iscf
India Smart Cities Fellowship

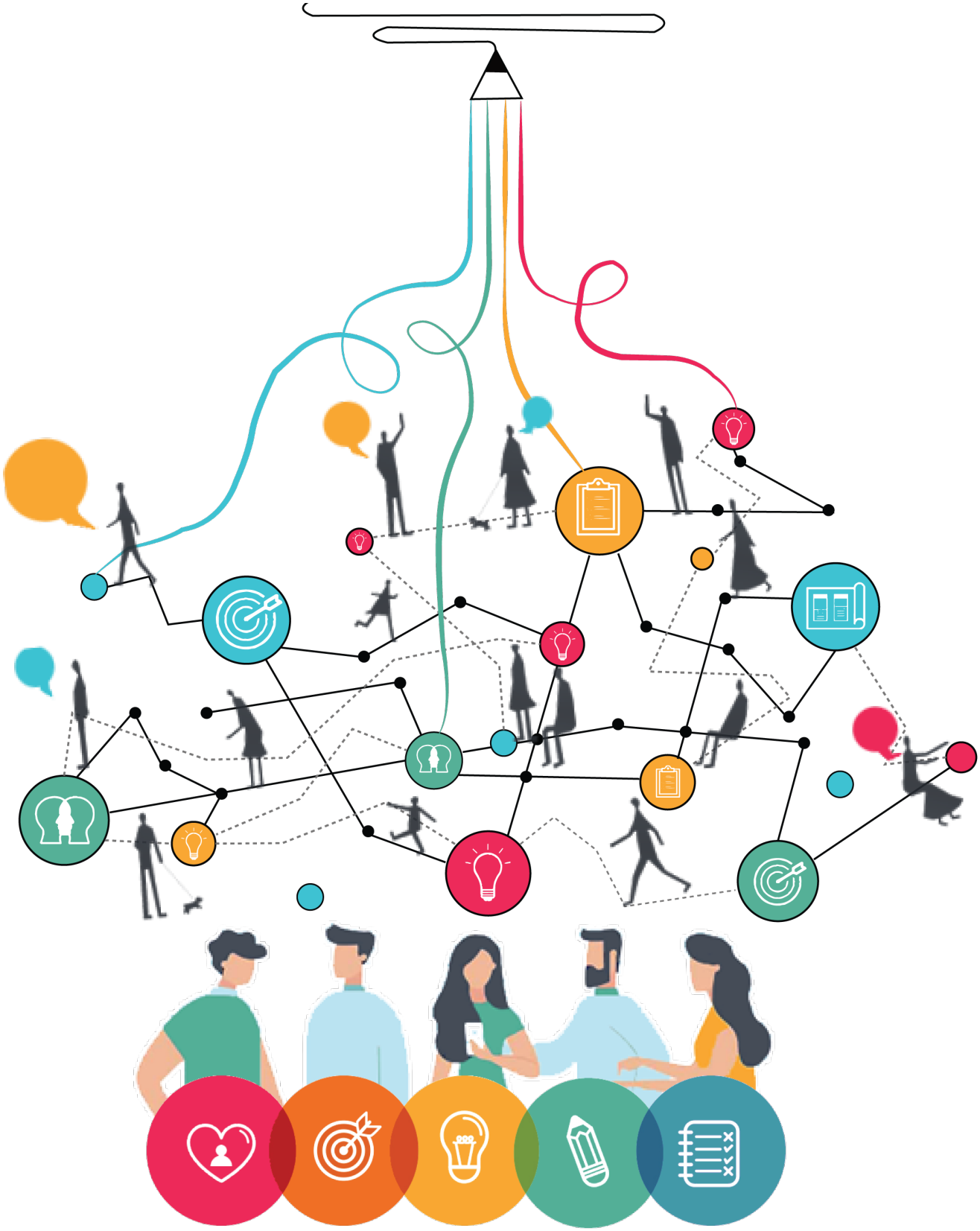
NIUA
National Institute of Urban Affairs

Ministry of Housing and Urban Affairs
Government of India

Smart City
MISSION TRANSFORM-NATION

India Smart Cities Fellowship Program 2021

COMPENDIUM
OF PROJECTS



NATIONAL INSTITUTE OF URBAN AFFAIRS
Compendium of Pilot Projects: India Smart Cities Fellowship Program
March 2023

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National Institute of Urban Affairs

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ABOUT THE PROGRAM

The development of Smart Cities is a step in the attempt to create an urban ecosystem that represents a comprehensive development of institutional, physical, social, and economic infrastructure to improve ease of living and attracting people and investments to urban areas. The India Smart Cities Fellowship (ISCF) is an initiative of the Ministry of Housing and Urban Affairs (MoHUA) under the Smart Cities Mission to cultivate youth leadership and usher vibrancy in the design of India's urban future. It was launched by the Hon'ble Minister of Housing and Urban Affairs, Government of India on 09 July 2018.

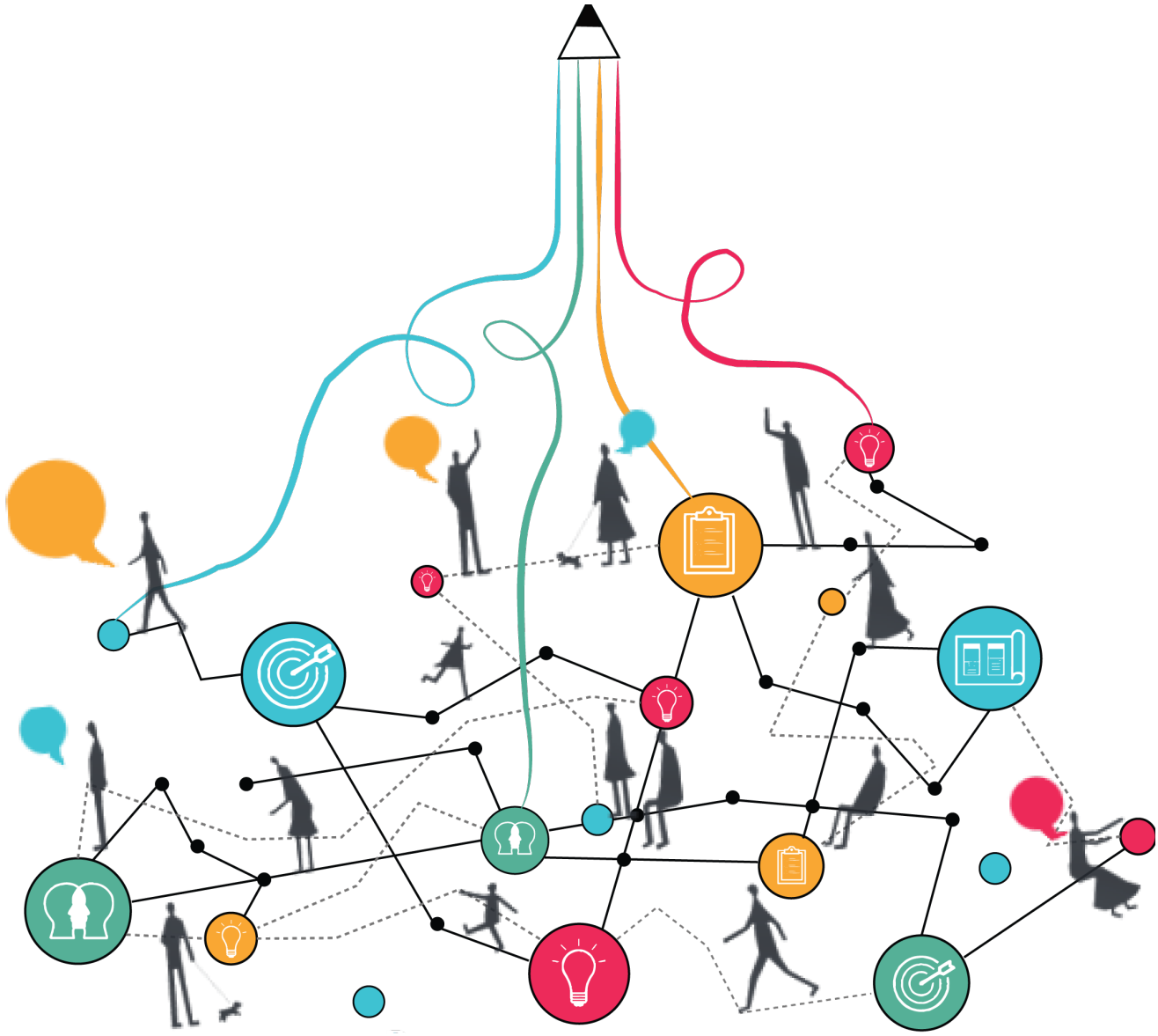
The objective of this program was to select a cohort of promising young professionals who have the potential to contribute to the innovation ecosystem that is fast developing around the Smart Cities Mission. These fellows provided necessary support to the Office of Mission Director, Smart Cities in MoHUA and CEOs of selected Smart Cities in terms of analytics, research, documentation, etc.

The first batch of the India Smart Cities Fellows was inducted in February 2019 through a first-of-its-kind selection process. The fellows worked on 12 marquee projects and were involved in developing innovative products. The second batch of 57 fellows was inducted on 12 March 2020 under Smart Cities Mission and they also worked on 13 different projects, few of which were ultimately converted into viable products that can be adopted across India.

The third cohort of the Fellowship consists of 36 Fellows, who were inducted into the Fellowship Programme in October 2021. The Fellows of the present cohort have developed 10 projects to impact the sectors of Placemaking, Climate Change, Municipal Performance, Governance, Economy, Finance, Mobility, Solid Waste Management and Energy.

India Smart Cities Fellowship Program 2021

COMPENDIUM
OF PROJECTS



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Government of India

Smart City
MISSION TRANSFORM-NATION

ACKNOWLEDGEMENTS

Ahmedabad Smart City

Ahmedabad Municipal Corporation

Bhopal Smart City

Bhopal Municipal Corporation

Indore Smart City

Indore Municipal Corporation

Kochi Smart City

Kochi Municipal Corporation

Nagpur Smart City

Nagpur Municipal Corporation

Nashik Smart City

Nashik Municipal Corporation

Pimpri-Chinchwad Smart City

Pimpri-Chinchwad Municipal Corporation

Pune Smart City

Pune Municipal Corporation

Raipur Smart City

Raipur Municipal Corporation

Surat Smart City

Surat Municipal Corporation

MESSAGE

HARDEEP SINGH PURI
MINISTER OF HOUSING AND URBAN AFFAIRS;
and PETROLEUM AND NATURAL GAS,
GOVERNMENT OF INDIA

हरदीप एस पुरी
HARDEEP S PURI

सत्यमेव जयते

आज़ादी का अमृत महोत्सव

आवासन और शहरी कार्य मंत्री
पेट्रोलियम एवं प्राकृतिक गैस मंत्री
भारत सरकार
Minister of
Housing and Urban Affairs; and
Petroleum and Natural Gas
Government of India

Message

The India Smart Cities Fellowship Program has evolved to become a one-of-its-kind laboratory for passionate young minds to research and implement projects for the government. When this program began, the objective was to provide deserving youngsters and freshers in the job market with hands-on experience of the nuances of city governance. It has since morphed into a centre for innovation and incubation as many of your projects and solutions have provided ULBs and urban departments with novel ideas and innovative approaches.

I firmly believe that the youth can bring about massive change with their abilities. They are riding the wave of innovation in the country today, and are utilising cutting-edge technology to solve problems and disrupt industries, manufacturing processes, and commercial services along the way.

I am glad to note that the Fellows have viewed urbanisation in India as an opportunity, and have worked with that mindset to undertake interesting research on issues such as mitigating poverty, reducing carbon footprint and strengthening last-mile connectivity. The Smart Cities Mission was launched with the aim of improving the quality of life of urban citizens. Such an endeavour requires smart people to proactively participate in urban reforms. Your integral involvement in the mission has revitalised local urban governance in India.

I congratulate the Fellows and wish them bigger successes ahead.

New Delhi
28.02.2023

(Hardeep S Puri)

Office:- Room No. 104-C, Nirman Bhawan, New Delhi-110011; Phone: 011-23061166, 23061162, 23062089 (Fax)

QUOTES

Manoj Joshi

Secretary, Housing and Urban Affairs

“ Urban development is a vast and complex subject and the Smart Cities Mission has been addressing a diverse set of projects across 100 Smart cities. The India Smart Cities Fellowship Program has made it possible to involve youth in developing innovative ideas that will decide future of urban India.”

Kunal Kumar

Joint Secretary, Housing and Urban Affairs

“The India Smart Cities Fellowship Program offers talented urban professionals the opportunity to develop innovative solutions to Indian cities’ challenges. Being a fellow in this program ensures a dynamic and exciting experience. ”

Rahul Kapoor

Director - SCM, Housing and Urban Affairs

“The Smart Cities Mission aims to enhance the living standards in Indian cities by utilizing technology to guide data-centric governance. The India Smart Cities Fellowship Program provides young individuals with the chance to participate in these efforts by participating in the implementation of smart city projects and by brainstorming, creating, and evaluating solutions on the ground. ”

Hitesh Vaidya

Director, National Institute of Urban Affairs

"The National Institute of Urban Affairs (NIUA) supports the growth of India Smart Cities Fellows as they work together to find groundbreaking solutions to the challenges facing Indian cities. This approach transforms NIUA into a training ground where young professionals can develop practical skills."

Nabamalika Joardar

Innovation Head, National Institute of Urban Affairs

"The 2021-22 cohort of India Smart Cities Fellows, consisting of highly motivated and talented individuals from diverse urban backgrounds, demonstrated exceptional teamwork and resilience in the face of numerous difficulties. The Compendium of Projects 2021-22 is proof of a year filled with unwavering determination and hard work by the fellows."

INTRODUCTION

Exploding population and shrinking resources are adversely impacting cities across our country. To help solve the increasing urban inconsistencies, the Government of India launched the Smart Cities Mission in 2015 to drive economic growth and cultivate equitable urban ecosystems. To this extent, the India Smart Cities Fellowship Program was initiated by the Ministry of Housing and Urban Affairs (MoHUA) and the National Institute of Urban Affairs (NIUA) to promote youth leadership and usher vibrancy in the design of India's urban future.

The 2021-22 fellowship cohort comprises 36 young interdisciplinary and multidisciplinary thinkers from across the country. Despite the pandemic, the fellows developed a keen understanding of the Smart Cities Mission by reviewing the 100 smart cities and their current progress. They developed a database identifying each smart city's key areas/sectors of interest. Soon after, a 'Design Thinking' approach was adopted for project ideation based on issues identified in various sectors according to the developed database, and 10 projects were finalized.

The 36 fellows were then divided into 10 teams, each of which was mentored by subject matter experts throughout the fellowship. ISCFP fellows from diverse academic backgrounds have worked tirelessly to evolve context-specific digital products that help cities take stock of their current realities and highlight strategic ways to streamline development according to the focus of the product and the city. Technology here was utilized as a means to achieving an outcome as opposed to being the outcome itself, making the 10 projects and the fellowship a unique endeavor.

This compendium of projects in the 2021-2022 cohort is the culmination of a year-long attempt by fellows at problem-solving and innovation in 10 Smart Cities of India.

PILOT CITIES
ISCFP 2021

THE TEAM

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India Smart Cities Fellowship Manager

Priya Upadhyay
Advisor

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Design Team

Rohitaash Debsharma
Advisor

Akruti Murhekar

Roshni Gera

Sarayu Madhiyazhagan

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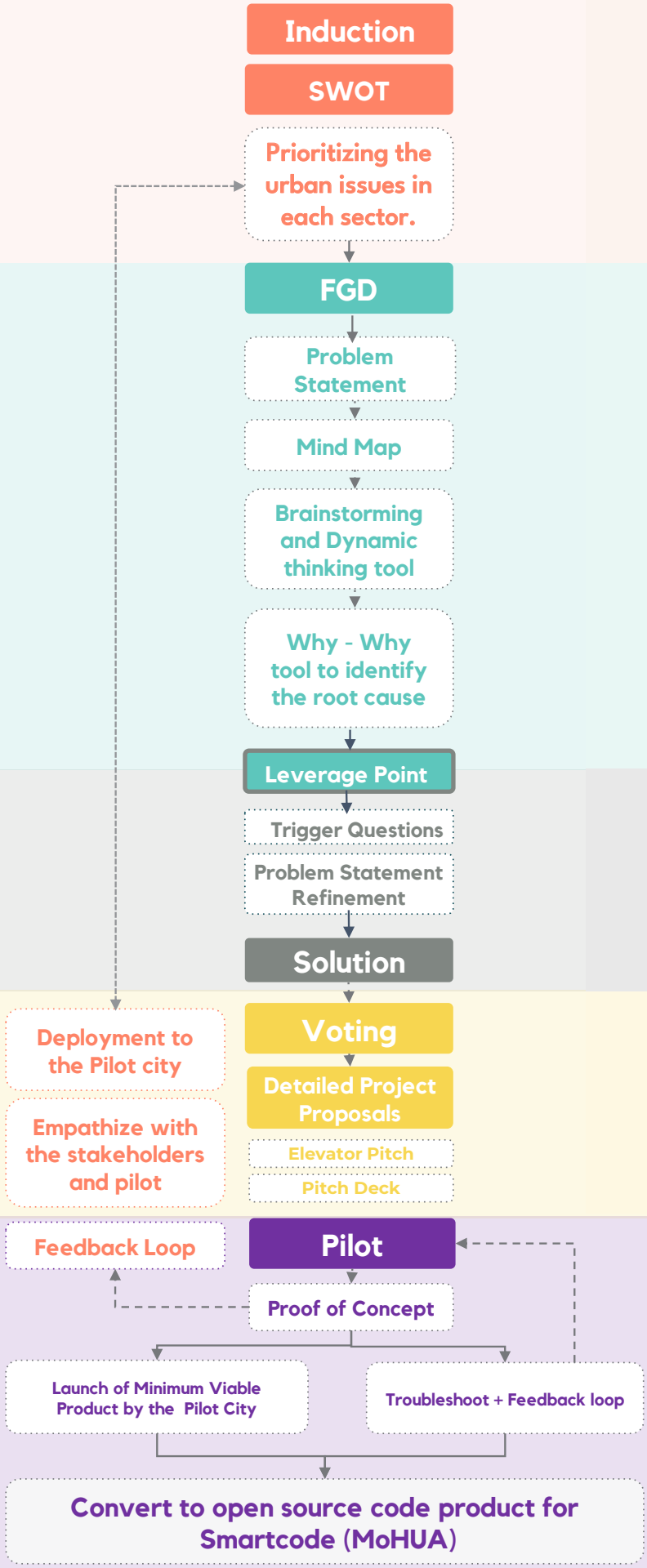
FELLOWSHIP METHODOLOGY



PROJECTS

Empathize

Define

Ideate

Prototype

Test

ACTIVATE

Crowdsource ideas and crowdfund public space projects

INDORE
Indore Smart City
Indore Municipal Corporation

URBAN DESIGN | PLACEMAKING
Crowdsourcing of ideas and crowdfunding

USERS
Urban Local Body
Citizens

Activate Public Space Mobile application
Mobile and desktop compatibility

5 Active Days
966 Number of Downloads
288 Suggestions Received

4 Months
App Plug-in is developed & embeded in the Indore Smart City application & live

Link
https://www.smartcityindore.org/sector/activatepublicspaces/

Source: CartoSat-2, ISRO

ACTIVATE

Crowdsource ideas and crowdfund public space projects

Several small city spaces have a crucial impact on the quality of life. Public authorities own these abandoned and vacant lands, unfortunately, their usage is not specified at the policy level as it is not one of the critical objectives under planning. Such spaces without any designated activity assigned to it, results in the wastage of land.

Certain infrastructure developed for public use are not used to their full potential, like subways, foot-over bridges, and the ground beneath flyovers that cannot attract the anticipated footfall for multiple reasons. Those areas eventually become hotspots for anti-social activities or garbage dumps, not realising their inherent capacity to generate an economy if an activity is assigned to them, thus negatively impacting the communities health, safety, and economy.

Source: Asif Khan, via Instagram

01 Context

Community- being the end user is the significant stakeholder and is crucial in studying such spaces. Thus globally, various design approaches are undertaken wherein the community is placed at the apex of decision-making which plays a vital part in revitalising under-utilised spaces. Placemaking through tactical urbanism or other community-centric design approaches has ensured the successful utilisation of these spaces. However, there are instances wherein, even after redesigning these spaces, cities cannot generate footfall in the long run due to missing newness. People are habituated to redevelopment, and there's no pulling factor.

02 Problem Statement

Underutilised spaces in cities require transformation as it negatively impacts the community's health, safety, and economy. Such spaces can be dump sites, land beneath the flyovers, neighbourhood parks, and road wedges. Cities are trying to restore these spaces through different placemaking initiatives therefore we, Team Activate, are attempting to create an organised framework to transform underutilised city spaces through crowdsourcing ideas and crowdfunding projects. The organised framework will enable the citizens to identify, ideate, and support transformations in their neighbourhood while also partnering with the ULBs to oversee operations & maintenance of the shortlisted space owing to a sense of belongingness with the space.

03 Objective of the Project

Leveraging this opportunity, we aim to design a systematic framework to carry out placemaking initiatives to create an inclusive neighbourhood based on shared responsibility, instilling a sense of belongingness. The objectives to achieve this aim are-

1. Identification of potential sites by the community.
2. Design a platform to transform underutilised spaces according to the community's aspirations.
3. Encourage communities to support the transformation of such spaces around them, both financially and non-financially.
4. Assist the ULB in transforming spaces prioritised by the community.
5. Gather local financial support for the re-development of similar spaces around them.

04 Project Strategy

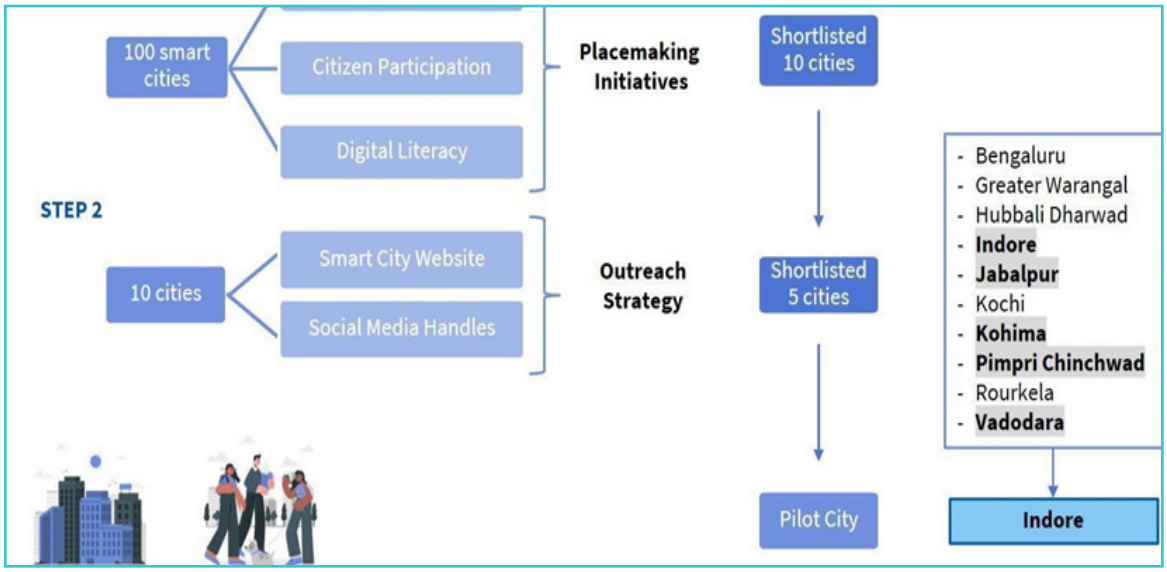
a. Pilot City Identification

To finalise the pilot city, we started shortlisting cities based on two primary parameters,

1. The city's performance in the placemaking marathon and nurturing neighbourhood challenge
2. The magnitude of citizen participation and digital literacy.

An additional round of shortlisting was based on the city's outreach strategy which demanded an active website and social media handles. Based on the parameters mentioned above, final shortlisted cities were,

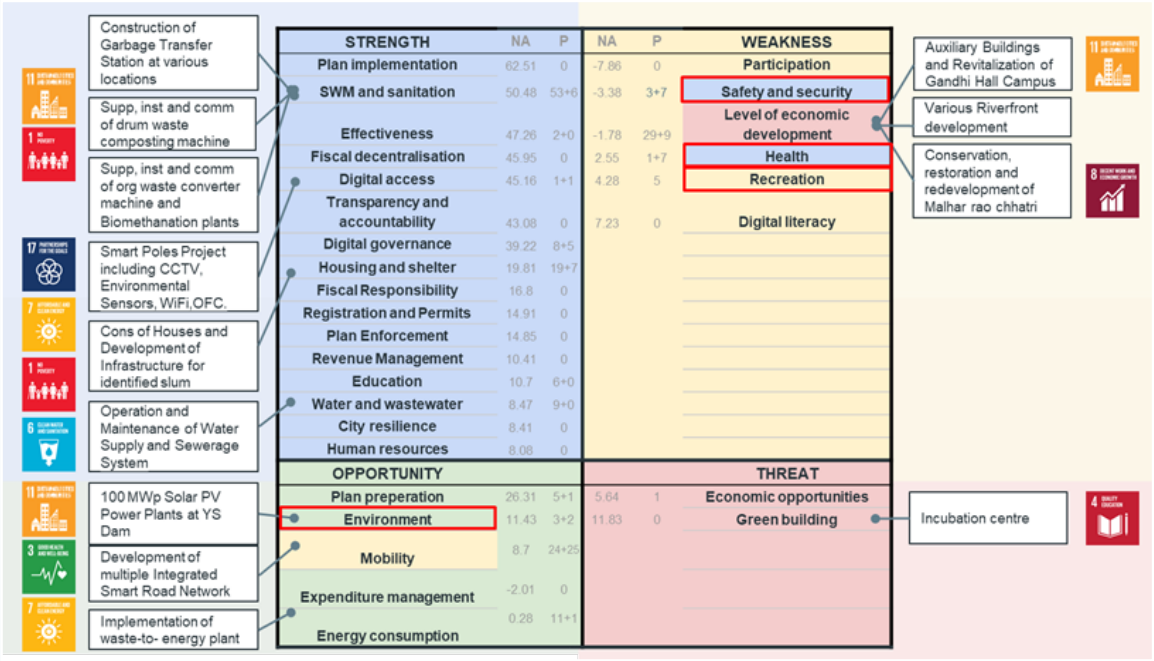
1. Indore
2. Jabalpur
3. Vadodara
4. Kohima
5. Pimpri Chinchwad



City Selection Matrix

Furthermore, once we presented our project idea, **Indore was assigned as our pilot city** following this, we explained our idea to Mr. Rishav Gupta, CEO of Indore Smart City. Our concept was received well, as the city was already working on crowdfunding techniques, which was a significant component of the app we intended to build.

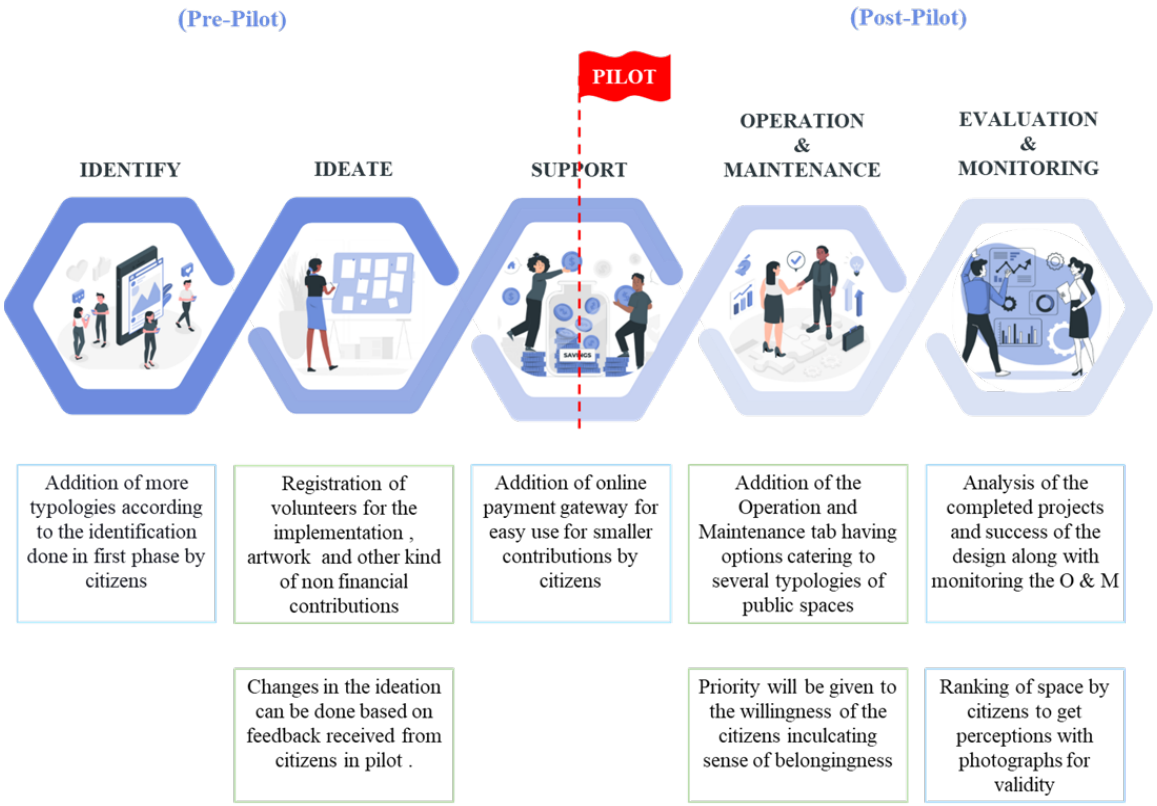
Before being deployed, we analysed the city and created a SWOT. As per our findings, Indore was weak concerning health, safety, and security. However, due to multiple gardens, Indore had potential in the environmental sector. Another factor favouring us was the city's endeavour to develop a CSR webpage under the SCM.



Indore SWOT Analysis

Since our idea complemented theirs, the city officials were highly cooperative and supportive. However, due to lack of time and delays in seeking financial approvals, we could not pilot our project and promote our product offline.

b. Project Development and Implementation



Project Development & Implementation

c. Expected Outcomes

Based on the crowdsourcing and crowdfunding mechanisms, the outcome will be a plug-in to the Indore 311 app, enabling citizens to identify and document the various underutilised spaces to the ULB. Citizens can then share their opinions regarding the activity requirements/ design for the spaces, including subways, foot-over bridges, and the land beneath the flyovers. Once done, they will get an opportunity to assist the authorities in prioritising development by voting (upvoting/downvoting) and volunteering to raise funds and donate non-financial assets for the shortlisted space. Lastly, the product will aid in revitalising the underutilised spaces by bringing the citizens to the forefront, Thus creating a sense of belongingness, while improving the quality of life for individuals living near the underutilised spaces as more and more economic opportunities come up. The designed product aims to augment citizen participation and enhance safety and security while ensuring the beautification of dead spaces.

d. Actual Results

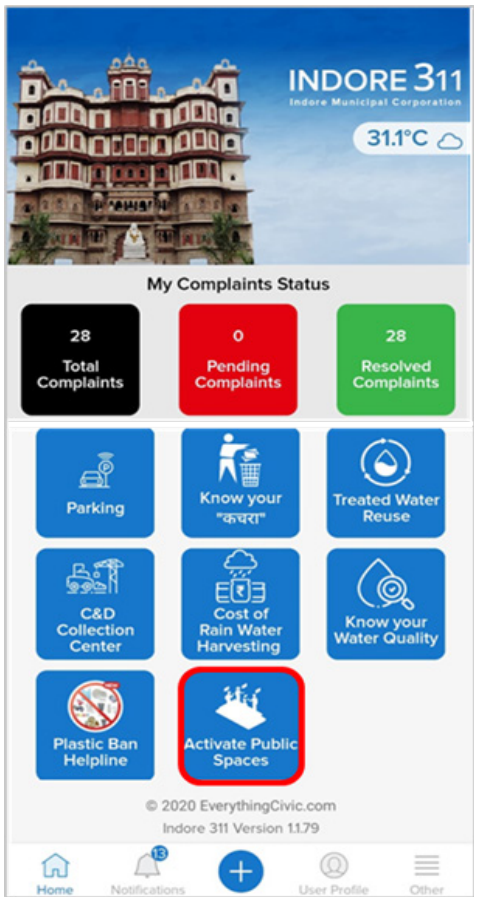
Team Activate developed the 'Activate Public Spaces' plug-in to Indore Smart city's 311 App and successfully linked the 'Support' tab to the CSR webpage. Following is the current status:

Status of the plug-in 'Activate Public Spaces'

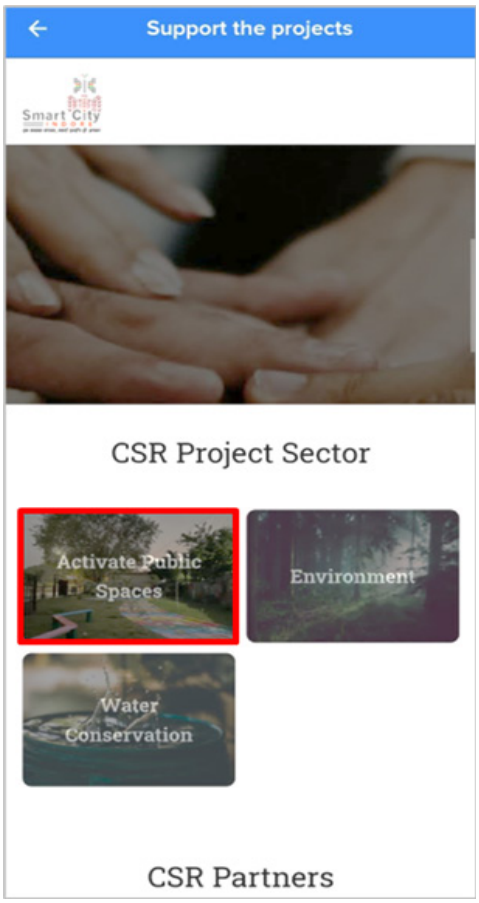
- Received the first version of the plug-in from the developer. It is developed as per the prototype shared.
- Reverted to the developer with modifications for the same.
- The plug-in is live on the Indore-311 app and available on iOS and Android.
- 105 spaces of different selected typologies are stored in the database.

Status of the tile 'Public Spaces' on the CSR webpage

Post carrying out various meetings with the webpage developer to explain the prototype for the tile 'Activate Public Spaces' with programs in it, namely, 'Land beneath Flyovers', 'Undeveloped gardens', 'Back-lanes', 'Anganwadis', and 'Residual spaces', the product was received from the developer on 12th October and is now live!

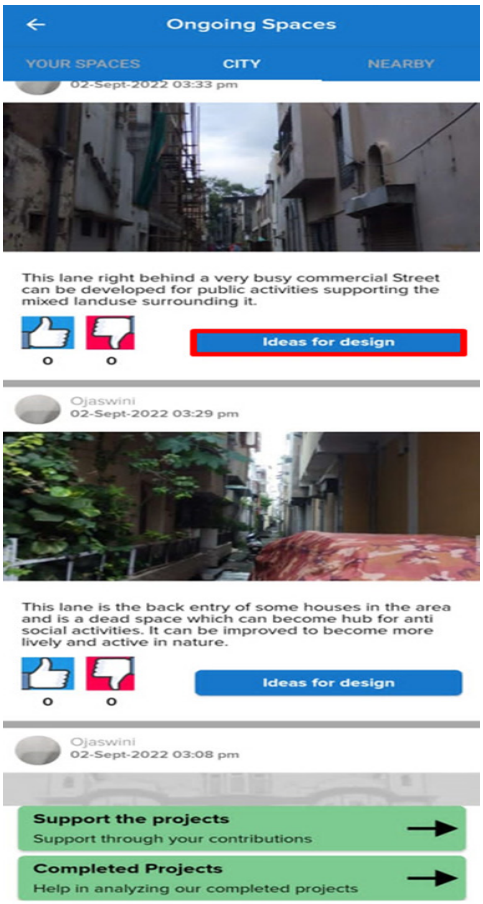


Activate Public Spaces on Indore - 311 App

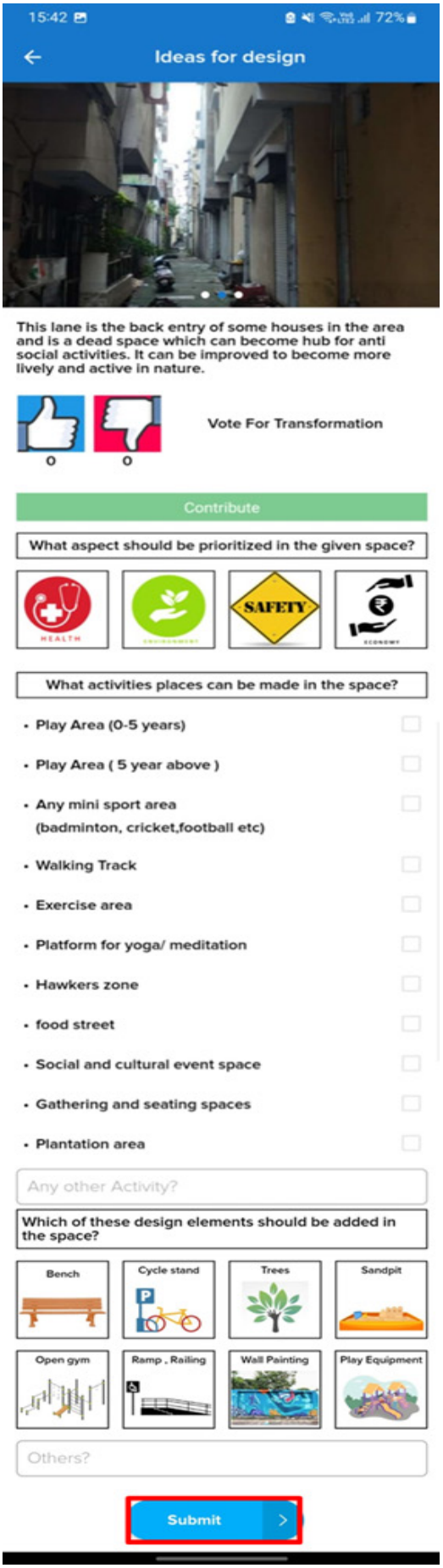


Activate Public Spaces on Indore Smart City's CSR Webpage

'Activate Public Spaces' gif with short description of the plugin



Tab shows - spaces uploaded by citizen, 'your spaces', 'city', 'nearby'



Tab shows ideas for design to be incorporated in the space

CSR webpage - 'Activate Public Spaces' tile

e. Link to the Tool

1. Android: https://play.google.com/store/apps/details?id=com.everythingcivic.indore
2. iOS: https://apps.apple.com/in/app/indore-311/id1135167189
3. CSR Webpage: https://www.smartcityindore.org/sector/activatepublicspaces/

05 Conclusion

For the second phase, we will attempt to add more UUS typologies based on the identification accomplished in the first phase. Furthermore, there can be additional changes in ideation based on feedback acquired through the pilot. For instance, registration of volunteers/ artists, thereby giving them a platform to showcase their talents.

An essential element for further phases is an online payment gateway instead of the current one. An entirely online platform will be more user-friendly for smaller contributions by citizens.

An Operation and Maintenance tab will be added to effectively and efficiently manage the newly transformed spaces. However, the citizens' willingness to inculcate a sense of belonging will be prioritised.

We also endeavour to permit citizens to rank places to gauge their perceptions, alongside photographs for proof. Lastly, an in-depth analysis of the completed project and examining the design's success are envisioned for proper evaluation and monitoring.

To ensure scalability, we aim to integrate Activate Public Spaces with the Placemaking Marathon and Nurturing Neighbourhoods Challenge webpage. Consequently, we seek to pilot the product in other cities with the 311 App while incorporating it in initiatives like Cycles4Change and Streets4people.


Kaustubh Mirajkar


Ojaswini Bansal


Vasudha Sharma


Tarini Gupta

Internal Mentor

Ms Jeenal Sawla
Principal Advisor, Data Analytics & Management Unit, Smart Cities Mission, MoHUA

External Mentor

Ar. Prasanna Desai
PDA

ADAPT

Adapt and mitigate the effects of climate change

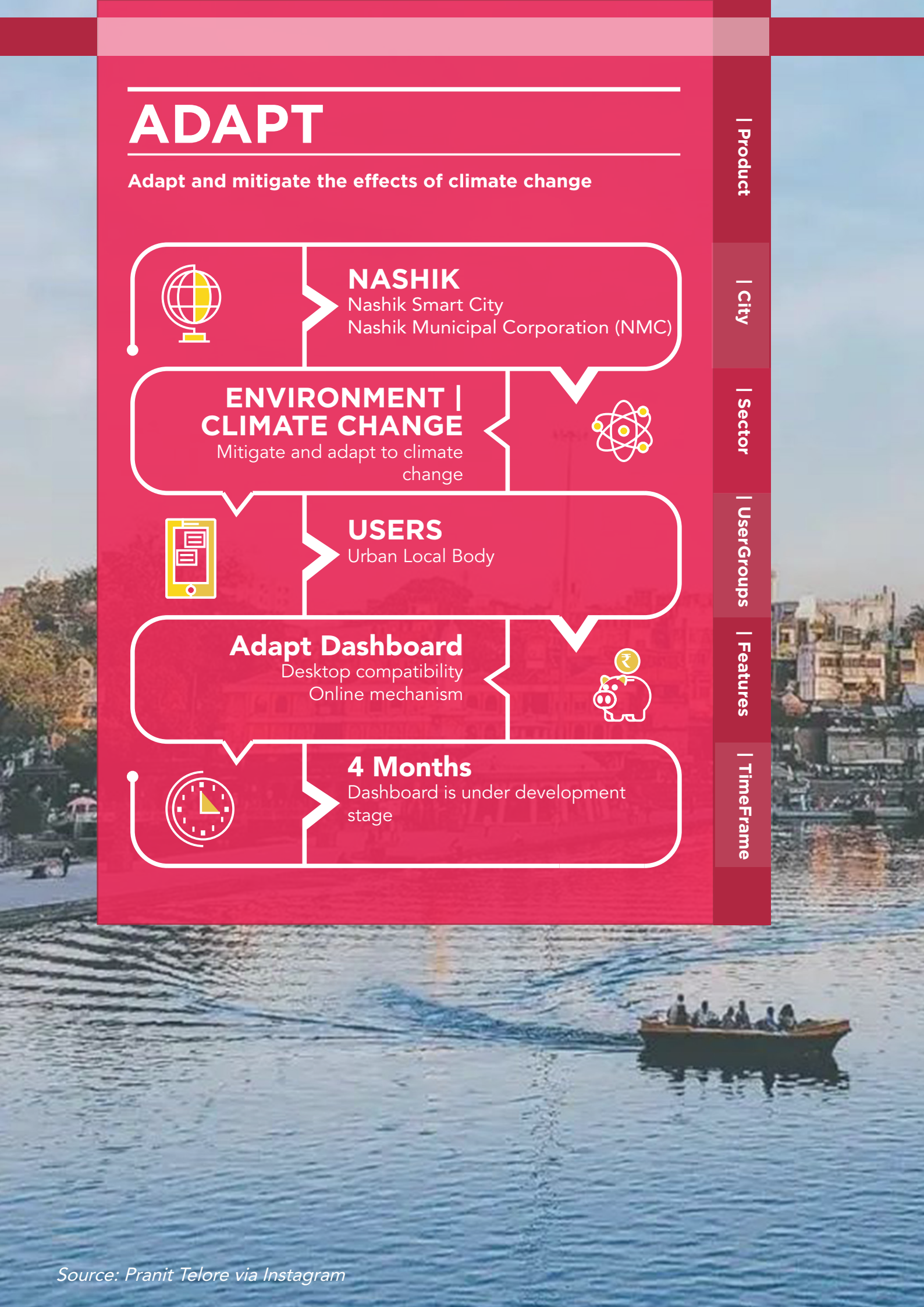
NASHIK
Nashik Smart City
Nashik Municipal Corporation (NMC)

ENVIRONMENT | CLIMATE CHANGE
Mitigate and adapt to climate change

USERS
Urban Local Body

Adapt Dashboard
Desktop compatibility
Online mechanism

4 Months
Dashboard is under development stage



Source: Pranit Telore via Instagram

ADAPT

A data-driven tool for Indian cities to adapt and mitigate the effects of climate change

The point has been reached where most of the world's population now lives in cities. As projected by the UN, between 2009 and 2050, the population of urban areas is expected to increase from 3.4 billion to 6.3 billion, absorbing most of the projected increase in the world population. With 'urban activities' already constituting over 80% of anthropogenic carbon dioxide emissions produced each year globally, what happens in cities will drive the global outcome of climate change. The landscape transformation and the associated activities of urban areas have modified the city's meteorology and urban climate.

Source: Pranit Telore via Instagram

01 Context

There has been a worldwide vision to design sustainable, healthy, comfortable, and even enjoyable cities. To achieve this goal, it is necessary to understand and apply urban climate information in the urban planning and design process. There is a need to bridge the gap between urban climatology and urban design; to transfer climatic knowledge into planning language.
IPCC's recent assessment report recommends new research directions and urges scholars to establish theoretical and empirical links between the science of climate change, urban planning, and design. Thus, it is the need of the hour to find innovative and effective ways to address the issue of climate change at the city level.

02 Problem Statement

There is a lack of climate change adaptation and mitigation studies that address urban design at the neighbourhood or city scale. Despite the government's policy to incorporate climate change actions at a city level, the master plan document of many Indian cities does not show evidence of the same. This is primarily due to the lack of interdisciplinary media to connect urban climate information with the master planning process.

Therefore, this product advances with an idea to address the need for climate-responsive planning by developing a data-driven tool for Indian cities to adapt and mitigate the effects of climate change.

03 Objective of the Project

1. To assess the possible planning intervention for climate change adaptation and mitigation.
2. To prepare a toolkit for the development authority to assess the microclimate zones in the city.
3. To develop a platform for development authority to ensure informed decision-making.
4. To develop a portal for citizens with gamification for awareness generation and crowdsourcing data.

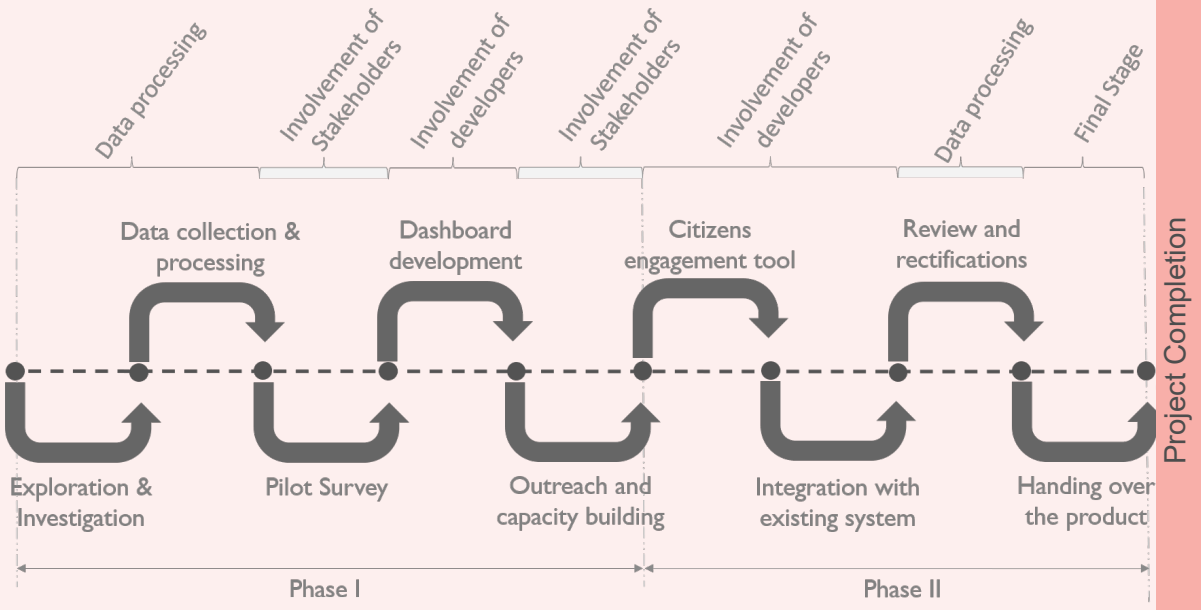
04 Project Strategy

a. Pilot City Identification

Following a detailed literature review and analysis of available data, a few criteria were applied to determine the city to pilot the project. These were ratings as per Climate Smart Cities Assessment Framework 2.0, functional Integrated Command and Control Centre, availability of master plan document, existing citizen portal, active smart cities website, and ongoing climate projects.

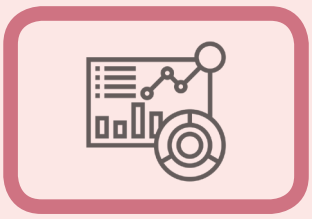
Nashik was selected for piloting the project as it passed all stages. Nestled at the Western Ghats foothills in the north-western Maharashtra region, Nashik is one of the state's fastest-growing tier II cities. The city is also known as Maharashtra's 'Spiritual capital' due to the presence of many pilgrimage destinations. It is also 'The Wine Capital of India' due to its rich vineyards and wineries. Large-scale industrialisation and the presence of agro-based industries have transformed Nashik from a traditional pilgrimage destination to a modern, vibrant city in the past two decades.

b. Project Development and Implementation



Project implementation strategy

c. Expected Outcomes



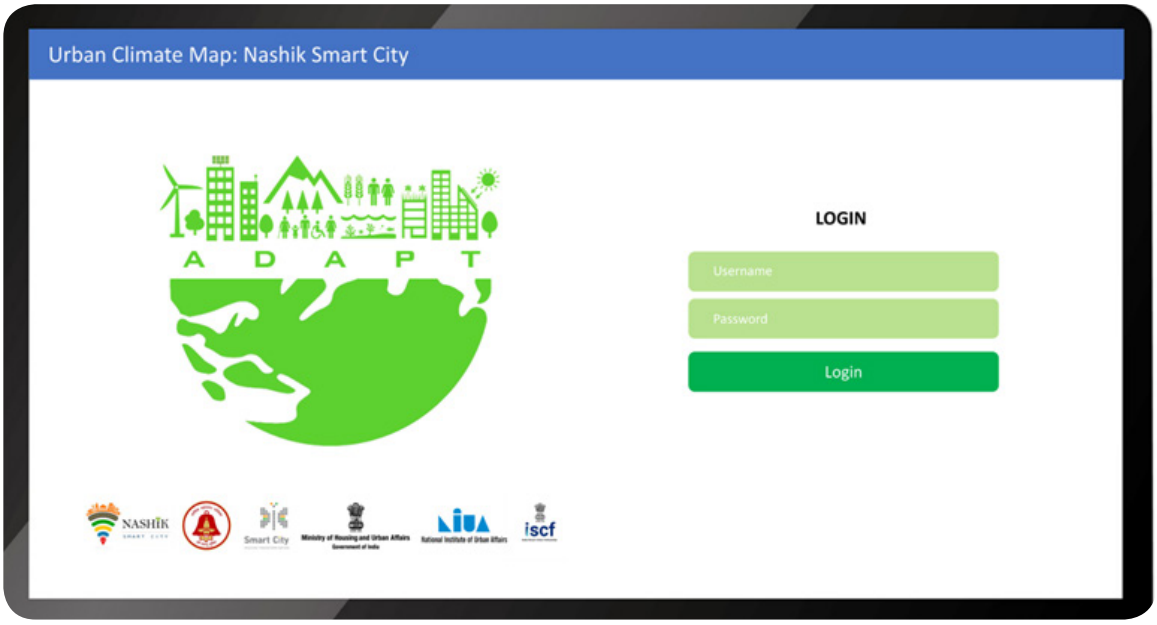
A. Dashboard (under Phase I)

The dashboard will be an extension of the existing portal of the city. It will contain information about the toolkit used, data collected, current microclimate zones in the city, and predicted future scenarios for comparative analysis. It will help ULBs to identify the areas in the city that are prone to climate change's effects and take necessary actions accordingly.

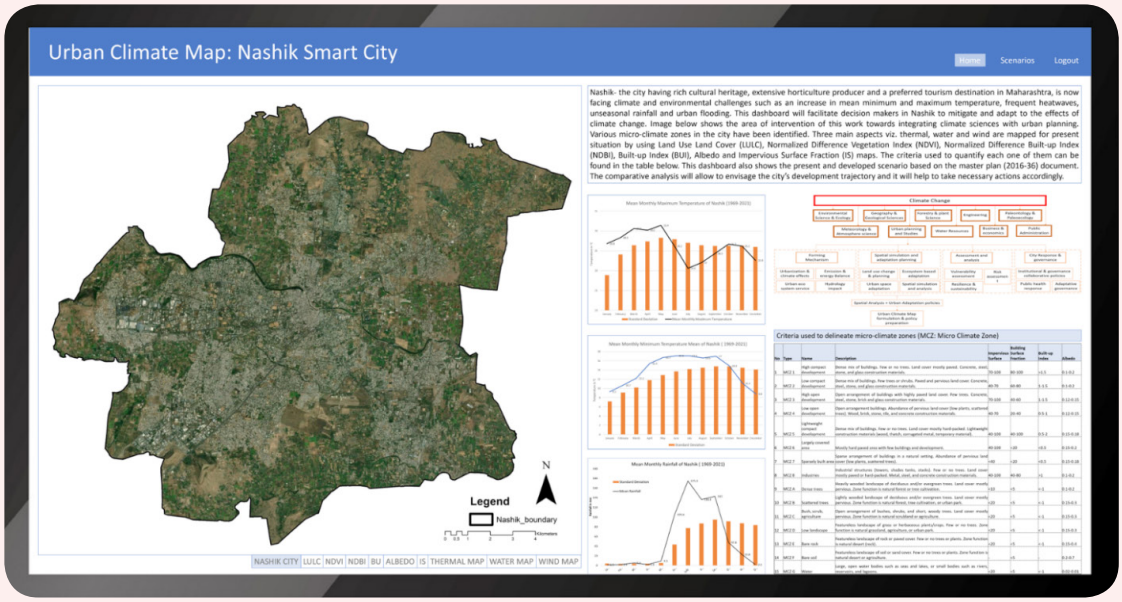
B. Webpage (under Phase II)

It will consist of gamification for awareness generation. This will let the users locate their buildings and, based on the pre-decided parameters, identify what actions they can undertake to combat the effects of climate change. It will consist of real-time calculation of the incentives for activities undertaken individually. There will be a provision for crowdsourcing the data from the citizens regarding public spaces or liminal spaces.

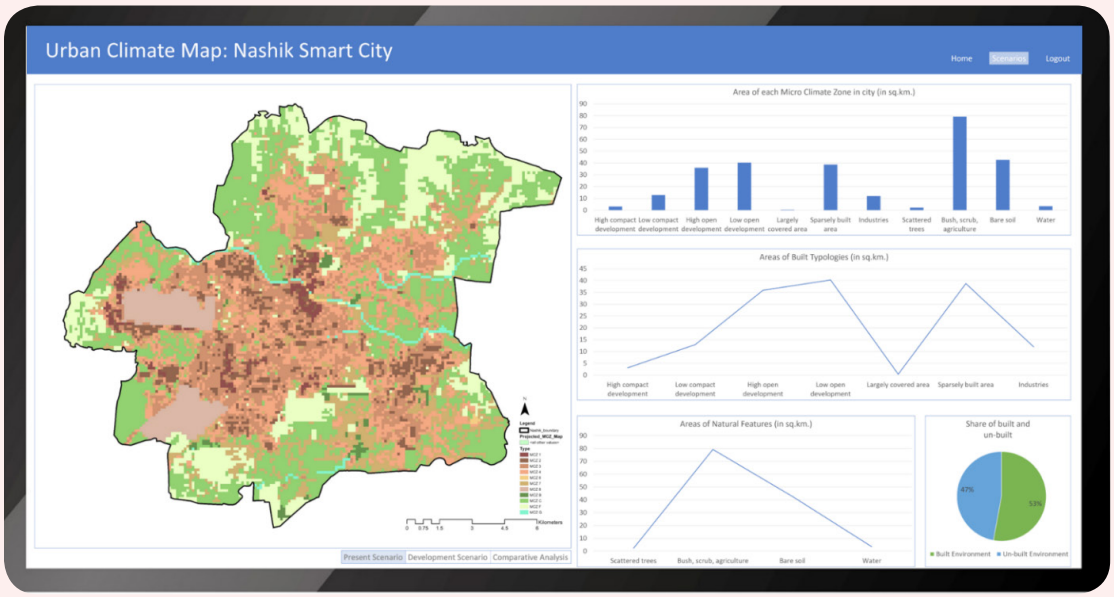
d. Actual Results



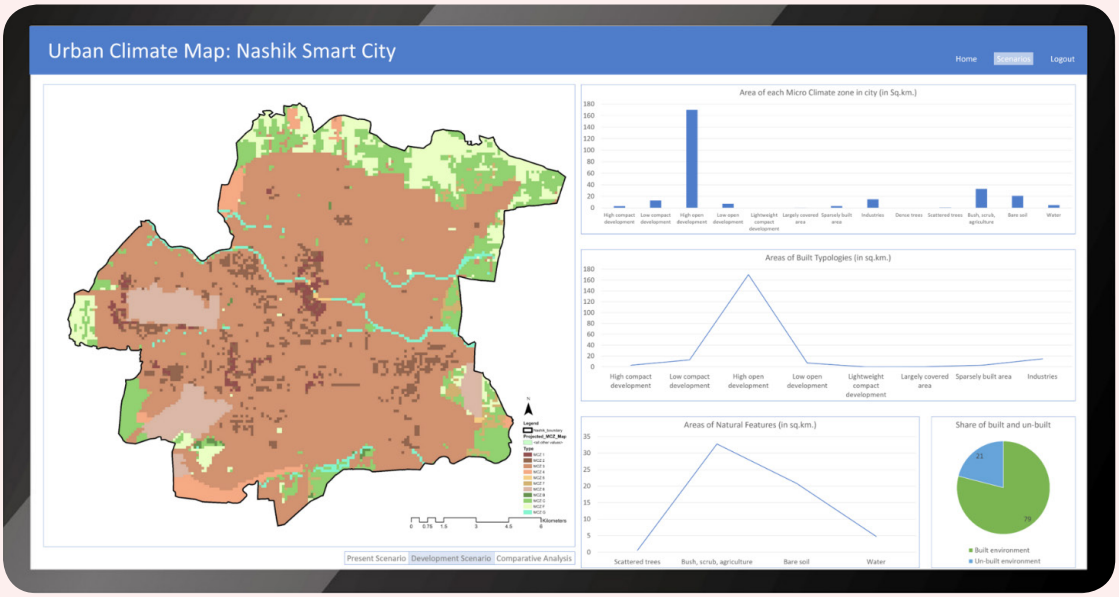
Login page of the dashboard



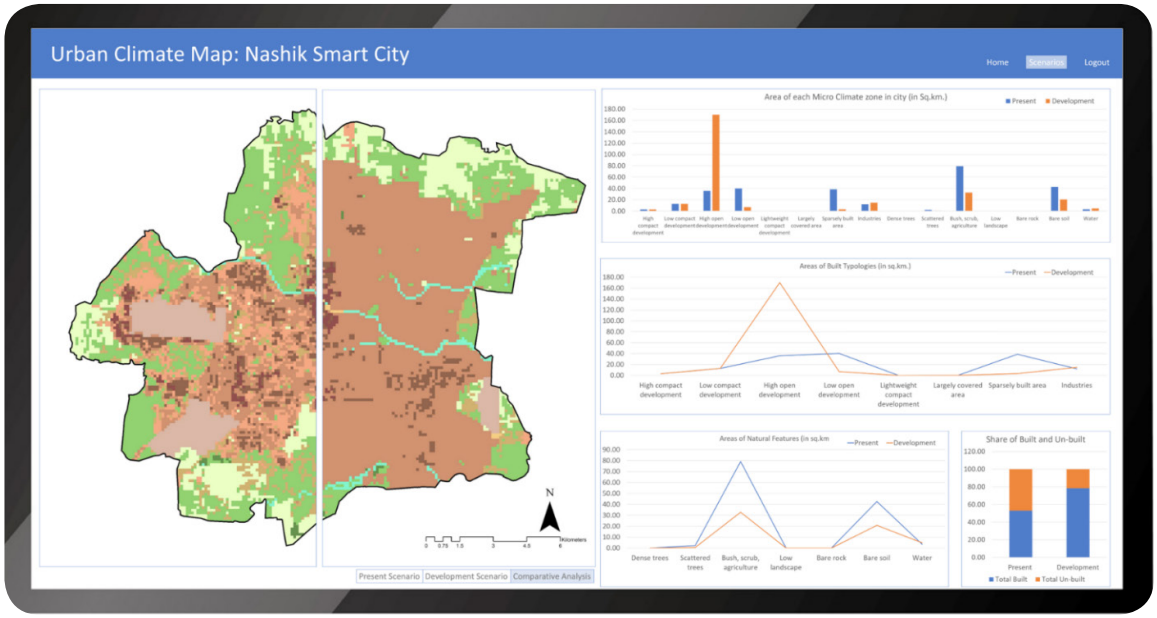
Home page of the dashboard



Scenario page showing 'Present Scenario' and other relevant data



'Development Scenario' view on the second page of the dashboard



'Comparative Analysis' view on the dashboard

05 Conclusion

This project attempts to address all the gaps identified from the literature review. The climate map will bridge the gap between urban planning and climatology at the zonal level and help city administrators take the required decisions. Local climate zones will enable planners and policymakers to understand the character of every zone within the city, its contribution, and vulnerability to climate change. The developed dashboard has the scope to add more layers. It can be scaled up to address any city-specific issue by integrating it along with the process of preparation of a micro-climate map. Preparing this map and using the data is very easy and can be replicated in any of the Indian cities. This product addresses the emerging need of the century, climate change, through urban planning, and a digital tool has been developed here, which will surely help to achieve desirable results.

Manoranjan Ghosh

Prasanna Bhangdia

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ASPIRE

Ward level competitiveness to enhance urban service delivery through localisation of SDGs

PIMPRI-CHINCHWAD

Pimpri-Chinchwad Municipal Corporation (PCMC)
Pimpri-Chinchwad Smart City Ltd (PCSCL)

GOVERNANCE

Municipal Performance | Ward wise Competitiveness

USERS

Urban Local Body
Citizens

In-WARDs Dashboard

Mobile and desktop compatibility
Online Mechanism

Milestones

Integration with PCMC Smart Sarathi

4 Months

Dashboard (Phase-1) is under development stage

Link

https://poc.diverjan.org/

Source: Akshay Ubale via Instagram

ASPIRE

IN-WARDs Dashboard

A platform for Ward level competitiveness to enhance urban service delivery

With the transformative goal of "leaving no one behind" as per the 2030 Agenda adopted by the U.N., ensuring inclusive and equitable distribution of urban services is imperative. Ward-level competitiveness extends a granular assessment of the local government bodies and, in the process, also creates scope for increasing transparency and promoting grassroots democracy. In-WARDs is a Geo-Spatial Dashboard for ward/ zone-level competitiveness to ensure better urban service delivery via the localisation of Sustainable Development Goals (S.D.G.s). Project In-WARDs entails the development of a statistical framework for assessing zones to evaluate the urban service delivery, visualised through a dashboard that features the zones' service delivery status and enables comparative analysis of multiple zones.

The project is co-created, developed, and piloted as an Open-Source Digital Product in association with Pimpri-Chinchwad Municipal Corporation (PCMC) and its SPV Pimpri-Chinchwad Smart City Limited (PCSCL). It has been ideated by the India Smart Cities Fellowship Program and now has been integrated as a part of P.C.M.C. Smart Sarathi, an interactive application of Pimpri Chinchwad city.

Source: Akshay Ubale via Instagram

01 Context

The Ward/Zone level assessment is carried out in phase 1 of the project under seven major urban themes: Urban Environment, Built Environment, Mobility & Transportation, WASH, Social and Economic aspects, Governance, and Innovation. To assess the above-mentioned urban issues at the granular level, the Ward-level Index for Service Evaluation (W.I.S.E.) Framework has been formulated for monitoring and tackling urban issues and enhancing their serviceability across the city. The WISE framework has adopted 38 indicators from the SDG Indicator Framework, Municipal Performance Index, Ease of Living Index, and Climate Smart Cities Assessment Framework, of which 12 have been used for the initial assessment.

Phase 2 of the project focuses on the Citizens' perception in terms of satisfaction with U.L.B. serviceability and the individual/ community S.D.G. local actions. The project entails citizens' engagement and measuring their efforts, which will act as a catalyst for the equitable distribution of resources and facilities.

This idea of evaluation will also bring forth the outcomes achieved by municipal bodies and provide citizens with crucial insights into the functioning of local bodies and build dialogue between stakeholders, thus enabling informed decision-making by various stakeholders for enhancing urban service delivery.

02 Problem Statement

Lack of mechanism to ensure the performance of service delivery by the ULBs at the ward level, which affects the city's sustainable development. The following issues were identified:

a. Inadequate mechanism to measure the performance of service delivery at the grass root level, like the ward.
b. Unexplored potential of urban competitiveness to enhance ward performance.
c. Lack of recognition for individual/ community level contribution to achievement of SDGs.

03 Objective of the Project

1. To develop a statistical framework for assessing wards based on SDG Indexing to evaluate urban service delivery.

2. To develop a dashboard that displays the wards' status and enables comparative analysis of urban services among different wards.

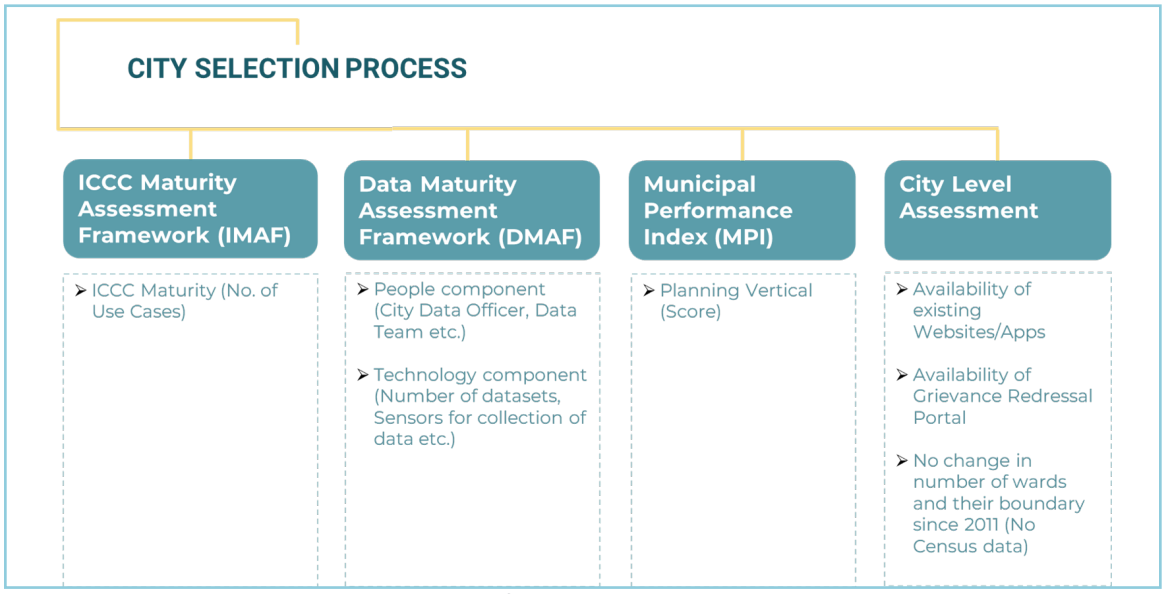
3. To engage various stakeholders in the process of prioritising the sectors to intervene to improve the wards' status.

04 Project Strategy

a. Pilot City Identification

The city selection process was based on the four criteria of the ICCC Maturity Assessment Framework (IMAF), Data Maturity Assessment Framework (DMAF), Municipal Performance Index (MPI), and City Level Assessment. The cities were shortlisted in a matrix where the criteria of number of use cases, number of data sets, score for the planning vertical, availability of existing websites/apps, availability of grievance redressal portal, availability of City Data officer and Data Team, and checking if there have been any changes in the number of wards and their boundaries since 2011.

Pimpri Chinchwad's very active data set, with the influence of Pune Smart City's initiative on Participatory Budgeting, led to selection of the city for piloting the project. After this process, top 10 cities were shortlisted based on an average score. Out of the listed ten cities, the city officials were contacted to enquire about the availability of the data sets, through which there were four cities for the final selection.



Criteria for Pilot City Selection

CITY SELECTION PROCESS

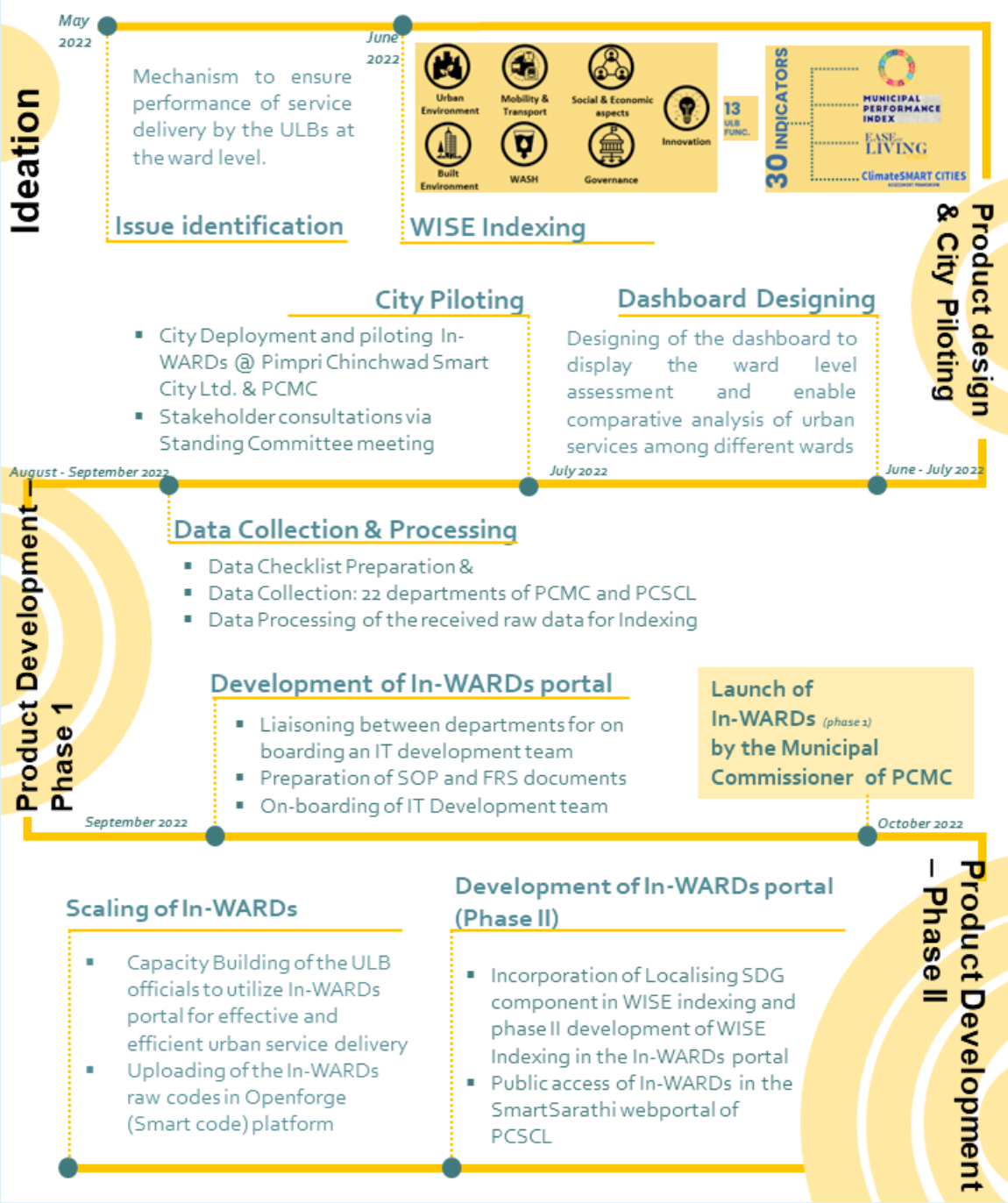
Sl. No.	Smart Cities	ICCC Maturity (No. of Use Cases)	ICCC Normalisation	DMAF - PEOPLE	DMAF - TECHNOLOGY	Scores in Planning vertical	Existing Websites / Apps	Average
1	Surat	6	27.27	100	68	68.64	100	**72.78**
2	Vishakhapatnam	22	100.00	35	45	71.81	100	**70.36**
3	Pune	5	22.73	80	74	67.47	100	**68.84**
4	Pimpri Chinchwad	4	18.18	90	60	62.99	100	**66.23**
5	Ahmedabad	12	54.55	65	50	58.46	100	**65.60**
6	Bhopal	4	18.18	90	51	67.9	100	**65.42**
7	Vadodara	12	54.55	50	45	63.44	100	**62.60**
8	Kakinada	4	18.18	95	45	54.16	100	**62.47**
9	Thane	10	45.45	65	53	39.16	100	**60.52**
10	Varanasi	6	27.27	55	60	50.53	100	**58.56**

City Criteria Matrix for selection

b. Project Development and Implementation

The project has been developed using PHP language for the backend and frontend development, with chart.js to integrate the geospatial and statistical components. The project's first phase has been developed by the MI Tech team of developers.
The project's first phase is hosted at the Integrated Command and Control Centre (ICCC) of PCSCL with the PMU teams and the assistance of PCMC's IT department. The project is hosted on a virtual machine within the ICCC unit and would be made an integral part of the city app and web portal 'PCMC Smart Sarathi' and is currently in the process of it.

The project is developed in collaboration with the Pimpri-Chinchwad Municipal Corporation (PCMC), Pimpri-Chinchwad Smart City Ltd (PCSCL), and a private firm named Marketing Intelligence Tech Pvt. Ltd (MI Tech).



c. Expected Outcomes

The project was conceptualised with certain envisioned outcomes that would enhance a city's existing governance structures and service delivery mechanisms. Some of the expected outcomes are listed below:

1. **Ward-level Assessment:** The Bottom-up approach of ward-level granular assessment of urban service delivery will provide first-hand knowledge about the strengths and weaknesses of the wards.

2. **Citizen Engagement:** The engagement of citizens and measurement of their efforts will act as a catalyst for inclusive development.

3. **Common Assessment Platform** Ward Competitiveness creates scope to examine, analyse and compare each ward across sectors by bringing them to a common assessment medium.

4. **Informed decision-making:** Indexing brings transparency about the ULB's performance and enables informed decision-making by various stakeholders for enhancing urban service delivery.

5. **Voluntary Local Review:** The 'local actions for SDGs' is another essential component for the Voluntary Local Review of the United Nations, and Pimpri-Chinchwad would be one of the pioneer cities to do so in India.

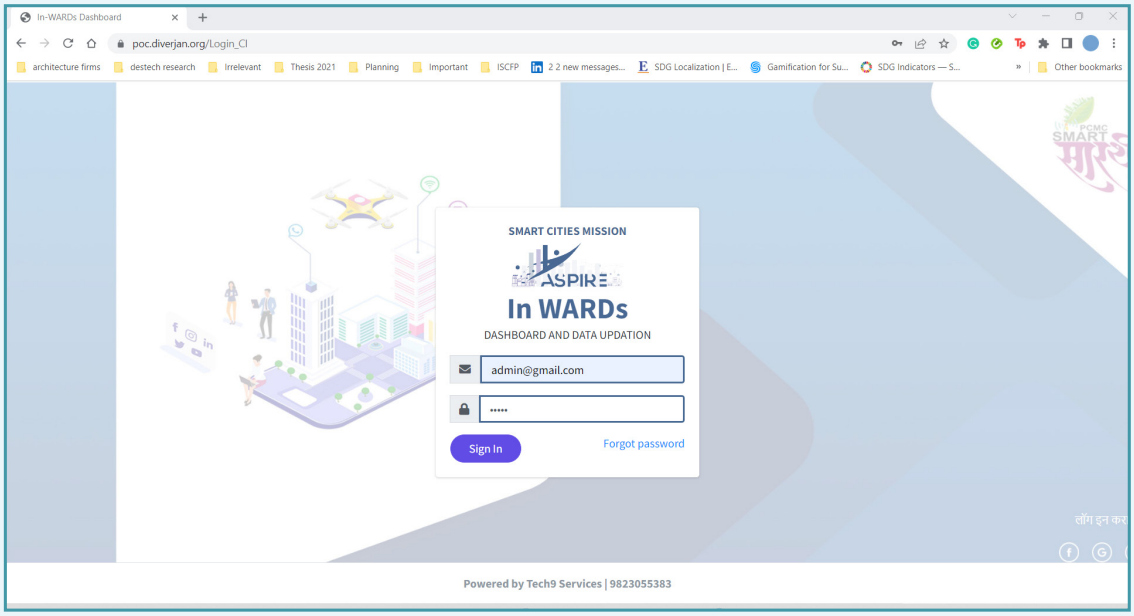
d. Actual Results

The project, as mentioned earlier, is divided into phases for ease of development and based on the two different user groups. While the project has been presented to the PCMC officials, it is yet to be grounded with capacity building to be at its core for the project to sustain and to be integrated as an integral part of the city's functioning and governance. The project's development, which the city officials will utilise, is partially completed with 12 of the 38 indicators developed in the portal with data collected from 22 departments of PCMC, and the rest is currently being developed.

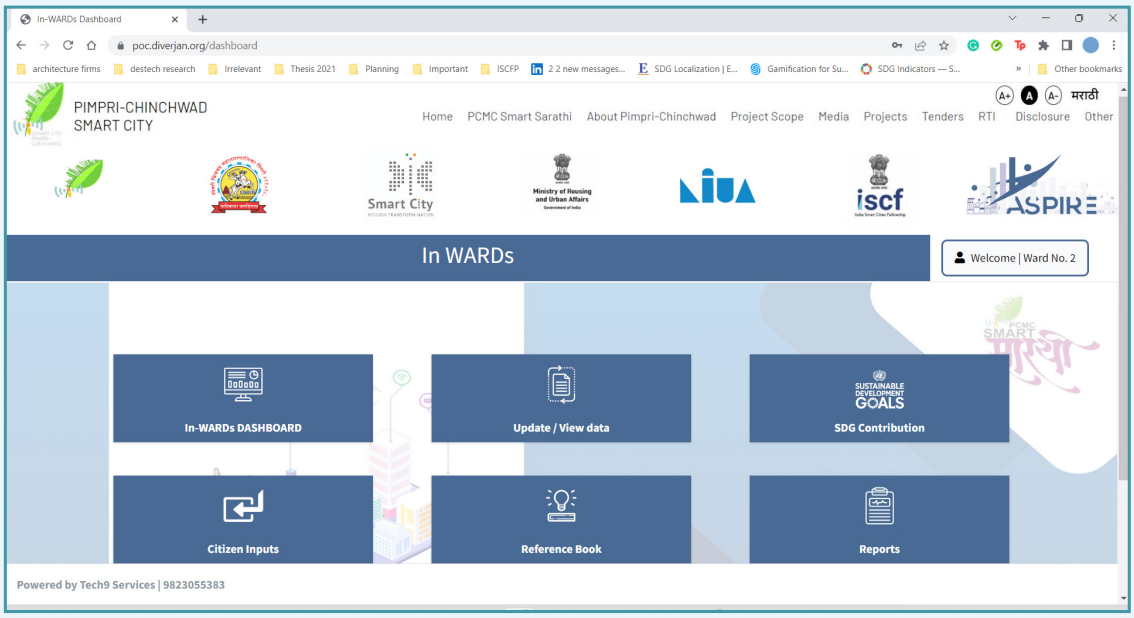
There are two main **user groups** for the product with role-based access system in place for:

1. **ULB officials**
2. **Citizens**

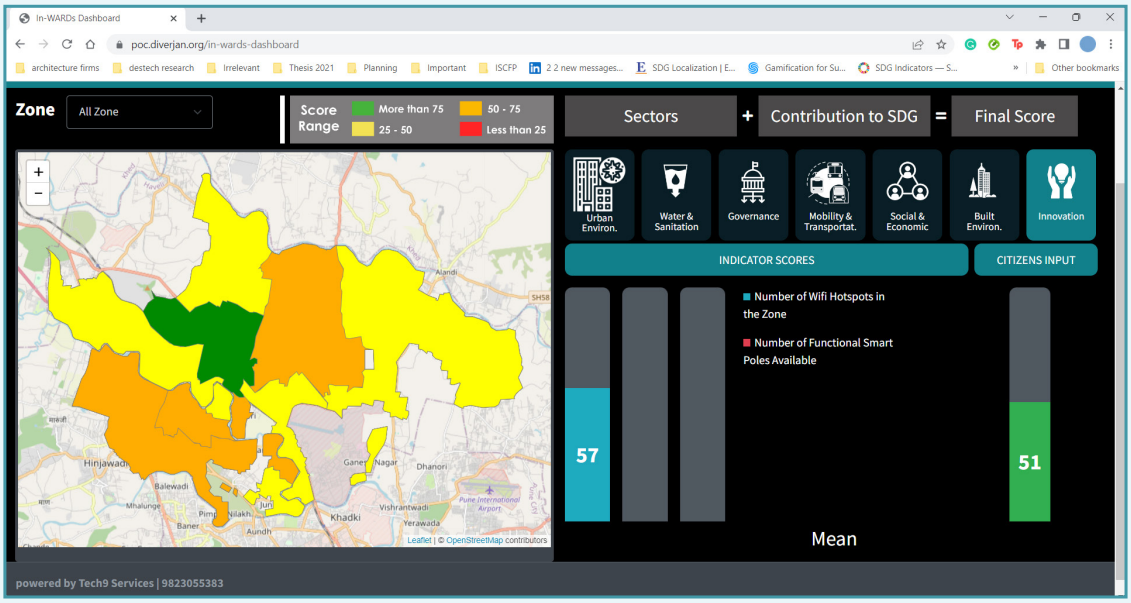
User 1: Admin - ULB Officials



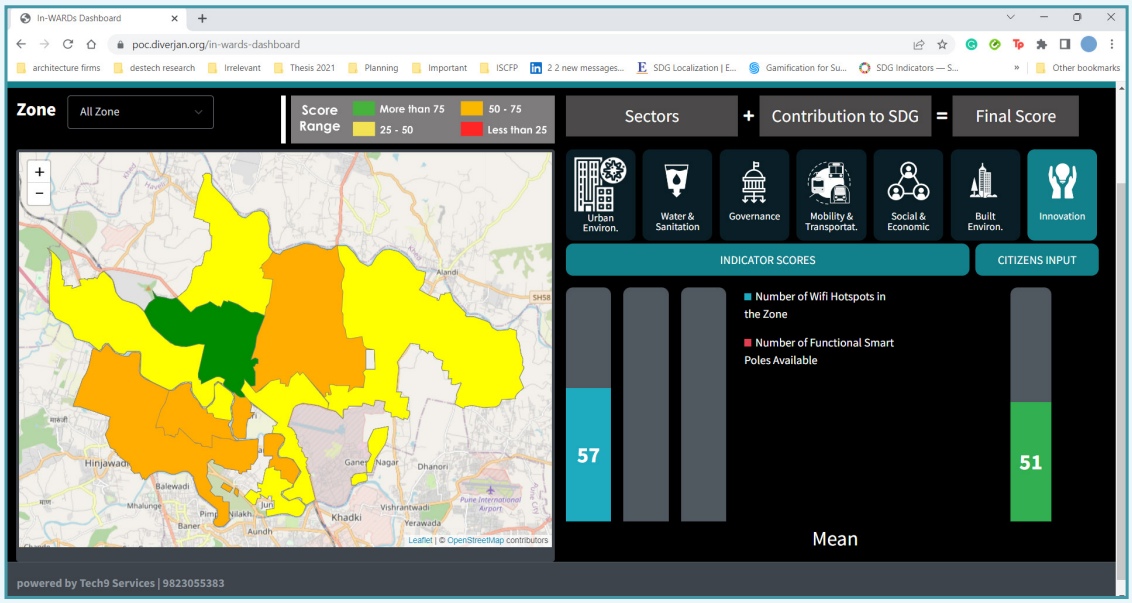
Admin Log in Page for ULB Officials



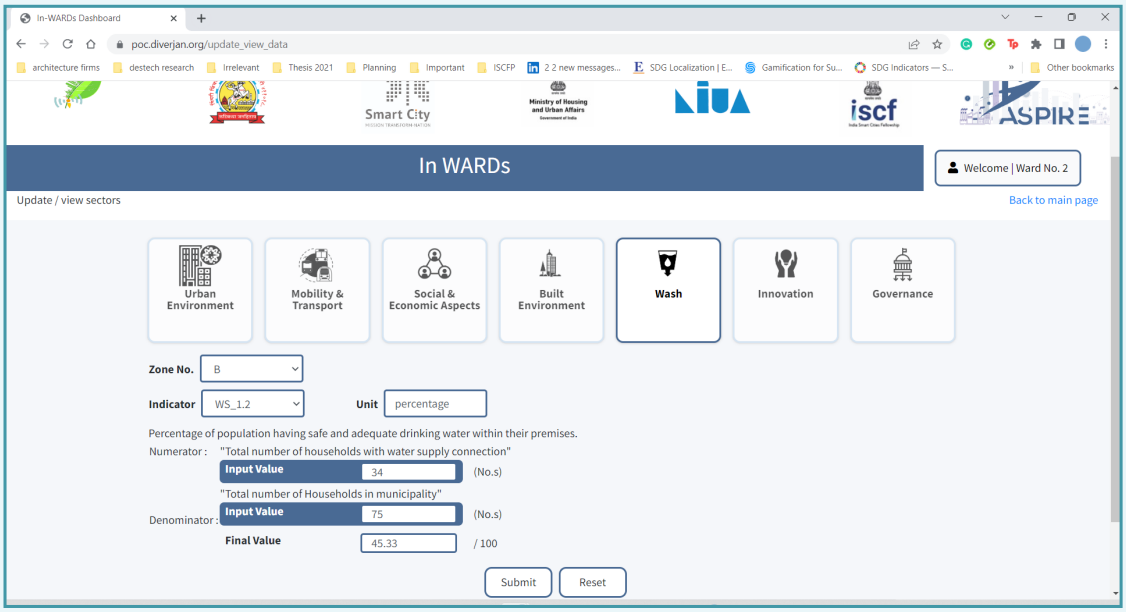
Landing page upon for ULB officials



In-WARDs dashboard showcasing the ward status based on WISE assessment



In-WARDs dashboard showcasing the ward status for one sector based on WISE assessment

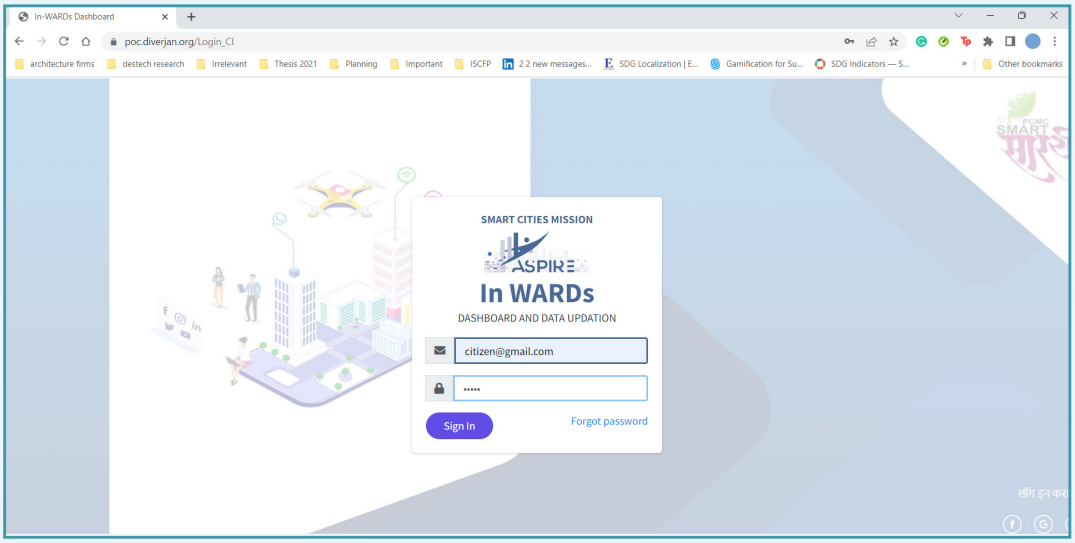


Data Input and Update Page

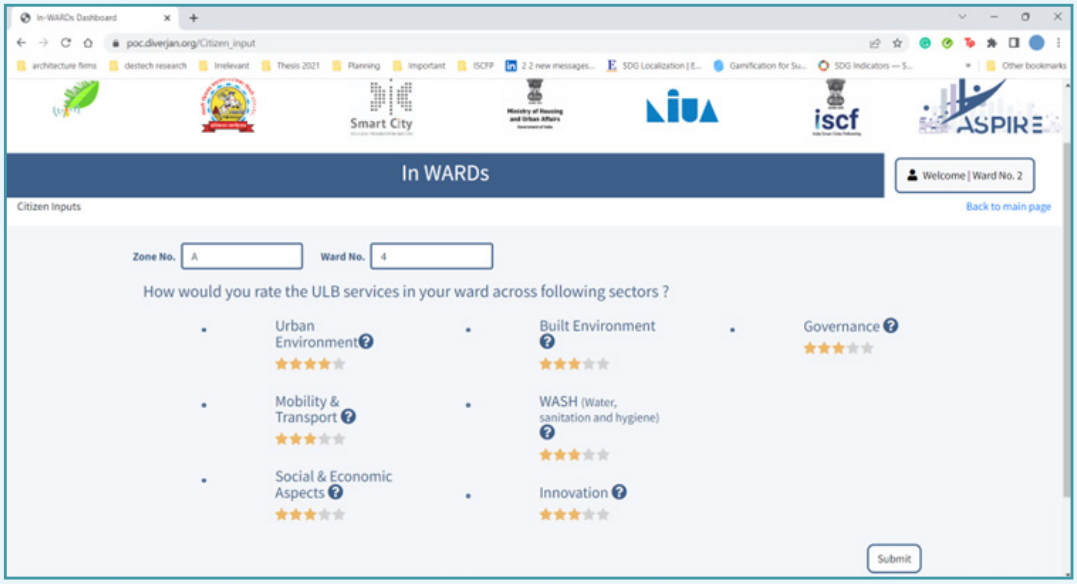
Zone No	Ward No	Urban Environment	Mobility & Transport	Social & Economic Aspects	Built Environment	Wash	Innovation	Governance
A	4	5/5	1/5	1/5	1/5	1/5	1/5	1/5
A	4	5/5	1/5	1/5	4/5	1/5	1/5	1/5
A	4	3/5	1/5	1/5	4/5	1/5	1/5	3/5
A	4	3/5	1/5	1/5	4/5	3/5	1/5	3/5
A	4	3/5	4/5	1/5	4/5	3/5	1/5	3/5
A	4	3/5	4/5	4/5	4/5	3/5	1/5	3/5

View Citizen Input Page

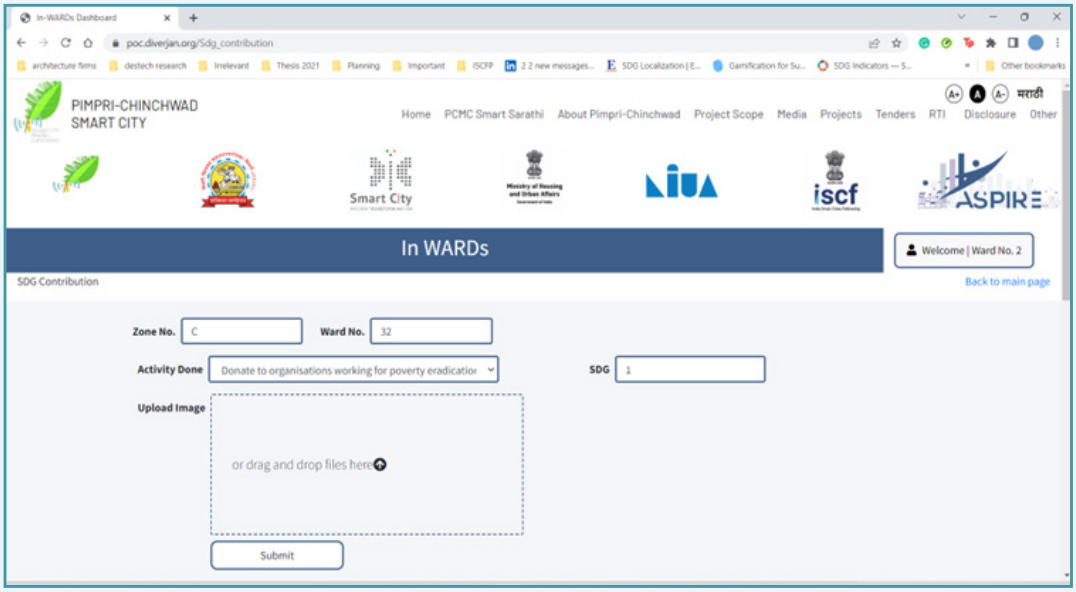
User 2: Citizens



Citizen Log in Page



Citizen Input page for ranking wards



SDG contribution page

05 Conclusion

The Ward-level Index for Service Evaluation (W.I.S.E.) Framework has adopted 38 indicators and has been framed for monitoring and tackling these urban issues and enhancing their serviceability across the city. The indicators and the framework are highly scalable depending upon the ward-level context-specific assessment and the required data availability. Only quantitative assessment is being made in this WISE; qualitative assessment, including the usability and popularity of the services, can be brought into this. Most of the standards are for only benchmark level comparison; to ensure spatial equity and inclusivity, coverage area analysis or population serving analysis can be carried out to identify the actual impact of the municipal services.

Since the project's inception, citizen input has been an important component, envisioned to be completed in the second phase of the project. The citizen input is vital since the city is willing to take it forward and incorporate it into the existing assessment framework offered by project In-WARDs. The grievances shared by citizens in the PCMC Smart Sarathi portal and city app are in the pipeline to be used as citizen inputs for ranking the sectors at the ward level using a machine learning model.

Additionally, the project recognises local SDG contributions and facilitates the evaluation of municipal serviceability. It can be rightly aligned with the intent of UN Voluntary Local Reviews. The project is envisioned for all the cities in India. Still, the pilot is associated with Pimpri-Chinchwad Municipal Corporation (PCMC) and its SPV Pimpri-Chinchwad Smart City Limited (PCSCL) to co-create, develop and pilot an open-source digital product. It has now has been integrated as a part of PCMC Smart Sarathi, an interactive application of Pimpri Chinchwad city.

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ASSET

Municipal asset management tool

KOCHI
Kochi Smart City
Kochi Municipal Corporation

GOVERNANCE | ECONOMY

USERS
Urban Local Body

m-ASSET
Web Application
Desktop Compatibility
Online Mechanism

4 Months
Dashboard is under development stage

ASSET

An Asset Management Tool for Urban Self Governance

Our cities are growing rapidly. However, the financial corpus of the Urban Local Governments (ULGs) has remained a source of concern even after enactment of the 74th Constitutional Amendment Act. Over the years, it has been seen that most of the time the focus has been more towards intergovernmental fiscal transfers to the ULGs, and one of the major areas which remained ignored is 'municipal asset management'. This absence of a total municipal asset management tool, not only, weakens the financial base of the city governments, but also, led to several hurdles while delivery of urban civic services.

Source: Sachin via Instagram

01 Context

Before city deployment, fellows of team asset went through extensive analysis of existing asset management systems and manuals across States (say Andhra Pradesh Municipal Asset Management Manual-2017) and ULGs, some existing SRS documents, and SWOT analysis of cities in terms of its interoperability with digital and smart asset management system. Post deployment in Kochi, the team went through comprehensive communication with CSML and KMC officials during the exercise of data collection and analysis. During that exercise fellows of team asset got to know about the existing manual system (Zone Wise Asset Registers of KMC), and partly decoded digital asset registers developed by IKM under 'Sachithra' (an asset management application of Kerala LSG department).

These factors helped team Asset to bring with a more comprehensive SRS document and outlay of m-Asset dashboard, which is having potential to assist KMC with providing one stop solution for mapping; managing and monitoring its assets with the help of 18 categories of forms and having unique feature of GIS enabled asset mapping and asset entering process.

02 Problem Statement

Asset management is becoming a more essential area of decision-making for municipal governments for strategic, operational, and financial reasons. In many countries, new expectations for better service provision, trends toward decentralised public sector administration in emerging economies, possible synergies, and changing roles in the public and private sectors are driving the need for better municipal resource management and accountability. Public trust depends on open and competent administration and reporting of public property resources. However, there has been widespread concern in many countries regarding real and prospective misuse, abuse, or corruption, particularly in relation to the misappropriation and disposition of public property.

Across municipal administration/urban local government, there is a lack of a systematic asset management tool. An effective asset management system can be implemented using technology to provide useful information to city managers and other stakeholders about a city's present and projected net worth and asset base. In absence of a holistic asset management system in place, the revenue, and financial bases of the Urban Local Governments (ULGs) weaken. This further disrupts the rendering of urban civic services and creates several hurdles during the entire life cycle of municipal assets starting from their mapping, managing and monitoring.

03 Objective of the Project

The primary objective of the m-Asset project is to empower urban local government (here Kochi Municipal Corporation/KMC) with providing a one stop smart systematic asset management portal for keeping record and track of all of their immovable (land, building, roads etc.) and movable assets (vehicles, street furniture etc.) along with GIS-enabled asset mapping features so that the corporation can not only have a proper checks and balance on O&M of its assets throughout their life-cycle, but also ensure effective and efficient delivery of urban civic services.
As it is a well-known fact that keeping record of manual asset registers is a hectic task for corporations, this smart asset management tool (m-Asset) can help the municipal authorities to come up with better city master plan and create avenues of investment as a long-term goal.

The objective of the Project is to develop a dashboard

1. Encompassing approx 16,700 + assets of Kochi Municipal Corporation
2. Spreaded across 74 Wards and 5 Zones
3. Through decoding those assets in 18 Forms under one management system i.e., m-ASSET.

04 Project Strategy

a. Pilot City Identification

Out of 100 smart cities, a total of 25 cities were selected based on the following parameters: Tier (Tier 2 and 3 were preferred), MPI ratings and Work done under AMRUT. Further out of the 25 cities, 10 were finalised based on the existing asset management system in place in the respective ULBs, state/city level asset plan or policy, Availability of balance sheet, asset registers, GIS maps, digital asset repository, etc. Of the 10 selected cities, NDMC, Thiruvananthapuram and Surat already had an Asset Management System in place for few of their assets, therefore the remaining 7 cities were proposed as prospective pilots for the project. After brainstorming and creating the secondary data repository, Kochi city was finalised.

Existing methods of Asset Management in Kochi:

Existing desktop based Asset Management application – 'Sachitra' developed in the year 2007 by Information State Mission (IKM) – an autonomous institution under Local Self Government Department, Government of Kerala. Digital output downloaded as reports but no data has been updated since 2013, further manual asset registers are being used till date, which shows the opportunity of intervention.

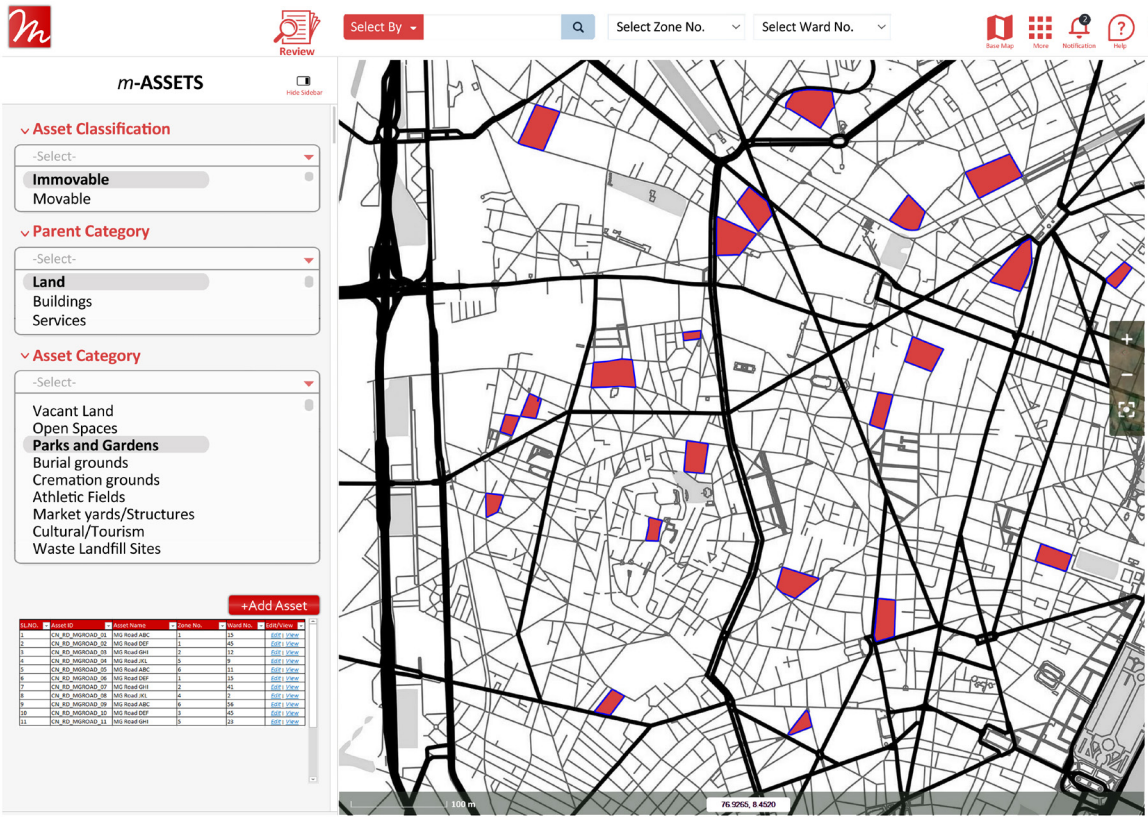
Budget allocation for Asset Management in the annual budget of KMC, 2021-2022:

Supervision of immovable and movable properties, survey of all KMC properties using modern technical systems. A plan for the renovation of all the buildings owned by the KMC will be prepared and implemented. Assistance of expert agencies will be sought for implementation of the project. Ten Lakh rupees will be earmarked for the project this financial year.

b. Project Development and Implementation

Project Development Strategy

c. Expected Outcomes



View of the dashboard

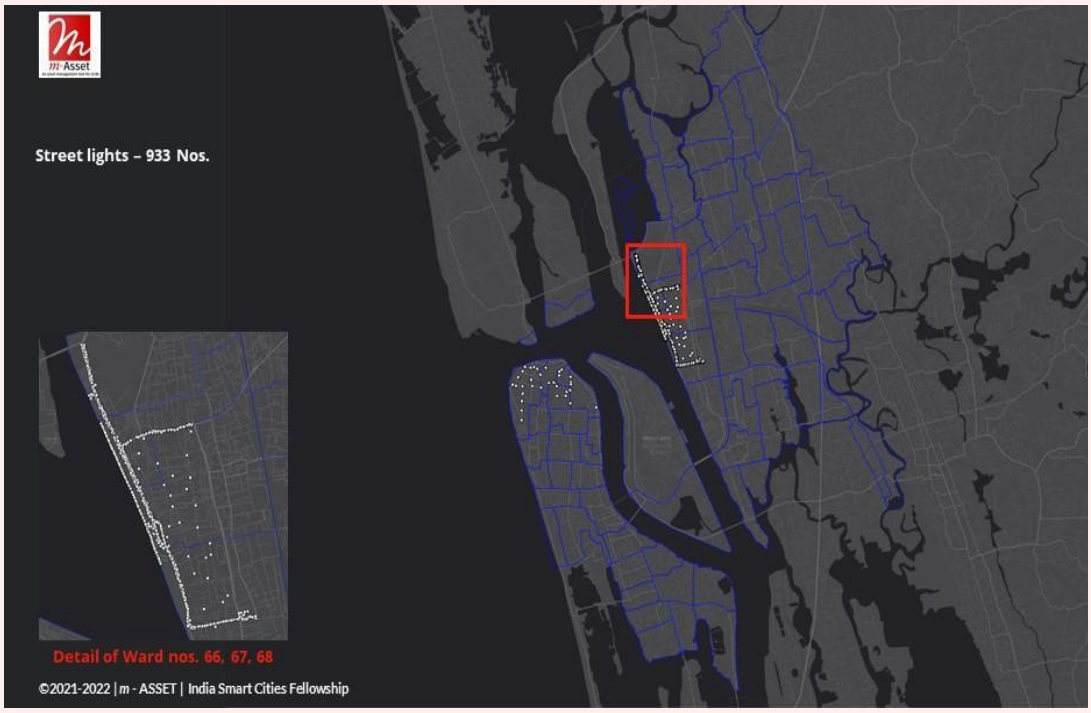
By categorising all the assets, final output will look like this where all the assets will be geotagged and the information of each asset will be highlighted (general detail, location detail, asset detail, asset cost detail and asset status detail).

d. Actual Results

View of identified vacant lands on dashboard

View of roads, streets, and lanes mapped

View of Electricity (DTR) for selected wards on the dashboard



View of streetlights mapped

Asset details documented in excel form:

286
Land

424
Buildings

5100
Roads

2980
Advertisement Spots

158
Vehicles

Asset Register - Form 17 - Vehicles

General Detail						Asset Details				Asset Cost Details							Additional Details											
																		If CWIP, then										
Serial No	Book Page Ref	Asset ID	Asset Category Type	Asset Name	Department	Description	Parking location	Registration Number	Engine Number	Chassis Number	Date of Acquisition	Acquired from/Source agency	Mode of acquisition	Acquisition Cost (Rs)	Vehicle improvement cost (if any) Rs.	Total cost (in Rs.)	Present Market Value (in Rs.)	Asset Status	Work order number	Year of Sanction	Project Cost (estimated) in Rs	Income of Funding	Source of Funding	Attach Document	Asset Photographs	Asset Videos	Remarks
139	10		BOLERO			Town Planning Committee- Sanalmon		KL-07-CJ-3042		MAHINDRA	14 December 2016																	In running condition
140	11		BOLERO			Works Committee (Sunitha Dixon)		KL-07-CK-8424		MAHINDRA	10 May 2017																	Running
141	12		CAR			EE (Sreshe)		KL-07-BQ-2109		HYUNDAI VERNA	05 January 2011																	Running
142	13		CAR			Kochi Corporation, Official Vehicle of ADDL		KL-07-BM-6436		MARUTHI SWIFT DEZIRE	15 December 2009																	Running
143	14		CAR			EE (Ambily)		KL-07-CB-1516		SWIFT DEZIRE	21 December 2014																	Running
144	15		CAR			SE		KL-07-CN-7586		MARUTHI SWIFT DEZIRE	26 April 2016																	Running
145	16		BOLERO			Welfare Committee (Sheeba Lal)		KL-07-CN-3574		MAHINDRA	13 February 2016																	Not Running, Estimate Stage
146	17		JEEP			Not in Use		KL-07-W-6967		MARSHAL	06 May 1995																	Auctioned
147	18		JEEP			AEE Pturuthy		KL-07-BN-4164		MAHINDRA 550	04 May 2010																	Running
148	19		JEEP			AEE E dapally		KL-07-BN-4036		MAHINDRA 550	04 May 2010																	Running
149	20		JEEP			AEE Fort Kochi		KL-07-BN-4151		MAHINDRA 550	04 May 2010																	Running
150	21		JEEP			AEE Vyttila		KL-07-BN-4180		MAHINDRA 550	04 May 2010																	Running
151	22		JEEP			PO		KL-07-BN-4119		MAHINDRA 550	04 May 2010																	Running
153	23		JEEP			Council		KL-07-V-5791		MAHINDRA	02 December 1998																	Auctioned
154	24		SUMO			Not in Use		KL-07-W-6973		TATA SUMO	06 May 1995																	Placed for auction
155	25		MARUTI VAN			Kochi Corporation, Palliative Care (Edapally Govt. Hospital)		KL-07-BY-6230		OMNI	06 September 2010																	Running
156	26		MARUTI VAN			Kochi Corporation, Palliative Care (Karuvelippadi Hospital, Thoppumpadi)		KL-07-BZ-3828		OMNI	17 January 2014																	Running
157	27		MARUTI VAN			Kochi Corporation, Ambulance (Pallurutht				OMNI	29 August 2008																	Running

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Asset details documented

So at present, approx.

16,700+

asset details have been partially captured across 18 classifications

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View of total assets mapped for the selected wards

05 Conclusion

In the proposed m-Asset tool, the asset classification has been based on the actionability of the assets after due diligence of various existing modules of asset management of various cities. The other possible classification can range from public infrastructure and civic amenities, natural assets, utility assets, service delivery institutions and related assets etc. The tool can be further utilised for identifying assets that require improvement but check on the remarks section of the asset page or through the downloaded reports. The system also has an option for marking the asset as CWIP – Current work in progress. Further the m-Asset system in future holds the potential of solving any queries raised through the existing grievance redressal system by integrating it.
This asset management tool in terms of its replicability can be a game-changer in municipal finance and online governance, the very reason; the authority has shown interest to develop this as the 10th Module of UPYOG Platform. The tool has a potential for providing a one stop solution for mapping, managing and monitoring of the assets under the ULGs.

ASSET MANAGEMENT TOOL


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BIOME

Towards sustainable and resilient cities

| Product
| City
| Sector
| UserGroups
| Features
| TimeFrame
| More Info

RAIPUR
Raipur Smart City
Raipur Nagar Nigam

ENVIRONMENT
Resilient city | Sustainable city

USERS
Urban Local Body
Citizens

Mor Talaab dashboard
Desktop compatibility
Online mechanism

4 Months
Phase 1 is developed, hosted and live in the Raipur Smart City Application

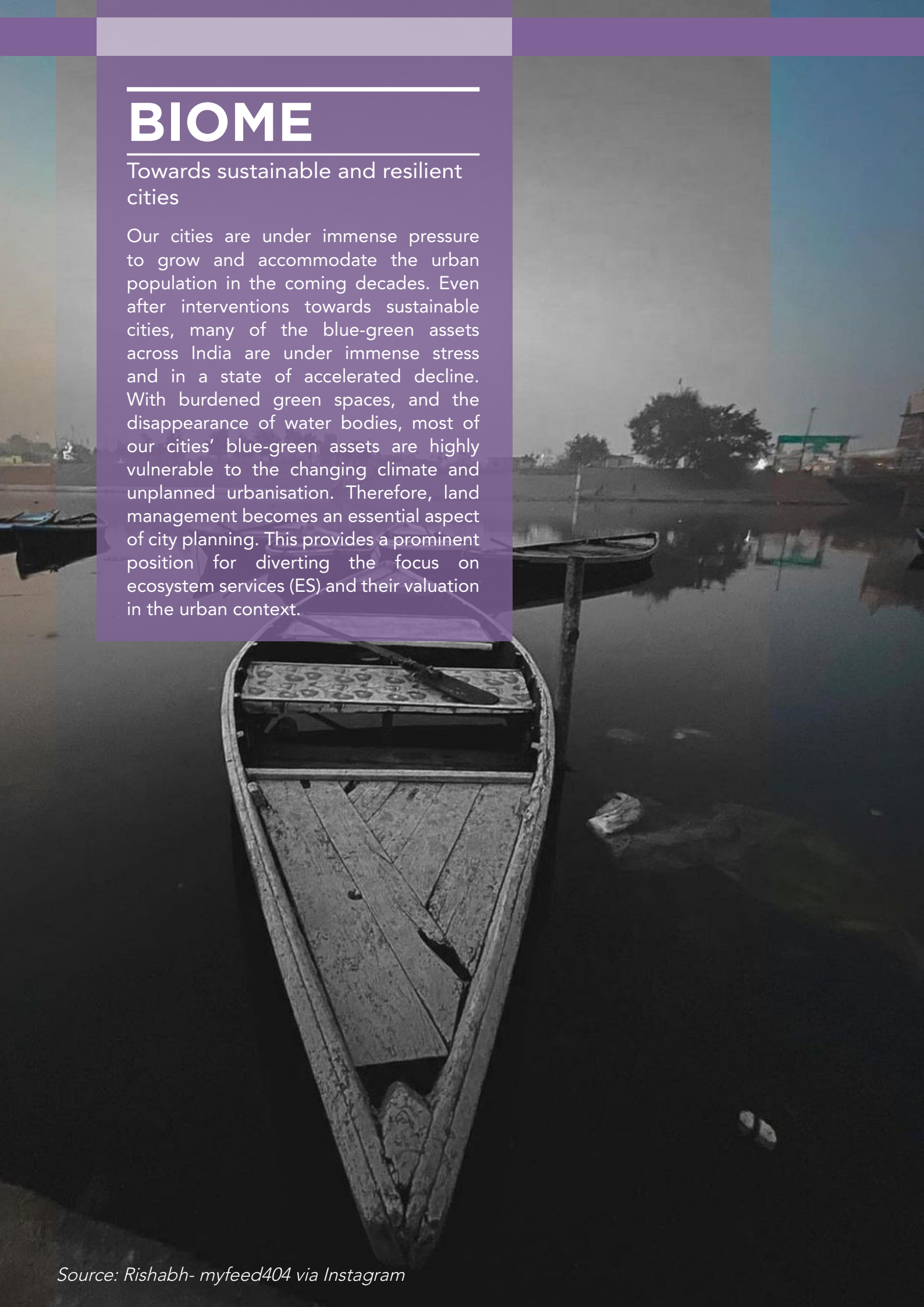
Link
https://municipal-project.000webhostapp.com

Source: Anzaar Nabi via Instagram

BIOME

Towards sustainable and resilient cities

Our cities are under immense pressure to grow and accommodate the urban population in the coming decades. Even after interventions towards sustainable cities, many of the blue-green assets across India are under immense stress and in a state of accelerated decline. With burdened green spaces, and the disappearance of water bodies, most of our cities' blue-green assets are highly vulnerable to the changing climate and unplanned urbanisation. Therefore, land management becomes an essential aspect of city planning. This provides a prominent position for diverting the focus on ecosystem services (ES) and their valuation in the urban context.



Source: Rishabh- myfeed404 via Instagram

01 Context

The Ecosystem Services approach is necessary as it helps create a stock of the services provided by natural resources for human societies. The approach and tangible impacts also include non-tangible aspects, which are often invisible or neglected.
The toolkit developed is to help identify the Ecosystem Service provided by the lakes in urban areas based on the change in functions of the waterbody with urban interventions. This will help determine the multiple functions provided to help make better decisions concerning the conservation of natural resources in urban areas. The services provided by the lakes can also be enhanced based on the understanding of the present context.

02 Problem Statement

The lack of information regarding the services provided by natural resources results in urban development incongruous with local natural ecosystems leading to increased disaster risks.
Urban Local Bodies invest directly in rejuvenating water bodies in the city. There is a lack of a holistic mechanism to understand these interventions' impacts on existing ecosystem services.

03 Objective of the Project

The project aims for more sustainable development at the city scale. This can be achieved through mainstreaming the identification of ecosystem services for interventions around natural resources. The identified project is to develop a toolkit that will help in the decision-making of urban local bodies regarding ecosystem services to be promoted for natural resources. The toolkit based on information will help produce the extensive list of ecosystem services provided. The decision-makers can then decide on ecosystem services as essential and desirable services to help identify the interventions to be undertaken based on identified services.
Firstly, it is crucial to have a robust data collection system in place for creating a database to understand the trends in the natural resources with interventions undertaken. The collected information on the surveyed natural resources (lakes in this case) will help draw recommendations for the lakes with the gathered information. The identified recommendations will help us categorize the required interventions for each ecosystem service. This database can be created for more and more lakes each year. The gathered information on lakes of different functionality and geography will help us understand condition-specific trends. This is necessary to develop a predictive model to identify trends in ecosystem services for the lakes not surveyed and provide design recommendations based on the information provided.

04 Project Strategy

a. Pilot City Identification

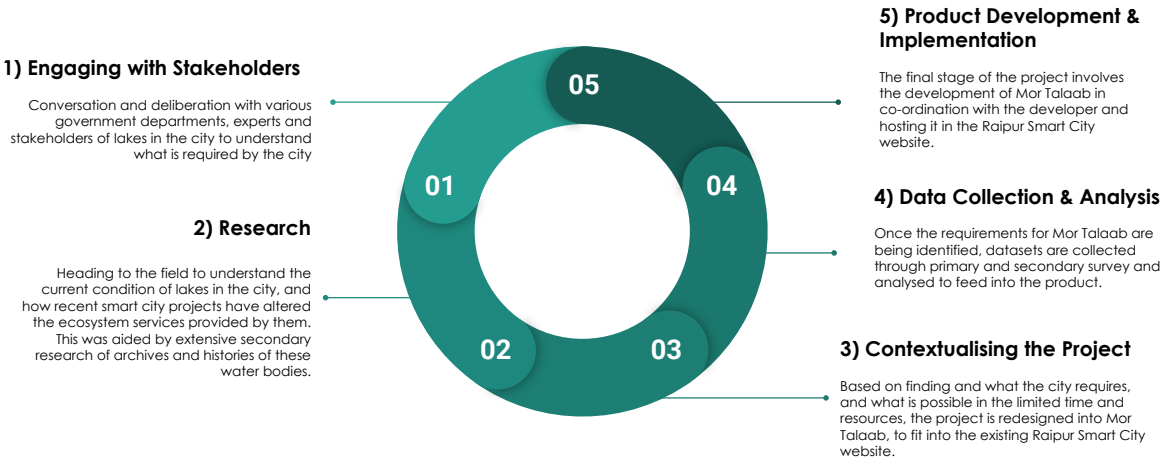
The study concentrates on the ecosystem services offered by natural resources. The smart cities are applicable to urban contexts, which often have limited natural resources. The primary form of natural resources in urban contexts are parks and lakes. While designing the methodology for the study, it was realised that scoping in terms of one type of natural resource is critical due to the limited time frame.

As per our experience, parks are often landscaped and perform limited ecosystem services. Hence the urban lakes, often neglected in an urban context, were identified as the study area. The smart cities with lakes as dominating natural resources were identified. The other method of identifying pilot cities was based on the maximum number of smart city projects on urban lakes and the versatility in the nature of projects.

As per the indicators identified, the city of Raipur was selected as a pilot study. The smart city of Raipur is situated in the central part of the Indian subcontinent.

The city of Raipur has more than one hundred and twenty lakes. The smart city has 373 completed projects under the Smart Cities Mission, of which 82 are directly related to urban lakes. Based on the context, the lakes in the city serve different ecosystem services. The methodology recognises the various categories of lakes for inferences and recommendations.

b. Project Development and Implementation



3-stage maturity approach: Pre-pilot | Pilot | Post-Pilot.

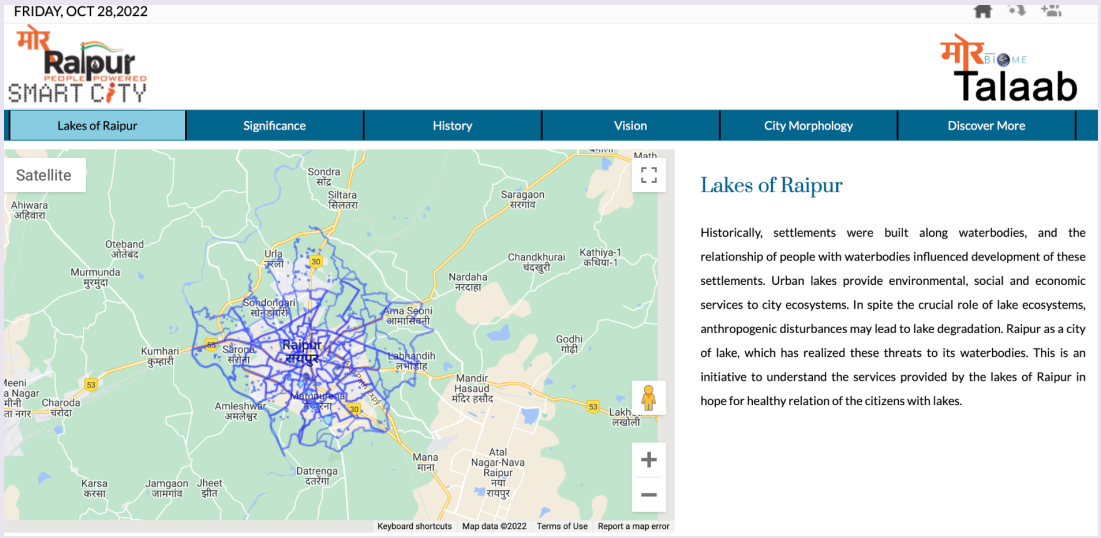
c. Expected Outcomes

INPUT	ACTIVITIES	OUTPUT	OUTCOMES	IMPACT
Data collected (primary + secondary), interface design, Web developer,	Website for information dissemination and feedback collection on ecosystem services of lakes in urban context	Information collection on ecosystem services of the urban lakes, information on concerns regarding lakes based on feedback	Understanding on the trends of ecosystem services in urban lakes based on context, activities, interventions taken, etc.	Enhance utility of the lake for citizens
Data analysis	Toolkit to provide recommendations for the surveyed lakes based on major functions	Priority wise design interventions for the lakes to enhance the crucial ecosystem services in the urban context	Preservation of lakes (natural resources) with efficient utilisation of resources for development as green infrastructure	Sustainable urban development and increased utility of natural resources
Data collection over time, data analysis	To understand the trend in ecosystem services based on interventions undertaken	Understand long term impact of interventions taken	Better functioning of green infrastructure to enhance utility	Sustainable urban development and increased utility of natural resources
Data trends, web developer,	Predictive model to identify trends in ecosystem services and provide design recommendations based on information provided	more nature based design of the city for sustainable development		Sustainable urban development, better decision making for natural resources

d. Actual Results

As discussed in the last section, to develop the predictive model for ecosystem services, the data over a while is required to be collected to understand the trends in development. In initial interactions with the urban local bodies, it was realised that there are data gaps in the available information required to develop the tool. In the study's first phase, a tool to collect information is needed. This digital platform is hosted on the Raipur Nagar Nigam and Smart City website, which will help collect data and disseminate information.

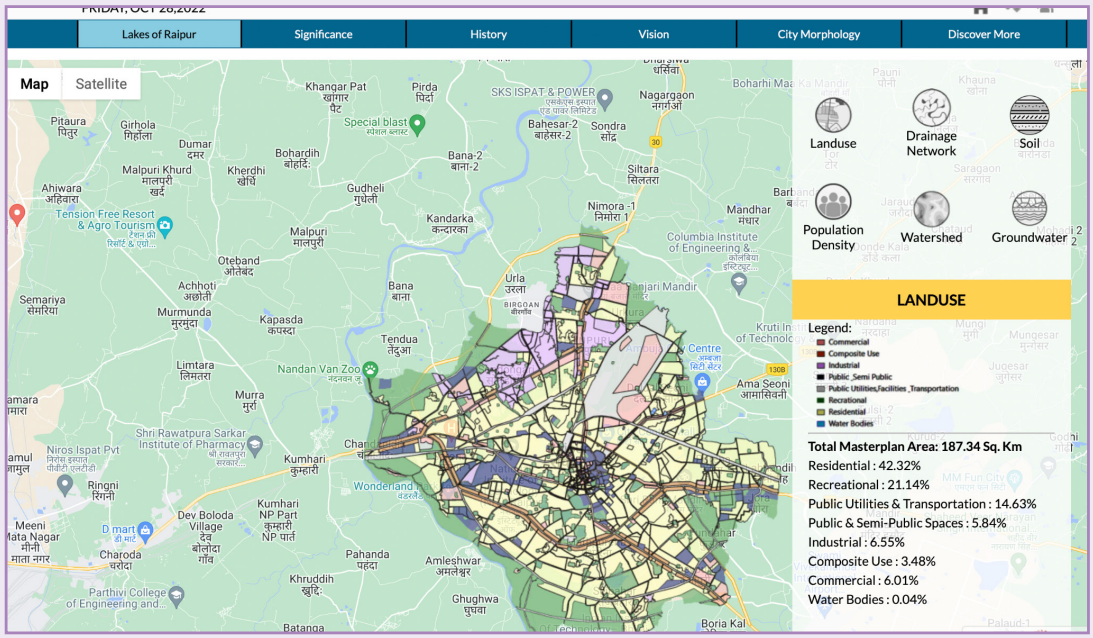
The platform introduced the lakes of Raipur with basic information and the activities around the lakes. The platform identifies the ecosystem services provided by the lakes and collects feedback from the citizens. The platform will also offer recommendations for major lake types identified in the city based on the major ecosystem services provided. The website details data at two levels, the city level and the urban lake level. The following series of figures showcase the city-level information.



Home page, introduction to lakes of Raipur

"With development of its lakes, Raipur works toward its vision of clean and healthy city with inclusive development"

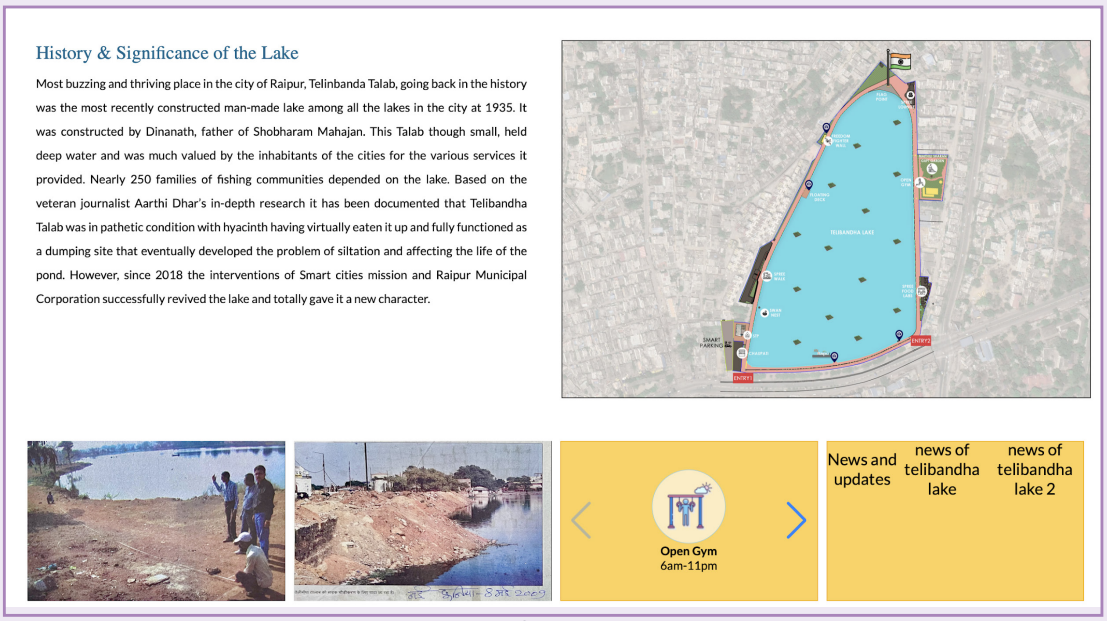
Vision of city governance for the city



City level spatial data representation

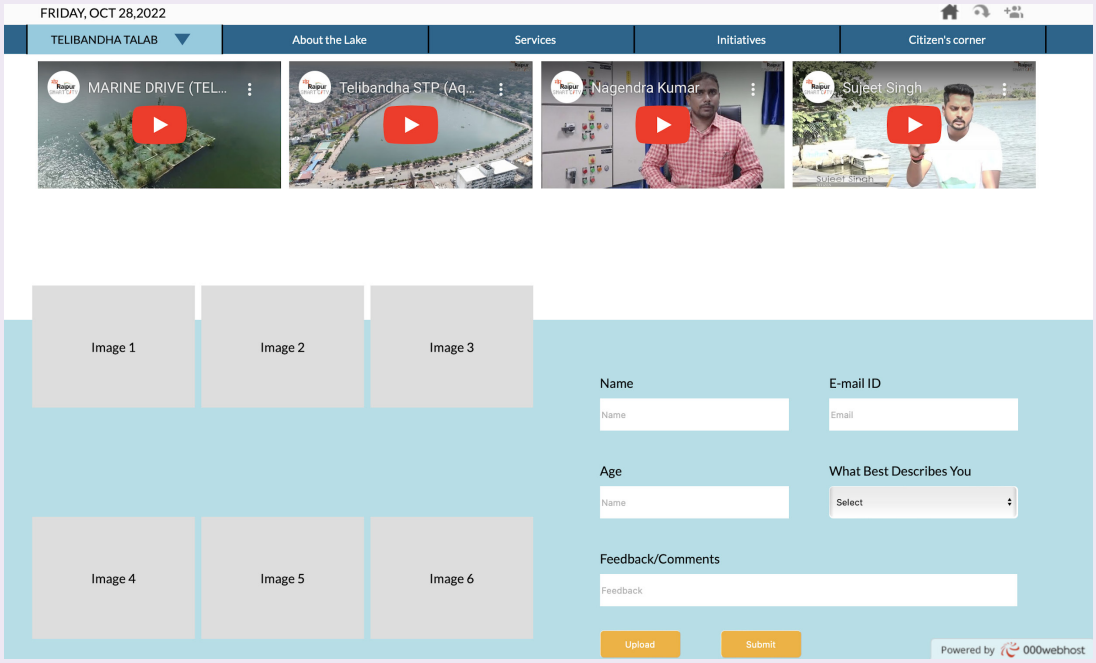
Recommendation for lakes in Raipur

The city-level information is to introduce the lakes of Raipur to the citizens, along with an interactive map of the city with lakes. The platform details the city's history and how the city evolved, and lakes were urbanised in the city. The platform also creates awareness about the projects undertaken by the smart city. The citizens are also introduced to the city's spatial representation and natural resources. The city page ends with the recommendations for the lakes as identified from the study. The images below are the pages dedicated to each lake in Raipur.



History of the lake detailed

Ecosystem services information as collected from primary survey



Lake related feedback

At lake level, the information in relation to the history of the lakes followed by the detailed information about the ecosystem services as obtained through surveys are shared.

e. Link to the Tool

https://municipal-project.000webhostapp.com

05 Conclusion

The project is hopeful to aid more sustainable development at the city level. The project focuses on municipal bodies as primary toolkit users to strengthen decision-making for a more nature-based development. Team Biome has prepared the toolkit for urban lakes in central India. This can be scaled to cover different geographies and lakes serving different functions in urban areas. The project's methodology can also be used to develop a toolkit for other natural resources. It is realised that approx. 25 percent of the total smart city interventions are about natural resources where the toolkit can be applied.

BIOME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CONNECT

A plug-in to leverage Integrated Command and Control Centre (ICCC) based systems to solve complex urban issues

SURAT
Surat Smart City
Surat Municipal Corporation

GOVERNANCE
Inter-department co-ordination and leverage ICCC

USERS
Urban Local Body
Citizen

Flood Rehabilitation Dashboard
Mobile and Desktop compatibility
Online Mechanism

4 Months
Phase 1 is developed and Phase 2 is under development

Link
https://office.suratmunicipal.org/DisasterManagementSystemweb#

Source: Surat_city_05 via Instagram

CONNECT

A plugin to leverage ICCC based systems to solve complex urban issues using citizen and cross departmental collaboration

Cities worldwide are striving to solve urgent issues like security, non-inclusivity, rising inequities, food security, unemployment, liveability, and climate change. However, the complexity of these issues cuts horizontally across the conventional hierarchies of organisation and urban governance. It asks for a systemic approach to understand, analyse and address the issue in an interconnected manner. The typical vertical structuring of departments - the siloed functional culture - not only makes the approach to these issues convolute but also relegates the citizens from being the city's drivers to those being driven.

Source: Sourabh Chhabra, via Instagram

01 Context

In India, the lack of interdepartmental management and coordination between the layers of governance and the citizens leads to undermining all stakeholders' ability and potential to contribute towards critical city functions. Departments working in silos lack the holistic vision and collaborative abilities required to address complex interconnected urban issues. The urban solutions implemented unidirectionally end up creating even more significant systemic problems. Furthermore, there is the absence of a real-time dialogue between the departments and the citizens beyond matters of grievance redressal. In conjunction, these handicaps may lead to a lack of city-specific 'smartness' that is responsive to the local geography, ecological setting, climate, and culturally unique attributes.
Therefore, Team Connect aims to create an ICCC-driven communication system that will enable horizontal inter-departmental management and a proactive vision shaped by the citizens in a bottom-up manner - leading to holistic, context-driven solutions around urgent urban themes.

02 Problem Statement

Nearly 56% of Indian smart cities are prone to flooding, as per a report published by SEEDS and the Centre for Research on the Epidemiology of Disasters (CRED) in 2018. As per World Bank, India accounts for 1/5th of global deaths from floods. Most Indian cities have multiple departments working on different aspects of water management, such as supply, drainage, and wastewater treatment. The demarcation in duties and responsibilities of these departments often creates enormous gaps in managing the system as a whole. Data available is in silos and often cannot be accessed rapidly by other allied departments working in the same domain making the solutions non-coherent and not addressing the root cause. Another contributing factor is the low adoption of a data-driven approach to development by government departments. The resolution of complex urban challenges, such as water-related issues, is undermined by the absence of a cross-sectoral and cross-stakeholder approach to development practices, owing to the dearth of rapid collaboration channels between citizens and line departments.
ICCCs have been set up across India to improve the delivery of municipal services. These were envisaged to be the nerve centre of city operations. ICCCs are building situational awareness using descriptive analysis. They also have the potential to scale up to diagnostic and prescriptive analysis, which would help the city generate actionable outputs to support evidence-based decision-making. Thus, this platform can generate meaningful insights to address complex urban challenges that require inter-departmental collaboration.

03 Objective of the Project

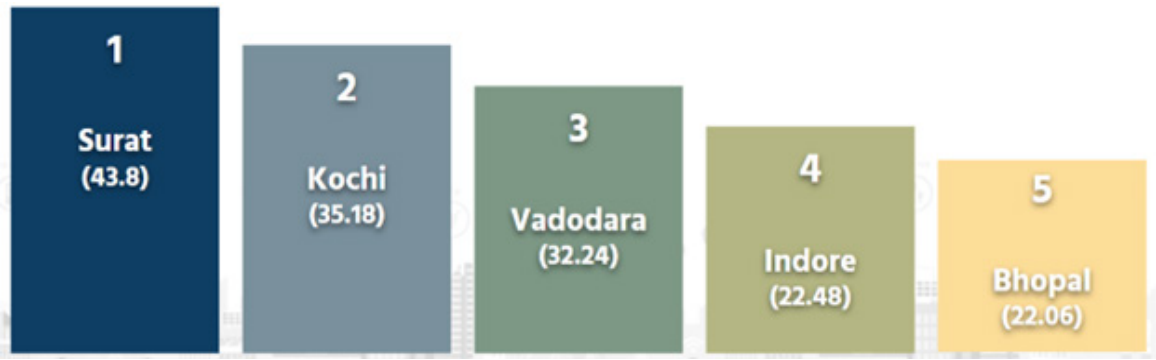
1. Ground ICCC as the centre of operations for all working divisions within the city.
2. Enable seamless integration in the workings of different line departments.
3. Establish a communication bridge between the citizens, the ICCC, and the city administration.
4. Address complex interconnected challenges in the city by strengthening people's systems supported by governance structures.

04 Project Strategy

a. Pilot City Identification

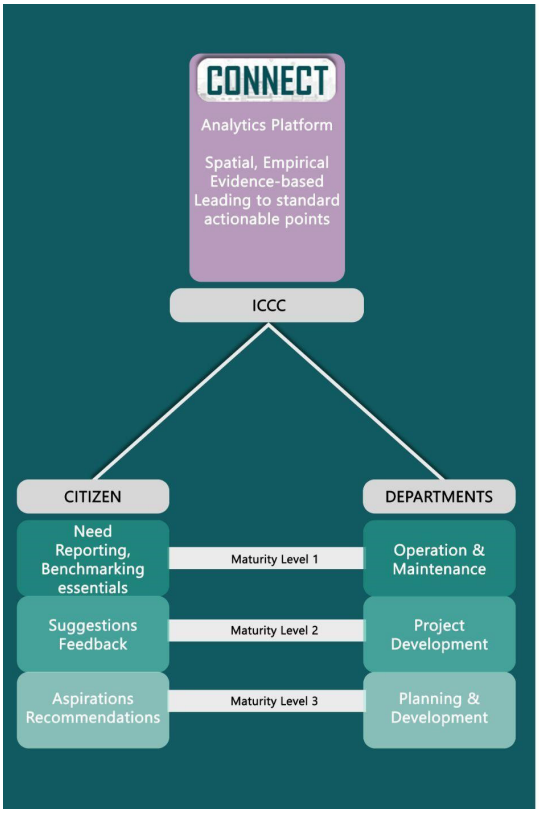
Cities were scored out of a total score of 45 based on selected parameters such as DMAF scores, the number of ICCC use cases, activeness on IUDX, availability of technical support, among other things, including city responsiveness to centre's instruction, the language proficiency of the team members and suggestions by the internal mentor. Using the weighted average method; Surat stood at rank one with a score of 43.8, Kochi stood second with a total of 35.18 and Vadodara at third with 32.24.

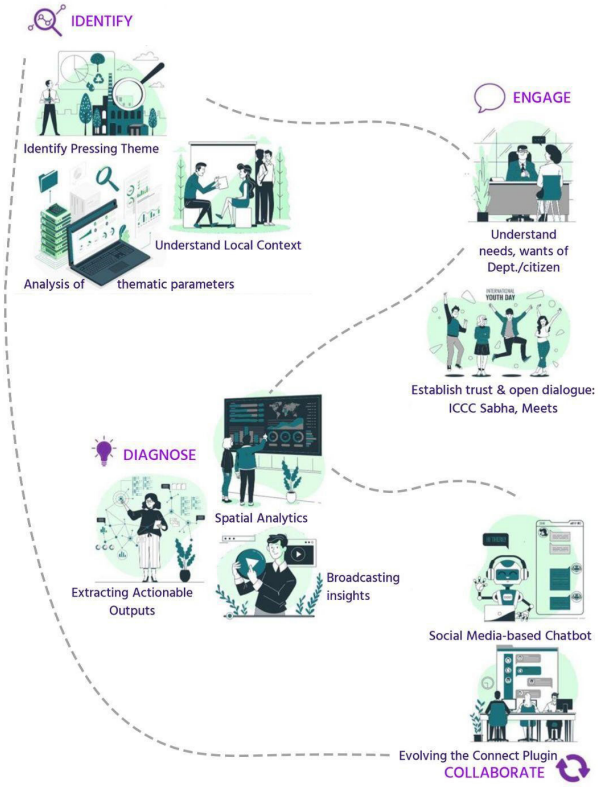
Surat was selected as the pilot city for the project, as suggested by Shri Kunal Kumar and Shri Rahul Kapoor. Surat also has one of the most mature ICCCs among other cities and is highly receptive to new ideas. Surat has also heavily invested in a new state-of-the-art ICCC facility - the Surat Urban Observatory and Emergency Response Centre (SUOERC), which would incorporate many more use cases to help ease the project's implementation.



City Selection criteria final score

b. Project Development and Implementation





Project Development and Implementation

C. Expected Outcomes

This project addresses a significant lacuna in moving Smart Cities from collections of top-down, siloed entities to expanding networks of collaborating stakeholders. As such, the project holds massive potential in creating an easily replicable & scalable real-time assistive solution for Smart Cities of varying Socio-physical contexts. To achieve this, the expected outcomes for the pilot project are:

Product Outcomes

1. An ICCC-driven information exchange platform, ensuring seamless management between departments and real-time engagement with citizens.

2. Spatially-mapped datasets depicting overlapping layers of citizen aspirations with ICCC & Departmental development plans- providing a real-time holistic picture of ward-wise development.

3. Single-window rapid response platform for citizens to actively receive broadcasts around ICCC & departmental, allowing active contribution to vision shaping & project development.

4. A system for segregation and analysis of data around thematic lenses such as Security or Natural Disaster, aiding context-specific solution finding for the Smart City.

Strategic Outcomes

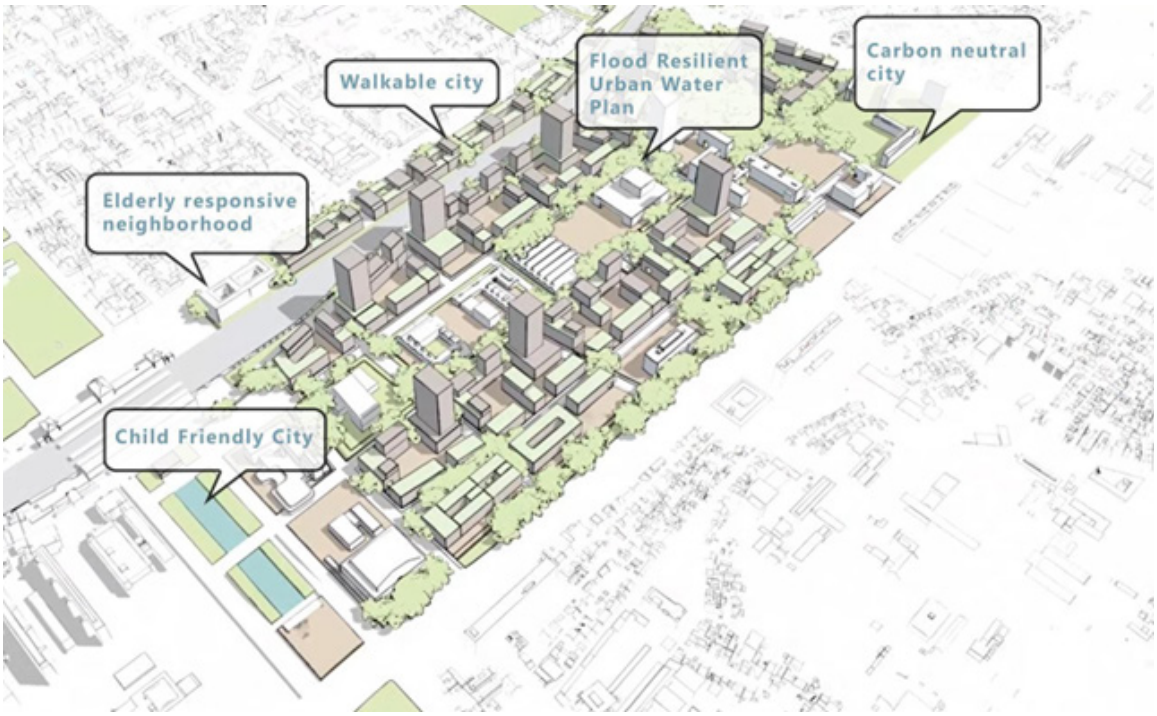
1. Maximised work efficiency and minimised grievances for development projects across the ward by enabling easy management between all stakeholders.

2. Realising the potential of ICCCs to act as the city's nerve centre- enabling collaboration between stakeholders while forming a real-time, holistic vision for context-driven development of the city.

3. Encouraging a culture of trust by reducing the current apprehensions and resulting siloed department working.

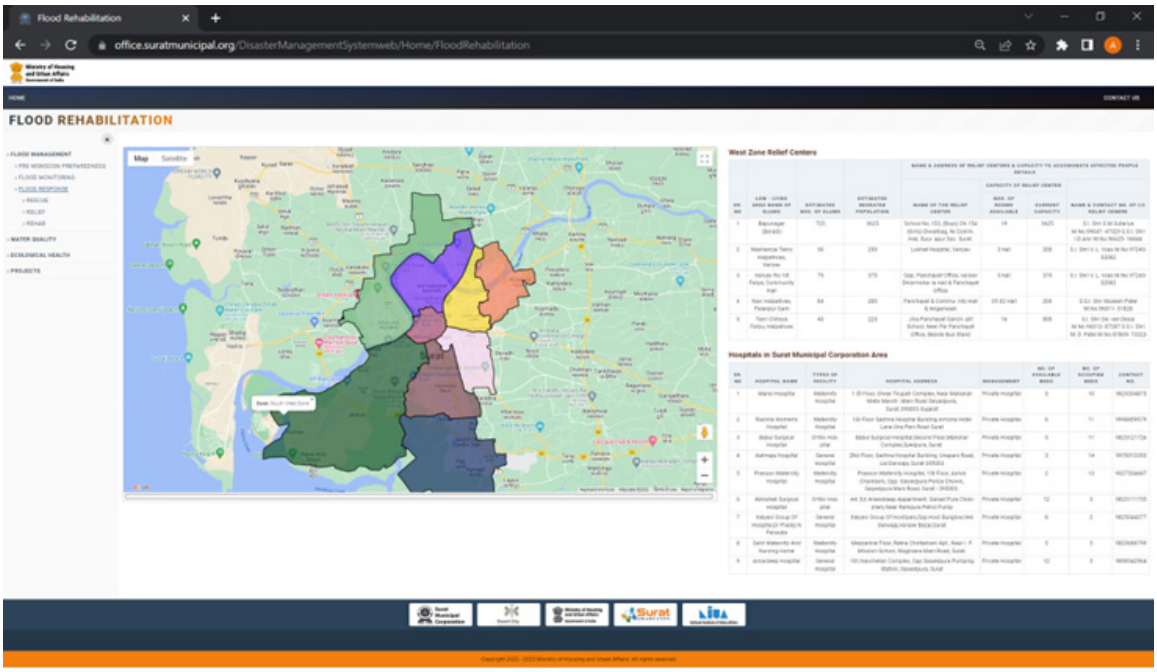
4. Not only providing the citizens with a real-time picture of the city's current development but also allowing them to place their aspirations at the heart of the vision for all future developments proposed by the authorities.

5. Opening the door for the Smart City to build upon and contextualise the basic infrastructure in place, bringing out the local definition of 'smart' and eliminating the templatized application of solutions.



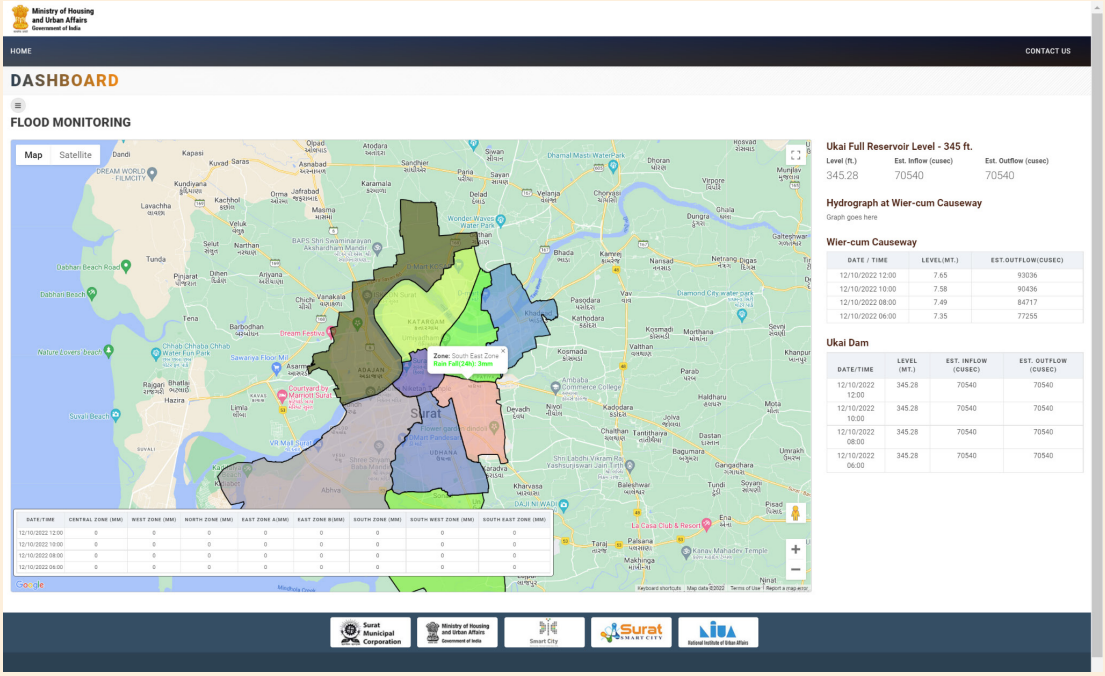
Conceptual view of an ideal city

The flood management component of the Urban Water Resilience platform has been developed in the project's pilot phase, considering the urgency of its use to the city administration and citizens. The preparedness, flood monitoring, and rehabilitation components of the same have been developed and hosted on the Surat Municipal Corporation (SMC) website. The APIs have been integrated for real-time flood monitoring at critical locations on the river Tapi such as the Ukai dam, Kakrapar weir, Weir-cum causeway, and others. In the coming monsoon season, the product would be tested for pre-monsoon preparedness functioning with the integration of the WhatsApp communication channel of the ICCC-Connect.

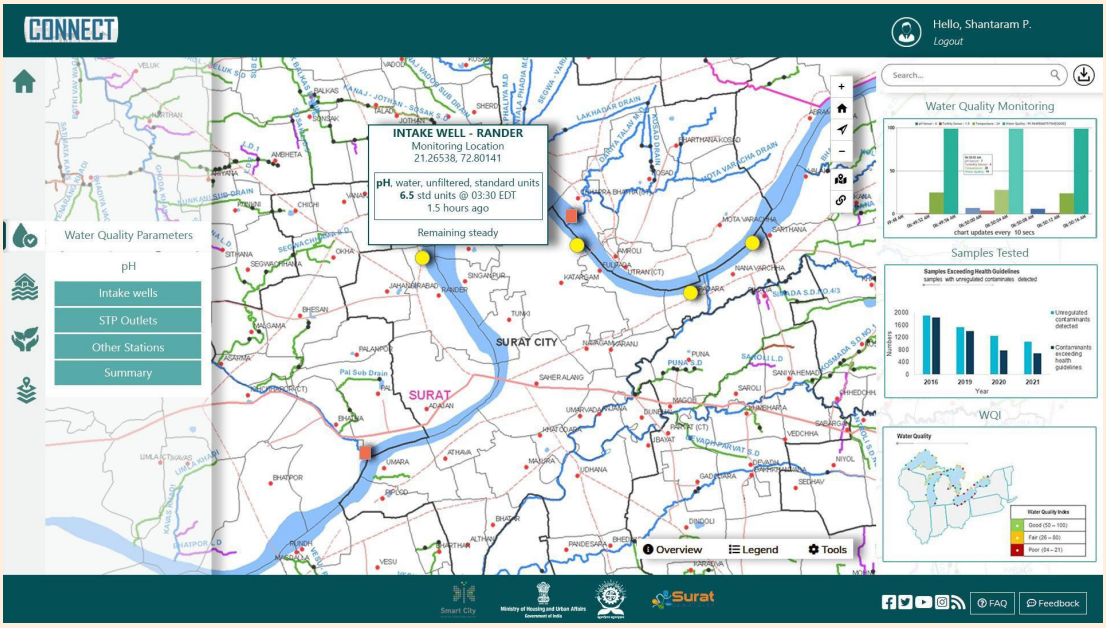


View of the dashboard

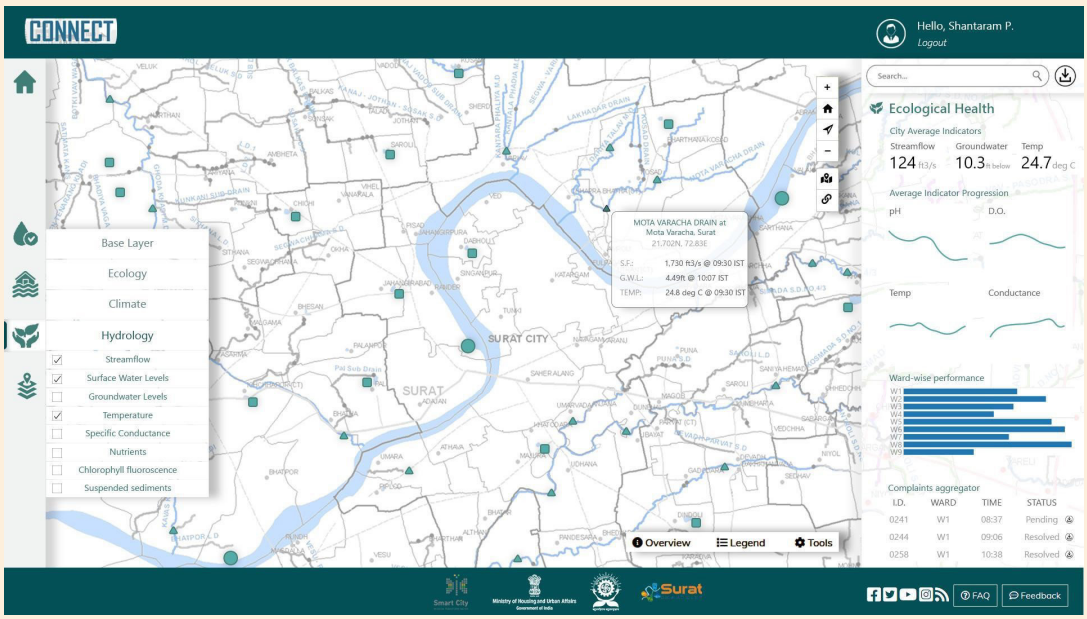
d. Actual Results



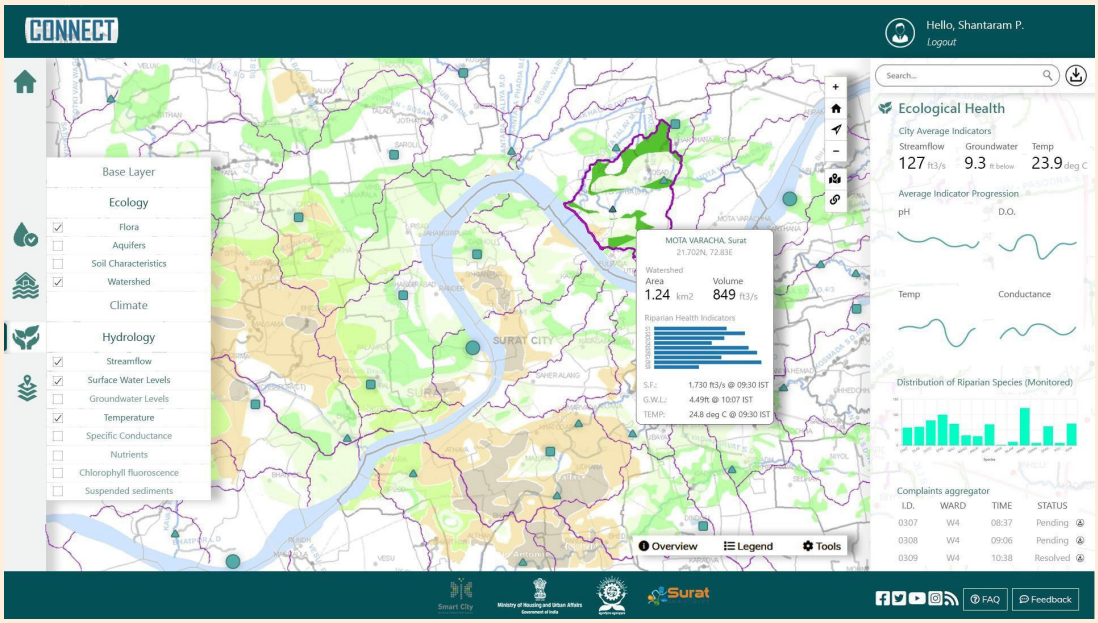
Pilot: Functional Product



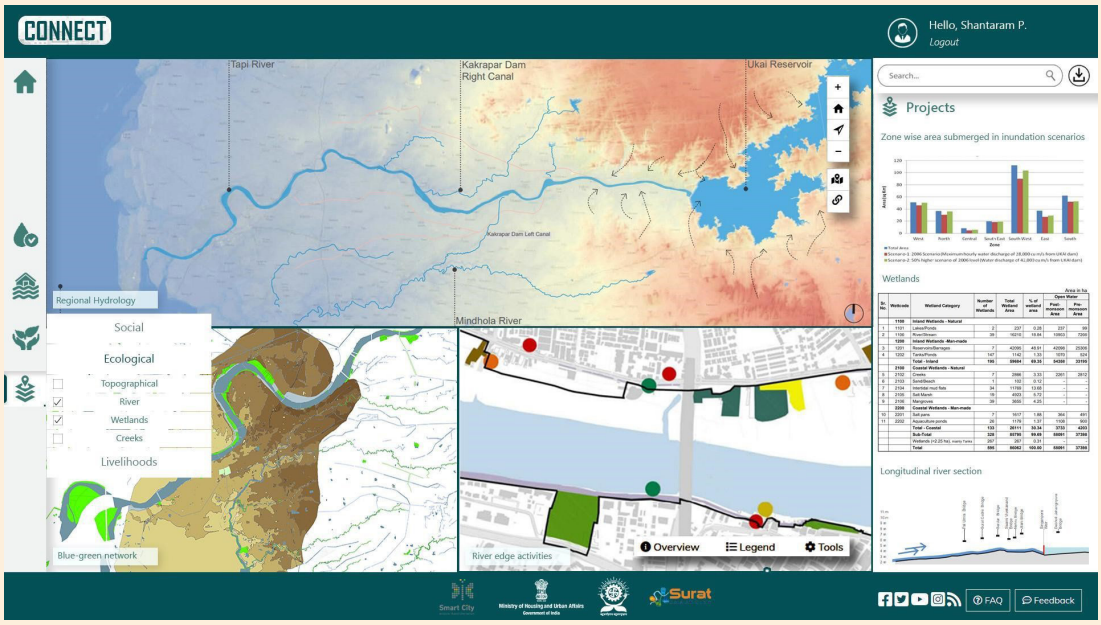
Post-Pilot: Other Components to be Developed | Tab for monitoring Water Quality



Tab for monitoring Water Quality



Tabs for monitoring Ecological Health



Tabs for monitoring Projects

e. Link to the Tool

https://office.suratmunicipal.org/DisasterManagementSystemweb#

05 Conclusion

The product has four active components under Urban Water Resilience: Flood Management, Water Quality, Ecological Health, and Projects. In the pilot phase, the primary thrust of the pilot city is to develop the Flood Management component of the portal, which comprises three parts - Pre-Monsoon Preparedness, Flood Monitoring, and Flood Response.
Other components of the product would fall in the next phase of development. The product can also accommodate data feed from WhatsApp API, which is a paid service and must be taken up by the city based on requirements.
The product can be replicated in cities that have acute water crisis, different departments handling different components of water supply and wastewater treatment, and cities that are prone to flooding that require an aggregate platform to understand the condition of water systems within the city using data feeds from different departments/sources. The idea of the platform can also be replicated in cities with a pressing issue requiring multiple departments to collaborate and share information on a real-time basis.

In the long term, the product is intended to help in the following:

1. Realising the maximum potential of ICCCs in terms of data analysis.
2. Improving work efficiency and resource optimization for departments.
3. Encouraging a culture of trust around data-driven governance & its benefits.
4. Creating resilient cities through a hybrid of data-smart and nature-based solutions.

CONNECT

A plugin to leverage Integrated Command and Control Centre (ICCC) based systems to solve complex urban issues using citizen and cross departmental collaboration

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Mr. Sanjiv Jha
Principal Smart Infra, Amazon Web Services

EMPOWER

Participatory Budgeting PB+
Towards creating financially inclusive cities together

PUNE
Pune Smart City Development Corporation Limited (PSCDCL)
Pune Municipal Corporation (PMC)

GOVERNANCE
Citizen-centric urban governance
Finance | Budget Planning

USERS
Urban Local Body
Citizen

PB+ web application
Mobile and desktop compatibility
Offline Mechanism
Print/Social Media Campaigns

5 Active Days
966 Number of Hits
288 Suggestions Received

4 Months
Implementtation of phase 1 from 13th June 2022 to 9th October 2022)

Link
https://www.pmc.gov.in/en/citizen-budget#

Source: Asif Khan, via Instagram

EMPOWER

Participatory Budgeting PB+

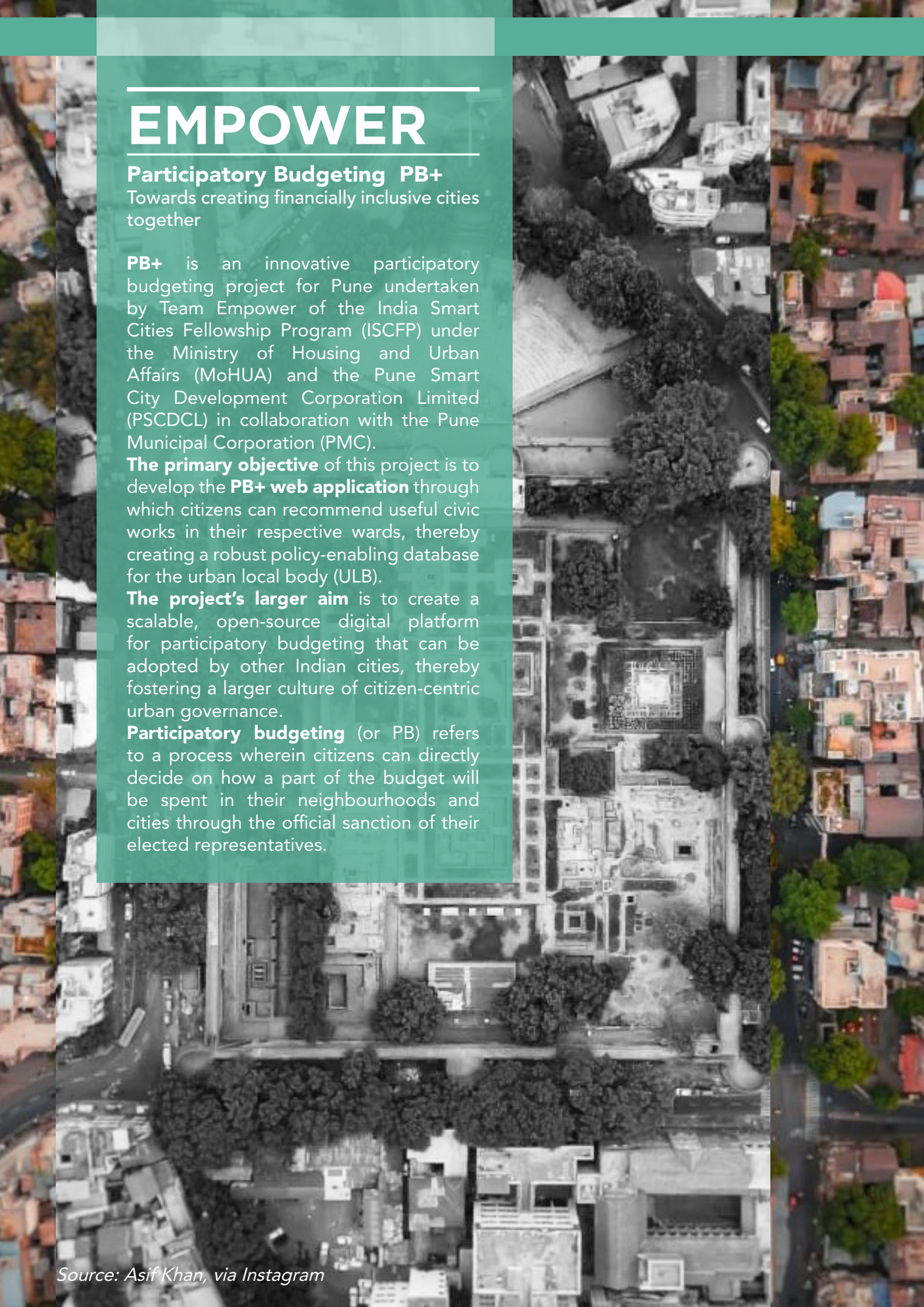
Towards creating financially inclusive cities together

PB+ is an innovative participatory budgeting project for Pune undertaken by Team Empower of the India Smart Cities Fellowship Program (ISCFP) under the Ministry of Housing and Urban Affairs (MoHUA) and the Pune Smart City Development Corporation Limited (PSCDCL) in collaboration with the Pune Municipal Corporation (PMC).

The primary objective of this project is to develop the **PB+ web application** through which citizens can recommend useful civic works in their respective wards, thereby creating a robust policy-enabling database for the urban local body (ULB).

The project's larger aim is to create a scalable, open-source digital platform for participatory budgeting that can be adopted by other Indian cities, thereby fostering a larger culture of citizen-centric urban governance.

Participatory budgeting (or PB) refers to a process wherein citizens can directly decide on how a part of the budget will be spent in their neighbourhoods and cities through the official sanction of their elected representatives.



Source: Asif Khan, via Instagram

01 Context

Pune was chosen for this project since it is the only city in India to have a formal mechanism for Participatory Budgeting, with the Pune Municipal Corporation (PMC) setting aside a specific portion of its budget for projects recommended by citizens. The new PB+ platform will therefore be immediately helpful for the city of Pune (with the PMC already using it to collect citizen inputs in 2022), even as it provides a practical blueprint for other cities which seek to adopt such a mechanism and platform.

Project Status – 1 of 2 components has been completed. The first component is the PB+ platform for receiving citizen inputs, and it was completed and launched in August 2022. The second component is the PB+ administrator's database, which will be completed by December 2022.

02 Problem Statement

Based on a SWOT analysis of India's Smart Cities, Team Empower found that Citizen Engagement and Urban Governance were aspects that needed to be strengthened within India's urban ecosystem. Through their research, Team Empower further found that the practice of Participatory Budgeting was one of the best ways through which cities could improve their levels of citizen engagement and community-centric urban governance.

Given that India's cities were commanding ever larger budgets and expensive projects, it is imperative to promote mechanisms like participatory budgeting through which citizens can make decisions over how their taxes are spent and their cities are shaped by their elected governments.

Through their research of various Indian cities, Team Empower found that a handful of Indian cities (like Pune and Bangalore) were carrying out participatory budgeting regularly. Despite this, there was an absence of a dedicated open-source platform that could simultaneously –

(i) increase the levels of participatory budgeting in these cities and (ii) promote the practice of participatory budgeting in cities across the country.

Given the nascent development, immense potential, and urgent necessity of participatory budgeting in India, Team Empower had essentially identified an ideal project to focus on under the India Smart Cities Fellowship Program.

In this context, Team Empower identified its problem statement as follows –

"There is a dearth of platforms that enable participatory budgeting in order to promote financial transparency and inclusivity amongst the ULBs (urban local bodies) in most Indian cities."

03 Objective of the Project

Based on this primary objective, the team conceptualized the PB+ web application as a platform that could collect citizens' project suggestions to create a robust database and GIS-enabled dashboard to facilitate the ULBs project selection and policy-making process.Based on this objective, Team Empower defined the scope of work for its PB+ web application for Pune.

The primary features of this web application would be –
1. Open-source code,
2. Mobile and desktop compatibility,
3. Relevant licensing, along with
4. Support and maintenance for 2.5 months

Given the need for participatory budgeting platforms in the Indian urban ecosystem, Team Empower went defined its primary objective as follows –

"To create a platform for participatory budgeting that can assist the ULBs in the ward-wise collection of citizens' inputs towards the formulation of the city's budget."

The basic functional requirements of the proposed PB+ platform was provided as follows –

1. An open-source PB+ web application with multiple device compatibility.
2. A citizen-input platform wherein citizens can make project suggestions for participatory budgeting process (e.g., citizen name, project description, exact location of the proposed project through a GPS map)
3. An administrator's database system wherein the PMC's ward officers and engineers can view and shortlist the citizens' suggestions to prepare a list of select PB projects.
4. An administrator's dashboard wherein the PMC's Finance Department can access a GIS map and statistics based on various citizen suggestions and selected PB projects.

04 Project Strategy

A Three-Fold Strategy for PB+

Team Empower's strategy or methodology for a PB+ platform to strengthen the participatory budgeting process in Pune focused on three components –

1. **Strengthening the PB+ Offline Mechanism –** including redesigning the 16-year PB form into a new user-friendly format that could collect multiple accurate data points, including project sector, sub-sector, location, and type of work.

2. **Developing the PB+ Digital Platform –** for which Team Empower is working with the PMC, PSCDCL, and the developers (Monarch Technologies) to develop a user-friendly PB+ platform to collect citizen inputs for a database and dashboard that will help the administrators to select relevant projects.

3. **Citizen Engagement and Print/Social Media Campaigns -** spreading awareness on the PB process through citizen engagement sessions, newspapers, and social media.

These three strategies required a dynamic methodology and data sources which included the following –

- **Review of Secondary Literature and Data of the PMC** pertaining to the participatory budgeting process – especially the PMC's budget for 2022-23, including the list of plan and non-plan projects under the participatory budgeting process.
- **Presentations/Interviews with various City Administrators –** to secure the necessary permissions and resources for the platform and to better understand, deconstruct, and design the PB+ online platform.
- **Creation of Functional Documents for the Developers –** These include the creation of a functional requirement document, along with a scope of work and multiple rounds of wireframes to assist the software developers in their development process.
- **Citizen Engagement Sessions –** With various citizens and groups, including housing society groups, women's organizations, teachers, students, and ULB employees.
- **Content Creation for Print/Social Media campaigns –** Creation of social media posts for the official handles of the PMC and PSCDCL. Providing newspapers (both English and Marathi) with relevant information on PB to spread public awareness.

a. Pilot City Identification

Team Empower made its pitch presentation for the Participatory Budgeting Platform to Shri Kunal Kumar Sir (Joint Secretary of MoHUA). Based on the honorable Joint Secretary's inputs, it was decided Team Empower would deploy to Pune to develop this platform since it was the only city in India to have a formal mechanism of Participatory Budgeting. Team Empower spent the subsequent four months (from 13th June 2022 to 9th October 2022) working with various stakeholders in Pune to develop the platform for Participatory Budgeting.

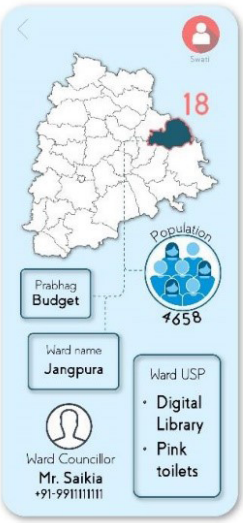
Participatory Budgeting in Pune – In 2006-07, Pune became the first Indian city to incorporate a formal participatory budgeting mechanism. Under this model, the Pune Municipal Corporation allocates a certain budget to the city's wards. The ward residents are empowered to use the money allocated to the projects per their priorities and needs. This type of PB allows citizens to recommend specific projects - ranging from the paving of specific streets to the building of public toilets - in their respective neighbourhoods.

PB+ seeks to maximize the potential of Pune's pre-existing participatory budgeting mechanism through a user-friendly online platform that can collect citizens' inputs towards creating a robust database for the city's administrators. In this regard, the proposed PB+ platform will increase citizen participation levels, improve administrative analytics, and facilitate greater transparency, thereby overcoming the shortcomings of the previous system.

b. Project Development and Implementation

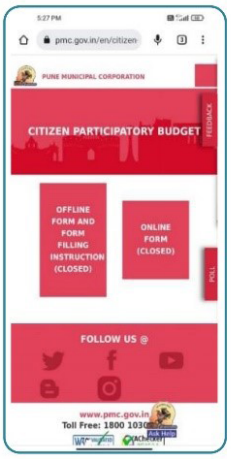
Project Development

Created Wireframe and workflow for developers, PMC and PSCDCL



Pilot- Phase I product Launch

Successful launch of citizen side platform of the web application



Link from the PMC Website

Log In/ Registration Page

Project Suggestion Page

Post Pilot- Admin Side of the Platform

Prepared wireframe and workflow for the admin side of the platform for the developers, PMC and PSCDCL

Data Entry

Engineer Login

Prabhag Samiti

PMC Admin

Working with PMC, PSCDCL, and developers to create admin side of the platform

Stage maturity approach: Pre-pilot | Pilot | Post-Pilot

C. Expected Outcomes

For the Urban Local Body

1. **Financial Transparency:** By providing its budgetary details to the public, this participatory budgeting platform will dramatically improve ULBs financial transparency and credit ratings. Such an improvement in financial ratings will bolster the ULB's ability to attract and raise investments (including municipal bonds and masala bonds) which are likely to become a significant source of future revenue for cities everywhere.

2. **Citizen-led Governance:** The ULBs will be able to receive inputs and formulate budgets as per the needs of the citizens. By putting people at the center of their budgeting process, the ULBs can gain the trust and confidence of their citizens. This will lead to a more mutually cooperative relationship, wherein citizens are more likely to engage with municipal issues and regulations (including paying their share of taxes).

For the Citizens

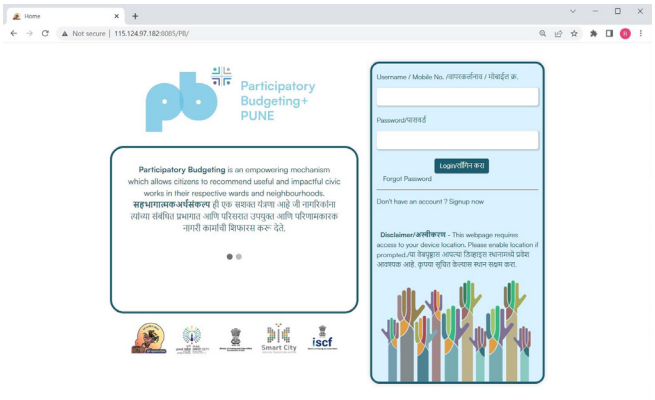
1. **Increase Financial Literacy:** The awareness campaigns conducted under the project aim to improve citizens' financial literacy, thereby making them active participants in the city's governance process and financial realities.

2. **Accountability of ULB:** PB mechanism will help the citizens understand the priorities of the ULB in terms of its budget allocation and hold them accountable for the same.

3. **Increased sense of belonging:** As citizens participate in the budget formulation process, it will heighten their sense of belongingness to the city. Conversely, a PB platform will make a city more inclusive to its citizens, thereby increasing their standard of living.

d. Actual Result

The application PB+ was integrated into the city's website and was utilized to receive citizens' inputs for the financial year 2023-24. The inputs received will be used to formulate the next financial year's budget. (The working of this platform has been elaborated in the Standard Operating Procedure section of the report).



Screenshot of the Citizen Input Platform

5 No. of Active Days
The PB+ citizen input platform was launched on 26th August 2022, active till 1st September 2022.

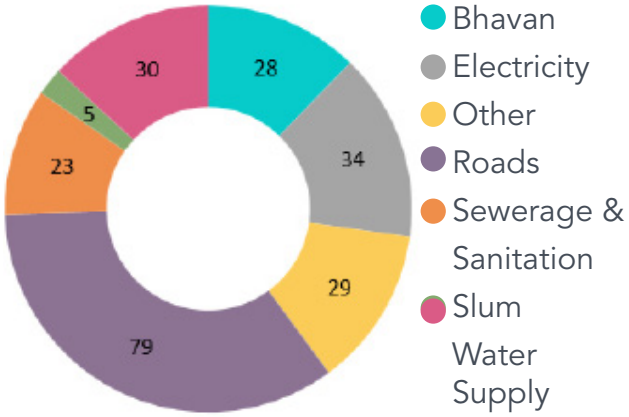
288 Suggestions Received
Total suggestions received during 3 working days and 2 holidays.

966 Number of Hits
Within few hours of the web app launch, the number of visitors in citizen participatory budgeting page.

Results of the Received Inputs

The inputs received had been collated and given to ward offices to undergo the formal filtering mechanism to get incorporated into the final budget. The administrator side is still under development at the time of writing this report. Below given are the preliminary analysis that has been performed based on the received inputs.

Total Online Suggestions



There were a total of 6 sectors that citizens could choose from to provide input. After analysing data from the previous year's budget inputs, each of these sectors was classified into sub-sectors. The sectors divisions were based on recommendations from the PMC finance department and ward offices.

The roads had maximum recommendations of 34.6%, followed by electricity (14.9%), Water Supply (13.1%), Others(12.7%), Bhavan(12.2%) , Sewerage and Sanitation(10%), and slum sector (4.3%).

e. Link to the Tool

https://www.pmc.gov.in/en/citizen-budget#

05 Conclusion

Cities willing to deploy a participatory budgeting process in formulating their city budgets can download this application from smart code. Before this, the Participatory Budgeting process of Pune has to be understood.

Hence, the cities willing to deploy a participatory budgeting process to formulate their budget have to consider the sectors involved in their final budget and change the platform accordingly. Apart from this, the respective cities' administrative divisions must be incorporated into the platform. In addition, the flow of the citizen input side would remain the same for most cities.

The administrator side of the project has been made, taking into consideration the process in Pune. Depending on the process involved in incorporating the citizens' suggestions into the budget document, the city where the product is replicated would have to amend it accordingly.

However, Pune being the only city in India to allocate a budget for its citizens' cities in its nascent stages, cities interested in this process would successfully incorporate the Pune model of participatory budgeting. Therefore, to maximize the usage of this platform across India, guidelines have to be released, nudging cities to take up this mechanism in formulating the budget via the participation process.

Way Forward

To maximize the potential of this project following steps can be taken up:

Preparation of Participatory Budgeting Guidelines:

To encourage cities to take up the process of PB, it would be essential to formulate a handbook of participatory budgeting guidelines. Such a handbook would introduce city administrators to the idea of participatory budgeting and the guidelines they would require to implement the practice of PB in their city. These guidelines would also explain how cities can use the PB+ platform through the Smart Code platform.

Admin Side of Dashboard

The inputs received from citizens must be scrutinized by ward offices, and the final selection list must be sent to PMC. Completing this process will ensure comprehensive digitization of the PB process. The admin side, which involves ward engineers Prabhag Samiti and the finance department of PMC, is yet to be fully developed.

GIS Analysis

The current GIS map indicates the suggestions made by citizens. However, there are possibilities that citizens are not fully aware of the amenities required around them and can make redundant recommendations. Hence ward wise mapping of amenities and providing citizens with the necessary information to make progressive suggestions will augment the impact of the process. This will also ensure in making of evidence-based decisions by the city officials.

Simplification of PB Budget

Providing citizens with the details of selected and rejected projects under the PB mechanism and collecting year-wise data of the same will ensure citizens are aware of the corporation's financial status.

Hence, pursuing these ideas would ensure the PB process is replicated in various cities, encouraging transparency and accountability in the governance process.

PARTICIPATORY BUDGETING
Towards creating financially inclusive cities together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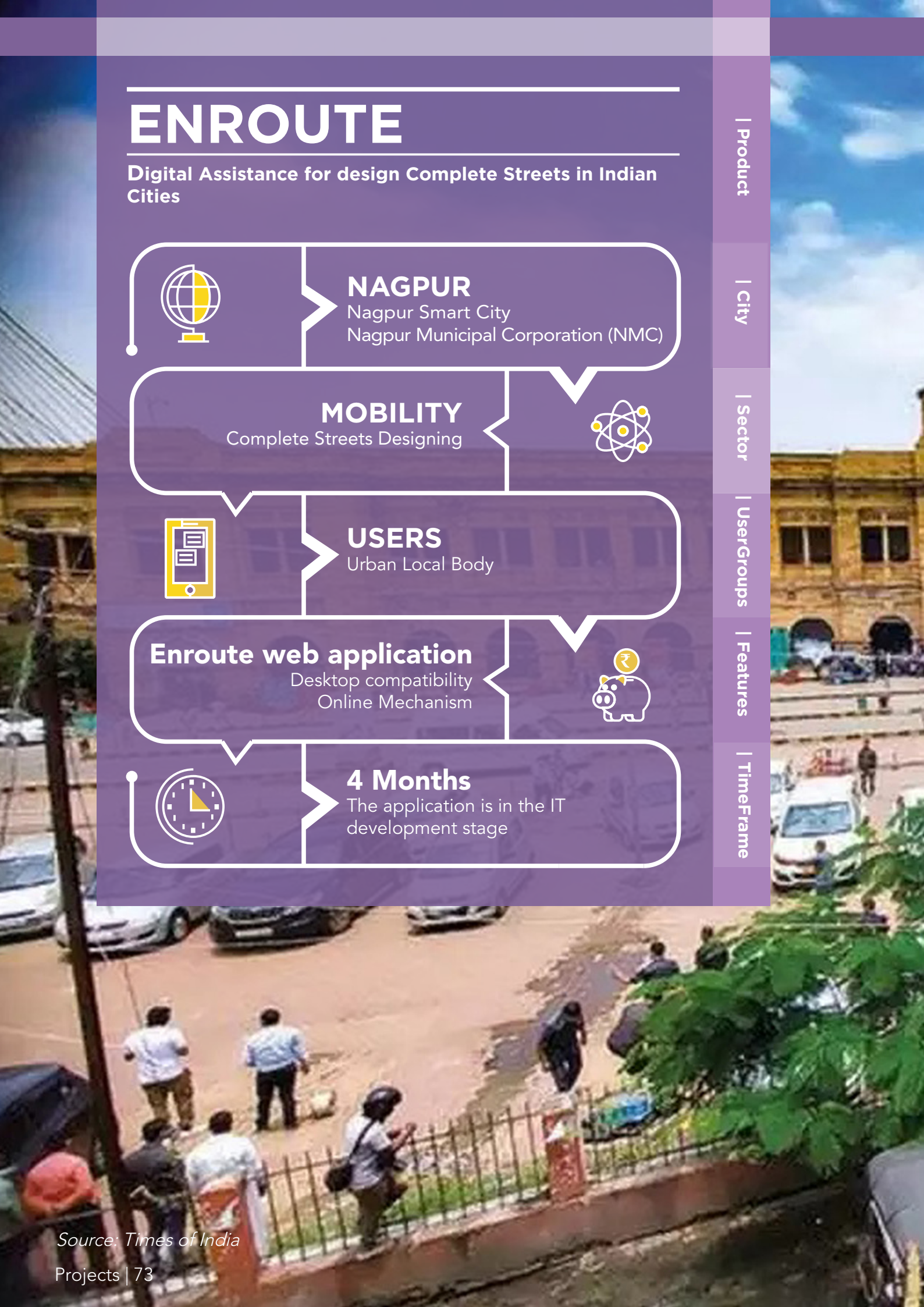
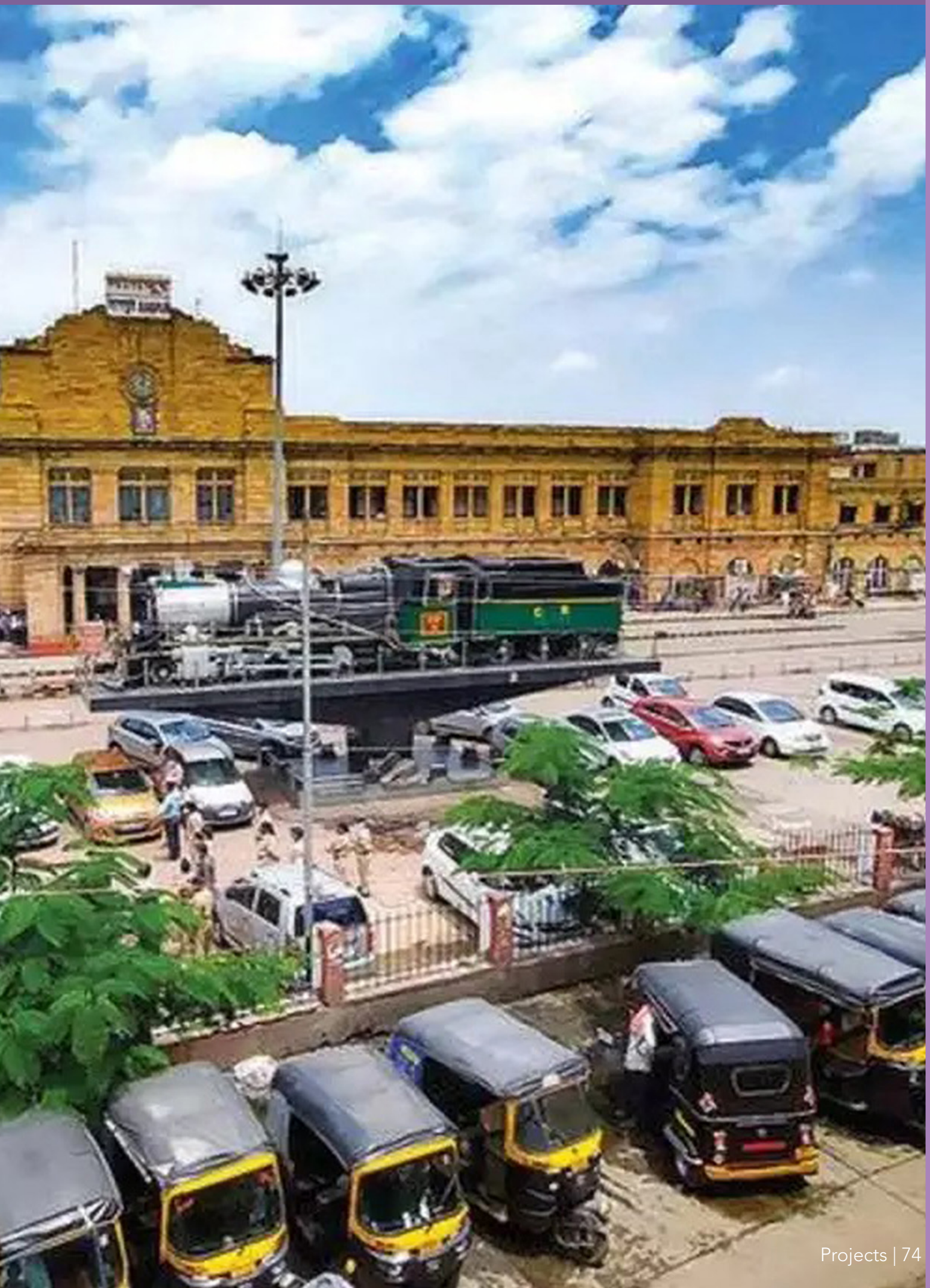
ENROUTE

Digital Assistance for design Complete Streets in Indian Cities

Product	City	Sector	UserGroups	Features	TimeFrame
	NAGPUR Nagpur Smart City Nagpur Municipal Corporation (NMC)	**MOBILITY** Complete Streets Designing	**USERS** Urban Local Body	**Enroute web application** Desktop compatibility Online Mechanism	**4 Months** The application is in the IT development stage



Source: Times of India



ENROUTE

Digital Assistance for design Complete Streets in Indian Cities

In the past decade, infrastructure has seen massive growth in terms of technology and expansion in our country. The infrastructure projects of the future promise a prosperous vision. However, the plight of the pedestrian has still not received the attention in the manner it should. Inadequate space for commuters on foot in the streets, absence of prominent points of crossing, inadequate traffic calming measures, and absence of measures to stop the encroachment of pedestrian zones due to vehicular parking are a few of the many issues we come across almost every day. The central zones of any city with wider streets often get a face-lift in terms of these amenities. The lesser significant areas with dense fabric get excluded due to pre-existing constraints. Additionally limited understanding of the significance of 'Complete Streets' among the ULBs and its specifications that are necessary among ULBs leading to the design of inefficient mobility corridors.

Source: Deekhshabhoomi

01 Context

Looking at this situation, under the Smart Cities Mission, many Indian cities have begun to identify and implement street design and junction improvement projects. The projects aim to improve walking and cycling infrastructure ensuring pedestrian and cyclists' mobility and safety. However, most projects are disconnected segments rather than a continuous network. This approach results in standalone interventions instead of creating a usable and connected network for walking and cycling. (Complete Streets Planning Workbook, MoHUA, 2019)

02 Problem Statement

Of the many urban issues, the absence of a safe pedestrian realm is one of the most pressing concerns in the country. There are a number of Street Design guidelines and recommendations by development authorities that have set standards to maintain the adequacy and quality of amenities in the public realm. However, given the gradient in the urban structure and built form in any city, and the constant evolution it undergoes with time, a broad set of guidelines has failed to address issues related to the pedestrian spaces for every part of the city.

This calls for context-based design standards that address pedestrian issues on a level specific to the area concerned. A plethora of written standards & documents by various organisations exist in the knowledge forum in this domain but the accessibility and understanding of the same are missing. This calls for a digital intervention that collates all these standards and suggests permutations of street amenities suitable as per the context, RoW, land use, and mandatory amenities, which will assist and fasten the decision-making process in the ULBs.

This will be a simulation interface that provides workable options for street sections flexible to the context but mandate minimum standards and a palette of components essential for the design of streets that ensure inclusivity, safety & convenience.

03 Objective of the Project

To create a digital tool that guides ULBs in the efficient design of 'Complete Streets' accounting for inclusivity, safety, security, convenience, comfort & character. To ensure coordination between various local bodies/departments in-charge of lighting, sanitation, drainage, safety, regulations, and maintenance related to streets thus speeding up the operation and maintenance processes of the street and its amenities.

The Approach derived for achieving the above objective are:

1. **Project Exploration:** The project exploration adopted an inquiry into the prevalent standards of street designs being followed by cities and the issues that occur thereafter.

2. **Placement:** Identification of the zones in a Complete Street and all the street amenities that should be mandatory, optional, and flexible as per the context. This was followed by the identification of the specifications related to each of those amenities and their appropriate placement on the street as per land use.

3. **Building of a Flexible System:** The approach took into consideration the uniqueness of every street in order to attend to the issues or needs of the street in question. Therefore a flexible system in the form of a digital tool is required to be built that will provide multiple options to the officials for informed decision-making.

04 Project Strategy

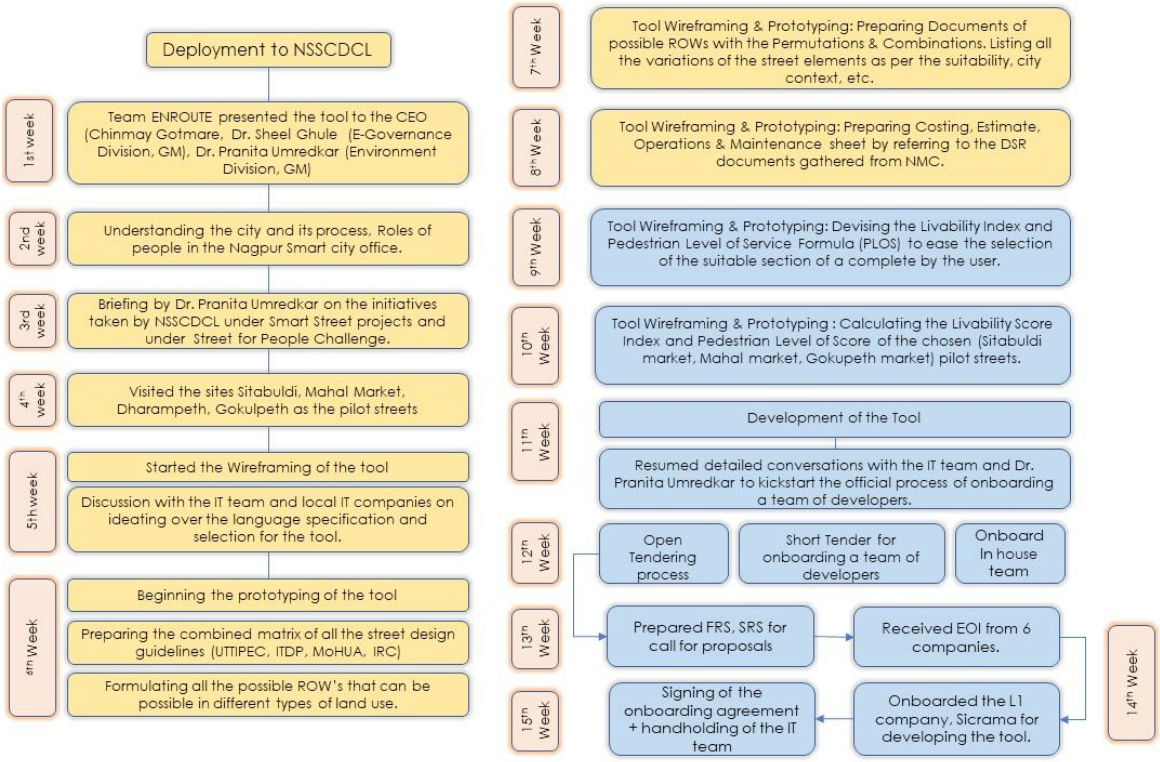
a. Pilot City Identification

We studied the relevant and updated Street Design Guidelines and Standards recommended by ITDP, UTTIPEC, IRC, WRI, etc., and enlisted the overlaps and gaps in the same. Further we identified cities that are already implementing initiatives aiming at developing 'Complete Streets' and were keen on accepting a system that helps re-configure streets through a faster and more efficient system.
The city of Nagpur won the 'Streets for People Challenge' and 'Cycle for all challenge', an initiative by the Smart Cities Mission, Ministry of Housing and Urban Affairs. The winning design proposal of the Sitabuldi market street in Nagpur aimed at tackling the high footfall of pedestrian traffic on the street, revitalising the dead spaces, and regenerating the economy in the neighbourhood.
An efficient re-configuration of the shared street resulted in 84% of the street serving pedestrian activity as opposed to an existing 5%. To promote the Non-Motorized Transportation system, in the last three years the city has invested Rs

650 crore. The City of Nagpur has also proposed to construct 75 bicycle stations to promote the usage of NMV's. Nagpur Smart City is extensively working towards creating an 'Inclusive, Equitable and Access to Public Spaces' to meet the vision of Nagpur Smart city proposal.

Noticing these initiatives taken by Nagpur city, we selected the city to work further and narrowed down three market streets Gokulpeth Market, Mahal Market, and Sitabuldi market to pilot our tool output in redesigning these mentioned streets.

b. Project Development and Implementation



Project Development and Implementation

c. Expected Outcomes

A simulation interface with a palette of amenities, recommended zoning and maintenance measures based on the existing standards and guidelines by various authorities.

1. An empty canvas asking for basic information about the street to be designed such as - Right-of-Way, Land-Use, etc.

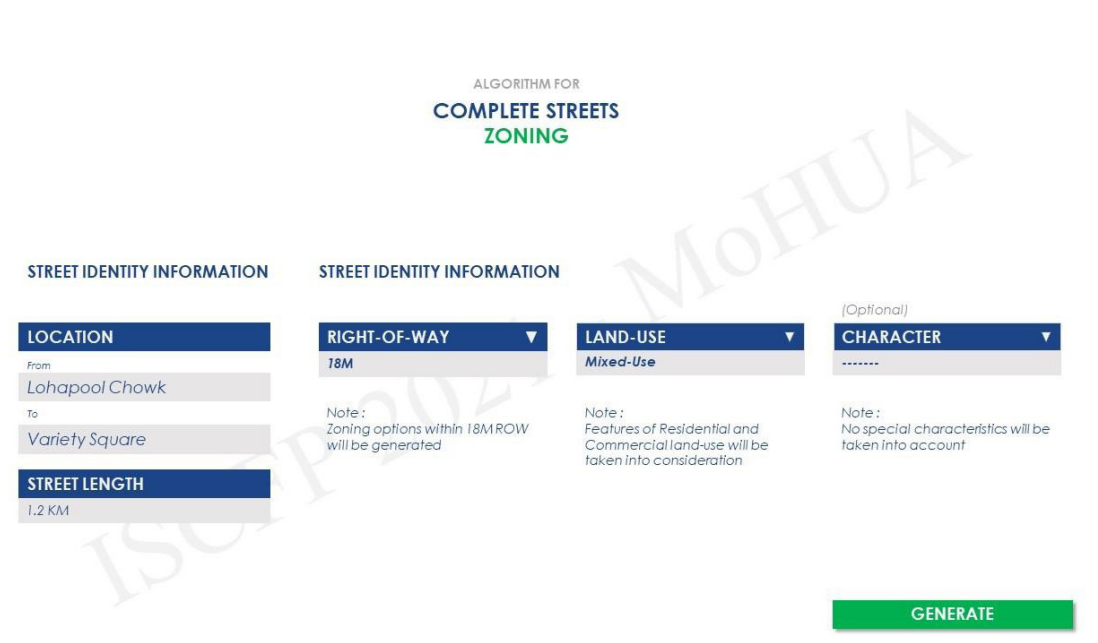
2. A mechanism of determining a 'happiness quotient' or livability index can notify the designer about the qualitative improvement with the changes in the built environment.

3. Once a street configuration is finalised, an operation and maintenance schedule of the amenities will also be generated alongside.

d. Actual Results

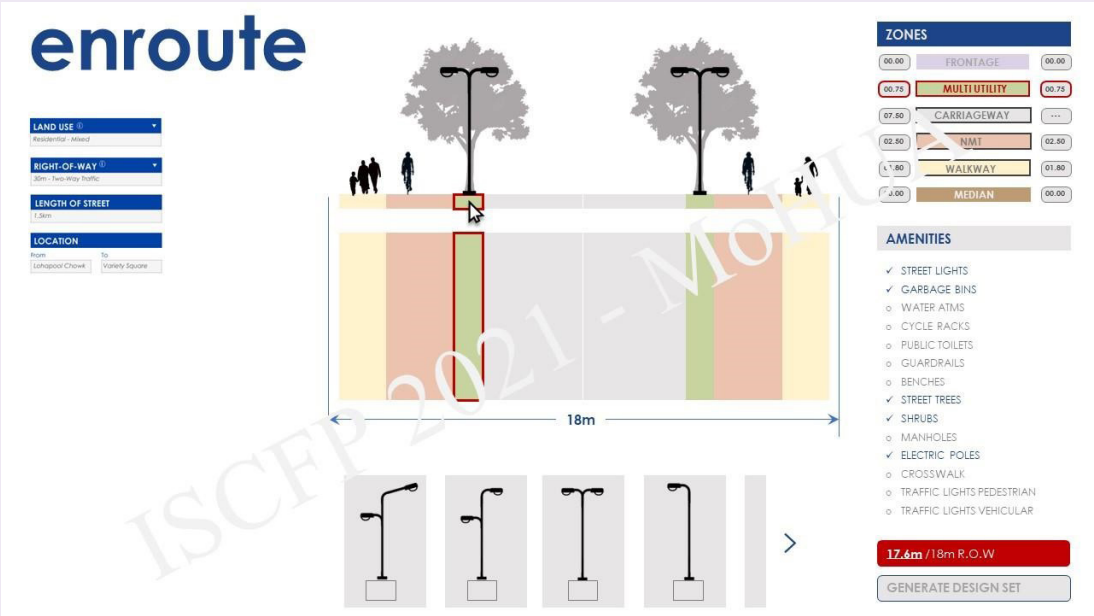
The tool development work is in progress in tandem with a working prototype developed to assist the IT companies onboarded post tendering by the NSSCDCL.
Following are the actual tool screenshots.

Login page of the web application



Design Interface after filling of information

Options generated as canvas for download or further edit



Zone selection for editing i.e. resizing and repositioning

Final interface showing list of drawings/ documents downloaded

e. Link to the Tool

http://115.124.110.196:8080/smartCity/

05 Conclusion

Scalability to other cities: Once the tool is ready, it can be used by other cities directly by providing city-specific data which will allow the tool to select specific amenities as per the city context, climate, and census data.

Phase 2: Creating a dashboard with mapping of existing underground and aboveground utility services of an area/stretch/city.

1. A geodatabase format with layers of various services overlaid on a map.
2. The final products of the whole mapping process will be maps presenting all the utility and geospatial information in a logical and easy-to-understand manner.
3. The map will allow inter-departmental agencies to view and use the data.

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IMPROV

Participatory Budgeting PB+
Towards creating financially inclusive cities together

BHOPAL
Bhopal Smart City Development Corporation Limited
Bhopal Municipal Corporation

SOLID WASTE MANAGEMENT
Monitoring of Garbage Vulnerable Points (GVPS) using crowdsourced data

USERS
Urban Local Body
Citizens

IMPROV Dashboard
Desktop compatability
Online Mechanism

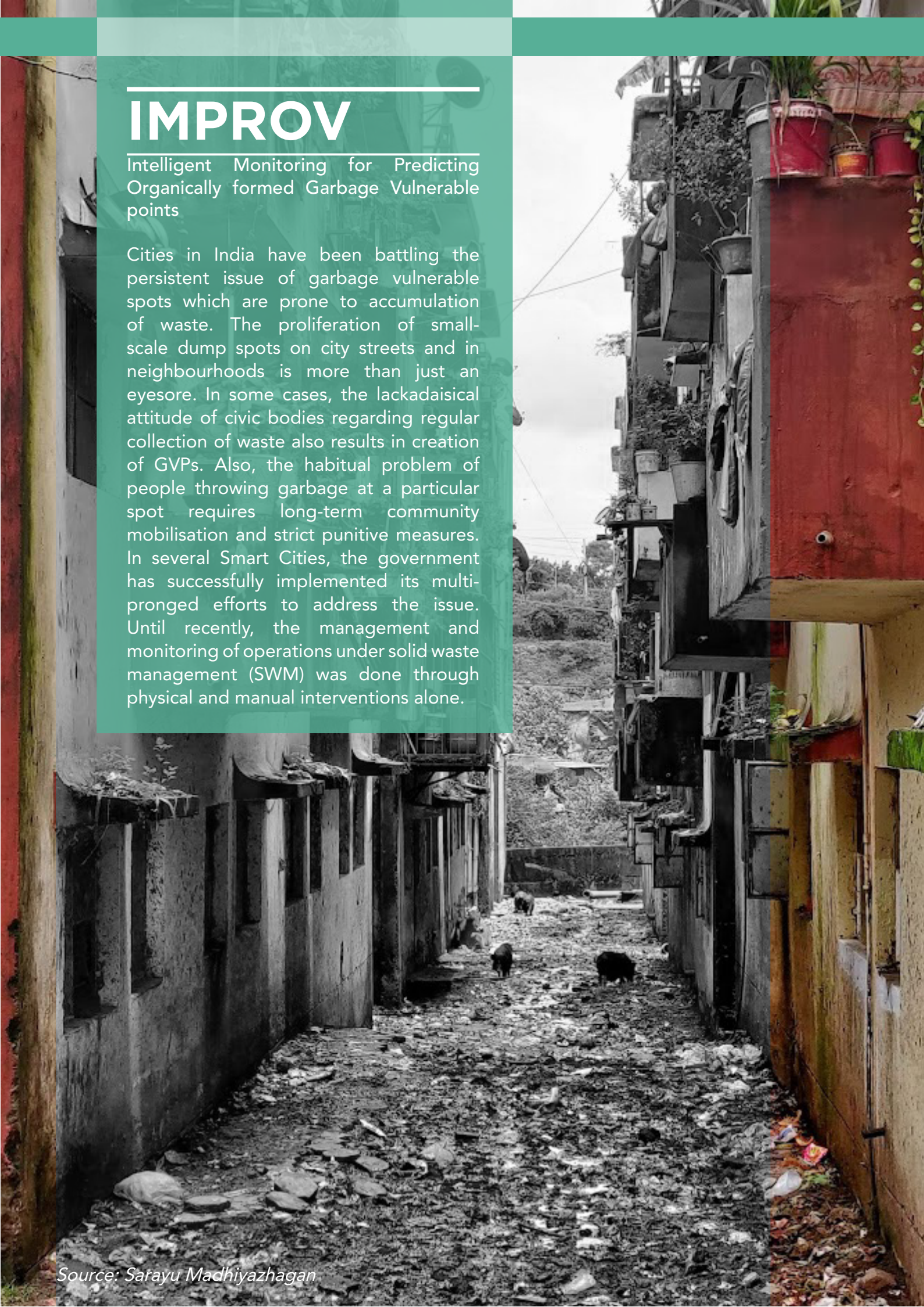
4 Months
Phase 1 developed and in process of integrating with Bhopal Smart City App

Link
https://smartbhopal.city/improve-map/login.php

IMPROV

Intelligent Monitoring for Predicting Organically formed Garbage Vulnerable points

Cities in India have been battling the persistent issue of garbage vulnerable spots which are prone to accumulation of waste. The proliferation of small-scale dump spots on city streets and in neighbourhoods is more than just an eyesore. In some cases, the lackadaisical attitude of civic bodies regarding regular collection of waste also results in creation of GVPs. Also, the habitual problem of people throwing garbage at a particular spot requires long-term community mobilisation and strict punitive measures. In several Smart Cities, the government has successfully implemented its multi-pronged efforts to address the issue. Until recently, the management and monitoring of operations under solid waste management (SWM) was done through physical and manual interventions alone.



Source: Sarayu Madhiyazhagan

01 Context

The advent of ICCCs has paved the way for digital interventions in this sector. In line with the recent technological advances, **IMPROV** (**I**ntelligent **M**onitoring for **Pr**edicting **O**rganically formed garbage **V**ulnerable spots) has been developed with an aim to leverage artificial intelligence and machine learning to tackle the problem of recurring garbage vulnerable spots by developing an Artificial Intelligence based decision support system for the prediction and monitoring of garbage vulnerable spots and informed and prompt service delivery in the SWM sector. The project was conceptualised both in relation to human behaviour and urban planning practices to develop a model for predicting susceptible spots.

02 Problem Statement

"How to enable informed and prompt service delivery in the Solid Waste Management (SWM)?"

An artificial intelligence based (AI-based) administrative dashboard for predicting and monitoring garbage vulnerable points (GVPs).

03 Objective of the Project

The project aims at creating a decision-support system for informed and prompt service delivery in the Solid Waste Management (SWM) sector.

1. An Artificial Intelligence based administrative dashboard for predicting garbage vulnerable spots.
   - The objective is to develop a spatially-enabled, real-time predictive mechanism for identifying informal waste dumping spots in the cities.

2. Input from various data sources for monitoring the identified spots and directing to necessary redressal mechanisms.
   - This will help in providing the city administration with a data-driven perspective on monitoring and investigating the waste management in the cities.

3. Provide alternative solutions that can be implemented to tackle the issue and prevent the formation of these spots.
   - This component will give the city administration a set of suitable strategies for each spot which will be derived from: (a) pre-fed solutions, and (b) aggregation of suggestions uploaded by city support organisations.

04 Project Strategy

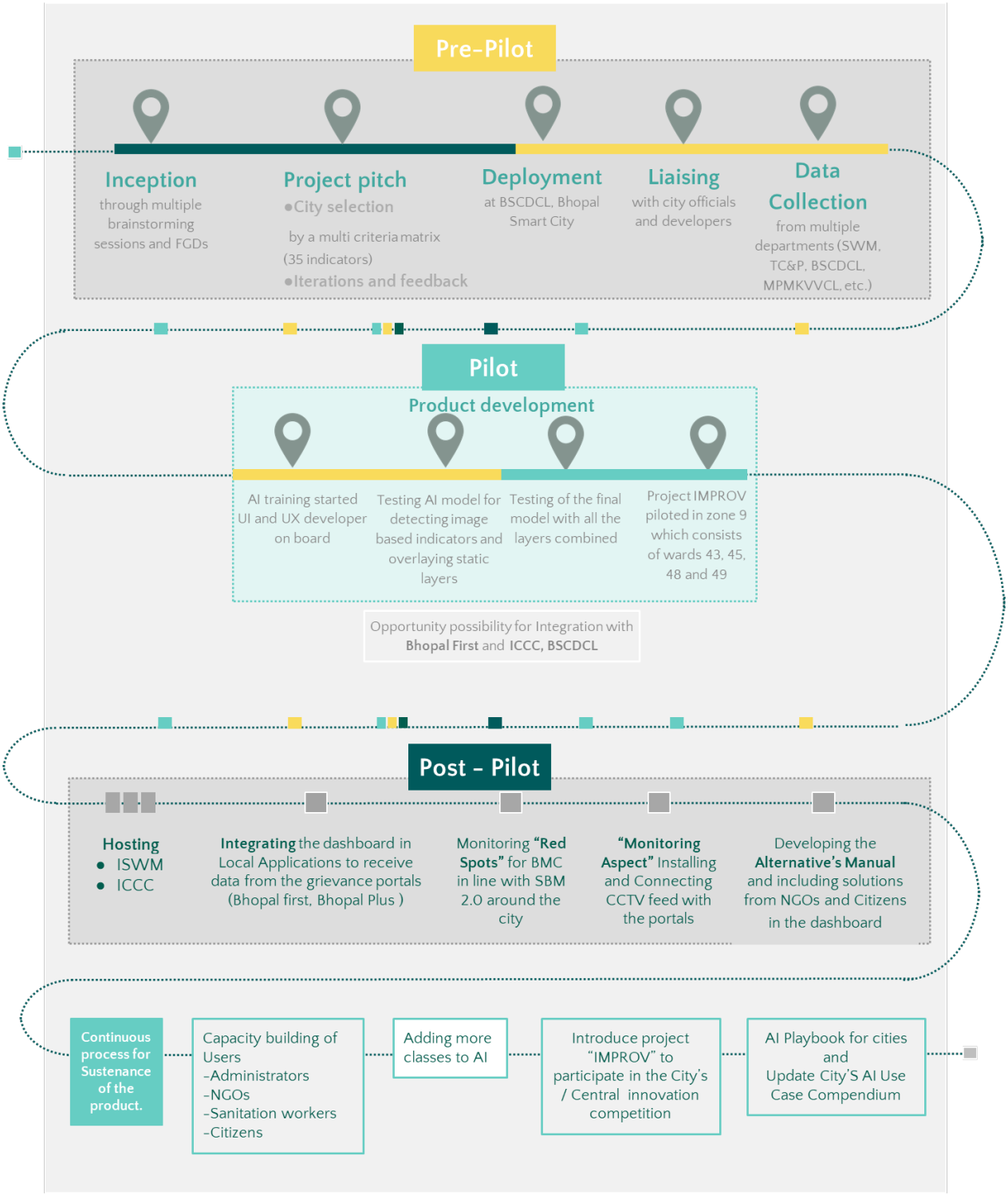
a. Pilot City Identification

Bhopal has ranked **7th** in the **Swachata Survekshan Ranking of 2022**.

Bhopal also has a functional ICCC for more than two years. The city ranks 17 in both ease of living ranking and municipal performance index, hence making it suitable for the pilot stage.

Bhopal has a very active SBM team working under Bhopal Municipal Corporation to keep the city clean. Smart City Bhopal has also made endeavours in implementing an efficient real time monitoring system for waste collecting vehicles. However, the high ranking of the city later turned up to be a roadblock for the team, as it was difficult to convince the authorities to accept the shortcomings in the SWM sector. Apart from this, the local ICCC consultants got into a feud with BSCDCL (Bhopal Smart City Development Corporation Limited) and the product could not be hosted in the official portal. However, stakeholder meetings revealed that the issue of recurring Garbage Points is currently a major challenge to the ULB, hence the project was taken forward in Bhopal.

b. Project Development and Implementation



Stages of Project Development

C. Expected Outcomes

1. **An artificial intelligence-based system** to detect the nature, locations, and quantity of garbage being dumped in the city.

2. **A database of tools** to enhance machine learning that can be tweaked and customised for any urban infrastructure. The tool will open more horizons of exploration for various municipal services.

3. **A comprehensive geospatial dashboard** to visualise different aspects of a city.

4. **Database for garbage vulnerable spots** that facilitates the ULBs to make informed decisions, hence improving their grievance redressal mechanism. This data can be further used for other research purposes.

5. **Informed decisions, efficient resource management and evidence-based approach for intervention related to the SWM sector.**

6. **An interactive and accessible system** for the administrative officials and the civil support organisations to participate further in creating and implementing urban centric solutions to tackle issues such as SWM.

7. It will enhance overall cleanliness and hygiene in the city.

d. Actual Result

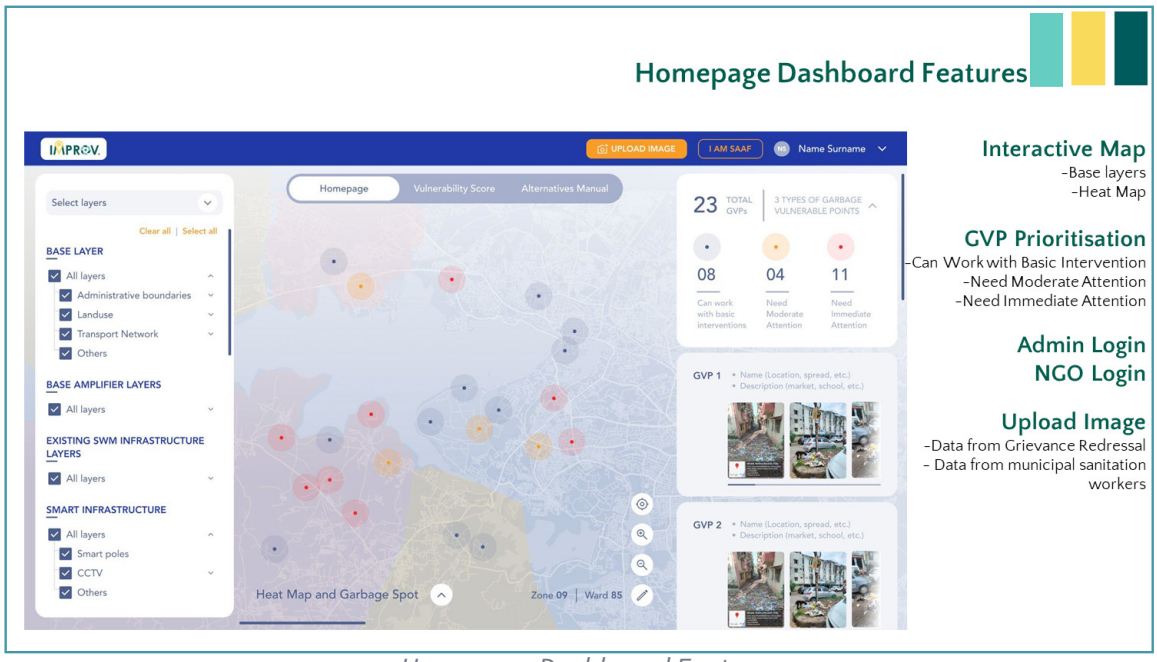
1. **The AI model of IMPROV** has been trained to identify GVPs and their surrounding objects with 86% accuracy.

2. **IMPROV** has an AI based automated method to come up with a **vulnerability score for each of the appearing spots** on the dashboard on the basis of the factors influencing those spots, so that the administrative body can prioritise which spot to clear first.

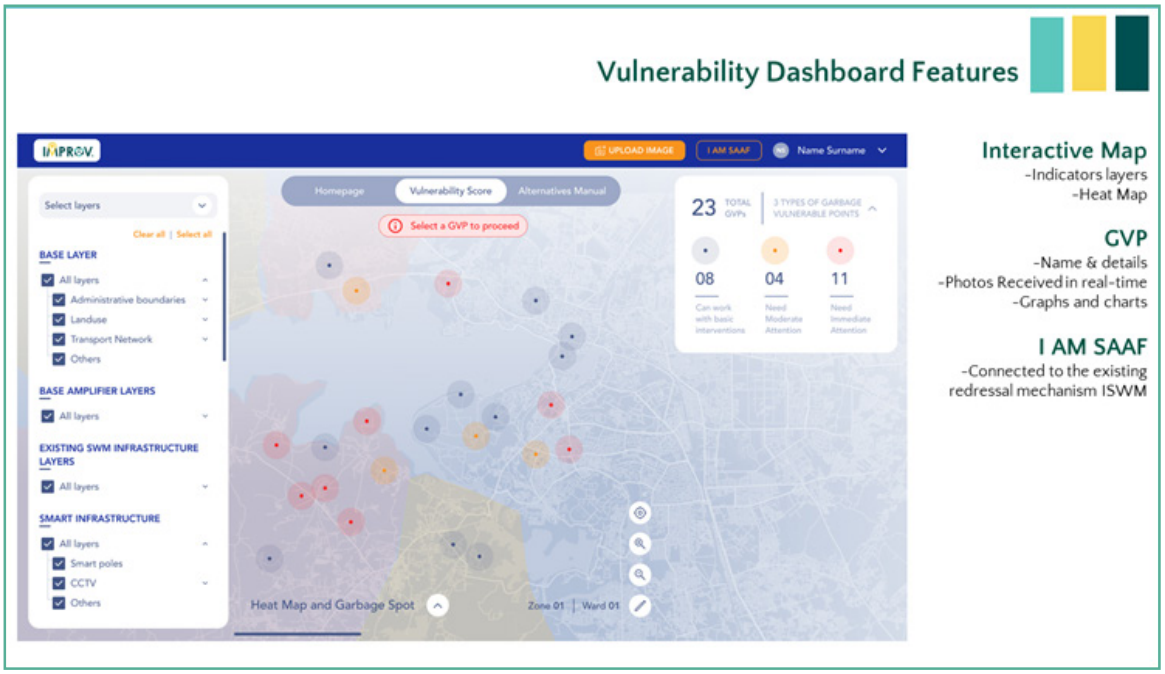
3. **A comprehensive GIS-based layer** for calculating the vulnerable score and creation of the heatmap has been developed which gives an overview of the city as well as the functioning of the Solid Waste Management system in the city.

4. **A dashboard** to understand the indicators resulting in the emergence of GVPs, the spread of GVPs and heatmap to depict the variations of factors influencing each GVP with alternate solutions to eradicate such points will be offered by IMPROV.

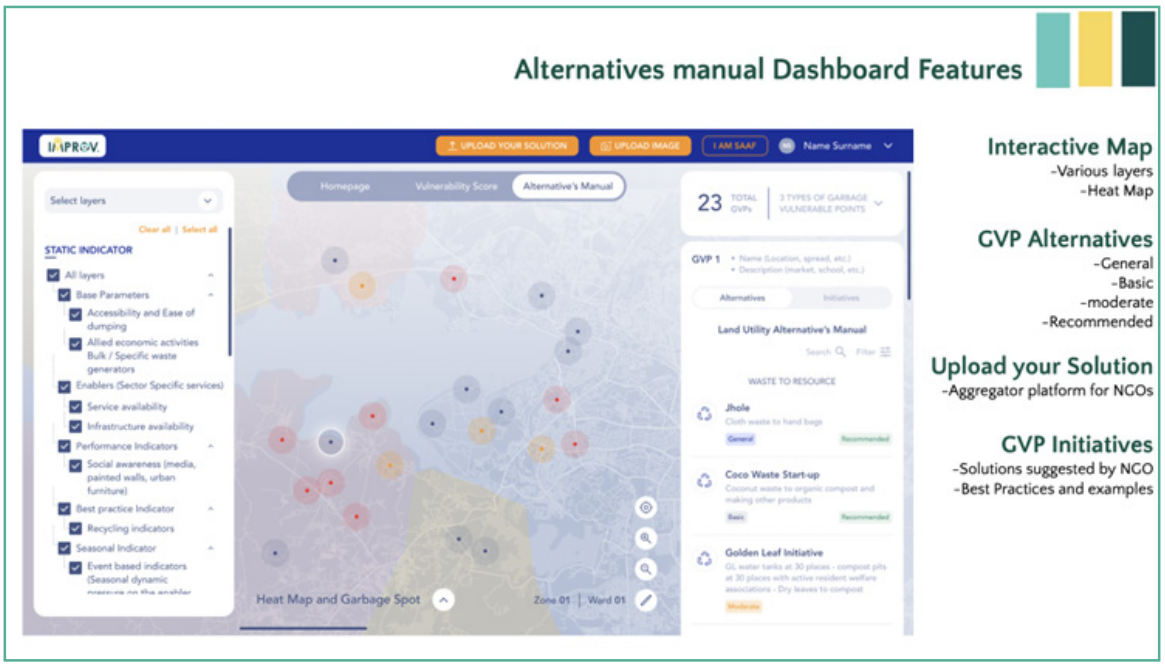
5. For the sustenance of the project and to make it more city-specific, IMPROV will work as an intermediate platform between the existing grievance applications (BhopalFirst App, BhopalPlus etc.) of the city from where the data will come for analysis and the applications (Sw having Structural hierarchy of SWM) to inform the concerned department regarding the issue to take proper solutions.



Homepage Dashboard Features



Dashboard (Prototype) of 3 tabs and its features



Dashboard (Prototype) of 3 tabs and its features

e. Link to the Tool

https://smartbhopal.city/improve-map/login.php

05 Conclusion

The next phase of product development will focus on vertical scaling by adding more components to the product such as a dual data input and monitoring mechanism, increasing the number of classes in the AI model for more efficiency, connecting different grievance mechanisms under one platform, option of CSOs uploading solutions, and refining the alternatives manual.

Additionally, the city administration has expressed their interest in participating in the Swachh Technology Challenge with project 'IMPROV' under the innovation category. For which, the product will be scaled up to identify and monitor 'Red Spots' and 'Yellow Spots' in the city.

The solution has the potential for scalability and replicability to other cities by changing the data inputs such as the classes used for identifying GVP, adding more layers of geo spatial data, etc. and/or by deploying the solution in another sector using the same methodology.

IMPROV.

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SWITCH

Monitor electricity consumption and renewable generation in city

AHMEDABAD
Ahmedabad Smart City
Ahmedabad Municipal Corporation

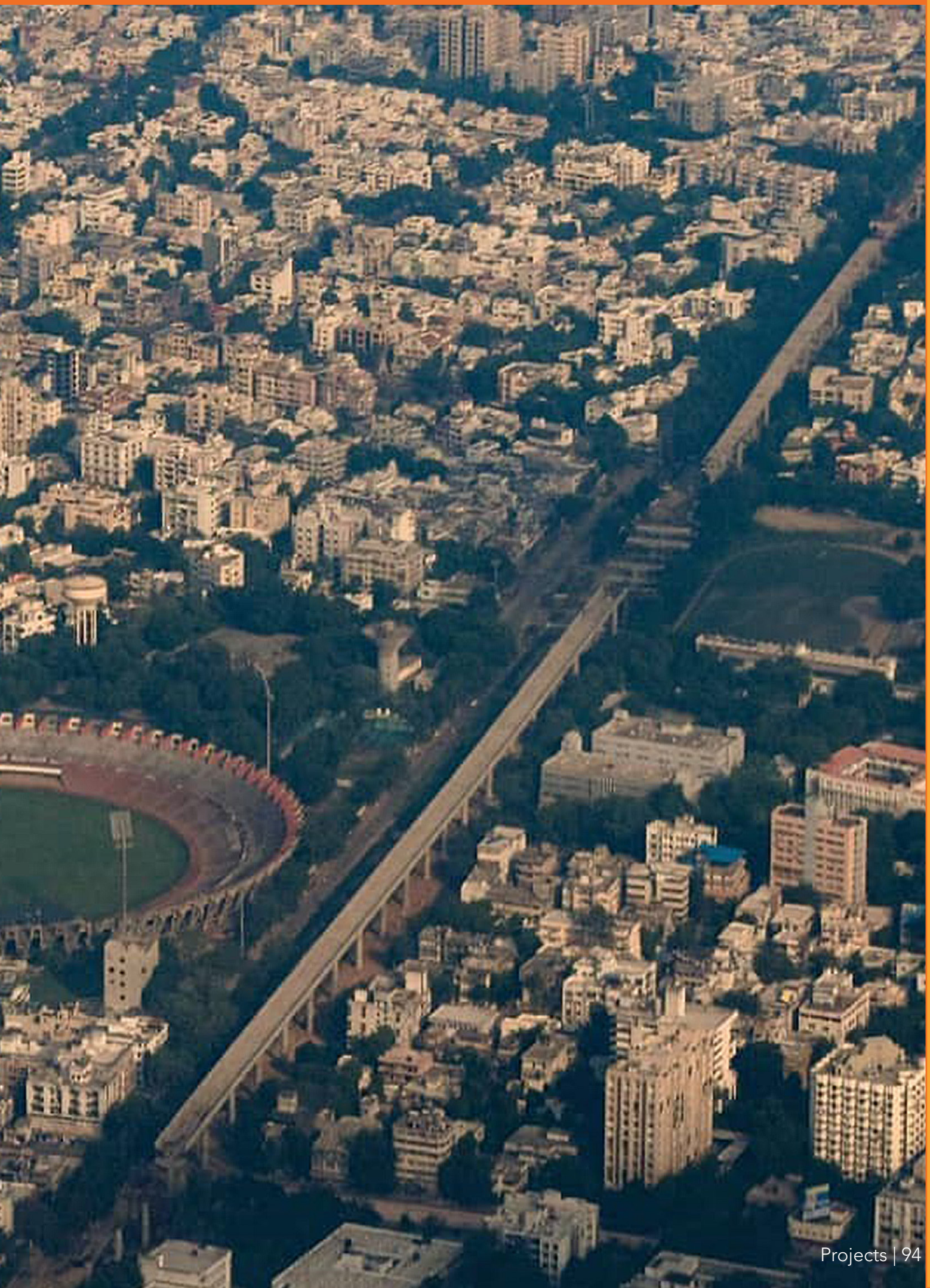
ENERGY
A platform to monitor electricity consumption and renewable generation in city

USERS
Urban Local Body

Switch Dashboard
Desktop compatibility
Online Mechanism

4 Months
The application is in the IT developmental stage

Link
https://arjun-krishna1-iscf-project-energy-usage-72wpqx.streamlitapp.com/Home_2



SWITCH

A platform to monitor electricity consumption and renewable generation in city

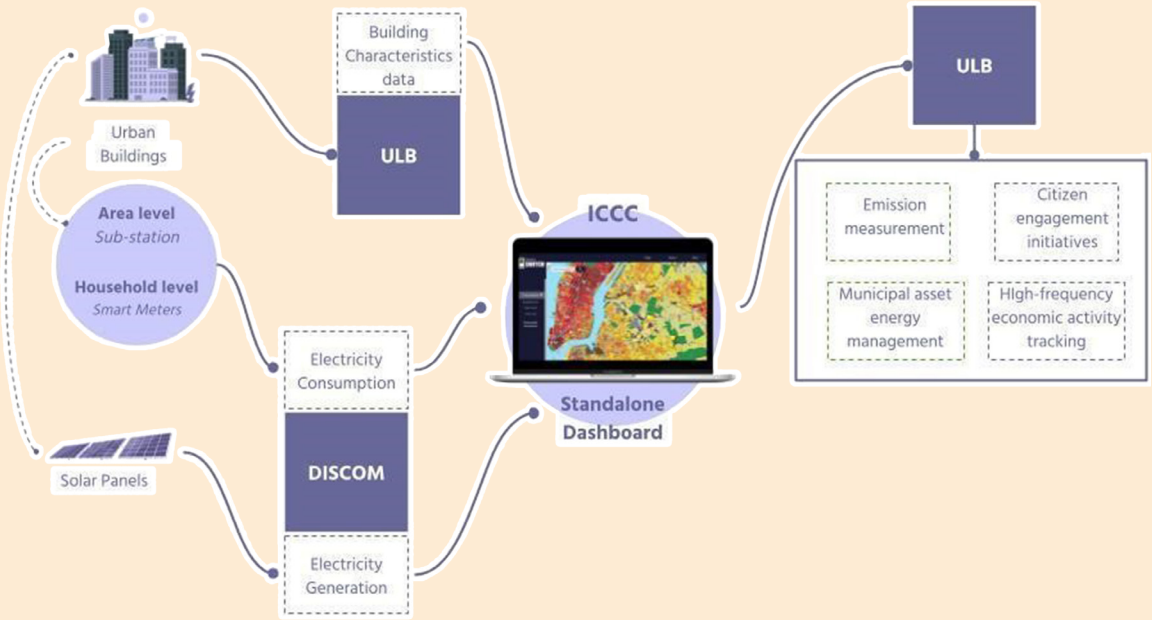
Cities across the world are responsible for consuming 70% of the total energy while accounting for only 2% of the earth's surface. This means around 50% of global emission happens in cities. In COP26, India declared to achieve net zero by 2070 and generate 50% of its energy through renewable resources by 2030.

Building sector in Indian cities accounts for 30% of the energy consumption. To achieve the magnanimous target declared by India, cities across the country must create a roadmap to monitor their electricity consumption and renewable generation. But a challenge remains in the jurisdiction of city administration in India, where electricity does not fall under its work mandate. Hence, Team Switch from the Smart Cities Fellowship Program is developing a platform called EnergyScan, which looks to monitor electricity consumption and renewable energy generation from the smart meters data.

Source: Asif Khan, via Instagram

01 Context

The platform will spatially show the electricity consumption pattern across the city along with type and age of the building. It will also provide insights into the change in terms of weather and other external factors. This will help city officials to launch evidence-based policies towards optimising electricity.



Process flow EnergyScan

The possibilities with EnergyScan are endless and can help in optimising the electricity consumption of Urban Local Bodies as well as create a roadmap to a more climate-resilient city.

02 Problem Statement

In the 74th Amendment Act, ULBs functions were decided which included rendering basic services such as water, drainage, sanitation, governing land use, issuing building permits, etc. While the ULBs cater these services to the citizens, they do not have any role in providing electricity which is the task of a Distribution Company (DISCOM). Research shows that it is important for ULBs to monitor their electricity consumption so as to plan towards net zero.

For doing this, a platform is needed which would help to visualise electricity consumption and the related emissions at a very granular level and then provide the ULB and the citizens with insights on how they can reduce electricity consumption and also provide scope for offsetting the carbon emission by installing renewable energy infrastructure.

While the mandate of the ULB and DISCOM does not overlap, the data gap is creating an obstacle to plan ahead for city climate resilience.

03 Objective of the Project

The following are the objectives of the project:

1. To monitor and visualise electricity consumption within a city at a building level.

2. To quantify renewable energy generated at the local level.

3. To check change in energy consumption behaviour through citizen engagement campaigns.

04 Project Strategy

a. Pilot City Identification

An integral aspect of the project was to ideate in a way which can be city agnostic and once piloted, it can be adopted by other cities. Prerequisite to the project were,

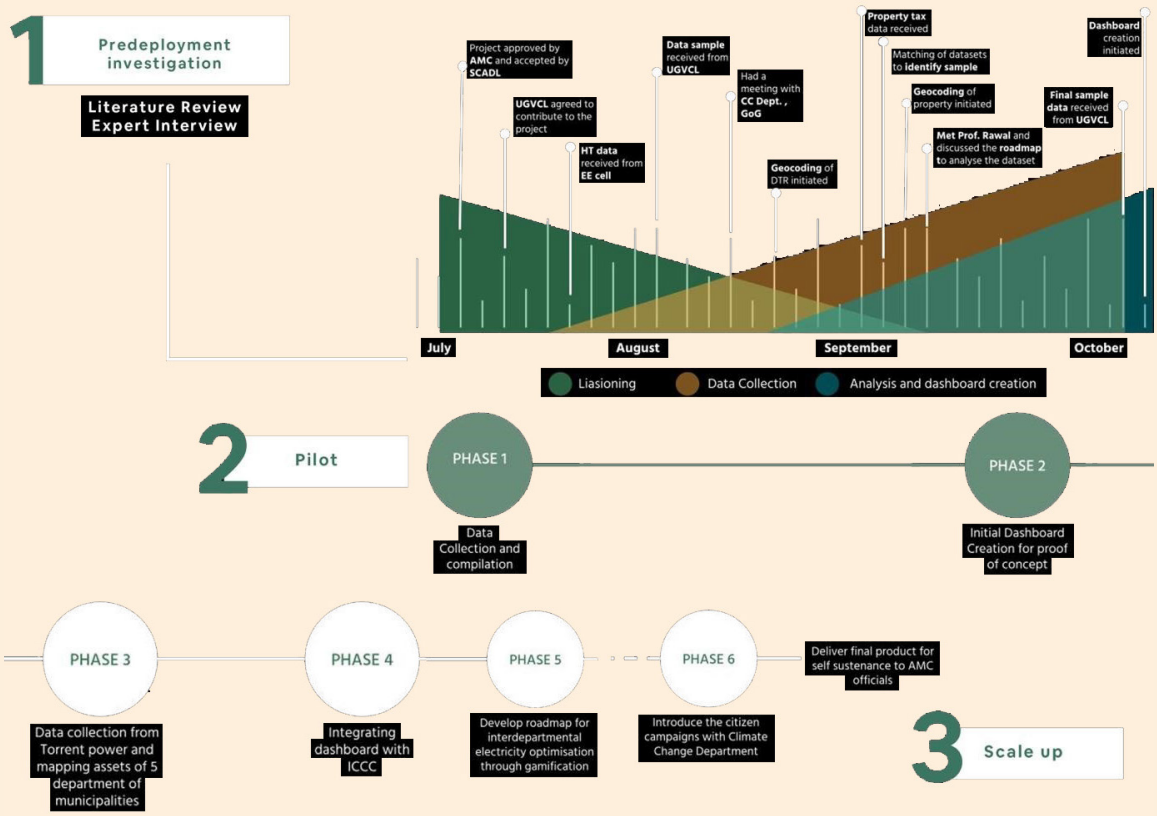
1. Installed smart meters for electricity
2. Considerable solar PV penetration
3. Public DISCOM
4. Digitised property tax data
5. Availability of ICCC

Ahmedabad smart city fulfilled all these criteria and was an ideal place to initiate the project.

Ahmedabad

Ahmedabad had a favourable stance in our project as it had all the prerequisite data, administrative setup and technical infrastructure. The first thing about Ahmedabad was having a public DISCOM called UGVCL. It repeatedly ranks one of the best public DISCOMs in the country and also has the biggest smart grid pilot under NSGM. The smart grid pilot which was happening in the Naroda area of Ahmedabad has more than 28,000 smart meters which consists of consumers of various types, such as residential, commercial and industrial. This mix of consumers and the high number of meters installed made it a favourable data source. Apart from that Ahmedabad also has one of the most versatile ICCCs among all the smart cities and was eager to make something regarding electricity consumption and renewable generation. Their idea was to create a map for the city towards net zero. Ahmedabad also had a digitised dataset of all the residents in the pilot area of Naroda which made it possible for us to overlay both of them to understand the consumption pattern in accordance with the building type, age and area.

b. Project Development and Implementation



Project Development and Implementation

c. Expected Outcomes

Short term outcome

The short term outcome would be the creation of a dashboard through which the city administration can know the electricity consumption in the city and the emissions associated with it. The dashboard would also provide the information to administrators regarding climate impact analysis of electricity consumption.

Long term outcome

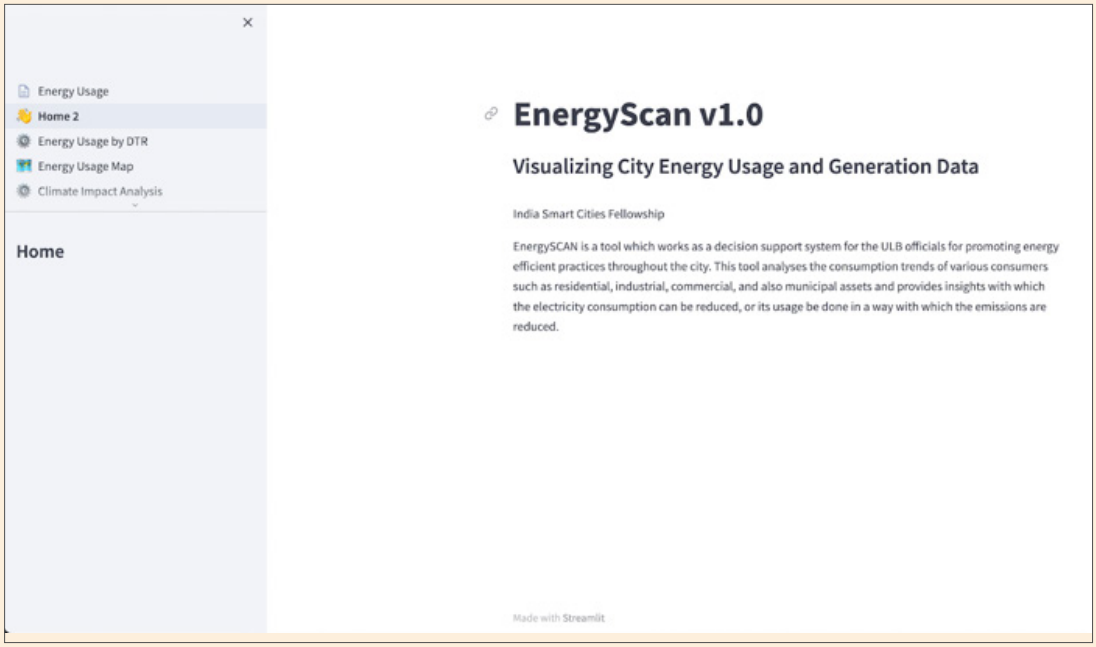
In the long run, the dashboard would provide the administrators insights into the electricity scenario of the city and help them take measures to reduce the city's carbon footprint. The dashboard is created with the purpose of fulfilling India's commitment of becoming net zero by 2070. This would happen when the actions are taken at the local level, which can be taken with the help of this dashboard. Furthermore, long term insights can also be derived which will aid the administrators in creating a road map for that city to become net zero.

d. Actual Results

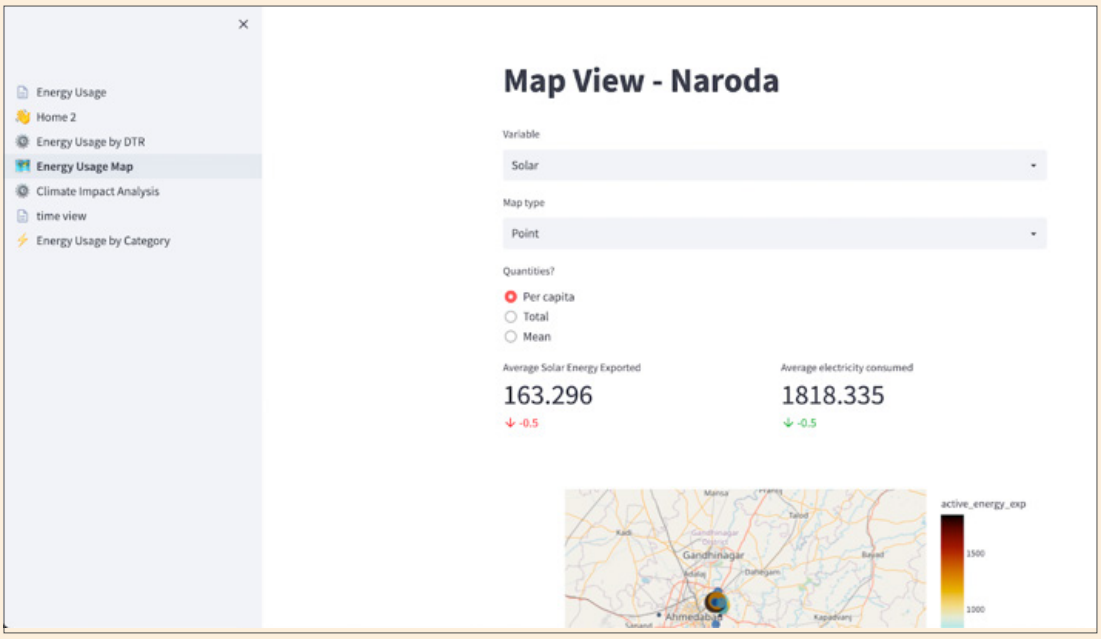
The platform is built for the city administration to draw insights for planning and policy-making. In order to ensure proper insights are provided, the platform consists of three main sections for now and has plans to incorporate more with the integration of more data layers into the platform.
At the present three main sections are:

1. Energy use map
2. Climate Impact Analysis
3. Energy use by type

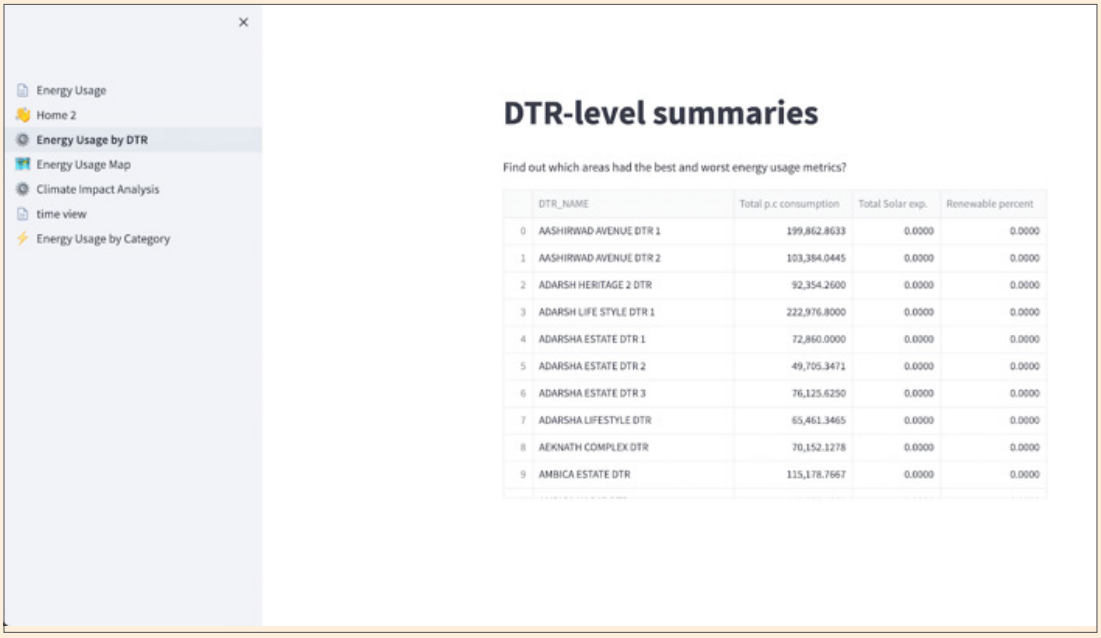
The energy use map is a heat map which shows the places with the highest electricity consumption in the area. The climate impact analysis has various parameters such as temperature and wind speed against which the consumption data is correlated to get insights into behavioural changes in consumption.
Finally, the energy use by type correlates the building use type with the consumption pattern and gives insights into the pattern of use throughout the day.



Introduction to EnergyScan v1.0

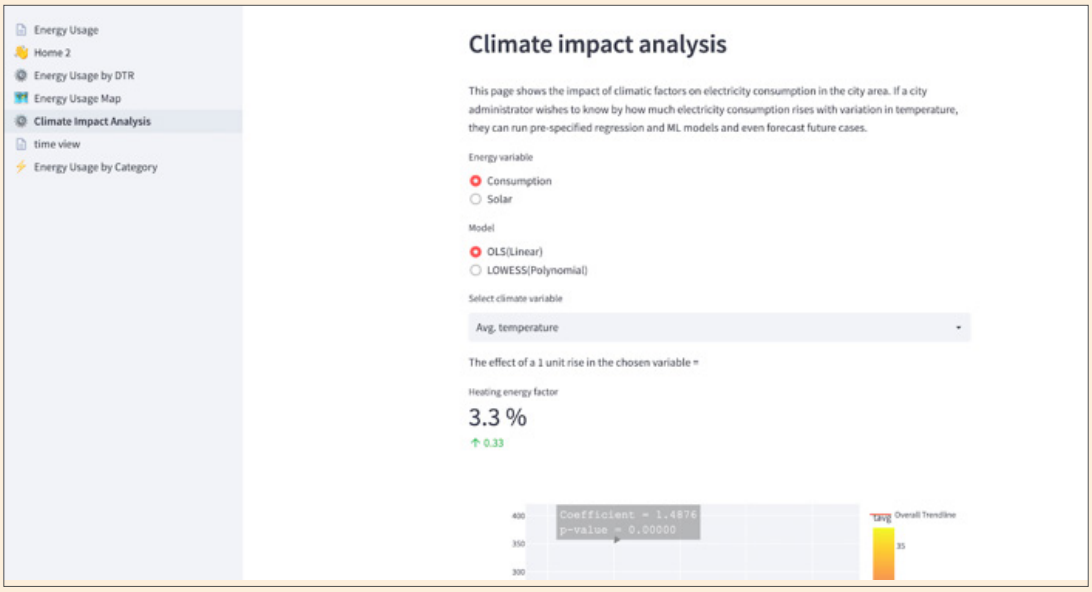


Dashboard Home Page



	DTR_NAME	Total p.c consumption	Total Solar exp.	Renewable percent
0	AASHIRWAD AVENUE DTR 1	199,862.8633	0.0000	0.0000
1	AASHIRWAD AVENUE DTR 2	103,384.0445	0.0000	0.0000
2	ADARSH HERITAGE 2 DTR	92,354.2600	0.0000	0.0000
3	ADARSH LIFE STYLE DTR 1	222,976.8000	0.0000	0.0000
4	ADARSHA ESTATE DTR 1	72,860.0000	0.0000	0.0000
5	ADARSHA ESTATE DTR 2	49,705.3471	0.0000	0.0000
6	ADARSHA ESTATE DTR 3	76,125.6250	0.0000	0.0000
7	ADARSHA LIFESTYLE DTR	65,461.3465	0.0000	0.0000
8	AEKNATH COMPLEX DTR	70,152.1278	0.0000	0.0000
9	AMBICA ESTATE DTR	115,178.7667	0.0000	0.0000

Energy usage map



DTR Summaries

e. Link to the Tool

https://arjun-krishna1-iscf-project-energy-usage-72wpqx.streamlitapp.com/Home_2

05 Conclusion

There is a huge potential for the platform to grow given its nascent stage. As a proof of concept, a sample of historical data was provided to us by DISCOM. The property tax data and weather data were overlaid to get insights into the same.

To scale up the project into a full-fledged platform, a live API must be created from the smart meters data which when matched with the location and its adjacent property tax data and external weather data will provide live insights into electricity consumption which can be used to create behavioural change campaigns. Also, the platform can be linked to the municipality's department which can show various aspects of optimising their personal electricity consumption.

A dashboard with such capability can enable the city to monitor its electricity consumption, and take measures to reduce the carbon footprint or the emissions related to it.

With the help of such tool, city administrators can create a road map for making their city net zero and thus taking actions to realise India's goal of becoming net zero by 2070, pledged at COP26.

Abhishek Chatterjee

Himangshu Kumar

Shivam Vinod Dave

Internal Mentor

Sayli Mankikar
Head - City Climate Alliance
National Institute of Urban Affairs

External Mentor

Prof. Rajan Rawal
Senior Advisor – Centre for Advanced Research in Building Science and Energy, CEPT University

FELLOW PROFILES

FELLOWS

Abhishek Chatterjee

Abhishek Chatterjee is an urban sustainable development researcher and communicator. His interest is in the fields of urban sustainability, climate resilience, and the socio-ecological history of urban spaces. He has a cumulative experience of more than four years of working in the development sector. He was previously engaged as the Communication lead and researcher in the Environment Conservation Society. Prior to that, he was working with Azim Premji University as a researcher, where he tracked the socio-ecological history of Kumartuli artisans of Kolkata. Over the years he has worked with organizations such as UNFPA, Riverbank Studios, Centre for Wildlife Studies, and World Bank. He was also one of the delegates from the Ministry of External Affairs to represent India in Japan on the theme of 'Economic Co-operation' and one of the first Swachh Bharat Ambassadors. Abhishek holds a degree in Masters of Ecology, Environment, and Sustainable Development from the Tata Institute of Social Sciences (TISS). In his free time, Abhishek can be found doing photography, dancing, or playing guitar.

Akanksha Singh

Akanksha Singh is an architect and a regional planner. Her interests are in the fields of urban governance, infrastructure planning and development. She has two and a half years of experience in the urban development sector. She was previously associated with Growever Infra Private Limited, Delhi as an Urban Planner and Infrastructure Expert in two Smart Cities-Aizawl and Kohima. In addition to this, she has worked as an Urban Infrastructure Expert in preparing local area plans and Town Planning schemes for Dehradun and Elevated Corridor Design at Port Blair. Prior to that, she worked as a Research Associate in the Department of Urban Planning at the School of Planning and Architecture, New Delhi. She plans to work in the areas of smart urban governance, social equity, and its implementation. Akanksha is an alumna of the School of Planning and Architecture, New Delhi, and Birla Institute of Technology, Mesra. She holds a degree in Masters of Planning with a specialization in Regional Planning. In her free time, Akanksha enjoys reading and volunteering for an NGO working on spreading awareness on menstrual health and hygiene among marginalized women.

Akruti Murhekar

Akruti Murhekar is an architect and an environmental planner. Her interests are in the fields of climate action, equitable and inclusive planning, governance, and innovation for sustainable development. She has one year of experience working with an architecture and planning firm based in Mumbai. Prior to that, she was engaged with Partners for Urban Knowledge, Action and Research, where she conducted community-based participatory action research. She was also a part of the Indo-German Center for Sustainability summer school 2020 and worked on a project that focused on smart sustainable urban mobility & policy options. She has published literature on climate equity in urban areas. She plans to work in the areas of capacity building, innovation in sustainable development, inclusive and equitable planning, climate action, and policy implementation in urban areas. Akruti Murhekar is an alumna of the School of Planning and Architecture Bhopal. She holds a degree in Master of Planning, with a specialization in Environment. In her free time, Akruti indulges in reading, writing, traveling, and documenting heritage and culture. She volunteers with environmental and social welfare organizations.

Anna John

Anna John is an architect and an urban planner. Her interests are in the fields of urban land management and affordable housing. She was previously associated with the Department of Architecture, National Institute of Technology, Calicut as an Ad-hoc faculty. Prior to that, she has worked on the master plan for Thiruvananthapuram city and area-based development through local area plans during her tenure as an intern with the Department of Town and Country Planning, Kerala. She has presented content on urban land readjustment in Kerala. She plans to work in the areas of sustainable development and inclusive cities. Anna is an alumna of College of Engineering Trivandrum. She holds a degree in Masters of Planning in Housing.

FELLOWS

Anshul Rathore

Anshul Rathore is an architect. His interests are in the fields of sustainable urban development and inclusive cities. He has two years of experience of working on institutional projects. He was previously associated with the Indian Institute of Technology Roorkee as a Project Assistant Architect for the campus development project of Chhattisgarh Institute of Medical Sciences in Bilaspur. Prior to that, he interned as Project Architect in Aga Khan Development Network, Nairobi where he worked on various institutional and in-house projects for Aga Khan University. He plans to work in the areas of urban planning, sustainability and its implementation. Anshul Rathore is an alumnus of Indian Institute of Technology Roorkee. He holds a degree in Bachelors of Architecture. In his free time, Anshul enjoys sketching and painting urban landscapes and also likes to play lawn tennis.

Divya Bharti

Divya Bharti is a policy and governance professional with a background in civil engineering. Her interests are in the fields of public policy, governance, participatory processes, environment and climate change, sustainable development and social change. She has one and a half years of experience in the education and urban development sector. She was previously associated with EduBrisk Knowledge Solutions as a Content Developer, in the social sciences department, where she developed simplified and creative educational content based on academic curriculum. Prior to that, she has worked with Tata Trusts and Government of Odisha for the implementation of Odisha Liveable Habitat Mission in Rourkela Municipal Corporation. She plans to work in public policy and governance. Divya Bharti is an alumna of Tata Institute of Social Sciences, Mumbai. She holds a degree in Masters of Science in Urban Policy and Governance. In her free time, Divya enjoys reading, listening to music, yoga and meditation.

Divya Chand

Divya Chand is an urban researcher and an architect. Her interests are in the fields of southern urbanism, affordable housing, inclusive and sustainable development. She has three years of experience working in spatial development. She is the co-founder of 'Lokal Habitat Labs' which is working to develop a framework that enables dignified, safe and resilient self-constructed housing in Vidarbha, Maharashtra. Prior to that, she has worked with Architecture Workroom Brussels and has also been an Urban Fellow at the Indian Institute for Human Settlements. She has presented and published content on sustainable construction technologies and adaptive urban practices in India. She plans to work in the field of circular economy and enabling it in the Indian context. Divya is an alumna of School of Planning and Architecture, New Delhi. She holds a degree in Masters in Urban Studies from Vrije Universiteit Brussel and Université Libre de Bruxelles in Belgium. In her free time, Divya enjoys photography, pottery, and exploring streets in cities.

Harsha Arya

Harsha Arya is an environmental planner. Her interests are in the field of environmental studies, and she has two years of experience in the domain of philanthropic research. She was previously associated with the Asia Venture Philanthropy Network (AVPN) as the Executive- Knowledge Centre, where she was exploring the philanthropic appetites of Asian countries in the climate sector. Prior to that, she was involved in the preparation of the Environment Impact Assessment (EIA) Guidelines for Tanzania with the Centre of Science and Environment (CSE). She also presented a paper on 'Urban Local Governance for Low Carbon Communities and Infrastructure' at the 4th International Conference on Bio Energy, Environment and Sustainable Technologies, held at the Arunai Engineering College in Tiruvannamalai, Tamil Nadu in January, 2019. Harsha is an alumna of School of Planning and Architecture, New Delhi. She holds a degree in Masters of Environmental Planning. In her free time, Harsha enjoys composting and gardening.

FELLOWS

Himangshu Kumar

Himangshu Kumar is a development economist. His interests are in the fields of urbanization studies, and local governance and he has one year of working experience in the development sector. He had been previously working as a Research Associate in project-analyzing Panchayat-level finance in the state of Odisha, with the University of St. Andrews and ASPIRE a non-profit organization. During this engagement, he was also involved in the roll-out of conducting a large-scale household survey in Odisha, to assess the effects of school closures during Covid-19 induced lockdown. His research work on Covid-19 policies in India has been acknowledged & published by the Centre for Economic Policy Research (CEPR) and the European Journal of Development Research (EJDR). He was previously associated as a Researcher with the Blavatnik School of Government, University of Oxford, as part of their project 'Oxford Covid-19 Government Response Tracker (OxCGRT)'. Himangshu plans to work in the areas of urban housing, with a focus on economics and housing policies. Himangshu is an alumnus of the Centre for Development Studies (JNU), Trivandrum, Kerala. He holds a degree in Master of Philosophy, with a specialization in Economics. In his free time, Himangshu enjoys traveling and reading.

Irene Anna Shaji

Irene Anna Shaji is an architect and an urban manager. Her interests are in the fields of city governance, its service delivery, operations and management. She was previously associated with the Research and Action Center for Local Democracy (RACLD) as a Management Trainee, where she was involved in the preparation of Gram Panchayat Development Plans (GPDPs) for the Panchayats of Tamil Nadu. During this engagement, she was also involved in the tasks of data collection and data coordination related to water-resources through use of technologies. She is having publication exposures in areas of exploring open data journeys and data-driven decision making in Indian smart cities. She plans to work in areas of data-driven governance, and its implementation in helping cities foster resource effective, demand-based decision making. Irene Anna Shaji is an alumna of the CEPT University, Ahmedabad. She holds a degree in Masters of Management Studies, with specialization in Urban Management.

Kastury Biswas

Kastury Biswas is a geographer and an urban planner. Her interests are in the fields of public spaces design, infrastructure development, environment, and public policy. She has two years of experience in the sectors of infrastructure development and environment. She was previously associated with the Gujarat Ecology Commission as an Information Officer, where she was involved in preparation of State Environment Report of Gujarat, and on evaluation of projects implemented by the Gujarat State Watershed Management Agency. Prior to that, she has worked with the Centre for Urban and Regional Excellence India on water and sanitation and education of child labour in the low income settlements of Agra. She has also worked on preparation of the Master Plan for Delhi, 2041. She plans to work on dynamics of open public space, inclusivity of a city, urban policies and climate change. Kastury Biswas is an alumna of School of Planning and Architecture, Vijayawada and Jawaharlal Nehru University, New Delhi. She holds a degree in Masters of Planning with specialization in Urban and Regional Planning and a degree in Masters of Arts in Geography. In her free time, Kastury enjoys traveling, reading books and dancing.

Kaustubh Mirajkar

Kaustubh Mirajkar is an architect and urban designer. His interests are in the fields of public open spaces, transportation and community-based designs. He has over three years of experience in the sectors of architecture and interior design. He was previously associated with the V.C. Mirajkar Associates, Kolhapur as an Associate Architect, where he worked on multiple projects. Prior to that, he has also worked with Udupi Nirmithi Kendra and NGO- Grassroots U, for community-based development in Karnataka. He worked as a visiting faculty at Manipal School of Architecture and Planning and with Shivamogga Smart City on sustainable transportation. He was also selected for the International Design Studio by Vastu Shilpa Foundation under the mentorship of Prof. B.V. Doshi. He has published research work on under-utilised spaces. He plans to work on placemaking in public spaces, NMT and community-based tourism initiatives. Kaustubh is an alumnus of Manipal School of Architecture and Planning, Karnataka. He holds a degree in Masters of Urban Design and Development. In his free time, Kaustubh enjoys travelling and playing table tennis and football.

Lipi Ghosh

Lipi Ghosh is a research analyst and a development economist. Her research interests primarily include analysis of inequality and multidimensional poverty, impacts of quality education, climate change and effective government policies on poverty and lives of people. She has authored several research articles, including 'Foundational Literacy and Numeracy of West Bengal' published in Economic and Political Weekly (EPW). She holds a degree in Masters in Rural Management. She was previously engaged with the Government of Jharkhand, under a research project based on "assessment of education status in the state by adopting Randomized Control Trial (RCT) evaluation method to understand the impact of the Teaching at the Right Level approach in comparison to the government's Continuous Comprehensive Education approach". She was also associated as a Research Associate with the School of Development Studies, TISS, Mumbai, where she was working in the 'Action Room to Reduce Poverty' program of the NITI Aayog and UNDP. She is an alumna of the Visva Bharati University, Santiniketan and TISS Mumbai.

Manoranjan Ghosh

Dr. Manoranjan Ghosh is a geographer and a climatologist. His interests are in the fields of climate change, climate vulnerability and adaptations, regional planning, and inter-linking impact of climatic change with local livelihoods. Dr. Ghosh has been awarded with several reputed academic and institutional fellowships during his educational and research journey, these included JRF-SRF by UGC (2017-21), scholarship by Government of West Bengal. He was previously engaged with the Department of Geography, University of Burdwan as a researcher (2016). He has successfully completed more than ten summer schools and short courses from several reputed universities and institutions, such as TISS, IGIDR, University of Edinburgh, Australian Centre for International Agricultural Research, IIT Guwahati, IIT Kharagpur, TERI University, and Global Initiative of Academic Networks (GIAN). He has published ten articles in reputed Scopus indexed journals and contributed five book chapters. He is an alumnus of University of Burdwan and Indian Institute of Technology, Kharagpur. He holds a degree in Doctor of Philosophy in 'Climate and Development'. He plans to work in the areas of impact of climate change on local livelihood.

Nikhil Sanjay Shah

Nikhil Sanjay Shah, is a Researcher, Architect and an Urban Designer. His research interests are in the domain of urban design, indigenous studies, agro-ecology, eco-feminism, heritage conservation, sustainable (re)development, gender and queer studies, and he has four years of experience in the academic, research and development sector. He was previously associated with the NITTE Institute of Architecture, Mangalore as a Head of Urban Studies Research Collective and an Assistant Professor, and People's Resource Centre, Delhi, as a research fellow. Prior to that, he was a research fellow working with SVNIT, Surat and Salford University, UK; a research assistant to Ar. Shveta Mathur, GIZ Delhi and a research fellow at UNESCO Sahapedia, Delhi. He plans to work on the Urban Water Plan for the Coastal cities of the Indian subcontinent and research on diverse issues exploring multi-disciplinary pedagogical frameworks to evolve co-learning processes. He holds a Masters in Urban Design from the SPA, Delhi. In his free time, Nikhil loves to listen to music, wander, engage with performance art, write, and save and disperse seeds.

Nishant Raj Tonk

Nishant Raj Tonk is an urban manager. His interests are in the fields of urban planning, urban governance, data analytics, infrastructure planning and development and safe road infrastructure design. He has one and a half years of experience in architecture and transportation. He was previously associated with the WRI India as a Project Associate (Road Safety Advisory), where he worked on a streetscape project, Delhi. During his post-graduation, he worked with Gopali youth welfare society an NGO, where he worked on the project RISE (Reform and Innovate School Education), and was head 'Parents as Co-Educators' program. He presented his work at two international conferences. His bachelor's thesis work was awarded by 'Best Architectural Thesis 2018'. He plans to work in the sector of urban governance, reduction of rising surface temperature in urban areas, and policy-making. Nishant is an alumnus of IIT Kharagpur. He holds a degree in Masters of Technology with a specialization in infrastructure design and management. In his free time, Nishant enjoys singing, playing various musical instruments and engaging in various volunteering activities.

FELLOWS

Ojaswini Bansal

Ojaswini Bansal is an architect and an urban designer. Her interests are in the fields of mobility, public spaces, and cultural aspects of a city. She has received the Chancellor award by RGPV university for being the university topper. She has worked with the Ahmedabad Urban Development Authority in designing multiple neighborhood gardens and documenting for HSR station area development. She was also a part of the team, which worked with BReUCom in building capacity for urban resilience in Kalbadevi precinct in Mumbai. She has worked as an architect for a year in the city of Ahmedabad. She aspires to work towards improving the quality of life of people. Ojaswini Bansal is an alumnus of School of Planning and Architecture, Bhopal. She holds a degree in Masters of Urban Design. She is a bookworm and in her free time, she enjoys swimming and exploring old core areas of cities.

Oviya T

Oviya Thangaraj is a development professional. Her interests are in the fields of sustainable social inclusion and equitable cities. She has experience in working with several government and non-government organizations, especially related to the social development sector. She was previously associated with Chennai Metropolitan Development Authority, where she was a part of forming the vision document of Chennai's third master plan and helped the team with data collection and stakeholder engagement in the George Town area of Chennai. Prior to that, she worked as a health governance field intern for NITI Aayog's SATH project at Piramal Swasthya in rural parts of Assam. Oviya was awarded as best outgoing student in her undergraduate studies at Madras Christian College. She plans to work in making policies that make cities inclusive and equitable. Oviya is an alumna of the Indian Institute of Technology, Guwahati. She holds a degree in Masters of Development Studies. In her free time, Oviya loves to watch and critique movies and to visually document city life.

Prakriti Saha

Prakriti Saha is an architect and urban designer with six years of work experience interspersed between design, research and academia. She has been associated with the City Level projects teams as a Research Consultant at the Delhi Urban Art Commission (DUAC) where she extensively worked on developing guidelines for Streets & Design Manual for Street Elements & Amenities for Delhi. Additionally, she maintains a deep understanding of visual hierarchy along with information design concepts and its application to user experience & user interface related deliverables and continues to develop her skills in this field. Furthermore, her portfolio comprises a diverse palette of - Renovation projects; Graphics, Branding & Publication Design as freelance ventures. She was briefly associated with the School of Architecture & Design at Manipal University Jaipur as an Assistant Professor and coordinated urban design & visual arts studios. When not at work, she enjoys blogging about urbanism and visual storytelling through travel photography.

Prasanna Bhangdia

Prasanna Bhangdia is an Architect and an Urban Planner. His interests are in the fields of Sustainable development, Climate change and Disaster Resilient planning and has two years of experience in the field. He was previously associated with the Dayanand College of Architecture as an Assistant Professor. Prior to that he was involved with two research works, first one was 'Application of Black Titanium Dioxide to minimize the effects of UHI in Walled city of Jaipur' and second one was 'Planning for Disaster Resilience A Case of Chandrasekharpur Zone, Bhubaneshwar'. Till date he has published five research papers in prestigious National & International journals. Apart from that he has also received many awards, The Best Student Award, The Certificate of Indian Institute of Architects, G. K. Manolikar Prize to name a few. He was selected for the Inspire Internship which was funded by Govt of India; Ministry of Science & Technology and Department of Science & Technology, New Delhi. He holds a degree in Masters of Urban Planning from NIT Jaipur. In his free time, Prasanna enjoys reading and volunteering with social organisations.

FELLOWS

Rahul Saikia

Rahul Saikia is a Human Geographer. His interests are in the fields of Urban Ethnography, Place Making, and the Politics of Space. He has a year of experience in the education sector. He was previously associated with the Department of Geography, at the North Eastern Hill University as a Guest Lecturer where he taught students at the post-graduate level. Prior to that, he completed his MPhil and Masters in Geography from the Delhi School of Economics. Drawing on his MPhil fieldwork, he presented a paper on the politics of space in Delhi's industrial areas. He is now exploring urban experiences at the intersections of policy, governance, and ethnography. In his free time, he enjoys reading, writing, and exploring the city.

Rashi Jain

Rashi Jain is an artist, architect and a mental health advocate. Her interests are in the field of architectural journalism, heritage and tourism management, and entrepreneurship. She has three years of experience in architecture journalism and public relations and one year of experience in the design and marketing, and two years of experience in the mentorship sector. She was previously associated with Global Policy Insights and GPODS fellowship as design and marketing manager. Prior to that, she has worked as an architectural journalist and a public relation executive at Creative Group, Delhi. Her thesis was nominated in Archiprix International Thesis competition, she has won a design excellence award in International Design Competition organized by the University of Westminster, London, was a Semi-finalist at UC Berkeley Essay Prize Competition. She is an alumna of School of Planning and Architecture, Shri Mata Vaishno Devi University, JnK and holds a post graduate diploma in Built Environment from Anant National University. In her free time, Rashi loves to travel, document tangible and intangible heritage of different parts of the country, and invest in running her initiative Swajanm which is on breaking stigma and spreading awareness on mental health and wellbeing.

Ritika Rajput

Ritika Rajput is an urban researcher. Her interests are in the fields of small-town urbanism, urban water, ecology, climate change, sustainability and rural development. She has a year long experience in the urban sector and was previously associated with the Indian Institute for Human Settlements, Bengaluru as Urban Fellow. She recently published a research paper, titled, 'Worlding of Bodh Gaya'. In future, she plans to work in the water sector, climate change and small-town urbanism. Ritika is an alumna of Nalanda University, Rajgir and holds a degree in Masters of Ecology and Environment Studies. In her free time, Ritika enjoys gardening, farming, yoga, dancing and reading.

Roshni Gera

Roshni Gera is an Architect and Computational Designer. Her interests lie in the fields of circular design, sustainable practices, integration of cutting-edge technology and artificial intelligence. She has two years of experience in the design and education sector. She was previously associated with minD Design, London, as a partner and Architect. Along with this, she was also a visiting Professor at BMS College of Architecture, Bangalore. 'Orb[i]s' - her design research project addressing change in the urban environment and the future of culture was published by RIBA - Future Architects, April 2020. She also presented her work at the DigitalFUTURES World Young: Interactive Design Conference. In future, she plans to align her work in bridging the gap between design, technology and social welfare. Roshni Gera is an alumna of Dayananda Sagar Academy of Technology and Management - School of Architecture. She holds a degree in Masters of Architecture in the field of Architecture and Urbanism (DRL) from the Architectural Association School of Architecture, London. In her free time, Roshni enjoys engaging with the outdoor world through sports and adventure-based activities as well as voluntary work for organisations like the Youth for Parivarthan.

Sarayu Madhiyazhagan

Sarayu Madhiyazhagan is an Urban Planner and an Architect. Her interests are in the fields of energy, urban planning and self-sustaining economies. She has two years of experience in the development sector. She was previously associated with Total Synergy Consulting Pvt. Ltd. as a young professional, where she was involved in implementing the "Support to Women-led Enterprises in Nepal" project. Prior to that, she worked as an Urban Transit Design Fellow in the Directorate of Urban Land Transport functioning under the Urban Development dept., Govt of Karnataka. In future, she plans to work in experimenting with planning and decision-making processes at all scales leveraging the strengths of all stakeholders and focusing on encouraging social cohesion within the local economy in reducing the carbon footprint of city resources by setting up a co-beneficial framework. Sarayu is an alumna of Politecnico di Milano. She holds a degree in Master of Science in Urban Planning. As a part of the academic studio, her project titled 'Designing and diffusing NBS for a resilient city with co-creation processes' was presented and published in Ri-formare Milano 2018. In her free time, Sarayu enjoys sketching, traveling, and volunteering as a graphic designer.

Satarupa Roy

Satarupa Roy is an architect, urban planner and an artist committed towards building sustainable and livable cities. Her interests are in the fields of smart and sustainable infrastructure development, land use transport integration, heritage and tourism development, policy and governance. She has experience of three years in research, urban planning and architecture. She was previously associated with IPE Global as a Project Associate working with Srinagar Smart City. She has assisted the PMU and the Cities for Climate Smart Cities Assessment Framework-1 under the Ministry of Housing and Urban Affairs, New Delhi during the India Smart Cities Internship Program 2019. She also worked for Jabalpur Smart City. In future, she plans to work in the field of heritage and tourism development, integrating smart inclusive neighborhood planning for smart cities. Satarupa Roy is an alumna of School of Planning and Architecture, Delhi. She holds a degree in Masters of Planning, with a specialization in Urban Planning. In her free time, Satarupa loves to travel, exploring and capturing India's rich heritage and culture, and keeps her hands on creating new paintings, sketches, calligraphy and writing.

Shaurya Chouhan

Shaurya Chauhan is an architect, urbanist and green building enthusiast. His interests are in the fields of urban placemaking, open source design processes, and application of analytics in architecture, and he has one year of experience in the architecture sector. He was previously associated with Morphogenesis as Junior Architect. He is also an accredited professional with the IGBC, U.S. Green Building Council and a member of the International Society of City and Regional Planners (Hague). He is the recipient of the ISOCARP Student Award 2020 (Abu Dhabi), UniATA Award for Best Project in West & South Asia Region and Saint Gobain National Scholarship 2021. In 2020, he represented India at the AGORA PAUMME Awards held at the German University in Cairo and represented his University at RIBA President's Medals 2020 (London). He plans to work in the areas of urban analytics & sustainable development. Shaurya Chauhan is an alumnus of Sushant School of Art and Architecture. He holds a degree in architecture. In his free time, Shaurya can be found conversing with his Kindle, cheering-on his favourite football team or boxing at the local gym.

Shivam Dave

Shivam Dave is an electrical engineer. His interests are in the fields of electric vehicles, microgrid networks and renewable energy sources. While pursuing undergraduation, one of his electric vehicles projects was awarded a grant from the Government of Gujarat under the Student Startup and Innovation Policy (SSIP). He has also published research papers in the fields of perovskite and organic solar cells. He plans to work in the vehicular and renewable energy sector. Shivam is an alumnus of Institute of Infrastructure, Technology, Research and Management. He holds a Masters degree in Electrical Infrastructure with a specialization in control system engineering and organic photovoltaics. In his free time, Shivam enjoys listening to music, photography, reading, writing, and learning new things.

FELLOWS

Shonit Nayan

Shonit Nayan is a policy researcher and an IT engineer. His interests are in the fields of public finance, fiscal federalism, environment and human rights. He has more than five years of experience in skill development, local government finance, and BHR. He was previously associated with the National Human Rights Commission as Junior Research Consultant, and contributed in preparation of human rights advisories amid Covid-19 on Particularly Vulnerable Tribal Groups, BHR, and protection of human rights of informal workers. Prior to that, he was associated with the Indian Institute of Public Administration as Research Assistant, where he worked upon two research projects entrusted by the NITI Aayog and the 15th Finance Commission respectively. He has extensively written research papers, and columns for publication portals. He is an alumnus of Banaras Hindu University. He holds a degree in Masters of Public Administration, and a degree in Bachelors of Information Technology. He plans to work in the areas of municipal finances, municipal asset management, and informal economy. In his free time, Shonit enjoys writing poems, columns and singing etc.

Soumya Shrivas

Soumya Shrivas is an architect, urban planner and a cultural enthusiast. Her interests are in the fields of urban policy, land management, and has three years of experience in the field. She was previously associated with KPMG Advisory Services and Private Limited as an Analyst, where she was deputed as a Smart City Consultant with the Directorate of Urban Local Bodies, Haryana. Prior to that, she has worked as a consultant for the Pradhan Mantri Awas Yojana with the Directorate of Urban Administration & Development, Madhya Pradesh. She is a recipient of the National Bal Shree Honor and the Center for Cultural Resources and Training- junior scholarship. She plans to work in the field of urban and rural development by promoting inclusive and innovative Housing and exploring the workings of real estate. Soumya is an alumnus of School of Planning and Architecture, Delhi and Maulana Azad National Institute of Technology, Bhopal. She holds a degree in Masters of Planning, with a specialization in Housing, a degree in Bachelors of Architecture and Arts (Kathak). In her free time, Soumya enjoys watching theater, associating with local art and cultural groups, exploring and capturing places, reading and having a cup of tea.

Swati Pradhan

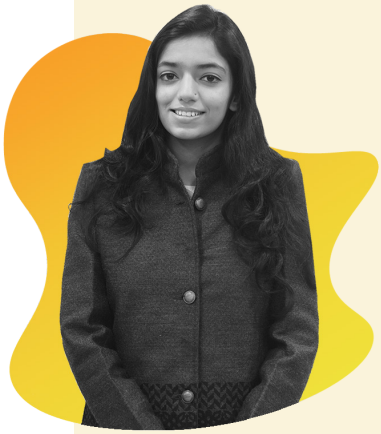
Swati Pradhan is an architect and an urban planner. Her interests are in the fields of sustainable development, local area planning and community participation, and has one year experience working with Nangia Andersen LLP as project associate- government and public sector advisory. Prior to that, she has worked as a research intern with NIUA and developed a knowledge product on "Innovations in Urban River Management" as a part of a project under the NMCG. She has also worked as a planning intern with the Town and Country Planning Organisation, Delhi on the sub-scheme on formulation of GIS-based master plan under the AMRUT mission. She has published research work on traditional housing settlements, urban renewal and form-based codes. She plans to work in the areas of inclusive development, sustainable and energy-efficient solutions. Swati Pradhan is an alumna of School of Planning and Architecture, Delhi. She holds a degree in Masters of Urban Planning. In her free time, Swati enjoys gardening and exploring new places.

Tarini Gupta

Tarini Gupta is a Policy Research Analyst. Her interest lies in governance policies , especially in the fields of Environment, Gender, History and Public Administration and Urban Policy. Her prior professional experience includes working with top education organizations like Leverage Edu and DPS (Delhi Public School). While at DPS, she has led a broad spectrum of responsibilities ranging from marketing communications, brand building and most importantly liasoning & communication affairs with concerned stakeholders across various districts, state, CBSE offices, for setting up the DPS institution. This role of communication and liasoning interested her, landing her in St. Xavier's College, Mumbai for a Master's degree in Public Policy. Tarini is a travel enthusiast and loves to bake and in her free time.

Upama Ghosh

Upama Ghosh is an Architect and Urban Designer. Her interests are in the fields of Urban Conservation, Ecological Urbanism and Place-making, and has three years of experience in the architecture and urban development sector. She was previously associated with Creative Group LLP as an Urban Designer, where she has worked in several railway station redevelopment projects including one of the largest railway stations in Eastern India and in various institutional and tourism oriented urban master-planning projects. Prior to that, she has worked as an architect in planning affordable and child-friendly housing projects in West Bengal. She also received a gold medal for her exemplary academic performance during her Bachelors. She plans to work in the fields of sustainable urbanism sensitive to the natural and cultural heritage. Upama Ghosh is an alumna of CEPT University, Ahmedabad. She holds a degree in Master of Architecture, with a specialization in Urban Design. In her free time, Upama enjoys cooking and dancing.



Vasudha Sharma

Vasudha Sharma is an Urban Planner. Her interests are in the fields of community participation, urban governance, transportation, and water, and she has seven months of experience in the water sector. She was previously associated with Water Security and Sustainable Development Hub Project funded by UK Research and Innovation (UKRI) through the Global Challenges Research Fund (GCRF), India Collaboratory at School of Planning and Architecture, New Delhi as a Researcher, where she was involved in the comprehensive research on 'Water Values'. Before that, she worked as an intern with the NIUA and assisted in developing a knowledge product on Urban River Management as a part of a project under National Mission for Clean Ganga (NMCG). As an intern, she has also briefly worked with Delhi Metro Rail Corporation (DMRC) and NITI Aayog. Vasudha is an alumna of the School of Planning and Architecture, New Delhi. She holds a degree in Masters of Planning, with a specialisation in Urban Planning. In her free time, Vasudha enjoys doing yoga and listening music.

Vignesvar J

Vignesvar J is an Urban & Regional Planner with a background in Civil Engineering. His interests are in the fields of Sustainable Urban Development, GIS and its application in Planning. He has two years of experience in urban planning and construction sector. He was previously associated with Tandon Urban Solutions Pvt. Ltd. as urban planner, where he worked on GIS-based Development Plan. Earlier, he was employed as a Research Assistant at the School of Planning and Architecture, Bhopal; and worked as Associate Urban Planner at DDF Consultants Pvt. Ltd. He has presented a Research paper titled "Measuring Peri-Urbans' Ability to reach Goods and Services-A case study of Coimbatore" at the 3rd Asian Regional Conference on Peri-Urbanisation. He plans to work in the Sustainable Development of Urban areas and aid them via Policy Interventions. Vignesvar J is an alumnus of the School of Planning and Architecture, Bhopal. He holds a degree in Master of Planning with a specialization in Urban and Regional Planning. In his free time, Vignesvar J enjoys fishing about the latest in the world of technology and loves listening to music.

Yateen D

Yateen is a policy analyst. His interests are in the fields of economics, education, and urban affairs, and he has two years of experience in the public policy sector and was previously the Legislative Assistant to Member Of Parliament (LAMP) fellow with PRS Legislative Research, where he was involved in working with Member of Parliaments and assisted them in their Parliamentary work. He plans to work in the field of citizen engagement and improve their participation in the field of Governance. Yateen is an alumnus of Christ Deemed University (Bangalore). He holds a degree in Bachelors of Business Administration specialising in Entrepreneurship Development. In his free time, Yateen enjoys playing basketball, swimming, and reading books associated with psychology and public policy.

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