PLUS CODES

A COMMUNITY LEVEL MAPPING SYSTEM OF URBAN BASIC SERVICES TO REACH THE UNREACHED

COMPREHENSIVE REPORT BY SHELTER ASSOCIATES

INDEX

LIST OF ABBREVIATIONS

CTB	Community Toilet Block
FGD	Focus Group Discussion
GIS	Geographic Information System
HH	Household
IPC	Infection Prevention & Control
RCCE	Risk Communication and Community Engagement
SA	Shelter Associates
ULB	Urban Local Body
WASH	Water, Sanitation & Hygiene

LIST OF TABLES & FIGURES

A. BACKGROUND

Having an independent, accessible address along with provision of basic services can lead to better entitlement of social service delivery in densely populated slum pockets and Low-Income Settlements. As per 2014 World Bank Data, 24% families in India, comprising millions of families live in informal settlements in large cities. Their individual slum pockets can house 20,000-50,000 persons. The address is normally the name of the slum and survey number which is common to 1000's of families living there. At the same time Maharashtra has the largest slum population in India.
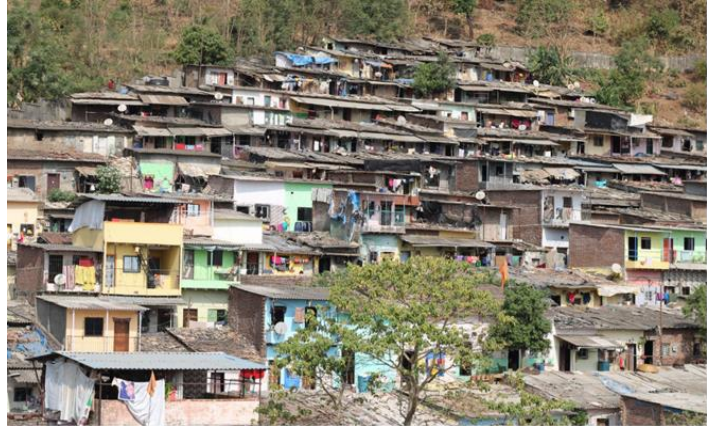

Image 1. Lokmanya Nagar slum Settlement

Slum dwellers are often crammed into overcrowded dwellings and restricted living conditions. They either do not have an address or have one that does not identify their house or business location accurately. Over and above, the environmental sanitation situation of these settlements need immediate attention as the prevalence of open defecation, lack of proper drainage, unclean & crowded community toilets, open dumping of garbage, etc. contribute to the health-hygiene disorder of residents. Therefore, for basic facilities and emergency services to reach their doorsteps or getting to the nearest infrastructural facilities, a navigable location address is a prerequisite in the present digital era and readiness to respond. In addition, during medical or fire emergencies, accurate location code can direct the respondents in time.
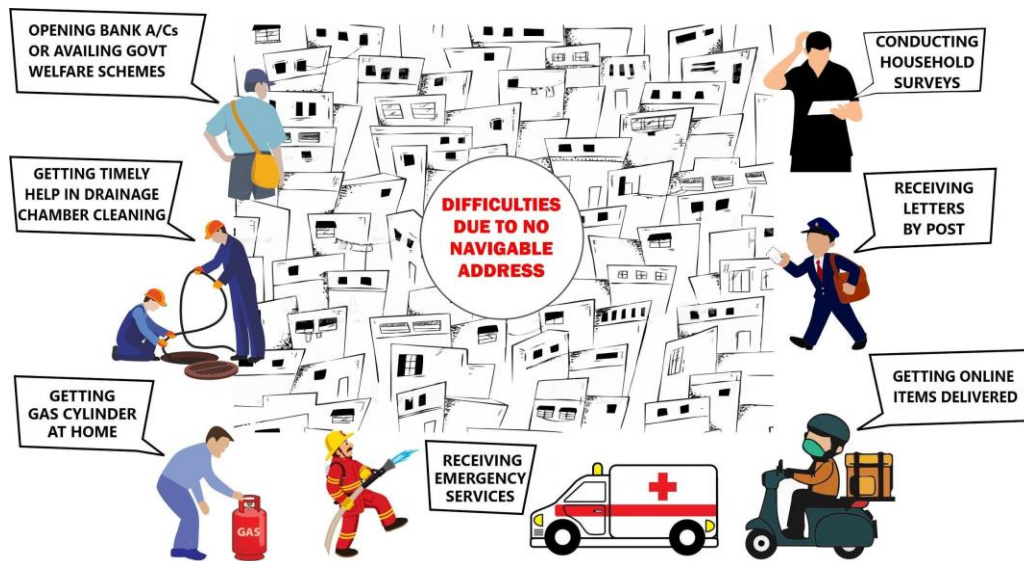

Image 2. Difficulties due to absence of navigable address

The COVID19 pandemic further exposes certain fault lines like lack of access to improved sanitation and personal hygiene facilities and the inability of the Urban Local Bodies (ULB) in tracing and monitoring patients in slum pockets. These settlements form an integral and important part of the city's economy and outbreak of the pandemic in these communities can have a long-lasting impact in all strata of society.

In the **2011 census**, 65.5 million or 22.5% **population of India** lived in **slums** which are distributed among 2613 towns/cities. Maharashtra alone comprises a slum population of 11.85 million. The 69th National Sample Survey Organization (NSSO) survey of 2013 pointed out that in Maharashtra, around 39% households are living in slums. 75% of these slums do not come under the purview of Government declared slums and are therefore not eligible for certain key services.
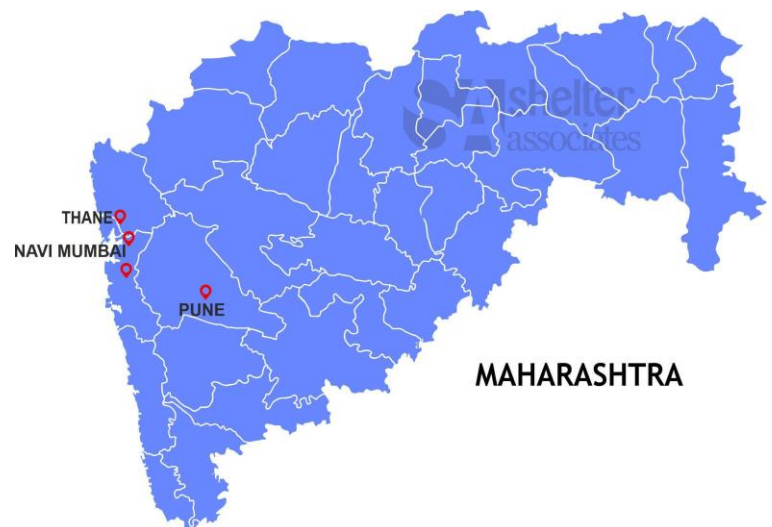
The ever-increasing slum population is a continuous phenomenon in towns/cities, but providing good facilities at the rate of their growth will definitely benefit all the slum dwellers. There is an urgent need to tackle this situation for long term sustainable development as well as for city prosperity. Limited availability or access to micro data of slums is an impediment for government and development agencies from systematic monitoring for social service delivery. This was witnessed during COVID19 pandemic also.

This is where the need for a unique and data solution like **Plus Codes** arises benefiting the poorer section of the city. Plus Code is a digital address given to every location on earth and through this project, Shelter Associates aims to map social and basic services of the slum settlements with unique location code. This location code can be used on Google Maps and will allow slum residents to access services such as postal, emergency services, gas cylinders & other online services. In addition to that, the WASH infrastructure facilities with the slum such as Community Toilets, Manholes, Drainage Chambers, Water standposts, etc. can be located easily. City Municipal Corporations will be able to provide basic facilities like water, sanitation, waste management, electricity, etc. to every household accurately.

B. PROJECT AREAS

As a pilot, Plus Codes have been implemented in the selected informal settlements of Maharashtra, India. The slum settlements selected for the initial implementation are Laxmi Nagar & Vadarwadi in Pune, Lokmanya Nagar in Thane and Chinchpada in Navi Mumbai.

Shelter Associates partnered with UNICEF to implement Risk Communication and Community Engagement (RCCE) and Infection Prevention and Control (IPC) interventions in these slums. The reasons for

selecting these slums is the high prevalence of COVID19 virus in these settlements due to densely inhabited populations and lack of access to individual toilets. Project Plus Code is an extension to the RCCE and IPC Project implemented in these four slums as along with WASH, getting easy access to basic amenities and services was also essential in the present scenario.
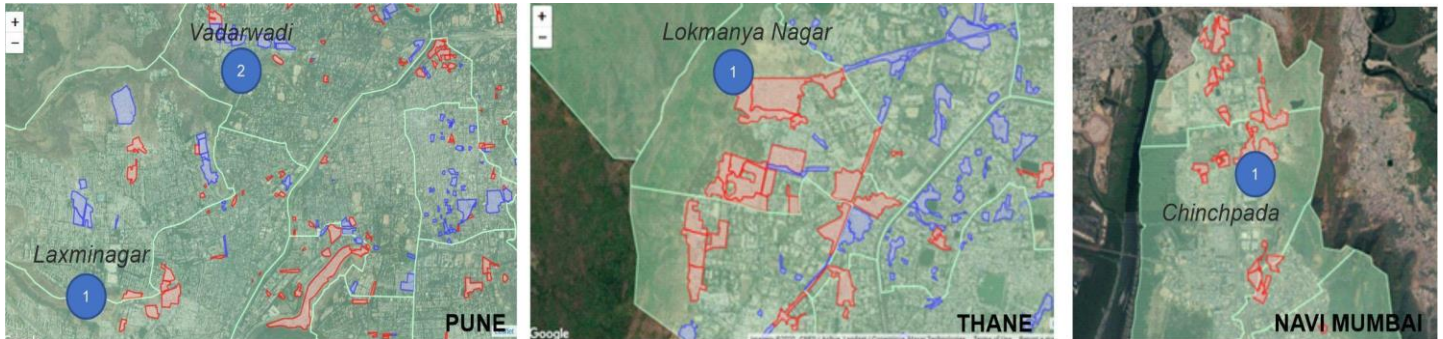

Image 3. Screenshot of maps locating slums selected for the project

C. PROJECT TIMELINE

The duration of the Plus Codes project is 2 months - **November 2020 to December 2020**
This project is an extension to the 3 month 'COVID19 response on Urban WASH' Project initiated in partnership with UNICEF from August - October 2020 in the slum settlements of Pune, Thane and Navi Mumbai.

D. A JOINT COLLABORATION BY SHELTER ASSOCIATES, GOOGLE & UNICEF

Believing strongly in a data driven & community centric approach, Shelter Associates (SA), an NGO based in Pune works towards equitable distribution of resources by enabling access to basic infrastructure, sanitation and social housing to the urban poor. SA pioneered the use of Geographic Information System (GIS) technology & Google Earth in the late 90's for spatially mapping poverty with a recent milestone achievement of facilitation of over 22,000 individual household toilets for the slum families (Till Dec 2020). SA has invested in creating spatial data on slums of 7 cities of Maharashtra in the last 2 decades and made mapping of slum data a vital component of its work. SA has demonstrated how this data can become an excellent planning tool to effectively deliver essential services like water, sanitation, housing etc. The below table spotlights the impact created by Shelter Associates in mapping and surveying slum households, facilitating laying of new drainage networks and providing safe sanitation through individual household toilets in the urban slums:

	Pune	Pimpri Chinchwad	Kolhapur	Navi Mumbai	Thane	Panvel
Slum HHs mapped & surveyed	**62%**	**100%**	**100%**	**100%**	**30%**	**100%**

Table 1: Status of Mapping & Survey of Slums in Maharashtra (Updated December 2020)

	Pune	Pimpri Chinchwad	Kolhapur	Navi Mumbai	Thane	Panvel
% increase in Household Toilets	35% to **60%**	11% to **57%**	25% to **67%**	18% to **39%**	29% to **39%**	5% to **47%**
% increase in Drainage Coverage	90% *Existing Coverage*	37% to **68%**	23% to **37%**	13% to **46%**	17% to **29%**	16% to **47%**

Table 2: Impact percentage in SA intervention slums across cities (Updated December 2020)

The above data has helped Shelter Associates in initiating dialogues with the Urban Local Bodies and leveraging the data into implementation of community led projects.

Through a thorough study of slum data and the challenges faced by communities, Shelter Associates have also recognized the importance of having an easily navigable location and ease of service delivery. With these objectives in mind, Project Plus Codes for the informal settlements have been undertaken by Shelter Associates jointly with Google and UNICEF Maharashtra in the slum settlements of Laxmi Nagar & Vadarwadi (Pune), Lokmanya Nagar (Thane) and Chinchpada (Navi Mumbai).

The Objectives of the Urban WASH project are:
- To improve the access to sanitation,
- To increase awareness on COVID19 prevention, healthy practices and safe use of public sanitation,
- To facilitate construction of individual household toilets and
- To use spatial data for effective decision making on sanitation & sewerage planning for long term sustainable development.

The Plus Code project is an extension to the COVID19 response on Urban WASH and has been a supporting factor in the facilitation of the planned objectives.

The Plus Code technology is developed by Google who has further trained Shelter Associates on the use and generation of Plus Codes for the slum houses and infrastructure amenities within that slum. As part of the partnership, the internal road data mapped by Shelter Associates is further ingested on Google Maps for better navigation. Google has also supported the provision of Plus Code Plates to every structure in the pilot slums. Moreover, Google has facilitated SA with the creation of MyMap tool for all the project affected slums.

Image 4. Screenshot of Laxmi Nagar map on My Map Tool

E. PRE-INTERVENTION GROUND RESEARCH

An initial ground research was conducted before the project was put to practice. To understand the issues faced by communities in the absence of an easily identifiable address and to assess the need in the slum communities, Shelter Associates conducted Focus Group Discussions as a preliminary activity to understand ground level data, facts and practical issues faced by communities every day. The FGD tool was designed by UNICEF which was adopted by Shelter Associates.

NO. OF SLUMS INTERVENED: 4 slums in 3 cities of Maharashtra
NAME OF THE SLUMS: Laxmi Nagar & Vadarwadi (Pune), Lokmanya Nagar (Thane) and Chinchpada (Navi Mumbai), Maharashtra.
PARTICIPANTS:
1. Group A: Community representatives including Women, Men
2. Group B: Adolescent Boys and Girls
3. Group C: Stakeholders included drainage workers, anganwadi workers, political party representatives, youth groups like *'Tarun Mandals'*, SHG members, ASHA workers, ULB representation

Slum Name	No. of HHs	Total FGDs conducted	Men	Women	Girls	Boys	Stakeholders (Group C)
Lokmanya Nagar, Thane	4,021	14	0	70	56	4	10
Chinchpada, Navi Mumbai	4,434	14	14	64	25	14	7
Laxmi Nagar, Pune	1,116	5	0	18	20	0	10
Vadarwadi, Pune	1,079	3	0	20	10	0	0
Total	**10,650**	**36**	**14**	**172**	**111**	**18**	**27**

Table 3: Slum-wise no. of. Focus Group Discussion conducted

Image 5. Focus Group Discussions held in communities

DURATION - Approx. 30 mins discussion with each group

Key findings and feedback from the community & stakeholders:

1. The facilities in community toilets were reported to be poor & inadequate especially when it comes to electricity, availability of water, hygiene, maintenance, scheduled or periodic cleaning and safety concerns for women and adolescent girls. Residents are unable to report such infrastructural problems to the authorities. People in most slums are also agitated as drainage lines are choked for a long time or there is irregular collection of household waste and garbage, water clogging due to rains, etc. In such a scenario, there is not a redressal system where complaints can be raised.

2. There is no system to navigate or to identify remotely, any infrastructural amenities in the slum such as water stand posts, drainage chambers, manholes, etc. Residents provide directions by simply pointing out to the facility making it difficult for a new person to understand its location.

3. Many people face difficulty in getting service providers to locate their homes. Few women shared that if there are any issues related to electricity or water, they have to meet the electrician or plumber at a common place and guide him to their house. During emergencies too, no

services can reach individual doorsteps because of lack of knowledge of internal roads and exact location of a house. Services such as ambulance, police, fire brigade, etc. take a lot of time to navigate and reach the destination.

4. Letters from the posts and other parcels get delivered at a common area in the slum. It creates inconvenience to the residents to collect their deliveries. It even leads to parcels getting misplaced or lost.

5. It was also shared by adolescent girls that it will be helpful for them to know which streets have light poles and which do not. By knowing in advance, it will help them avoid such lanes at night as it may give rise to nefarious activities such as theft or eve-teasing.

6. The ULB representatives who are directly associated with the sanitation work in the slum are aware of the existing drainage network, community toilets, manholes, etc. whereas the newly recruited workers are unaware of the same. They may take a longer time to get trained and be adept at knowing the sanitation requirements of the slum.

7. If anyone entering the slum vicinity wants to use the washroom, they do not know where to go. Even if relatives of slum residents wish to visit their home for the first time, someone from the family has to go out on the road to receive them. No one can reach their houses directly. It is therefore imperative to have a location code that leads individuals to the required destination.

8. For any ward related issues, the residents and a few stakeholders depend on the local councilor to resolve the concerned issues. The process at times is very lengthy and time consuming.

The above findings further deepen the need for having a navigable address and easy access to infrastructural facilities within the slum.

F. THE APPROACH

1. PLUS CODES FOR LOW INCOME SLUM SETTLEMENTS

Innovative approach to tackle the above-mentioned situations is to entrench **Plus Codes** within the system. This technology has been used in multiple countries. The **Plus Codes** technology is **open source** and free to create and use. This feature is available for both Android and iOS devices. Plus Codes use latitude and longitude of any place on the Earth to produce a short, easy-to-share accurate alpha-numeric geo-tagging code that can represent a specific location. Opening a bank/postal account, securing confidential letters, leveraging emergency services or simply ordering medicines or food online, Plus Code on google maps can ensure delivery at the doorstep. Since the codes are simple, it can be shared with others. With Plus Codes, people of the settlement can connect with the Municipal Corporation for the repair of public facilities in the settlement. It will help in directing service providers to the nearest infrastructural facilities such as water stand posts, electrical posts, community toilets, waste management, manholes, etc. for repairs and maintenance. Plus Code can be added to the current address and can be further included in Aadhar card, ration card, voter card,

insurance documents, electricity bill, bank passbook and other address documents. Adding this code will help service providers understand appropriate locations to deliver the service in a timely manner. Number plates with the Plus Codes are fixed on the doors of individual huts for ready reference of the unique location code.

2. HOW TO FIND LOCATION THROUGH PLUS CODES

Directions to a destination using Plus Codes is easy to find using the Google Maps application on the phone. For e.g. 'FRR5+VGPP Pune' is the Plus Code of a Community Toilet in one of the slum settlements in Pune. After entering this code with the city name into Google Maps or Google Search, the system will direct the person to that location.

Step 1: Open Google Maps   *Step 2: Enter the Plus Code & city name route*   *Step 3: Click on start to find the*

Image 6. Steps on how to find location using Plus Codes

G. THE IMPLEMENTATION PROCESS

A step-by-step process is followed before every household, business establishment of infrastructural facilities receive their independent Plus Code.

1. Slum mapping & Plus Code Generation

Slum mapping is conducted to create base maps of each settlement. These maps are shared with the field team who cross check the data and plot each household against the map. Along with houses and shops, existing infrastructure such as location of Community Toilet Blocks, Manholes, Chambers, Public water standposts, waste bins, open dumping area, drainage lines, Gutters, Nala/River, electricity poles/DPs etc. are also marked. Based on the ground data of each household in the slum, the maps

are digitized. Post digitization, Plus Codes in the form of alpha numeric digits are generated for each house and infrastructural facilities.

Image 7. Mapping of slums for Plus Code Generation

2. Rapid Household Surveys

A team of surveyors are allocated to every slum where they gather basic household information such as name, type of house, number of family members and facilities available at home such as water, sanitation, etc. of individual families which is then linked to their Plus Code. This information is essential for government and non-government organizations for prompt and effective service delivery. All the information remains confidential and is only shared with the City Municipal Corporations.

Image 8. Household Surveys conducted in the slum

3. Mobilization for leveraging Plus Codes

The Plus Code activation happens in 2 ways. Firstly, through community mobilization wherein Shelter Associates team conducts community meetings, group discussions and live demonstrations. IEC materials are developed to help communities educate on the concept of Plus Codes and its application. Secondly, the ULBs officials and staff such as Sanitary Inspectors, Engineers, Sanitation Workers, etc. are trained to understand the application of Plus Codes for effective governance.

A detailed description of each mobilization activity is stated below:

Mobilization Activities:

1. Focus Group Discussions (FGD): To understand community issues, needs and perspectives, focus group discussions are being conducted in the slum settlements where Plus Codes are implemented. This is a closed group discussion conducted with persons of different age groups and genders. Separate FGDs are conducted for men, women, adolescent girls & boys and senior citizens. The advantage of group discussions is that residents can discuss their views openly and raise concerns related to the topic.

Image 9. Focus Group Discussions conducted for slum residents

2. Plus Code Chitrakatha: This is an IEC material developed with an objective to educate communities on the concept, use and implementation of Plus Codes. It is in the form of a Picture Story that shows the situation of a slum settlement whose residents face difficulties with the absence of a navigable address. The Chitrakatha also details the implementation process followed by Shelter Associates Plus Code team to provide Plus Codes to every house. The activity is conducted through the medium of corner meetings with a small group of people.

Image 10. Mobilizing Communities through Plus Code Chitrakatha

3. Training Sessions: Along with beneficiaries, key stakeholders such as Sanitation workers, Waste Collectors, ULB representatives, etc. are also trained to understand the use of Plus Codes and use it for smooth delivery of services. Once they understand the use of Plus Codes on the ground, a faster and transparent system of service delivery will follow. New recruits in the system will also benefit from the same.

Image 11. Plus Code training to Sanitation Workers

My Maps Tool (The work in Progress)

The Plus Code data of an informal settlement will be uploaded on **Google My Map** tool and shared with key stakeholders. It is a tool that will show the map of individual slum settlements and location to its various infrastructural facilities. Training sessions will be conducted on the use of My Maps. It will allow beneficiaries to communicate with the ULB representatives and share the Plus Code of the particular infrastructural facilities that may need maintenance or repair. The ULBs will be able to further delegate the task and monitor the progress through this tool.

Below slum settlements are linked to the Google My Map Tool. Click on the slum name to view maps:
[Laxmi Nagar, Pune](#)
[Vadarwadi, Pune](#)
[Lokmanya Nagar, Thane](#) and
[Chinchpada, Navi Mumbai](#)

4. Plus Code Demonstrations: The practical use of Plus Codes is explained to the beneficiaries through live demonstrations where Plus Code of any house or infrastructural facility is entered on Google Maps and they are made to navigate to the destination. This facilitates effective transfer of knowledge and the demonstrations guarantee a better understanding on the use of Plus Codes.

Image 12. Live Demonstrations of Plus Code to community beneficiaries

4. Physical Map Installation in Slums

After Plus Code Generation and mobilization, the last step towards implementation is installation of large Slum Maps of individual settlements that show Plus Codes of every house, business entity and infrastructural facilities in the slum. This provides an easy reference for slum residents, service providers, ULB representatives and other visitors.

Image 13. Large slum maps with Plus Codes displayed at Laxmi Nagar settlement, Pune

H. CHALLENGES FACED DURING IMPLEMENTATION

While introducing Plus Codes into the community and the governance system, a set of challenges have been encountered by Shelter Associates:

1. Resistance from the slum communities: A few communities have expressed a negative standpoint on the concept of Plus Code connected with the fear of getting their privacy compromised. Additional efforts have therefore been taken by Shelter Associates for mobilizing communities through constant meetings, ground discussions, etc. in order to clear their misconceptions. The team has been able to convince people that no personal data will be displayed in any Public Domain such as Google Maps.

2. Network issues in the slum: For getting to a location through Plus Codes, having a good internet connection is a must which is sometimes a hindrance within slum settlements. Connectivity issues also disrupt the quality check procedures conducted by the Data team wherein they navigate to randomly selected Plus Codes on the field for understanding its accuracy. In addition to network issues, unavailability of smart phones with a few slum residents also acts as a limitation to the use of Plus Codes.

3. Unavailability of household information: During ground surveys, the field team comes across locked and unoccupied houses where the household level information cannot be gathered. Due to unavailability of information, some houses have to be left out during the intervention.

4. Political Interferences in the slum: Local leaders in the communities create controversies related to Plus Codes and try to influence slum residents on the negative impact of Plus Codes. The involvement of ULB officials such as Ward Officers, Councilors, etc. is crucial here to implement the project successfully. An MoU between SA and ULB giving permission to conducting slum mapping and household level survey in slums has been signed to create a transparency within the system. Also involving respective ward offices, Shelter Associates have received a formal permission letter from the ULB to fix the Plus Code plates on the doors of beneficiaries.

I. IMPACT OF PLUS CODES

A total of **14086** Plus Codes have been generated in the slums of Laxmi Nagar and Vadarwadi (Pune), Lokmanya Nagar (Thane) and Chinchpada (Navi Mumbai) which includes houses, shops, amenities and Infrastructural facilities showing WASH parameters. Below is the slum-wise breakup:
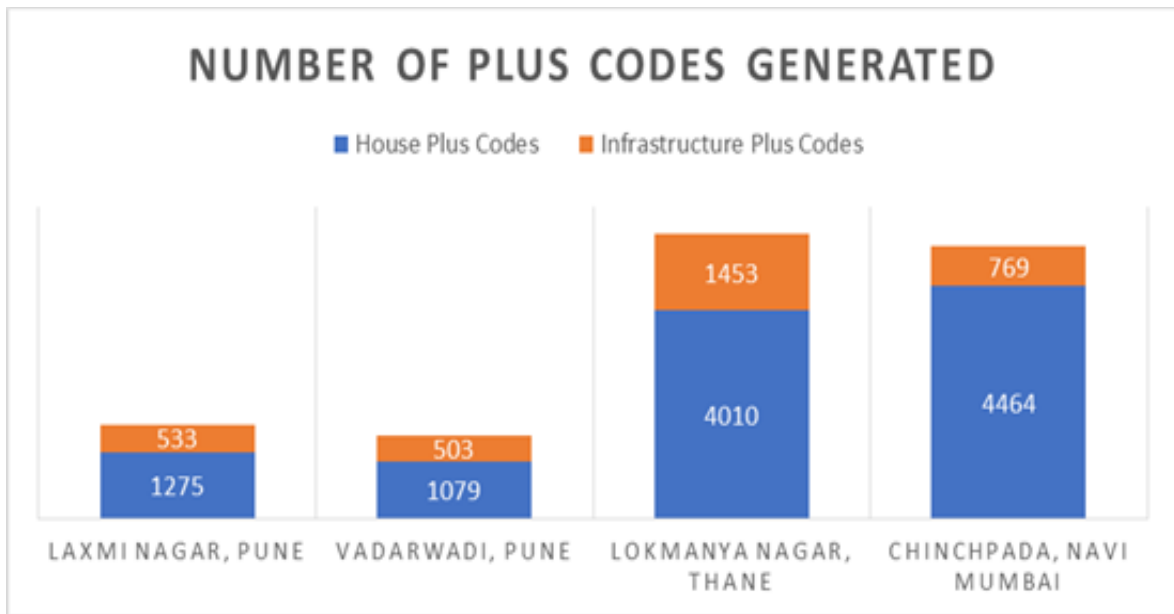

Fig 1. Numbers showing generation of Plus Codes

1. BENEFIT OF PLUS CODES TO THE SLUM COMMUNITIES

The Plus Code project being at its nascent stage, it is too early to comprehend the impact of Plus Codes to the slum communities. However, all slum dwellers receiving an independent location code will benefit by getting accessibility to basic and emergency services, further saving time and guiding service providers to reach individual doorsteps. Some of the benefits of having a navigable address is listed below:

- There will be easy access to basic urban services such as availability of water, electricity, community toilets, etc. Also letters from the post/courier, LPG cylinder, etc. can be received at their doorsteps by simply providing the Plus Code to service providers. This will enable ease in delivery and nullify any possibility of deliveries getting misplaced or stolen.

- In case of any WASH related issues such as drainage chamber cleaning, CTB repair & maintenance, etc. the beneficiaries can direct the ULB workers by providing the Plus Code of the affected infrastructure amenity within the slum. The ULBs can further track and monitor the progress of its work and respond in time.

- Receiving Government Welfare schemes will be simplified since ULBs will have a database of individual families who can be a part of welfare programs and may need additional assistance.
- There will be ease in opening bank or postal accounts as Plus Code can be added to beneficiary's address documents such as Aadhar card, Voter's ID, Ration card, etc. Confidential papers or passwords will reach the beneficiary directly without any tampering.

- Ordering medicines, food or commodities online will be trouble-free. This will save a lot of time which is otherwise wasted while directing service providers to the beneficiary's house.

- Receiving timely emergency services such as Ambulance, Fire Brigade, Police will be possible as the respondents can locate the house easily and in time.

- Door to door waste collection in slums can be regularized with the help of a navigable address. This will also reduce the practice of open dumping at a large level.
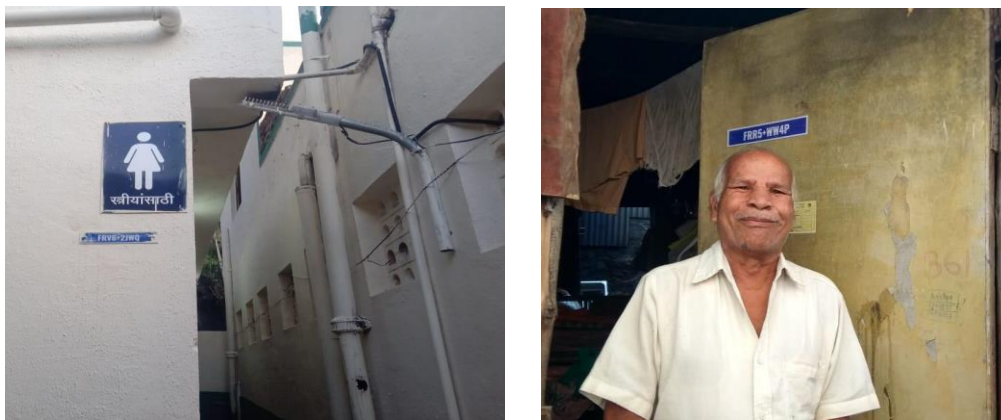

Image 14.(l) Plus Code Plate at a Community Toilet Block and (r) Beneficiary houses with Plus Code Plates

Beneficiary Experiences:

"The drainage gutter near my house were clogged and they were being cleaned but the dirt was laid on the road for over 2 days. The stench and increased number of flies around the area was bothering us. I contacted the Sanitation workers by sharing the Plus Code of my house and got the dirt cleaned."
- Sagar Thorat (resident of Chinchpada, Navi Mumbai)

"I ordered a Pizza through Swiggy and mentioned my Plus Code along with my address. The delivery person called to enquire about the link which I said is the location code to my home. For the first time, I was delighted to have received pizza right at my doorstep."
- Madhuri Dashrath Pol (Resident of Laxmi Nagar, Pune)

2. PLUS CODES FOR GOOD GOVERNANCE

The Plus Code project is not limited to communities only but has also been playing an instrumental role for effective e-governance. Lack of granular data has always hampered governments from reaching out to the vulnerable families but through this initiative, the Urban Local Bodies will link this new data to their existing data through which they can access and update more precisely. Advantages to the Urban Local Bodies mentioned below:

- Getting real time data of families and infrastructural facilities within the slum for timely decision making & planning.

- Every ULB department can link their datasets to Plus Codes for effective governance. Since every household will have a Plus Code, any additional information on that house can be linked to the same code. For example, the water department can link their data to the Plus Code of House A. Similarly, the electricity, postal, property tax, public health and all such departments can link their data to the same Plus Code as and when generated.

- Planning programs related to Water Supply, Sewerage, Sanitation, Wastes Management, Public health, education, livelihood, etc. for every slum household will be easier. This is possible as a common household and infrastructure database developed by Shelter Associates and linked to Plus Codes will be available with the ULBs.

- Tracking and monitoring families during pandemics such as COVID19 will be hassle-free as ULBs can plan on screening, testing as well as vaccination.

- Service related to the maintenance of drainage lines, waste collection, etc. can be systematically planned and fast-tracked.

- Disaster response & management during flood, fire, etc. will be less stressful as the Government will have access to households needing relief.

Image 15. Easy availability of services on having an independent Plus Code

J. PLUS CODE COST EFFECTIVENESS

Plus Codes is an open source technology and is free to create and use. However, there is a need for certain groundwork that is conducted while the partner provides Plus Codes to slum settlements and amenities. The below table details out the steps undertaken while facilitating houses with Plus Codes.

HEAD	DETAILS
Slum Infrastructure along with Mapping of WASH parameters	Mapping of slums and creating slum-wise maps showing individual hutments and different infrastructural facilities within the selected slum.
Ground research & household survey	Conducting individual rapid household surveys and gathering basic household data after which Plus Codes are generated and household data is linked to individual codes.
Validation of data	Validation of data by ULBs which includes the total structures and infrastructural facilities within the slum. Furthermore, the internal road network marked by SA is validated by Google and ingested in Google Maps.
Plus Code Plates	Sourcing and fixing Plus Code Plates on the doors of individual houses, shops, Community Toilets.

Table 4: Process involved in the Plus Code Implementation

Generation of a single Plus Code will cost approximately Rs. 150/- (USD 2) which Includes mapping, surveys and Plus Code Plate installation.

Slum data is not commonly available with the City Municipal Corporations. Every department incur independent costs in gathering household level data, further multiplying the manpower costs and time within the ULB. GIS Mapping conducted in-house at Shelter Associates captures the slum location as well as household and WASH infrastructure data such as Water standposts, manholes/Chambers, CTBs, Waste bins, Open dumping areas etc. of that settlement. The Plus Codes are generated separately and connected to this GIS data. While Plus Code is simply a location code, when amalgamated to the GIS data, it further enhances the efficiency of this navigable Code making it richer and multi-functional. By sharing this data with the ULBs, it further saves the time, money and efforts taken by multiple surveyors and GIS analysts who independently collect similar kinds of data.

As a normal practice, Multiple departments incur separate costs to collect slum household data through individual household surveys which they would then link to their department datasets. For e.g. The Water Department will collect basic household data and link their water data to these households. Similarly, the process is repeated with other departments such as Property Tax, Solid Waste Management, Electricity, Social Welfare, etc. who would gather the same household information and link it to their department data. All departments conduct surveys independently and datasets are not shared with other departments. Below is the infographic interpretation of the process of data collection followed by various ULB departments:
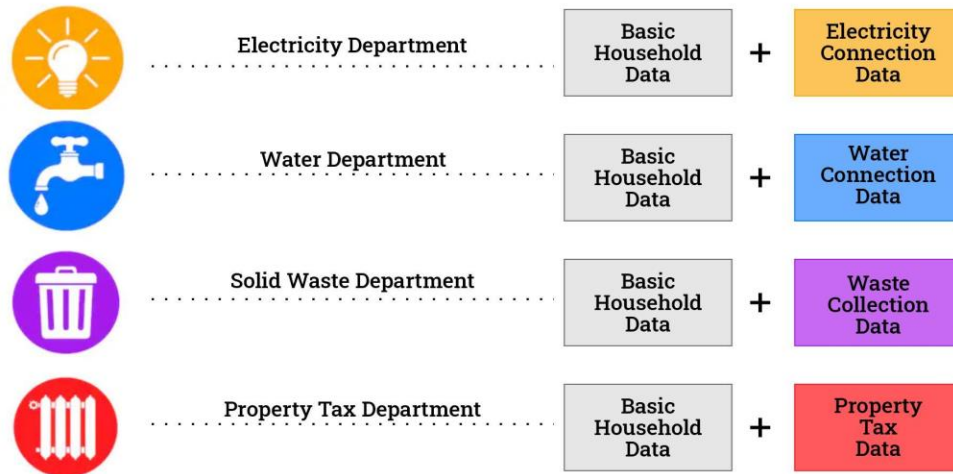
Image 16. Infographic showing the existing data collection process by different departments

As an efficient and cost-effective solution, the household data gathered by Shelter Associates is linked to individual Plus Codes. The data linked Plus Codes acts as a single reference that can be leveraged by various ULB Departments. They can easily link the Plus Code to their department datasets and duplication in the household survey can be avoided.

Since a strong and granular database of slum households linked to Plus Codes is created and shared with the Urban Local Bodies, the return on value can be substantial. Having a ready database of slum households, ULB departments can save the costs incurred in conducting basic household surveys.

For e.g. The Sanitation Department will incur 'x' amount for basic household survey and additional 'y' amount for sanitation related survey. Total cost = x+y

With Plus Codes linked to slum data, ready data will be available on basic household information and therefore cost 'x' can be saved. Similarly, other departments too can save cost 'x' by updating the same Plus Code to their datasets. The added advantage is that, along with household level information, every infrastructural facility is also mapped, giving additional data to the stakeholders related to their department. The ease in governance through the use of a singular data is denoted in the below infographic.
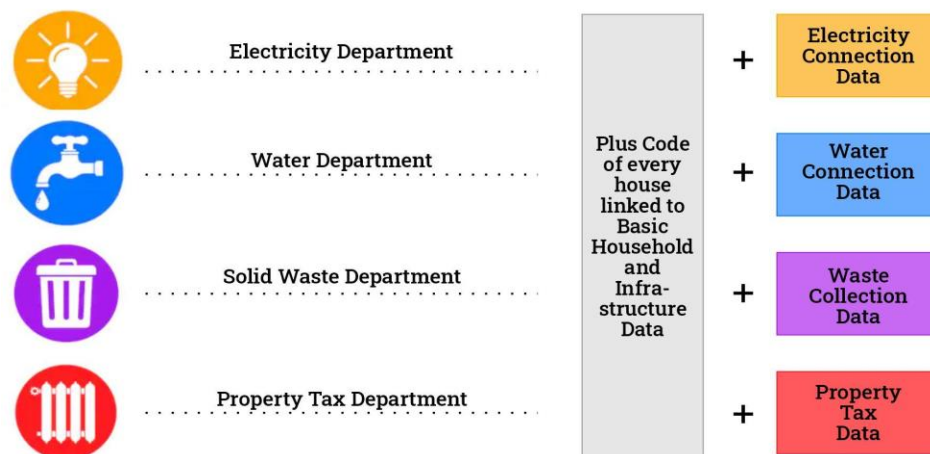

Image 17. Infographic showing the how a singular data can be used by different departments

K. PLUS CODE PROJECT SCOPE & WAY AHEAD

Although Plus Code is not a replacement to an address, it is an easier and effective way of finding any location. This simple addressing solution works not just across India, but globally as well. The project can extend its scope to various informal settlements and for partnering with the Urban Local Bodies for its implementation. In the digital era, each city should have a digital address for every house in the informal settlements for effective governance. Need of the hour is to institutionalize this data within ULB's system for sustainable development of the city's poor and hence improve their quality of life.

The Plus Codes project in the pilot slums of Pune, Thane and Navi Mumbai has paved way to a bigger project, wherein Shelter Associates jointly with Google, have initiated city-wide Plus Code Generation for all slum settlements in the city of Kolhapur, Maharashtra.

The Slum data linked to Plus Codes will serve as an excellent tool for Smart Cities with respect to good governance. Having mentioned earlier, the Urban Local Bodies can efficiently track and monitor the slum dwellings and its various infrastructural amenities through a single code.

Speaking about Swaccha Survekshan endeavours, a singular data gathered on the sanitation status of the slum along with the available amenities, will be an effective tool for monitoring and decision making. The data on household toilet usage, drainage chambers, manholes, community toilets, Solid waste management, planning and monitoring of solid waste collection are essential elements of the Swaccha Survekshan platform and with the connection of Plus Codes to this data, it will help the decision makers in better planning and execution.

Plus Codes can also play a vital role in Jal Jeevan Mission (Urban), an extension of the AMRUT scheme for Urban cities. Household level water availability data can be linked to the Plus Code of each house. Not just in WASH, but this can be useful across various sectors of development, such as Maternal and Child Health, Nutrition, Education, Livelihood, Social Welfare Schemes, etc. as this will be an enabler to identify the needy families residing in urban slums who can benefit from the scheme. Plus Code can be easily plugged into the existing system which will help in getting real time data very effectively.

When city administration bodies adopt Plus Codes at a citywide level, validation of data will be easier, further facilitating real time GIS based data to service providers. Shelter Associates is therefore planning city level projects with various ULB departments. For instance, by using the Plus Code data, the water department can systematically plan on providing metered water connection to all houses in slums.

Contemplating the project on a larger scale, this innovation should aim at reaching all tier1 and tier2 cities of India through knowledge sharing workshops and training. Shelter Associates can play the role of a trainer along with other partners for implementing Plus Codes pan India. Through joint collaborations with various stakeholders, this project can be scaled across India and benefit the slum population at a larger level.