Responsive and Evidence-Based Community-Driven Mapping as a Catalyst of Change Towards Disaster-Resilient Communities: A Case of Muntinlupa City, Philippines

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Key words: community mapping, participatory planning, disaster risk reduction and management, informal settler families, Philippines

SUMMARY

The Philippines ranks third among most disaster-prone countries worldwide (World Risk Report, 2017). Its exposure to natural hazards is compounded by lack of coping and adaptive capacities such as high poverty rate, uncontrolled settlement in danger zones, failure to implement construction standards, and degradation of natural resources. The brunt of these challenges is largely felt by the 27.6 million Filipinos belonging to the marginalized sector including informal settler families (ISFs).

Traditionally, disaster risk reduction management (DRRM) initiatives such as the *Oplan Likas* has been carried out by government authorities, with greater efforts focused around disaster preparedness and response, instead of prevention and mitigation (National DRRM Plan, 2011). Little participation is generated from ISFs who in fact possess deeper and better understanding of their own physical contexts and struggles. Furthermore, their socio-economic conditions seem to trap them in a never-ending cycle of disaster, displacement and rebuilding. For a developing country like the Philippines, a proactive risk management approach is imperative.

The launch of the *Citywide Development Approach* (CDA) to upgrading informal settlements in 2014—a multi-stakeholder collaboration of the national and local government agencies, civil society groups and people's organizations—marked the introduction of community-driven data collection, mapping and profiling and planning of informal settlement communities in the country. The CDA is seen as a clear alternative to the usual unsystematic, project-based and top-down planning of cities that emphasized the participation of all stakeholders, especially the ISFs. The CDA was tested in three pilot cities in Metro Manila, including Muntinlupa City where the *Homeless People's Federation Philippines Inc*. (HPFPI) and its partners facilitated community-driven data gathering initially in 83 informal settlements across four *barangays* in District II. The participatory, community-led nature of the CDA has placed community members at the heart of the process that doubled as a research agenda and a mobilizing tool for communities. The Muntinlupa experience presents opportunities for grassroots communities to scale-up community-driven initiatives to inform a responsive, evidence-based DRRM planning and policies from city to national level.

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1. INTRODUCTION

The Philippines ranks third among most disaster-prone countries worldwide (World Risk Report, 2017) *(see Table 1).* Its exposure to natural hazards such as typhoons, floods and earthquakes is rooted primarily to its location along the Pacific Typhoon Belt, within the Pacific Ring of Fire, and above two tectonic plates, i.e., the Philippine Plate in the east and the Eurasian Plate in the west.

Table 1: World Risk Index 2017

Components (including definition)	**Mean Values (2012-2016)**
Exposure – covers threats due to extreme natural events	52.46
Vulnerability – relates to social, physical, economic and environmental factors which make people or systems susceptible and adaptive to the negative impacts of natural hazards and develop adaptation strategies	52.78
▪ Susceptibility – structural characteristics and framework conditions of a society	32.97
▪ Coping capacities – measures and abilities that are immediately available (direct action and resources) to minimize harm and damages in the occurrence of an event	80.92
▪ Adaptive capacities – a long-term process that includes structural changes, measures and strategies dealing with and attempting to address the negative impacts of natural hazards	44.45
World Risk Index	**27.69%***

**The Philippines ranked 3rd, trailing Vanuatu (1st, 50.28% index) and Tonga (2nd, 29.42% index)*

In 2016 alone, the country registered a total of 216 earthquakes (Carteciano, 2017), with most of it caused by the several fault lines running across, and the 220 known volcanoes, 22 of which are considered active, dotting the archipelago (Center for Disaster Preparedness, 2018). Among five active fault lines, much attention has been given both by the public and the government on the 100-kilometer West Valley Fault (WVF) predicted to generate a 7.4-magnitude earthquake that could kill 34,000 lives across six cities in Metro Manila and nearby provinces where it traverses. The *Philippine Institute of Volcanology and Seismology (*PHILVOCS) traces four major earthquakes originating from the WVF in the last 1,400 years, with intervals ranging between 400 to 500 years (Sabillo, 2015). The last quake activity was recorded in 1658 or 361 years ago—a warning that the anticipated so-called "The Big One" could happen within this century, if not in the next 40 to 50 years or so.

Aside from geologic activities, an average of 20 typhoons frequent the country annually, the most devastating of which happened in November 2013 when Super Typhoon *Yolanda* (international name: *Haiyan*) claimed over 6,300 lives, with over a thousand still missing until now, and damaged approximately P19.6B worth of infrastructures and another P20.3B worth of agriculture across the Visayas and nearby regions (Asian Disaster Reduction Center, 2017).

While the Philippines has had faced calamities of greater degree in the past, it was only recently—learning from the Yolanda experience and in anticipation of The Big One—that the national government, local communities and concerned stakeholders put concerted efforts to dig much deeper into the country's disaster risk reduction and management (DRRM) programs.

This paper looks into the opportunities community participation through mapping play in informing a responsive, evidence-based development planning process that could catalyze change towards disaster-resilient communities. The next chapter provides a review of the current state of the country's disaster programs and underscores people's participation as essential factor in achieving a truly inclusive DRRM planning process.

2. COMMUNITY PARTICIPATION IN DISASTER RISK REDUCTION MANAGEMENT (DRRM)

Traditionally, disaster risk reduction and management (DRRM) initiatives in the Philippines such as the *Oplan Likas* has been carried out by government authorities, giving more focus on efforts around disaster preparedness and response and not so much in identifying the hazard-prone areas and in building people's capacities towards sustainable livelihood options (National Disaster Risk Reduction and Management Plan, 2011). Little participation is generated from marginalized sectors including informal settler families (ISFs) who bear the brunt of these challenges and who, in fact, deeper and better understanding of their own physical contexts and struggles. Furthermore, their socio-economic conditions seem to trap them in a never-ending cycle of disaster, displacement and rebuilding. For a developing country like the Philippines, a proactive risk management approach is imperative.

2.1 The Philippines' legal framework on DRRM

The *Republic Act (R.A.) 10121* or the *National Disaster Risk Reduction and Management (DRRM) Act of 2010* is the Philippine government's response to the lack of a legal framework that provides basis for policies, plans and programs to deal with disasters. It acknowledges the need to "adopt a DRRM approach that is holistic, comprehensive, integrated and proactive in lessening the socio-economic and environmental impacts of disasters including climate change, and promote the involvement and **participation of all sectors** and all stakeholders concerned at all levels, **especially the local community**." The *2011-2028 Philippine National Disaster Risk Reduction and Management Plan* (NDRRMP) brands itself as:

"...a road map on how DRRM shall contribute to gender-responsive and rights-based sustainable development. It shall promote **inclusive growth**, build the adaptive **capacities of communities**, increase the resilience of **vulnerable sectors**, and optimize disaster mitigation opportunities with the end view of promoting people's welfare and security.

"...it is about **partnerships** towards effective delivery of services to the citizenry, i.e., working together through complementation of resources. Thus, harnessing and mobilizing the **participation of civil society organizations** (CSOs), the private sector and volunteers in the government's DRRM programs and projects is part and parcel of the plan..."

Figure 1: Four (4) thematic areas of DRRM

*RA 10121 also calls for the need to develop a NDRRM Framework which shall provide for a comprehensive, all hazards, multi-sectoral, inter-agency and **community-based approach to DRRM**. It conveys a paradigm shift from **reactive to proactive** DRRM wherein men and women have increased their awareness of DRRM, with the end in view of increasing people's resilience and decreasing their vulnerabilities / Image source: DRRM Plan 2011-2028*

Despite its seemingly innovative approach, there remained some implementation gaps that NDDRMP recognizes and tries to address. On top of these, and at the heart of DRR, is addressing the underlying causes of people's vulnerabilities—social, economic, physical, and environmental. More efforts are needed in **identifying hazard-prone areas** and factors which contribute to people's exposure to disasters, incorporating risk analysis in developmental plans, and building people's capacities towards sustainable livelihood options. Other gaps identified include:

- **Mainstreaming** of Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) **into development plans** to inform proactive national and local policies that would leverage funding and political support;

- Complementing DRRM components through **strengthening of partnerships** and improving ways of working among key players and stakeholders;
- Building capacities of people and institutions through continuous trainings and activities supporting **community-based DRRM** and **CCA risk mapping**

The NDRRMP recognizes that aside from financial resource mobilization, leveraging non-monetary resources available can also help attain the targets identified, e.g., **community-based good practices for replication and scaling up**, indigenous practices on DRRM, public-private **partnerships**, and DRR and CCA **networks of key stakeholders**.

To date, numerous organizations offer collaborative ways on dealing with disaster issues. In particular, non-government organizations (NGOs) have been promoting stronger particpation by local communities and other vulnerable groups otherwise excluded in DRRM planning processes (Lassa, 2018). The inclusivity approach advocated and used by international and local NGOs has enabled them to collaborate more closely with grassroots communities towards various causes. The same principle has been applied in the case study that follows.

2.2 The Citywide Development Approach (CDA) as an inclusive, participatory approach to DRRM planning

The launch of the *Citywide Development Approach* (CDA) to upgrading informal settlements in 2014—a multi-stakeholder collaboration of the national and local government agencies, civil society groups and people's organizations—marked the introduction of community-driven data collection, mapping and profiling and planning of informal settlement communities in the Philippines. The CDA is seen as a clear alternative to the usual unsystematic, project-based and top-down planning of cities. It emphasized the participation of all stakeholders, especially the ISFs. The CDA was tested in three pilot cities in Metro Manila, including Muntinlupa City where the Homeless People's Federation Philippines Inc. (HPFPI) and its partners facilitated community-driven data gathering initially in 83 informal settlements across four *barangays*[1] in District II. The CDA framework espouses the following key features:

- **Citywide in scope** as it mapped out all informal settler families (ISFs) in the area – the project covered a total of about 118,000 informal settlers in 186 communities residing in danger and non-danger zones whether private or government lands across eight barangays in the city;
- **Participatory and community-led** – through transfer of skills and knowledge from technical professionals, community members acted as primary data collectors of their own information. The framework has placed them at the heart of the process, instead of becoming merely respondents of census tagging and surveys otherwise conducted by government- and/or private sector-

[1] *Barangay* is defined as a village, suburb, or other demarcated neighbourhood; a small territorial and administrative district forming the most local level of government (Oxford Dictionary)

affiliated data enumerators. Community participation has been very evident in the mapping process that doubled as a mobilizing tool while serving as a research agenda. Initially, select community groups (*purok*/block leaders, health workers, barangay volunteers, etc.) were gathered through a general assembly where the formation of a 'mapping team' took place. The mapping team took responsibility over administering participatory action research methods, e.g., household surveys, settlement profiles, interviews and focus group discussions; in conducting site oculars and using handheld GPS devices to locate settlement boundaries; and in tallying, validating and encoding collected community information into database platforms—all while organizing communities by promoting the savings program of the HPFPI to strengthen financial capacities and build resiliency among them.

- **Inclusive partnership among city stakeholders** – support networks were established through a memorandum of agreement signed among project partners including people's organizations, i.e., *Urban Poor Alliance*; international and local support NGOs, i.e., the *World Bank, Philippine Action for Community-led Shelter Initiatives Inc.* (PACSII), *Technical Assistance Movement for People and Environment Inc.* (TAMPEI), and *Muntinlupa Development Foundation* (MDF); respective barangay councils, and the *City Government of Muntinlupa* through its *Urban Poor Affairs Office* (UPAO);
- **An integration of solutions** to land and housing problems with strategies to improve socio-economic status of the ISFs – the CDA adheres to international development frameworks such as the *2030 Agenda for Sustainable Development Goals* and the *2016 New Urban Agenda*.

2.2.1 Community mapping: Integrating DRR in the research tools and methods

The community mapping process covers statistical, narrative and spatial data, making it comprehensive and its results applicable to various community development initiatives, including planning for DRRM purposes. Statistical data includes demographic and socio-economic information, presented in the form of graphs and charts, gathered primarily through administration of household surveys. Narrative data compiles community histories collected through focus group discussions, interviews and settlement profiling. Spatial data covers information on housing structure, location of units, and all types of hazards present in the communities, all presented in the form of thematic maps.

Specifically, DRR-CCA concepts and issues were integrated in the mapping process through set of questions that underscores the communities' exposure and vulnerability to such conditions. For instance, in the settlement profile forms, there were sections pertaining to location problems, e.g., proximity to hazardous areas, historical accounts of natural and human-induced disasters, availability of basic social services, and threats of eviction or demolition. Upon validation of mapping results, these information serve as bases for community members in locating in a *quadrant (see Table 2)* the 'status' of their respective community associations through a set of

criteria (see Table 3) that they developed. Subsequently, communities proceed to identifying corresponding *strategies and intervention* appropriate for their unique situation *(see Table 4).*

Table 2: Quadrants

		Community Association	
		Moderate capacity (+)	Low capacity (—)
Location	Low risk (+)	**Quadrant I:** (+) Community (+) Location **Strategy**: On-site upgrading with cost recovery	**Quadrant II:** (—) Community (+) Location **Strategy:** On-site upgrading with subsidized capacity-building interventions
	Moderate risk (—)	**Quadrant III:** (+) Community (—) Location **Strategy:** Resettlement with cost recovery	**Quadrant IV:** (—) Community (—) Location **Strategy:** Subsidized resettlement and rental with capacity-building interventions

Table 3: Criteria

Community association		**Location**	
Moderate capacity (+)	Low capacity (—)	Low risk (+)	Moderate risk (—)
▪ Organized; registered to SEC/HLURB; recognized by other organizations; accredited by the local government ▪ Has masterlist of members ▪ Active in various issues ▪ Has the capacity to negotiate with landowner ▪ Implements savings program	▪ May be organized but has leadership issues, internal dynamics, etc. ▪ No community savings ▪ Inactive association ▪ Participates in partisan politics	▪ Government land that may be considered residential area ▪ Landowner may consider selling land ▪ Flooded but can be given technological solutions	▪ Danger zone, e.g., along transmission lines, flood-prone, crime ▪ Has court order for eviction ▪ Owner not willing to sell land

*Table 4: Community strategies and intervention**

Name of community	**Hazards present**	**Strategies**	**Possible hindrances**	**Services needed**	**Program / Project**
Samahang Pook (503 households, 124 of which are affected)	▪ Fire ▪ Industrial, chemical ▪ Power outage	Subsidized resettlement with capacity building interventions	▪ Owner not willing to sell land ▪ Place affected by flood ▪ Out of school youth ▪ No permanent source of livelihood ▪ No source of main water line	▪ Livelihood ▪ Water supply ▪ Electricity ▪ Education & scholarship	▪ Land acquisition and housing structure through CMP &SHFC ▪ Environment sanitation center ▪ DPWH programs ▪ Alternative learning system (ALS)

**Taken from a specific community in one barangay in District II; translated in English (originally in Filipino)*

~~2.2.2 Geospatial planning through the Social Tenure Domain Model~~

Along the course of the project, the CDA was rebranded to *Citywide Community Upgrading Strategy* (CCUS), whose framework was further facilitated by the use of affordable geospatial tools and participatory approaches, i.e., the Social Tenure Domain Model (STDM) introduced and facilitated by the UN-Habitat and the Global Land Tool Network (GLTN). This new initiative sought to complete the citywide mapping by targeting another 103 informal settlements totaling 17,065 households across four barangays in District I as areas of research and implementation. The Muntinlupa Urban Poor Affairs Office (UPAO) appreciated the preliminary results of mapping and further saw its potentials in alleviating urban poverty; thus, it supported the continuation of the process to achieve a citywide scale.

TAMPEI facilitated two workshops on community data processing that generated outputs including sample thematic maps related to DRRM and basic social services. Participants, coming from communities and barangay councils, altogether identified, from the households survey and settlement profiling forms and based on their personal experiences, hazards that impede their daily activities within their areas. These hazards were translated into thematic maps whose risk scales have been adapted to suit local contexts (*see Annex*es).

Related to this, several trainings on the Social Tenure Domain Model (STDM) were facilitated by TAMPEI to introduce to community members, government officials and university students a participatory approach to managing community data collected through mapping activities. Enhancement trainings were likewise conducted to provide continuous learning and effective transfer of skills and knowledge from technical professionals to community members, especially mothers and out-of-school youth who render volunteer services with the HPFPI and TAMPEI.

3. OUTPUTS AND IMPACTS

3.1 Awareness, mobilization and empowerment among communities

To ensure authenticity of results and ownership of the process, validation sessions were conducted with community members. It was during this time that larger populations, often the whole homeowners association (HOA), altogether gained greater awareness of their own situation while seeing themselves in a larger picture that is the city. This awareness, coupled with evidence-based information, has built confidence among community members in asserting their rights to the city. In relation to this, eight **technical working groups** (TWGs) composed of elected community leaders from each barangay were formed to pursue this citywide pro-poor advocacy initiated through the CDA. This and their subsequent recognition by the city government, along with the establishment of a **community-based learning hub** in partnership with one barangay council, are seen to sustain the initiatives and ensure that community members are the primary actors of their own development.

Furthermore, the **savings program** introduced by the HPFPI acted as a mobilizing platform and an empowerment tool, with most communities mapped starting to fortify their financial bases in order to negotiate with landowners to prioritize them in land auctions. Aside from financial literacy, the seminars and workshops conducted at the learning hub have capacitated community members on topics such as laws on housing and urban development, site survey and subdivision planning, and DRRM and climate change adaptation, among others.

3.2 Collaborative planning at barangay and city levels

The results of mapping had generated thematic maps, graphs and statistics on ISFs that were initially presented to HOAs for validation and to respective barangay councils for endorsement. The same results were presented to the Muntinlupa Local Housing Board (LHB) in 2016, upon initial compilation of data collected in District II. Another round of presentation to the LHB was held in 2017, after completing the citywide result which, this time, combines community information collected in District I. Both presentations to the LHB were aimed at integrating the results of citywide mapping into the City Shelter Plan.

To date, several dialogues between communities and the government have been carried out, with TWGs at the forefront of this cause. In 2017, the TWGs were officially recognized by the City Government of Muntinlupa through the Urban Poor Affairs Office (UPAO) as they took their oath as representatives of the urban poor sector. Some communities have begun registering with the Housing and Land Use Regulatory Board (HLRUB) and the Securities and Exchange Commission (SEC) to formalize their rather disunited associations. In one barangay, five communities have started processing documents for land title transfers from respective property heirs to their own associations. In other barangays, two communities received approval for onsite upgrading, with the Muntinlupa (UPAO) providing financial assistance through bridge-financing schemes.

3.3 Wider reach of policy advocacy through network formation

As a multi-stakeholder approach to planning, several groups have also been involved in the initiative, with respective partnership agreements signed between and among HPFPI and TAMPEI representing the *Philippine Alliance*[2] and the University of the Philippines Department of Geodetic Engineering (UPDGE) and the Geodetic Engineers of the Philippines (GEP). Both institutions offer not only technical assistance to the initiative but to other projects of the Philippine Alliance as well, for instance, in providing engineering services (i.e., boundary surveying) and giving community orientations on site development.

[2] The *Philippine Alliance* is a loose organization composed of five institutions, namely, HPFPI, TAMPEI, Philippine Action for Community-led Shelter Initiatives Inc. (PACSII), LinkBuild Inc., and the Community Resources for the Advancement of Capable Societies (CoRe-ACS)—all working with the informal sector in attaining security of tenure.

The experience and lessons learned in Muntinlupa was expanded to other cities in collaboration with international partners, local authorities and communities. In Malabon, the participatory approach to data gathering has united community associations that were otherwise fragmented before the process, thereby strengthening the existing citywide alliance of urban poor dwellers in collaborating closely with their city government. Maps generated were used to provide information about their access to basic social services and risks to different hazards, primarily flood- and liquefaction-prone communities as the city is a low-lying with area lined with creeks and rivers channeling through the nearby Manila Bay.

In Iloilo, the introduction of geospatial tools and participatory approaches through technical trainings has resulted in a tripartite partnership agreement among the city government, a local university, and the HPFPI that has since been pushing for the signing of a city-level executive order that would institutionalize participatory methods of data gathering into city planning processes that prioritizes relocation of informal settlements situated along Calumpang shoreline and Batiano River.

Additionally, the community-led process served as framework for the baseline mapping of informal settlements in the rural municipalities of Naic in Cavite and Tanay in Rizal and the City of Pasay in Metro Manila for an ongoing child-centered resettlement project in these areas. Dialogues with city departments have activated the once dormant Local Housing Board in Pasay City.

Similar initiatives have been introduced and replicated, respectively, in the cities of Talisay and Davao through continuous support from various partners. In Talisay, although the project was shelved due to unforeseen political conflicts, the innovations became basis for a citywide heritage mapping workshop. In Davao, out of nine coastal barangays piloted for implementation, two have been completed and being readied for presentations and formulation of a barangay-level shelter plan. These barangays have been prioritized as they are faced with demolition threats due to an impending railroad infrastructure by the national government. Nevertheless, the mapping activities in Davao paved the way for the Philippine Alliance to initially engage with the Social Housing Finance Corporation (SHFC), one of the country's five national key shelter agencies. A recent meeting with SHFC has had the Philippine Alliance penetrating national-level programs on organizing communities and housing delivery through a formal partnership as well as through institutional accreditation as community mobilizer and homebuilder, with SHFC acknowledging the positive implications of a community-led framework in innovating housing policies on a national scale.

At the international level, the accomplishments of the interventions in Muntinlupa have been shared with key partner organizations in Asia-Pacific during the 2018 World Urban Forum in Kuala Lumpur. Likewise in 2018, three countries from the Asian Coalition for Housing Rights network participated in a learning exchange in

Muntinlupa City to learn from local experiences on resettlement, community-led mapping and inclusive partnerships among city stakeholders.

4. WAYS FORWARD

While it may be true that the Philippines can be considered a new player in the field of disaster risk reduction and management (DRRM), it nevertheless possesses great potential in developing innovative DRRM systems that could be adopted by countries facing the same challenges. The experiences brought about by Yolanda in 2013 and the anticipation of The Big One in the coming decades or so offer tremendous amount of information when it comes to planning collaboratively for disasters. The *Philippine National Disaster Risk Reduction and Management Plan* (NDRRMP) recognizes gaps and challenges, but it also identifies opportunities for improvement to better implement programs and activities that contribute to its overall goal:

> "The NDRRMP highlights the need for **institutionalizing DRRM policies**, structures, coordination mechanisms and programs with continuing budget appropriation on DRR from national down to local levels. Thus, the plan outlines the activities which shall strengthen the capacity of personnel of national government and local government units and partner stakeholders; **build the disaster resilience of communities**; and institutionalize arrangement and measures for reducing disaster risks including projected climate risks, and enhancing disaster preparedness and response capabilities at all level."

In general, governments and public actions may have received greater attention in DRRM studies, but recent shifts in attention to promote bolder engagements of both non-governmental organizations and business communities in DRRM can be seen as a necessary condition for the future resilience of society (Lassa, 2018). It is within this premise that citywide community mapping comes into play.

4.1 Opportunities for integration into development plans and policies

The community-led, participatory approach of the CDA framework makes it possible to reduce disaster risks by eliminating susceptibility and developing good coping and adaptive capacities. *Table 5* situates the CDA process vis-à-vis DRRM framework and how it can help in achieving such.

Table 5: Integrating NDRRMP and the CDA Framework

NDRRMP	Community mapping / CDA
Thematic Area 1: Disaster prevention and mitigation *Outcome 4:* Enhanced and effective community-based, scientific DRRM and CCA assessment, mapping, analysis and monitoring / *Outcome 5:* Communities access to effective and applicable disaster risk	▪ Community participation enhances data capture, especially when indigenous knowledge is considered in the collection process and analysis of results. ▪ The savings program introduced to mapped communities help lessen their social vulnerability in times of disasters. In the experience of HPFPI, homeowner associations (HOAs) that have higher amount of savings are often equipped with greater capacities to adapt to the economic

financing and insurance	losses brought about by disasters.
Thematic Area 2: Disaster preparedness *Outcome 7:* Increased level of awareness and enhanced capacity of the community to the threats and impacts of all hazards / *Outcome 11:* Strengthened partnership and coordination among all key players and stakeholders	▪ Community members participating in the mapping process have higher appreciation and awareness of their own contexts, especially with regards to the various hazards present in their areas. ▪ The multi-stakeholder approach of the CDA initiative creates linkages with various groups with defined expertise and resources that could altogether contribute in creating disaster-resilient communities.
Thematic Area 3: Disaster response *Outcome 12:* Well-established disaster response operations / *Outcome 15:* Safe and timely evacuation of affected communities / *Outcome 16:* Temporary shelter needs adequately addressed / *Outcome 17:* Basic social services provided to affected population (whether inside or outside evacuation centers	▪ Community mapping brands itself as a process and a mobilizing tool. It helps in organizing communities through generation of holistic awareness on different issues surrounding their localities. In times of disaster, especially during response and evacuation phases, communities with more advanced level of organization and modes of communication prove to become more systemize. ▪ Identification of affected population becomes easier through generation of research outputs such as statistics and thematic maps that readily pinpoint location and specific needs of vulnerable groups.
Thematic Area 4: Disaster rehabilitation and recovery *Outcome 22*: Houses rebuilt and repaired to be more resilient to hazard events; safer sites for housing / *Outcome 23:* Disaster and climate change-resilient infrastructure constructed/reconstructed	▪ Community mapping offers opportunities for identifying safer sites for housing to become more efficient as hazards present in the area, as well as structure information (e.g., construction material used, number of storey, and measurement of housing units) were all taken into account in the mapping process. /

Building on the principles of disaster resiliency, both the CDA framework and the NDRRMP are aligned, and thus, contribute to the achievement of global risk reduction instruments such as the *Sendai Framework for Disaster Risk Reduction (2015-2030)* and the *2030 UN Agenda for Sustainable Development* particularly SDG No. 11 "*Making cities and human settlements inclusive, safe, resilient and sustainable*."

4.2 Conclusion

The case of Muntinlupa presents exemplary outcomes of effective community-led mapping at a city-scale which can lead to improved citywide management. Through the effective organizing of these communities, one can be able to plan and develop strategies and mitigation on the possible damages of calamities. The framework which focuses on using the mapping process as a mobilizing platform and as an empowerment tool, by way of transferring knowledge and capacity, presents a concrete example of a genuine participatory and bottom-up planning of cities and an alternative to the usual top-down planning traditionally carried out within the purview of national and local government offices.

The mapping process and information collected can be contextualized in numerous ways in disaster prevention and mitigation, preparedness, response, rehabilitation and recovery programs. This process demonstrates the possibilities of scaling-up participatory data gathering methodologies to inform city planning towards safer, adaptive and disaster resilient Filipino communities—one that truly considers and caters to the basic needs of society's vulnerable sectors, primarily ISFs.

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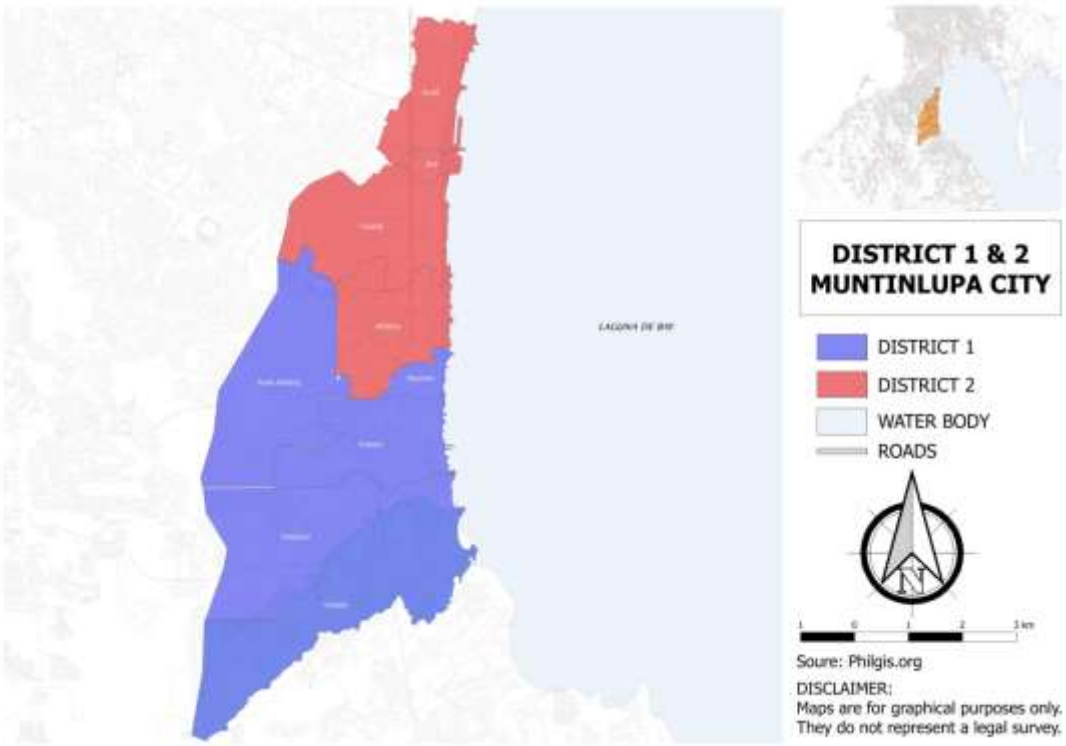
ANNEXES



Sample maps generated via Social Tenure Domain Model (STDM)

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