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A street cleanliness rating and consulting agency whose mission is to bring actionable data to our partner organizations.

Table of Contents

Problem.....	3
Solution.....	4-5
Evidence	5-6
Sustainability.....	6-7
Make it Real.....	7-8
Citations.....	9
Appendices.....	10-14
1. Randomized Control Trial.....	10
2. Empathy Map.....	11
3. Business Model Canvas.....	12
4. Theory of Change.....	13
5. Story in 7 Sentences.....	14
6. Metric Manual.....	15-30
7. Category Survey Feedback.....	31-32
8. Street Smart Prototype.....	33

The Problem

While the government along with many organizations, and businesses are working on cleaning up the streets of Bengaluru, to our knowledge no data is being collected about the conditions over the long term. Without data to evaluate, how can they track trends over time, measure their impact, and make process improvements? The Ugly Indian has taken the initiative to map and keep clean 500km of Bengaluru's roads, with the goal to expand. “In this challenge, it is not just The Ugly Indian volunteers who are involved, but even residents and locals. They will review the progress and keep uploading information about the roads.”¹ The Ugly Indian is an organization in Bengaluru that has made the most efforts and impact on beautifying public spaces. With thousands of spotfixes, strong governmental relationships, CSR funding, and 10+ years of experience their dedication is of no surprise. While they are more than capable of cleaning the streets, the challenge lies in the long term cleanliness. With no system in place to rate the street cleanliness, and track their progress, there is no way to show their sponsors that they are satisfying their commitment.

While there are existing reporting apps in Bengaluru, none seem to be effective. After reading comments and reviews many citizens seem to be frustrated that no action is being taken to fix the problems reported. Many, hinting that it's another tactic used by the government to make citizens think actions are being taken in improving public spaces. Others just simply never picked momentum. With limited platforms for citizens to have their voice heard, The Ugly Indian, needs a way to get citizens feedback on street conditions, so they can better strategize and build a platform that citizens will utilize. With limited resources, and time, organizations are forced to focus on fixing the problem and not on collecting long term data. The Ugly Indian is on the way to change that, and Street Smart is here to help them reach their goal.

¹ "The Ugly Indian: A Bengaluru Group That Is Determined To Beautify" 10 Oct. 2018, <https://swachhindia.ndtv.com/theuglyindian-group-determined-to-beautify-urban-spaces-26370/>. Accessed 9 Mar. 2023.

Our role

1. Develop a benchmark metric.
2. Create a survey protocol.
3. Conduct surveys.
4. Compile data into meaningful format.

3 Part Solution

Part 1 : Pilot Project

The first step in the pilot project was building a metric. After conducting interviews with both our organization members and citizens of Bengaluru the following 4 categories were recognized as being most important when considering what makes a street unclean; loose litter, open dumping, illegal ad posters and footpath condition. Each of the categories will be rated on a scale. 1 = clean, 2 = somewhat clean, and 3 not clean (see appendix). The second part of the pilot project is the inspection protocol. An inspection team will first be trained on the metric and then survey the 500 km quarterly. Ratings will be reported every 0.5 km. The following inspection components will be randomized to deliver representative data. The time of day that the inspection is done, day of the week, week of the month, and the inspector (see appendix).

Part 2: Street Smart App

The Street Smart app generates crowdsourced street ratings from the public. This is important for a few reasons. First, it will give citizens a platform to be heard, which is a main goal of the 500 km initiative. Secondly, it will inspire citizens to be a part of the solution. Third, citizens will be provided with information to make real estate, business and school decisions. Fourth, provide citizens generated comparison to Street Smart administered ratings. The app has been designed in a way that is clear to understand and easy to use. (see appendix)

Part 3: Intelligent Street Framework

The Intelligent Streets Framework is a machine learning model that will auto classify photo samples taken in the field from both the Pilot Project inspection team and Street Smart App users. Adding the machine learning aspect to our solution was important for a few reasons. It will allow us to optimize services, lower costs, reduce data processing time, improve rating credibility and give us the opportunity to morph the model and expand services. First using the photos from the Pilot Project and Street Smart App the training data will be generated. Then using computer vision techniques the model will be built and trained. Finally before deploying the model the accuracy of the model will be measured using precision and recall against test data sets.

Evidence

In April of 2016, Los Angeles launched CleanStat, a block-level cleanliness system. The project consisted of driving 22,000 miles and assessing the cleanliness every quarter, using video and geographic information system (GIS). Los Angeles sanitation (LASAT) uses CleanStat as an operational and reporting tool to improve routing to different areas in the city and ensure effective and equitable service delivery. LASAN holds monthly meetings with operational staff to review successes and challenges in service delivery throughout the city and brainstorm ways to improve in future quarters. In addition to internal reviews, findings are reported quarterly to council districts to help them decide where to allocate new garbage receptacles and where to target beautification efforts. Since launching CleanStat almost a year ago, the city has reduced unclean streets by 82% and somewhat clean streets by 84%. During the last quarter of 2016, unclean streets made up only 1% of the total street segments and 87% of the streets were rated clean.²

² "Turning Dirty Streets Clean through Comprehensive Open Data"
<https://www.govtech.com/data/turning-dirty-streets-clean-through-comprehensive-open-data-mapping.html>. Accessed 9 Mar. 2023.

“To Improve Efficiency of Operations, the Street Sweeping Section Should Use Data to Effectively Monitor and Make Timely Adjustments to Route Priorities and Sweeping Frequencies”³.

The Office of the City Auditor in San Diego did an audit for the Transportation and Stormwater department’s Street Sweeping Section. Although the department has a comprehensive data collection process, it did not use that data to analyze operations. The audit had 3 major findings. Finding 1: Without data evaluation, Street Sweeping ability to track and monitor the effectiveness of operations and make process improvements is limited. The inability to make timely adjustments to components such as sweeping priorities, frequencies, and posted routes limits Street Sweeping potential to reduce, to the greatest extent possible, the amount of pollutants entering the City’s waterways.⁴ Finding 2: Without data analysis, we found that some routes with relatively high amounts of debris are swept less frequently than optimal, while at the same time, other routes with relatively low amounts of debris are swept at a higher than optimal frequency.⁵ Finding 3: We found that Street Sweeping current key performance indicator (KPI)—annual miles swept—does not reflect the effectiveness at achieving its purpose—removing debris and sediment from City’s streets.⁶ The Ugly Indian has partnered with Street Smart because they know the value of data and what it can do for their organization.

Sustainability

Rating services will be our main source of income. Our team will be trained on the metric so that the ratings best reflect the conditions of the streets. Our inspection team will be doing quarterly ratings of the streets. Each sample will be taken every 0.5km and the variation in inspection will be randomized on the following components to deliver representative data. Who does the inspection, the

³ "stormwater department's street sweeping section - City of San Diego." 1 Sep. 2020, https://www.sandiego.gov/sites/default/files/21-003_streetsweeping.pdf. Accessed 9 Mar. 2023.

⁴ "stormwater department's street sweeping section - City of San Diego." 1 Sep. 2020, https://www.sandiego.gov/sites/default/files/21-003_streetsweeping.pdf. Accessed 9 Mar. 2023.

⁵ "Street Sweeping Debris Characterization and Program ... - Revize." https://files4.1.revize.com/largoflorida/Largo_Street_Sweeping_Final_Memo_20221003_S&S.pdf. Accessed 9 Mar. 2023.

⁶ "Street Sweeping Debris Characterization and Program ... - Revize." https://files4.1.revize.com/largoflorida/Largo_Street_Sweeping_Final_Memo_20221003_S&S.pdf. Accessed 9 Mar. 2023.

time of day that the inspection is done, what day of the week, and what week of the month.

Secondary source of income will be our reporting services. Using rating data from our Pilot Project along with ratings from the Street Smart App we will be able to collect, compare, and report our findings to our organizations. This will provide organizations with tangible data that can be used to make impactful decisions. Reports will be done quarterly and formatted in a way that are easy to understand, and made available to both organizations and the public.

Tertiary and final source of income will be our consulting metric service. First metric for The Ugly Indian has been completed according to their request in what they wish to target to keep streets clean. The metric can be custom to focus on categories organizations need data along with a scale that will result in the most accurate data. With our Intelligent Street Framework we hope to scale to organizations all over India, not just focused on urban clean streets, but rural streets, beaches, and all spaces that will help India reach their goal of eliminating trash in public spaces.

Make it real

As a data collection agency collaborating with organizations focused on grand challenges, it is our highest priority that we help them maximize their impact. Starting with The Ugly Indian, our metric has been reviewed and accepted. To build our metric our team did a survey to get citizens feedback on categories they found to be of most importance when considering cleanliness (see appendix). After many changes we built a metric that can be introduced to the public for rating. The app has also been designed so that it is easy to understand, and use in hopes that it will encourage citizens to use the app longterm. To build the app, it will require technical architecture, UI coding, backend setup, functional implementation, integrations and testing.⁷ The app is considered “mid size version” and will take 23-25 weeks to complete the above tasks. Building the app can be done by a professional, or college student. Since organizations are working on grand challenges, speeding up the time between building the metric and gathering data is time sensitive and adding more people to the team will help minimize the gap.

⁷ "How Long does It take to Build an App - Startup Grind."
<https://www.startupgrind.com/blog/how-long-does-it-take-to-build-an-app/>. Accessed 9 Mar. 2023.

The Pilot Project and Street Smart App will satisfy Street Smarts obligations to The Ugly Indian. Building the machine learning model will allow Street Smart to expand beyond The Ugly Indian and outside of Bengaluru. Making a machine learning model will automate and optimize services, lower labor costs, reduce processing time, improve rating credibility, and give Street Smart the opportunity to morph the model and expand services beyond just street cleaning. This process will require a machine learning expert to join our team.

Citations

1. "The Ugly Indian: A Bengaluru Group That Is Determined To Beautify" 10 Oct. 2018,
<https://swachhindia.ndtv.com/theuglyindian-group-determined-to-beautify-urban-spaces-26370/>. Accessed 9 Mar. 2023.
2. "Turning Dirty Streets Clean through Comprehensive Open Data"
<https://www.govtech.com/data/turning-dirty-streets-clean-through-comprehensive-open-data-mapping.html>. Accessed 9 Mar. 2023.
3. "stormwater department's street sweeping section - City of San Diego." 1 Sep. 2020,
https://www.sandiego.gov/sites/default/files/21-003_streetsweeping.pdf. Accessed 9 Mar. 2023.
4. "stormwater department's street sweeping section - City of San Diego." 1 Sep. 2020,
https://www.sandiego.gov/sites/default/files/21-003_streetsweeping.pdf. Accessed 9 Mar. 2023.
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7. "How Long does It take to Build an App - Startup Grind."
<https://www.startupgrind.com/blog/how-long-does-it-take-to-build-an-app/>. Accessed 9 Mar. 2023.

Randomized Control Trial

Context:

To test if our data collecting services will help The Ugly Indian keep their streets clean over the long term.

500 km of Bengaluru streets that are scheduled to be cleaned by The Ugly Indian. The 500 km is to be divided into 50 10km loops.

Control Group:

25 of the loops will be tracked over a period of 1 year starting from the beginning of the project. This group will not have data collected.

Test Group:

The other 25 loops will be rated by both citizens and our inspection team quarterly and the data will be reported to the organizations quarterly.

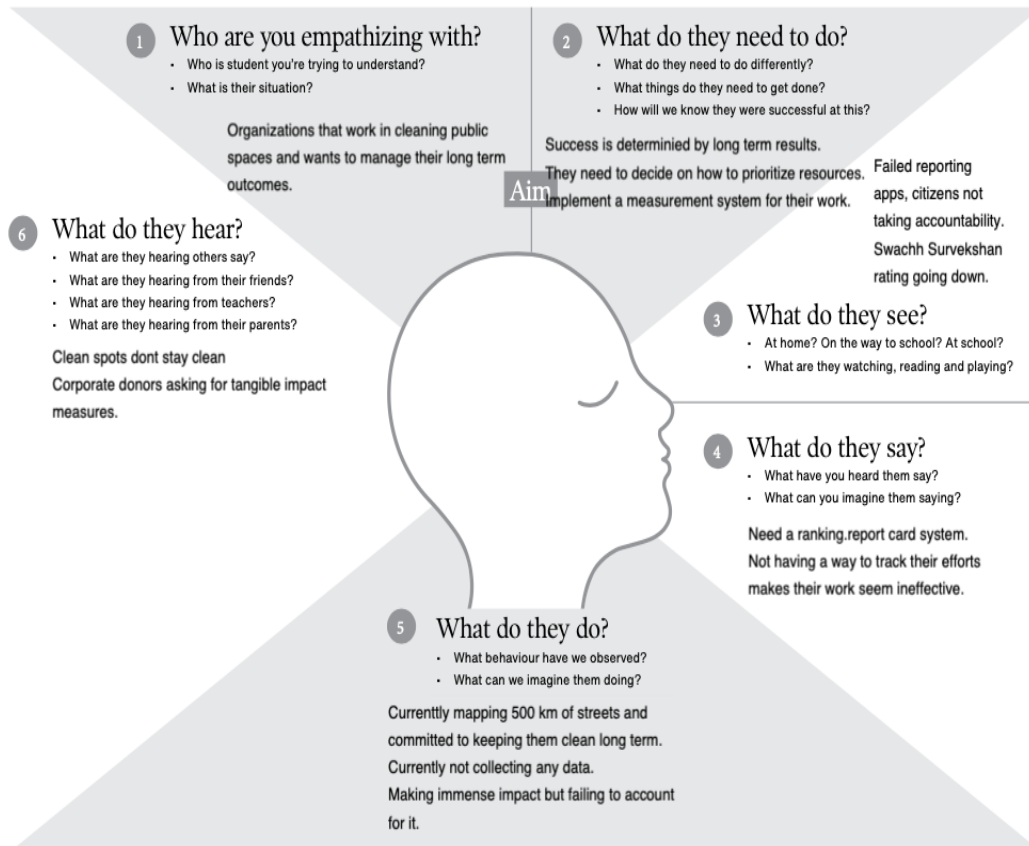
Testing Results: To be tested.

Analysis: To be collected.

Appendix



Empathy Map Canvas



Designed by: Carmen Foca & Nick Osmundson

Date: 03/08/2023

7 What do they think and feel?

Pains

What are their fears, frustrations and anxieties?

Lack of accountability structure.
Unsure if their efforts are making long term impact.

What other thoughts and feelings might motivate their behaviour?

Credibility for thier organizations.
Confirmation about their theory of change.

Gains

What are their wants, needs, hopes and dreams?

Sustainable impact in public spaces.
Metrics for informed decision making.
Model that can scale across india.

We acknowledge the original work and source material for empathy maps to be Dave Gray and his 'Big Head Exercise.' Watershed uses this work with respect and does not claim to have created the original concept.

Business Model Canvas

Date: 2023

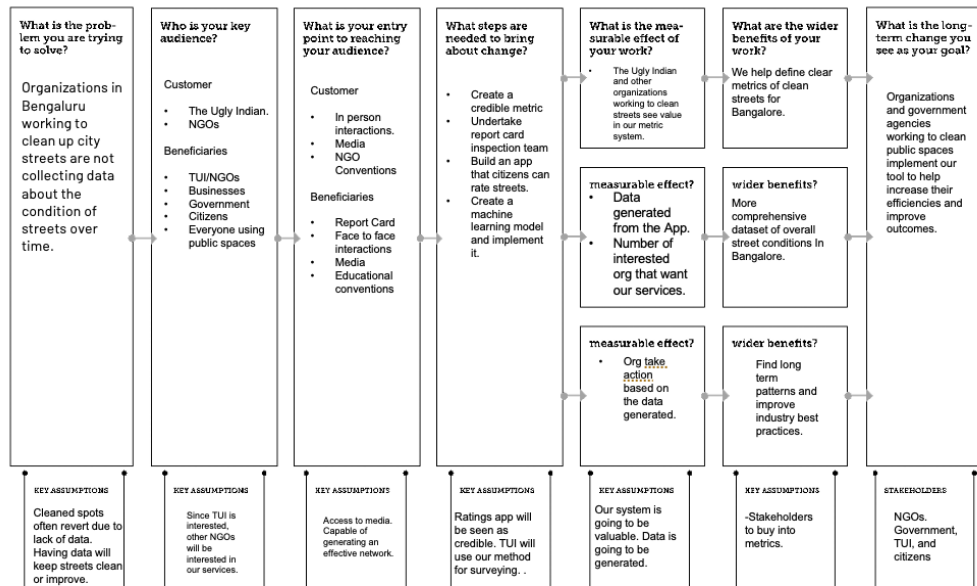
Street Smart

Key Partners <ul style="list-style-type: none">• NGOs and businesses working on cleaning up streets.• IT contractors (Information services, Machine learning, web developing)		Key Activities <ul style="list-style-type: none">• Model development• Survey execution• Metric training• Result reporting and interpretation	Value Proposition <ul style="list-style-type: none">• Key metrics to assess TUIs <u>impact</u>• Lack of method to measure their organizations <u>strategies</u>• Customer measurement system and survey execution services• Actionable data• Reporting for funding retention	Customer Relationships <ul style="list-style-type: none">• Client facing assessing individual.• Ongoing consulting partnership	Customer Segments <ul style="list-style-type: none">• NGOs, businesses and government agencies working to clean up public spaces (<u>streets</u>) and looking to gather data to better use their resources.
Key Resources <ul style="list-style-type: none">• Machine learning knowledge <u>data</u>• Survey staff• Sales team• Machine learning employees.• App developer• Financial support		Channels <ul style="list-style-type: none">• In person interactions• Digital communications• Public campaign			
Cost Structure <ul style="list-style-type: none">• Marketing• Overhead• Machine learning equipment			Revenue Streams <ul style="list-style-type: none">• NGOs/businesses<ul style="list-style-type: none">• Consulting fees• Model development• Survey execution fees		

Theory Of Change

I want to clarify my priorities
by defining my goals and the path to reach them

THEORY OF CHANGE



Story in 7 Sentences

“Once upon a time...”

There was The Ugly Indian, an organization whose mission is to improve cleanliness of public spaces using design concepts that deter the public from re-dirtying them.

“....and every day...”

They go around Bangalore ‘spot-fixing’ problem areas by clearing symbols of neglect and installing symbols of respect in the hopes that citizens will recognize that this area is no longer suitable for littering, illegal dumping, public urination or other undesirable activities.

“...until one day...”

The Ugly Indian unveils their “Clean Streets 500km” initiative and have committed to not only spot-fixing an area one time, but also taking ownership over the long term cleanliness of 500 kilometers of main roads in Bangalore.

“...and because of this...”

They needed to implement a method of assessing, tracking and managing their portfolio of commitments and want a clearly defined metric to use for surveying street conditions that can provide actionable data in both the short and long term; the metric needs to be seen as credible and will be publicly available to citizens, businesses and the government

“...and because of this...”

The Ugly Indian partners with Nick and Carmen’s Clean Streets, a systems improvement consulting firm, that works with organizations to identify the critical measures of street cleanliness specific to their regional patterns, behaviors and design a ‘street score card’ from which the condition of street can be measured, logged and compared to other streets in the city.

“...until finally...”

They have a tool to manage their Clean Street 500 km commitments, measure their impact and introduce a method of accountability to their operations; The Ugly Indian is now in a position to gauge the effectiveness of their strategies, better target their resources, expand their impact over the long term and report the city’s progress to the public.

“...and ever since that day...”

Because TUI implemented our process change, the Clean Streets 500 km initiative is a benchmark example of how to run a street cleaning program in Bangalore and other NGOs and city governments around India begin adopting Clean Street’s score card; Streets across India benefit from our data driven accountability structure because the numerous organizations working to make an impact have a method to generate actionable data from their work.

Smart Street Manual



EVALUATING STREET CLEANLINESS: SMART STREET 500 KM SCORECARD PROGRAM

PROGRAM MANUAL

**DEVELOPED BY STREET SMART IN CONJUNCTION WITH INDIA
RISING TRUST**

STREET SCORECARD PROGRAM: OVERVIEW

1. WHAT IS THE STREET SCORECARD?
2. HOW DO YOU MEASURE CLEANLINESS?
3. SCORECARD RATING PROCEDURES
4. SCORECARD RATING SCALE
5. RATING 10 KM 'LOOPS'
6. QUALITY CONTROL ASSURANCE
7. INTERPRETING SCORECARD
8. APPENDIX
 - a. Open Dumping
 - b. Loose Litter
 - c. Footpath Condition
 - d. Illegal Ad posters

1. WHAT IS THE STREET SCORECARD?

- An inspection program designed for use by government agencies, NGOs, community organizations or neighborhood groups in Bengaluru.

- A cleanliness metric for city footpaths and streets.

- A source of information for:
 - Bruhat Bengaluru Mahanagara Palike (BBMP) for systems assessment, process development and planning of city operations.
 - Citywide government for tracking and monitoring street cleanliness over time.
 - NGOs and community impact groups for activities planning and impact measurement.
 - Community organizations or other public interest groups to learn about cleanliness conditions in neighborhoods.
 - The general public for review of the cleanliness conditions of their city.

2. HOW DO YOU MEASURE CLEANLINESS?

- Scorecard metrics were developed by studying conditions of Bengaluru streets and identifying the four most common factors of cleanliness across the city:
 - Loose litter
 - Open Dumping
 - Illegal Adposters
 - Footpath Condition
- The metrics are based off of photo documentation that clearly portray the standards of cleanliness for each category
- Measurement of each component of street cleanliness is based on a three-point scale:
 - 1.0 Clean
 - 2.0 Somewhat Clean
 - 3.0 Not Clean
 - Ratings below 1 is “acceptably clean”

3. SCORECARD RATING PROCEDURES

- Scorecard Inspection Teams:
 - Conduct rating surveys quarterly for each of the 50 loops of 10km that comprise the Clean Street 500 km initiative.
 - Record rating in each category every 0.5 km segments of sidewalk and roadway.
 - Perform a total of 1,000 inspections in each quarter.

- The schedule of inspections is designed to be varied to help deliver representative samples of street conditions, including:
 - What time of day the inspections are done.
 - What day of the week the inspections are done.
 - What week of the month the inspections are done.
 - Who does the inspection.

4. SCORECARD RATING SCALE

Loose Litter			
Rating	1	2	3
Description	A clean street, except for a few pieces of litter	Litter is concentrated in spots, there may be large gaps between litter.	Litter is highly concentrated, there are small gaps between piles of litter or no gaps between piles of litter
Open Dumping			
Rating	1	2	3
Description	Street, footpaths and all medians are completely clear of illegal dump spots	Street is mostly clear of open dumping except for one pile that could have accumulated overnight and or small piles of construction waste.	Open dumping is concentrated, organic and inorganic waste are present, large piles of construction waste, piles are partially blocking footpaths or roadway.
Footpath Condition			
Rating	1	2	3
Description	All footpaths along the roadway are completely clear of obstructions or hazards	Footpath condition is good except minor obstructions, cracked or missing panels, minor overhead hazards, one to two detours.	Footpath has significant obstructions, missing more than one panel or has large elevation changes between panels, many detours.
Illegal Ad Posters			
Rating	1	2	3
Description	Vertical surfaces surrounding the roadway have no illegal posters	Vertical surfaces surrounding the roadway are clean except single or isolated ad posters.	Vertical surfaces surrounding the roadway have many posters

5. RATING 10 KM 'LOOPS'

- Loop figures are derived from the samples collected every 0.5km segments within the respective loop.
- Quarterly scorecards provide information about the average cleanliness rating and percentage of streets within a loop that score: 1 - acceptably clean.
- Compiled loop figures can be used to compare between the other loop segments in the 500 km initiative to identify geographic patterns.

6. QUALITY CONTROL MEASURES

- Inspection personnel are trained on the program and undergo regular quality assurance checks.
- Ratings are frequently reviewed to detect potentially biased scores
- Quarterly reports are 'cross checked' to ensure consistency between inspectors
- Ratings that are questionable or erroneous should be dropped and if necessary another rating should be taken.

7. INTERPRETING SCORECARD

- Quarterly reports show historical trends of street cleanliness and percentage of acceptably clean streets.
- Changes in quarterly cleanliness ratings can be influenced by many factors including time of year, seasons, weather, festivals or government initiatives.
- Meaningful trends can be analyzed by:
 - Comparing quarterly ratings with those of the same quarter of the previous years.
 - Calculating quarterly percentages of streets that are acceptably clean.
 - Comparing 10 km loop segments with others across the city.
 - Comparing results between categories across the city, and between quarters.

8. APPENDIX

A: Open Dumping



1.0: A clean street, except for a few pieces of litter.



2.0: Street is mostly clear of open dumping except for one pile that could have accumulated overnight and or small piles of construction waste.



3.0: Open dumping is concentrated, organic and inorganic waste are present, large piles of construction waste, piles are partially blocking footpaths or roadway.

B: Loose Litter



1.0: A clean street, except for a few pieces of litter.



2.0: Litter is concentrated in spots, there may be large gaps between litter.



3.0: Litter is highly concentrated, there are small gaps between piles of litter or no gaps between piles of litter.

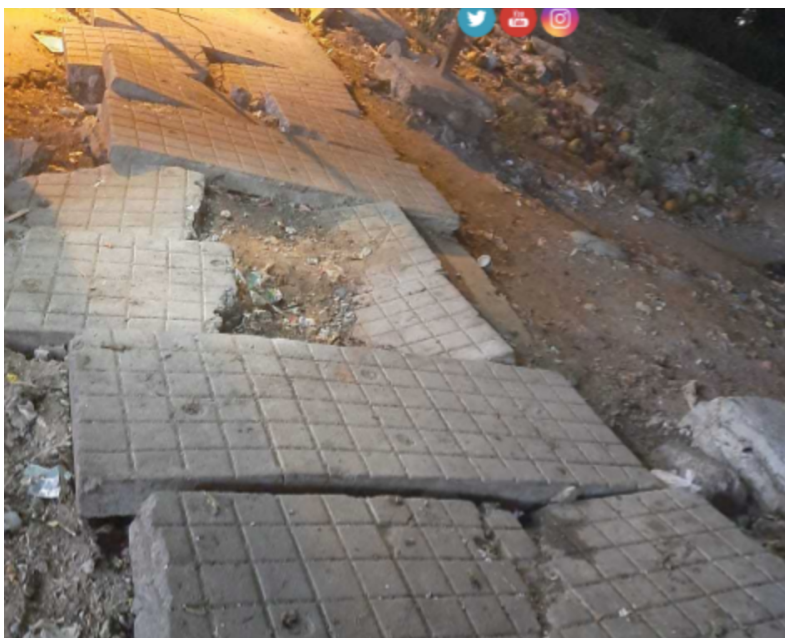
C: Footpath Conditions



1.0: All footpaths along the roadway are completely clear of obstructions or hazards.



2.0: Footpaths condition is good except minor obstructions, cracked or missing panel, minor overhead hazards, one to two detours.



3.0: Footpath has significant obstructions, missing more than one panel or has large elevation changes between panels, many detours.

D: Illegal Ad posters



1.0: Vertical surfaces surrounding the roadway have no illegal posters.



2.0: Vertical surfaces surrounding the roadway are clean except single or isolated ad posters.



3.0: Vertical surfaces surrounding the roadway and walkway have many posters.

Category Survey

*** GOT A MINUTE!**

Rank the following cleanliness categories
in order of importance

CATEGORIES:

Loose Litter	Illegal Dumping	Walkability	Public Urination
		Illegal Adposters	

RANKING SYSTEM

① Not important at all	③ Important	④ Fairly important
② Slightly important		⑤ Very important



Prototype (Street Smart App)

