PARTICIPATORY MAPPING FOR SLUM UPGRADING

Mapping at city and settlement level for data-based decision making

WHAT?

Mapping entails gathering collecting thematic information about an area and then synthesizing it in a map to analyse, draw conclusions around spatial patterns, and present it in an understandable way. Maps are characterised by their geographical **scope**; the **scale** they are developed at which determines the level of detail of the map. Maps can represent information from different **times:** the past, the present reality, a planned future and can be used to understand **dynamics** (e.g. connections between transport network and service delivery).

In the context of slum upgrading maps can be developed at city level – to identify the slums at city level and their relationships - and at settlement level to provide more details about the living conditions in a slum. Maps for slum upgrading include **information** about the location, the population, the risks, the conditions of infrastructure, housing, etc. however this information will vary depending on the scope and purpose of the map.

Table 1. Four Main Attributes that Define Maps

Attribute	City level mapping For City-Wide slum upgrading strategies and urban profiling	Slum level mapping For participatory neighbourhood planning
Scope, which is the boundaries of the maps.	In this case the scope of the maps is most often the city boundaries. Sometimes it makes sense to show information related to areas a bit outside the immediate boundaries of the city. For example, concerning land use and climate change.	The scope is the neighbourhood boundary. The limit and the area of intervention and the households integrated in this area need to be agreed with the community.
Scale, which is determining the level of detail of the map.	The scale of the maps must be adjusted to what specific information and patterns it should show. Suggested scales to work in are 1:25 000 and 1:50 000.	The scale varies according to the size of the neighbourhood and the planning requirements. Suggested scales to work in are 1:5 000 to 1:2 000.
Time**,** which is defining what time the information is representing.	Often maps of land use exist but are not consistent with what is happening on the ground. Creating new maps should therefore specifically aim at updating and showing the actual land use and patterns. Master plans considering different thematic areas should always be collected.	If possible, understanding with the help of the community how the neighbourhood has evolved during the years will be important. Also, mapping the planned interventions for infrastructure delivery for example in the neighbourhood is important.
Dynamics, which is the relationship between places, functions and characteristics.	To show and analyse dynamic relationships between places and functions by adding different thematic information on the same map is encouraged.	Community can help in understanding the use of the spaces in the neighbourhood and relationships between the different functions.

WHY?

Maps provide a visual representation of an area and enable the analysis of the relationships between the physical, social and economic domains within the boundaries, as they:

- Provide an initial understanding of the urbanization pattern;
- Make both obvious and unobvious existing patterns of the land use visible;
- Provide information to understand the land use and the location and spatial extent of slum settlements;
- Give a symptomatic view of the poverty deprivation pockets within the city.

The information from the city level maps will be used to draw conclusions on the patterns of slum formation and understand the trends in slum conditions. At slum level, mapping enables a deeper understanding of the selected slums including the slum residents' access to basic urban services and infrastructure and the living conditions in the slum. This information at city and at slum level will guide decisions making and inform strategies for citywide slum upgrading and prevention.

MAPPING IS NOT AN OUTPUT, IT IS A PROCESS, bringing together different stakeholders. Participatory mapping promotes stakeholders' feeling of identity and ownership in the larger city/urban, enables a mindset change, and empowers stakeholders for action.

WHO?

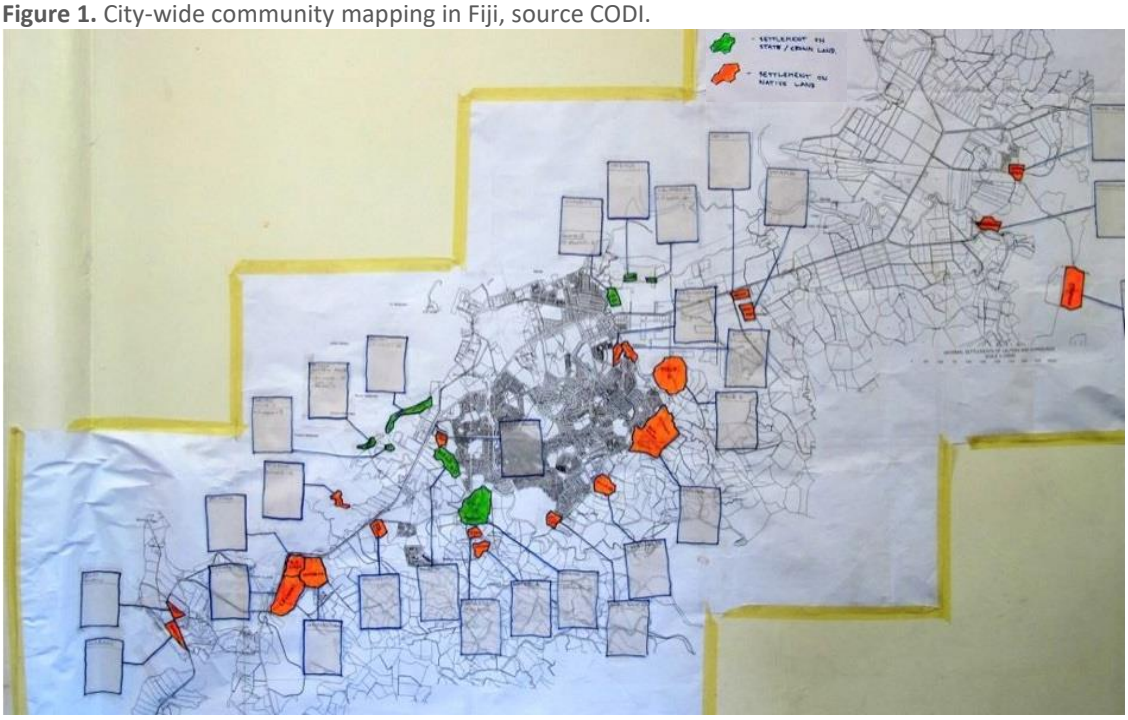
Mapping should involve all the relevant stakeholders for slum upgrading as it is primary a tool for decision making. Also, engaging diverse stakeholders in the mapping process will ensure that all data sources, knowledge contributions are tapped.

Whenever possible community mapping should be encouraged. Community mapping involves the community members in the collection of mapping data with the guidance of mapping expert as communities have first-hand knowledge from their neighbourhoods' challenges and opportunities. Community participation in the data gathering process is key to ensure that actions are targeted and will empower the community in the monitoring and implementation of the agreed actions.

Case study:
https://knowyourcity.info/2015/11/profiling-and-mapping-for-alternative-slum-upgrading-solutions-in-kiandutu-kenya/

"Community mapping should focus on providing the skills and expertise for community members to create the maps themselves, to represent the spatial knowledge of community members and to ensure that community members determine the ownership of the maps and how and to whom to communicate the information that the maps provide. The community mapping can influence the internal dynamics of a community. This process can contribute to building community cohesion, help stimulate community members to engage in land-related decision-making, raise awareness about pressing land-related issues and ultimately contribute to empowering local communities and their members".
(retrieved in: https://www.ifad.org/documents/38714170/39144386/PM_web.pdf/7c1eda69-8205-4c31-8912-3c25d6f90055)

Figure 1. City-wide community mapping in Fiji, source CODI.



HOW?

What information can be represented through maps:

The information to be presented in a map will depend on the purpose and theme, scope and scale of the map. The tables below summarize what information can be mapped at city and at settlement level for informing participatory slum upgrading.

Table 2. Information to map in city level mapping

Maps	Description	Some Examples
Mapping of the city against the five deprivations stated in the UN-Habitat slum definition	Sanitation, water, housing, overcrowding and land tenure	Disaggregated by area: Percentage of households with access to safe drinking water, percentage of households with access to sanitation, density of households, percentage of formal and informal land tenure, percentage of permanent and non-permanent housing structures
Poverty	Poverty level, income	Disaggregated by area: Average income, percentage of population below the poverty line
Infrastructure in the city	Transportation, water, sanitation etc.	Map showing the main sewer lines, water lines, road network etc.
Location of slums		Show where the slums are located in the city, and also the type of slum.
Main Features of/near the slum	Nearby natural/ artificial features.	Located in a flood plain, located on steep land, existing near a fault line, exists near a toxic dumpsite, close to other housing units, close to infrastructure etc.
Other relevant themes at city level (maps for	1. Urban Demographics	Disaggregated by area: population density, income levels, population growth rates, education levels, average age.
	2. Urban Governance	Map with administrative boundaries.

the urban profiling)	3. Urban Planning and Design	Master plans. Structure plans.
	4. Urban Economy	Disaggregated by area: average income levels; Gini coefficient; average tax payments. Location of markets (formal/informal), industrial areas, business districts, service areas, artisan manufacturing areas, agricultural production/processing areas, government premises, capital market/stock exchange areas, sea/river ports, extraction areas (mines, fishing, quarries, etc.), tourist attractions/national parks.
	5. Land and Property Rights	City boundaries. Main geographical features (hills, rivers, springs etc.). Main land use in different areas such as: residential areas and settlement types (formal and informal settlements), environmental protected areas, industrial areas, business areas, vacant land, reserved land for different purposes, areas with institutions and academia, roads and other transport, commercial areas (markets), green areas etc. Type of tenure in different areas (public, private, freehold, leasehold). Clear or unclear property ownership and/or rights. History of evictions and displacements.
	6. Urban Basic Services	Percentage of households in given areas that have/have not access to adequate water, sanitation, sewer, electricity, public transport and solid waste management. Location of water treatment plants, sources of power, public transport nodes and corridors, and both legal and main illegal dump sites, etc.
	7. Housing	Location of government owned housing and private owned. Data disaggregated by area: average cost of housing, average plot size, average persons per room, average density, typical building material and housing typologies. (e.g. detached houses, row houses, multifamily apartments, informal settlements)
	8. Social Facilities	Location of public spaces, such as public squares, markets, community halls, social centres and parks. Location of educational facilities, medical facilities, libraries, religious facilities and fire service facilities. Data disaggregated by area: under-five mortality rates, HIV/aids prevalence, literacy rates, percentage of children in school age enrolled in school.
	9. Environment and Risk Reduction	Location of areas at natural hazard risk and types of risks, such as flooding, erosion, bush fires, pollution, earthquake and storm. Predictions of changes in water levels and temperature. Location of environmental features (e.g. hills, lakes, rivers, watercourses, forests, springs, grasslands, etc.). Location of risk reduction features such as reforestation, flood protection walls, restoration of natural flood plains, protection of watercourses from pollution, etc. Current quality of land and water surfaces in terms of contamination/pollution.
	10. Crime and Safety	Data disaggregated by area: prevalence and types of crime, crime prevalence and crime solving prevalence. Police stations.
	11. Culture and Heritage	Location of buildings or areas of special cultural, historical, natural or touristic value, location and type of cultural

		facilities (museums, libraries, theatres, cinemas, dance/music venues, art galleries, culture associations, etc.). Location of areas for preservation. Location and type of natural heritage features such as specific ecosystems, mountains and unique flora and fauna.
	12. Slums and Slum Living Conditions	Location of slums. Level of durability of structures in slums. Areas of slum households with secure/insecure tenure. Areas of shelters built on hazardous locations. Areas of households with more than three persons per room (room occupancy).

Table 3. relevant data for neighbourhood mapping

To be Mapped	Examples
Services in the slum	Location of water points, location of toilets, location of health facilities, location of schools, location of government offices, location of community facilities, religious centres
Land use in the slum	Open spaces, businesses, housing, railway reserve, electric line reserve, pipeline reserve, dumpsite etc
Features in the slum	Rivers, floodplains, steep areas, fault lines, open quarries or holes, swamps
Infrastructure in the slum	Roads in the slum, water and sewer pipeline in the slum, electricity line in the slum, railway line in the slum
Poverty	Income in the slum, expenditure in the slum, cost of basic urban services, cost of rent
Land ownership	Who owns the land in the slum
Density of the slum	Population density in the slum, household density in the slum

Steps for mapping:

Maps can be developed through the collection of primary data or gathering secondary already available mapping data or through a combination of both. The generic steps for mapping include:

1. **Establish mapping working group(s).**
These groups should consist of relevant stakeholders and are the ones who will undertake the mapping process with guidance from the Implementing Partner or stakeholder with technical knowledge on mapping. When the mapping is done at community level, include a community leadership team a to manage the community mapping.

2. **Collect existing maps and available mapping information at city or settlement level.**
Assess the available data sources and collect maps and plans showing information about the city or the selected slums. Maps can be gathered from for example national and local governments, NGOs, CBOs, academia, and online mapping resources, private sector or research institutions.

3. **Produce a base map.**
The base map should include some basic spatial information that does not change significantly over time. if no other mapping information is available you can use as reference a basic map from free software such as openstreetmap.org or Google Maps.

4. **Decide and agree on what maps to create based on the information you need and purpose of the mapping exercise.**
Identify jointly the focus for the mapping exercise set benchmarks, goals and outcomes, determine the appropriate types maps and data collection approach. Decide and agree on:

- what geographical boundaries (i.e., a neighbourhood or a whole town) you will use
- what needs to be mapped and what data is available.
- what thematic maps to create to complement the collected existing maps? Keep in mind the four attributes of maps explained above while doing this.
- how to collect and analyse the new data needed. Will it be done through community mapping ?
- how can the mapping exercise promote the mindset change and empowerment you are seeking with the overall process? (remember mapping is the beginning of a process not an output)

5. Collect the missing data.

If the available secondary information collected is not enough for the objectives of the mapping, then primary information needs to be collected. Data can be collected from multiple sources and with multiple approaches (through field work, walks and site visits, door to door collection exercises, interviews and group events) and using different technologies (from hand drawing to mobile phones or tablets with specific geo-referenced data collection apps). If the data collection involves community mapping events and/or surveys or data collection led by communities, please consider:

- Plan the logistics and resources needed for the mapping exercise. Reference materials such as the base maps and other tools need to be prepared in advance to help the data collection.
- Determine the facilitators and structure of the mapping event and invite a diverse group of interested citizens. *Sometimes it is helpful to have a trial run or a mini-mapping exercise in a planning meeting. This may uncover gaps in your preparation, methodology and data collection.*
- Train the surveyors and data collection team.
- Provide feedback (maps) to the community to build trust and make results transparent and known.

6. Create the maps.

Use the base map and add the thematic information onto it to create the desired maps. This can for example be done manually or through using GIS, Google earth, open street maps or any other available mapping software. Coding the information by colours, patterns, symbols or numbers together with a proper legend on the side is advisable.

7. Analyse the maps.

Reflect upon and analyse the information on the maps. Are there land use patterns overtime that are on-going trends? Are there any dynamic relationships between places and functions and characteristics? What are the symptomatic conditions in and around the slums in your city? Is there a pattern in where slums are located? Etc.

Representing the collected information:

Maps can be presented with simple techniques such as hand drawing or even using google maps or google earth as a basis for the mapping if no other base map is available. Remember that the objective of the mapping exercise is to gather, visualize and analyse data to influence decisions, not to produce beautiful maps.

Figure 2. Example of a Map Prepared Manually (Kigali, Rwanda)

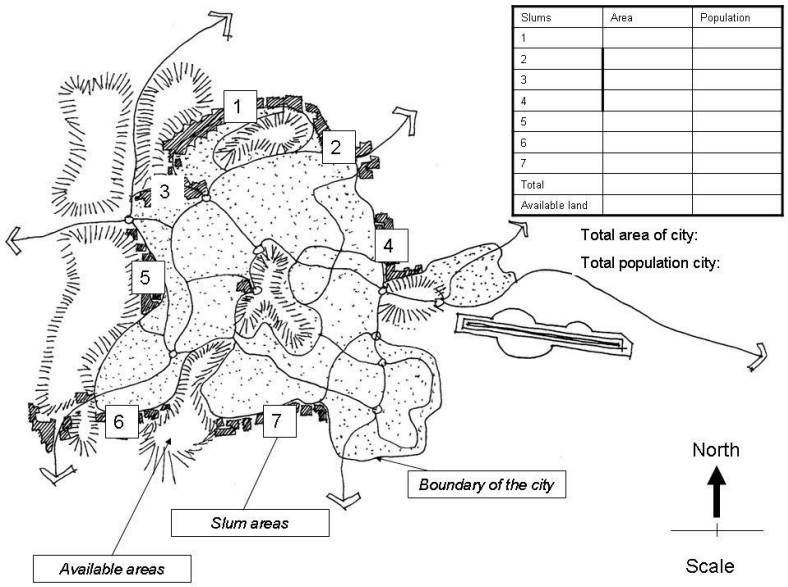
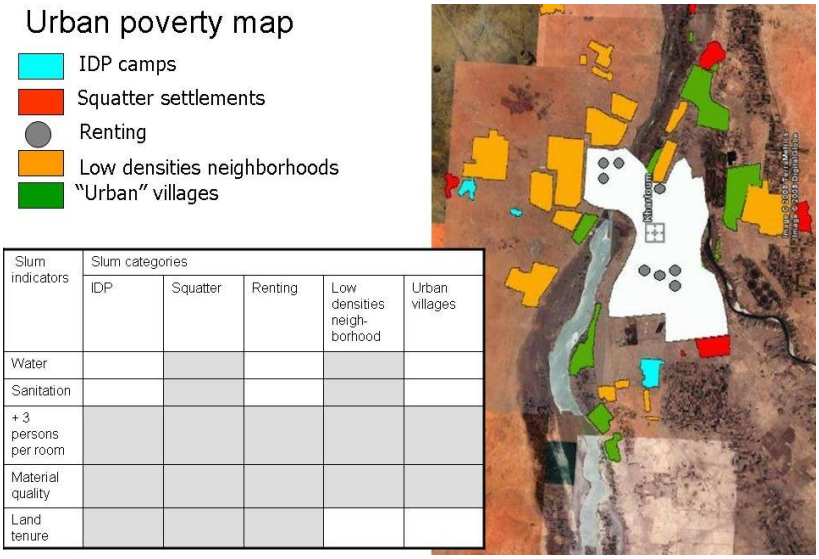


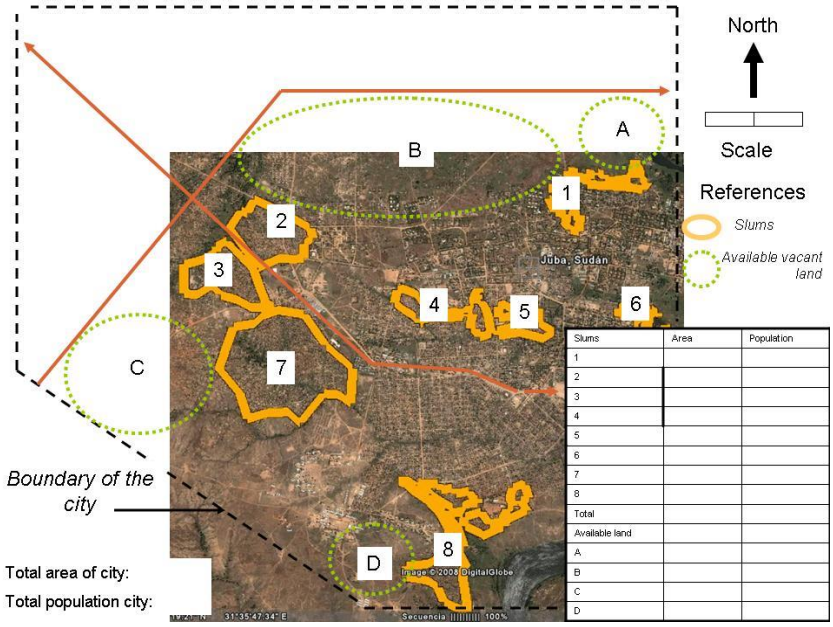
Figure 3. Example of Poverty Map Prepared with Google Earth According to Locally Developed Data (Khartoum, Sudan)



Slum indicators	Slum categories				
	IDP	Squatter	Renting	Low densities neigh-borhood	Urban villages
Water					
Sanitation					
+ 3 persons per room					
Material quality					
Land tenure					

To create maps based on primary data and to use GIS technology for the mapping is highly encouraged if the expertise and resources are available. The advantage of GIS is that it enables to combine the geographical information in a map with other types of data, presented in a table format.

Figure 4. Example of a Map Based on Google Earth (Juba, Southern Sudan)



When representing the information in map remember to include: a scale (indicating at which scale it has been drawn at), an orientation (showing where the geographical north is), and a legend (explaining what the graphic code is and helping understand the information of the map).

Further references:

- https://www.ifad.org/documents/38714170/39144386/PM_web.pdf/7c1eda69-8205-4c31-8912-3c25d6f90055
- https://www.ohchr.org/Documents/Issues/Housing/InformalSettlements/UNHABITAT_A_PracticalGuidetoDesigningPlaningandExecutingCitywideSlum.pdf
- https://www.researchgate.net/publication/327851481_Machine_Learning-Based_Slum_Mapping_in_Support_of_Slum_Upgrading_Programs_The_Case_of_Bandung_City_Indonesia
- Street mapping: https://www.ohchr.org/Documents/Issues/Housing/InformalSettlements/UNHABITAT_StreetsasToolsforUrbanTransformationinSlums.pdf