# Settlement Mapping

Typically conducted at the same time as Settlement Profiling and before Household Numbering and Enumeration, settlement mapping is a community-led data collection method. Also known as community mapping, the method is used to map structure footprints and facilities and service location points. Maps provide foundational data for profiling, numbering and enumerations.
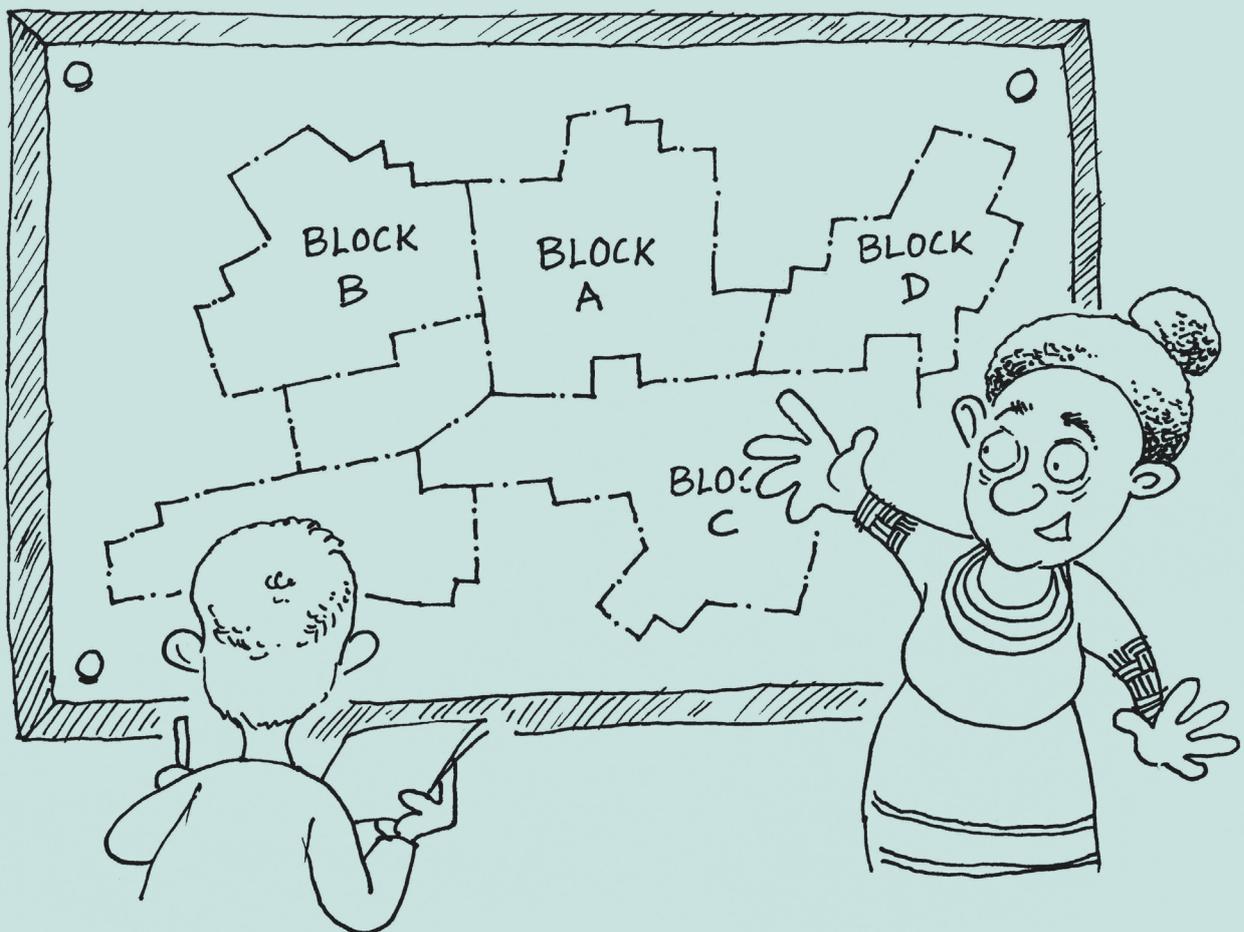
Who

Most useful for:

- ❏ Local Champions
- ❏ Residents
- ❏ CBOs
- ❏ Urban Poor Federations
- ❏ Federation-support NGOs

Also useful for:

- ❏ NGOs
- ❏ Academia
- ❏ Local Governments

What

Settlement mapping (and Settlement Profiling) can be undertaken with small teams of residents experienced in data collection. It provides a detailed map of all structures and their land use as well as community facilities and service location points for the entire settlement (or target area).

This typically happens at the same time as profiling activities. Co-researchers walk their area of the settlement, visiting each structure. However, instead of speaking to every household as they do during enumeration, they only speak to one household. For mapping purposes, this household indicates how many units/rooms and households there are within the structure as well as how they access essential services, the distance to service location points (e.g. 500 meters), whether services are functional and who owns them. For profiling, the household representative answers questions about sectoral challenges (e.g. health, water, sanitation).

Data collected during mapping is typically used to advocate for an upgrading project in partnership with the local government. It yields statistics like the total number of structures, number of permanent vs temporary and occupied vs vacant structures, number of units/rooms in each structure, number of households, and number of tenants vs structure owners. It also provides data to assess relative poverty levels and how adequate or overextended existing services are. For residents, mapping also helps them get to know their area better and where they can access different existing services.

Photo Credit: Akiba Mashinani Trust

Data collection team doing mapping in Mukuru in 2018.

During planning for upgrading projects, it provides the basis for spatial planning. It also serves as a baseline for other data collection efforts like Settlement Profiling and Household Numbering and Enumeration as well as additional data collection activities once an upgrading project gets underway.

Quality mapping data is crucial for undertaking Household Numbering and Enumeration, the process when co-researchers assign every unit (aka room or door) within a structure a number to build a settlement-wide address system for every household.

Landmarks points

Settlement boundary

Area boundaries

Structure footprints
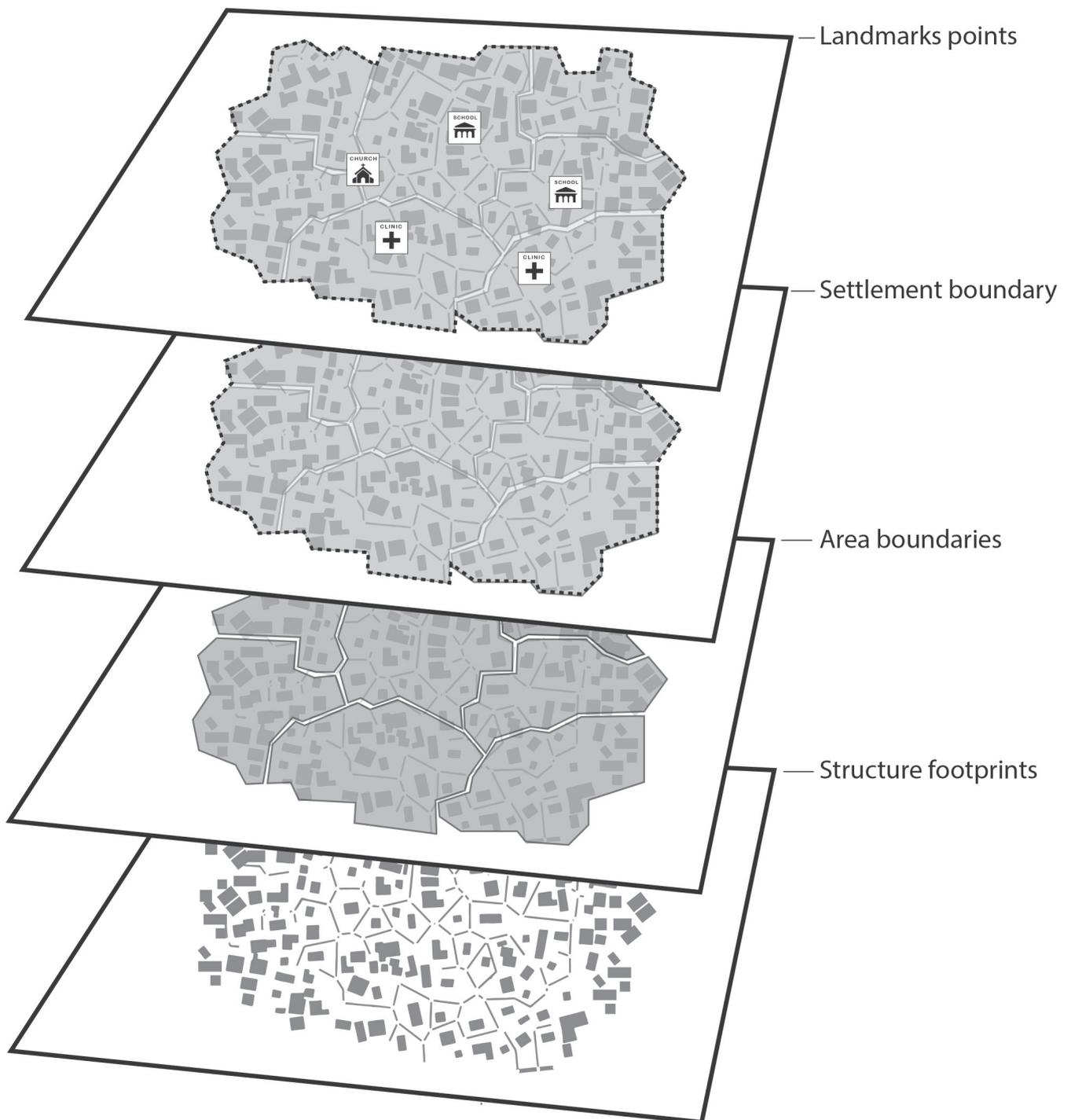
To undertake mapping, you will need both a technical team with GIS (i.e. computer mapping software) and data skills and community data collection teams. If possible, rely on experienced community co-researchers with training in data collection. Otherwise, train a core set of co-researchers who can then recruit and train additional co-researchers from their areas.

To prepare a map for data collection, you will need to obtain satellite imagery of the settlement and digitize structures. You will also need to identify areas within the settlement (i.e. neighborhoods, villages, etc) and major landmarks. These data will be used to generate unique address codes for every structure.

Once the initial map is prepared, the technical and community teams will work together. They will walk the settlement to ground truth existing data and collect additional data like the locations of services and facilities. Once field work is complete, a team will update databases with both ground truthed and new data. It is essential that residents — not just the technical team — have ownership of the data generated for their own discussions of development priorities and negotiations with local governments. Ownership should be both legal (i.e. agency to use the data however they like) and communal (broad buy-in from residents into the community data collection process). See How for more detail.

Why

COMMUNITY-LED DATA COLLECTION methods involve processes led by informal settlement residents with support from their civil society partners. Flexible by nature, these methods adapt well to different national and local contexts.

A process by the community for the community, the goal of these methods is for residents to collect their own data about themselves — instead of relying on outsiders to tell them about themselves — and own and use these data to inform both their fellow residents and government authorities about key challenges and priorities. In particular, challenges and priorities related to land tenure, housing, and basic infrastructure and services, key ingredients in building climate resilience in urban areas.

Armed with these data, residents can speak the same language as governments and their development partners. To exist in the eyes of local authorities, residents must first show up on the map. These methods provide the data needed for residents to make their case to local authorities for upgrading of housing, infrastructure and services in their settlements. It can also support organizing activities and campaigns to deter eviction as well as open up ongoing dialogue with local authorities, development partners, civil society and academia.

Community-led data collection does not just provide the currency for residents to negotiate and plan with government. It also engages residents in a process where they begin to see

themselves as part of a larger community with shared problems and learn to work together instead of individually to understand common challenges, determine priorities and act collectively to negotiate among themselves and with government. Data collection activities begin dialogues among residents and demonstrate the crucial role data plays in shaping development priorities. More broadly, it enables urban poor communities to assert their right to the city as well as secure tenure, risk-reducing infrastructure and services, and dignified livelihoods. It can also lead to greater involvement in city policymaking and the delivery of subsidized services. Working with residents to do research is also likely the most resource-efficient option.

See COMMUNITY-LED DATA COLLECTION for more.

❝ Mapping and data collection and I also knew how data defends people. How the data spoke for us in the government. And also I learned how to bring people together and empower people. I also learned how to talk with these people in these big offices, because I come from the slums, I don't have to despise myself, I have to know that I have information that they don't have. And the other thing I learned is I have also the right as a Kenyan person to have good life and the other thing is, every change to take place wherever I am, it is good for me to participate and to give also my ideas. ❞

Christine Mwelu Community Mobiliser – Lunga-Lunga Centre, Mukuru Viwandani (Nairobi, Kenya)

Personal communication, 18 May 2022.


Photo Credit: Akiba Mashinani Trust

Community mobilizer presenting information from data collection activities in a community meeting in 2018.

Like other community data collection methods, **settlement mapping** provides essential data for residents to speak to, negotiate and plan with local governments. Mapping quantifies the scale of need (e.g. only x toilets for y households). It can also identify areas with the greatest need — even within settlements, some households are more vulnerable than others.

Where

Community methods training and data collection often follow a concentric instead of linear pattern. This is because community mobilizers and co-researchers often start in familiar territory in their own neighborhoods and expand out from there. The data collection processes also typically don't have one beginning or end point, instead happening iteratively. Civil society or CBOs often undertake the initial training of local leaders and other motivated residents (youth can be excellent candidates because they learn quickly and may not be employed). Once this initial class of co-researchers is trained, they can recruit additional candidates in their neighborhoods to be trained as well.

It is beneficial to map the entire settlement so that the scale of need is fully understood. It also contributes to the aggregation of data citywide. Aggregation provides evidence to bargain and plan with local governments, giving urban poor federations a better sense of the size of their political constituency and what they contribute to the city's economy. However, if not feasible to do mapping settlement wide, collecting data where you can will still benefit residents and their advocacy efforts.
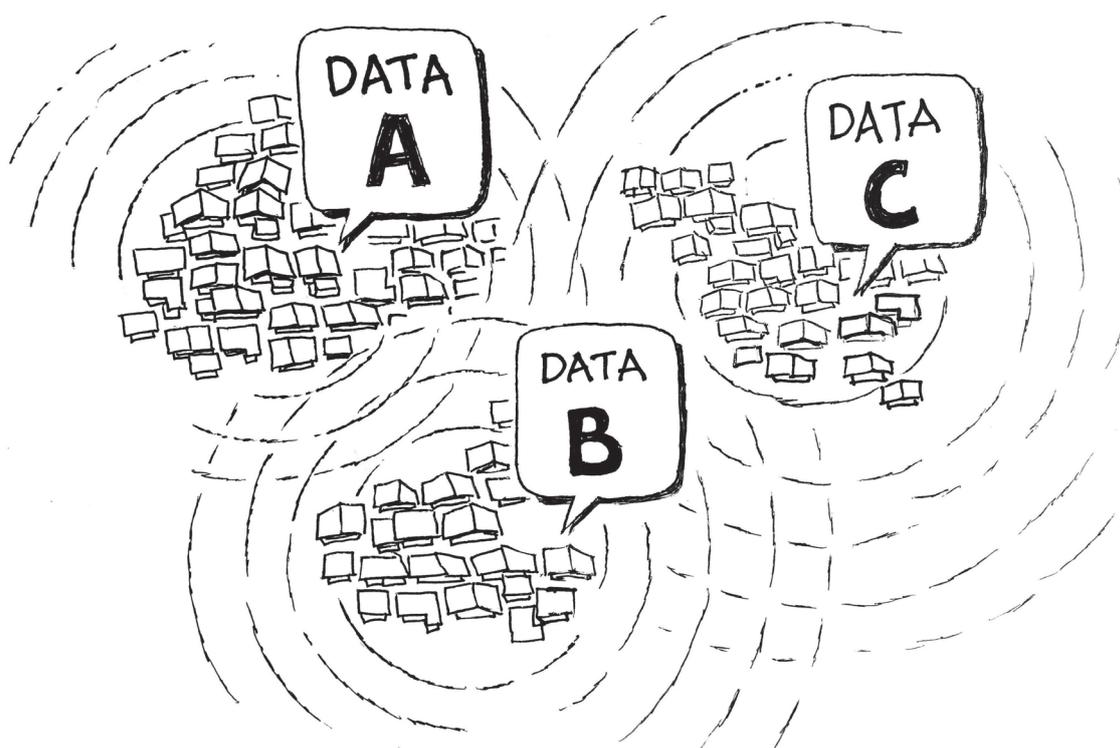
When

Unlike Household Numbering and Enumeration, mapping (and Settlement Profiling) can be undertaken before a specific upgrading project has been slated. Indeed, it is important to undertake mapping to negotiate with the local government to upgrade the settlement. That said, mapping and profiling activities do have a cost and should not be undertaken arbitrarily. They should be strategically aligned to specific goals and advocacy efforts for upgrading initiatives.
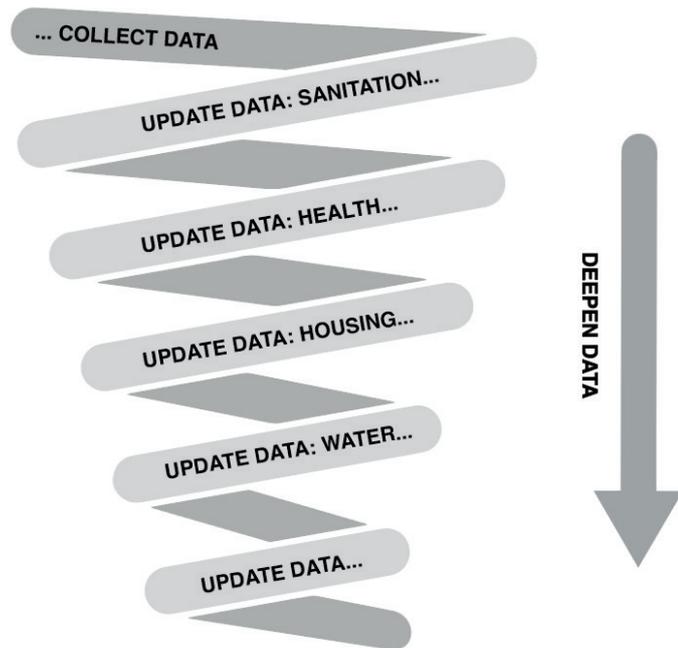
While the technical work of preparing the initial settlement map should be undertaken before Settlement Profiling, field work for mapping and profiling are often carried out at the same time. If necessary, however, mapping can also be done after profiling. The timing of these data collection activities will be determined by considerations unique to each settlement.

Starting with mapping and profiling gives residents a chance to learn about upgrading initiatives and organize around certain topics. When activities are not targeted directly at their household, residents will be less afraid and more receptive to learning about projects. And therefore, once numbering and enumeration starts, some residents will already be familiar with the project and have bought into the process.

Given an existing community mobilization network and trained co-researchers, mapping can take place over a few weeks time. This will obviously vary according to the size of the settlement, existence of any adversarial stakeholders, political complexities, or other unforeseen factors. Indeed, strive to carry out mapping within a short period of time because if it is instead drawn out, conditions on the ground will inevitably change and complicate data validation activities.

Community-led data collection is not a one-and-done process. In the context of resource-poor informal settlements, data collection activities have a significant cost — you should only do as much as is required at the time to further current advocacy and planning efforts. The environments in informal settlements also change rapidly and data will quickly become out-of-date. Therefore, data collection is a highly iterative process. You will continually return to sectors to update data and fill in gaps where data lacks the depth needed for detailed sector-level planning.

How

Make a Work Plan

Because mapping requires both technical work in the office and data collection in the field, it is useful to establish a work plan to coordinate the office and field work. Like all community data collection work, this is not a linear process. It will inevitably be staggered for different areas of a settlement, taking place as time and resources permit.

Technical office work like digitizing structures could be done all at once for an entire settlement (but may require updating if there is a big lag between it and field data collection). The rest of the work will likely be done on an area-by-area (i.e. neighborhood) basis. Therefore, the timeline below lays out the work for one area. More than one area can be done at a time given enough resources and big enough teams.

Typical Timeline

Week	Office work	Field work
1	Assemble technical team Begin processing spatial data	
2	Prepare initial map (footprints with structure address codes)	Recruit and train community co-researchers
3		Groundtruth existing structures data and collect additional data on facilities and service location points
4		*At the same time, do field work for* Settlement Profiling
5	Compile ground truthed and new data (as well as profiling data)	
6		Validate the data (from both mapping and profiling)
7		Analyze and share the data

Assemble a Technical Team

Because parts of the mapping process require GIS expertise, identify a suitable technical team. This is often undertaken by a federation-support NGO like Slum Dwellers International, other local NGOs, or a local university. The technical team will undertake all the computer work in the office; they do not need to be residents of the settlement.

They will likely be involved in the training of community co-researchers as well. And they will help supervise co-researcher teams during field work. Finally, they will ingest the data collected into the GIS database.

## Obtain Structures Data for the Entire Settlement

Structure footprints provide the base for settlement mapping (footprints are polygons that represent the two-dimensional shape of a structure as seen from above). To obtain footprints, you have several options. The most common source of free data is satellite imagery from Google Earth (in raster format). In some cases, it may be possible to instead obtain building footprints already in vector format.

If footprints are not already available, download a satellite image for the entire settlement. Then, import it into a GIS software program (e.g. QGIS, ArcGIS). Make sure to georeference the satellite image — a simple way to do this is to get the latitude and longitude coordinates for several easily recognizable locations in Google Earth, and then use those coordinates with a georeferencing tool in your GIS program.

Note that if you can obtain historical satellite imagery, you can use it to demonstrate the growth of the settlement over time (e.g. "growth between 2002 and 2016").

Digitize Structures to Create Polygon Footprints

You can do this manually. Or you can try using a raster-to-vector processing tool in QGIS, ArcGIS or other GIS software (but make sure to quality check the output data for topology errors). Even using an automated tool, you will inevitably still need to manually digitize any missing structures. Once complete, make sure to back up these valuable data.
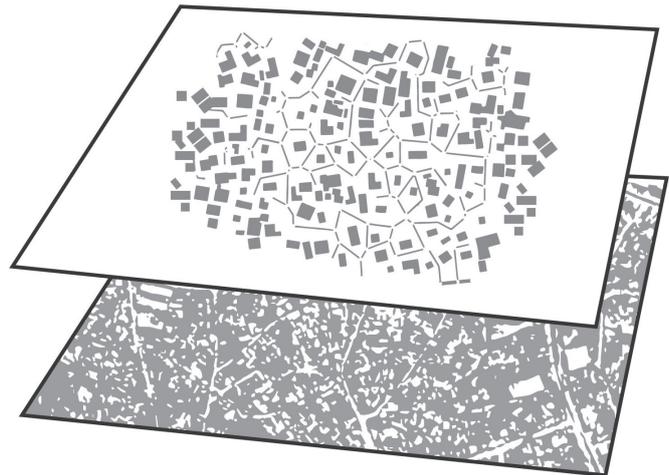
Identify Areas Within the Settlement

All settlements will have commonly accepted "areas" (i.e. neighborhoods, villages, etc) with names. Identify these areas with residents. You may be able to use already existing GIS data. If not, you will have to manually draw the areas in your GIS program (make sure to validate the data with knowledgeable residents). Finally, overlay the structures layer with the area polygons.
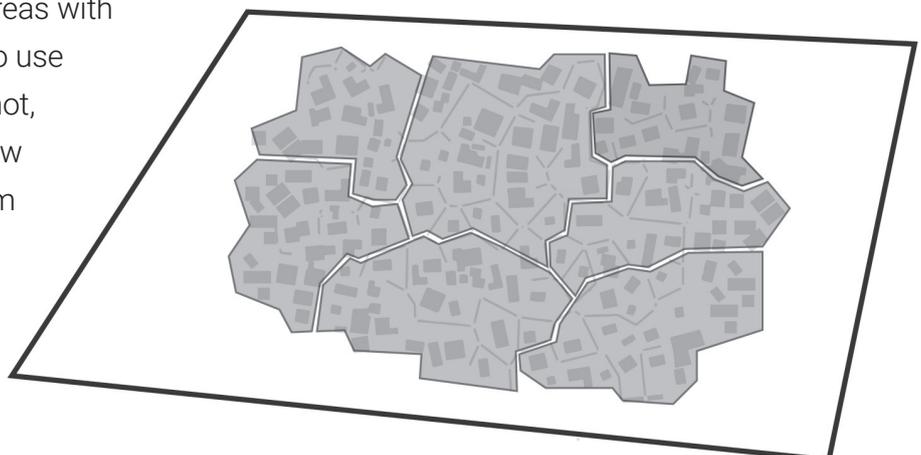
Identify Major Landmarks

Landmarks are crucial for data collection teams during fieldwork, helping them orient themselves while collecting data. They are also often a good starting point for assigning structure numbers in a neighborhood. Common landmarks include schools, churches, mosques, community centers, clinics and groceries.

Work with knowledgeable residents to identify major landmarks. Then, locate each landmark within the structure footprints data on the map. Finally, in the GIS database, tag the corresponding structure footprint with its name.
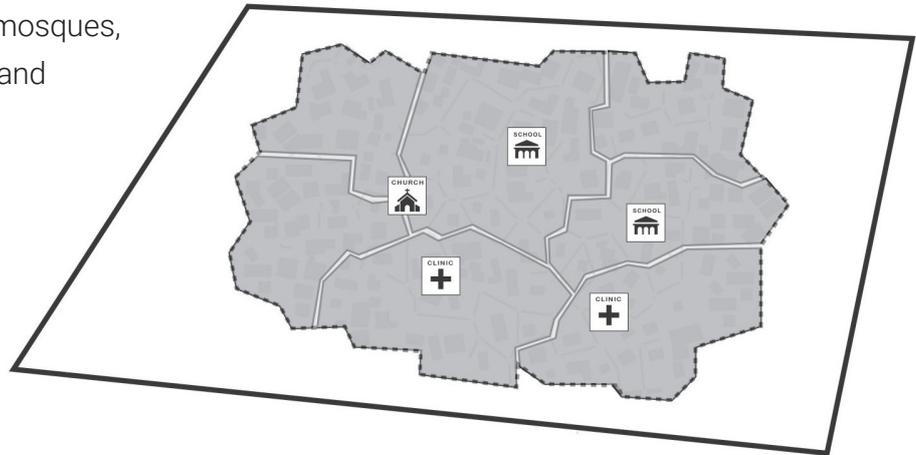
Assign a Unique Code to the Settlement and to Each Area

Simplify the name of the **settlement** to two or three letters. For example, for Mukuru Kwa Njenga: *MN*.

Do the same for the **area** (i.e. neighborhood, village, etc). For example, for Riara: *R*.
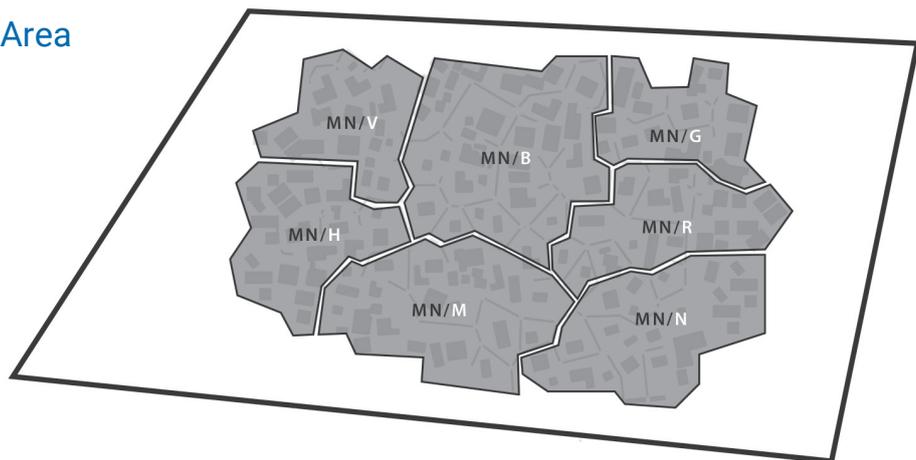
	Settlement	Area
☐ **Input**	Mukuru Kwa Njenga	Riara
↓ **Simplify**	MN	**R**
■ *Area code*	*MN/R*	

Define Structure Blocks

Once you have structure footprints, landmarks, and area polygons on your map, group structures into **blocks** of up to 200 households. Manually draw polygons over these blocks in your GIS program. Defining blocks helps ensure oversight and data accuracy during the community data collection process.
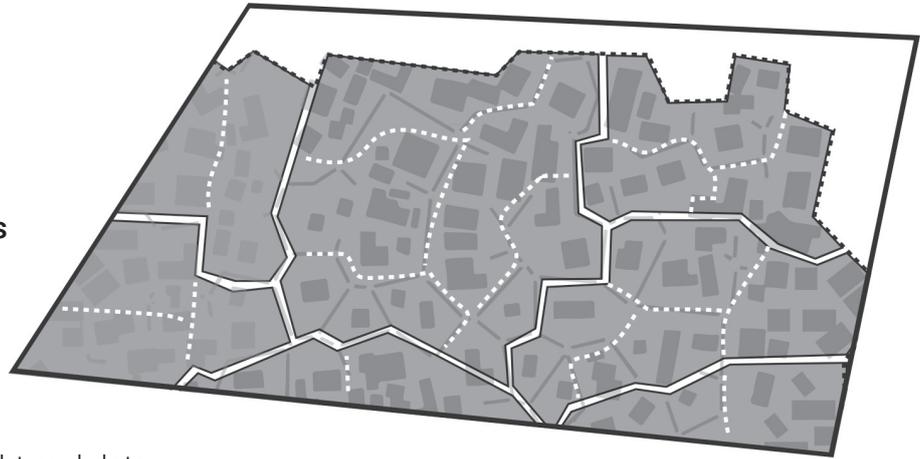
Assign a Unique Code to Every Block

Once you have drawn every block polygon in the settlement, assign it a unique letter from A to Z (see the diagram below).

		Settlement	Area	Block
☐	**Input**	Mukuru Kwa Njenga	Riara	A
↓	**Simplify**	MN	R	**A**
■	***Block code***	*MN/R/**A***		

If possible, it is also a good idea to use a GIS spatial intersects tool to tag each structure footprint with its settlement/area/block code — this will allow you to automatically label each block using basic GIS functions instead of having to do it manually.
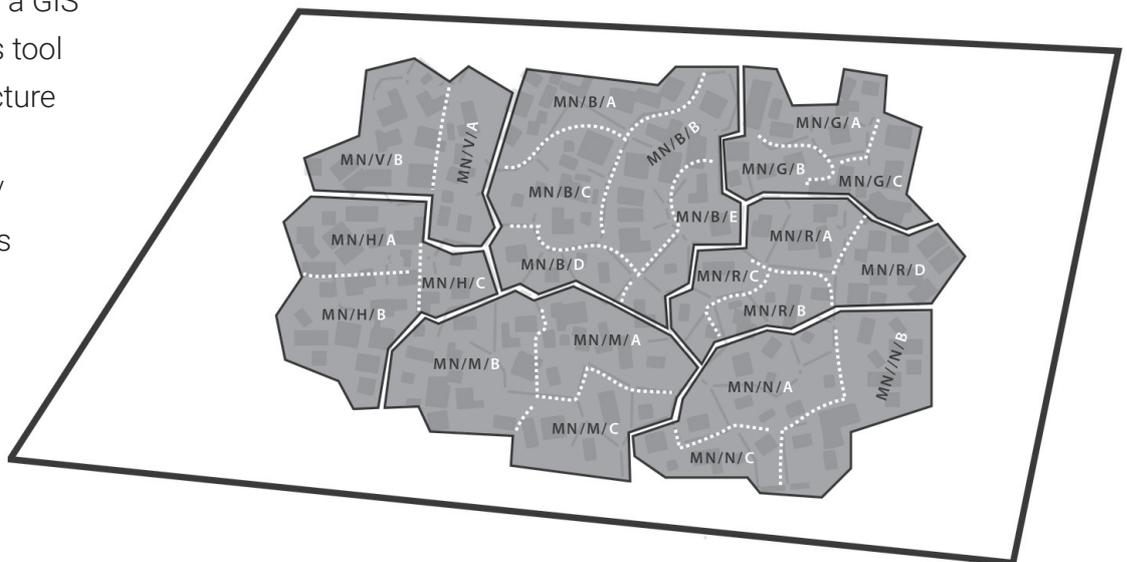
Recruit and Train Community Co-Researchers

The technical team will not know the settlement as well as its residents (and the team is also too small to do all the work alone). Recruit a core team of lead co-researchers from different areas/neighborhoods across the settlement (this can be done at the same time as the technical team is processing data to produce the initial map).


If possible, rely on residents who already have some experience with data collection (i.e. an understanding of the basics of data collection and quality assurance). If few to no residents have experience, you will also need to train them. Local leaders and youth often make good candidates. Each lead co-researcher can then recruit and train residents in their area to form teams for data collection (residents will not trust people they do not know, even residents from other parts of the settlement).

The total number of co-researchers needed is subject to the needs, opportunities and constraints in your settlement. But, a general rule of thumb is five to ten residents per cluster (of up to 1000 households).

See Recruiting and Training Community Mobilizers and Co-Researchers for more detail.

Assign Blocks to Co-Researchers

Form teams of five or more co-researchers per block. One co-researcher will act as the team lead and liaison with the technical team. A member of the technical team will provide oversight.
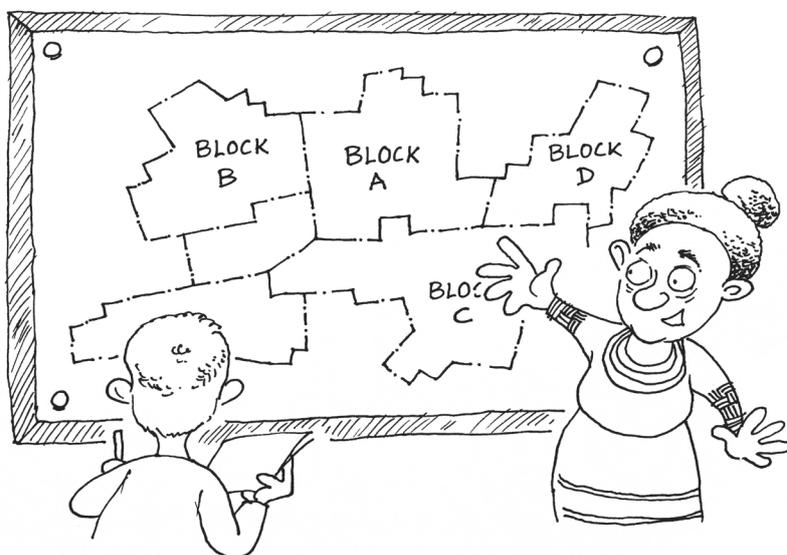
Groundtruth Existing Data and Collect Additional Data During Field Work

Provide data collection teams with:

- A printed map with landmarks and every structure labeled with its settlement/area/block code. For example: *MN/R/A/*

- The data collection forms (see Example Materials)

  - *Structures Data Collection Form*

  - *Services Data Collection Form*

  - *Facilities Data Collection Form*

- If possible, a handheld GPS device

As they walk their assigned locations, data collection teams will undertake several activities at the same time. See the following steps:

Field Work: Validate Structure Footprints

Verify that footprints are in the correct location. Also identify any structures that are missing and fill them in on the map.
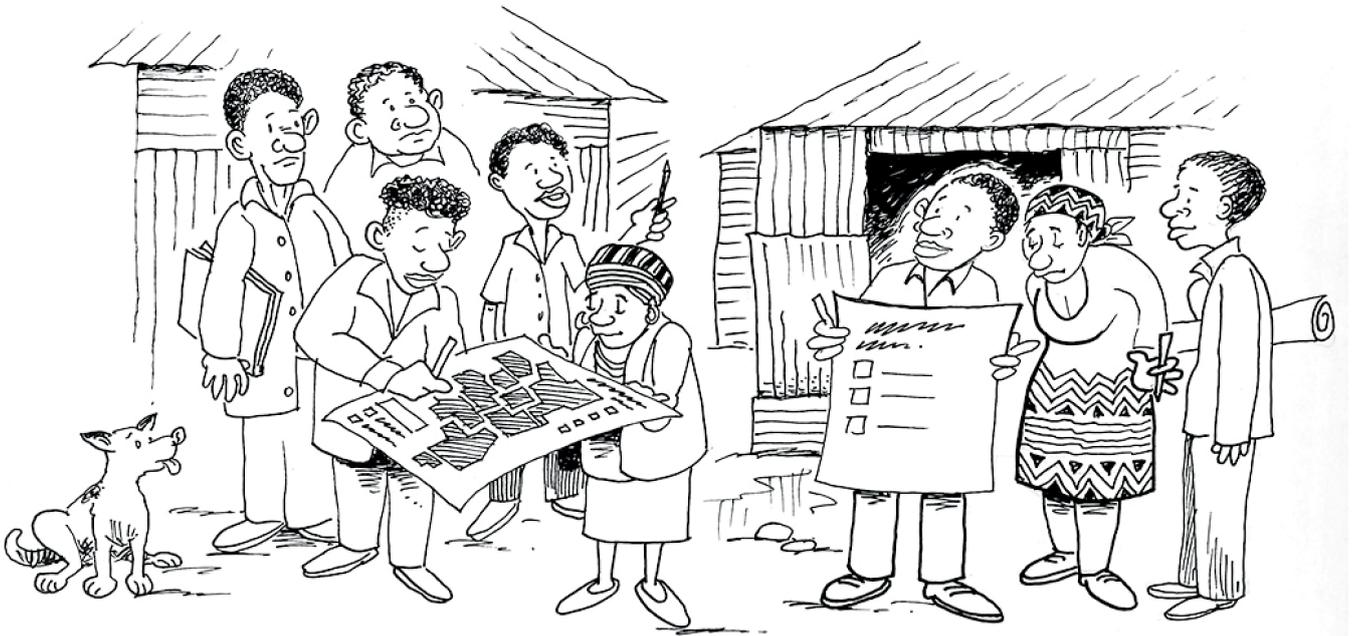
Field Work: Assign a Unique Address Code to Every Structure

Building on the codes for the settlement, areas and blocks, assign a three-digit number to each structure. For example: *001*.

		Settlement	Area	Block	Structure number
☐	**Input**	Mukuru Kwa Njenga	Riara	A	001
↓	**Simplify**	MN	R	A	**001**
■	*Structure code*	*MN/R/A/001*			

Write the structure number (e.g. 001) on top of each structure on the map (as well as on the *Structures Data Collection Form*).

Field Work: Collect Additional Structure Data

Footprint data provides no information about:

- How the structure is being used.

- Whether it is temporary or permanent.

- Whether it is occupied or vacant.

- The number of units/rooms.

- Number of households.

- Number of shops.

- Whether the structure owner lives there or not.

- *etc*

As you validate footprint data and assign each structure an address code on the map, also record this information using the *Structures Data Collection Form* (see Example Materials). Write down the unique address code for each structure from the map on the *Structures Data Collection Form* and fill in associated details in the table (e.g. "structure use"). At this stage, you only need to talk to one household to fill in the form. They will speak for all the other households in the structure.

Field Work: Collect Data on Facilities and Service Location Points

Service points include toilets, sewer lines, water points, garbage disposal sites, electricity transformers, and streetlights. Facilities include health centers, schools, religious institutions, and community centers.

For service points: If possible, use a handheld GPS device to record latitude/longitude points. Record the GPS coordinate number on the *Services* and *Facilities Data Collection Forms* (see Example Materials). If GPS is unavailable, draw in the point on the map.

For facilities: Make a note on top of the structure's footprint on the printed map. If possible, also take a GPS data point. Finally, record the structure's details on the *Services* and *Facilities Data Collection Forms*, including its unique address code.
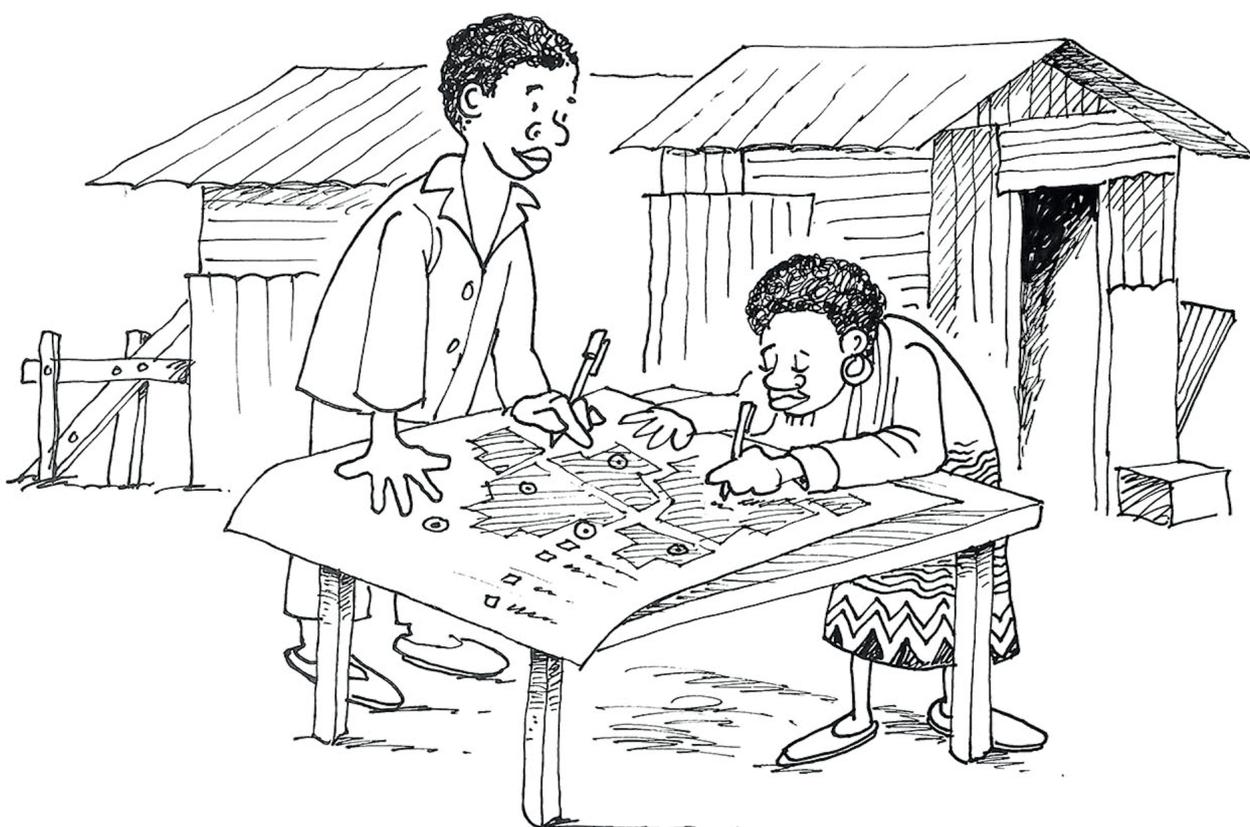
Quality Check Data Collection

Before compiling the data in a database, co-researchers must check each other's work. A lead co-researcher with substantial experience and a strong track record of producing accurate data should spot check about one-third of the data collection forms. This entails randomly selecting forms, visiting the corresponding structure, and talking with the household representative that was previously interviewed to assess the accuracy of data. If the work of any co-researcher contains a substantial number of errors, the team must then re-collect that data.

Compile the Data

Once field work is complete for an area, bring the maps and the three data collection forms back to the office. The technical team will update the GIS database with both ground truthed and new data.

Alternatively, if trained, co-researchers can enter the data into a spreadsheet or database. Data entry by residents ensures continued ownership of the process and deeper understanding of the data.

Validate the Data

Errors in data collection are inevitable. Validation is an essential step for producing trustworthy datasets to inform evidence-based advocacy and planning with local governments. Also, structure or household information may have changed between the time data was collected and the time its validated.

Hold focus group meetings in every area (i.e. neighborhood) with residents to validate the data collected during both mapping and profiling. Make sure not to continually engage the same residents; this will ensure greater inclusion in research activities and help combat research fatigue.

If possible, fix any issues raised by participants in the meeting itself. If needed, return to the field with participants to fix any unresolved issues. You can also continue to validate the mapping data by presenting it in other community meetings and asking residents to locate their homes on the map.

If possible, also work with researchers from local academic institutions to validate the data. Their involvement will lend legitimacy to the findings in the eyes of the local government.

Analyze the Data

Use the data to calculate statistics like the total number of structures, number of permanent vs temporary structures, number of units/rooms, number of households, number of tenants vs structure owners, etc. This can be used during community meetings to inform residents of research findings. It can also be used for advocacy and negotiation with the local government.
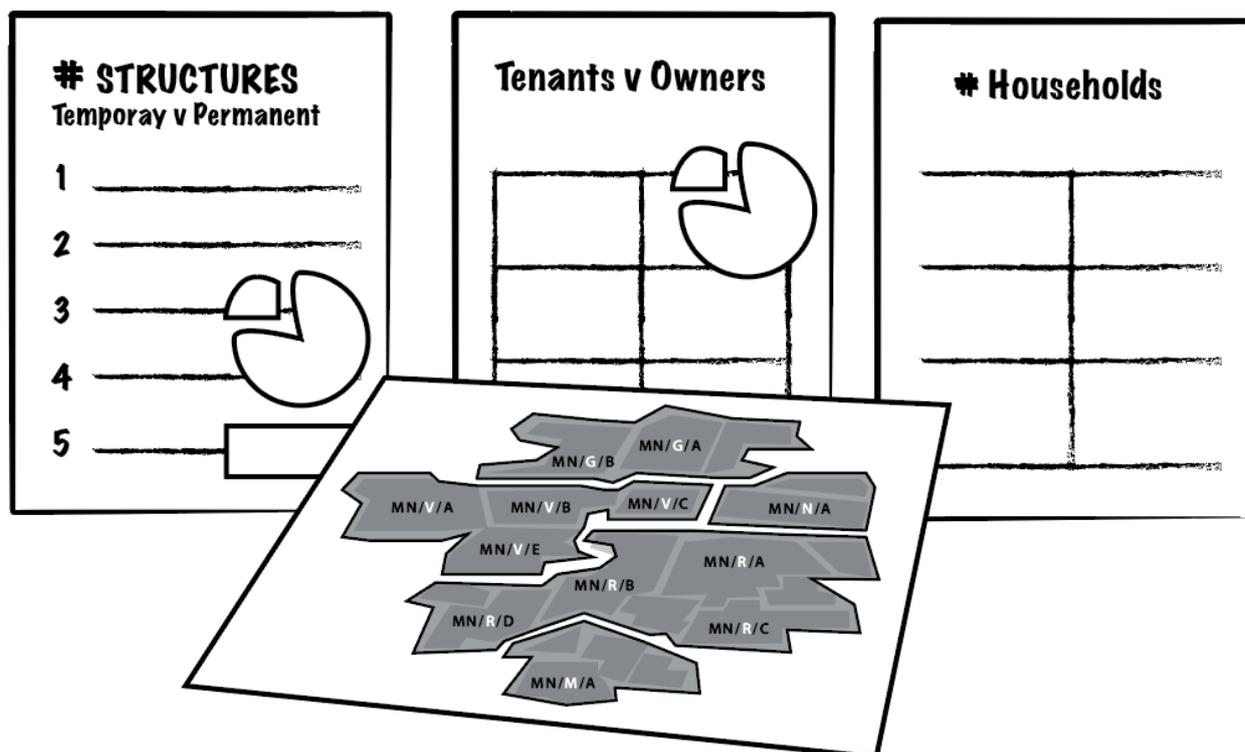
Share the Data to Determine Next Steps

Residents must see the results of their work to maintain trust in the process. Sharing the data also helps communities understand what their top priorities may be to formulate a plan of action. Data should not only be shared as findings in community meetings — as it is community-generated and owned, it should be made freely accessible to all residents (though this can prove challenging in practice).

Considerations

How can we ensure that all stakeholders are involved?

Before beginning community data collection activities, it is useful to identify all possible stakeholders in the community and the roles they should play in an upgrading project to ensure everyone is represented. Without a good understanding of who stands to benefit and lose out, the loudest and most powerful residents will inevitably gain while the most vulnerable lose out. This starts during data collection. Some stakeholders will seek to protect their interests and even take advantage for their own gain by influencing the data collection process.

While the profiles of stakeholders may be similar across informal settlements, it is important to identify specific groups to understand the dynamics of local politics, relationships, vested interests, and vulnerabilities in the settlement. To do this, engage residents, especially the quiet ones, to create a detailed stakeholders map.

It is also important to understand the social hierarchies at play in the settlement. In addition to ensuring broad support across stakeholders, it is important to recognize both formal and informal local leaders. This could be a local government official or a religious or community leader. Engaging these leaders helps ensure broader community engagement and participation.

Who should co-researchers be?

They can be any resident — tenant, structure owner, local leader, etc (but should not be outsiders). Women and youth often make good candidates as they may have more time free during the day. In particular, seek out people that demonstrate commitment to community work and data collection processes.

Should we compensate community mobilizers and co-researchers?

Yes, provide some small compensation as possible. Residents' time is precious and few may be able to contribute consistently without some consideration of the cost of their time.

How can we ensure that collected data is accessible to residents?

You can present it in community meetings, distribute it in printed materials, and share it via media like community radio. If possible, you should also strive to make hard copy and digital databases accessible, storing them in local facilities like a community center. However, make sure to never share sensitive personal data like ID numbers, phone numbers, etc.

How do we ensure that our data is accepted as credible, consistent and accurate by government?

The data validation process is essential for ensuring acceptance of community-collected data. The data validation process is essential for ensuring acceptance of community-collected data. This entails two activities: (1) co-researchers quality checking each other's work and (2) conducting

focus group discussions with residents. If possible, also engage local university partners to validate the data as well.

What can we do if we don't have access to GPS devices?

While it is nice to have GPS units for placing service points and facilities in digital GIS maps, they are not necessary. Plotting locations on the paper maps during field work will also work well.

You could also explore using GPS data collection apps for smartphones. They are less accurate than a GPS device but should be good enough.

What if we want to map something other than structures and services?

A similar process can be used for mapping other infrastructure or challenges. For example, you could use a similar approach for mapping the location of climate or other hazards. Central to the process is procuring the right data, processing it into a format useful for field work in settlements, forming teams of both community and professional researchers, and sharing the findings with residents so they can begin discussions and determine priorities.

Challenges

Data Collection Errors

Errors are inevitable, especially when community co-researchers have little experience in data collection. You can minimize errors by starting small. This way, co-researcher trainees can make mistakes, discuss together and learn so that once they scale up they are better prepared. This approach also saves resources, minimizing work that would need to be redone during quality checks by other co-researchers and during the community validation process.

Among the often densely built structures in informal settlements, you may miss a structure or even map it twice. You can overcome this by training co-researchers to look out for this, having team members check each other's work, and validating the data in community meetings. You can also have residents locate their homes on the map in other community meetings to see if any structures are missing or double counted.

Multiple Address Systems Already Exist

Due to multiple development projects happening in the settlement, you may find that several different numbering and address systems already exist. This can be a great source of confusion for residents. If possible, seek to use an existing system instead of inventing your own.

Residents' Distrust, Lack of Awareness, and Misinformation

Residents in informal settlements have faced a long history of land grabs and evictions as well as many development projects that have failed to produce tangible results. There are also inevitably opportunists inside and outside the community that will seek to use upgrading efforts to their own benefit. Residents are therefore often skeptical of upgrading projects and fearful when they see you walking around with a map in your hand. Some residents will resist the process and you may even be threatened. You can overcome this through patient dialogue, inviting trusted local leaders to speak about the project, inviting local government staff to speak to residents, and striving to provide near-term, incremental benefits to build confidence in the process. It is also essential to include community participation from the start as residents will not trust people they don't know. Additional strategies include: training a core team that understands the method and its promise for bringing benefits to the settlement; and involving trusted local leaders, including from the local government administration (e.g. ward chiefs).

> **❝** The structure owners thought that we were selling the settlement because they didn't want to attend meetings, for them to understand what we were telling people. So, it was conflicting for me, for them to say I'm selling their houses, they won't be getting the money they were getting. So, my life was also threatened, and people were confronting me on the roads and saying how bad I am as a woman. I remember when we were doing numbering, someone came and said he will slice us into pieces using a *panga*, we had to leave his house behind and get back to our government and the people we were working with and explain to them the challenges we were facing on the ground, to use chairmen to inform people that the work we were doing is government's, because we personally do not have the title deed for that area. **❞**

Christine Mwelu Community Mobilizer, Lunga-Lunga Centre, Mukuru Viwandani (Nairobi, Kenya)

Personal communication, 18 May 2022.

Research Fatigue and Disbelief

Again, because so many research initiatives and development projects fail to produce promised results, residents may not want to participate in data collection activities and be skeptical that promised benefits will ever materialize. Residents may not be able to distinguish between research that is a one-and-done extraction and research that supports larger community-building and upgrading processes. Help them understand the difference. But be careful not to over engage residents or overpromise benefits. This is why it is so crucial that work be iterative and incremental. Residents need to see tangible benefits to invest their time. They also need help as soon as possible. Therefore, projects that only think long-term will largely fail in this challenging context.

Examples from the Field

Mukuru, Nairobi (Kenya)

Residents in Mukuru undertook a large-scale data collection process to support a settlement-wide participatory upgrading process that sought to engage over 100,000 households. Information provided by community data collection activities played a crucial role in conversations with the Nairobi city government and supported the declaration of Mukuru as a Special Planning Area (SPA) in 2017.

Community-led data collection and action research with partners was instrumental in making the case to local government. Because of the dire risks and challenges highlighted by residents in these campaigns, an interdisciplinary team of action researchers (from the University of Nairobi, Strathmore University, the Katiba Institute and the University of California, Berkeley), commissioned by Canada's International Development Research Centre (IDRC), in close collaboration with Muungano, undertook a multi-year research project to document living conditions in Mukuru.

Crucial to this research was the practice of settlement profiling pioneered and refined by SDI affiliates for decades, a method used by community researchers to gather data on living conditions in resource and data-poor informal settlements. Profiles enhanced existing research on conditions across Mukuru, providing data on an array of planning, built environment and basic services metrics to inform situational analyses of existing conditions (connectivity, accessibility, health, security, opportunity and livelihoods).

Co-researchers started in their own neighborhoods because it was familiar and they were known there. They then worked outwards to other neighborhoods to better understand the rest of their settlement.

> **It is good first if they start at counting, they do mapping first for knowing how many structure owners do they have in a specific area and also the number of tenants. It is also good they will know what they have in terms of infrastructure, whether they have government facilities, schools, hospitals and the rest. They will be able to identify what they have so they can note what they don't have. Number three, they will be able to bring those people together then they start negotiation including the local government so that it can help the people to come together.**

Alphonce Masaku Structure Owner – Simbacool, Mukuru Kwa Reuben

Personal communication, 20 May 2022.

Quarry Road West, Durban (South Africa)

Researchers from the School of Built Environment and Development Studies at the University of KwaZulu-Natal (BEDS, UKZN) worked in partnership with community members to co-produce community-based participatory GIS maps, which have led to new pathways for supporting climate adaptation.

Chinhoyi (Zimbabwe)

Inclusive city-wide strategies for sanitation in Chinhoyi have engaged low-income communities in mapping, profiling and GIS to document their sanitation needs and leverage strategic relationships with local government. By engaging in the co-production of this knowledge, local authorities are pushed to recognize the sanitation needs of urban poor communities. The Sanitation and Hygiene Applied Research for Equity (SHARE) program builds on partnerships that have developed incrementally between slum dwellers and local authorities in Zimbabwe. This has emerged, in part, as a result of the severe financial challenges faced by local authorities, along with the advances made by low-income groups using savings and local data collection methods in relation to housing and upgrading in cities across Zimbabwe.

Ngaoundéré (Cameroon)

Open Cities Africa, an initiative of the Global Facility for Disaster Reduction and Recovery (GFDRR), supports the collection of open-source risk information through citizen engagement and the development of data products to support local decision-making. For instance, in Ngaoundéré in Cameroon, this approach allowed the team to map over 300 km² of urban area combining inputs from local residents, with data from the municipality and new drone imagery. Geospatial data collection was done by students from the University of Ngaoundéré. This role strengthened their technical skills and provided them with a hands-on opportunity to contribute to community development efforts. The use of students was especially effective because they spoke the local language, Fulfuldé, and understood the social and cultural norms around approaching households. The initiative was coordinated with the World Bank-financed Cameroon Inclusive and Resilient Cities Project (CIRCP) that is being implemented by the Ministry of Housing and Urban Development.

Materials

For office work:

1. Computer with GIS software installed (e.g. QGIS, ArcGIS)

2. GIS data: structure footprints; settlement boundaries; area (i.e. neighborhood) boundaries; structure block boundaries

For field work:

1. Handheld GPS device (optional)

2. Printed map for each data collection team

3. Structures Data Collection Form (one row in table per structure)

4. Services Data Collection Form (one row in table per service point)

5. Facilities Data Collection Form (one row in table per facility)

Example Materials

See the following two pages for the:

- Structures Data Collection Form

- Services Data Collection Form

- Facilities Data Collection Form

[5] STRUCTURES DATA COLLECTION FORM

Form last updated Sep 2022

Block code _____ Data collection team _____ Date _____

MN/R/A/

Structure number	Structure use* (see codes below)	Structure type (P) Permanent (T) Temporary	Structure status (OCC) Occupied (VAC) Vacant	Number of...				Resident structure owner (Y) Yes (N) No	Monthly rent paid (Ksh)	Structure name (if applicable)
				Units/ Rooms	House holds	Shops	Vacant units			
1	001	COM	T	OCC	1	0	1	0	N	2500	Bazu Electronics
2	002	RES	T	OCC	6	6	0	0	Y	1500	-
3	003	REL	P	OCC	1	-	-	0	N	-	Al Adha Mosque
4	004	RES	T	OCC	8	6	0	2	N	1250	-
5	005	COM	T	VAC	4	0	0	4	N	-	
6	006	MIX	T	OCC	7	5	1	1	Y	2300	
7											
8											
9											
10											
11											
12											
13											
14											

*Structure use codes – (RES) Residential (COM) Commercial (MIX) Mixed residential/commercial (IND) Industrial (HLH) Health services (ED) Education services (COM) Community (REL) Religious (INS) Other institutional (PUB-UTL) Public utility (OTH) Other - specify

[6] SERVICES DATA COLLECTION FORM

Form last updated Sep 2022

Block code MN/R/A/

Data collection team _____

Date _____

GPS code _____

	Service* (see codes below)	Type (PRV) Individual/Private (SHR) Shared/Yard (PUB) Public (KSK) Kiosk	Status (W) Working (NW) Not working	Operator name	Funded by (PUB) Public (PRV) Private (COM) Community	GPS coordinate number
1	WAT	SHR	NW	-	PRV	185
2	TLT	PRV	W	-	PRV	186
3	WAT	KSK	W	Baba Khan	PRV	187
4	OTH - Water dam	PUB	W	Nairobi Water	PUB	188
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Service codes — (TLT) Toilet (WAT) Water (GD) Garbage disposal (ELT) Electricity transformer (STL) Street light (OTH) Other - specify

[7] FACILITIES DATA COLLECTION FORM

Form last updated Sep 2022

Block code _MN/R/A/_

Data collection team _____

Date _____

GPS code

	Facility* (see codes below)	Type (funded by) (PRV) Private (PUB) Public (COM) Community	Status (W) Working (NW) Not working	Operator name	GPS coordinate number
1	SCH	PUB	W	Ministry of Education	189
2	SCH	PRV	W	EdUcate Partners	190
3	OTH - Community Garden	COM	W	-	191
4	HLH	PUB	NW	Ministry of Health	192
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

Facility codes – (SCH) School (REL) Religious institution (HLH) Health center (PLC) Police station (OTH) Other - specify

Related Components

Guides

- Community Mobilization, Organization, Representation and Coordination Strategy

Methods

- Recruiting and Training Community Mobilizers and Co-Researchers

- Settlement Profiling

- Household Numbering and Enumeration

- Risk profiling: Identifying risks, assessing solutions and determining community priorities

Sources

Interviews (2022) with staff from SDI-Kenya and the Akiba Mashinani Trust as well as a review of relevant documents and data collection forms from these same organizations.

Mukuru Kwa Reuben community. (2022, May 20). [Focus group interview by B. Hicks]. Mukuru SPA documentation 2022, Reuben Centre, Mukuru Kwa Reuben, Nairobi, Kenya.

Mukuru Viwandani community. (2022, May 18). [Focus group interview by B. Hicks]. Mukuru SPA documentation 2022, Mukuru Skills Primary School, Mukuru Viwandani, Nairobi, Kenya.

Horn, P., Kimani, J., Makau, J., & Njoroge, P. (2020). *Scaling participation in informal settlement upgrading: A documentation of community mobilisation and consultation processes in the Mukuru Special Planning Area, Nairobi, Kenya*.

Mazeka, B. et al (2019). *Community-Based Mapping Methodology for Climate Change Adaptation: A Case Study of Quarry Road West Informal Settlement, Durban, South Africa*.

Banana, E. et al. (2015). Co-producing inclusive city-wide sanitation strategies: Lessons from Chinhoyi, Zimbabwe. *Environment and Urbanization*.

Banana, E. et al. (2015). Sharing reflections on inclusive sanitation. *Environment and Urbanization*.

Additional Resources

For an in-depth discussion of the history, evolution, benefits, challenges, ethics, and legitimacy of settlement mapping, see:

Patel, S., Baptist, C., & D'Cruz, C. (2012). Knowledge is power – informal communities assert their right to the city through SDI and community-led enumerations. *Environment and Urbanization*, 24(1), 13-26.