Platform For Solid Waste Management System

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Overview of challenges in SWM

Urban India generates 62 million tonnes of waste (MSW) annually, said a 2014 Planning Commission report. It is also predicted that the volume will increase to 165 million tonnes by 2030.

India's solid waste collection efficiency, however, is around 70 percent at present, while it is almost 100 percent in many developed countries.

Moreover, 43 million tonnes of municipal solid waste was collected annually, out of which 31 million were dumped at the landfill sites and 11.9 million were treated, the environment ministry said in 2016.

A huge portion of the untreated waste is dumped irregularly on the outskirts of towns or cities, causing groundwater contamination and air pollution. There is, thus, a growing need to detect blind spots in the collection and transportation of waste so that the operation can be made more efficient

'For any region, SWM has issues like Non-participation of households, trade & commerce, Lack of sufficient knowledge on benefits of waste segregation at source, Lack of proper & timely communications, No real-time tracking & monitoring of Drivers/Vehicles, Irregular collection, and transportation facility.'

Validation of Challenges

The above-mentioned challenges will be validated through primary and secondary data. Primary data will be collected using questionnaires for surveys of various stakeholders, one-to-one and online, interviewing citizens, and using empathizing techniques to find a better solution. The secondary data will be used for understanding the volume of impact using data available with government and research centers. This collected data will be used to identify the user and analyze the utility of the solution built.

*The whole process of solution building will be done in the following steps:*
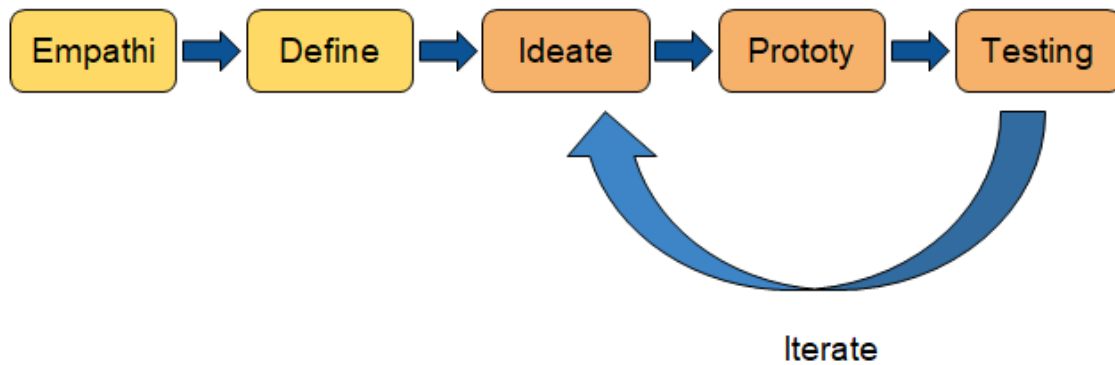
Solution

Note: This solution is on the basis of secondary data collected from various government websites.

A platform is required in order to assist in keeping the city clean, in which various actors are present, like citizens, vendors, urban local bodies. This platform will also ensure a smooth flow of activities like segregation, collection, transportation & disposal of waste. A smart, integrated waste management system will ensure real-time monitoring of the collection and transportation of waste.

How this will help

If we look at challenges and issues in the waste management system, we can observe that major causes of these are high amounts of waste generation, non-segregated waste, this leads to lack of space for landfills and a high volume of untreated waste. It is also noted that there are a lot of waste materials that can be reused before even being treated as waste.

There are places and bins where the waste is thrown for months, leading to an increase in diseases in the area and the creation of unapproved/illegal landfills. This happens majorly because the staff is unaware of these newly created landfills and the condition of the bins. All these causes can be addressed with just aware citizens and staff. An aware citizen will help the system to follow the tunnel of waste management(see below figure), which will eventually lead to a decrease in volume and type of waste generation at source.
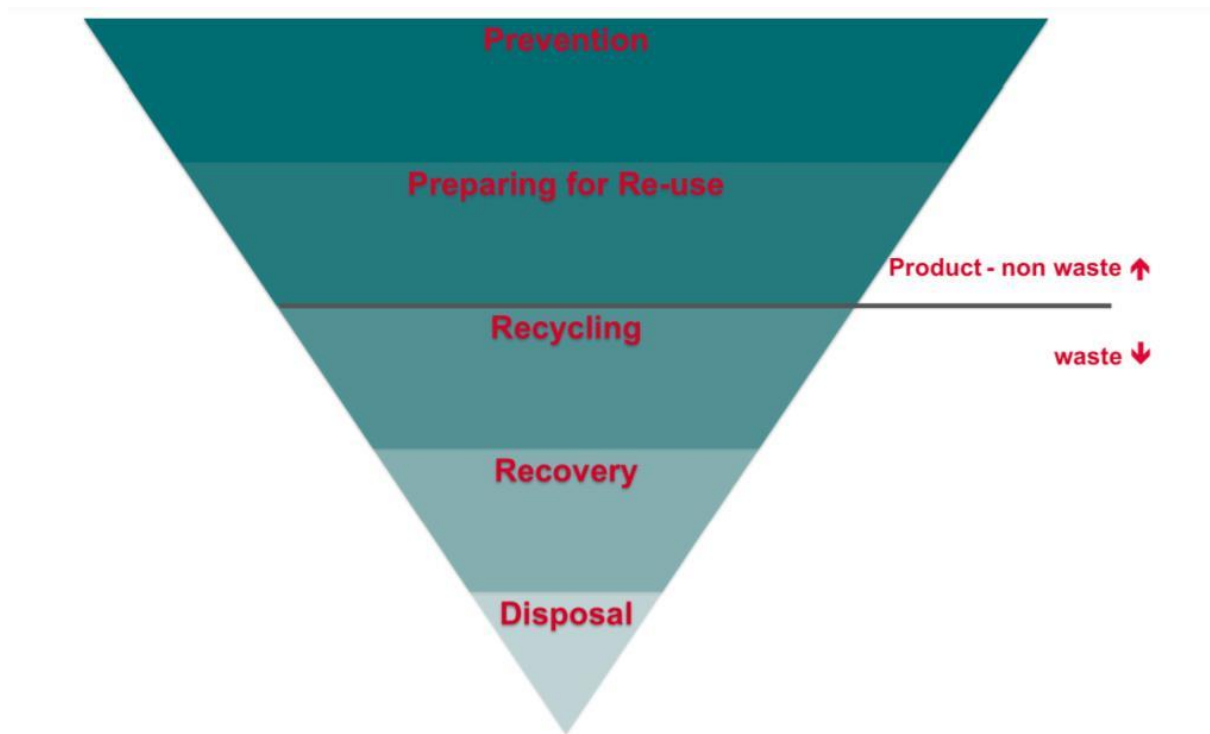
Source: European Environment Agency, 2019a

An aware staff will help to attain following leading to efficiency in waste management system:
- *Central management & control*
- *Operational efficiency & improved service quality*
- *Immediate intervention capability through real-time alerts*
- *Increased employee productivity*
- *Increased customer and citizen satisfaction*

Objective

- *To develop a platform for SWM to assist the efficiency and smooth flow of activities from the pickup of the waste to the point of disposal.*
- *To collect data, monitor, and analyze the activities involved in the Solid Waste Management System*

Platform for SWM

The platform is divided into 3 parts: a website for ULBs and Vendors, an app for the on-field workforce, and an app for the citizens and activists.

Below is the breakdown of the platform along with key features.

Static Pages
1. Guidelines
2. SWM knowledge base

3. Archive to display all uploads
4. Notice Board for Notification

ULB Dashboard

1. UI Design
2. User profile
3. Login for dashboard
4. Position and route tracking of Garbage vehicle
5. Report analysis
6. Grievance control system
7. Report control system for SLA breach
8. Assets Monitoring

Vendor Dashboard

1. UI Design
2. User Profile
3. Login for Dashboard
4. Task Assignment
5. Pickup Points
6. Vehicle allocation
7. Attendance Monitoring
8. Vehicle location Monitoring
9. Asset condition reports
10. Alerts for staff

Citizen app

1. UI design
2. User Profile
3. User login
4. Ticket Management with location
5. SWM Gamified Knowledge
6. Pickup timing
7. Report section
8. Facts section

App for Staff

1. UI Design
2. User Profile
3. User Login
4. Task Section
5. Route Section
6. Attendance monitoring
7. work status

High-Level Requirements

ULB Dashboard

Requirement Number	Requirement Description	Notes	Category
001	ULB will be able to track the position and routes of the garbage vehicle		Transportation
002	ULB will be able to view an analysis report in order to check the number of staff employed and their attendance on daily, weekly, monthly and yearly basis		Transportation Disposal and Treatment/Processing
003	ULB will be able to see and respond to the complaints tickets of the consumer		
004	ULB will be able to see and respond to the complaints tickets of the vendor		Transportation Disposal and Treatment/Processing
005	ULB will be able to see delivery analysis reports of all pick-up points in order to see any breach in SLA.	This will be high in terms of time or non serviced pickup points	
006	ULB will be able to send instructions to vendors		Transportation Disposal and Treatment/Processing
007	ULB will be able to view the number of active (on-field) assets		Transportation Disposal and Treatment/Processing
008	Platform will have a notice board to display any new guidelines from the ULB		Transportation Disposal and Treatment/Processing
009	Platform will have archive section to display all the documents uploaded till date		
010	ULB will be able to monitor the activities of Transportation facilities, Disposal Facilities, and Treatment/Processing Facilities		Transportation Disposal and Treatment/Processing
011	ULB will be able to see the report on weight and categories of Waste Collected		Treatment/Processing

Vendor Dashboard

Requirement Number	Requirement Description	Notes	Category
001	Vendor will be able to assign tasks to individual employees		Transportation Disposal and Treatment/Processing
002	Vendor will be able to see SLA for particular Pick up point		Transportation
003	Vendor will be able to redirect any vehicle from its route by sending instructions		Transportation
004	Vendor will be able to allocate the vehicle to the particular Driver		Transportation
005	Vendor will be able to monitor the staff attendance		
006	Vendor will be able to track and monitor the location of all the employed vehicles via GPS		Transportation
007	Vendor will be able to view the report on service and condition of all the asset employed		Transportation Disposal and Treatment/Processing
008	Vendor will be able to view SLA of all the pickup points		Transportation
009	Vendor will be able to schedule the routes and time for all pickup points		Transportation
010	Vendor will be able to view the status of service of all the pickup points		Transportation
011	Platform will send alerts in case of a breach in SLA is detected	In terms of transportation ● For Example: In case the SLA for a pickup point is till 10 am. ● At 9:30 am the Vehicle associated with the pickup point is 45 mins away from the location.	Transportation

		● In this scenario, the system will send alerts to the dashboard stating possible breaches in SLA.	

App for Citizen and Activists

Requirement Number	Requirement Description	Notes	Category
001	Users will be able to report complaints using ticket system		
002	Users will be able to click the photo in order to attach a grievance.	This Photo will be sent along with information of the location where the photo was clicked using the GPS System.	
003	Users will be able to learn about Solid Waste Management practices via short courses	This will be delivered in the form of short courses of maximum read minutes of 5min. Learning will be in form of facts and quizzes	
004	Users will be able to track their learning progress		
005	Users will be able to see arrival timing of the pickup cleaning vehicle for a particular pickup point	For Industry, commercial buildings	
006	Users will be able to see schedule and arrival timing of informal staff for collection of waste	For Household and Apartments - door to door collection	
007	Users will be able to see the report and facts about the cleanliness of their area on a daily basis.		
008	Users will be able to review and give feedback on the service and cleanliness of their City.		

App for Staff

Requirement Number	Requirement Description	Notes	Category

001	Staff will be able to see the schedule on Daily Basis		Transportation Disposal and Treatment/Processing
002	Staff will be able to see tasks assigned to them individually.		Transportation Disposal and Treatment/Processing
003	Staff can see the best route for several pickup points		Transportation
004	Staff will receive alerts in case of any changes in assigned routes or pickup points		Transportation
005	Staff will be able to mark their attendance on a daily basis	For Transportation Facility Staff: ● The attendance will be marked only when proof of service will be updated. ● Proof Service: Upload (before and after) photographs of all pick-up points and the GPS system verifies that they have crossed all the pick-up points.	Transportation Disposal and Treatment/Processing
006	Staff can check their profile	Staff ID, Details of the vehicle assigned, etc	Transportation Disposal and Treatment/Processing

Wireframe

SWM Platform

SWM by eGov
| Guideliness | SWM Knowledge Base | About us | Contact Us | Login/signup |

SWM Login

SWM by eGov
| Guideliness | SWM Knowledge Base | About us | Contact Us | Login/signup |

Account Login

For ULB

Login Name

Login ID

Password

Login

For Vendor

Login Name

Login ID

Password

Login

Dashboard for ULB

SWM by eGov

Guideliness   SWM Knowledge Base   About us   Contact Us   Account

ULB Dashboard

Report Analysis	Grievance Control	SLA Monitoring	Asset Monitoring
Vendor Connect	Vendor Monitoring	Archive Control	Notice Control

Dashboard for Vendors

SWM by eGov

Guideliness   SWM Knowledge Base   About us   Contact Us   Account

Vendor Dashboard

|			
Task Control	Vehicle Control	Pickup Control	Asset Monitoring
Alert Control	Attendance Monitoring	ULB Connect	Stafff and Vehicle Monitoring

Citizen App --> Frist Screen --> Home
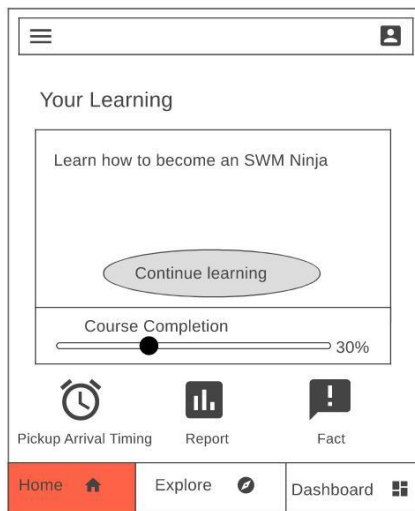
- Your Learning section shows your progress and you can continue your learning from there.
- The clock icon shows the pickup arrival time.
- Users can see the cleanness report of the city.
- Users can see SWM-related facts in the city.
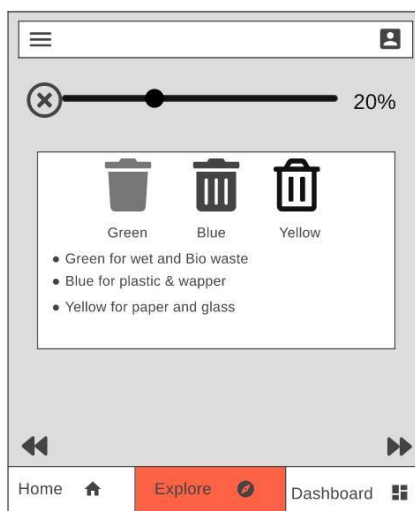
Citizen App --> Frist Screen --> Explore
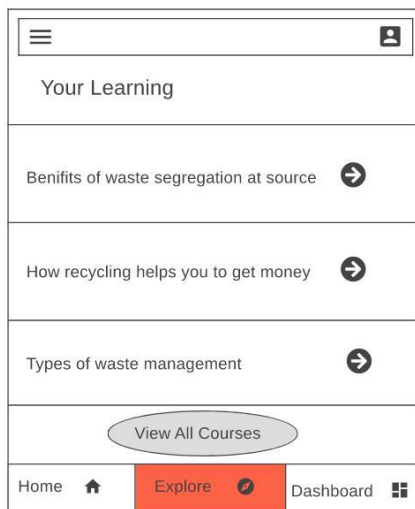
- You can choose what you want to learn on SWM.
- You can explore all courses on SWM.
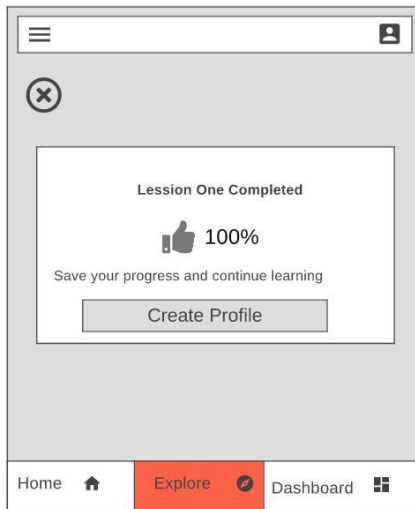
Citizen App --> Frist Screen --> Dashboard
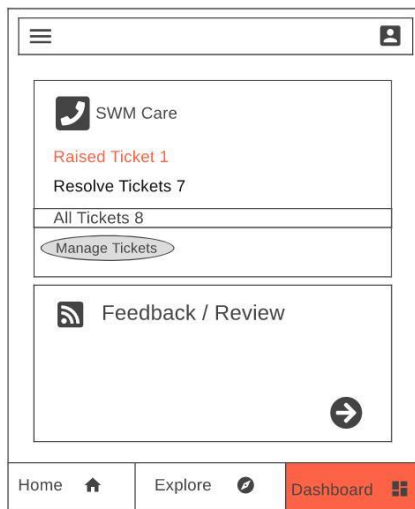
- Users can raise tickets and do any complaints related to SWM.
- Users can give feedback and review.
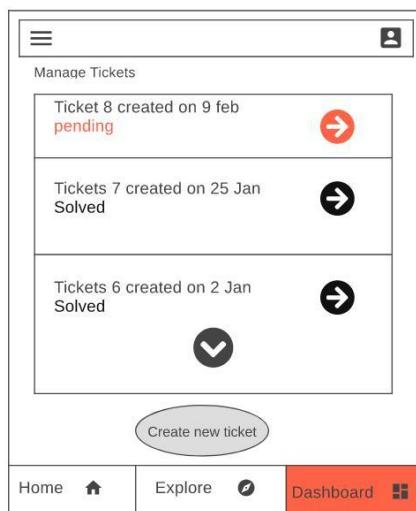
Citizen App --> Inside --> Explore Section

- Gamification of courses to aware and enhance the knowledge on SWM.
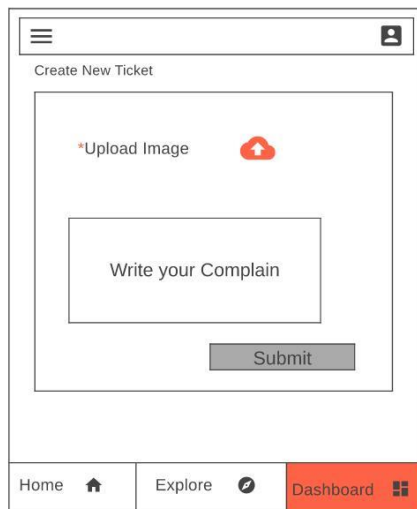
Citizen App --> Inside --> Explore Section

- Removing Commitments asking to register if users want to save and personalize their data to make the user experience better.
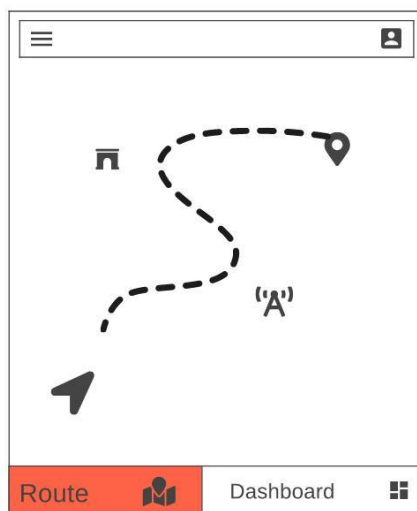
Citizen App --> Inside --> Dashboard section

- Users can track their ticket or complaints status.
- Users can create tickets.

Citizen App --> Inside --> Dashboard section

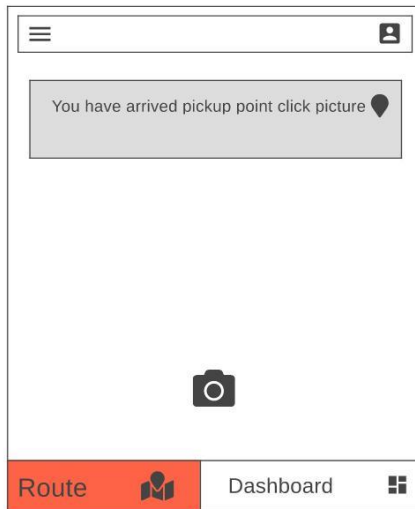- Image with a location-based complaint.

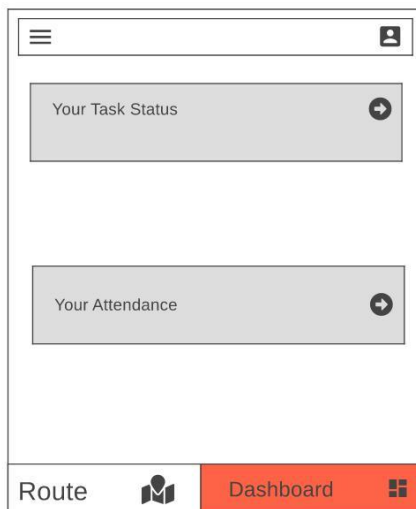# Staff App --> First Section --> Route

- Optimize route with vehicle suggestions for staff.
- Distance with time and traffic

Staff App --> First Section --> Route

- Camera Icon appears only when staff at pickup location.
- Attendance will automatically be completed when the route will be completed and the photo uploaded.

Staff App --> First Section --> Dashboard

- Staff can see and track his work status.
- Staff can check his attendance.

Roadmap

Note: Kindly zoom for a better view.

[Click Here to view Roadmap](#)

KPI

Area of Focus	Measurable Metrics
Time consumption due to real-time monitoring of Vehicles	100% communication is happening in real-time without any delay
Completion of SLA post the implementation of platform as compared to prior case	95% of Vehicles are able to complete tasks within SLA
Awareness (via App)	50% segregation happens at source (at household and apartments)
Grievance Redressal System	Tickets are resolved timely (within SLA)
Monitoring data and optimization route	Stakeholders are able to track and monitor the routes of 100% of the vehicles on road.

Project Success Criteria

Area of Focus	How to reach it
Development of Platform	Regular discussion Meetings, Daily Standup Meetings, Active Stakeholder involvement throughout the development process, Releasing MVPs
Segregation at source	Gamification of courses regarding waste management System for citizens
Lesser Challenges	Validation, Regular Surveys pre and post-implementation of Platform
Awareness among Staff	Real-Time view of job card via app
Efficient control of source system	Real-Time monitoring and analysis of activities.
Increase in recycle of materials	courses regarding waste management System for citizens

References

● https://economictimes.indiatimes.com/news/science/how-to-transform-waste-management-using-ict-to-enable-swachh-bharat-mission/articleshow/47957702.cms?from=mdr
● http://cpheeo.gov.in/upload/uploadfiles/files/Part3.pdf
● https://www.adb.org/sites/default/files/institutional-document/324101/tool-kit-solid-waste-management.pdf
● https://www.ccacoalition.org/en/initiatives/waste