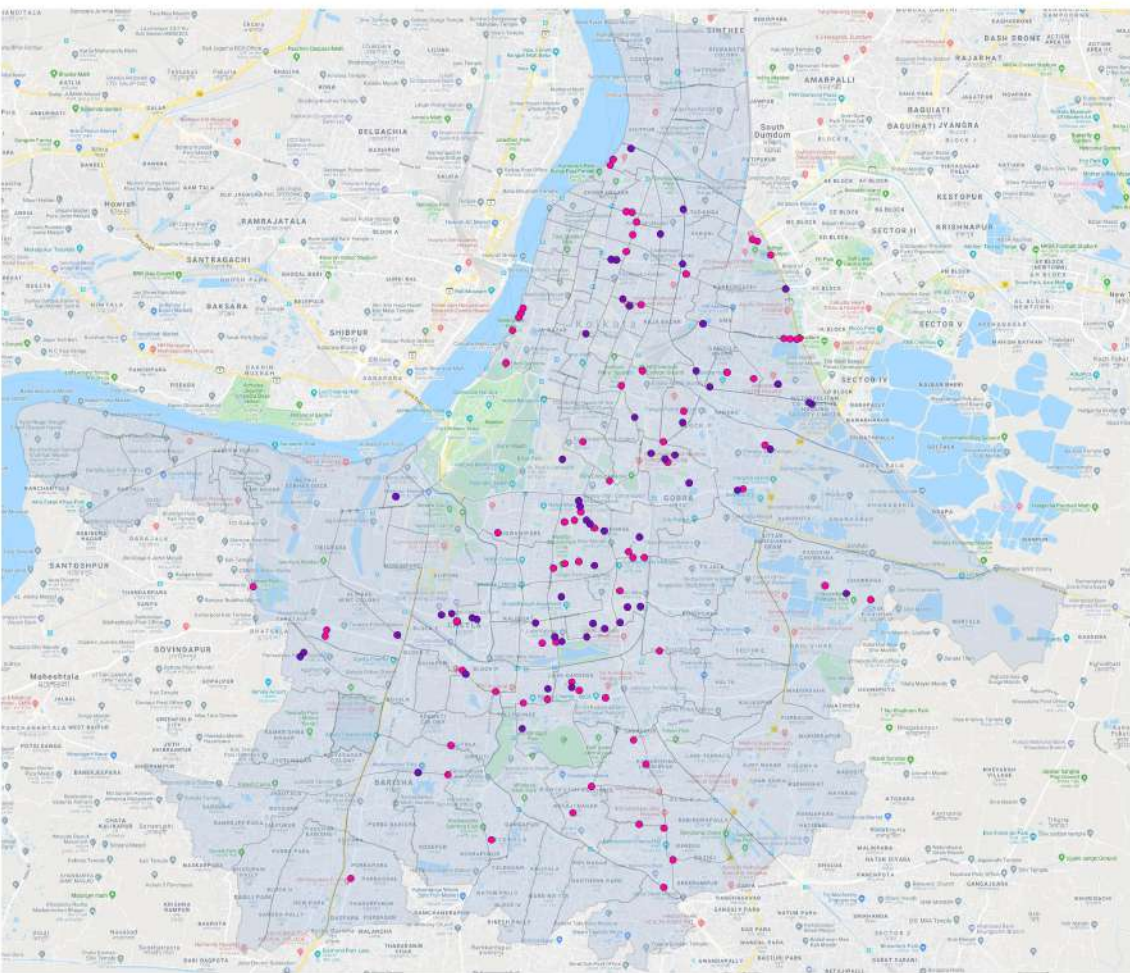
GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show signage poles on footpaths.

Kolkata:
Accessibility
Footpath Blocking

Legend

- Light Pole
- Signage/Advert Pole
- Kolkata

Base: Google Map



KOLKATA: FOOTPATH BARRIER - UTILITY BOXES
Assessment of Footpaths

Safetipin identified 'utility boxes for communication and electricity on footpaths' as a type of physical barrier disrupting clear path of access for all pedestrians. We mapped both the kinds of utility boxes found placed incorrectly on footpaths during the image mapping and geo-tagged the information with their exact locations on a GIS layer. The map below illustrates the intensity of the issue of having these boxes wrongly placed on footpaths. The GIS layer generated could be used for immediate public space intervention to upgrade these areas. The layer is provided as a CSV file and needs to be integrated with the city's existing GIS platform.



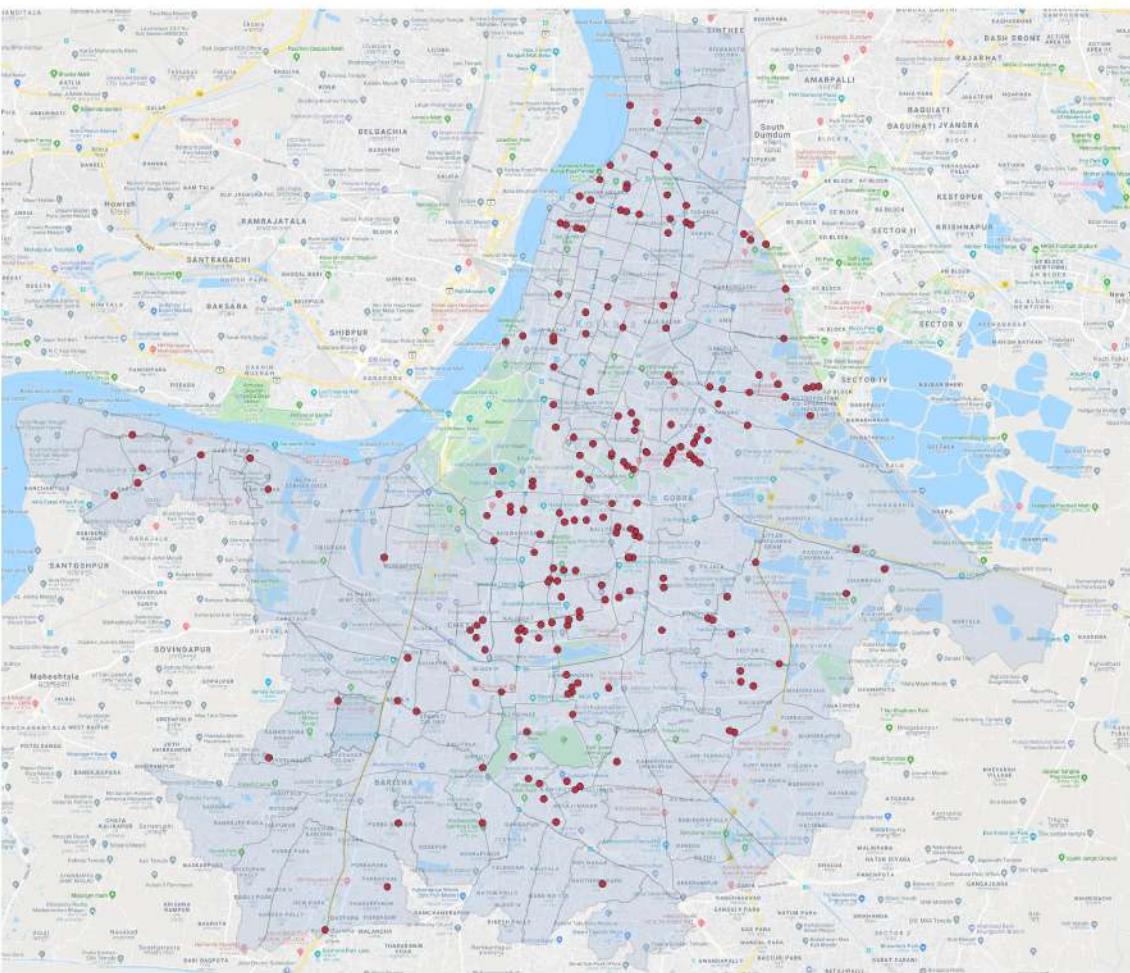
GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show utility boxes on footpaths.

Kolkata:
Accessibility
Footpath Blocking

Legend

- Utility Box
- Kolkata

Base: Google Map



KOLKATA: FOOTPATH BARRIER - DUMPED GARBAGE
Assessment of Footpaths

Safetipin identified 'loose garbage dumped on footpaths' as a type of physical barrier disrupting clear path of access for all pedestrians. We mapped all big and small garbage dumps found on or by the footpaths during the image mapping and geo-tagged the information with their exact locations on a GIS layer. The map below illustrates the intensity of the issue of having loose garbage on footpaths. The GIS layer generated could be used for immediate public space intervention to upgrade these areas. The layer is provided as a CSV file and needs to be integrated with the city's existing GIS platform.



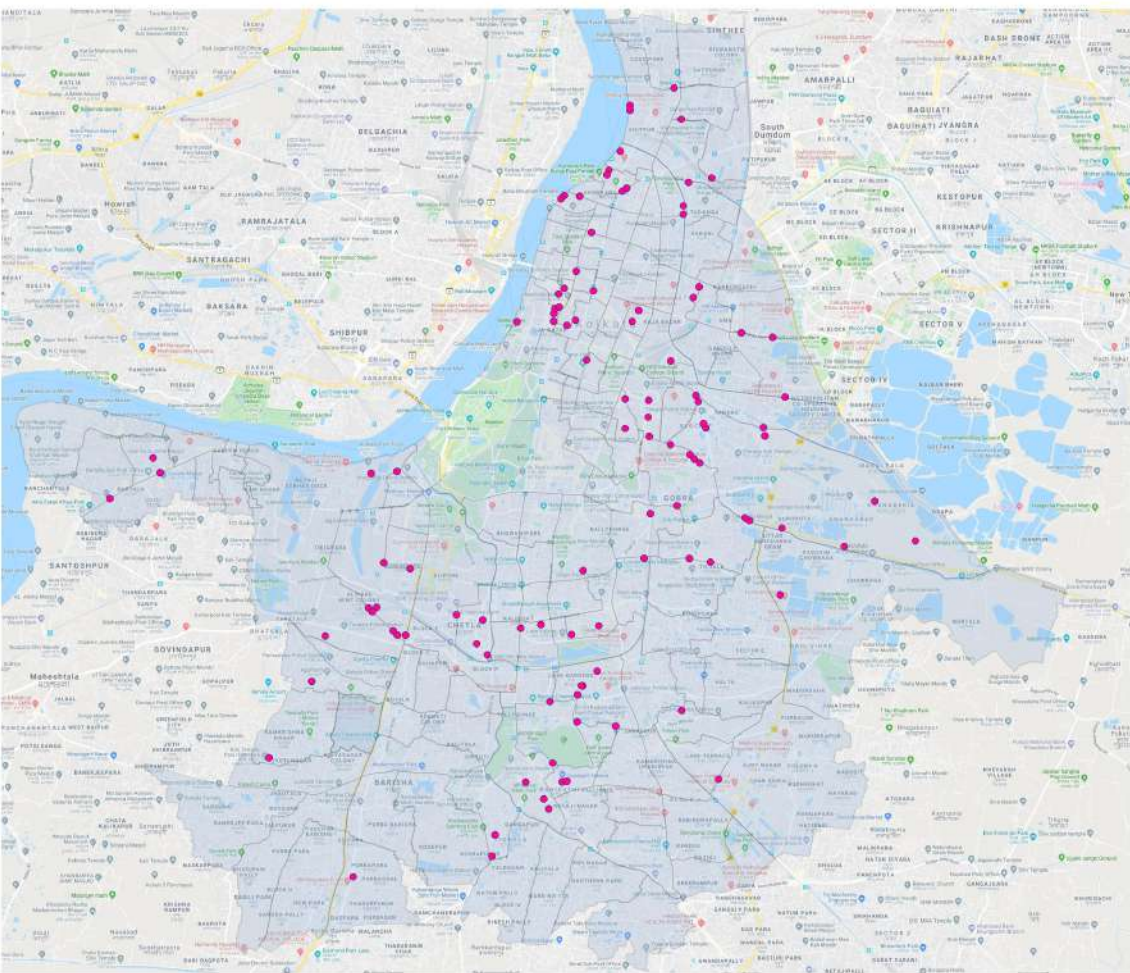
GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show garbage dumps on footpaths.

Kolkata:
Accessibility
Footpath Blocking

Legend

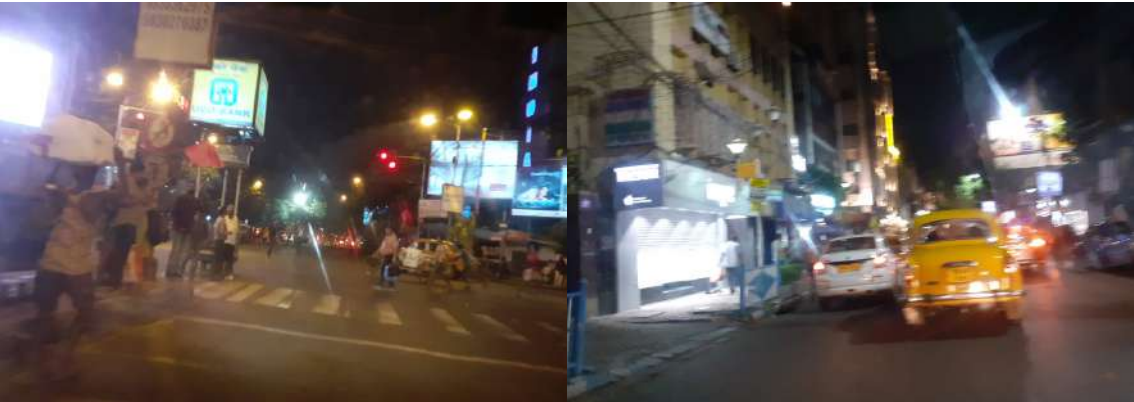
- Garbage
- Kolkata

Base: Google Map



KOLKATA: FOOTPATH CONDITIONS - COMPOSITE MAP
Assessment of Footpaths

Safetipin identified three type of physical elements which assists all pedestrians in having at grade walking experience, especially the vulnerable users. These are namely curb ramps, median breaks and zebra crossings. We mapped all of the above as found in the city during the image mapping and geo-tagged the information with their exact locations on GIS layers. The composite map below represents all the street elements as found on the streets and highlights the intensity of the issue of having no or inadequate street elements for a seamless walking experience. Separate maps for each type of element identified are discussed as follows.



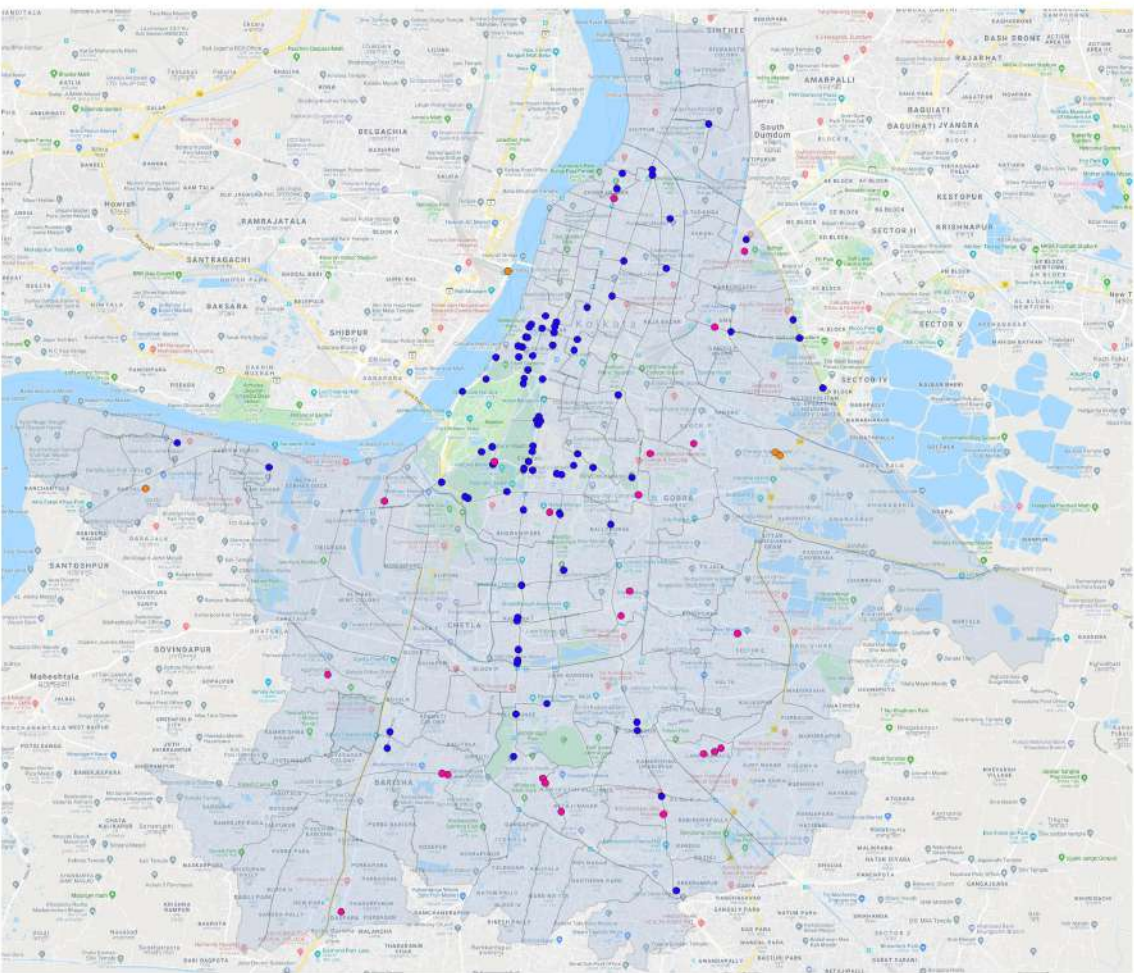
GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show street elements on streets.

Kolkata:
Accessibility
Footpath Condition

Legend

- Median Cut
- Curb Ramp
- Zebra Crossing
- Kolkata

Base: Google Map



KOLKATA: FOOTPATH CONDITION - CURB RAMP
Assessment of Footpaths

Safetipin identified the presence of 'curb ramps' to be a type of footpath element which assists all pedestrians in having at grade walking experience. We mapped all the locations where curb ramps were present on footpaths during the image mapping and geo-tagged the information with their exact locations on a GIS layer. The map below shows the availability of curb ramps only at 24 locations in the city and illustrates the intensity of the issue of having no or inadequate curb ramps. The said GIS layer is provided as a CSV file and needs to be integrated with the city's existing GIS platform for further analysis.



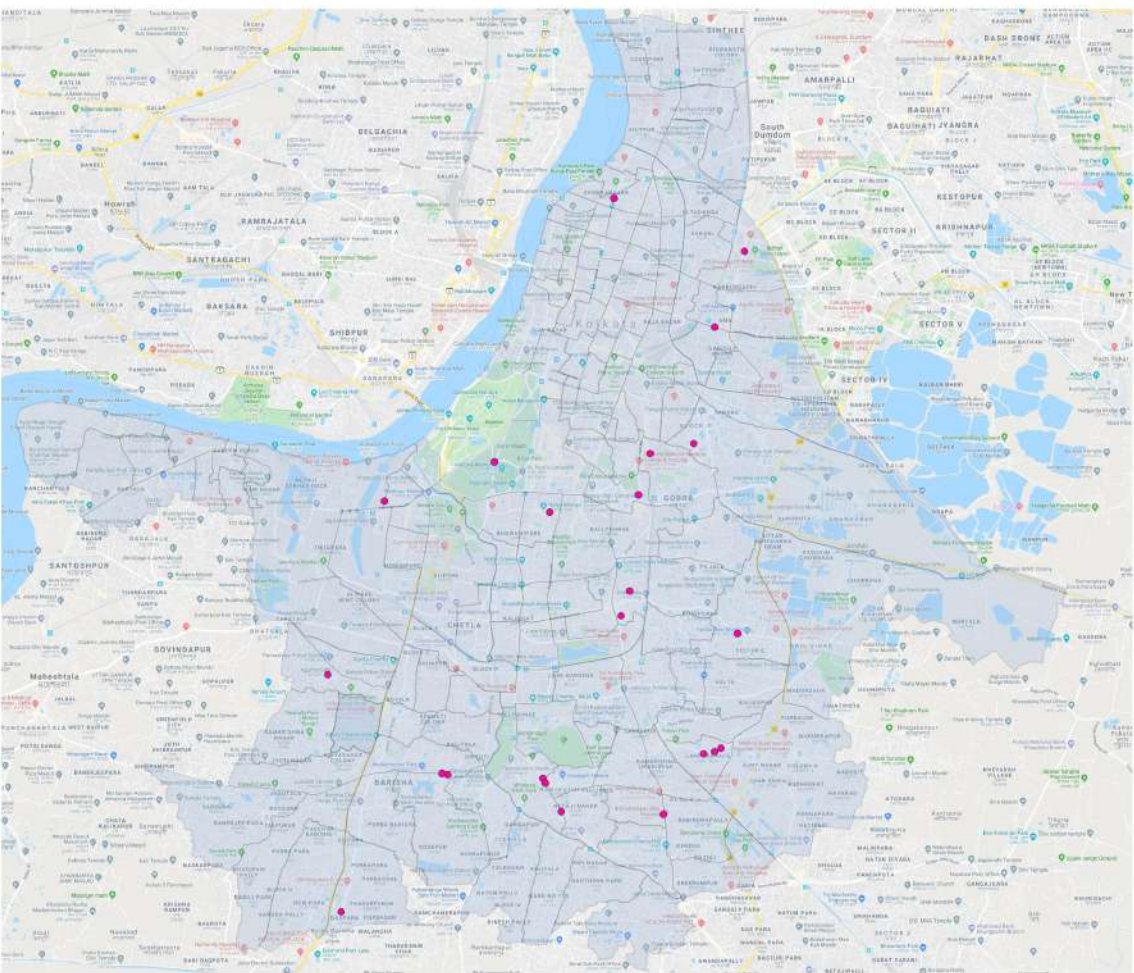
GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show types of curb ramps on footpaths.

Kolkata:
Accessibility
Footpath Condition

Legend

- Curb Ramp
- Kolkata

Base: Google Map



KOLKATA: FOOTPATH CONDITION - ZEBRA CROSSING
Assessment of Footpaths

Safetipin identified the presence of 'zebra crossings or pedestrian crossings' to be a type of street element which assists all pedestrians in having at grade walking experience. We mapped all the locations where zebra crossings were present on streets during the image mapping and geo-tagged the information with their exact locations on a GIS layer. The map below shows the availability of zebra crossings only at 87 locations in the city and illustrates the intensity of the issue of having less or inadequate pedestrians crossings. The said GIS layer is provided as a CSV file and needs to be integrated with the city's existing GIS platform for further analysis.



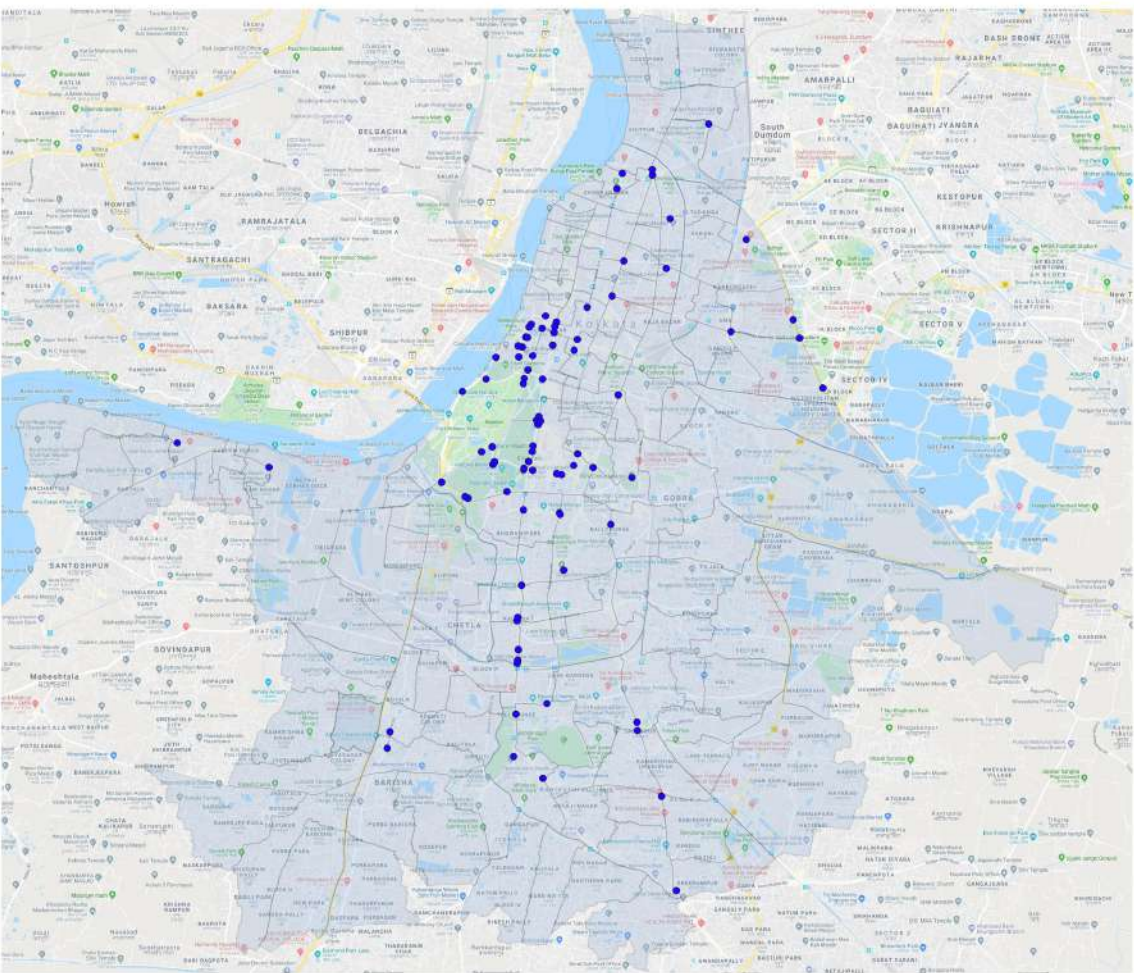
GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show obstructed zebra crossings on streets.

Kolkata:
Accessibility
Footpath Condition

Legend

- Zebra Crossing
- Kolkata

Base: Google Map



KOLKATA: FOOTPATH CONDITION - MEDIAN CUT
Assessment of Footpaths

Safetipin identified the presence of 'median cuts or median breaks' to be a type of street element which assists all pedestrians in having at grade walking experience. We mapped all the locations where median cuts on footpaths were present during the image mapping and geo-tagged the information with their exact locations on a GIS layer. The map below shows the availability of curb ramps only at 4 locations in the city and illustrates the intensity of the issue of having no or inadequate median cuts. The said GIS layer is provided as a CSV file and needs to be integrated with the city's existing GIS platform for further analysis.



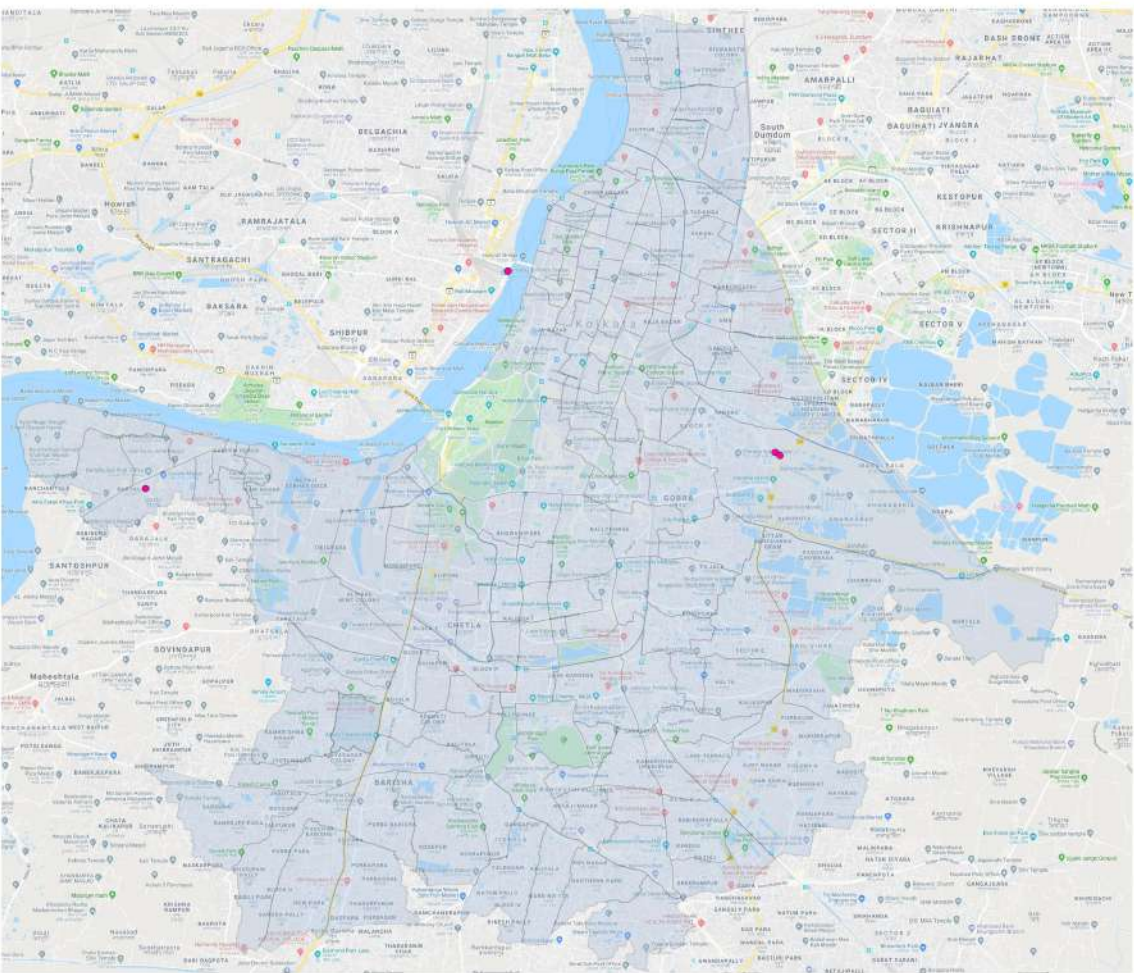
GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show types of median cuts on streets.

Kolkata:
Accessibility
Footpath Condition

Legend

- Median Cut
- Kolkata

Base: Google Map



KOLKATA
DATA ANALYSIS

Data representation and correlation maps

To further analyse the data layers generated by Safetipin and to gain a deeper understanding of the spatial issues related to vulnerability and accessibility, some data layers were overlaid onto other data layers. This helped in understanding their relationship with each other and how they might be applied to inform decision making for spatial interventions. The following correlation maps explore this understanding at a spatial level. Safetipin also looked at representation of data layers by grouping and segregating them. For example the Safety Score map below illustrates Safety Score at each ward level and can be used by the development authorities to priorities on the five wards which appear yellow on the map and have scored average on safety and vulnerability. The table in the next page lists ward wise safety score and average ratings for four actionable parameters for immediate improvement. These are Lighting, Walkpath, Public Transport and Visibility.

Ward-wise Safety Score map below showing good, above average and average safety score in various wards

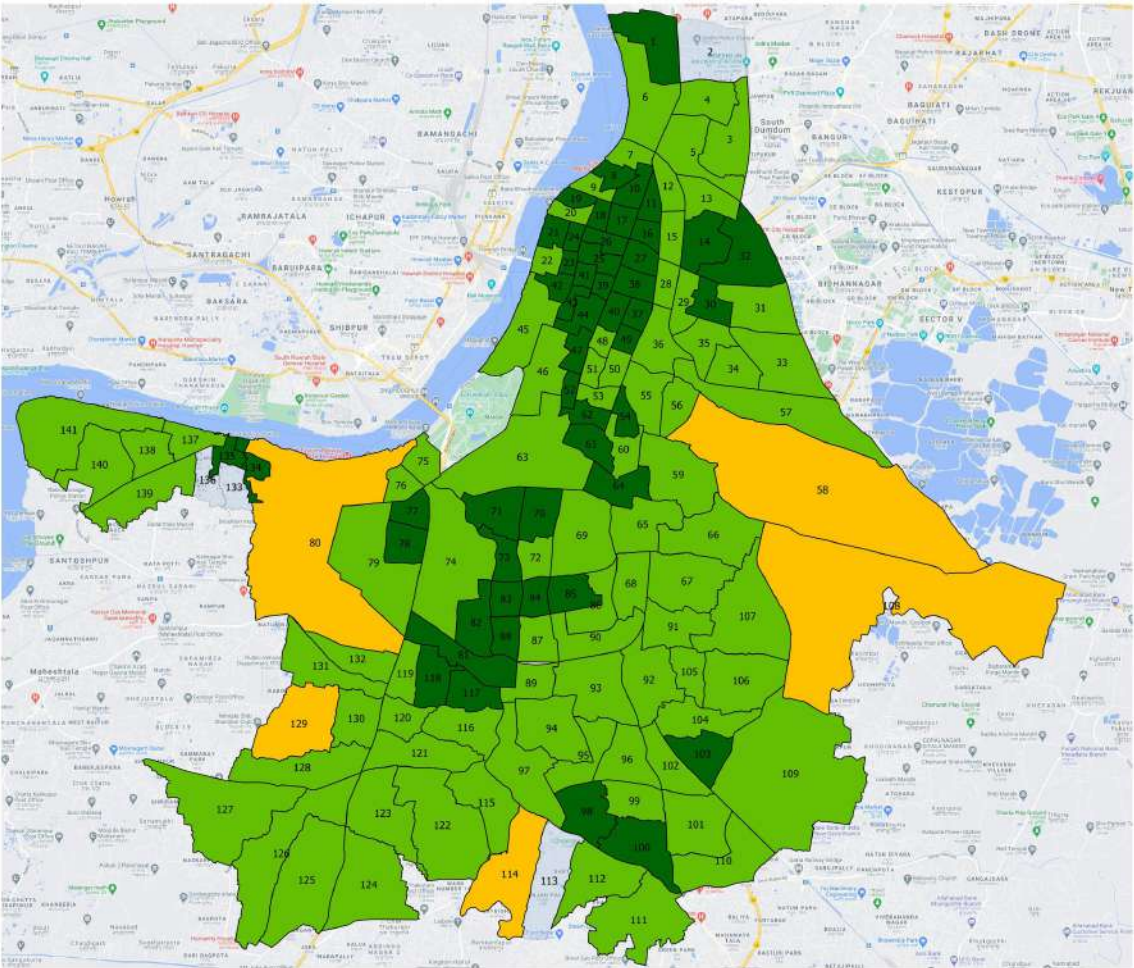
Kolkata:
Ward Wise
Safety Score

Legend

Safety Score

- Poor
- Below Average
- Average
- Above Average
- Good
- Kolkata

Base: Google Map



Ward wise Safety Score and Average Rating of Parameters						
Ward Number	PARAMETERS				SAFETY SCORE	Audit Points
	Lighting	Walkpath	Visibility	Public Tansport		
1	2.5	1	1	1.5	4	4
3	2.8	2	1.3	1.8	3.8	21
4	3	2	1.4	1.8	3.9	5
5	2.6	1.8	1.2	1.9	3.5	22
6	2.9	1.7	1.1	1.6	3.6	35
7	2.9	2	1.4	2	3.9	12
8	3	1.9	1.6	1.9	4.2	21
9	2.8	1.6	1.7	1.5	3.9	25
10	3	1.9	2.5	2.7	4.5	19
11	3	1.9	2.5	2.7	4.5	15
12	2.9	1.7	1.6	1.8	3.9	24
13	2.9	1.5	1.5	1.2	3.6	35
14	3	1.6	1.8	1.1	4.1	24
15	2.6	1.8	1	1.4	3.5	22
16	2.6	1.9	1.5	2.4	4.1	11
17	2.9	2.1	2	2.6	4.2	9
18	3	2	2.2	2.4	4.3	11
19	3	1.5	1.1	2.4	4.3	8
20	2.9	1.8	1.9	1.9	4	15
21	3	1.5	2	1.8	4.4	4
22	2.8	2.1	1.3	2	3.8	31
23	3	2	2.8	1.3	4.3	4
24	2.9	1.6	2.3	1.6	4.3	8
25	2.9	1.8	1.9	2.2	4.3	10
26	2.9	2	1.6	2.3	4.2	11
27	2.8	2	1.5	2.4	4.2	13
28	2.7	1.5	1.3	1.3	3.9	28
29	2.8	1.7	1.5	0.5	3.9	15
30	2.9	2.1	1.9	1.8	4.3	8
31	2.9	1.9	1.2	2.3	3.8	19
32	2.9	1.9	1.4	2.3	4.2	56
33	2.9	2.2	1.1	1.6	3.7	40
34	2.8	2.2	1.2	1.6	3.7	26
35	2.2	1.9	1	1.4	3.5	18
36	2.8	1.6	1.1	1.6	3.5	33
37	3	1.6	2	2.5	4.2	13
38	2.9	1.9	2	2.5	4.4	14
39	3	1.9	2	2.5	4.3	11
40	2.8	2	1.8	2.7	4.3	12
41	2.9	1.4	2.4	2.1	4.5	7
42	2.9	1.5	2.3	2.2	4.3	24
43	2.7	1.4	1.7	2.1	4.1	14
44	2.9	1.9	1.7	2.4	4.2	21
45	2.9	2	1.1	2.2	3.9	105
46	2.8	2	1.5	2.1	3.8	80
47	2.8	1.9	1.4	2.5	4	26
48	2.6	1.6	1.6	2.8	3.6	5
49	3	1.5	1.7	2.3	4.3	6
50	2.6	1.8	1.7	2.5	4	13
51	2.9	1.8	1.4	2.3	3.7	12
52	3	2.2	1.8	2.3	4.3	6
53	2.9	2	1.5	2.3	4	8
54	2.8	1.8	2.4	1.7	4.2	16
55	2.8	1.7	1.6	2.1	3.9	31
56	2.9	1.8	1.4	1.3	3.8	23
57	3	1.9	0.9	1	3.5	35
58	2.6	1.4	0.7	1.2	2.8	173
59	2.9	1.7	1.4	1.3	3.8	79
60	2.8	1.5	1.5	1.9	3.9	24
61	2.7	1.9	2	2.1	4.1	27
62	2.9	1.9	2.5	2	4.3	8
63	2.8	2	1.2	1.8	3.6	210
64	2.7	2	1.6	2.2	4	49
65	2.6	1.7	1.9	0.9	3.8	59
66	2.7	1.3	1.9	0.4	4	19
67	2.7	1.3	1.6	1	3.6	71
68	2.8	1.8	1.8	1.7	3.8	52
69	2.8	2.2	1.5	1.7	3.9	84
70	2.9	2.3	2	1.5	4.2	46

Ward wise Safety Score and Average Rating of Parameters						
Ward Number	PARAMETERS				SAFETY SCORE	Audit Points
	Lighting	Walkpath	Visibility	Public Tansport		
71	2.9	2.1	2.1	1.8	4.2	45
72	2.8	1.8	1.9	1.7	3.9	27
73	2.9	2	1.9	2.2	4.3	13
74	2.5	2	1	1.1	3	24
75	2.9	2	1	1.5	3.7	44
76	2.8	2.3	2	1.4	4	20
77	2.5	2	2	2.5	4.1	2
78	3	1.9	2.3	0.9	4.3	9
79	2.4	1.5	1.2	1.1	3.1	41
80	2.1	1.6	0.6	1.7	2.8	127
81	2.8	2.2	1.8	2.3	4.1	36
82	2.8	2	1.9	1.7	4	27
83	2.8	1.5	1.6	2.5	4.1	11
84	2.3	1.4	1.5	2.9	4	8
85	2.8	2.1	1.9	2.1	4.1	36
86	2.8	2	1.5	2	3.8	62
87	2.9	2.2	1.2	1.7	3.7	33
88	2.6	2.1	1.6	2.8	4.2	9
89	2.8	2.3	1.3	2	3.8	23
90	2.7	2.1	1	2.1	3.7	48
91	2.9	1.2	1.9	0.3	3.7	50
92	2.8	1.5	1.5	1.6	3.8	52
93	2.7	1.9	1.6	1.4	3.8	82
94	2.4	1.9	0.9	1.8	3.2	34
95	2.9	1.7	2.1	1	3.8	40
96	2.7	1.5	2.1	1.4	3.8	36
97	2.7	1.8	1.5	1.9	3.8	69
98	2.9	1.9	1.9	1.3	4.1	23
99	2.8	1.8	2.3	0.8	3.7	17
100	2.9	1.7	2.3	2.5	4.3	30
101	2.9	1.4	1.1	1.5	3.3	29
102	2.7	1.7	1.3	2.5	3.8	12
103	2.8	2.2	1.8	2.5	4.1	13
104	2.7	1.4	1.4	0.2	3.2	34
105	2.8	1.3	1.7	0.9	3.9	26
106	2.8	1.4	1.2	1	3.2	49
107	2.8	1.9	1.1	1.8	3.5	75
108	2.2	1.6	0.6	0.4	2.6	57
109	2.6	1.4	0.6	1.4	3.2	58
110	2.9	1.9	0.3	2.2	3.1	19
111	2.4	1.1	1.9	0.3	3.6	9
112	2.8	1.1	1.8	0.5	3.5	13
114	2.8	1	0.4	0.4	2.6	5
115	2.7	1.1	1.7	1.6	3.7	34
116	2.7	1	1.5	0.5	3.4	23
117	2.8	1.3	2.1	0.8	4.1	12
118	3	1.8	2.8	2.3	4.4	4
119	2.1	2.1	1.1	1.8	3.7	18
120	2.5	1.5	1.9	1.5	3.6	20
121	2.3	2.1	2.2	1.1	3.9	30
122	2.3	1	1.9	1.9	3.6	35
123	2.6	1.7	1.6	1.4	3.7	35
124	2.4	1.6	1.7	1.6	3.6	55
125	2.1	1.3	1.4	2	3.7	43
126	2	1.1	1.1	2.5	3.6	21
127	1.7	1.1	2.2	1.9	3.4	25
128	2.1	1	1.6	2.3	3.6	37
129	2.4	1	1.5	0	2.5	25
130	2.4	1	1.6	2	4	24
131	2.2	1.6	1.8	1	3.4	33
132	2.6	1.2	1.7	1.4	3.8	33
134	2.9	2	1.6	2.6	4.1	9
135	3	1	3	1	4.4	2
137	2.8	1.3	1.7	0	3.2	18
138	2.5	1.7	1.7	0	3.2	22
139	2	1.8	2.4	0	3.3	5
140	2.4	1.2	1.7	0	3	17
141	2.4	1.3	1.7	0	3.1	23

KOLKATA: ACTIONABLE PARAMETERS FOR WARDS WITH AVERAGE RATING

Ward wise data analysis

Lighting, Walkpath, Public Transport and Visibility are the parameters which address some of the key issues of safety and vulnerability. Conditions of Walkpath and Public Transport directly affects accessibility and mobility in the city especially for the vulnerable groups. Whereas, Lighting and Visibility affects actual safety as well as perception of safety on the streets by the availability of street lighting after dark and by the presence of ‘eyes on the streets.’ These parameters along with Gender Diversity have the strongest correlation with the overall safety score. If physical infrastructure parameters - Lighting, Walkpath, Public Transport and Visibility could be improved with strategic interventions at neighbourhood and city level - collectively these will have a positive impact on Gender Diversity which is a parameter on social usage of space. It will also improve the Safety Score. Since Lighting, Walkpath, Public Transport are physical parameters they could be easily acted upon. Visibility is a social parameter but could be acted upon easily by ensuring more eyes on the streets. The two most actionable parameters are highlighted in blue for every ward and recommendations are given for them. Improving these parameters will impact safety and accessibility in the wards as well as Kolkata.

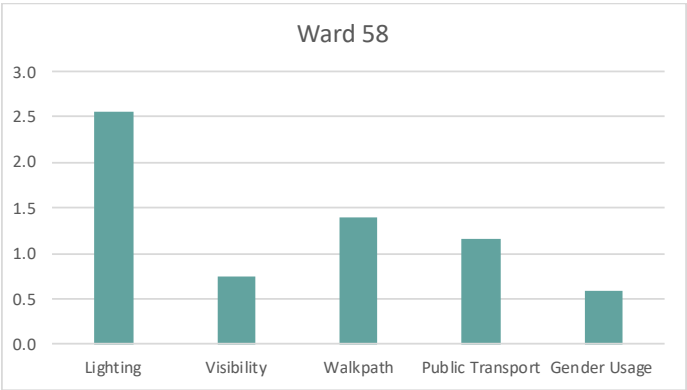
RECOMMENDATIONS FOR WARDS WITH AVERAGE RATING

PARAMETER	AVERAGE SCORE	RECOMMENDATIONS
WARD 58		The parameter graph shows that there is enough Lighting in the streets but Visibility, Public Transport and Walkpath needs attention to improve overall accessibility and Gender Usage within the ward.
Visibility	0.7	Not many windows or entrances of shops or residences overlook the streets in this ward. Presence of high boundary walls, isolating the streets is another reason for low visibility. Allowing street vendors and informal shopping will improve visibility in this ward. Lowering boundary walls will also improve visibility.
Public Transport	1.2	Metro stations, bus stops or auto/rickshaw stands could not be reached within 5-10 minutes of walking distance. Adding public transport stands/stops within 2-5 minutes of walking distance will enhance access to public transport and improve overall accessibility.
Walkpath	1.4	Footpath exists but is inaccessible in most parts because of poor walking condition and unavailability of clear walking space. Removing footpath blockages and having safe walking surfaces will improve accessibility in this ward.
Gender Usage	0.6	No women or children in sight after dark. Only men can be seen using the streets of this ward. Improving paramters like visibility, public transport and walkpath will have a positive impact on this parameter.

PARAMETER RATING GRAPH

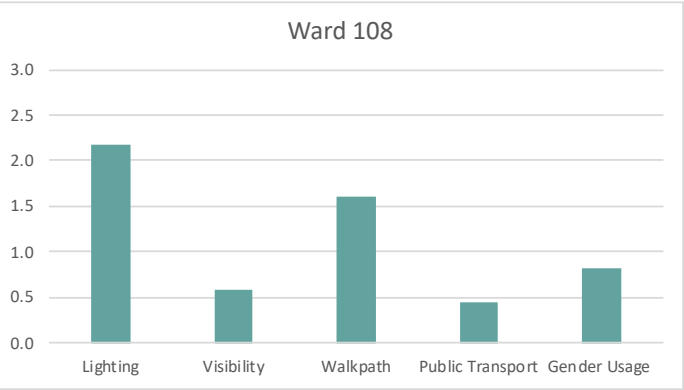
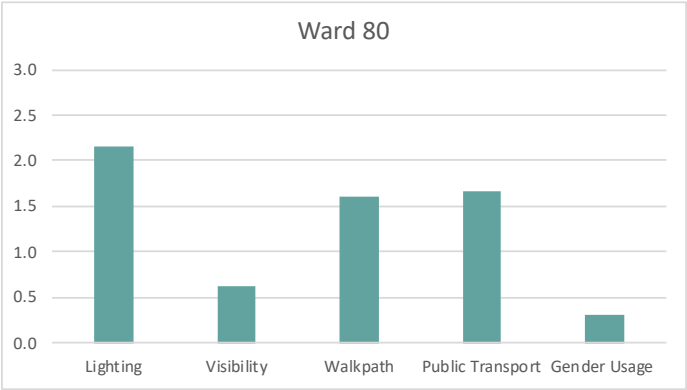
Left to right

The graph shows the ratings for the five most important parameters on safety and accessibility



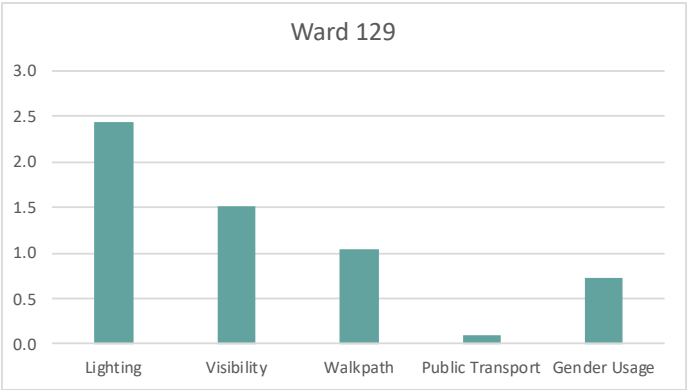
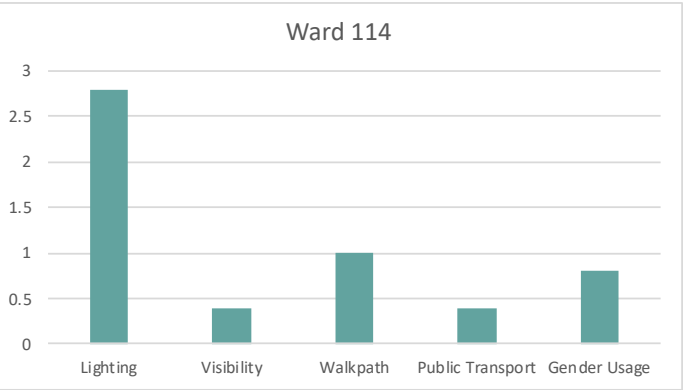
RECOMMENDATIONS FOR WARDS WITH AVERAGE RATING

PARAMETER	AVERAGE SCORE	RECOMMENDATIONS
WARD 80		The parameter graph shows that there is enough Lighting in the streets but Visibility, Walkpath and Public Transport needs attention to improve overall accessibility and Gender Usage within the ward.
Visibility	0.6	Not many windows or entrances of shops or residences overlook the streets in this ward. Presence of high boundary walls, isolating the streets is another reason for low visibility. Allowing street vendors and informal shopping will improve visibility in this ward. Lowering boundary walls will also improve visibility.
Walkpath	1.6	Footpath exists but is inaccessible in most parts because of poor walking condition and unavailability of clear walking space. Removing footpath blockages and having safe walking surfaces will improve accessibility in this ward.
Public Transport	1.7	Metro stations, bus stops or auto/rickshaw stands could not be reached within 5-10 minutes of walking distance. Adding public transport stands/stops within 2-5 minutes of walking distance will enhance access to public transport and improve overall accessibility.
Gender Usage	0.3	No women or children in sight after dark. Only men can be seen using the streets of this ward. Improving paramters like visibility, public transport and walkpath will have a positive impact on this parameter.
WARD 108		The parameter graph shows that there is enough Lighting in the streets but Public Transport, Visibility and Walkpath needs attention to improve overall accessibility and Gender Usage within the ward.
Public Transport	0.4	Metro stations, bus stops or auto/rickshaw stands could not be reached within 10 minutes of walking distance. Adding public transport stands/stops within 2-5 minutes of walking distance will enhance access to public transport and improve overall accessibility.
Visibility	0.6	Not many windows or entrances of shops or residences overlook the streets in this ward. Presence of high boundary walls, isolating the streets is another reason for low visibility. Allowing street vendors and informal shopping will improve visibility in this ward. Lowering boundary walls will also improve visibility.
Walkpath	1.6	Footpath exists but is inaccessible in most parts because of poor walking condition and unavailability of clear walking space. Removing footpath blockages and having safe walking surfaces will improve accessibility in this ward.
Gender Usage	0.8	No women or children in sight after dark. Only men can be seen using the streets of this ward. Improving paramters like visibility, public transport and walkpath will have a positive impact on this parameter.



RECOMMENDATIONS FOR WARDS WITH AVERAGE RATING

PARAMETER	AVERAGE SCORE	RECOMMENDATIONS
WARD 114		
The parameter graph shows that there is enough Lighting in the streets but Public Transport, Visibility and Walkpath needs attention to improve overall accessibility and Gender Usage within the ward.		
Visibility	0.4	Not many windows or entrances of shops or residences overlook the streets in this ward. Presence of high boundary walls, isolating the streets is another reason for low visibility. Allowing street vendors and informal shopping will improve visibility in this ward. Lowering boundary walls will also improve visibility.
Public Transport	0.4	Metro stations, bus stops or auto/rickshaw stands could not be reached within 10 minutes of walking distance. Adding public transport stands/stops within 2-5 minutes of walking distance will enhance access to public transport and improve overall accessibility.
Walkpath	1	Footpath exists but is inaccessible in most parts because of poor walking condition and unavailability of clear walking space. Removing footpath blockages and having safe walking surfaces will improve accessibility in this ward.
Gender Usage	0.8	No women or children in sight after dark. Only men can be seen using the streets of this ward. Improving paramters like visibility, public transport and walkpath will have a positive impact on this parameter.
WARD 129		
The parameter graph shows that there is enough Lighting in the streets but Public Transport, Walkpath and Visibility needs attention to improve overall accessibility and Gender Usage within the ward.		
Public Transport	0.1	Metro stations, bus stops or auto/rickshaw stands could not be reached within 10 minutes of walking distance. Adding public transport stands/stops within 2-5 minutes of walking distance will enhance access to public transport and improve overall accessibility.
Walkpath	1	Footpath exists but is inaccessible in most parts because of poor walking condition and unavailability of clear walking space. Removing footpath blockages and having safe walking surfaces will improve accessibility in this ward.
Visibility	1.5	Very few windows or entrances of shops or residences overlook the streets in this ward. Presence of high boundary walls, isolating the streets is another reason for low visibility. Allowing street vendors and informal shopping will improve visibility in this ward. Lowering boundary walls will also improve visibility.
Gender Usage	0.7	No women or children in sight after dark. Only men can be seen using the streets of this ward. Improving paramters like visibility, public transport and walkpath will have a positive impact on this parameter.



KOLKATA: CORRELATING SECURITY WITH PRESENCE OF WOMEN IN PUBLIC SPACE

Security and Women in public space

Safetipin overlayed analysed 'presence of women in public spaces' data on another analysed data layer of 'security' generated by Safetipin's vulnerability mapping. This helped in geographically locating the areas which had presence of women but have no formal police or private guards. The map below clearly illustrates this correlation. The dark purple data points are where women are present with no formal police or private guards. This GIS layer is also provided as a CSV file and could be integrated with the city's existing GIS platform for further analysis and could be supplemented with other real-time security data for improving security.



GEO-LOCATED IMAGES

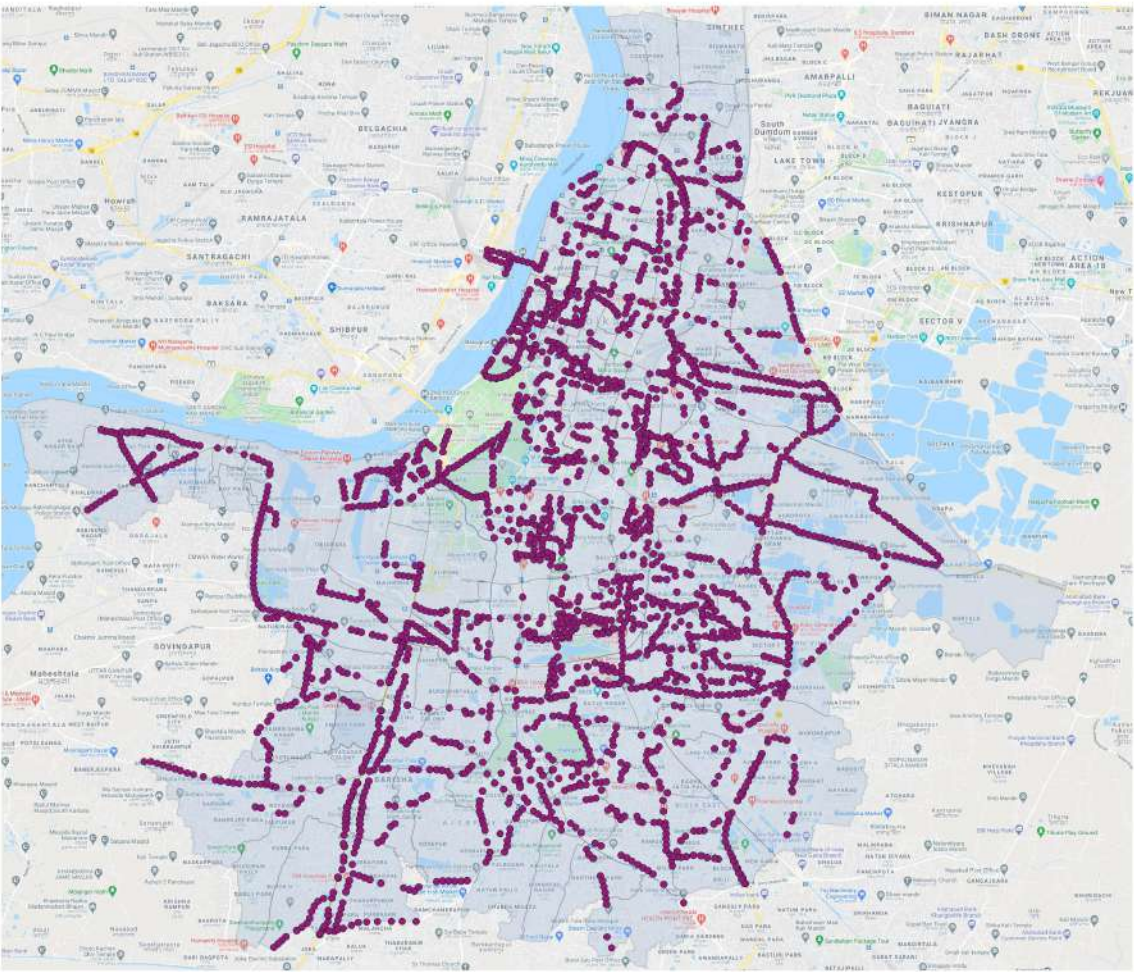
Left to right

The geo-tagged photos show no women in public space

Kolkata: Correlation between Poor Security & Poor Gender Usage

Legend

- Safety Audits (2494)
 - Kolkata
- Base: Google Map



KOLKATA: CORRELATING OBSTRUCTED FOOTPATH WITH PEOPLE USING THEM
Walkpath and People

Safetipin overlayed analysed 'presence of people in public spaces' data on a GIS layer of footpath barriers generated by Safetipin's accessibility mapping. This helped in geographically locating the areas which are used by people but have various barriers present on the footpaths. The heat map below clearly illustrates this correlation. The dark purple areas are where people are present and the light pink areas are where streets are deserted. This GIS layer is also provided as a CSV file and could be integrated with the city's existing GIS platform for further analysis and this information could be used for up-gradation program.



GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show poor and no street lighting

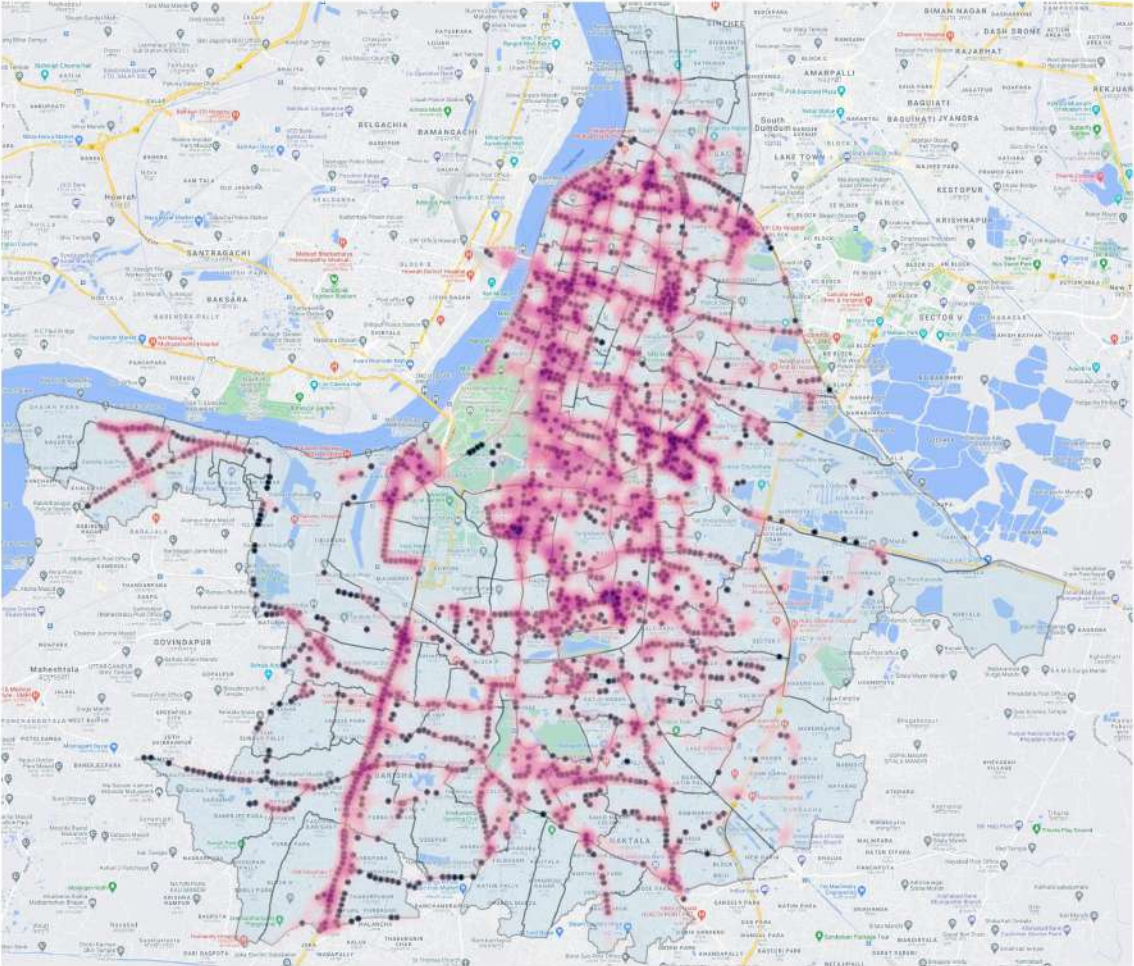
Kolkata:
Heat map showing people using obstructed footpaths

Legend

People

- Deserted
- Few People
- Some Crowd
- Crowded
- Footpath Barriers
- Kolkata

Base: Google Map



KOLKATA: CORRELATING PUBLIC TRANSPORT WITH PUBLIC SPACES
Public Transport and Public Space

Safetipin overlayed analysed public transport data on a GIS layer of public places (open spaces, transport hubs, public buildings) received from the city authorities. This helped in geographically locating the areas around public places where public transport stands/stops are available or unavailable. The heat map below clearly illustrates this correlation. The dark brown areas are where transport stands are within reach and the light yellow areas are where they are out of reach. This GIS layer is also provided as a CSV file and could be integrated with the city's existing GIS platform for further analysis which could be used for up-gradation program.



GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show public transport stands/stops.

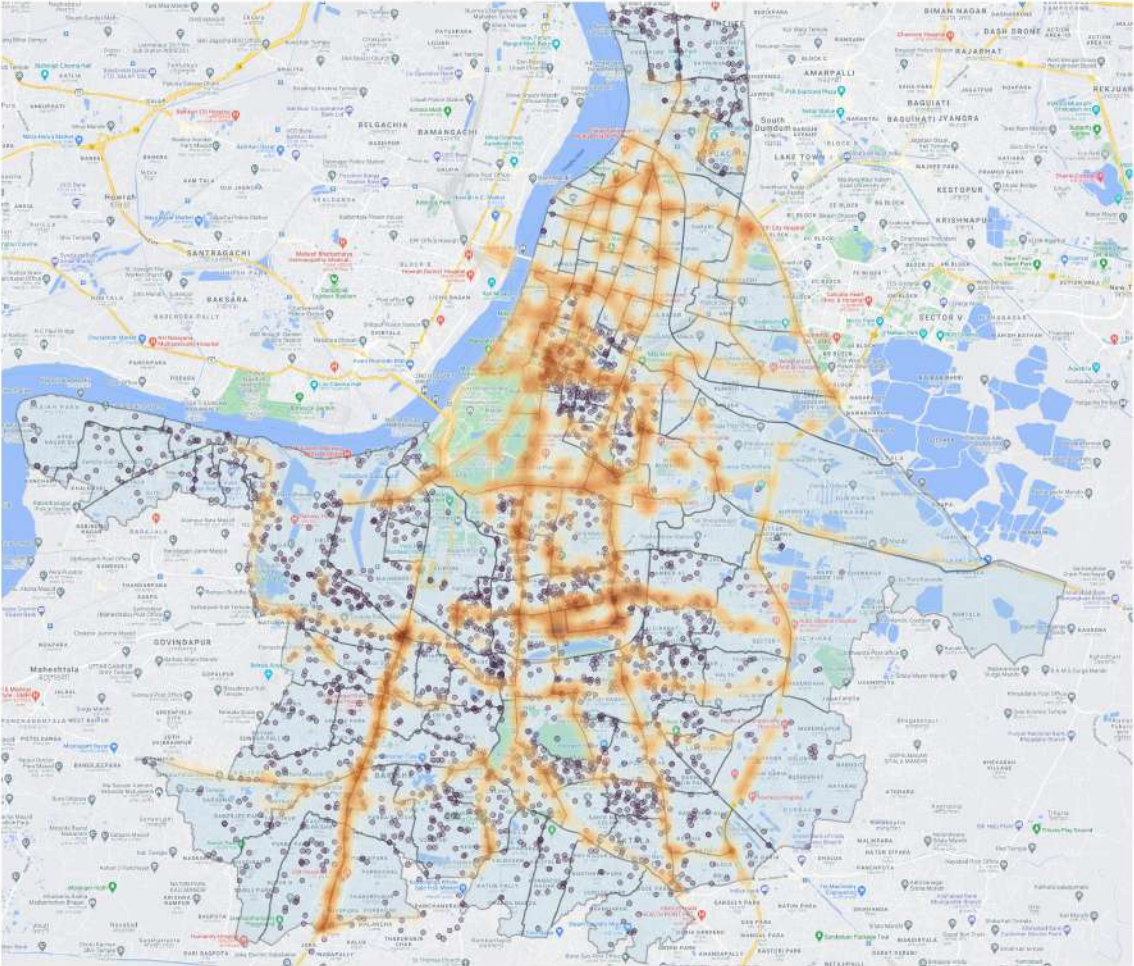
Kolkata:
Heat map showing public transport around open spaces

Legend

Public Transport

- Unavailable
- Distant
- Nearby
- Very Close
- Public Places
- Kolkata

Base: Google Map



CITY WIDE
RECOMMENDATIONS

Action points and planned interventions

MAKE PUBLIC SPACES WALKABLE

Walkable cities are places that are easily and safely navigable on foot. Walking has the capacity to promote equality and reduce social exclusion. As a free means of transport, walking can provide access to a range of resources and opportunities. Persons with disabilities, like walking with walking aid, people assisting others, like pushing wheelchairs and prams and people having reduced walking speed like children and elderly - must have equal access to the walking facility. This implies that people on foot are given consideration first in street design by keeping the city's most vulnerable user in mind. This is the core principle of universal access: every street must be accessible by people of any age and ability.

Kolkata has a great potential to create a walkable city with good local level pedestrian connections by improving the quality of footpaths, walking environments and links to access public transport.

As discussed before, the analysed data highlights the state of physical infrastructure and social participation in public space. Hence, in order to make streets and public spaces more accessible and safe the following parameters need immediate attention. Condition of street lighting, quality of footpath and access to public transport, are the physical infrastructure parameters and visibility, is the social usage parameter which needs improvement. Specific maps for each parameter with data points having lower ratings are given below.

- Analysed data shows,
- 37% of Kolkata, **has no or poor footpath**
 - 42% of Kolkata, **distant or unavailable transport stops/stands**
 - 51% of Kolkata, **has no or poor visibility**
 - 19% of Kolkata, **has deserted public spaces**
- Women and children using public space in the evening (6-8pm)**
17% of Kolkata, **have presence of women and children in streets**

LEARNING FROM OTHER CITIES

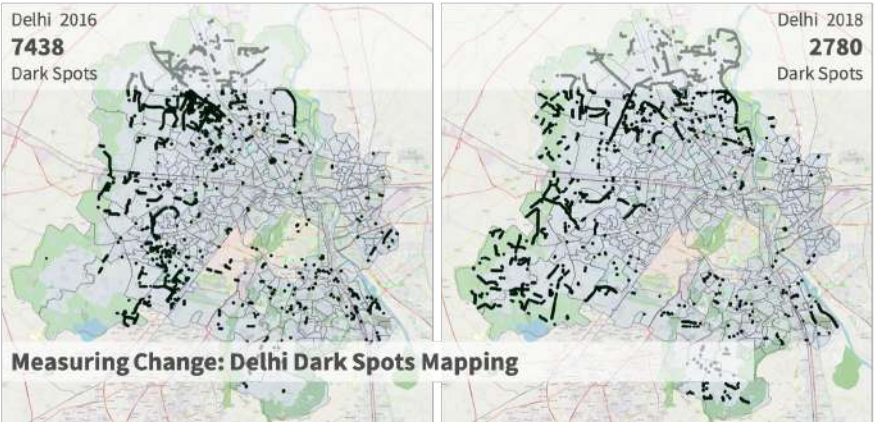
Safetipin's mapping in other cities like Delhi, Gurgaon, Gwalior have yielded positive results in identifying and improving certain parameters for enhancing safety and accessibility in public spaces.

In Delhi in 2014, after the first round of mapping, 7438 darkspots were identified in the city. The authorities made dedicated efforts in making the city well lit at night to improve safety and usage of public space. In 2018, another round of audits were done to map the city's improved condition and to identify more dark spots.

Similarly, in Gurgaon in 2016, mapping was done to improve the quality of street lighting in order to make people feel safer on the streets after dark. The Gurgaon Municipal Corporation asked to identify places where people were seen at night and where street lighting was inadequate. 630 nos. of such spots were located in the city where street lighting was improved for better visibility and safety at night.

In Gwalior in 2019, after Safetipin's mapping of the city, Gwalior Smart City launched 'Gwalior One City One App' to provide its citizens information on administrative as well as infrastructural status of the city. One section of the app was developed and named 'Veerangana' (meaning brave woman) that allows users to conduct safety reviews. This review is similar to Safetipin app's Safety Audit wherein one has to rate physical and social infrastructure of a place on the basis of its condition and status.

The maps/images on the next page displays Safetipin's involvement in all three cities mentioned above and highlights the strong linkage between physical infrastructure and usage of public space.



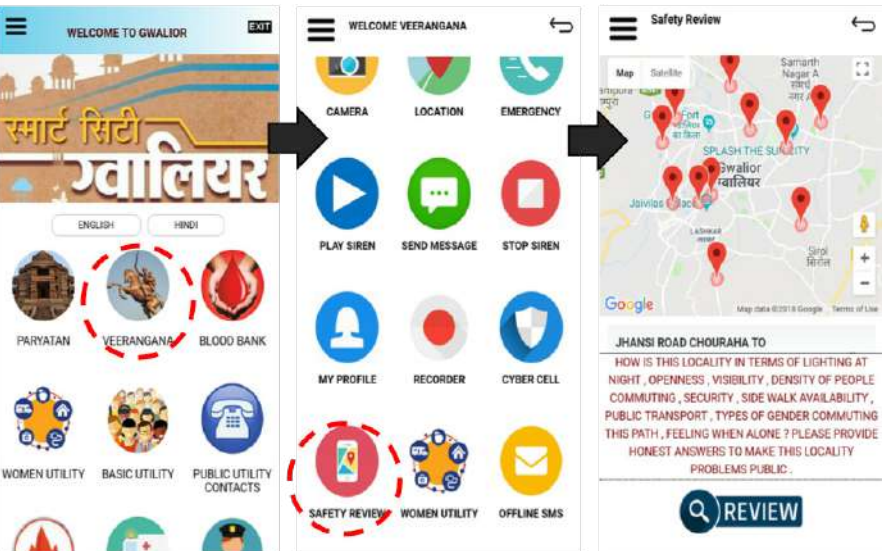
DELHI AUDIT

Image on left
The image shows dark spot mapping of the city of Delhi



GURGAON AUDIT

Image on left
The image shows before and after photos of a stretch of road where lighting was improved



GWALIOR AUDIT

Image on left
The image shows Smart City Gwalior app with Safety Review feature

LEARNING FROM DELHI

Mapping for actions

The issue of women's safety has been in the forefront in Delhi and there have been several programs and initiatives to address it. One important method is the safety audit of public spaces to examine the reasons for lack of safety in the city, including its streets and public spaces. In 2015, the data collected was presented to the Delhi government with a specific focus on the dark spots at several locations. Based on the lighting data of the report, improvements such as fixing the existing streetlights and installing additional streetlights in the areas of poor lighting were carried out by key agencies. Safetipin also did a safety audit of 15 metro stations around the city. In 2018, Safetipin was commissioned to conduct a fresh safety mapping of the entire city including streets, as well as transport hubs, markets, public toilets, parks and other public spaces. Data was collected using two apps - My Safetipin and Safetipin Nite. The former was used to generate data from users and volunteers while the latter was used to generate images of the city which were then coded and analysed for key safety concerns. The aim of this study in 2018-2019 is to provide concrete evidence of the safety challenges in the city with clear recommendations for improvement.

COMPARING KOLKATA WITH DELHI

Safety score and ratings on lighting, walkpath, transport and visibility

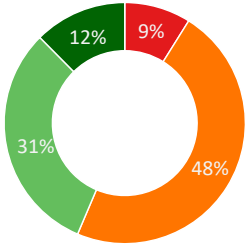
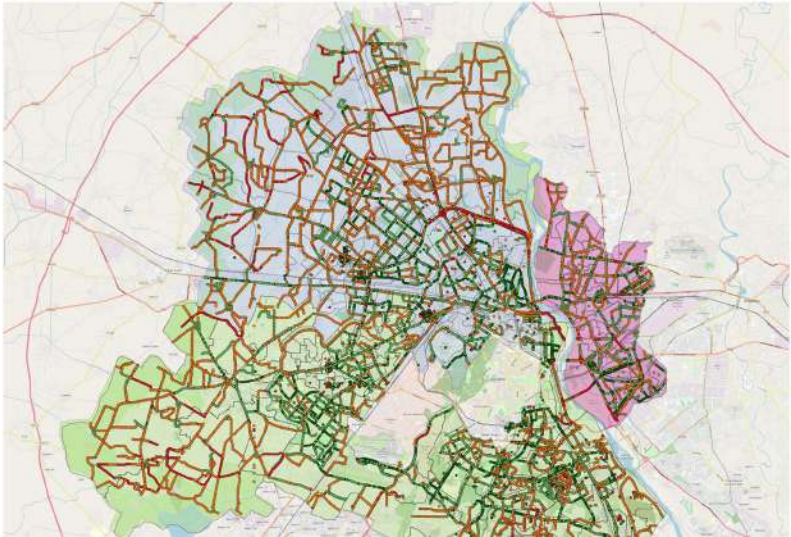
Safety assessment for Delhi has been done using both of the Safetipin applications. A total of 25,294 audits have been conducted in the city from Dec, 2018 - May, 2019. Of the total audits, 11,624 audits have been conducted in North DMC followed by 11,156 audits in South DMC and 2,514 in East DMC. The overall Safety Score for Delhi is 2.5/ 5 i.e. 'Average'. Kolkata faired better in the overall Safety Score - 3.7/5 which is 'Above Average'. Kolkata even faired better in all the actionable parameters - lighting (97%), walkpath (63%), public transport (58%) and visibility (49%) which indicates availability of good infrastructure against Delhi which scored in lighting (67%), walkpath (43%), public transport (48%) and visibility (26%) as availability of good infrastructure. Hence, Kolkata has a better chance of improving its overall score by focusing on the gaps found in the Safetipin mapping.

COMPARING KOLKATA WITH PATNA

Safety score and ratings on lighting, walkpath, transport and visibility

In Patna, data was collected through both the applications - 'Safetipin Nite' mapped the city through photographs and 'My Safetipin' involved volunteers to express their safety concerns by auditing popular public spaces. A total of 3680 audits have been conducted in the city from Sept, 2019 - Jan, 2020. The overall Safety Score for Patna is 2.6/ 5 i.e. 'Average'. Kolkata faired better in the overall Safety Score - 3.7/5 which is 'Above Average'. Kolkata has also faired better in all the actionable parameters - lighting (97%), walkpath (63%), public transport (58%) and visibility (49%) which indicates availability of good infrastructure against Patna which scored in lighting (36%), walkpath (33%), public transport (14%) and visibility (45%) as availability of good infrastructure. Kolkata hence has a better chance of improving its overall score by focusing on the gaps found in the Safetipin mapping.

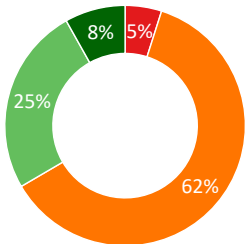
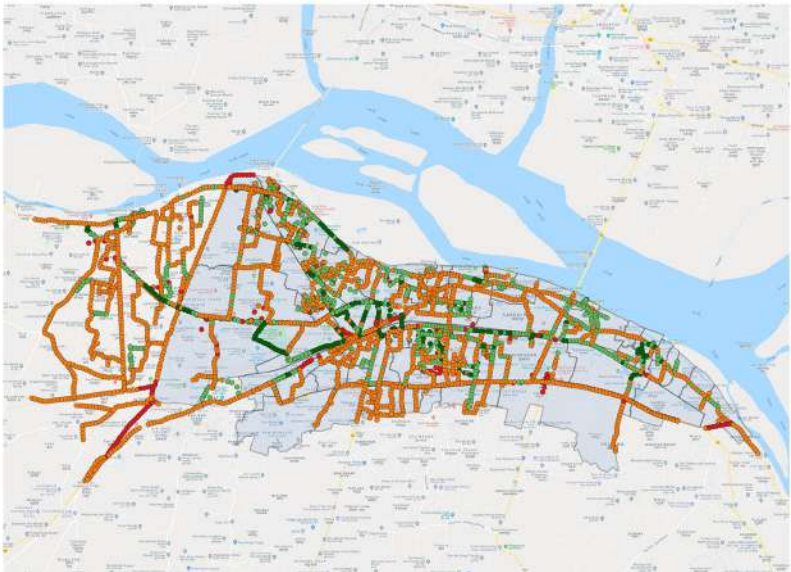
Delhi:
Parameter
Walkpath



DELHI WALKPATH

Image on left
Walkpath mapping of Delhi, 2019

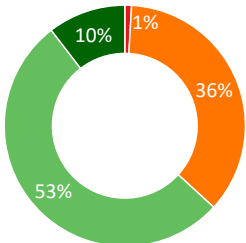
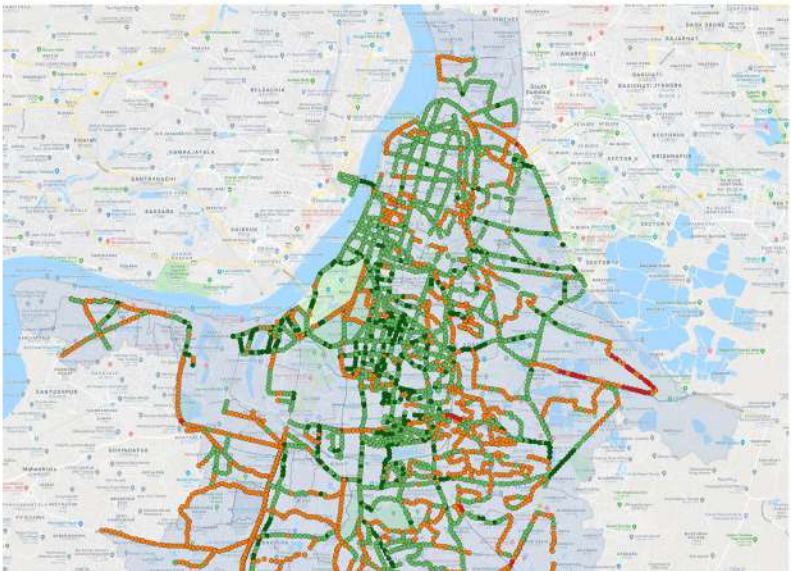
Patna:
Parameter
Walkpath



PATNA WALKPATH

Image on left
Walkpath mapping of Patna, 2019

Kolkata:
Parameter
Walkpath



KOLKATA WALKPATH

Image on left
Walkpath mapping of Kolkata, 2019

KOLKATA: ACTION POINT ONE
On non-functional street lighting

03% of the city has inadequate street lighting and could be fixed immediately to achieve 100% street lighting in Kolkata. Street lighting is crucial for ensuring safe accessibility in public spaces and plays a vital role in people's, particularly vulnerable users' perception of safety in streets and public places after dark. Safetipin's data (geo-located images) can be used to improve street lighting in the city. The map below represents the locations where there are either absolutely no lights, inadequate lights or non-functional street lights. This information can be used for the ease of planning for immediate up-gradation like, adding and fixing street lights.



GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show low street lighting.

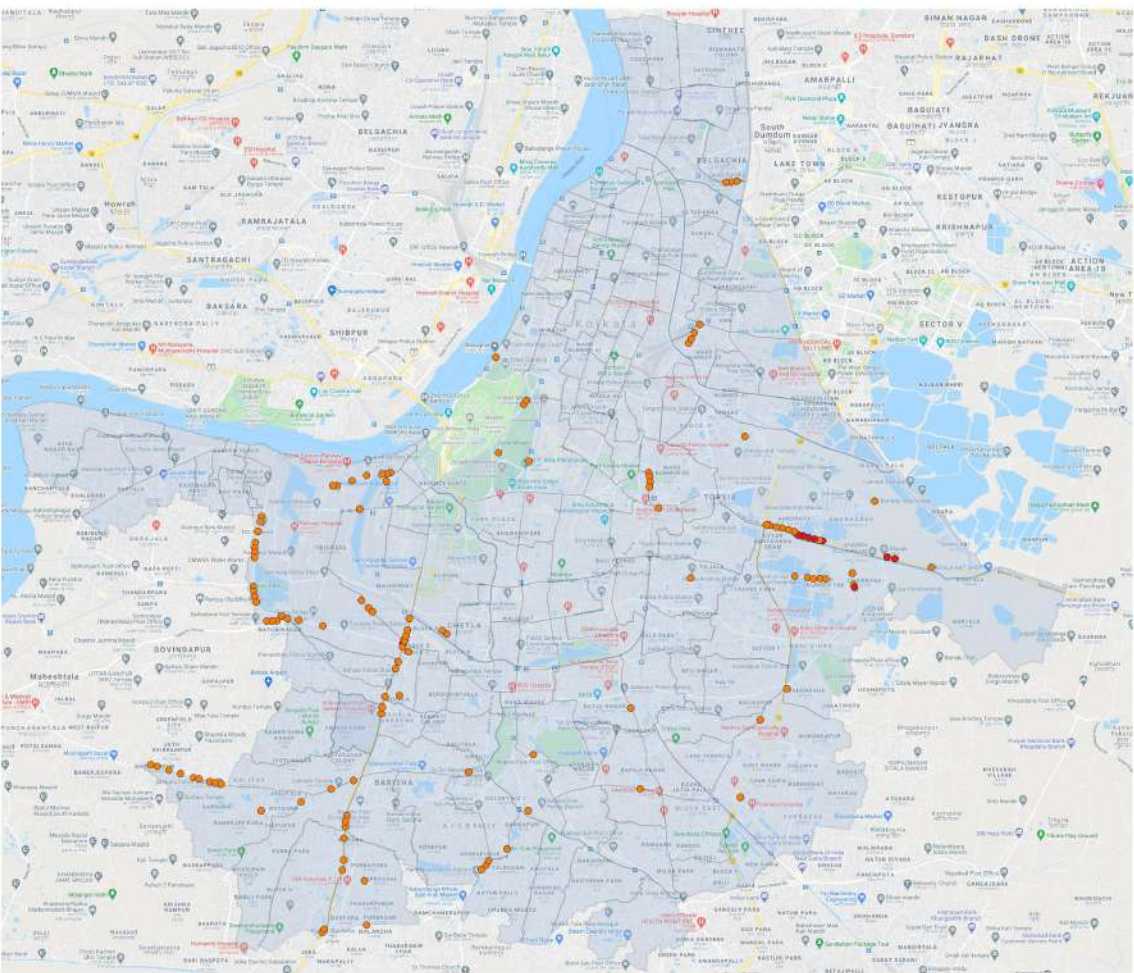
Kolkata:
Poor Lighting

Legend

Safety Audits

- Poor Light (9)
- Some Light (115)
- Kolkata

Base: Google Map



KOLKATA: ACTION POINT TWO
On poor condition of footpath

37% of the city has either no or poor footpath condition. Broken, discontinuous and blocked footpaths could be easily fixed to achieve ease of walking in the city which is important for pedestrians, especially vulnerable users to feel safe while accessing the city for various daily activities. Safetipin's data (geo-located images) can be used to improve pedestrian access in the city. The map below represents the locations where there are either no dedicated footpaths, no constructed footpaths or obstructed footpaths. This information can be used for immediate footpath up-gradation like, construction, repairs and removal of all obstructions.



GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show very narrow footpath.

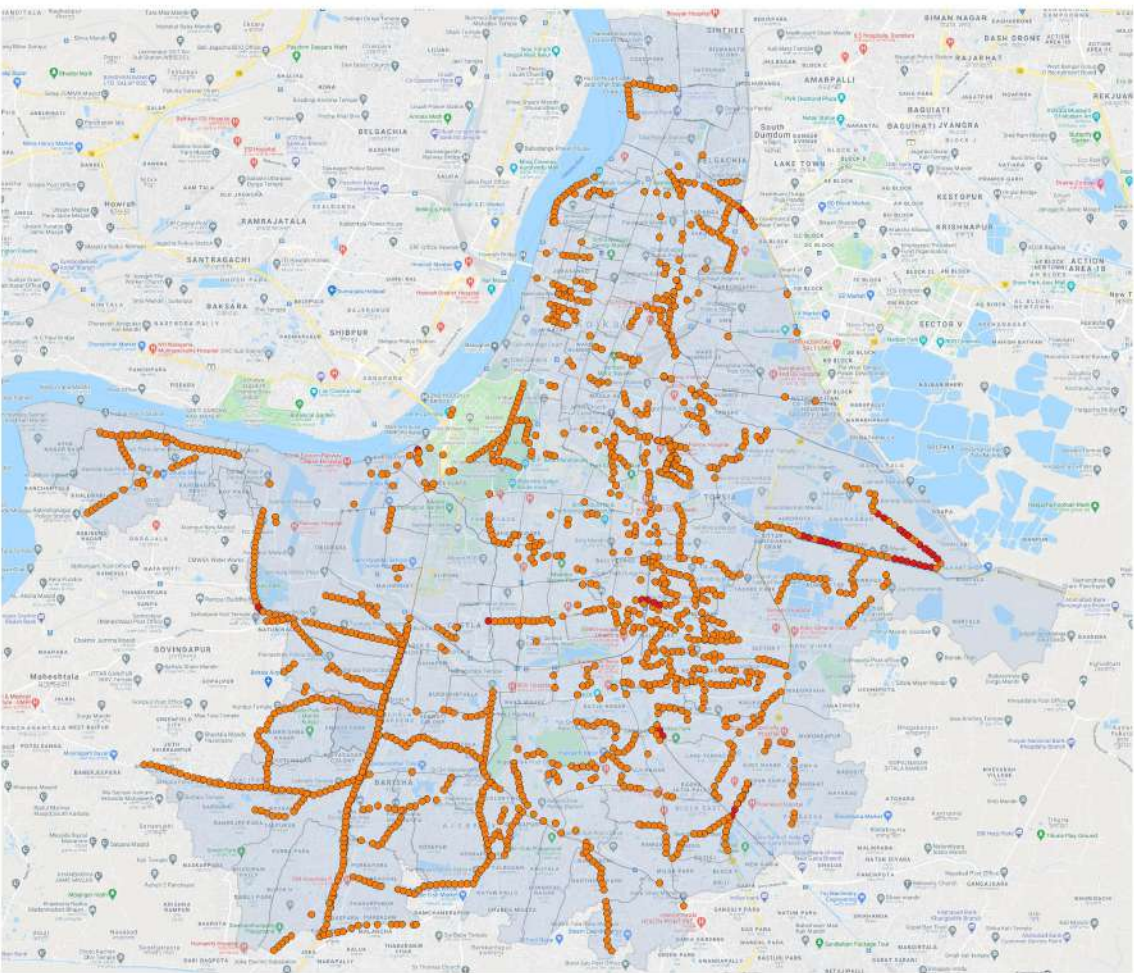
Kolkata:
Poor Walkpath

Legend

Safety Audits

- None (37)
- Poor (1479)
- Kolkata

Base: Google Map



KOLKATA: ACTION POINT THREE
On out of reach public transport

42% of the city has either distant or out of reach public transport. Adding more public transport stops/stands will improve access for all. Safe and reliable public transport is the critical link between people's access to education, employment and resources in the city. Safetipin's data (geo-located images) can be used to improve access to public transport in the city. The map below represents the locations where there are either no public transport stops available or the stops are distant. This information can be used for planning transport linkages such as, adding more bus stops, auto/rickhaw stands within 2-5 mins walking distance.



GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show public transport stands.

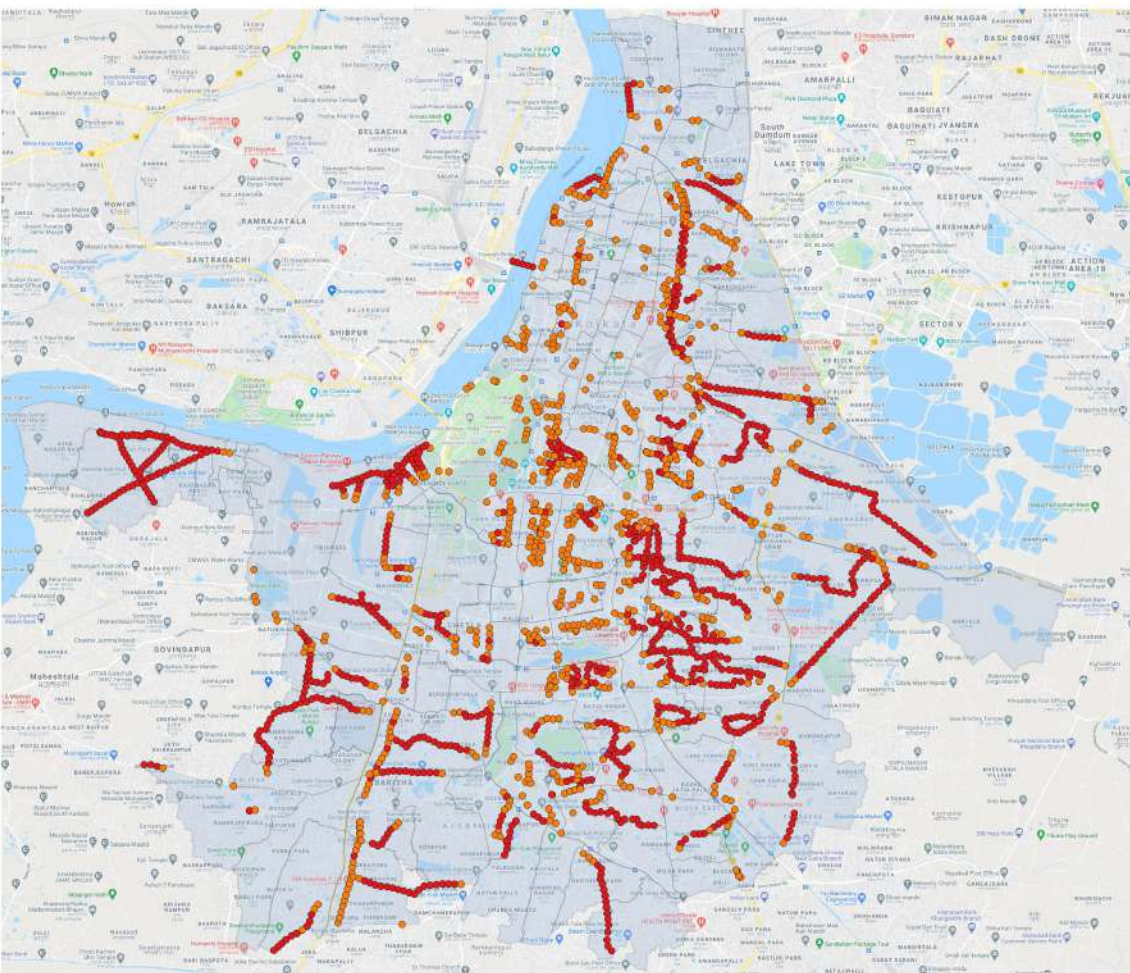
Kolkata:
Distant/Unavailable
Public Transport

Legend

Safety Audits

- Unavailable (956)
- Distant (794)
- Kolkata

Base: Google Map



KOLKATA: ACTION POINT FOUR
On low visibility or eyes on the street

51% of the city has either no or poor visibility which means people present on the streets cannot be seen by other people living by or working on the streets. Safetipin's data (geo-located images) can be used to improve 'eyes on the streets' - the key component in making cities safe and accessible. The map below represents the locations where visibility is low. This information could be used for planning for immediate enhancement of visibility like replacing boundary walls with fences, adding lights to transport stops, foot-overs, underpasses and allowing and organising street hawking.



GEO-LOCATED IMAGES
Left to right
The geo-tagged photos show good visibility.

Kolkata:
Poor Visibility

Legend

Safety Audits

- No Eyes (694)
- Few Eyes (1419)
- Kolkata

Base: Google Map



DESIGN PRINCIPLES

Planned interventions

Unlike action points which are pragmatic in nature, long term public space intervention strategies look at the city holistically. These strategies serve the purpose of helping cities function better and more effectively. They make the connection between aspects that are linked but not so visible, such as the link between improved physical access and opportunities for a better life for people with vulnerabilities. Below are a few design principles as recommendations which would help Kolkata in achieving the overarching goal of 'access for all.'

MAKE WALKING SEAMLESS

Footpaths, curb ramps, crossings, footovers, underpasses

To make walking easy, safe and seamless walking routes must be in good condition and connected to a larger network of streets in the city. A good walking route must be well paved, well lit and free from any type of obstruction. Additionally all walking route must be well connected to other routes and well designed with crossovers to have a seamless walking experience when travelling from point A to point B. This particularly benefits vulnerable users.

MAKE PUBLIC TRANSPORT EASILY ACCESSIBLE

Transport stops, routes, frequency, capacity, safety within transport

To make public transport within everyone's reach, various transportation systems functional in the city should be looked at. It is important to understand how one transport system interacts with the other and how people use them. Only then the gaps or overlaps between systems could be identified and improved to make them seamless. Such interventions to stitch different systems makes the overall transport network accessible and allows people to switch within transport systems easily. Safety inside every transport is a very essential aspect to consider.

FOCUS ON LAST MILE CONNECTIVITY

Non-motorised transport, light motor vehicles, informal transport

Last mile connectivity is an important aspect of any public transportation system operating in the city. Strengthening informal transport like non-motorised vehicles and light motor vehicles which serve as first/last mile connectivity to one's origin and destination could be an useful way of ensuring seamless and safe travelling. Often vulnerable people forego opportunities available in the city due to weak, unsafe or expensive first/last mile connectivity options.

MAKE STREETS ACTIVE

Mixed-use development, informal shopping, eyes on the streets

Active streets are safe streets. To make streets safe an optimum amount of activity on the streets and by the streets is required. Just the way over crowded streets tends to be unsafe, similarly under used streets are unsafe too. Streets which have enough people overlooking it from buildings next to it and have enough people present on it are safer. Encouraging mixed-used developments, on street shopping, informal hawking and discouraging high boundary walls, front setback for buildings are good practices to make streets active round the clock.

MAKE STREETS INCLUSIVE

Employment in public services, representation in govt, advocacy and sensitisation programs

Ensuring person with disabilities are employed and represented in public services and government include their perspective in planning, designing and maintaining public space. Participatory planning methods are useful ways of including vulnerable perspective into planning.



EXAMPLES OF
GOOD PRACTICES

Design Standards and Best Practices

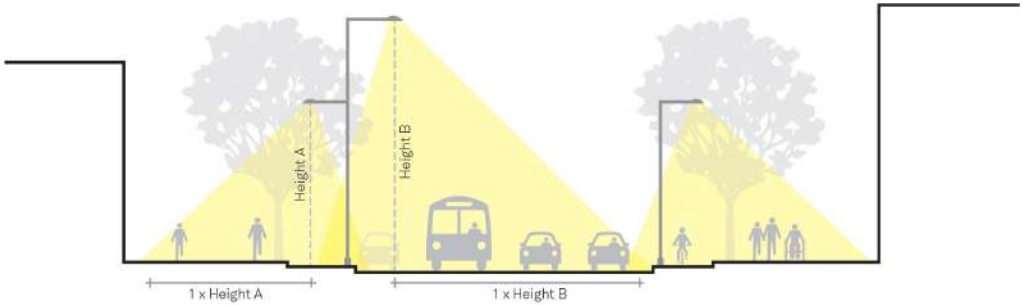
DESIGN CONSIDERATIONS FOR ACCESSIBLE STREETS

Walkable Streets: Every trip begins and ends with walking, and therefore everyone is a pedestrian on a city's street at some point. Providing continuous and unobstructed clear paths ensures walkable streets for everyone. Each footpath's clear path should be complemented with active street edges and accessible facilities to make the journey comfortable and engaging. Cities are places for people, and they use streets for diverse activities. This requires making people the highest priority in street design, with careful consideration for the most vulnerable users: women, children, elderly, and the disabled. The middle image on the left illustrates different types of uses of the street - people walking, cycling, driving, waiting, conducting business, doing maintenance work and residing or working in the buildings by the street. All of these uses, and user groups must be catered to when designing a street. Find the full detail on <https://globaldesigningcities.org/publication/global-street-design-guide/>

Well-lit Streets: There is a wide range of light sources that contribute to the overall illumination of the public realm. Well-designed solutions incorporate different types of light sources such as conventional pole-mounted lights, decorative light fixtures as well as signage/advertising illumination. Borrowed light spilling from storefront or residences, lights mounted to building exteriors and facade lighting may add to street illumination too. However, borrowed illumination may not always be consistent, evenly distributed, or designed for human comfort. Hence pole-mounted street light fixtures are installed for uniform distribution and illumination of roadways and footpaths. The top image on the left illustrates thumb rules used for streetlight spacing, height and light cone. Find the full detail on <https://globaldesigningcities.org/publication/global-street-design-guide/utilities-and-infrastructure/lighting-and-technology/lighting-design-guidance/>

Active Streets: Streets that provide safety, comfort and amenities for all users are active streets. Create "eyes on the street" by removing setbacks and boundary walls and building to the edge of the street's right of way. This would allow people from inside to look out on to the pavement, thus discouraging misbehaviour and creating safety through visual surveillance. Encourage commercial facades to have minimum 30-50% transparency. Provide adequate street lighting for pedestrians footpaths and bicycles lanes. Create mixed-use developments, commercial edges/shopfronts and hawking zones at regular intervals to encourage walkability, increase street activity and provide safety. The bottom image on the left illustrates the above principles which makes safe, inclusive and accessible streets. Find the full detail on <http://www.uttipee.nic.in/>

Safe Streets: Feeling and being safe in the street is a basic requirement for people to perform daily activities, such as going out, walking, cycling or using public transport. Thus, it is necessary to ensure that the environment in which people move and interact every day is safe. Street safety may have different meanings for different people, depending on factors that range from social norms to gender perceptions and individual mobility patterns, among others. For some, street safety is narrowed to being protected from physical harm caused by traffic, while for others, the absence of assault may be overarching. To take into account these different understandings of safety the physical and social dimensions of streets must be considered when designing streets. Here are a few good practice examples and design standards given to illustrate the importance of well-designed streets which caters to diverse users of public space and makes them safe, inclusive and accessible.



The spacing between light poles is typically 2.5–3 times the height of the fixture. A single row of light poles might be sufficient for a narrow street, while wider streets will require multiple rows.

STREET LIGHTING

Image on left

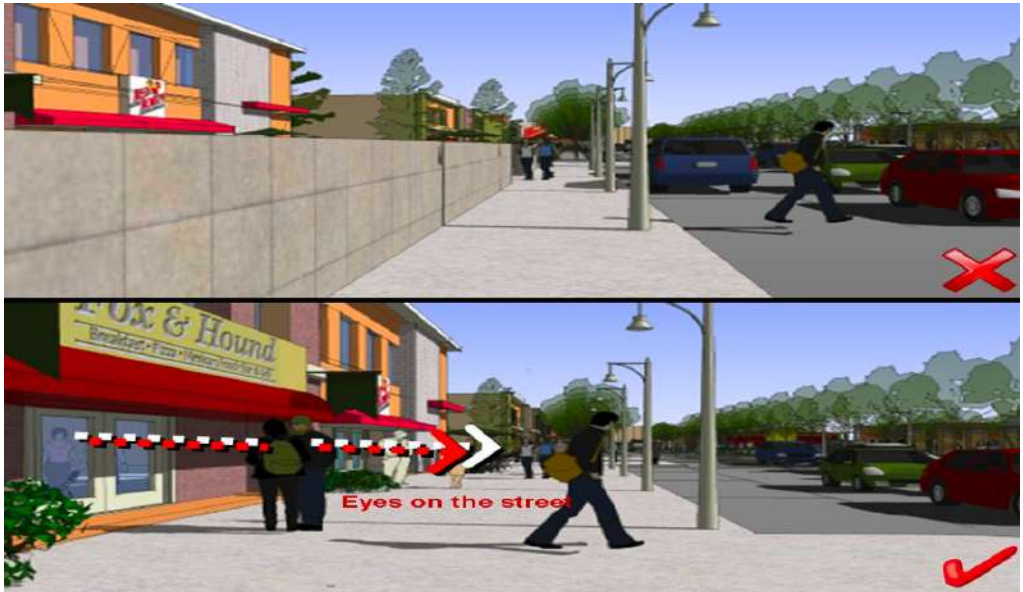
Image source: Global Street Design Guide, Global Designing Cities Initiative



WALKABLE STREET

Image on left

Image source: Global Street Design Guide, Global Designing Cities Initiative



ACTIVE STREET

Image on left

Image source: Pedestrian Design Guidelines UTTIPEC, DDA, New Delhi

PILOT DESIGN
INTERVENTIONS

Action points and planned interventions

STREET SELECTED: JAMES LONG SARANI

James Long Sarani is situated in the south of Kolkata and runs through the wards - 119, 120, 121, 123 and 124. It is a 7.2 Km long stretch and has been chosen for ‘Pilot Design Intervention’ to improve access for all, especially the vulnerable groups - women, children, elderly and people with disability.

Safetipin mapped James Long Sarani twice - first time, when mapping the entire city of Kolkata and second time, for the intervention to specifically assess the status of accessibility on the selected stretch.

James Long Sarani is a neighbourhood, secondary level road running parallel to Diamond Harbour Road and lies between Taratala and Joka in Kolkata. It runs through an organically developed, mixed-use (typically, retail and residential mixes) neighbourhood. Footpaths are provided on either side of the road and are regularly used by all groups of people in everyday life. There are many schools both primary and secondary, few clinics, hospitals, a library, a children's park, a public pool, a sport's stadium, a football field, many religious and public buildings, small eating places, ATMs & banks and numerous small grocery stores. These social amenities exist within walking distances of 5 minutes (400 metres) to 10 minutes (800 metres), making it a walkable neighbourhood. As seen in the walking radius diagram (refer image 05) drawn over a stretch of J L Sarani road - schools, bus stops and clinics is within 3 - 5 minutes of walking distance. It was also observed that people mostly walked in this neighbourhood. This could be seen on the Safetipin People parameter map which shows good presence of people on the street. Other parameter maps such as Walkpath, Lighting and Visibility show presence of footpaths, street lightings and enough eyes on the streets to enable people using the street.

LEARNING FROM OTHER CITIES

The entire stretch has three vehicular road condition:
A. Two-way, four-lane road with median (Image 02)
B. Two-way, six-lane road without median (Image 03)
C. Two-way, six-lane road with median (Image 04)

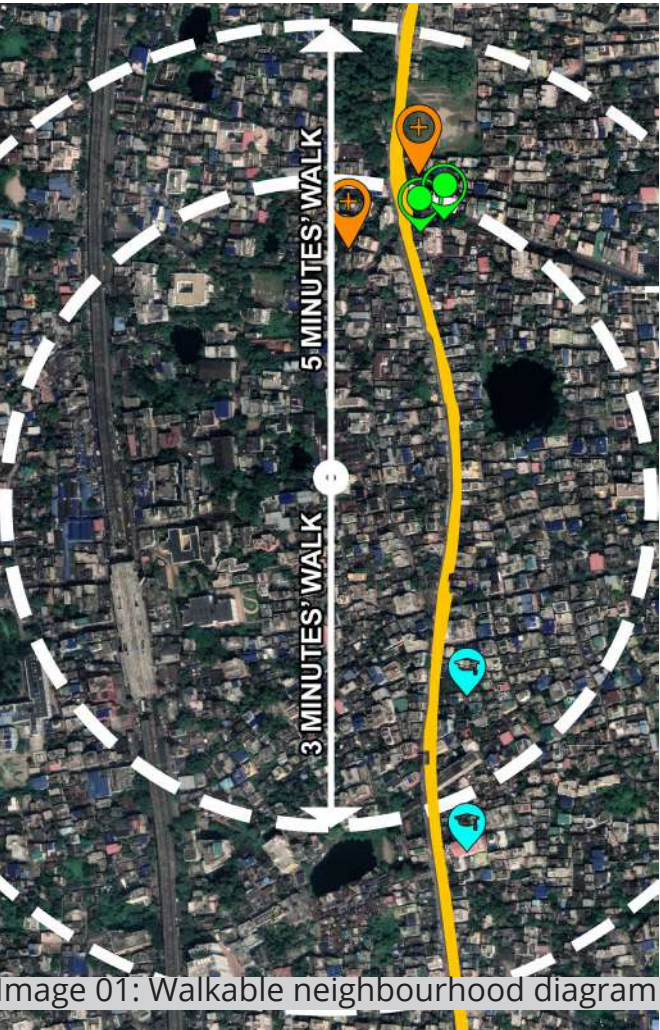


Image 01: Walkable neighbourhood diagram



Image 02: J L Sarani - Two-way, four-lane road with median



Image 03: J L Sarani - Two-way, six-lane road without median



Image 04: J L Sarani - Two-way, six-lane road with median

BARRIERS
Currently blocking the footpath

An additional set of accessibility parameters apart from the standard vulnerability parameters discussed before (people, walkpath, visibility & lighting) were applied for better understanding of the status of accessibility on J L Sarani - especially for the vulnerable groups. To map this, two sets of factors were considered to assess ease of walking on footpaths. First, to map the present condition of the footpaths. Second, to see if the footpaths are clear of any barriers, hindering access. Based on this, the accessibility parameters considered are as given below. A map was generated for both factors with geo-tagged information which helps to assess the nature of the issues related to accessibility and locate the same for action.

Accessibility parameter used for mapping access - Footpath Barriers:

- Garbage dumped on footpaths
- Vehicles parked on footpaths
- House and shop extensions onto footpaths
- Temporary shops, vendors obstructing footpaths
- Light, electric, signage and advert poles obstructing footpath

GEO-LOCATED MAPPING

Map below

Safetipin Parameter Map of
Footpath Barriers on J L Sarani

The Safetipin mapping shows (see map below) the presence of different types of barriers on the footpath on the entire stretch. The images on the right illustrate different types of barriers present on the street which together pose great difficulty for any pedestrian to walk safely and with ease on the footpath and certainly does not allow universal accessibility.

**Kolkata:
J. L. Sarani Road
Accessibility
Footpath Barrier**

Legend

- Signage
- Light Pole
- Garbage
- Electricity Pole
- Vehicle Blocking
- Shop Encroachment
- Vendor Blocking
- Car Blocking

Base: Google Map

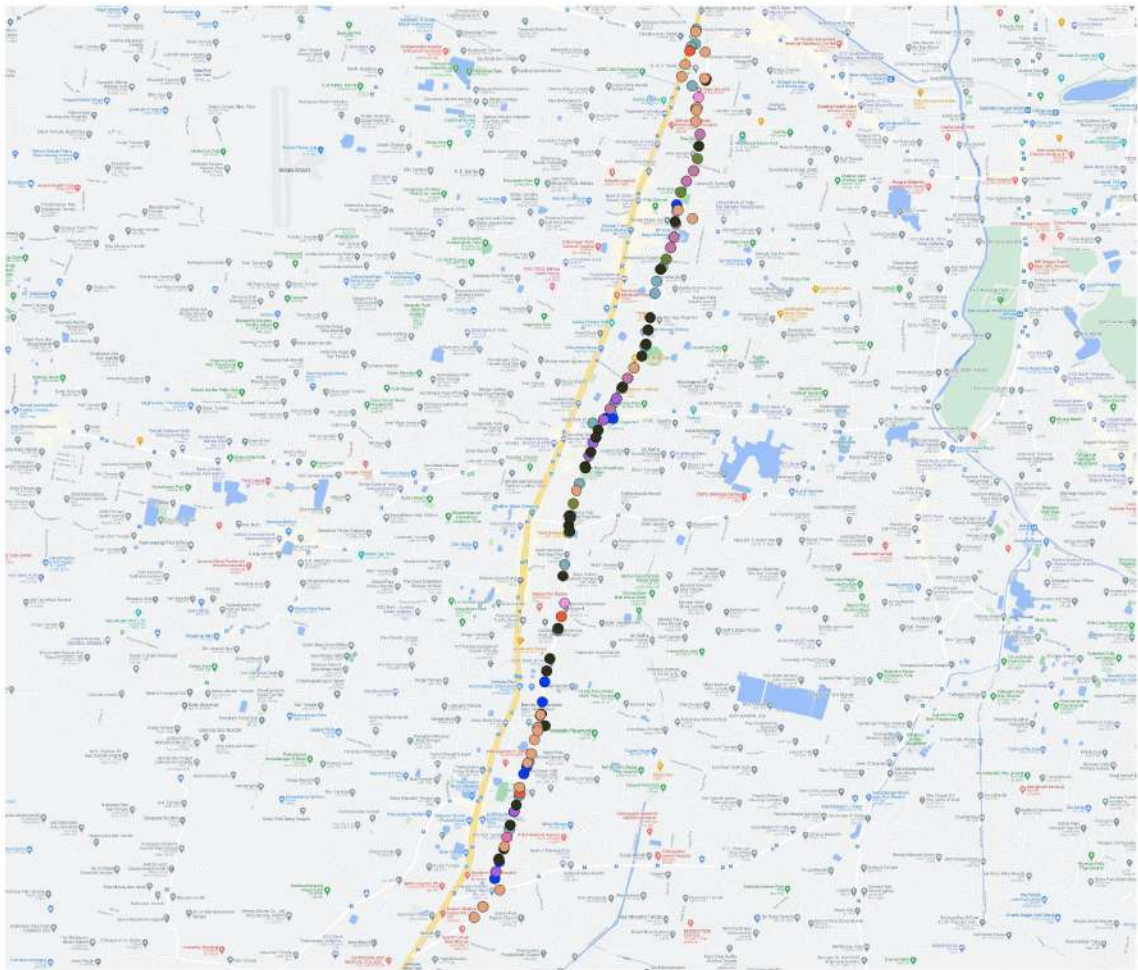


Image: Parked two-wheeler



Image: Shop extension



Image: Power transformers



Image: Parked four-wheeler



Image: Vegetable vendors



Image: Garbage dump

ELEMENTS

Of the footpath to assist access

Another accessibility parameter used for mapping access - Footpath Conditions:

- Non-existent footpath
- Broken, dis-continuous footpath
- Availability of curb ramps, median breaks and zebra crossings

The Walkpath parameter findings says that only 4% of the footpath on J L Sarani is in very poor condition. The rest 96% of the street has constructed footpaths for pedestrians. Image analysis shows that the condition of these footpaths are not fit for walking by all, especially the vulnerable groups. They are broken and dis-jointed in parts and pose as tripping hazard in many places because of having uneven walking surfaces.

The Footpath Condition map (see map below) shows no median breaks for pedestrian crossings and very few pedestrian crossings marked at the street intersections. Curb ramps were found at 10 locations only on the entire stretch and those too were not constructed properly for universal accessibility.

The street intersection drawing on the next page illustrates the principles of intersection planning with footpaths with tactile paving, curb ramps, pedestrian crossings and median breaks to allow at grade pedestrian access. The supporting detail images of each element of the footpath shows how they enable the pedestrian to move at grade easily and effortlessly.

GEO-LOCATED MAPPING

Map below

Safetipin Parameter Map of
Footpath Conditions on J L Sarani

Kolkata:
J. L. Sarani Road
Accessibility
Footpath Condition

Legend

- Ramp
- Curb Ramp
- Zebra Crossing

Base: Google Map

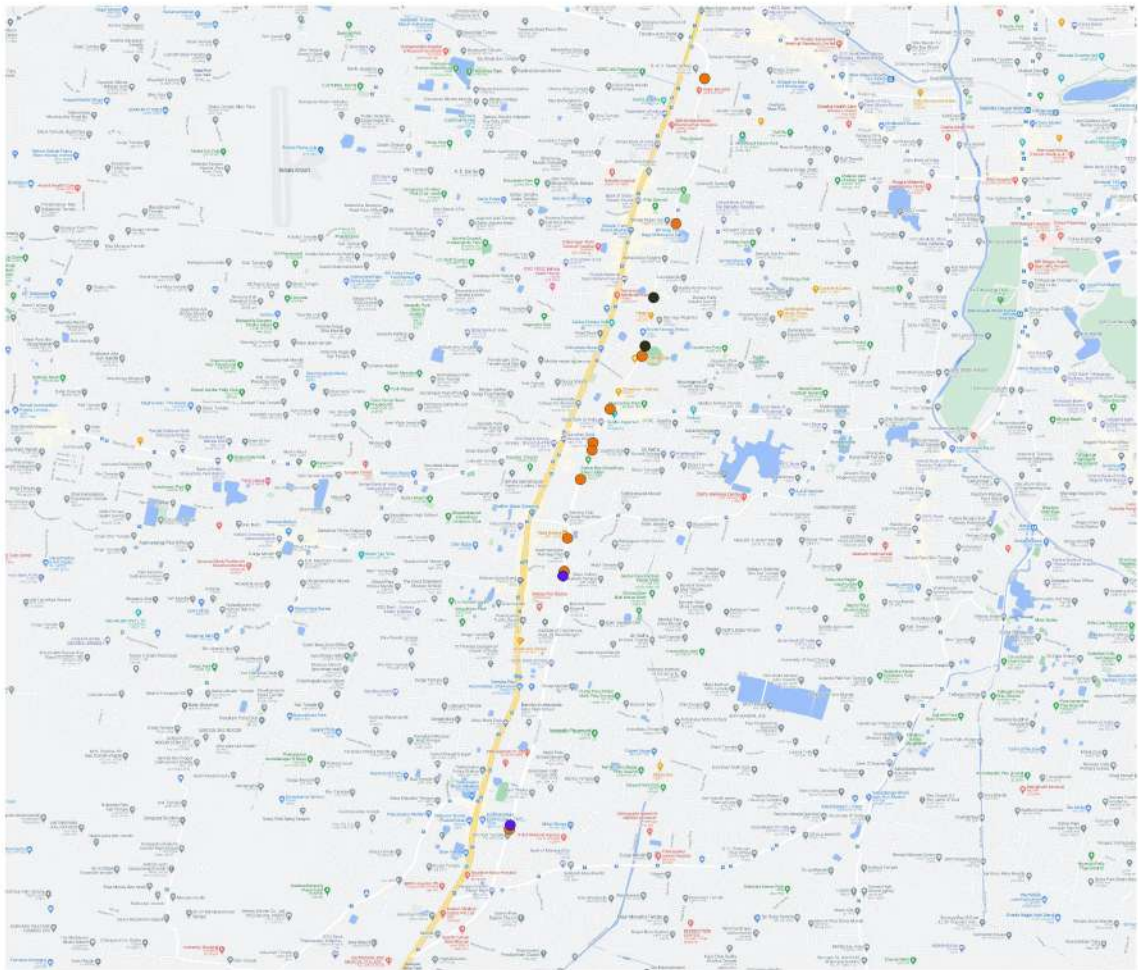


IMAGE: CURB RAMP DETAIL 1

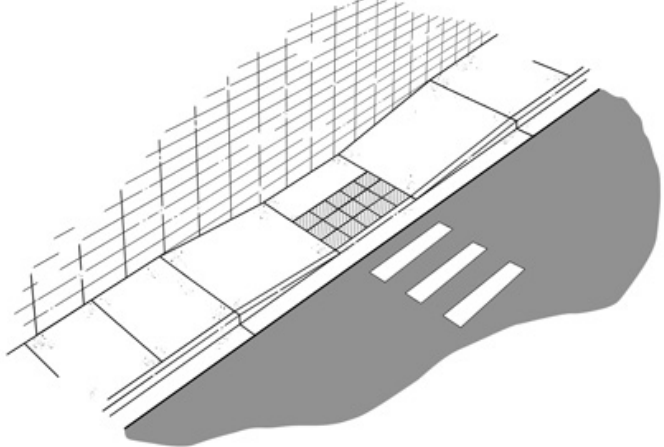


IMAGE: CURB RAMP DETAIL 2

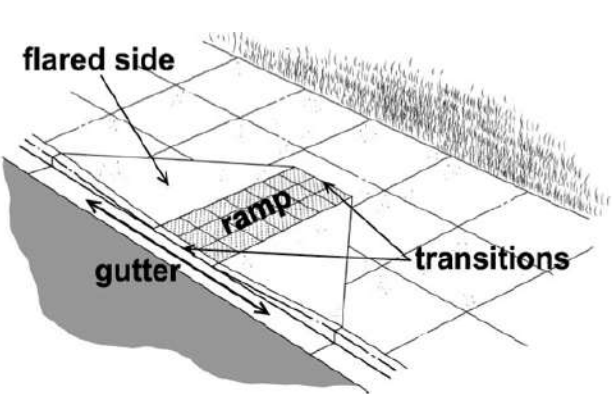
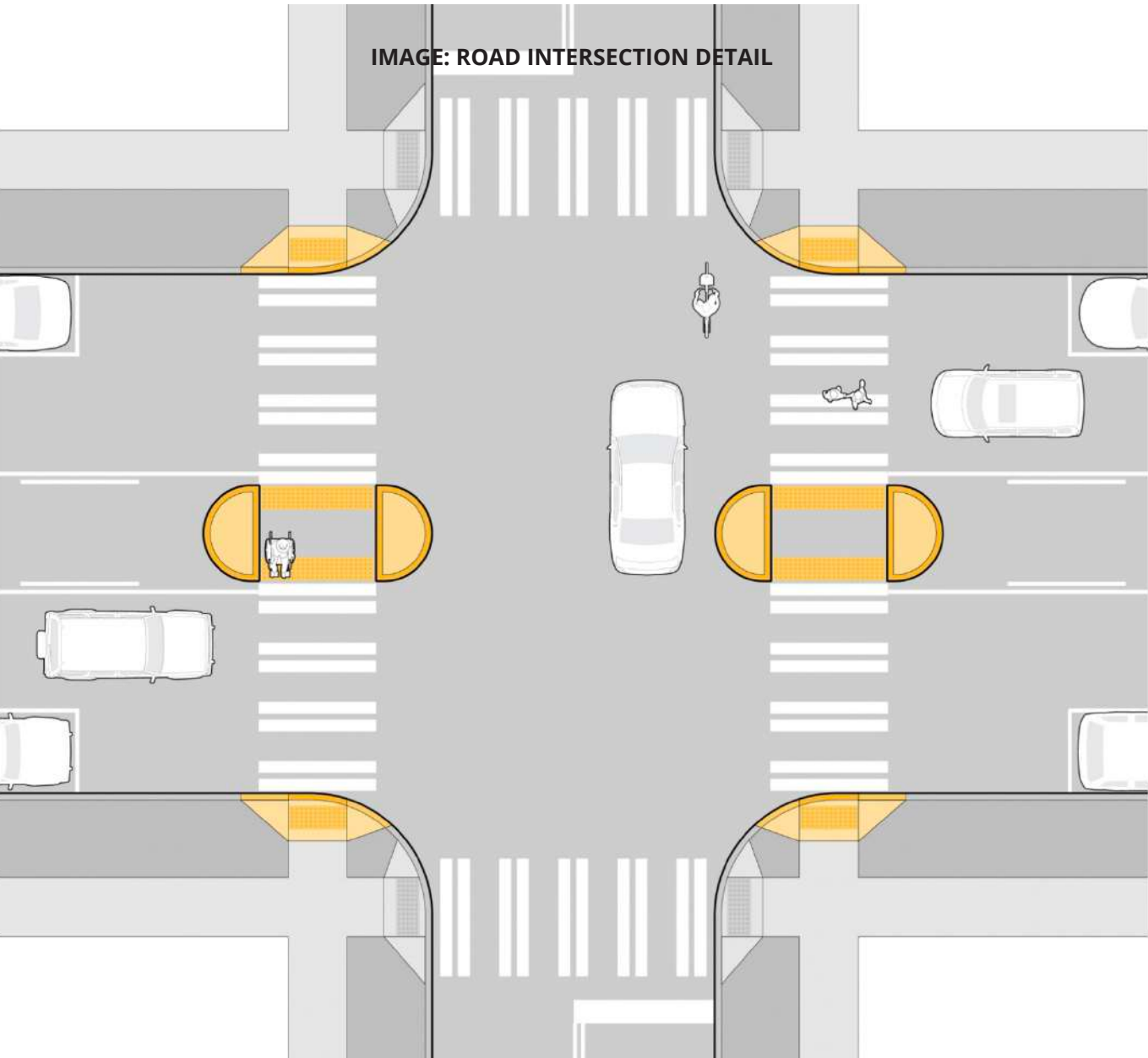
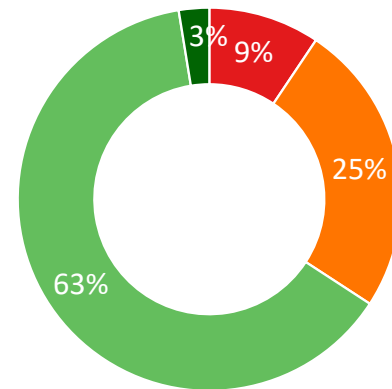


IMAGE: ROAD INTERSECTION DETAIL



66%

OF THE STREET HAVE GOOD NUMBER OF PEOPLE USING IT



Safetipin mapped 66% of the street to have good number of people present during the time of the audit. 25% of the street were found to have few people and 9% of the street were quite empty. When this data is represented geographically (see map below) it is seen that areas with higher ratings on people are spread all along the street. This means, people use the street well for performing everyday activities.

On the left, percentage distribution pie of the parameter map below. Tally with the legend below.

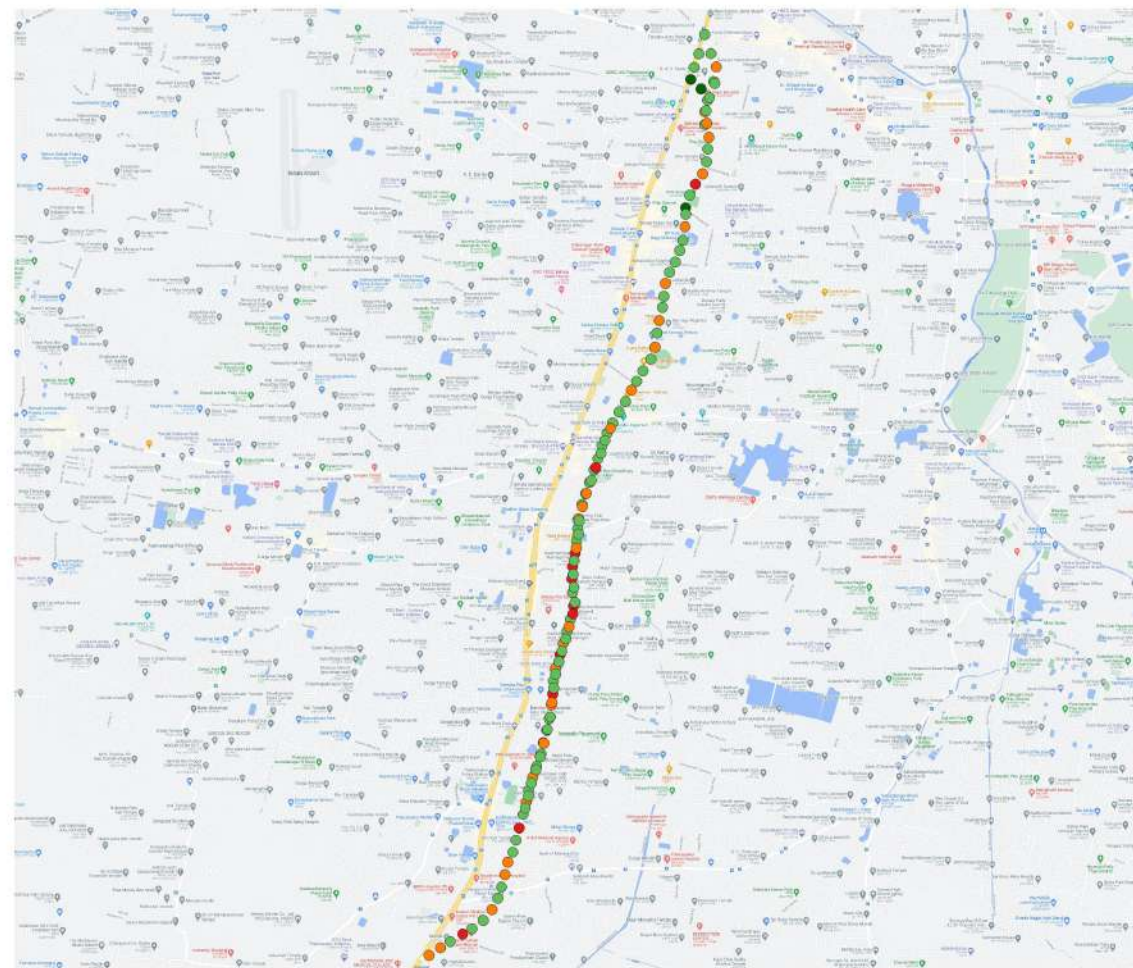
Kolkata: J. L. Sarani Road Parameter People

Legend

Safety Audits

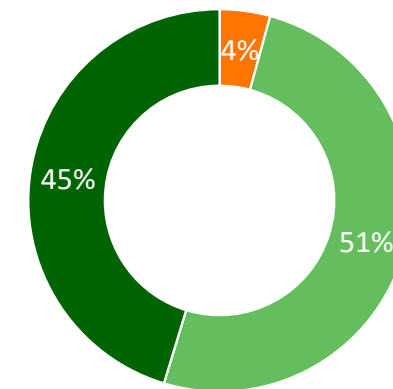
- Deserted
- Few People
- Some Crowd
- Crowded

Base: Google Map



96%

OF THE STREET HAVE FOOTPATHS FOR PEDESTRIANS



Safetipin mapped 96% of the street to have footpaths constructed for pedestrians and only 4% of the street is rated poorly on the same. When this data is represented geographically (see map below) it is seen that areas with higher ratings on footpaths are found all along the street and only in few areas they are missing or completely broken. This means, footpaths are built and allocated for pedestrians on this street. A detailed footpath analysis follows to understand the built condition of the footpaths and how accessible they are for all.

On the left, percentage distribution pie of the parameter map below. Tally with the legend below.

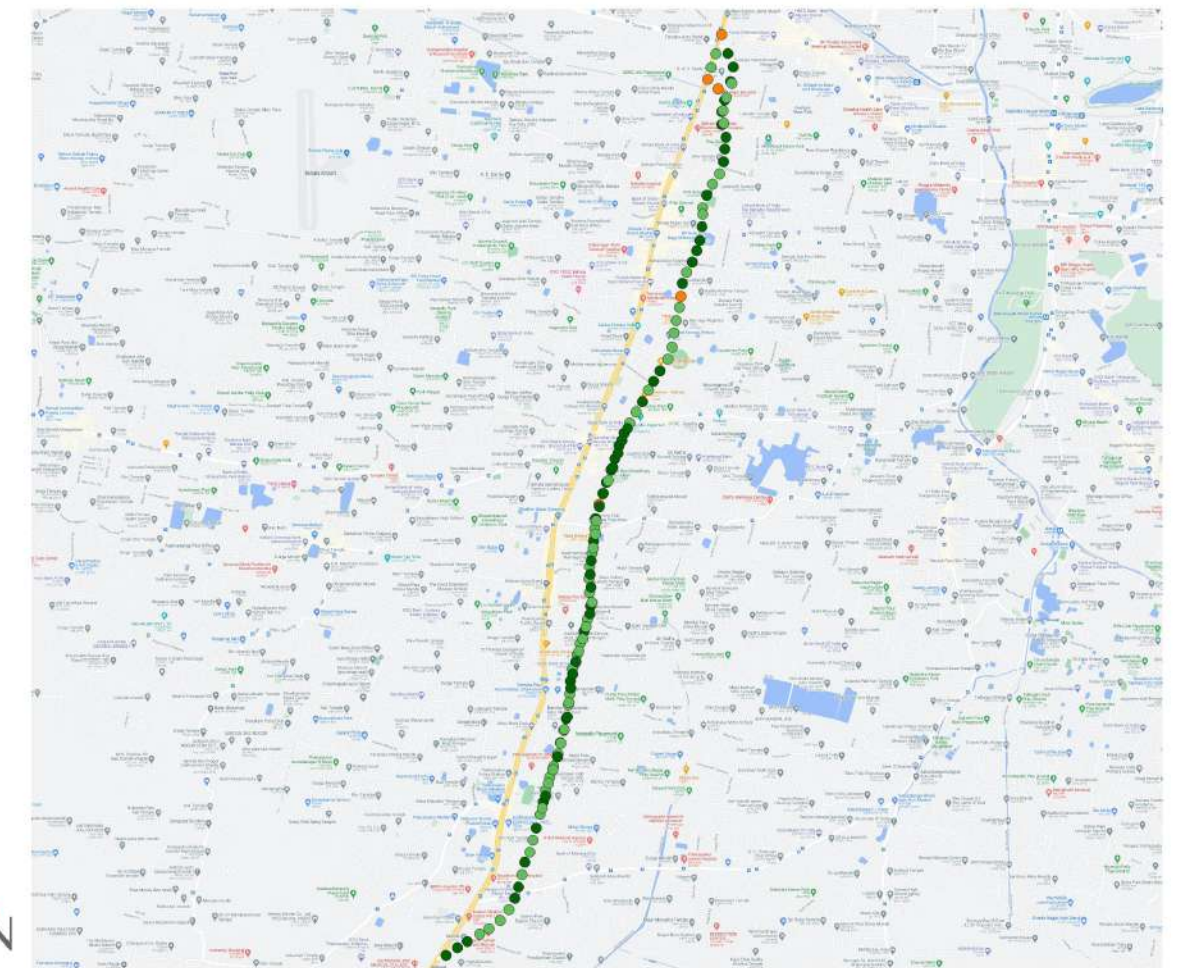
Kolkata: J. L. Sarani Road Parameter Walkpath

Legend

Safety Audits

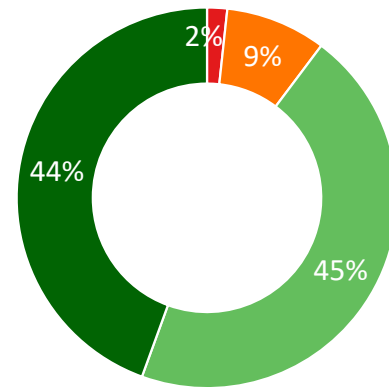
- None
- Poor
- Fair
- Good

Base: Google Map



89%

OF THE STREET HAS ACTIVE FRONTAGE AND VISIBILITY



Safetipin mapped 89% of the street to have good visibility or enough eyes on the street to make people feel safer on it. Only 11% were found to have poor visibility. When this data is represented geographically (see map below) it is seen that areas with higher ratings on visibility are spread all along the street and only in few locations visibility is found to be low. This means, the street has less number of high boundary walls or blank facades facing the street and have more people, vendors, shops on the streets to provide active frontage.

*On the left, percentage distribution pie of the parameter map below.
Tally with the legend below.*

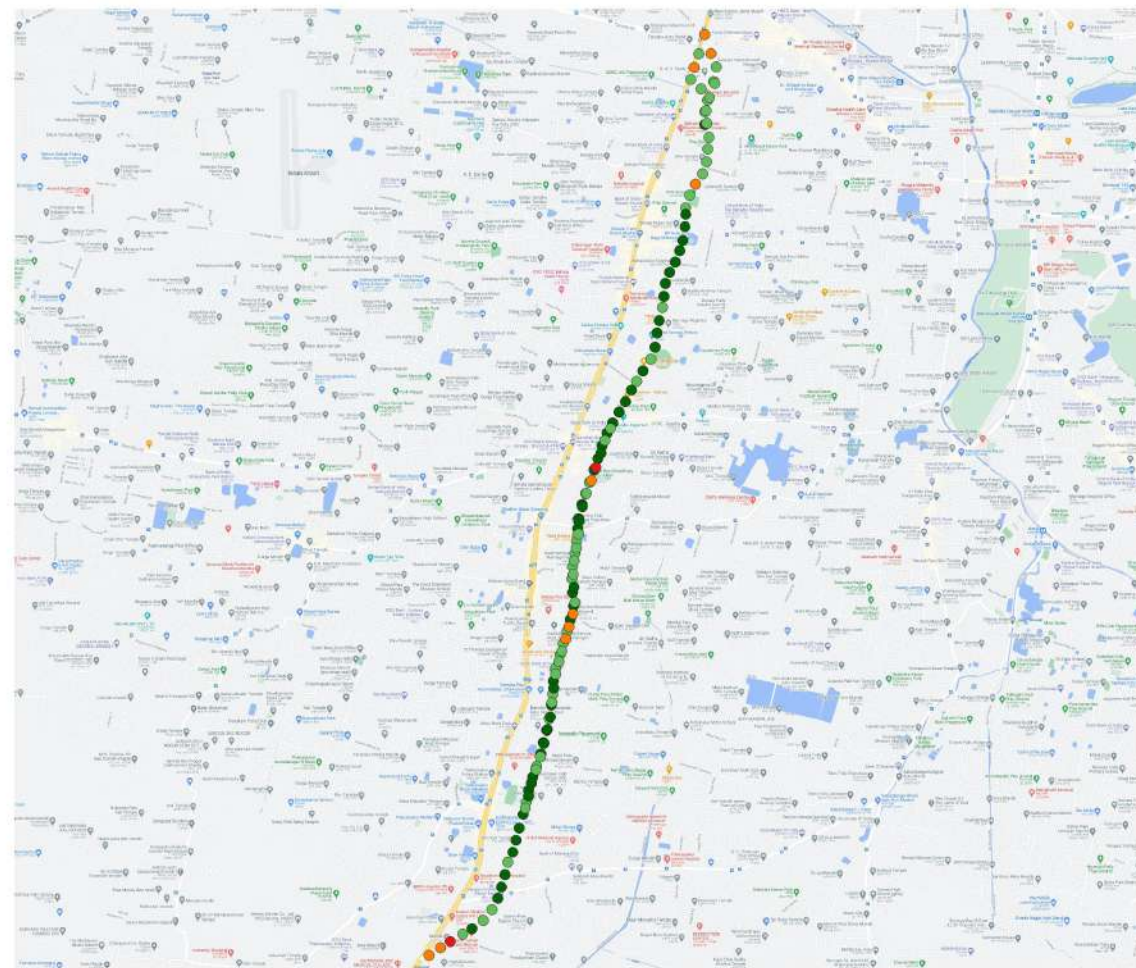
Kolkata: J. L. Sarani Road Parameter Visibility

Legend

Safety Audits

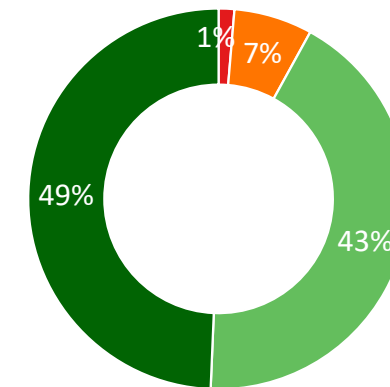
- No Eyes
- Few Eyes
- More Eyes
- Highly Visible

Base: Google Map



92%

OF THE STREET HAS ADEQUATE STREET LIGHTING



Safetipin mapped 92% of the street to have adequate street lighting and only 8% of the streets is rated poorly on the same. When this data is represented geographically (see map below) it is seen that areas with higher ratings on street lighting are found all along the street and only in few locations they are non-functional. This means, the street has adequate street lighting for clear visibility and is used by people for daily activities even after dark.

*On the left, percentage distribution pie of the parameter map below.
Tally with the legend below.*

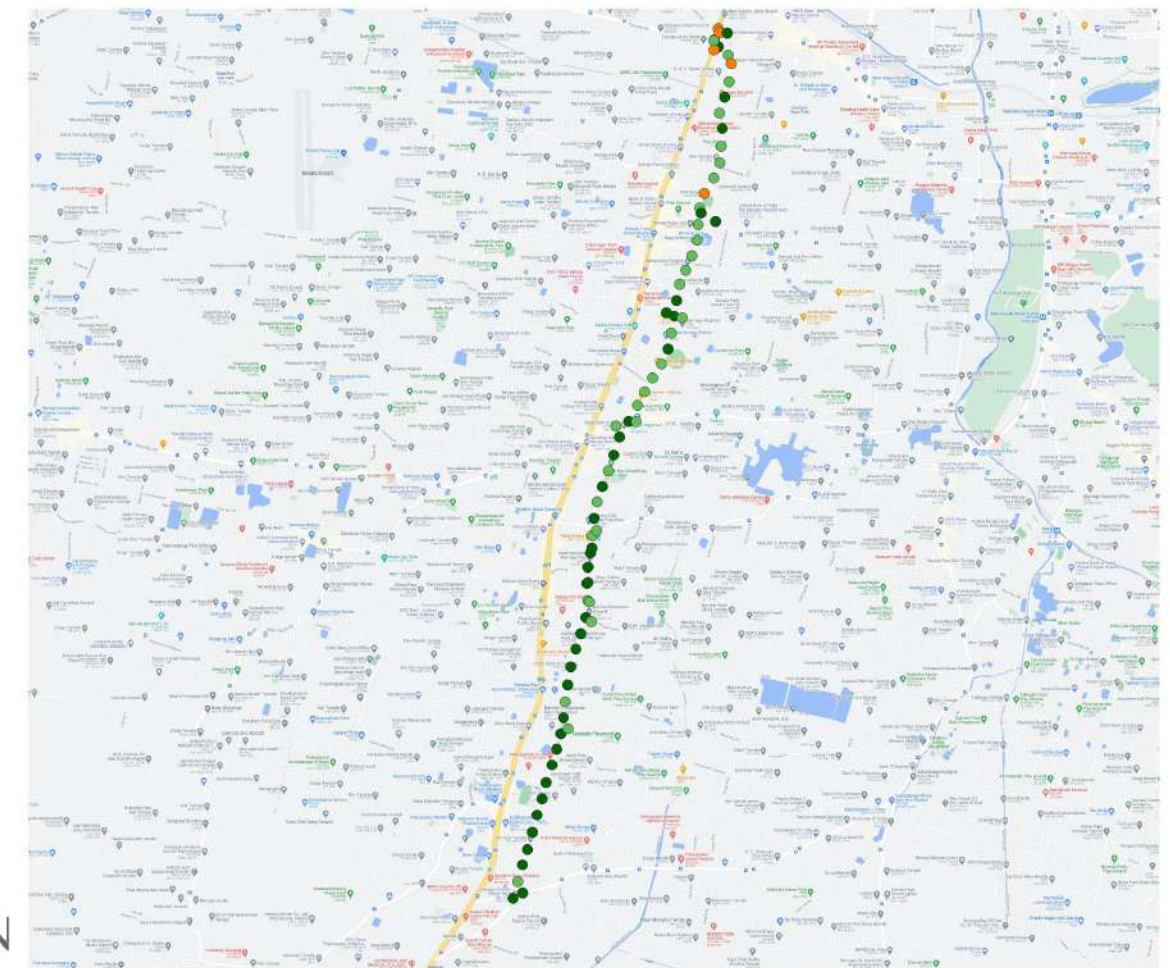
Kolkata: J. L. Sarani Road Parameter Lighting

Legend

Safety Audits

- Poor Light
- Some Light
- Enough Light
- Bright Light

Base: Google Map



PILOT INTERVENTION STRATEGIES

STRATEGY: REMOVE - REPAIR - RECLAIM

A three tiered action plan for James Long Sarani to improve access for all, especially the vulnerable groups - women, children, elderly and people with disability is given below in a table. The design intervention street sections are given at the end of the table.

Planned intervention

JAMES LONG SARANI - PILOT INTERVENTION STRATEGIES TO IMPROVE ACCESSIBILITY FOR ALL

FINDINGS	RECOMMENDATIONS
REMOVE obstructions out of the footpath to provide clear walking space	
OBSTRUCTIONS PRESENT ON THE FOOTPATH	Images of types of obstructions on the footpath can be seen on Page 10
Shop / house extensions	Remove shop and/or house extensions blocking on existing footpath to provide clear walking space (min 1.8m)
Temporary shops / hawkers	Remove temporary shops and hawkers occupying and blocking the existing footpath to provide clear walking space (min 1.8m) and organise them on the carriageway side of the footpath wherever the footpath width is more than 1.8m
Electricity, signage, signal poles and advertisement posts	Remove electricity, signage, signal poles and advertisement posts out of the existing footpath to provide clear walking space (min 1.8m) and arrange/align them on the carriageway side of the footpath wherever the footpath width is more than 1.8m
Telephone / communication boxes and power transformers	Remove telephone/communication boxes and power transformers out of the existing footpath to provide clear walking space (min 1.8m) and arrange/align them on the carriageway side of the footpath wherever the footpath width is more than 1.8m
Large garbage containers and loose garbage dumps	Remove large garbage containers and loosely dumped garbage from the existing footpath to provide clear walking space (min 1.8m). Plan and organise garbage collection points on the street at various locations to avoid spilling of garbage on the footpaths
Construction material blocking the footpath	Remove construction materials piled on and blocking the existing footpath to provide clear walking space (min 1.8m)
Vehicle (two, four wheelers, cycle rickshaws) parked	Remove two, four wheelers, autos, cycles and cycle rickshaws parked on existing footpath to provide clear walking space (min 1.8m). Organise parking for two, four wheelers, autos, cycles and cycle rickshaws on shared lane (parking and driving) of the carriageway
Google Map Link: https://www.google.com/maps/d/u/0/viewer?mid=1POdEbN0QSxnzPqTl6Z6_XUf0FIL6Gef7&ll=22.48445074666058%2C88.31494778499999&z=13	Please use the given map link and the csv files shared for the project to view the collected data supported with images at every point where obstructions are present on the existing footpath.

JAMES LONG SARANI - PILOT INTERVENTION STRATEGIES TO IMPROVE ACCESSIBILITY FOR ALL

FINDINGS	RECOMMENDATIONS
REPAIR broken footpath and add accessibility elements	
ACCESSIBILITY ELEMENTS OF THE FOOTPATH	Images of types of footpath accessibility elements can be seen on Page 12
Availability of Curb Ramps	Curb ramps are an essential component of footpaths for improving accessibility for all and could be only found on few locations on J. L. Sarani. Add curb ramps to negotiate all level drops and make it step-free to reduce hazards for the vulnerable groups. Refer standards given on Page 12.
Availability of Zebra Crossings	Zebra crossings are vital elements of street design to ensure safe pedestrian crossover for all. Most street intersections on J. L. Sarani did not have zebra crossings. Add zebra crossings to all street intersections for safe pedestrian access. Refer standards given on Page 12.
Availability of Median Breaks	Median breaks facilitate at grade street crossovers for pedestrians and are a crucial component for improving accessibility for all. There was no median break available at the intersections. Add median breaks to facilitate at grade crossover for all vulnerable groups. Refer standards given on Page 12.
Height of the footpath	Footpath height should be not more than one step (150 mm) high as per international street design standards. Reduce overall footpath height to ensure easy, hazard-free, pedestrian access. Refer images on page 10&13
Surface of the footpath	Pedestrian, especially vulnerable groups need at grade walking surfaces. Footpath surfaces with missing, broken, dis-jointed paver blocks, manhole cover protruding out, other fixed objects pose as hazards for pedestrians. Ensure at grade, hazard-free walking surface. Refer images on page 10&13
Google Map Link: https://www.google.com/maps/d/u/0/viewer?mid=1rGN9GSZLNyF0vrFfiDgTxwogYVWUZ87Sq&ll=22.485724321100623%2C88.31611722500003&z=13	Please use the given map link and the csv files shared for the project to view the collected data supported with images at every point where only few, incorrectly made footpath elements are present.
RECLAIM one vehicular lane on both side for footpath extension	
INSUFFICIENT SPACE AVAILABLE FOR PEDESTRIANS	Images on Page 4 of three typical vehicular road conditions seen on J. L. Sarani
Two-way, four-lane road with median	Reclaim encroached footpath spaces from house and shop extensions and maintain minimum 2 meters of footpath space for pedestrians and street lights. There is no space for any multi-utility or frontage zone on this stretch of the road. For illustration, refer proposed street section 1-1' on page 18
Two-way, six-lane road without median	Given the traffic on the existing road, two lane carriageway on each side of the road are enough. This keeps the vehicular speeds low and enhance both vehicular and pedestrian safety. The third lane on both sides could be reclaimed for widening the footpath which does not have adequate width to allow clear walking space for pedestrians. The 3 meter wide traffic lane on each side will increase the width of the existing footpath on either sides and will provide 1.8 meter of clear access for pedestrians - the minimum width required for two people to move. The remaining 1.2 meter will provide multi-utility space for street utility, vendors and street furniture. For illustration, refer proposed street section 2-2' on page 20.
Two-way, six-lane road with median	Same as above. For illustration, refer proposed street section 3-3' on page 22.



Image: Footpath blocked with construction material



Image: Footpath too narrow



Image: Children use street



Image: Manhole jutting out



Image: Footpath too high

IMAGES OF J L SARANI

EXISTING STREET
FOUR-LANE, TWO-WAY
WITH MEDIAN
SECTION 1A-1A'

EXISTING STREET
SIX-LANE, TWO-WAY
WITHOUT MEDIAN
SECTION 2A-2A'

EXISTING STREET
SIX-LANE, TWO-WAY
WITH MEDIAN
SECTION 3A-3A'

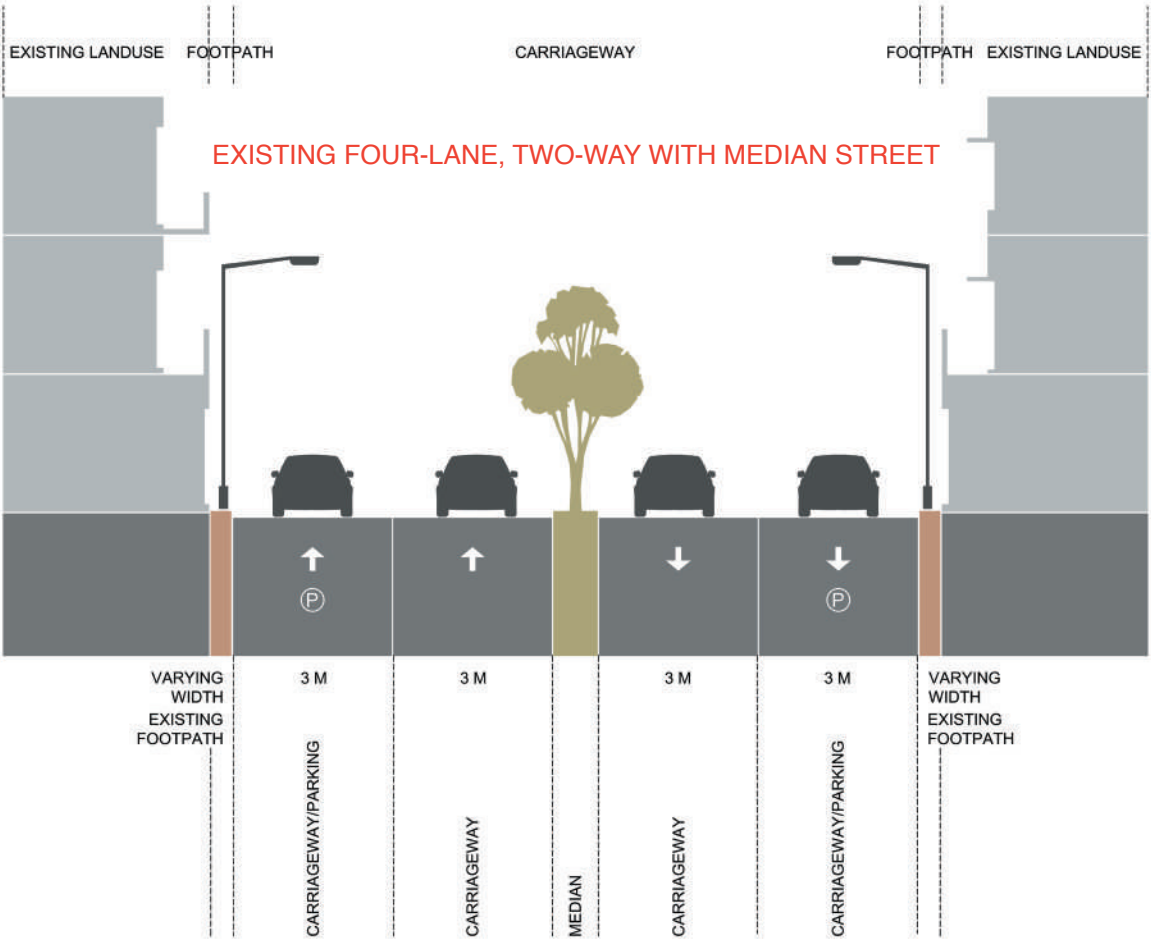


PROPOSED
STREET
SECTION 1-1'

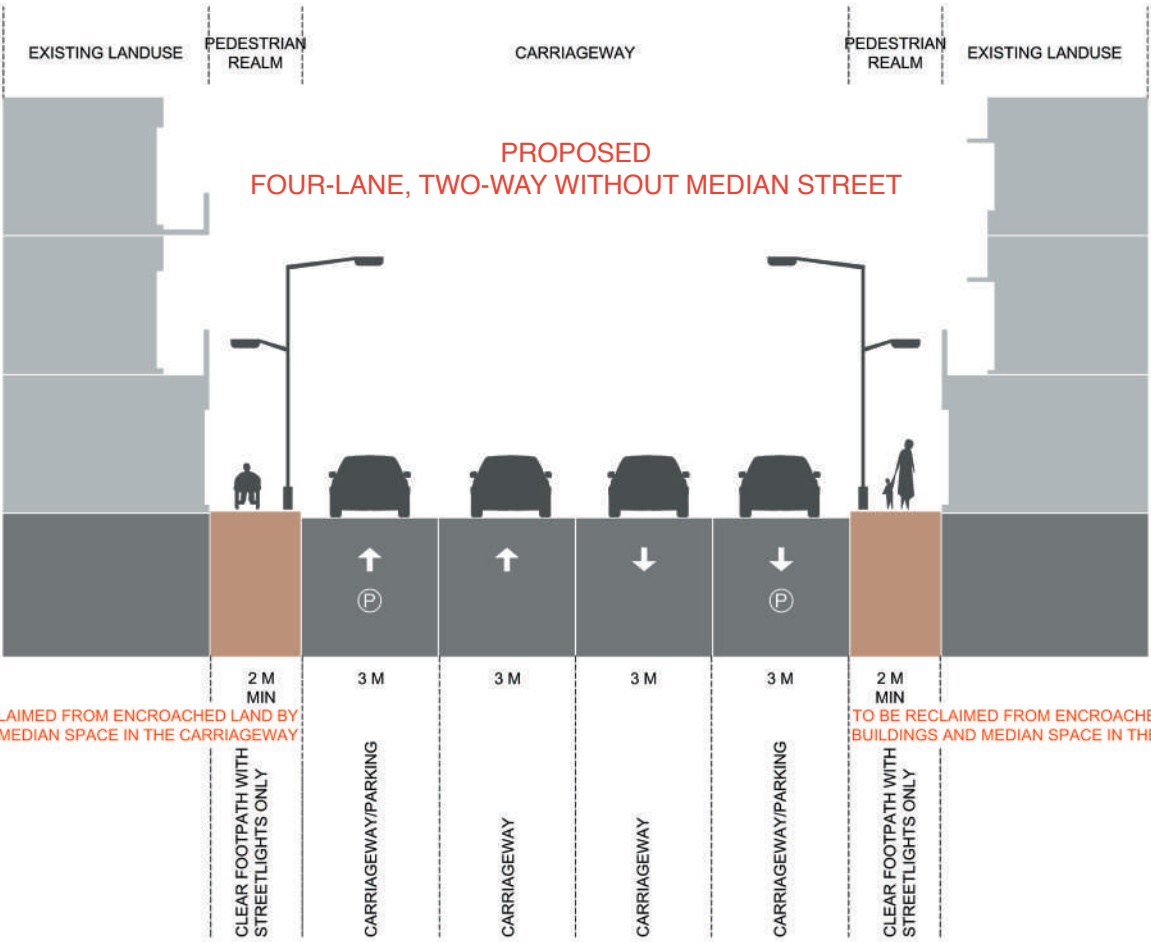
PROPOSED
STREET
SECTION 2-2'

PROPOSED
STREET
SECTION 3-3'

KEY PLAN OF J L SARANI



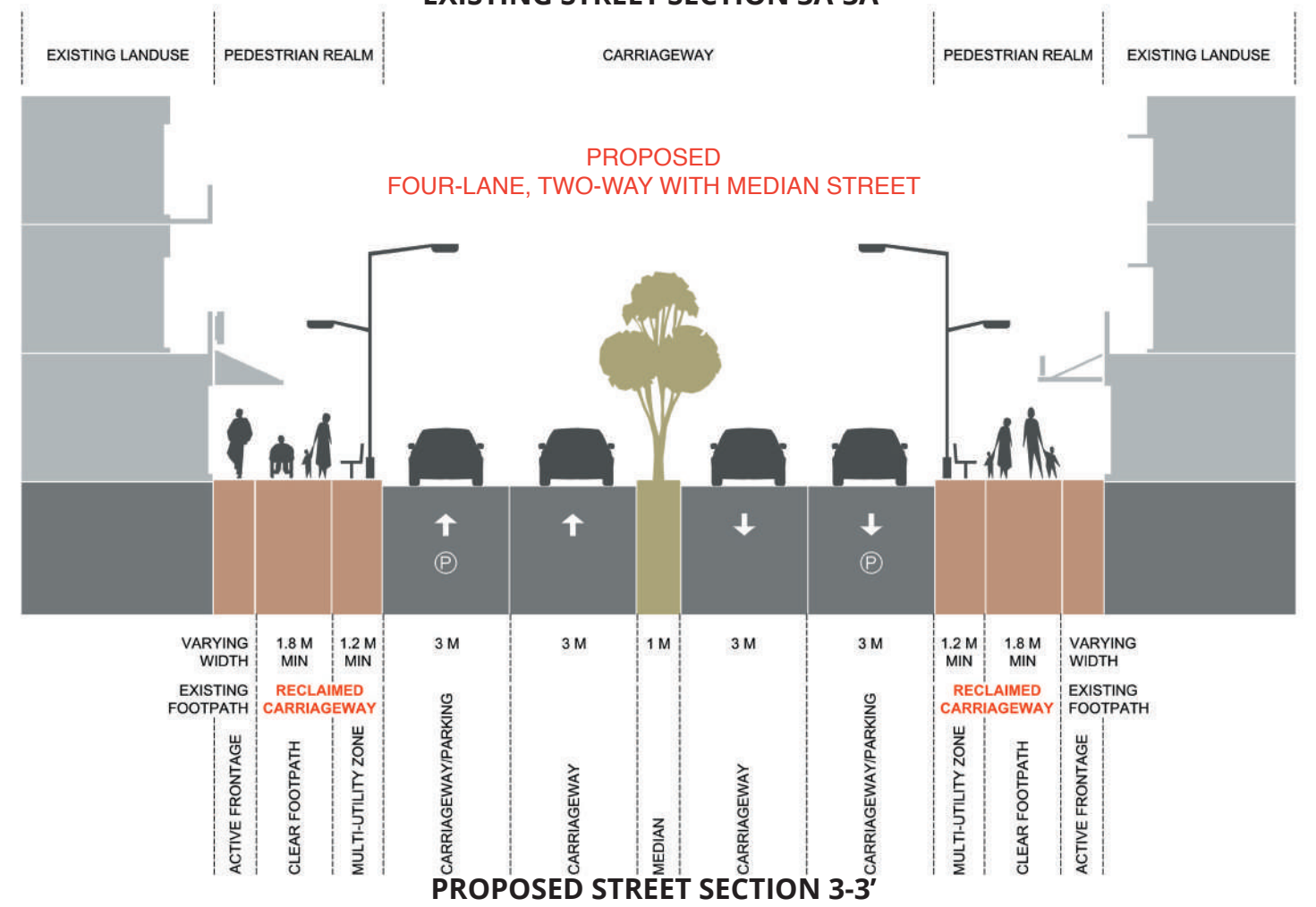
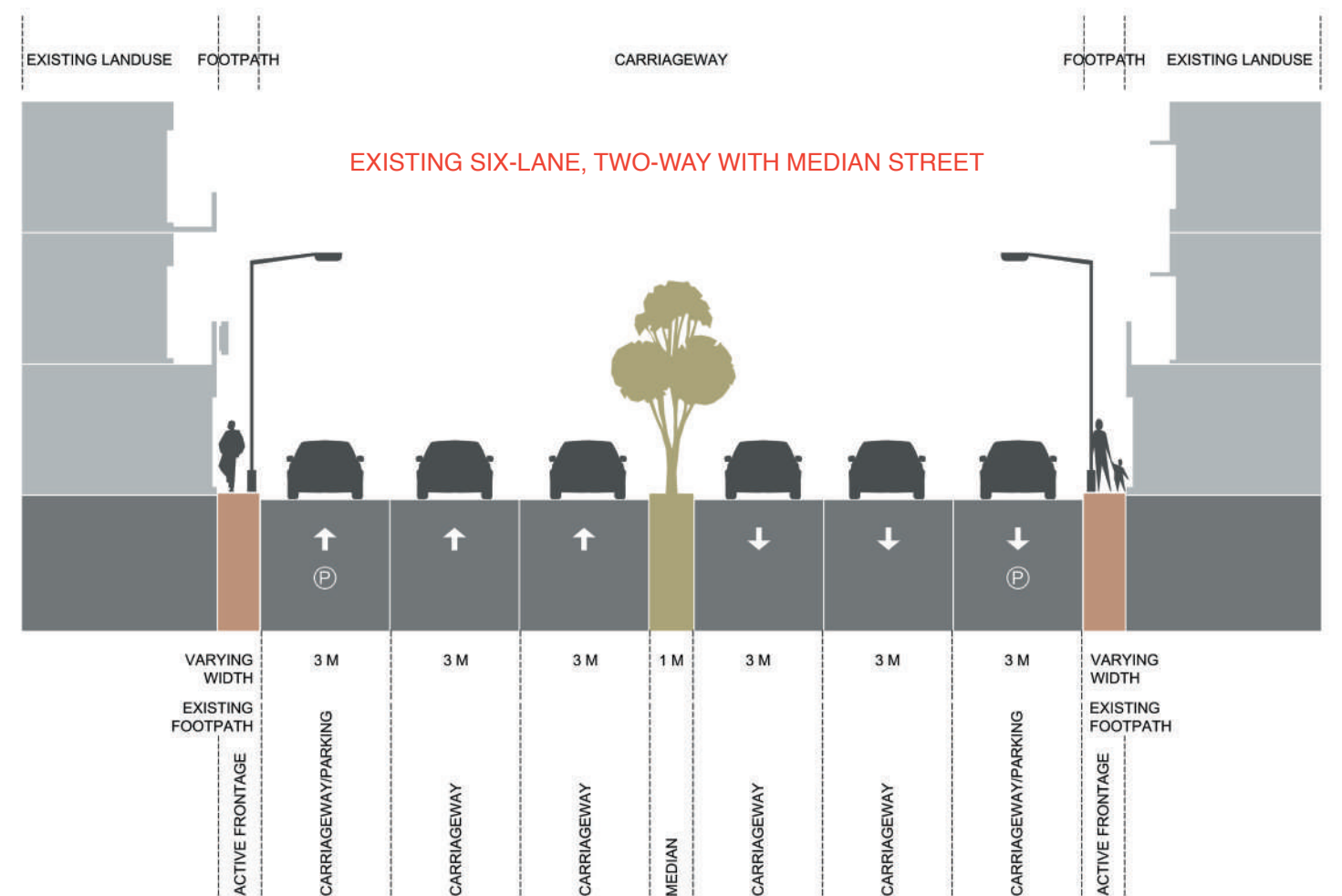
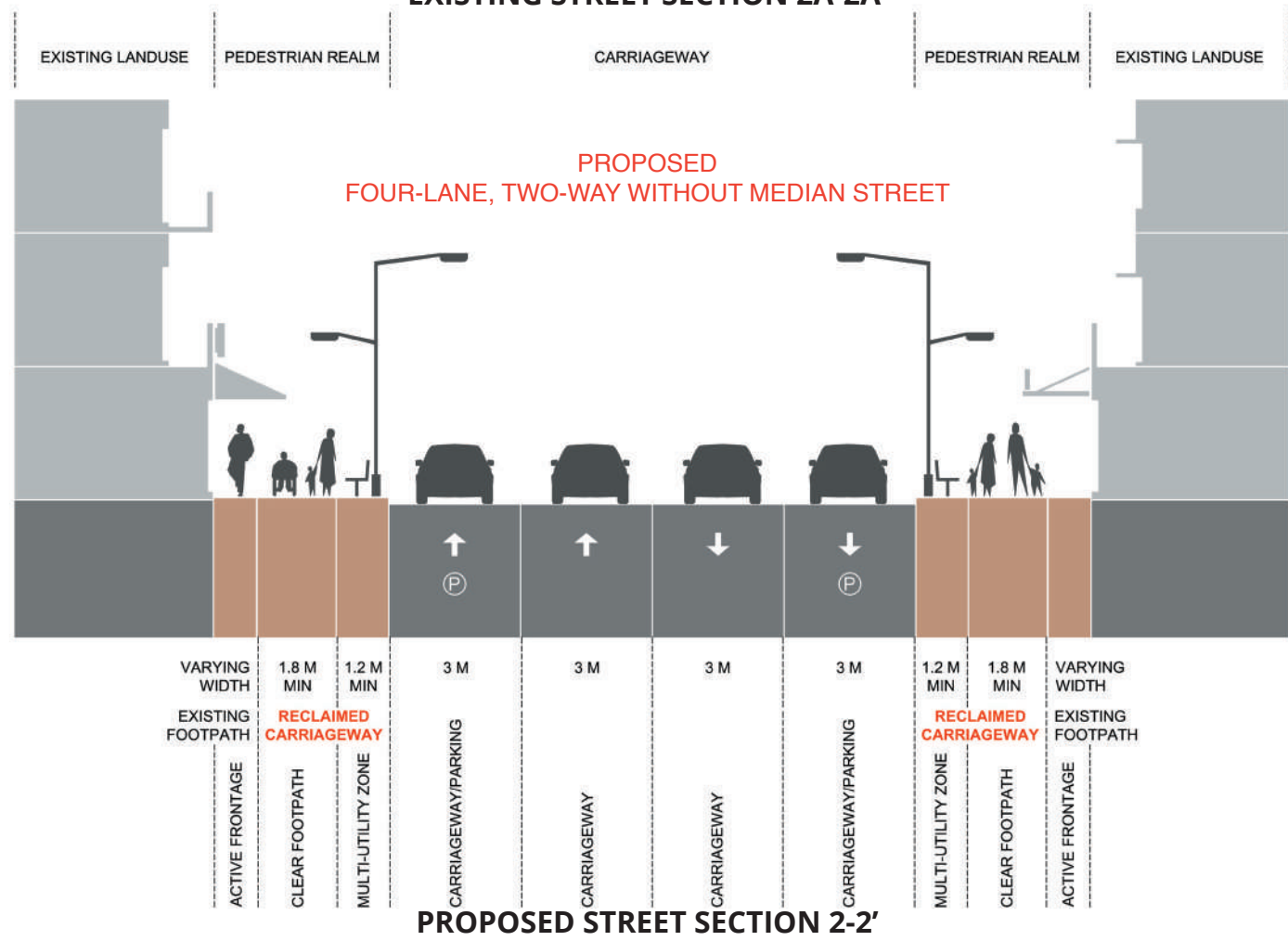
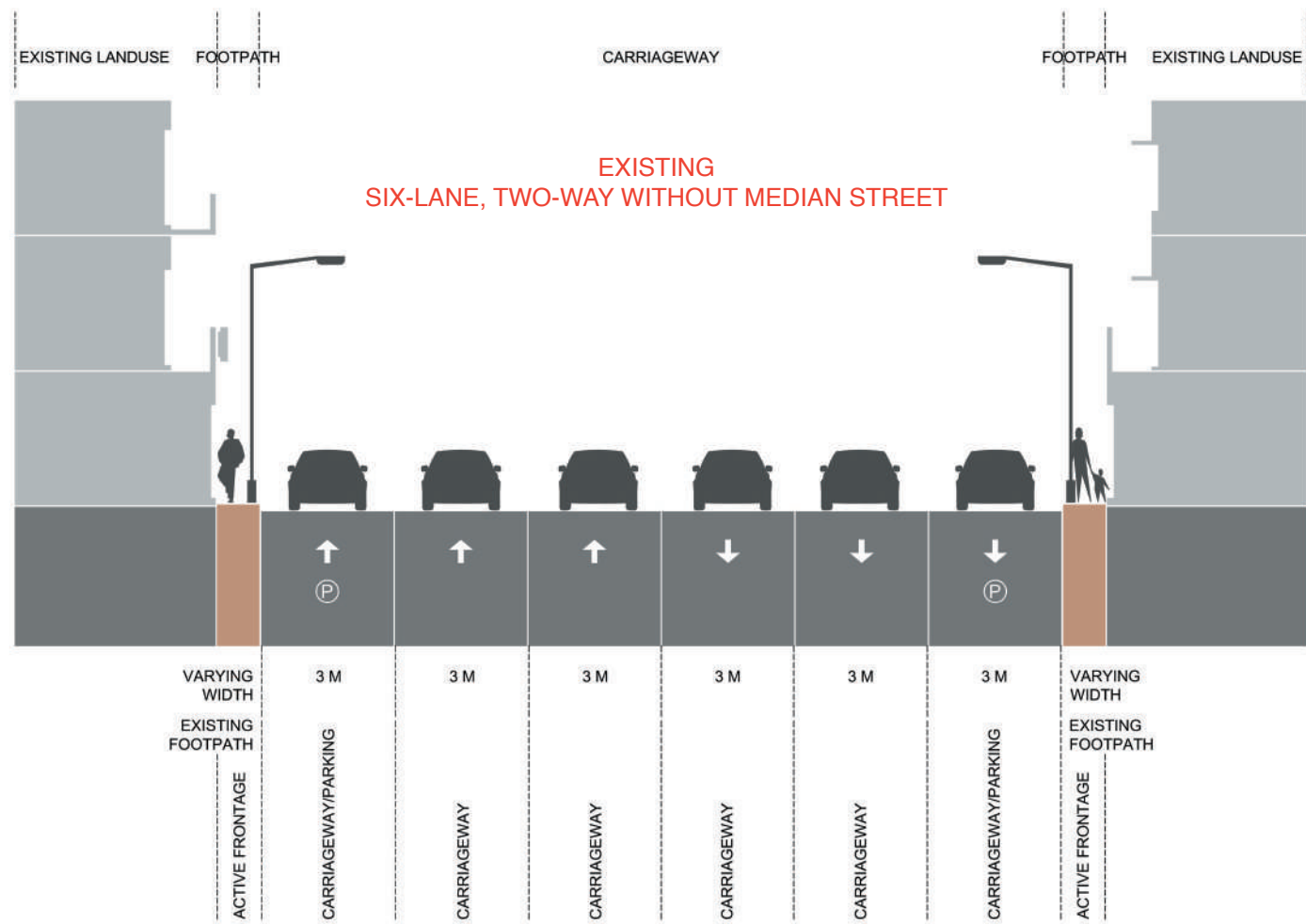
EXISTING STREET SECTION 1A-1A'



PROPOSED STREET SECTION 1-1'

TO BE RECLAIMED FROM ENCROACHED LAND BY BUILDINGS AND MEDIAN SPACE IN THE CARRIAGEWAY

TO BE RECLAIMED FROM ENCROACHED LAND BY BUILDINGS AND MEDIAN SPACE IN THE CARRIAGEWAY



APPENDIX

This section includes the CSV files generated for Kolkata as examples. These files have geo location for each audit point along with the ratings of every parameter. Every audit point is also accompanied by the images collected at that particular audit location. These files could be integrated with any GIS platform and analysed further. These could be also seen on Google Maps for easier visualisation.

KOLKATA CSV FILE

S No	ID	Latitude	Longitude	Lighting	Openness	Visibility	People	Security	Walkpath	Public Transport	Gender Usage	Feeling	Safety Score	Comment	Images					
3183	682410	25.6128157	85.1184547	2	3	3	2	1	1	0	0	1	4		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_182329-15042.jpg					
3278	682505	25.589459	85.1193023	3	3	3	3	0	1	0	3	2	4.4		https://safetipinimages.s3.amazonaws.com/20190829/15119/IMG_20190829_195934-15119.jpg; https://					
3415	682642	25.6145764	85.0915092	3	3	2	2	0	1	0	3	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15065/IMG_20190828_211132-15065.jpg					
1	492399	25.619	85.0453	2	0	1	2	0	2	2	2	1	3.5	no police are present in this area						
2	530580	25.5778	85.0693	3	2	2	3	2	1	3	2	2	4.5							
2147	681227	25.6254549	85.110333	3	2	2	2	1	1	0	2	2	4.2		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_180648-15042.jpg; https://					
2146	681226	25.624502	85.1101238	3	2	3	2	1	1	0	0	1	4		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_180717-15042.jpg					
3142	682369	25.632705	85.1163679	2	2	2	2	1	3	0	0	1	4		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_180922-15043.jpg					
3141	682368	25.6320617	85.1170707	3	2	2	3	0	3	0	2	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_180933-15043.jpg; https://					
3139	682366	25.6306888	85.1186103	3	2	3	3	0	3	0	1	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_181003-15043.jpg; https://					
2168	681248	25.6231815	85.1078761	3	2	2	2	0	1	0	3	2	4.2		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_181022-15042.jpg					
3138	682365	25.6299626	85.1193023	3	2	3	3	0	3	0	1	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_181022-15043.jpg; https://					
3137	682364	25.6294451	85.1201391	3	2	2	2	0	3	0	0	1	4		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_181044-15043.jpg					
3136	682363	25.6287777	85.1208901	3	2	3	2	1	3	0	0	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_181104-15043.jpg; https://					
3135	682362	25.6281489	85.1216465	3	2	2	2	1	3	0	0	2	4.2		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_181132-15043.jpg; https://					
3134	682361	25.6274718	85.1224029	3	2	2	1	0	3	0	0	1	3.5		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_181143-15043.jpg; https://					
2167	681247	25.6227462	85.1068997	3	2	2	2	1	1	0	2	2	4.2		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_181201-15042.jpg; https://					
3132	682359	25.626074	85.1238513	3	2	2	3	1	2	0	3	2	4.4		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_181243-15043.jpg; https://					
2166	681246	25.6218514	85.1072216	3	2	1	1	0	1	0	0	1	2		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_181305-15042.jpg; https://					
2165	681245	25.6210194	85.1077795	3	2	2	3	0	1	0	1	2	4.1		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_181354-15042.jpg; https://					
2150	681230	25.620202	85.109008	3	2	2	2	1	3	0	1	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_181504-15042.jpg; https://					
3086	682313	25.6236024	85.1253802	3	2	2	3	0	1	0	3	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_181517-15043.jpg; https://					
2151	681231	25.61952	85.1090703	3	3	2	2	1	3	0	0	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_181523-15042.jpg; https://					
2152	681232	25.6188863	85.1106226	3	2	3	2	0	2	0	1	4			https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_181554-15042.jpg; https://					
2153	681233	25.6182091	85.111497	3	2	2	2	1	2	0	1	2	4.2		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_181557-15042.jpg; https://					
3087	682314	25.6235927	85.1266515	3	2	1	3	1	1	0	1	2	4.1		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_181620-15043.jpg; https://					
3088	682315	25.6236217	85.1277727	3	2	2	3	1	2	0	2	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_181633-15043.jpg; https://					
2154	681234	25.6175755	85.1123607	3	3	3	3	1	2	0	1	2	4.4		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_181747-15042.jpg					
2155	681235	25.6169612	85.1131493	3	2	3	2	1	2	0	2	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_181802-15042.jpg; https://					
2156	681236	25.6163275	85.1139915	3	2	3	3	1	3	0	3	2	4.5		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_181820-15042.jpg; https://					
1939	681014	25.6222867	85.1338881	2	2	1	2	0	1	0	0	1	2		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_181920-15043.jpg; https://					
1940	681015	25.6218562	85.1349127	3	2	0	2	0	2	0	0	1	2.6		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_181936-15043.jpg; https://					
1941	681016	25.6214403	85.135771	3	2	1	2	0	2	0	0	1	3		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_181950-15043.jpg					
3187	682414	25.6152778	85.115236	2	3	3	1	1	1	0	0	1	3.5		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_182144-15042.jpg					
3186	682413	25.614649	85.1160944	2	3	2	2	1	1	0	0	1	3.5		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_182200-15042.jpg; https://					
1279	680322	25.6207921	85.1387805	2	2	0	1	0	1	0	0	1	1.3		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_182201-15043.jpg; https://					
1280	680323	25.6206131	85.1399285	2	2	1	2	0	2	0	0	1	2.6		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_182218-15043.jpg; https://					
3185	682412	25.6140105	85.1169312	2	2	2	2	1	2	0	3	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_182227-15042.jpg; https://					
1281	680324	25.6204487	85.1411033	2	2	1	2	2	2	0	0	1	3.5		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_182228-15043.jpg; https://					
1282	680325	25.6202842	85.1421869	2	2	0	2	2	2	0	0	1	3		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_182254-15043.jpg; https://					
3184	682411	25.613401	85.1177037	2	2	3	3	0	1	0	1	2	4.1		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_182302-15042.jpg; https://					
3075	682302	25.6129415	85.1191199	3	2	3	3	0	2	0	1	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_182445-15042.jpg; https://					
3076	682303	25.6139718	85.1196992	3	2	3	3	0	1	0	1	2	4.2		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_182523-15042.jpg; https://					
3077	682304	25.6149489	85.1201981	3	2	3	3	1	1	0	1	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_182559-15042.jpg; https://					
3078	682305	25.615955	85.1207507	3	2	2	2	1	1	0	1	2	4.1		https://safetipinimages.s3.amazonaws.com/20190828/15042/IMG_20190828_182643-15042.jpg; https://					
1377	680420	25.6135751	85.1438445	3	2	2	1	1	1	0	0	1	3		https://safetipinimages.s3.amazonaws.com/20190828/15044/IMG_20190828_183754-15044.jpg					
2573	681683	25.615926	85.1618314	3	2	3	3	0	1	0	3	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15043/IMG_20190828_183804-15043.jpg; https://					
1382	680425	25.6128834	85.1434475	3	2	3	2	1	2	0	1	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15044/IMG_20190828_184038-15044.jpg; https://					
1383	680426	25.6139476	85.1438445	3	2	3	3	1	2	0	1	2	4.3		https://safetipinimages.s3.amazonaws.com/20190828/15044/IMG_20190828_184114-15044.jpg; https://					

FOOTPATH CONDITION CSV FILE

S No	ID	Latitude	Longitude	Lighting	Openness	Visibility	People	Security	Walkpath	Public Transport	Gender Usage	Feeling	Safety Score	Comment	Images
1	5579	24.803745	84.9899019	3	1	3	2	3	3	2	1	2	4.5	Good	
2	672368	24.7873569	84.9983362	2	1	2	2	1	1	3	1	1	4.1		
1512	674850	24.7904018	85.0003517	2	2	0	1	0	1	0	0	1	1.3		https://safetipinimages.s3.amazonaws.com/20191121/15506/IMG_20191121_173854-15506.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15506/IMG_20191121_173917-15506.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15506/IMG_20191121_174029-15506.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15506/IMG_20191121_174044-15506.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15506/IMG_20191121_174113-15506.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15506/IMG_20191121_174137-15506.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15506/IMG_20191121_174201-15506.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15506/IMG_20191121_174357-15506.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15506/IMG_20191121_174422-15506.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15506/IMG_20191121_174448-15506.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15522/IMG_20191121_180951-15522.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15523/IMG_20191121_181012-15523.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15523/IMG_20191121_181036-15523.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15523/IMG_20191121_181310-15523.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15523/IMG_20191121_181317-15523.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15523/IMG_20191121_181332-15523.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15523/IMG_20191121_181400-15523.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15523/IMG_20191121_182454-15523.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15523/IMG_20191121_184918-15523.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15523/IMG_20191121_184931-15523.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15523/IMG_20191121_185056-15523.jpg ; https://safetipinimages.s3.amazonaws.com/20191121/15523/IMG_20191121_185125-15523.jpg
1517	674855	24.7914829	85.0003678	2	2	2	1	1	1	0	0	1	2.6		
1518	674856	24.7926176	85.0004321	2	2	2	1	1	1	0	0	1	2.6		
1519	674857	24.7937523	85.0005341	2	2	2	2	1	1	0	2	2	4.1		
1520	674858	24.7948335	85.0005877	2	2	1	1	1	1	0	0	1	2		
1521	674859	24.7960168	85.0006253	2	2	1	2	1	1	0	0	1	2.6		
1522	674860	24.7971807	85.0007111	3	2	2	2	0	1	0	0	1	3		
1523	674861	24.7982083	85.0007647	2	2	2	2	1	1	0	2	2	4.1		
1524	674862	24.7992601	85.0008506	3	2	3	2	1	1	0	2	2	4.3		
1528	674866	24.7997033	85.0001425	2	2	1	2	1	1	0	1	1	3		
1525	674863	24.8005798	85.0002712	2	2	1	2	1	1	1	0	1	3		
1526	674864	24.8016414	85.0003892	2	2	1	1	0	1	1	0	1	2		
1477	674815	24.8077429	85.0053084	2	2	2	2	0	1	0	2	1	3.5		
1478	674816	24.8087411	85.0055283	3	2	3	3	1	1	0	1	2	4.3		
1479	674817	24.8097588	85.0057375	2	2	3	3	1	1	0	3	2	4.3		
1480	674818	24.810757	85.0060058	2	2	2	2	1	1	0	1	1	3.5		
1481	674819	24.8133684	85.0071752	2	2	2	2	1	1	0	2	2	4.1		
1482	674820	24.8142677	85.0074888	3	2	1	3	0	1	0	1	1	3.5		
1483	674821	24.8151344	85.0078994	3	2	1	2	0	1	0	1	1	3		
1484	674822	24.8154266	85.0088435	3	2	3	3	0	1	0	1	2	4.2		
1485	674823	24.8156895	85.0098521	2	2	2	2	0	1	0	1	1	3		
1486	674824	24.8158063	85.0107747	2	3	2	1	1	1	0	0	1	3		
1497	674835	24.815373	85.0116652	2	2	2	2	0	1	0	0	1	2.6		
1499	674837	24.8145355	85.0135803	2	2	1	2	0	1	0	0	1	2		
1501	674839	24.8133134	85.0150448	2	2	1	2	0	1	0	0	1	2		
1542	674880	24.8200229	85.0130117	0	2	0	0	0	0	0	0	0	0.4		
1538	674876	24.8161764	85.0146747	0	2	0	0	0	1	0	0	0	0.4		
1715	675055	24.8019725	85.0133497	2	2	2	2	0	1	0	1	1	3		
1591	674929	24.7996984	85.0124967	3	2	3	2	1	1	0	0	1	4		
1589	674927	24.7979599	85.0127542	3	2	1	1	0	0	0	0	1	1.6		
1588	674926	24.7977402	85.0138539	3	2	0	1	0	0	0	0	1	1.3		
1584	674922	24.7968837	85.0182581	3	2	3	3	0	1	0	2	2	4.3		

