Participatory Mapping at Kommuniboli and Falake Pilot Sites in Solomon Islands

- Report -

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Rakuno Gakuen University, 2021

Preface

Participatory mapping has gained its importance in many countries, especially developing countries since the 1970s for various purposes such as land rights reclamation, decision making, local community empowerment, local knowledge recording, environmental management etc. Because participatory mapping engages and involves local communities from the start to plan and collect data, and to the end, to make decisions and conduct projects in achieving the communities' objectives, participatory mapping provides diverse benefits to communities, local governments, and relevant stakeholders.

This report is written as part of the Project on Capacity Development for Sustainable Forest Resource Management (SFRM) in Solomon Islands, cooperated between Japan International Cooperation Agency (JICA) and Ministry of Forestry and Research (MOFR). The report aims to increase the capacity of MOFR to coordinate and facilitate participatory mapping projects which empower and support the community to identify their current resources, plan for their future land use, and initiate pilot activities to achieve their plan.

This report is divided into six sections. Section 1 provides a simple explanation of what participatory mapping is, its applications and tools used. Section 2 provides the summary of 11 study cases extracted from 10 different journals/ reports as examples of how participatory mapping is being manipulated and applied in other countries for various purposes. Section 3 provides advantages and importance of participatory mapping while Section 4 provides disadvantages and challenges of participatory mapping. Section 5 reports the participatory mapping activities the JICA team has conducted at two pilot sites in Solomon Islands up to year 2020, namely the Komuniboli community in Guadalcanal province and Falake community in Malaita province. Section 6, the last section of this report, is the recommendation of a participatory mapping process for Solomon Islands from the beginning to the end, extracted and adapted from a few references.

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1: What is Participatory Mapping?

Participatory mapping, which is known as GPS Transect Walk in the Project on Capacity Development for Sustainable Forest Resource Management in Solomon Islands, literally means involving people to create map(s). It usually aims to gather, record, analyze, and visualize local knowledge shared or provided by the active community members (de Paiva, 2017), such as the local community, NGOs, private companies, the governments and other relevant stakeholders. It is a bottom-up approach to collect both attribute and spatial data, and is particularly important in areas, where data are scarce.

It emerged in the 1970s to support indigenous communities claiming their rights over traditional ancestral and customary land legally. The purposes of participatory mapping are gradually expanded to include the local community and stakeholders in decision-making process, planning and monitoring (IFAD, 2009; Kingsolver, Boissière, Padmanaba, Sadjunin, & Balasundaram, 2017), empowering local people (Di Gessa, 2008; Gilmore & Young, 2012; Corbett & Keller, 2006; Herlihy & Knapp, 2003), recording local knowledge (Gilmore & Young, 2012; Corbett & Keller, 2006), improving environmental management (Gilmore & Young, 2012; Mapedza, Wright, & Fawcett, 2003; Damastuti & de Groot, 2019; Bernard, Barbosa, & Carvalho, 2010), and etc.

Participatory mapping utilizes a diverse of tools such as ground sketching, paper sketching, scale-mapping, 3D model, GIS and/or multimedia and internet, and techniques such as interview, group discussion, workshop and transect walk to collect, analyze and communicate community information (IFAD, 2009; Damastuti & de Groot, 2019). A decade later in the 1980s, it had been widely spread to empower communities worldwide for it emphasizes transparency and inclusiveness of community members (IFAD, 2010).

2: Case Studies

This section provides summaries of 11 case studies from journals and reports. All summaries were extracted directly from the study (except the Tip for MOFR) to provide you a clearer understanding about the application of participatory mapping. Please find the source and details of the study from the link stated towards the end of every summary.

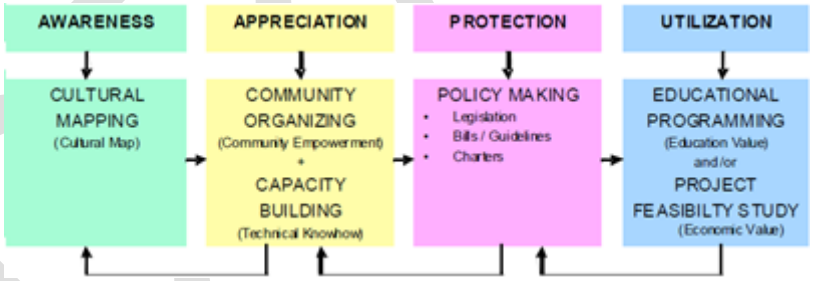
Case 1 - The Cultural Mapping Project of the Heritage City of Vigan

Author: (Zerrudo, 2008)

Objective: To create a framework for heritage conservation and sustainable development

Location: Vigan City, Philippines

Method:



Framework of heritage conservation and sustainable development involved four stages, namely ① awareness, ② appreciation, ③ protection, and ④ utilization.

① Heritage Awareness

- First step to development is to identify the availability of resources such as topographical, manpower, financial, technical and entrepreneurial.
- Participatory Cultural Mapping was a way to identify natural, movable, intangible, and built heritage resources of a community - against their intrinsic and associative attributes to capture their meaning.

Also provided a six months training program to relevant consultants, faculty and students from a local university, local government officials, architects, homeowners, and businessmen in the community

② Heritage Appreciation

- Development emphasize on involving public in cultural heritage activities to assure sustainability because heritage belongs to the people, not to governments.
- Could conduct community organizing, which brings about unity, targeting a broader group of people and capacity building, which impart technical skills, targeting focus groups. These community organizing and capacity building aim to mold and build the locals towards common visions, goals and interests.
- Conservation professionals shall initiate heritage appreciation by conducting multi-disciplinary activities and educational sharing to deepen and heighten the interest of the community.

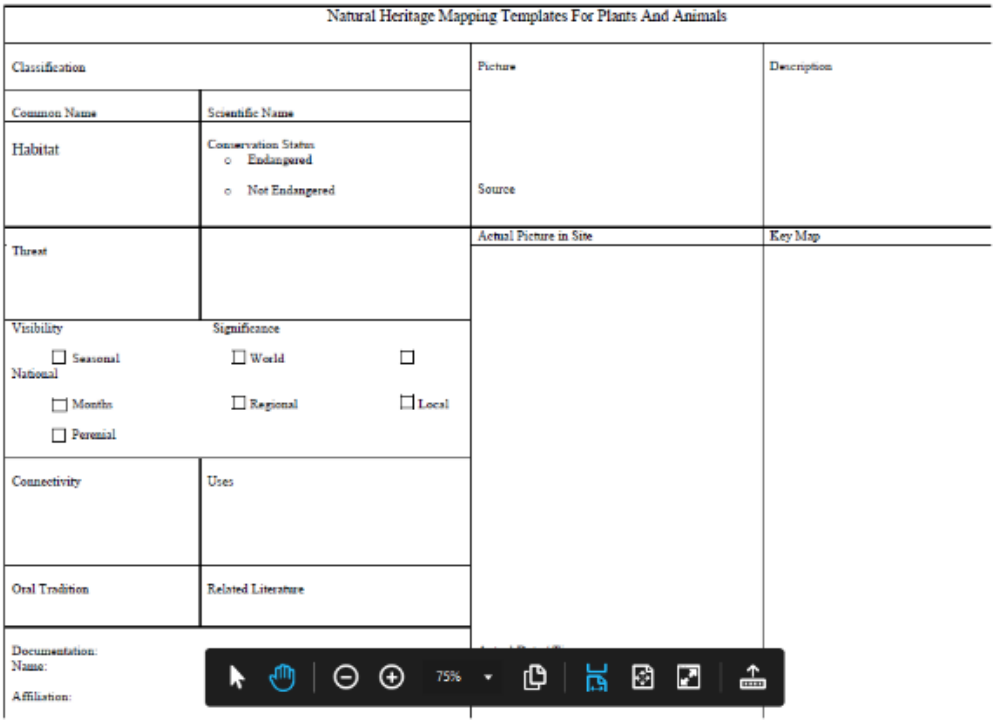
③ Heritage Protection

- Sustainable development is assured by resource identification, community participation, and value generation.
- Heritage protection can be done based on conservation guidelines (a set of technical standards developed by experts and legislators), heritage charter (an agreed set of conservation concept, policies, and practices), legislation and ordinance.
- Cultural mapping project provides information for the development/ amendment of conservation guidelines and legislation.

④ Heritage Utilization

- Development is to transform goods and services to improve man’s life quality.
- Utilize identified heritage to generate revenue, either educational or economic, via tourism, healthcare, education, and culinary arts.

Form

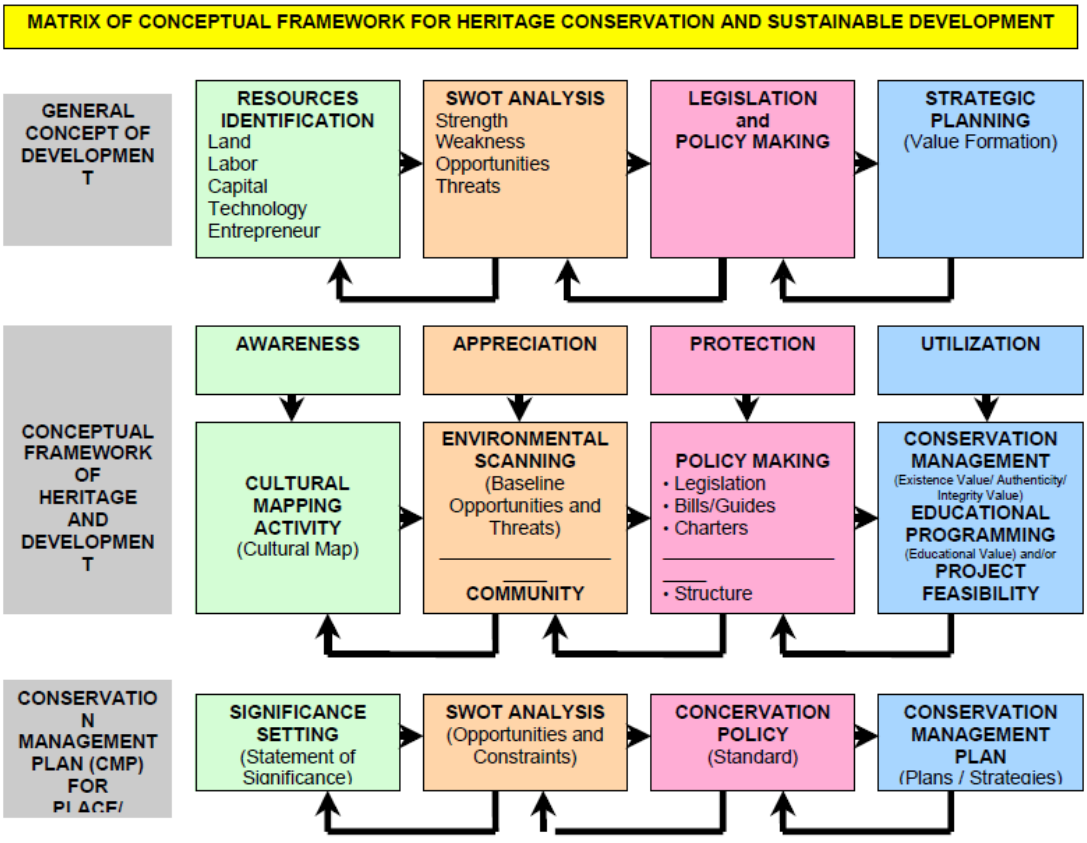


Natural Heritage Mapping Templates For Plants And Animals

Classification		Picture	Description
Common Name	Scientific Name		
Habitat	Conservation Status ○ Endangered ○ Not Endangered	Source	
Threat		Actual Picture in Site	Key Map
Visibility ☐ Seasonal National ☐ Months ☐ Perenial	Significance ☐ World ☐ ☐ Regional ☐ Local		
Connectivity	Uses		
Oral Tradition	Related Literature		
Documentation: Name: Affiliation:			

Figure above shows the data collection form for plants and animals

Results/ Output:



Results/ Output - Advantages:

- Taking Vigan city as an example, the report elucidated a relatively comprehensive way of sustainable development and that participatory cultural mapping is the foundation before one can achieve sustainable development.
- Involving the public ensures active participation and a sense of ownership among them, hence, ensuring the sustainability of the project.

Results/ Output - Disadvantages and challenges:

To achieve heritage conservation and sustainable development, it takes a lot of resources in terms of knowledge, finance, human and etc.**Tip for MOFR:**

Sustainable development is ensured by resource identification (awareness), community participation (in all four stages) and value generation (utilization).

Source: (free source)
http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/mow/mow_3rd_international_conference_eric_babar_zerrudo_en.pdf

Case 2 - The Use of Participatory Mapping in Ethnobiological Research, Biocultural Conservation, and Community Empowerment: A Case Study from the Peruvian Amazon

Author: (Gilmore & Young, 2012)

Objectives:

1. To examine the important role that participatory mapping can play in ethnobiological studies.

2. To examine the rich and diverse range of data that this methodology can generate, ultimately shedding light on how indigenous and local communities use, perceive, and interact with their environment and resources.

3. To explore the use of participatory mapping in biocultural conservation and community empowerment.

Location: Maijuna communities in Peruvian Amazon

Method:

1. Explained the project's objectives, methods, pros and cons with examples to obtain an informed consent from the villagers.

2. Villagers drew their village basemap by including key geographical and hydrological features of the watershed, such as rivers, streams, and lakes, on a large sheet of easel paper.

3. Each community added more detailed information on the basemap about important biological and cultural sites with symbology that represent each category of areas.

4. While mapping, the research team used semi-structured interviewing techniques to collect and document traditional cultural knowledge related to those sites and resources the participants had added onto the maps.

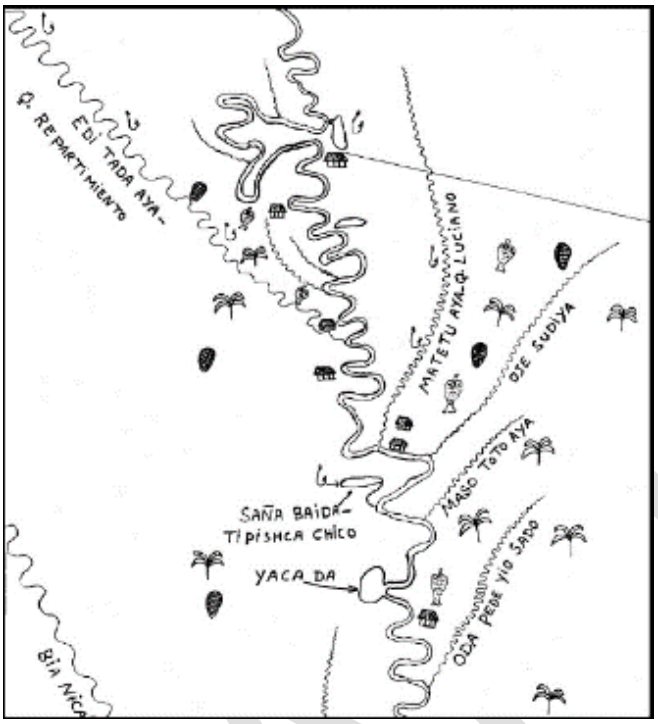
5. Conducted ground-truthing to collect GPS points with the villagers specialized in their various expertise and knowledge with additional interviews to document their ethnohistory, traditional stories and songs, place names, resources use and management using cameras, voice recorders, and video cameras.

6. Provided stipends to compensate villagers' time.

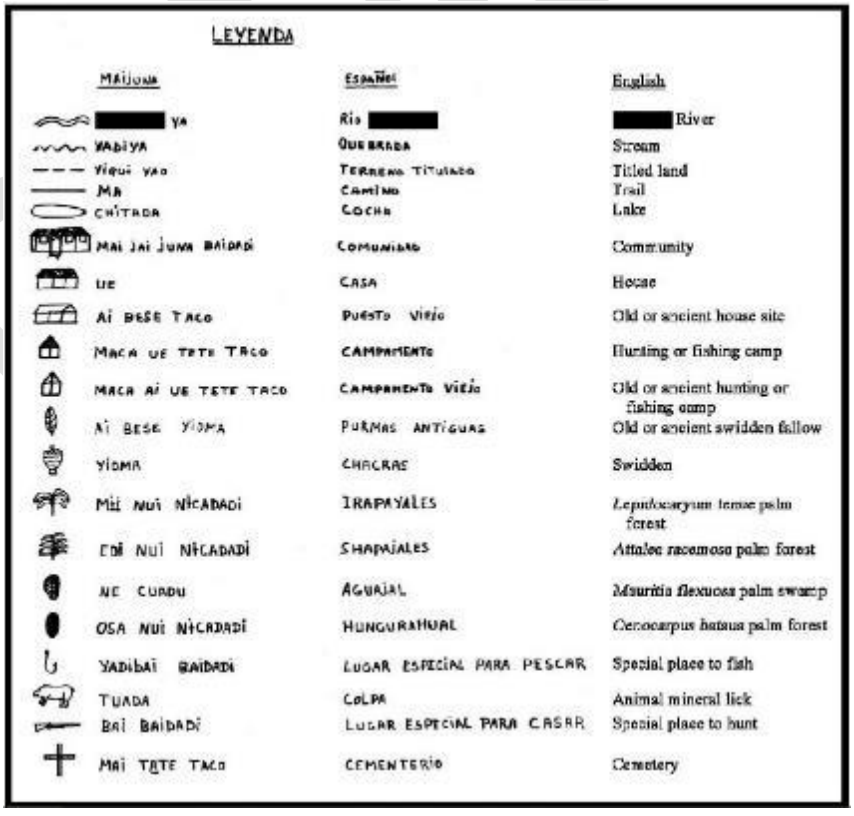
Note:

- Depending on overall project objectives, budget and schedule, participatory mapping can be done on a different scale and with different degrees of participation
- It is not a must to use GIS and GPS in participatory mapping depending on the time and financial resources allocated.

Results/ Output:



A small portion of hand-drawn map



Symbology

Results/ Output - Advantages:

Researchers/ outsiders:

- can understand how the community perceive and connect with their environment on a daily, seasonal or historical scale;
- may learn about the community traditional resources management system, past and present threats and challenges;
- may locate endangered species;
- may obtains new/ different insights by comparing the data collected in the project with other data sources.
- Can visualize the data which cannot be achieved merely by conducting interview
- Political empowerment
- Reduce cost of data collection

Community:

- is empowered through project facilitation, and technological capacity building
- is able to convey and share their knowledge within the community, to the younger generation and various stakeholders via maps to protect their rights and plan.
- can keep their oral traditions such as stories, songs and oral histories from being lost.
- Can develop a sense of pride
- Can value their traditional knowledge
- Cultural and community cohesion can be strengthened

Results/ Output - Disadvantages and Challenges:

- The resulting maps may conceal and manipulate essential information, maintaining existing problems and even creating additional problems.
- The usage of collected data and the prevention of data being exploited

Should be more accountable to the needs, challenges, and priorities of targeted communities.**Tip for MOFR**: Participatory mapping allows MOFR to empower the local communities to document traditional knowledge of the community in utilizing and managing their natural resources. When MOFR learns the threats and challenges the local communities have in managing their natural resources, and helps them to solve their issues , MOFR is indirectly achieving the mission statement of MOFR, ie. to utilize,

conserve, and manage the forest resources for the continuing benefit to the environment and the people of Solomon Islands.

Source: (free source)
https://bioone.org/journals/journal-of-ethnobiology/volume-32/issue-1/0278-0771-32.1.6/The-Use-of-Participatory-Mapping-in-Ethnobiological-Research-Biocultural-Conservation/10.2993/0278-0771-32.1.6.full

Case 3 - Cultural and Participatory Mapping

Authors: (Kingsolver, Boissière, Padmanaba, Sadjunin, & Balasundaram, 2017)

Objective: To involve local in land use planning

Location: six villages of Mamberamo Raya Regency, Indonesia

Method:

1. Used the same scale of 1:50,000, which is the scale used in official maps for easier comparing.
2. Provided a base map which showed the main rivers and tributaries, the positions of villages, roads and other features visible on satellite image.
3. Most participants were literate and their local Indonesian language was used.
4. Had two groups (men and women) understood the map by recognizing, add and correct rivers' name on the maps, usually starting from the tributaries closest to their village before expanding to further region.
5. After all names of the rivers were added or corrected, participants added important sites (eg. gardens, cemeteries, sacred places, and former village site) and ten most important resources area for their local livelihood (eg. plants and animals) onto two different maps, which were later combined into one map.
6. Ground truth survey using GPS under the guidance from villagers, usually the representatives from the landowner clan.

7. The sketched maps were corrected based on the GPS data in the village before provided to the community.

8. Discussed and created current land use map and then the future land use, and villagers' expectation in terms of development, conservation and governance. This process was participated by mostly land decision-makers such as the village head, customary leaders, clan heads, women and men elders.

9. Collected boundary data only upon request (usually for negotiation with logging company)

10. Obtained consent for sharing map data by explaining its pros and cons. The map was shared in a final workshop involving villagers, NGO, government and private sectors for land use planning discussion and collaboration.

11. Next step: to replicate the methods in other villages

Participatory mapping in 2012

Result/ Output:

- Women knew the landscape near the village and gardens better while men knew distant places better.
- The final printed maps were given back to the community.

- Maps were used in the discussion.
- It was powerful to use maps of the same scale to negotiate land use planning, development strategies and collaboration between the government and villagers. For example, the villagers could share and convince the government to use certain area for enlarging a navigable channel in the mangroves for the Yoke village with least environmental impacts.

Result/ Output - Advantages:

Community:

- is empowered through project facilitation, technological capacity building;
- is able to communicate their knowledge to various stakeholders via maps to share their plan and collaborate with them.

Government:

- has the opportunity to be inclusive in development while understanding the underlying issues of the villagers.
- can also reduce cost for long field visitation.

Tip for MOFR: This is quite similar to what the JICA team was doing in the two pilot sites as the JICA team also facilitated the community members to create current land use map and future land use map.

When the government of Solomon Islands has no power over the land of local communities (the customary land), yet the government wishes to develop Solomon Islands, participatory mapping is an effective way to involve local communities in land use planning. And when MOFR learns the intention of the local communities on forest resources management, MOFR may serve the local communities by providing legal consultation, knowledge, and equipment to sustainably manage their resources. Hence, achieving MOFR's vision and mission. Moreover, participatory mapping can be replicated to be applied in other regions.

Source: (non-free source)
https://link.springer.com/chapter/10.1007%2F978-94-024-1011-2_15

Case 4 - Participatory Mapping in a Developing Country Context: Lessons from South Africa

Authors: (Weyer, Bezerra, & De Vos, 2019)

Location: Eastern Cape Province of South Africa

Case Study 1 - Likhayalethu

Objective: To help the Likhayalethu community to create a heritage map

Method:

Preparation Stage:

1. Learned about the area, historical background, and power dynamics within the targeted community.
2. Considered the accessibility of the venue, availability of electricity and WIFI, and the language barrier.
3. Prepared equipment such as generators, extensions, projector, white sheets to cover windows, etc.

Mapping Stage:

1. Introduced the team and project.
2. Gained trust and be transparent by discussing expectations, ethical implications, and dismantled misperceptions that may occur as a result of the past.
3. Familiarized the participants with the technology (Google Earth Pro) by using pictures embedded on map to aid visualization, and layman terms so that everyone can understand.
4. Interviewed the participants and directly plot the shared information onto a digital map, the Google Earth Pro (known as Direct to Digital (D2D) mapping approach).
5. Allayed fears/ concern among the participants towards the use of technology to share their knowledge and information.

(Note: literacy level of the community presents a major challenge.)

Wrapping-up Stage:

1. Analyzed data before providing useful feedback to the participants.
2. Provided contact information with the participants.
3. Stored raw data according to the ethical guidelines and/or provided them the accessible format according to their literacy level and available resources (eg. computers).

Results/ Output:

Results/ Output - Advantage:

- Digital participatory mapping allows knowledge sharing across generations.
- Government/ outsiders could identify the social inequalities

Results/ Output - Disadvantage/ Challenge:

- Older generation unfamiliar with the technology.
- The community can be easily exploited for their knowledge because they did not have concerns about sharing their knowledge, though it was mostly due to the injustice Apartheid governments' policies.
- Literacy level of the community was low.

Case Study 2 – Tsitsa Project

Objectives: To build understanding around locals' interaction with their environment, how this has changed over time, and how this might impact the future of the area, and the proposed large-scale projects.**Method:**

1. Used D2D method to identify key resource areas of value to the locals, and understand how much the communities are relying on the natural environment for their livelihoods.

Advantage: Can bridge inter- and intra-cultural divides if the correct environment is created for knowledge sharing and trust building

Disadvantages/ Challenges: Socio-politically complex region with history of discrimination and conflict require sensitivity and understanding local power dynamics and managing expectations between parties involved.

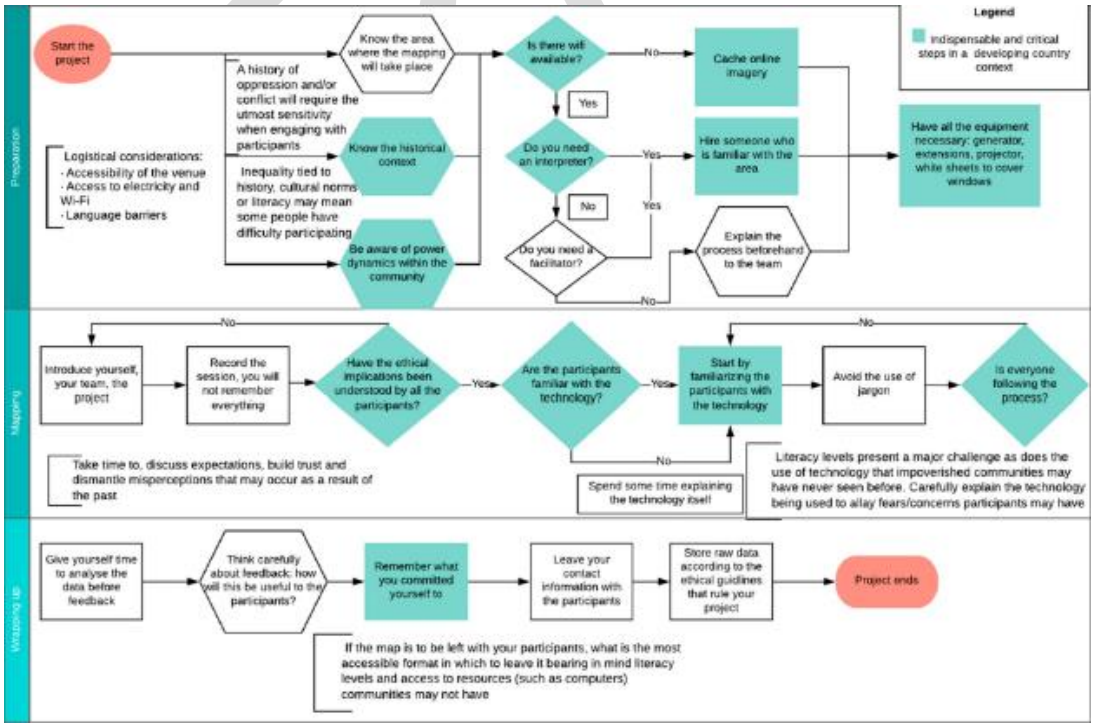
Practical Recommendation for a facilitator/ researcher

1. Build trust through clear and transparency
2. Exercise patience and sensitivity when working with people from different cultural backgrounds.
3. Explain ethical principles and informed consent to participants
4. Take extreme care to explain all risks and processes, from participation to dissemination in understandable language without jargon
5. Dismantle misperceptions such as visiting researchers may be linked to a better life
6. A thorough understanding of the local context, and building relationship within a community

Consider:

1. Logistic: location may link to power dynamics (setting the venue in the house of village chief may cause members uncomfortable to join), electricity and internet
2. Finance: pay for what is used
3. Conduct digital mapping offline, requiring the use of cached imager

Tip for MOFR: Digital mapping approach allows easier sharing of knowledge. When Google Earth Pro is connected to the internet, the staff of MOFR working with the targeted local community can share collected data (ie. placemarks, area, tours) to the headquarter in Honiara almost instantly.



Flow diagram for suggested decision-making process when conducting digital participatory mapping in a developing country context

Source: (free source) https://www.mdpi.com/2073-445X/8/9/134

Case 5 - An Investigation of Land Cover Change in Mafungautsi Forest, Zimbabwe, Using GIS and Participatory Mapping

Authors: (Mapedza, Wright, & Fawcett, 2003)

Objective: Investigates the processes governing land cover change in and around the Mafungautsi Forest Reserve in Zimbabwe

Location: Gokwe South District in the Midlands Province of Zimbabwe

Method: Identified the land cover change, perceived change and its causes via,

1. Participatory rural appraisal (PRA) through group discussion up to 10 people to explore different forest uses and perceived change over time and sketched local natural resources on map with timelines.
2. Types of change interviewed:
    - Wildlife change
    - Vegetation change (eg. tree cover, gum trees' number)
    - Land use change, ie. cattle numbers and grazing, tree plantings
    - Change in fire, its effects
    - Observed changes in land use drivers
        - Strictness of enforcement
        - Climate and hydrology
        - Population changes
        - Soil fertility change

3. Semi-structured interviews via workshop and the respondents were asked to draw land cover changes, local natural resources and fire frequency on acetates fixed over the aerial photographs.

4. Collected data were scanned, digitized, and georeferenced for analysis with historical aerial photographs and secondary data such as rainfall, crop yields, and arrests while cross-check interview findings.

5. Follow-up interviews with Forestry Commission staff and groups of youths, women, and the elderly

Result/ Output:

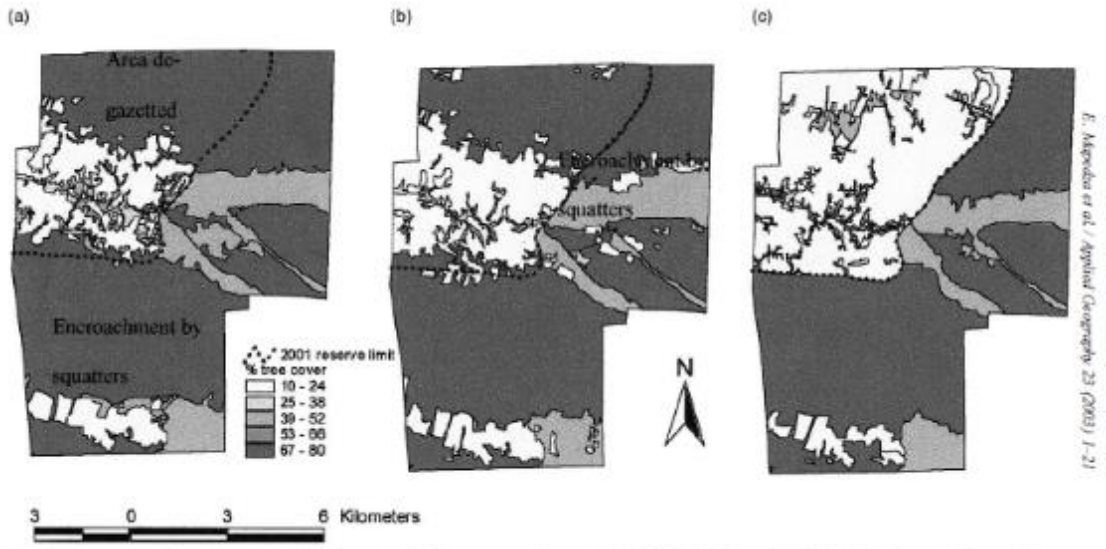


Fig. 2. Tree cover in the Batanai area of Mafungautsi and Gokwe communal area in (a) 1976/7; (b) 1984; and (c) 1996 (based on aerial photography).

The Figure above was the result of aerial photography analysis for the Batanai area. It supported the observation of farmers that tree cover had increased while FPU guard felt that tree cover remained unchanged. Probably due to the women role in firewood collection and the need to walk further as fuel wood became scarcer, the women were more aware of the reduction in tree cover than the male farmers' group.

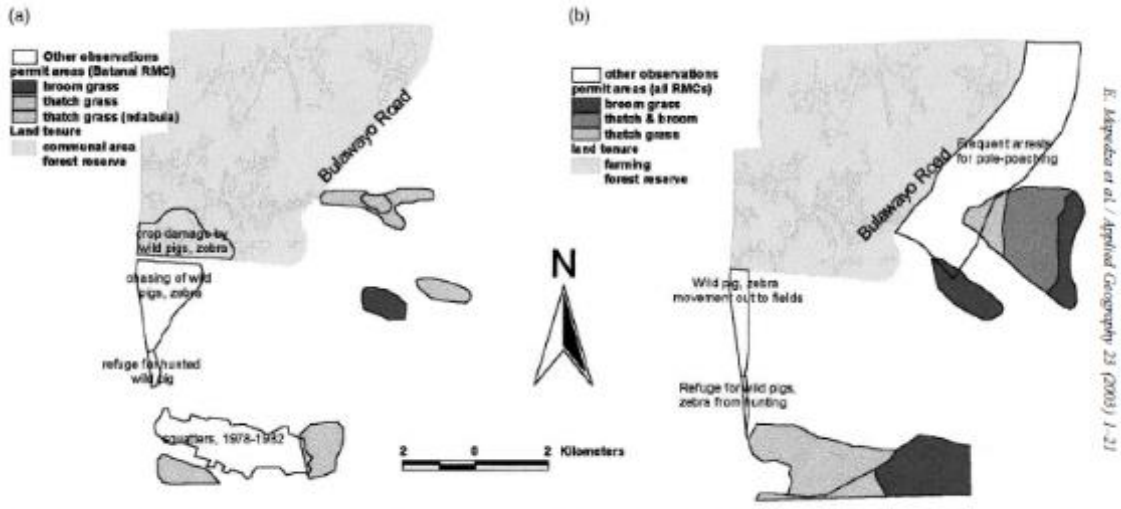


Fig. 3. Patterns of land uses in the Batanai area of Mafungautsi reserve as described: (a) by smallholder farmers; (b) by the Forest Protection Unit (FPU).

The figure above shows that the perceptions of smallholder farmers and the Forest Protection Unit about the land use in the batanai area of Mafungautsi Forest reserved are different.

Result/ Output - Advantages:

- Combining semi-structured interviews with participatory mapping and GIS using photo-mosaic yielded land use maps that could be easily geo-referenced and related to remote sensing data.
- Combining semi-structured interviews would generate unexpected information.
- Participatory mapping can identify the differences in perception between the Forest Protection Unit (FPU) and the local community, as well as among various groups in the community. For instance, women were more aware of a reduction in vegetation cover and knew more uses of tree species than men.
- The participatory mapping and semi-structured interviews helped identifying the underlying causes of declining tree cover, hence act as the foundation to counteract effectively.

Result/ Output - Disadvantages/ Challenges:

- The composition of the respondents is limited by the geographical location.
- FPU interpreted land cover changes differently than the Batanai farmer could be due to the needs of FPU to maintain their status that the forest cover remains unchanged because of their efforts.

Tips for MOFR: What you think is not what others think. We may think that we have the best plan for the local communities to manage their natural resources, but is it really so? Participatory mapping and photo-based interviews with several relevant groups allows MOFR to identify the local communities' real overall perception.

Source: (non-free source)
https://www.sciencedirect.com/science/article/abs/pii/S014362280200070X

Case 6 - Participatory Ecosystem Service Mapping to Enhance Community-Based Mangrove Rehabilitation and Management in Demak, Indonesia

Authors: (Damastuti & de Groot, 2019)

Objectives:

1. How has the overall mangrove landscape and locally important mangrove ecosystem services changed since the 1980s?
2. What are the factors influencing the ecosystem services (ES)?
3. How can the mapping processes and results contribute to enhance local mangrove management?

Locations: Two coastal villages, Bedono and Timbulsloko, in Sayung sub-district, Central Java, Indonesia

Method:

1. Used participatory resource mapping (PRM) approach by combining different tools (sketch and scale mapping) and techniques (focus group discussion, workshop and transect walk) to gain consensual qualitative information of ES based on local collective memories and perception. The communities were involved from the beginning in method selection, application, evaluation and verification.

2. Built good relationship with the villagers and local authorities by living with the local communities to learn about their local lifestyle learning for better communication and cooperation.

3. Cooperated with the village officers and some villagers to prepare for the mapping activities, such as meeting setup, participants' selection, venue and equipment preparation.

4. Participants were selected based on purposive sampling, in which the researchers relied on their own judgement (ie. the information from their observations and informal communication with villagers) when selecting participants. The number of participants were determined based on the number of sub-villages and the number of community associations involved in mangrove rehabilitation and management. The additional criteria were gender, age, and occupation to ensure a balance community groups.

5. Discussed the village conditions, and introduced the project in details, including mangrove ecosystem, importance of maps to manage the village and mangrove, mapping tools and techniques.

6. Engaged villagers in choosing the suitable methods for mapping, discussed attributes and determined the legends.

7. Started sketching in groups based on sub-villages to map the past condition first, and then describe the subsequent environmental change to map present conditions. Additional information was added with points and sticky notes.

8. Provided GPS training for the participants before the ground-truthing, and discussed the technical preparation needed, eg. strategic time, transportation, and person in charge.

9. During ground truthing, each group was accompanied by two facilitators to ensure the role of each participant such as marking, recording the coordinates and other attributes determined earlier were conducted.

10. Processed collected data with GIS and verified with the community and relevant stakeholders. Repeated as necessary.

11. Held a meeting involving multiple stakeholders to discuss ways to improve mangrove management, and sent the digital maps to relevant stakeholders.

12. Provided financial compensation and ensured that the activities were held only in weekend and was voluntary

Result/ Output:

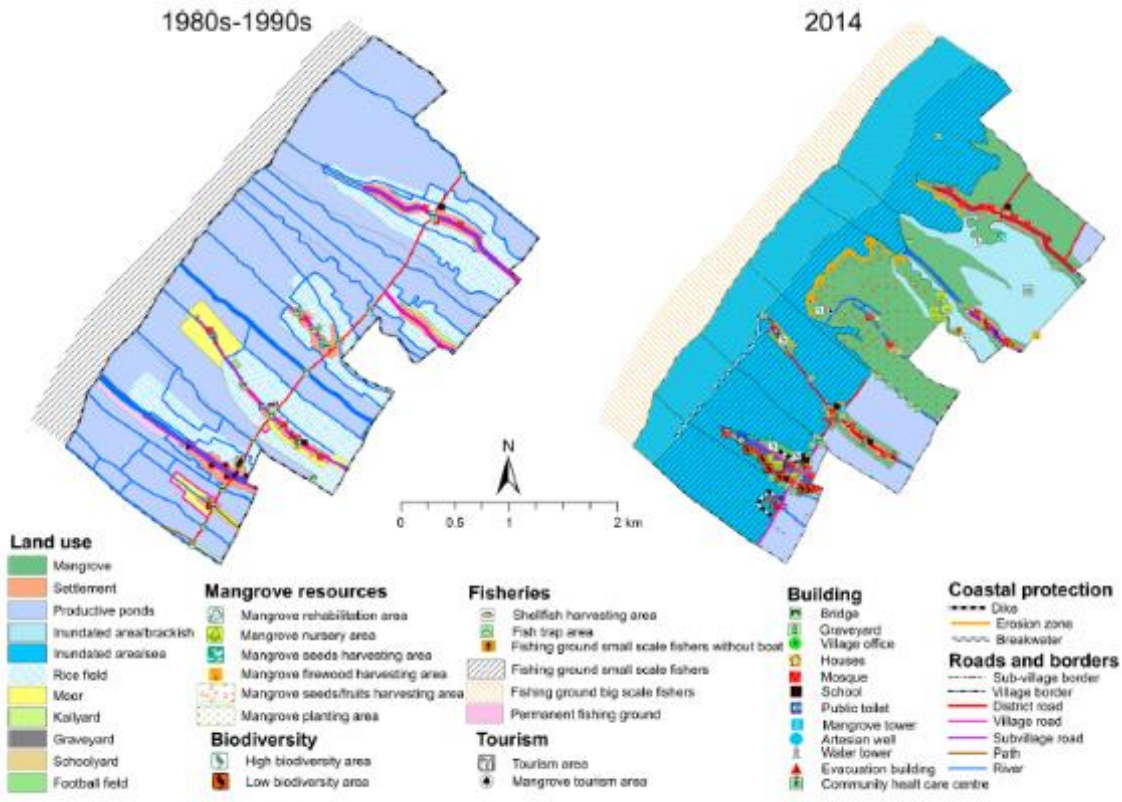


Fig. 2 (left) Historical map (1980s to 1990s) and (right) present map (2014) of Bedono

The villagers of Bedono village confirmed that the mangrove area has been decreasing since 1980s due to the land conversion to aquaculture and excessive of mangroves for firewood. The farmers also convert their fields into fish ponds in the 1990s because of salinization. Intensive coastal erosion in the mid-1990s destroyed lots of fish ponds nearby, forcing many villagers had to change their jobs, and evacuate. Therefore, various efforts were taken to protect the village from further erosion.

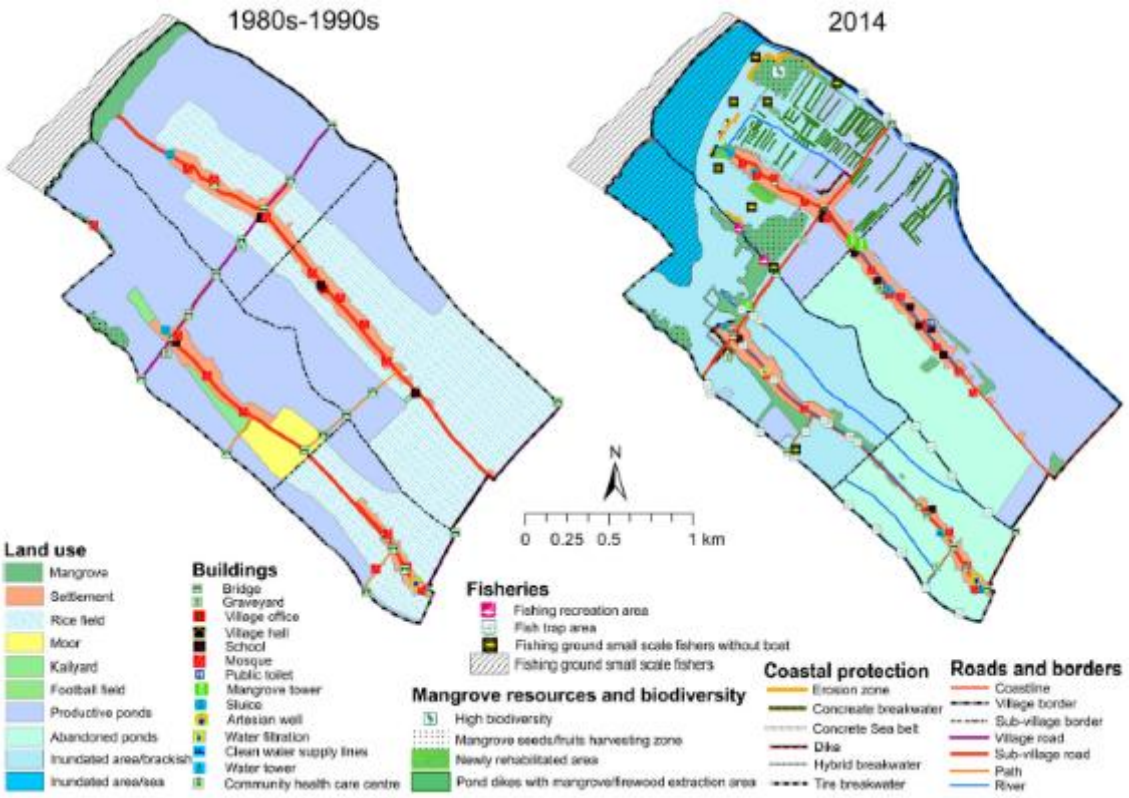


Fig. 3 (left) Historical map (1980s to 1990s) and (right) present map (2014) of Timbulsloko

In Timbulsloko village, the mangrove gradually disappeared since 1990s because of the coastal erosion. In 2014, most of the vegetable gardens, rice fields and moors have been replaced by aquaculture or inundated. Similarly, more than 50% of the ponds were flooded and abandoned by the owners.

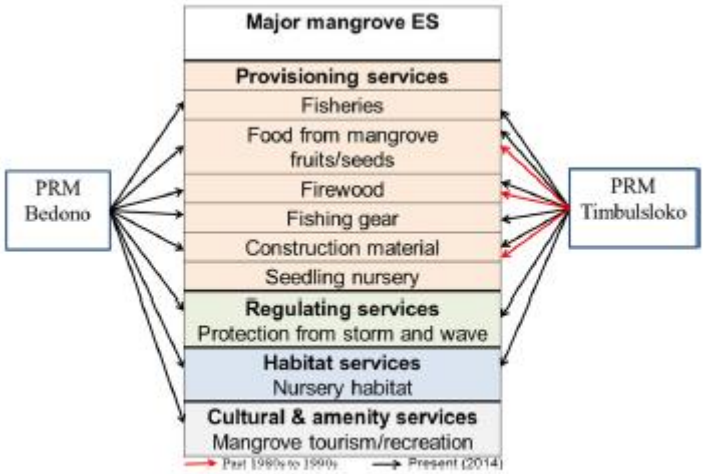


Fig. 4 Major ES identified by PRM participants

The figure above shows the major mangrove ecosystem services from the perception of the participants. Because the benefits of mangrove providing food and firewood were not as significant as converting mangrove to aquaculture ponds. This was due to the lack of knowledge about the importance of mangrove. When mangrove was rehabilitated, the increasing market price of mud-crab became one of the income source of the local community instead of only for household uses. Also because of the inundated farms, the farmers began small-scale business such as extracting fishing gear and seedling nursery from the mangrove.

Result/ Output - Advantages:

Community:

- able to gain new insights on the village potential such as fishery and tourism;
- facilitated learning and knowledge exchange;
- became more confident in communicating their ideas, opinions and management plan to the government and NGO (bottom-up communication) for the first time.
- The participatory ES mapping can facilitate social learning, provide the foundation for the creation of social capital, and equip the community with sufficient spatial information to improve local mangrove management.
- PRM also provided detailed information on the causes of the changes which are important for effective management.

Result/ Output - Disadvantages/ Challenges: PRM is affected by existing rules and norms, participants' experience, conflicting interests, and facilitators' skills in facilitation.

Tip for MOFR: Mapping the change over time would create new insights on the village potential. Involving the community members in the participatory mapping process is empowering the local community to improve local resources management.

Source: (free source) https://link.springer.com/article/10.1007/s10113-018-1378-7

Case 7 - Enabling Participatory Planning with GIS: A Case Study of Settlement Mapping in Cuttack, India

Authors: (Livengood & Kunte, 2012)

Objectives:

1. To set a precedent for a community-based implementation of RAY (a new national housing programme)

2. To empower the urban poor with new knowledge and tools to help them articulate their needs and demands using digital media

Location: Cuttack, India

Method:

1. Requested permission to survey with leaders and residents to fill a profile form which include settlement location, boundaries, population, number of houses, roads condition, number of community and individual toilets, access to water, risk of flooding and other natural resources.

2. Explained to the leaders the needs of boundaries, how to collect boundary data with GPS and the resulting map.

3. Collected GPS points every 3-5 meters. Marked the points inside and outside of the settlement if any barriers for correction with GIS later.

Note: GPS data is essential because many boundary lines aren't able to be collected via remote sensing. Besides, by looking at aerial imagery, the adjacent but separate slum community could not be differentiated.

Result/ Output - Advantages:

- Requesting permission was a chance to explain the project purpose, and how GPS works, which made engaging the community participation and decision-making stage easier.
- Involving community leaders ensured better accuracy and higher degree of community participation.
- It enabled the mapping team to verify the condition of the slum.

Result/ Output - Disadvantages/ Challenges:

- The use of GIS for planning applications can create confusion about facts and interpretation if failed to prove the source and method of data collection, and why certain data were selected for analysis.

- Elders were generally uncomfortable with the new technology, some residents may feel insecure for sharing information, and the scalability of the project to be applied in other cities.

Tip for MOFR: This study was mainly conducted by the government and supported by some community members interested to help, to collect data about the slums communities in India. Therefore, this is another suggestion for MOFR to collect required data while helping the communities.

Link: (free source) https://journals.sagepub.com/doi/full/10.1177/0956247811434360

Case 8 - Group Tierra: GPS Supported Community Mapping in Nicaragua

(From the book, Participatory Mapping as a tool for empowerment: Experiences and lessons learned from the ILC network)
Author: (Di Gessa, 2008)

Objective: To have a better knowledge of the community's territorial assets

Location: Nicaragua

Method:

1. Organized an inclusive meeting with the local community
2. The participants familiarized and understood the map by identifying the location of the participants' villages
3. The participants began adding information on the map by discussing what to show, and how to show on the map in groups
4. Each group presented their map for validation before digitizing.
5. Used GPS to measure the parcels sizes with villagers familiar with the area
6. Handed resulting maps to the community

Result/ Output - Advantages:

- Allowed the identification, resolution and conflicts prevention over land and natural resources.
- The methodology helped the community to further develop their capacity to communicate with other stakeholders such as the government.
- Resulted in better land and natural resources management, and sustainable territorial planning.
- Sustained the empowerment of local communities.

Result/ Output – Disadvantages/ Challenges: Nil

Source: (free source)
https://www.participatorymethods.org/sites/participatorymethods.org/files/particpatory%20mapping%20as%20a%20tool%20for%20empowerment.pdf

Case 9 - HARDI: Citizen's Cadastre in Madagascar Using Satellite Imagery

(From the book, Participatory Mapping as a tool for empowerment: Experiences and lessons learned from the ILC network)
Author: (Di Gessa, 2008)

Objective: To create a citizen's cadastre to enhance land tenure security, take farmers into consideration and respect the juridical framework

Location: Madagascar

Method:

1. Prepared via discussions
2. Informed the community via pamphlets and radio
3. Gathered the community for discussion facilitated by an agent of the land office and a representative of HARDI.

4. Examined one plot after another. Plot with multiple owners initiated a conflict resolution process. Then, the neighbor validated the position of markers. If failed, initiated further conflict resolution.

5. Land committee and land office officials identified and recognized land rights based on official documents. The owner answered questionnaires to record land situations, and to compare administrative law with customary rights before signing a certificate of recognition before the community.

6. The owner also demarcated land on the tracing paper stick on satellite image before the neighbors who validate the result before digitization to create.

Result/ Output - Advantages:

- Localized land registration and reduced government workload.
- Could prevent conflicts by identifying and recognizing local farmers' land rights and enhance their land tenure security.
- Strengthened community cohesion when the community worked together in solving conflicts.

Result/ Output – Disadvantages/ Challenges: Nil

Source: (free source)
https://www.participatorymethods.org/sites/participatorymethods.org/files/particpatory%20mapping%20as%20a%20tool%20for%20empowerment.pdf

Case 10 - Using Community Information Systems (CIS) to Express Traditional Knowledge Embedded in the Landscape

Authors: (Corbett & Keller, 2006)

Objectives:

1. To examines alternatives to typical GIS

2. To support indigenous communities in expressing, documenting, visualizing and communicating their traditional and contemporary land related knowledge using geographic ICTs

Locations: Two neighboring Benuaq Dayak villages in West Kutai in the province of East Kalimantan, Indonesia: ① Benung ② Tepulang

Method:

1. Introduced the project to the community.

2. The community determined the information they wanted to collect and its usage, the person in charge of information collection and the use of video, camera and computer equipment, the knowledge sharer, the accessibility of information, and the storage and maintenance of equipment.

3. Capacity building by training selected community operators and villagers to use camera, video, and computer equipment.

4. The community started gathering information, editing and managing.

5. The researchers obtained the community feedback of CIS Content informally

Result/ Output:

- Uses of CIS: recording of cultural information, documentaries (eg. Promises made by a timber buyer to community leaders), political information (eg. Video of the local community explaining to the government officers on why they should be allowed to harvest timber) and commercial information (eg. Selling of documentation of some traditional ceremonies).

Result/ Output - Advantages:

- The CIS, which was used to record cultural information and documentaries might be useful for communication with outsiders or as evidence in the future.
- Recorded political information helped the community to gain political support and create alliances with more powerful stakeholders.
- The community generated innovative ways by commercializing their skills and cultural information and documentaries to outsiders using VCDs.

Result/ Output - Disadvantages/ Challenges: The sustainability of the project was relying on the pre-existing authority condition which may cause conflicts, the maturity of the operators, the leadership capability of the village leaders, and the commitment of the villagers.

Source: (free source)
https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.606.2397&rep=rep1&type=pdf

Case 11 - Participatory GIS in a Sustainable Use Reserve in Brazilian Amazonia: Implications for Management and Conservation

Authors: (Bernard, Barbosa, & Carvalho, 2010)

Objectives: To perform Participatory GIS in sustainable use reserve and discuss its implications for the management and conservation of the area.

Location: Maués State Forest, Brazil

Method:

1. Research team consisted of 2 geographers, 1 forester, 1 agronomic engineer, and 2 biologists with experience in semi-structured interviews.
2. Sent invitations to the villages' representatives via radio or letters which included a short explanation of the purpose and request to participate because those villages were located too far away and were accessible by boat only.
3. Meeting started with introduction and clarification of basic information (eg. the reserve system and categories adopted in Brazil, land tenure rights, the use of natural resources, and the dos and don'ts of the environmental legislation)
4. Mapping started with explanation and practices to locate places on satellite imagery they were familiar with (eg. main rivers, their communities, houses etc).

5. They were asked to stick colored stickers (color-coded system), which represent different attributes (ie. yellow for houses, orange for agricultural area, red for hunting, deep blue for fishing, green for natural resources, light blue for livestock farming on the printed and laminated satellite images with the size of A3 or A2.

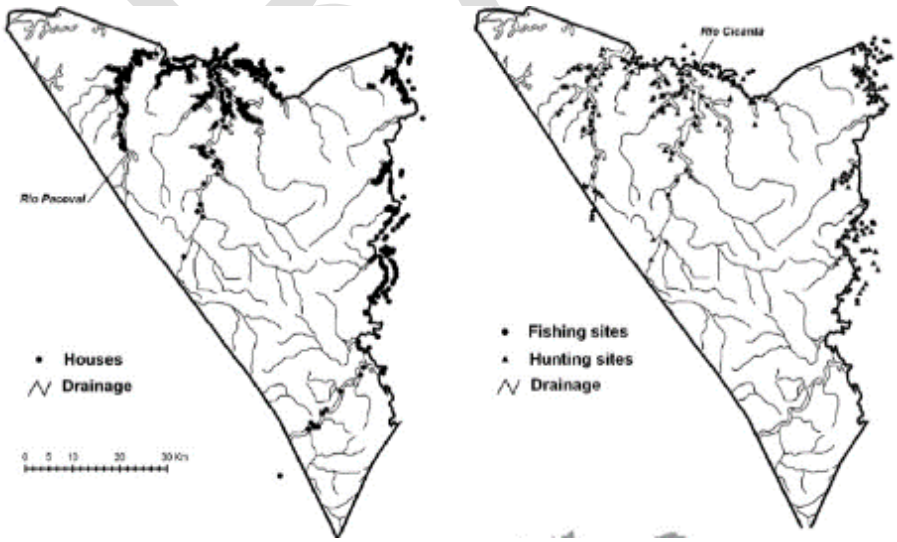
6. Additional information were refined via semi-structured interviews to define the diversity of plant species in their plantations, the animal raised, hunted and fished, and natural resources their extracted.

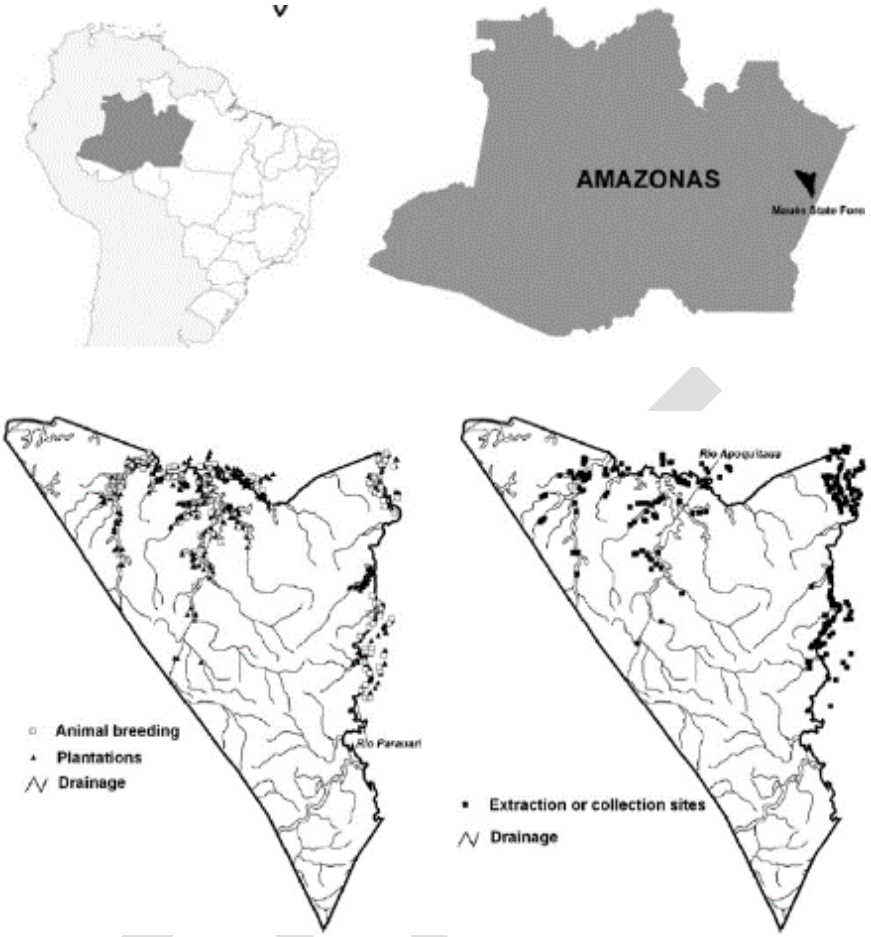
7. Ground truthing to validate the data collected with GPS accompanied by a villager.

8. Maps and data analyses using ArcView 3.2 software. Color-coded system was maintained, and GPS coordinates were added. 2-km radius circular buffers around each identified point to estimate the areas residents were using.

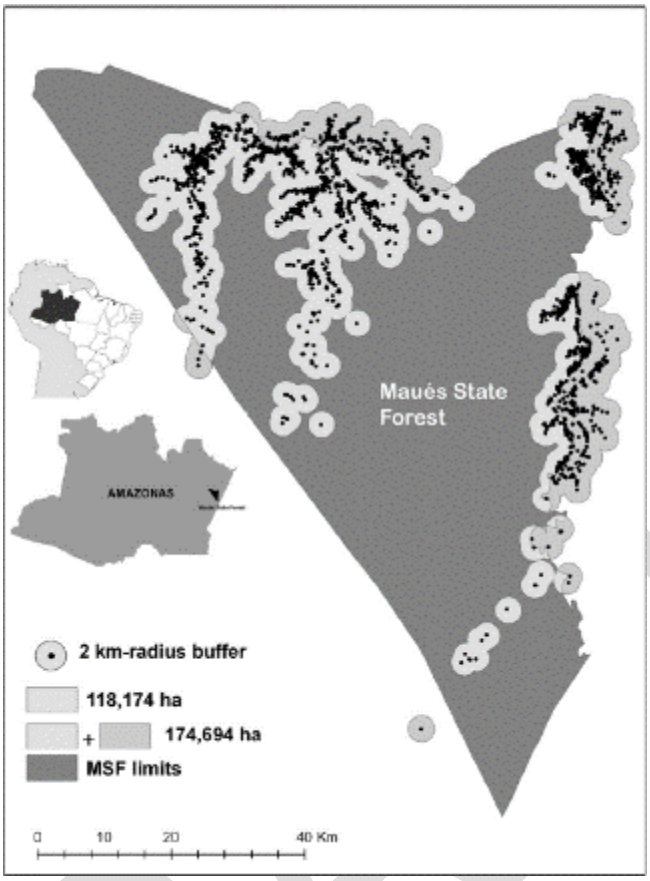
9. Resulting map was printed, laminated and sent back to the villages. Data were also made available to the *Agência de Florestas e Negócios Sustentáveis do Amazonas* (AFLORAM) for Maués State Forest (MSF)'s management planning and zoning.

Result/ Output:





Location of houses, plantations, hunting, fishing, collections and other sites of interests.



Buffers around each identified points of houses, plantations, hunting, fishing, collections and other sites of interests allowed an estimation of the area used by the communities.

Result/ Output - Advantages:

- Data collection could be done with 15 communities and 415 families in less than 20 days, and at an affordable cost of less than US$ 10,000 (transportation cost was the highest) on how local communities used natural resources in a sustainable use reserve (SUR) in Brazilian Amazonia.
- The methodology allowed the visualization of hotspots, areas and resources under stronger pressures or heavy usage.
- Semi-structured interviewing method also provided more information such as the practices of the communities (eg. slash-and burn technique for agriculture), the underlying causes of certain action take n by the communities (eg. the communities plant perennial or semi-perennial species such as cassava, banana, and guarana around their residential area and they also plant cyclic crops such

as beans, corn, watermelon and sugarcane because of the area have better soils), and the uses of certain natural resources (eg. timber, which was the most important, was used for construction of houses, storage houses or boats; turtle eggs, was the second most important extractive products).

- Digital data allowed the calculation of the total area use by the communities for their livelihood.
- The data were used by AFLORAM as a baseline for MSF's management plan, including a tentative zoning of the area

Result/ Output – Disadvantages/ Challenges: Nil

Tip for MOFR: If well planned, participatory mapping may help MOFR to collect data in a shortest time and lowest cost.

Source: (non-free source)
https://www.sciencedirect.com/science/article/abs/pii/S0143622810001621

3: Advantages and Importance of Participatory Mapping

3.1 Effective and Efficient Data Collection

The participatory mapping which usually gathers a small to large group of people for a focus discussion and semi-structured interview at once, will help to shorten the project length and cost. Therefore, when the organization, municipal, and regional governments organize and execute the participatory planning process in a well-conceived manner, data collection can be done with low costing and time consumption (Valencia-Sandoval, Flanders, & Kozak, 2010). According to Bernard and his team (2010), transportation was the most expensive expense, particularly traveling from one place to another to validate data during ground truthing because most governmental departments or NGOs would already have technological items such as GPS and laptops. They also said the local communities were good at mapping once they knew how to read the map and their accuracy rate was very high.

3.2 Data Collection for Sustainable Development

Sustainable development means developing without taking away the right of our future generations to enjoy the same resources that we are enjoying today. It is assured by identifying available resources by engaging the community to generate values (Zerrudo, 2008). In other words, we need data not only from government database, but also the community before we could identify the value of resources and utilize sustainably the resources for development.

According to Zerrudo (2008), there are four stages to develop sustainably: ① awareness through resources identification, ② appreciation through community organizing and capacity building, ③ protection and conservation, and ④ sustainable utilization. For example, when the community of Vigan City in the Philippines can identify the cultural heritage resources that they have, they can organize various cultural activities such as tours, training, seminars and competition to mold individual local

members towards a common vision, goal and interest. This would induce a momentum which eventually forced the government in formulating policies to better preserving and conserving the heritage resources. Moreover, the locals can utilize the heritage resources to generate income in areas such as tourism, arts, food and beverages, health, etc, which would eventually develop the area.

3.3 Identify the Real Needs of People

Participatory mapping provides opportunity for the local community to present their needs and priorities in development (Kingsolver, Boissière, Padmanaba, Sadjunin, & Balasundaram, 2017; Townsley, 1996; IFAD, 2010). The stakeholders such as government, NGOs, and researchers can identify the underlying issues and be more certain that the responses mean the community's real needs, hence, are able to cater to them better.

3.4 Ensure Project Sustainability

Participatory mapping which aims to involve the local community in planning, data collecting, data analyzing, and solution designing, especially about their priority issues, give them a sense of ownership to the project. A sense of ownership encourages the community to commit themselves in the management and implementation of the project, and eventually be self-reliant. Townsley (1996) said when a community does not have a sense of responsibility and feel being exploited by a community project run by outsiders, they will usually have problems of mismanagement and theft.

3.5 The Establishment of a Better Resources Management Plan

3.5.1 Without compromising local community needs

A lot of time when government designates a protected area, the government uses top down governance approach, which usually resulted in conflicts with local indigenous community, particularly on the use of land (Voo, Mohammed, & Inoue, 2016; Gilmore &

Young, 2012; Mapedza, Wright, & Fawcett, 2003). Participatory mapping which aims to understand the local community's perception by integrating them into natural resource management such as forest management and decision-making, could identify the community use area, and their trails and resource extraction routes. These information allow the government to designate protected area with zoning, reduce illegal encroaching and harvesting of forest by the outsiders (Voo, Mohammed, & Inoue, 2016; Bernard, Barbosa, & Carvalho, 2010), as well as to include as many biologically and culturally significant sites identified by the local community as possible (Gilmore & Young, 2012).

3.5.2 Effectively mitigating environmental effect

Involving the local community participants may help them to engage with government officers to effectively mitigating environmental effects (Kingsolver, Boissière, Padmanaba, Sadjunin, & Balasundaram, 2017), or defend their village from ill-conceived development (Gilmore & Young, 2012). It also support forest conservation through discussions that involve the local community and relevant stakeholders and spatial analysis by producing zoning maps that led to designation of the community conservation area (Ioki, et al., 2019)

3.6. Generate New Insights Which May Lead to Innovation

None in this world know all things. Even every individuals in a family or a community has different types of knowledge (Gilmore & Young, 2012). For example, a crab gatherer can provides critical information about where and how to catch crab in the mangrove area, which other hunter, cook, and planter cannot. Besides, no one knows better than the community themselves in where they have been living for generations. With the inputs of their local knowledge, known or previously unknown cultural and natural assets, both tangible and intangible, can be identified.

Once identified, it is easier to plan for development via the identified gaps and opportunities and the linking of assets to enhance experience (Ferguson, 2017). Such a process usually generate innovative ideas and plan that would empower communities and create partnerships under a common cause. For instance, the community of Benung village in Indonesia managed to come out with an innovative idea to package and sell

the recorded video for the project in VCDs on traditional carving methods and traditional ceremonies (Corbett & Keller, 2006).

3.7. Local Community Empowerment and Capacity Building

Participatory mapping which encourages the involvement of the local community usually leads to the empowerment of local people towards a more equitable society. It also empowers weak groups in access to, and control over resources, as well as to promote people' initiative, local control and ownership. The two main capacity building are the facilitation and mapping technologies (McCall, 2004).

3.7.1 Capacity building - facilitation

Facilitation skills is one of the essentials in leadership. It enables a leader (or the village's head) to better handle and deal with his/ her team (or villagers), stakeholders, or collaborators of any kind (eg. improving and developing the village). In general, a good facilitator can create an optimal environment for people to think critically and cooperate.

A participatory mapping project usually needs a facilitator, especially a local who has basic knowledge of the area, the ability to listen, and communicate clearly. It provides an opportunity for the local community members, who fully participated in all mapping sessions, to learn about the project and the facilitation techniques from the organizer by helping to lead and facilitate (Gilmore & Young, 2012; Kingsolver, Boissière, Padmanaba, Sadjunin, & Balasundaram, 2017).

3.7.2 Capacity building - Mapping Technologies

Participatory mapping can also be known as Participatory Geographical Information System (PGIS) if the activities include the use of spatial information technologies such as Geographical Information System (GIS), Global Positioning Systems (GPS), and remote sensing. Depending on the project's purposes, some mapping activities provide training to the local community members on how to use electronic devices such as smart phone and tablet, video recorder, voice recorder, digital camera, computer, video and

photographs editing and GIS software, usually with the aim to ensure the sustainability of the project (Corbett & Keller, 2006; Gilmore & Young, 2012). Transferring these technologies to developing countries provide them the opportunities to advance in communicating domestically and internationally (Kyem, 1999).

3.8 Increase Successful Rate through a Shared Ownership

Participatory mapping emphasizes on the word, ‘participatory’. Involving the local communities and relevant stakeholders throughout the project by enabling them to have full control over the visualization, utilization, dissemination, and management of data creates a sense of shared ownership. Hence increasing the successful rate of the project’s implementation (Thomas & Middleton, Oct. 2003; Gilmore & Young, 2012; Griebel, 2013).

3.9. Record Local Knowledge before Losing Them

Rapid economic, political and cultural changes in the world, including the local level hasten the loss of local traditional knowledge (Corbett & Keller, 2006). For this reason, the indigenous communities are in need of a way to record and preserve their knowledge, especially the oral traditions such as stories, songs, dances, oral histories, myths, rituals, community laws, local taxonomy, agricultural practices, traditional biological, ecological and geographical knowledge within the community and between generations (Corbett & Keller, 2006; Gilmore & Young, 2012; IFAD, 2010).

The inclusive nature of participatory mapping, which engages as many community members as possible, including the elderly, adults, youth and even children of both genders, allows the sharing of knowledge among individuals in a community and also between the elder generation and the young generation (Gilmore & Young, 2012). Though the participants might come from the same community, different social groups would have different concerns. For instance, Corbett and Keller (2006) stated that younger and middle-age men were usually concerned about the economy and politics

while the elders and women about the sustenance of traditional knowledge, especially in history, culture and customary laws. Meanwhile, Mapedza and his colleagues discovered that (2003) women were more aware of a reduction in vegetation cover and knew more uses of tree species than men.

Nevertheless, the local community should take note that maps only record spatial and time data, hence unable to record all data perfectly (IFAD, 2010). For this reason, multiple methods and techniques such as embed multimedia information (video, audio and text files) in a map shall be utilized together (IFAD, 2010; Corbett & Keller, 2006). And one of the comprehensive and powerful tools is the Story Map from Esri, which harnesses the power of maps to tell stories that matter.

4. Disadvantages and Challenges

4.1 The Difficulty in Adopting New Technology

Though the use of technology such as GPS, GIS and remote sensing provide higher quality and accuracy datasets during acquisition, they are something challenging to be used by all levels of people because of a few reasons below:

4.1.1 The barriers of senior citizens

Health conditions such as vision loss, difficult to focus, lack of knowledge and confidence, as well as skepticism and fear of the unknown were the major barriers that made it harder for the senior citizens to learn to use technologies (Vaportzis, Clausen, & Gow, 2017). Therefore, many of them would have a hard time in participating and using mapping technologies (Weyer, Bezerra, & De Vos, 2019; Livengood & Kunte, 2012).

4.1.2 The poverty

Developing countries, especially the least developed countries such as Solomon Islands, Cambodia, and Madagascar have high poverty rates. Poverty is a trap that is difficult for those countries and communities to detach from with their own strength (Chowdhury, 1995). Because of poverty, school dropout rate and illiteracy rate are high and basic services and essential facilities such as electricity, clean water, proper sanitization and sewage are lacking (CEDT, Unknown; Chowdhury, 1995; Weyer, Bezerra, & De Vos, 2019). Therefore, most participatory mapping projects with the community required the assistance of external organization(s) in terms of knowledge transfer, equipment sponsorship, and financial support.

4.2 The Difficulty to be Inclusive

Being inclusive is a foundation of participatory mapping. Most participatory mapping would try to involve as many groups such as youth, women, and elders as possible. However, in some cases, it is very difficult to be inclusive for the reasons stated below:

4.2.1 Social Status Issue

Though obtaining the assistance from the village leaders and the elites may make organizing the meetings and workshops easier, there is a tendency whereby they would dominate the discussion, which somehow restricts the participation of other participants (Weyer, Bezerra, & De Vos, 2019). Also, the average community members may feel uncomfortable or dare not voice out their opinions with the presence of people with high authority.

4.2.3 Geographical barrier

Participatory mapping projects which take place in the rural areas of developing countries usually are underdeveloped without proper facilities such as roads. It becomes even more difficult if the project includes a few communities because the participants have to travel some distance to attend the program on an allocated day (Mapedza, Wright, & Fawcett, 2003).

4.2.4 Methods Applied

Some methods such as the use of GPS and GIS, though provide higher accuracy, they indirectly excluded some members in a community, especially those elderly and illiterates (Livengood & Kunte, 2012; Weyer, Bezerra, & De Vos, 2019). Such conditions might further intensify existing injustices, and isolate the already isolated community (Weyer, Bezerra, & De Vos, 2019).

4.3 The Differences in the Facilitators' Capability

Facilitator is the key person who conducts the entire mapping process. He/ she has to understand the local context, build relationship within a community, provide thorough explanations, uses and limitations of maps, GPS and software used during the process, and create an encouraging environment to help participants feel comfortable and confident in the process (NOAA, 2015; Weyer, Bezerra, & De Vos, 2019). A facilitator also has to deal with conflicts, dominating and offensive individuals, and maintain positive group dynamics. Because of various roles a facilitator has, having different levels

of facilitation skills would also generate different results even though they are using similar tools (Damastuti & de Groot, 2019)

4.4 The Possibility of Inaccurate Information

Information may be or become incorrect during the data collection phase, or data analysis and interpretation phase (de Paiva, 2017):

During the data collection phase, the participation of key knowledge holders of the areas can influence the precision of the mapping process (Bernard, Barbosa, & Carvalho, 2010). Some local community members, especially those in authority position may choose to withhold information because they lost trust in external powers due to the reasons that they may have heard of other community or have personally experienced being taken advantage of by certain group of organization and authorities (Weyer, Bezerra, & De Vos, 2019). On the other hand, those in authorities or the government staff who may be involved in the participatory mapping process may provide information which are different from the local community to maintain their status and/or ensure their personal gain (Mapedza, Wright, & Fawcett, 2003).

During the data analysis and interpretation phase, the facilitator and the technician who edited and visualized the data, may cause a divergence of data from its original meaning because they may have a different understanding of collected data (de Paiva, 2017).

4.5 The Potential of a Community Being Exploited

According to Weyer and his colleagues (2019), locals may be inclined to maintain submission to outsiders who appear to be richer and advanced than they are. Another reason may be due to the community's historical background of being tyrannized unjustly for a long period of time. They would accept directly everything given and requested by outsiders without any further questions. Moreover, when the data and maps are accessible to the outsiders, the community may become vulnerable to exploitation (Damastuti & de Groot, 2019), and in face of legal action against their traditional practice which has now violated the law.

4.6 Raising Unrealizable Expectations

Because Participatory Mapping activities generally encourage the local participants to voice out their needs and issues, and brainstorm for solutions, the participants may have certain expectations, which may not be fulfilled (Damastuti & de Groot, 2019). This can be due to the discouraging political situation, the local power and social structure or bureaucratic issues in institutions (Townsley, 1996; IFAD, 2010). If the community is having unrealistic targets and without tangible results, they may be burned out with a series of activities (Gabriel, 2016). Such condition would reduce the trustworthiness of the project team which eventually resulted in the project failure.

4.7 Taking People' Time

The participatory mapping projects can be lengthy and required lots of time from participants. The participants may be busy earning a living from activities such as agriculture, hunting and natural resources extraction (IFAD, 2010). Sometimes because of the hospitality nature of the locals, they will still host the participatory mapping team by sacrificing their time. Therefore, it is important to understand their busy period and refrain from conducting participatory mapping activities during those periods, as well as compensate their time with a considerable amount of stipends (IFAD, 2010; Damastuti & de Groot, 2019).

4.8 Maps created for project purpose may be valuable to the project team only

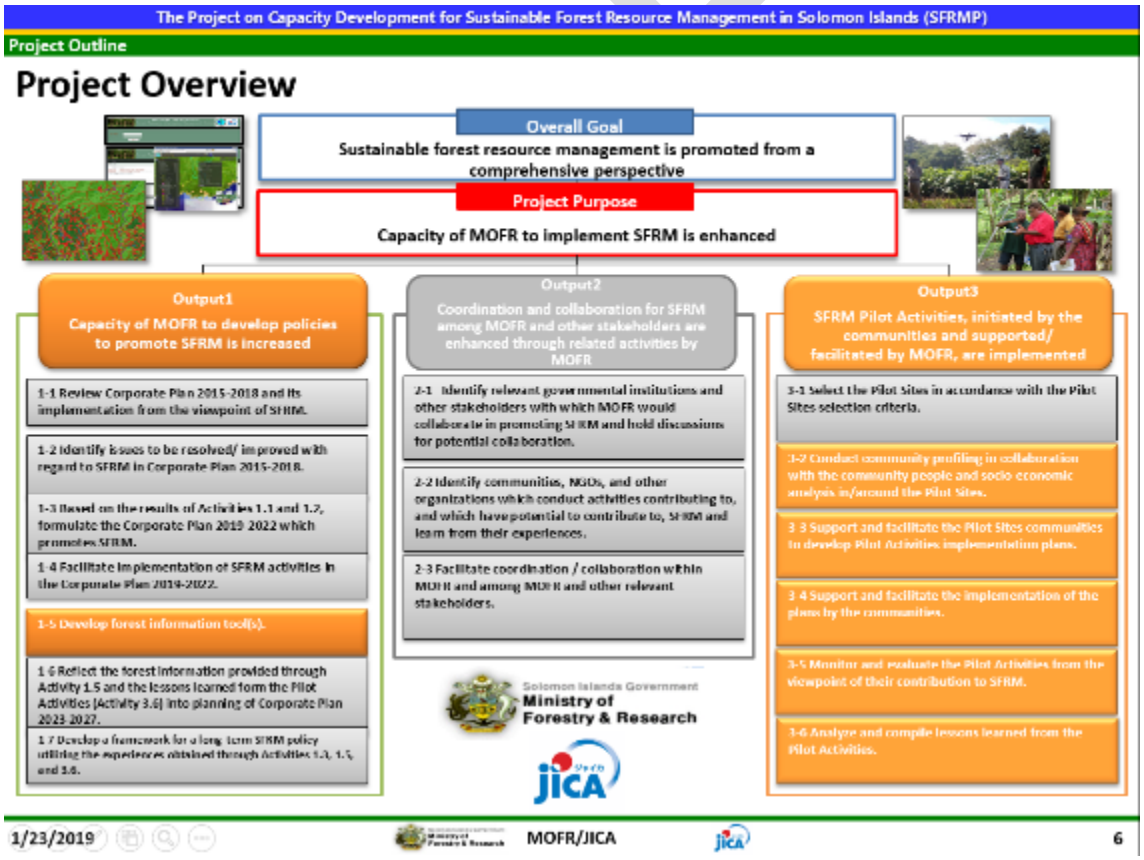
The project team may have decided their own purposes of the project without involving the community at an early stage. Therefore, the maps produced at later stages neither address the community's needs nor represent the entire community's perception and interests (IFAD, 2010; Griebel, 2013). In this case, giving back the map to the community is often meaningless because the community does not know what to do with the maps and would not feel that they are the owners of the map. They want to be the owner who has full control on how the information is represented, used, disseminated, and preserved (Griebel, 2013). Otherwise, the community and other communities might be unwilling to join in future similar projects.

5: Participatory Mapping in Komuniboli and Falake of Solomon Islands

5.1 Title

The Project on Capacity Development for Sustainable Forest Resource Management (SFRM) in Solomon Islands

5.2 Objectives



The project has three objectives or outputs stated in the above figure. However, this section only focuses on the output 3, which is the SFRM Pilot Activities, initiated by the communities and supported/ facilitated by MOFR, were implemented.

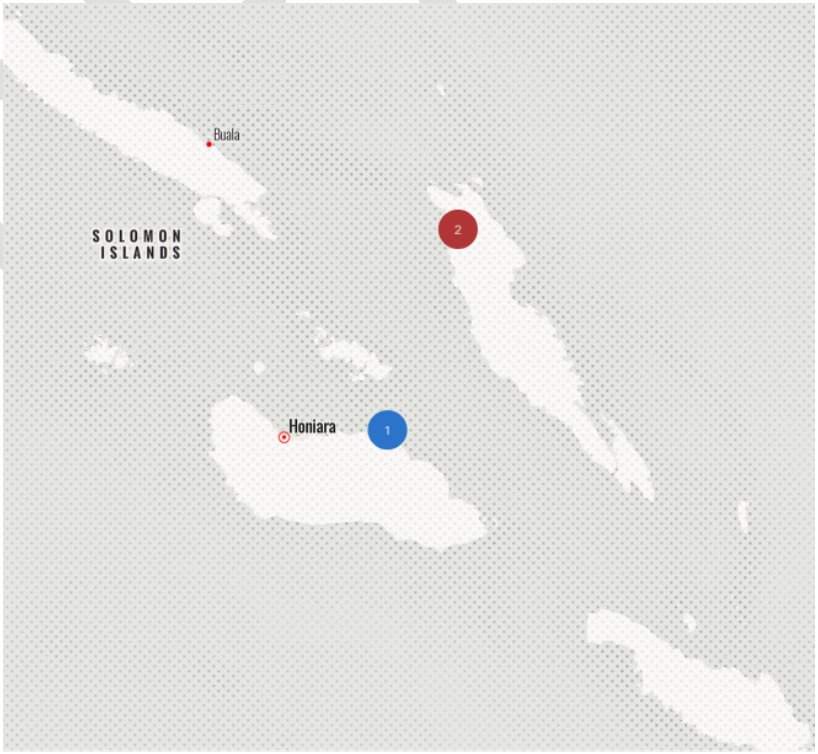
In other words, the main objective of the participatory mapping in this section is to empower local communities in initiating Sustainable Forest Resources Management (SFRM) pilot activities. And there are six(6) sub-objectives listed below:

1. Select the Pilot Sites in accordance with the Pilot Sites selection criteria.
2. **Conduct community profiling in collaboration with the community members and socio-economic analysis in/around the Pilot Sites.**
3. **Support and facilitate the Pilot Sites communities to develop Pilot Activities implementation plans.**
4. Support and facilitate the implementation of the plans by the communities.
5. Monitor and evaluate the Pilot Activities from the viewpoint of their contribution to SFRM.
6. Analyze and compile lessons learned from the Pilot Activities.

Sub-objective 2 & 3 in bold above are the main focus in this section.

5.3 Location

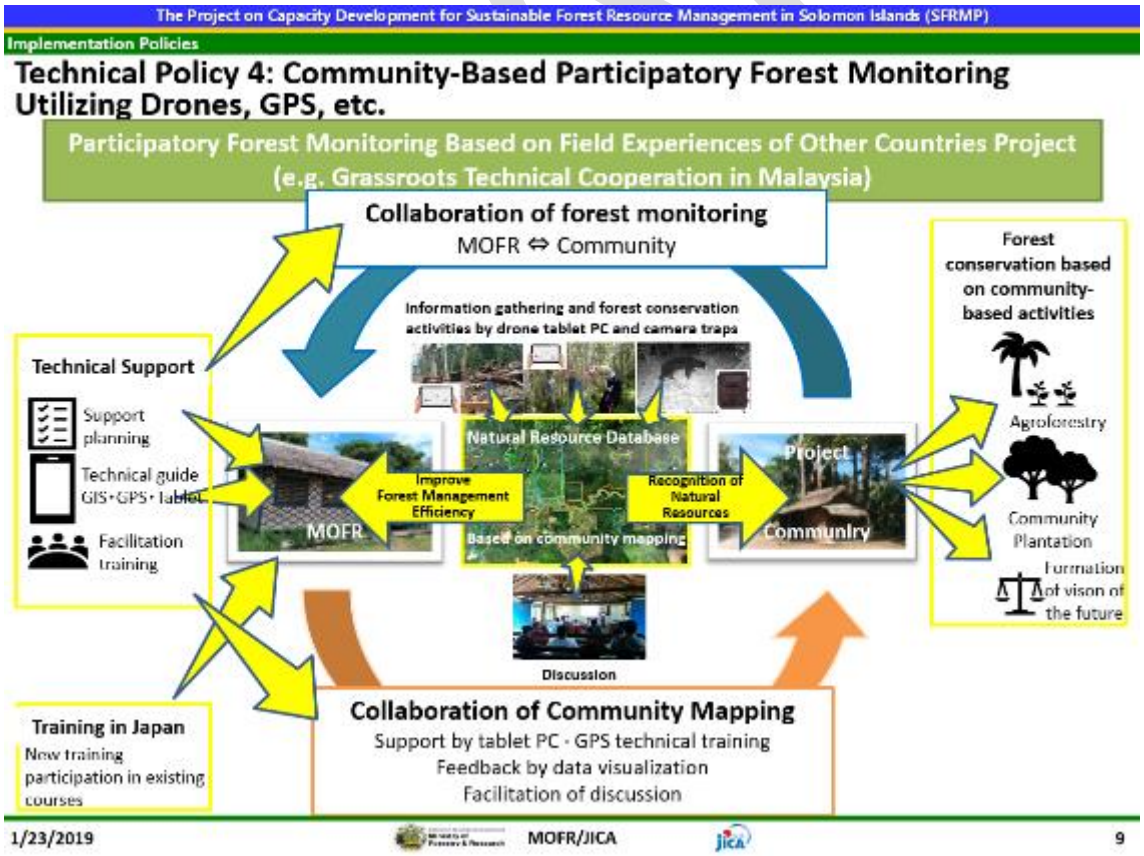
① Komuniboli community in Guadalcanal province & ② Falake community in Malaita province.



5.4 Method

To achieve sub-objective 2 and 3, there are many methods and one of them is participatory mapping. Participatory mapping, which include groups of community members (ie. youth and women) in planning since the beginning of the project, cultivate a sense of ownership among the participating community members, hence ensuring a higher chance of achieving a sustainable forest resources management activity. For this reason, it is the main method depicted in this section.

The figure below shows a chart of how MOFR, while receiving technical support and training from JICA Team, can collaborate with the community to collect and create a database of natural resources through participatory mapping, which eventually assist the community to initiate community-based Sustainable Forest Resources Management (SFRM) Activities. However, because this project has yet to be finished, this section only depicts how MOFR can collaborate with the community members through participatory mapping to collect data for community profiling (5.4.1 to 5.4.4), and to develop community-based Pilot Activities (5.4.4 to 5.4.9 and to be continued).



5.4.1 Got to know the community and obtained the informed consent

1. The introduction of relevant stakeholders, in this case the Ministry of Forest and Resources (MOFR) and project staff (the JICA team), the community, and Ado Rural Farmer Association (ARGA, the local forest cooperative)

2. The community leaders introduced the community to the outsiders (the project staff and MOFR)

3. Expert from the JICA team explained the project, the concept of sustainable forest resource management activities with community participation (pilot activities) and Memorandum of Understanding (MoU) details

4. Obtained consent forms from each household in the community

5.4.2 Data collection & training

5. Conducted a GPS training through lecture and practical for a boundary survey.
   (a) The survey divided participants into three groups to survey three different areas (hilly areas, flat areas, and along the rivers). Each group consisted of MOFR staff and community members, and their responsibilities were to record GPS data, take photographs and mark the boundary (usually painted light colour on trees).

6. Community members sketched and mapped their available resources, including high social, cultural, and conservation value sites. The following sites were identified as high conservation values (HCV) sites, which should be taken into account when planning forest management:

   (a) The First Settlement Area is where the ancestors first settled and is considered a sacred place.
   (b) Marshy area, known in Christianity as the Devil, where the goddess of water lives. However, we did not identify the area because it is a taboo to be shown on the map.

(c) A custom site called Sabo Popo or Wooden Bowls, which is no longer an object of worship due to the heavy Christian influence, but continues to be recognized as a sacred place.

(d) Warriors' baths (no longer in used but is still recognized as a respective sacred place, where no logging is allowed in the area)

(e) A small pond in the forest that serves as a fishing spot, where there is a tradition related to snakes.

7. Semi-structured interview was also conducted.

8. Conducted a training on how to use Avenza app installed in tablets for ground truthing.

(a) Ground truth (transect walk) with GPS and tablets which contained the Avenza app. Also taught the interested community members on how to use GPS and tablets.

(b) Conducted semi-structured interviews during ground truth (transect walk).

MOFR members were signing the MoU with the Falake community

MOFR members were introducing themselves to the Falake community members

GPS Training

A trial GPS transect walk in the forest, using GPS and Avenza Map installed in a tablet.

Boundary Marking

The location and access load of the resource obtained on the Avenza Map.

5.4.3 Collected data transcribed onto new maps

9. The JICA team transcribed collected data, boundary data and ground truth data, onto new maps, and printed out.

5.4.4 Current and Future land use plan

10. With boundary data, the JICA team also prepared a scaled satellite imagery map of the two communities' villages, printed out on a large sheet of paper and laminated with fluorine film that allowed the community members to draw with whiteboard markers and erase with a duster.

11. Conducted a Land use (LU) planning session with the community by creating two maps, namely the current LU map and future LU map.

5.4.4.1 Created current land use plan

12. The community members were divided into women and men groups so that the women can voice out their views without men interfering. This is particularly important if the community was patriarchal. Of course, depending on the community size and the availability of facilitators and time, more groups (eg. youth, elderly, and kids) can be formed.

13. For each group, the facilitators

    (a) Explained the objective: To help the community to understand their resources spatially.

    (b) Explained the expected outputs: Current land/ resources use map created.

    (c) Taught how to read standard maps, by letting the community members to identify the location of their houses, and the rough distance from point A to point B. When some, especially women, could not understand, additional examples/ practices in their local language were given.

    (d) Had the community members to check and compare the resulting maps from steps 8 & 9 above.

        i. Asked if they remember the Avenza Map that they have used to collect data? Asked who was involved?

        ii. Showed them their map (if possible, make them feel excited to see their work)

        iii. Asked if they can remember the location of the pictures? Explained to them by comparing to the map showing their entire region so that they can understand and read maps.

        iv. Also, explained what maps can do, eg. to show location of their resources which enable discussion with outsiders such as the government.

        v. Gave them some time to check and compare with other maps.

(e) Invited the community members to add data on the map with different color of whiteboard marker and sticky note for different groups in creating a current LU map.

(f) Encouraged more discussions, and brainstorming by utilizing his/her understanding about the community culture and lifestyle to ask some questions such as ‘where do you get the vegetables that we ate yesterday?’, ‘where do you get that crab?’, etc. Some other examples were the customary site, spiritual site, geographic of the region, land cover, land use, agriculture/plantation/poultry site, historical site, etc.

(g) Also some other questions about ethnobotany could be asked. Eg. What do they get from the forest or their surroundings? What do they use the resources for? Do they know the location of the resources? Any taboo or practice they have to do before taking any products from the region?

(h) Needed to talk and remind the community members about data privacy, the MoU they signed from time to time that the data they shared would be shared among the community, MOFR, and the JICA team only. This is because some community members felt naked and threatened by the sharing of their knowledge.

14. Each group was called to present their results and then discussed to reach a consensus.

15. The community members were asked to share their thoughts about their map, and information related to the land use situation to access the needs, policies, ideas, and land-related issues.

16. Presented a video on a successful participatory mapping project in Batu Puteh Village in Sabah State of Malaysia.

The women of Komuniboli were trying to check the maps created based on the data they collected with Avenza Map app (GPS Transect Walk) while trying to understand how to read maps.

The men group of the Komuniboli was trying to plot the current LU map on the large sized fluorine-film laminated satellite imagery.

Presentation from each group (men and women) with the aim to reach a consensus of the current LU map in Komuniboli

The women group was trying to plan for their future LU map

The result of GPS Transect Walk in the Falake village

The women group of the Falake was trying to plot the current LU map on the large sized fluorine-film laminated satellite imagery.

Presentation from each group (men and women) with the aim to reach a consensus of the current LU map in Falake

The current LU map created by the community members in Falake

5.4.4.2 Discussed and created future land use map

17. The facilitators:

(a) Explained the objectives: To make future land use plans with map (Not final).

(b) Explained the expected outputs: Future land/resources use map drafted for the first time.

(c) Explained how to make future land use plan stated as below:

In planning, we usually require to create more than three maps for various focuses such as conservation, economy, development and/or a mixture of all.

Nonetheless, we did only two maps focusing on conservation and economy due to resources (ie. only two A0 size fluorine film laminated satellite images we had) and time constraints.

Even though conservation-focus maps focus on conservation, it still has other land use areas such as economic and agriculture areas and vice versa. Economic map means the area/ location designated for activities to raise money or make provision. Examples are agriculture, logging and other types of harvesting.

18. Invited experts of forest management laws, Mr. Eric from the Ministry of Forest and Resources to explain relevant laws and regulations to the community members. Below is what he had stated:

Must designate a buffer zone of 40 m at both sides of rivers and streams. Neither logging activities nor residential areas are allowed in the buffer zone.

No logging is allowed in areas where the steepness is larger than 30 degrees.

19. Divided the villagers into two groups (conservation-focus & economic development focus) and started planning.

    (a) For the conservation-focus map, the planning started with designating the conservation area and then the rest. Meanwhile, the economic development focus map focused on the development of the village, such as timber logging and farming expansion. Undecided areas can be left as white/ blank areas whereby villagers can decide later.

    (b) Might need to ask some questions to assist the villages when they do the planning. For example, we asked, “What’s this?” while pointing at something on the map; and also asked questions based on the lifestyle, culture or the current land use map they created.

20. Conducted a comparative analysis of two land use planning proposals by discussing with the community members the differences between the two maps to identify the agenda to be considered and the details.

21. Reminded the community members that the two land use planning maps they created were not final because they could alternate accordingly based on their

internal discussion, inputs from members who did not attend our workshop, and other information they obtained.

5.4.5 Digitized both current and future land use maps

22. The JICA team digitalized both the current LU map and future LU map and printed out.

5.4.6 Reviewed & finalized the current and future land use maps

23. While explaining the information plotted on the current LU map, the facilitators checked by comparing them to the topographic map and GPS location information confirmed during the GPS transect walk, revised the land use map, confirmed the accuracy of the information, and finalized it.

24. Based on the findings of the finalized current LU map, we asked the community members to finalize the land use plan by integrating the two future maps (Conservation Focus and Development Focus) they had prepared in advance.
    At that time, the facilitators:

    (a) Explained the uses of the topographic maps, ie. to identify the riparian buffer zones, steep slopes, and catchment areas of water sources which had not been given special consideration in the current land use situation.

    (b) Explained the potential environmental impact of deforestation and other activities in these areas on water sources and soil.

    (c) Encouraged them to consider the size and scope of the area allocated as a conservation area based on the topographical map.

25. The community members presented their final LU map planning while the facilitators verified again with the community members with some questions listed below:

    (a) What is/are the use of an area that does not belong to any use zone in the land use plan?

    (b) Is the land use plan following the policies and approaches for delineating the boundaries of a core conservation area (a totally protected area), and a buffer

area which allows a certain amount of logging and collection of secondary forest products under strict rules?

(c) Is the location information on the map accurate?

(d) What is the scale of pilot sites allocated for agroforestry-related activities?

(e) What are the approaches to activities in areas where deforestation is allowed, which are catchment areas for streams, creeks, gullys, etc?

Reviewing and finalizing current and future LU maps with the Komuniboli community

The group photo taken with the finalized LU map in Komuniboli

Reviewing and finalizing the current LU map with the Falake community

The group photo taken with the finalized LU map in Falake

5.4.7 Community members determined the objectives of their land use planning

26. The facilitators also assisted the community members to determine their objectives of their land use planning:

    (a) Conducted a brainstorming session to engage the community members in identifying keywords they are concerned about.
    Examples of keywords obtained from the Komuniboli community: next generation, forest conservation, securing and protecting wildlife, sustainable timber supply, livelihood and livelihood improvement, water source conservation and improvement of water supply, soil conservation, and food security.

    (b) Categorized those keywords into groups. Examples obtained from the Komuniboli community: "sustainable forest conservation and forest resource use," "conservation of forest ecosystem services and biodiversity," and "food security and livelihood improvement.

    (c) Determined main objectives. Examples obtained from the Komuniboli community: sustainable forest conservation and use of forest resources, conservation of forest ecosystem services and biodiversity, and food security and livelihood improvement.
    Examples obtained from the Falake community: self-help and self-reliance through livelihood improvement, healthy living (water, sanitation, and housing), food security, and rule-based resource management.

Note: If the community plans to convert a certain land use type to another type in near future (like the case in Falake community), please determine the feasible scope during the project period, and then consider the action plan to achieve it. Also, it is necessary for the parties concerned to reach a firm consensus.

5.4.8 Clarification of the roles of MOFR and JICA team

27. When the community members learned to create their plan, they might request something out of the project scope. If we try to fulfill their request as much as possible, they might become too dependent on external resources and help,

especially from the MOFR and JICA team. For this reason, the project may not last long once the support period ends. Therefore, the facilitators explained the principles and scope of the project listed below:

(a) The work must be under the jurisdiction of MOFR;

(b) The field and content should be related to the project's objectives;

(c) The activities should be within the areas and scopes whereby the Ministry of Forestry and Research and the project staff have expertise;

(d) The amount of activities should be handleable by the local community in terms of manpower, who are the main implementers of the activities;

(e) The amount of activity must be within the time allotted to the local community, and must be feasible to implement within the two-year project support period;

(f) The activity must have the minimum basic infrastructure required to implement the activity;

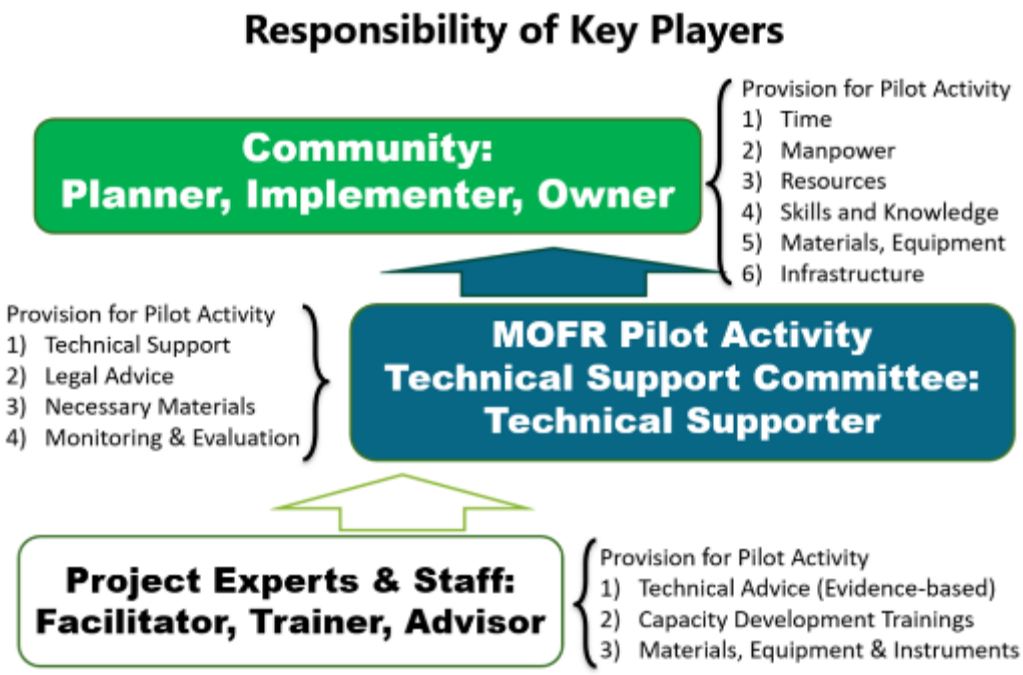
(g) The activities must be feasible even without allocating the budget for personnel and other necessary expenses to the local community, and the content and amount of activities must be within the budgetary limits of the Ministry of Forestry and Research and the project.

Note: Because the community members felt upset and argued that they have no budget to implement their planning, and that MOFR should have the responsibility to sponsor. The facilitator added some explanation as below:

i. The future LU planning is to be decided and implemented by the local community themselves. MOFR and JICA team are in the position to support them.

ii. Of the expenses required to implement activities, MOFR and JICA team cannot allocate personnel expenses for activities conducted by the local community themselves, but MOFR and JICA will continue to provide support for the procurement of the minimum necessary materials and equipment for implementation. In other words, although they would not receive financial support, they would receive benefits and support such as provision of materials and equipment necessary for the activities and training to strengthen their skills.

iii. It is important to ensure the sustainability of their own planned activities to achieve their own land use plans and objectives. However, it would be difficult to ensure the sustainability of their planned activities after the end of MOFR and JICA team's support if they are overly dependent on external funding and support (importance of ensuring the ownership and initiative of residents and ensuring sustainability).



5.4.9 Detailed planning of pilot activities (to be completed and continued)

28. Brainstorming: To list activity ideas for each land use zone

(a) Divided men and women into small groups.

(b) Asked them to come up with ideas at various levels (ranging from specific activity names to types of trees and vegetables they would like to plant) in each LU area.

(c) Broke down the ideas into the smaller activities necessary to realize each activity.

29. Detailed planning of the pilot activities (especially the forest management plan), including the framework, policies, how to develop the plan, and the schedule for developing the plan will be carried forward to year 2021.

The community members of Komuniboli were brainstorming for list of activities to be conducted to achieve their objectives decided earlier.

List of activities for each LU zone.

The community members of Falake were trying to figure out their objectives of their future plan

The man of the Falake community was explaining and sharing the objectives and list of activities they brainstormed.

5.5 Result/ Output:

Komuniboli Current Land Use	Hectare
Conservation	96.0
Ecotourism	0.5
Garden	0.9
Settlement	10.5
NTFP	0.5
Other Tribe Area	3.7
Plantation	6.2
Pond Buffer 1	2.2
Pond Buffer2	2.2
Pond (Core Area)	0.9
Production (Eg. Timber Harvesting etc)	178.5
Swamp Area	43.6
Tamboo Site	2.4
Water Source	0.3
Total	**348.2**

Komuniboli Future Land Use	Hectare
Buffer Conservation Area	67.8
Core Conservation Area	28.2
Ecotourism	0.5
Garden and Settlement	7.9
Agroforestry	5.6
NTFP	0.2
Other Tribe Area	3.7
Plantation	5.4
Pond Buffer 1	2.2
Pond Buffer2	2.2
Pond (Core Area)	0.9
Production Area	122.2
Swamp Area	73.0
Tamboo Site	2.4
Water Source	0.3
Spiritual Site	25.7
Total	**348.2**

(Left): The area of each current land use area in Komuniboli village; (Right): The area of each future land use area in Komuniboli village.

Falake Current Land Use	Hectare
Conservation	76.9
Production	143.3
Plantation	19.8
Reforestation	10.0
Settlement	5.2
Tamboo Site	7.4
Water Source	2.9
Garden	37.1
Total	**302.6**

Falake Future Land Use	Hectare
Conservation	73.9
Sustainable Production	30.8
Coconut Plantation	3.3
Rehabilitation	10.0
Settlement	15.5
Kindergarten	0.2
Church	0.1
Research Facility	0.4
Tamboo Site	7.4
Water Source	2.9
Agroforestry	143.4
Ado Rural Farmer Association	1.7
Enrichment	2.5
Medicinal Plants	0.7
River Buffer	9.7
Total	**302.6**

(Left): The area of each current land use area in Falake village; (Right): The area of each future land use area in Falake village.

5.5.1 Result/ Output - Advantages

The use of aerial photographs and satellite images, particularly the drone ortho-mosaic images with high resolution, provided the opportunity for the community members to view their villages from another dimension, ie. from the sky. Such a bird-eye view is very different from the view the local community have in their daily lives, ie. on land.

1. Since the discussion was based on the location information collected by the local community members themselves, it encouraged them to understand the land use situation in a realistic and concrete manner based on evidence, rather than abstract understanding and thinking of each individual.

2. The consensus reached through discussion helped community members to understand each other and to reconcile their ideas. This will promote the sharing of information between men and women and between generations, which had been restricted in the past, and will foster a "common understanding" that will serve as the basis for making land use plans and activity plans.

3. When the community members, who are the owners and users of the land and resources, learned about their current land and resources status, they will be able to develop a sense of ownership of the pilot activities to sustainably manage and use the land and forest resources.

4. The contribution of women to the development of forest land and resources, which had been limited so far, was significant especially in the patriarchal Falake community.

5. Being inclusive could identify the differences of roles and responsibilities between women and men in their respective communities. For example, the influence of male leaders on decision-making was stronger than women in the Komuniboli community even though the women have inheritance rights to the land and resources. Meanwhile, the men in Falake hold the ownership of land and resources while women, particularly those who join the community through marriage, are not allowed to participate in decision-making processes.

6. The use of semi-structured interviews during participatory mapping process, including mapping and ground truth enabled the JICA team to learn more about their traditional custom (eg. the men in the Komuniboli community shared that

they conserve and protect water resources because fishing sites are also their custom where they fish not only for food but also practice their ancestor's lifestyle who used to be partially fishermen by the sea.), gender-based high priority resources (eg. in Komuniboli community, women mainly are responsible to agricultural crops such as fruit trees and cash crops, and poultry and pig farms in the vicinity of their daily access settlements. They are also responsible to collect resources from sago palm plantations and giant taro from cultivation areas. Men, on the other hand, are responsible for the water sources such as springs and small streams, small-scale selective logging sites, fishing grounds in the forest, and mushrooms grown on sago palm beds. In the Falake community, women are mainly responsible for crops such as fruit trees, cash crops, pig farms in the vicinity of the settlement, and leaves for Motu cooking during traditional events. Men are responsible to their plantations, ornamental plants used in traditional ceremonies, water sources and rivers, bamboo, and cash crops such as betel nuts (bottle wax) and hippopotamuses), as well as underlying issues (eg. the Falake community has started to focus on ginger cultivation because of a rumour that the price is high but they have no idea about the real market price at all.)

7. In Solomon Islands, where detailed topographic maps and watershed information are not available, the participatory mapping project allowed the community members to: 1) create a highly accurate land use map, 2) improve their three-dimensional spatial understanding of the forest land for the pilot activities, 3) communicate with each other about land and resources, 4) develop a common understanding of the location and use of land and resources by sharing information among themselves.

8. Participatory mapping conducted in the Komuniboli community and Falake community showed their differences and similarities in needs, plan, and natural resources management.

9. Maps they created through the participatory mapping process, gave them the confidence to present their LU plan. Hence, it was obvious that participatory mapping had successfully fostered the ownership over the maps and initiative.

5.5.2 Result/ Output - Disadvantages & Challenges

1. The equipment such as computer hardware, tablets, GPS, and fluorine film-laminated maps are expensive.

2. The inability of some external experts (from overseas) to stay with the community members for a long period of time because of budget constraints, hence causing some difficulty during the facilitation of participatory mapping.

3. The needs of a non-community facilitator to learn different knowledge and culture of each community because each community has their own culture although they are under the governance of the same government of Solomon Islands.

4. The difficulty for the community members to comprehend the scaled-satellite imagery maps because most of them saw their villages from the sky for the first time.

5. The ability of the community members to have a better understanding of the project depends largely on their education level and their experience about forest degradation and forest loss. For example, the Falake community understand the project conducted in their village better than the Komuniboli community because they are better educated and have experienced forest degradation and loss due to continuous deforestation.

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