CHAPTER 2: PARTICIPATORY MAPPING

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A. Introduction

Since ancient times, map-making has been an integral part of human history. Indigenous tribes have been using maps to provide directions in their constant search for safe dwellings, food gathering and hunting activities, as illustrated in the cave paintings below.

For centuries, people have been using maps to represent their environment. Maps are useful in showing locations, distances, directions, and the size of land areas. Maps also display geographic relationships, differences, clusters, and patterns. Maps are used for navigation, exploration, illustration, and

communication in the public and private sectors. Nearly every area of scientific inquiry uses maps, and therefore, maps are indispensable tools for many aspects of professional, academic, and community development work.

Simply put, a map is a representation of some part of the earth's surface drawn on a flat surface (such as paper or on a computer monitor). It is defined as "any picture, drawing or group of objects that help people understand their place; maps are scale models of reality; a reduced and simplified model of reality containing geographic information; map contains spatial information such as patterns and structures; and an analysis tool to understand spatial relationships."

From cave paintings to ancient maps of Babylon, Greece, and Asia, and towards the 21st century, computerized mapping such as the use of Geographic Information System (GIS) have evolved from the participatory rural appraisal where local communities have been using sketch maps as essential tools to define, explain, and plan their community development programs. Indeed, map-making has made a significant contribution to knowledge generation and the advancement of intellectual human development. Maps serve as a record for human history.

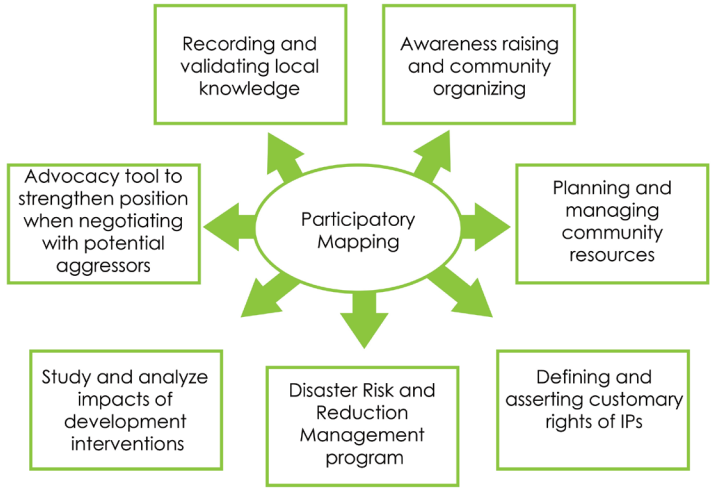
B. What is Participatory Mapping?

Participatory mapping is a set of approaches and techniques that combine the tools of modern cartography with traditional participatory methods to represent the spatial knowledge of local communities. It is based on the premise that local people are knowledgeable of their local surroundings and present conditions. Therefore, they must actively participate in community mapping activities. Participatory maps created by local communities represent the place in which they live, showing those elements they perceive as important, such as customary laws, land boundaries and traditional agricultural practices. It is important that local people control the use of

their maps containing detailed information about social, economic, and political trends, which they can use for community development.

C. Relevance of Participatory Mapping

Participatory mapping is a way of encouraging and empowering communities to take action with informed decisions, based on data they gather in the mapping activities. The information obtained in community mapping, along with community profiles, public consultations, and focus group discussions, can be used in community assessment and planning by identifying problems and opportunities as these relate to existing socio-economic systems and political structures in the community. Such information can be used for research and advocacy, community organizing, capacity building, and land use planning. It can also be extremely invaluable in managing community resources, disaster risk reduction and management, as well as the delivery of basic social services, with support from the local government, the private sector, the academe, and civil society organizations as shown in the figure below:



For indigenous communities, participatory mapping is used for planning the sustainable management of their natural resources (PAFID, Tebtebba Foundation). It is a powerful tool for collective analysis and entry point for community organizing for local people to:

- be more critical about different types of development interventions in their locality;
- counter existing State policies that are discriminatory to indigenous peoples;
- gain full access and rights over productive and natural resources;
- document and manage their human and natural resources;
- prepare for natural disasters and improve the status of their general well-being; and,
- support informed decision-making as basis for policy advocacy towards community development.

Participatory mapping is an essential component for the development of the Ancestral Domain Sustainable Development and Protection Plan (ADSDPP), which can be used for land use planning, decision-making, and advocacy. It is a process where the indigenous peoples, including women and the youth, are active partners and not merely passive recipients of government programs or services. The indigenous peoples' global partnership has identified five domains fundamental in indigenous peoples' pursuit of self-determined development. But this can also be applied to small farmers and upland dwellers.

D. Different Types of Participatory Mapping

Participatory mapping emerged from participatory action research, which has been widely recognized worldwide. Map making is a way of bringing subordinated voices into a tangible and visible medium for negotiation and greater collaboration with the government and other stakeholders. In this regard, community mapping can be a tool for land rights advocacy and

the management of natural resources (IAPAD, 2017; Tebtebba Foundation; IFAD, 2011)

Basically, there are two major categories of community mapping, to wit:

D1. Traditional Mapping Techniques

a) Sketch mapping **-** where community members draw maps on the ground or on paper based on their collective memories. The maps represent salient features of the land and other natural resources from a community's perspective. The community members do not rely on exact measurements and do not use a consistent scale or geo-referencing. They do show the relational size and position of features. Commonly associated with Participatory Rural Appraisal and related initiatives.

b) Scale mapping **-** presents accurate geo-referenced data. A scaled map means that a distance measured anywhere on the map always represents (depending on the scale) the equivalent distance on the ground, e.g.

one centimeter on the map equals one kilometer on the ground. Scaled maps are often referred to as 'base maps' by mapping practitioners. This method is commonly used where accurate and affordable scale maps are available. Local people are gathered and they are asked to discuss and draw a map based on the identified landmarks and spatial features: rivers, mountains, lakes, etc.

c) ***Eco-cultural Mapping*** **-** a method that collects indigenous peoples' perception concerning forest areas, grasslands, cultivated areas, water sources, sacred places, and natural resources within their domain. The community members are gathered and consulted about their agricultural practices, cultural norms, and traditional beliefs. The eco-cultural maps are drawn showing the community and geographic boundaries; the roads, water sources, cropland, pastureland, forested areas, etc., including major community infrastructures.

d) ***Participatory 3D Models*** **-** are created from the template of a topographic map where pieces of cardboard or rubber sheets are cut in the shape of the contour lines and pasted on top of each other. The model is then finished with wire nails, glue, plaster, and paint. Geographic features are depicted on the model using push pins (for points), colored string (for lines) and paint (for areas). A scaled and geo-referenced grid can be placed in the model to facilitate proper digitalization.

D2. Computerized Mapping Techniques

e) ***Geographic Information System (GIS)*** **-** is a collection of computer hardware, software, geographic data, and personnel assembled to capture, store, retrieve, update, manipulate, analyze, and display geo-referenced information.

f) ***Participatory GIS (PGIS)*** **-** is the fusion of participatory mapping with modern mapping techniques using GIS technology to capture data, manage, analyze, store, and present geo-referenced spatial information. These include spatial data management tools that can work with enabling tools such as imagery, Global Navigation Satellite System (GNSS).

PGIS technology used to be complicated and expensive but since the 1990s, the PGIS movement – spearheaded by NGOs and the academe – have tried to integrate local knowledge and qualitative data involving computer experts to transfer the technology locally as part of capacity building for community empowerment. PGIS has been used to influence policy makers. Practitioners place the control, access, and use of culturally-sensitive spatial data in the hands of the local people, thereby protecting traditional knowledge and wisdom from external exploitation.

g) ***Multimedia and Internet-based Mapping*** **-** can combine the usefulness of maps with other embedded digital media – such as video, images and audio – for information, education, and communication to the general public.

h) ***Google Earth*** **-** is an open source software that can be downloaded from the internet which has the satellite imagery of the Earth, is also being used by some local communities to map their land uses, as well as to locate their forests and other natural resources.

E. Basic Concepts of PGIS[4]

1. What is PGIS?

PGIS practice combines a range of geospatial information management tools and methods such as sketch maps, participatory 3D models (P3DM), aerial photographs, satellite imagery, GPS, and GIS to represent peoples' spatial knowledge as virtual or physical or two- or three-dimensional maps. These are used as interactive vehicles for spatial learning, discussion, information exchange, analysis, decision making, and advocacy. PGIS implies making global information technology (GIT) available to disadvantaged groups in society in order to enhance their capacity to generate, manage, analyze, and communicate spatial information (Rambladi, 2017).

2. Brief History of PGIS

The participatory creation of maps began in the late 1980s, whereby development practitioners have been using Participatory Rural Appraisal (PRA) methods – such as sketch-mapping (Mascarenhas and Prem Jumar, 1991), rather than scale mapping – which is more complex and time-consuming. PRA practitioners preferred to elicit local knowledge and build on local dynamics to facilitate communication between insiders (e.g. villagers) and outsiders (e.g. researchers and government officials). This approach placed little emphasis on charting courses of action that would enable ordinary people to interact efficiently with policy-makers. The situation was further compounded by State control of aerial photography, satellite imagery and large-scale topographic maps, under the pretext of national security concerns.

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[4] The main source of this section: *Introduction to PGIS Practice: Handbook for Trainees,* Rambladi, G., June 2017 retrieved from www.iapad.org last 29 June 2017.

The state of affairs in mapping changed in the 1990s, with the diffusion of modern spatial information technologies (including GIS, global positioning system (GPS), remote-sensing image analysis software, and open access to spatial data and imagery via the Internet). With the steadily decreasing cost of computer hardware and the availability of user-friendly software, spatial data that were previously controlled by government institutions became progressively more accessible to, and mastered by, civil society organizations (CSOs) and community-based organizations, minority groups, and sectors of society traditionally disenfranchised and excluded from spatial decision-making processes (Fox, et. al., 2003).

The new environment facilitated the integration of geospatial information technologies and systems (GIT&S) into community-centered initiatives. Practitioners and researchers around the world were able to adopt a range of GIT&S to integrate multiple realities and diverse forms of information. Their objectives were to empower underprivileged groups, promote social learning, support two-way communication, and thereby broaden public participation across socio-economic contexts, locations, and sectors. This merging of community development with geospatial technologies to empower less-privileged communities has come to be known as Participatory GIS (PGIS) practice.

3. Significance of PGIS

PGIS practice implies making GIT&S available to less-favored groups in society to enhance their capacity to generate, manage, and use their own indigenous spatial knowledge (ISK) and externally-generated spatial information in contexts such as:

- self-determination (e.g. protecting ancestral land and resource rights and entitlements);

- management and amelioration of conflicts among local community groups and between communities and local authorities regarding access, use, control, and allocation of natural resources;
- collaborative research;
- collaborative resource-use planning and management;
- preservation of intangible cultural heritage and identity building among indigenous people and rural communities;
- good governance regarding transparency and consensual spatial decision making;
- raising awareness and assisting with education and social learning for new generations;
- community-based hazard management and risk reduction (Gaillard and Maceda, 2009); and,
- promotion of equity regarding ethnicity, culture, gender and environmental justice.

More importantly, PGIS facilitates the building on ISK, such as:

- resource distribution: land cover and use, water sources, habitats;
- resource use, control and access:[5] hunting, fishing, farming, grazing, mining, gathering, and harvesting from the wild;
- places of historic, cultural, and religious significance; ancestral grounds and sacred areas;
- indigenous names; cosmovisions, creation, and origin myths; and,
- hazard perception (e.g. landslides, floods, malaria).

ISK may complement "scientific knowledge" in cases related to resource location, water conservation, or livestock management. In such cases, ISK might be considered more relevant to the

[5] Different maps on resource-use control and access can be produced for the same area by different groups in society. Of particular interest are the differentiated spatial perspectives of women, elderly people, youth and children (re: gender and age-related areas).

participatory process than the technology because it embodies generations of people's practical knowledge. Some ISK is cognitively different from scientific knowledge (i.e. mental maps). Mental maps may incorporate overlapping or layered zones, blurred or multiple boundaries, and uncertain or restricted locations (McCall, 2004).

4. Prospects and Challenges for PGIS Application

PGIS practice currently faces a number of methodological and implementation issues. The sociopolitical context that provides the basis for PGIS applications often alters the interaction between the PGIS organization and local institutions as the established structures cooperate to alienate the new organizations. Further, community-based PGIS organizations in the South are resource-poor and often need to conform to pre-set data standards, software models and the views and dictates of local elites and external experts (Sieber, 2000). This leaves the PGIS organization vulnerable to being co-opted by public officials and agents that oppose its agenda.

As PGIS becomes a more widespread and accepted development practice, there is evidence that local elites and State agencies are attempting to control the practice as they have for decades with conventional development projects. PGIS projects in developing countries are often externally driven and geared towards data management instead of community empowerment. Some technocrats advocate for more robust technology transfer to ensure sustainability of PGIS projects.

When decisions are taken to implement geospatial technologies in community levels, important questions need to be addressed: Whose GIS is it? Whose questions are addressed? Who sets the agenda? What will happen when experts leave or when donor funding dries up? What is left with those who generated the data and shared their knowledge?

Even though PGIS applications have become widespread and computers and GIT&S are getting cheaper and more user-friendly, it is still difficult for community-based organizations to raise the required capital and recruit experts to implement, maintain, and sustain "high-tech" GIT&S. Also, the technology is believed to be limited in incorporating subjective values (which abound in the realm of ISK) into the quantitative analyses that occur in GIS applications (Heywood, et. al., 1995).

The nature and form of participation are also critical factors in determining the outcome of the community empowerment process. We know that public participation takes on different forms (Weidermann and Femers, 1993), and each has serious implications for community involvement and empowerment.

The issue of "scale" is of interest because different community issues and questions require a particular scale of analysis. Also important is the degree of spatial or locational "precision" (or accuracy) which is required or appropriate in participatory (i.e. local-level) spatial planning (Minang and Rambladi, 2004).

PGIS often involves integrating local and modern scientific knowledge for applications that can potentially empower local communities. Because this involves combining low and high technology, questions arise about accuracy tradeoffs, reliability, and acceptability.

Other critical aspects include: identifying avenues for institutionalizing PGIS practice within local planning and development agencies (if appropriate); mechanisms for ensuring protection of privacy and intellectual ownership of local knowledge; and promoting control of and access to data and information by those who generated such data. There is a need to evaluate the experiences (failures and successes), develop guidelines and strategies for good practice, and for the sound adoption of PGIS to meet the needs of different groups within the developing world.

5. PGIS in Practice

PGIS practice is geared towards community empowerment planning (Minang and Rambladi, 2004). through measured, demand-driven, user-friendly, and integrated applications of geospatial technologies. GIS-based maps and spatial analyses become major conduits in the process. A good PGIS practice is embedded into long-lasting spatial decision-making processes, is flexible, adapts to different socio-cultural and biophysical environments, depends on multi-disciplinary facilitation and skills, and builds essentially on visual language. The practice integrates several tools and methods, while often relying on combining "expert" skills with socially-differentiated local knowledge. It promotes interactive participation of stakeholders in generating and managing spatial information and uses information about specific landscapes to facilitate broad-based decision-making processes that support effective communication and community advocacy.

If appropriately used, the practice could exert profound impacts on community empowerment, innovation, and social change. More importantly, PGIS practice could protect traditional knowledge and wisdom from external exploitation by placing control of access and use of culturally sensitive spatial information in the hands of those who generated it.

Producing, georeferencing and visualizing ISK helps communities engage in peer-to-peer dialogue, promote their particular issues and concerns with higher-level authorities, and address economic forces.

Maps based on ISK are also used in adversarial contexts, such as in counter-mapping where indigenous communities adopt participatory mapping methodologies to regain a measure of control over ancestral lands and resources.

PGIS is a component of an integrated and multifaceted process that provides legitimacy for local knowledge, generates a great sense of confidence and pride among people who are involved in the process, and prepares them to deal with outsiders. The process fuels self-esteem and raises awareness about pressing issues in the community. Experiences from the Philippines have shown that exercises conducted at the community level in response to local needs have fostered community cohesion and identity building, as shown in Box 2. ■

BOX.2. Participatory Resource Valuation Research Using PGIS: An initiative by Farming Communities in Nueva Vizcaya in the Philippines

Introduction/Context

Indigenous communities and landless familes were threatened by the operations of three big Australian mining companies in Nueva Vizcaya, Northern Philippines.

The State issued policy statements supporting the implementation of mining operations in the Philippines. Unfortunately, there was very limited information of the communities that would be affected by the mining industry. Thus, almost all current government data does not show the impact of the mining operations on the livelihood and land rights of the people.

In this context, the community leaders asked the assistance of PAFID and the Tides Foundation to prove to the Philippine Government that they exist and that they have livelihoods that will be affected. The farming communities in Nueva Vizcaya have been one of the most rapidly increasing upland populations in the Philippines.

PGIS Application

A community-based resource valuation research was designed by the CSOs, together with the community, aimed at identifying the affected communities and computing the value of local investments which will be affected by the mining operations.
A series of community workshops were conducted to facilitate the construction of the 3D models at the village level. Basically, the process involved the merging of traditional spatial information with modern technologies called Participatory Geographic Information System.

Using pushpins, the location of various important geographical features, such as houses, ritual areas, graveyards, resource gathering areas, and trap setting areas, were identified. The agricultural areas used for farming were color-coded according to crops planted. Thereafter, the data were transposed into a formal GIS via a digitizing software. At this point, the local communities directly traced the information from the 3D model using transparent thin plastic sheets. All the information represented by lines, points, and polygons were traced using color-coded permanent marker pens.

PGIS Application

Twenty seven villages representing 97 percent of the population affected by the three mining permits actively supported the participatory 3-D modelling and PGIS process. Unfortunately, there was very limited information of the communities that would be affected by the mining industry. The values of the total agricultural investments of at least 9,000 familes were computed and consolidated. Likewise, the costs of other local investments, e.g., social infrsutructure, were computed.

A formal GIS database covering all spatial data of the affected communities was developed by PAFID in collaboration with Tebtebba Foundation and the community members. The results of the data gathered were used to facilitate the analysis of the community, with technical support from other groups and experts from other sectors.

More than 270 community members were trained in basic spatial analysis and community mapping. The local municipal government adopted the results of the research to resolve internal boundary conflicts and used the data for land use planning. Hopefully, a resource valuation, combined with local peoples' ideas with scientifically established techniques such as cost-and-return analysis and cash flow analysis, would be undertaken in the future.

Opportunities for Scaling-up

The positive experiences of PAFID field workers encouraged them to fully develop PGIS in various regions of the country to help marginalized groups such as small farmers and fishers. In fact, the spatial data of other sectors were generated and analyzed.

As a result, five 1:5000-scale 3D models were constructed by CSO workers with the active participation of local communities. The communities' resource use patterns were drawn on the models by the local people using pushpins (for points), yarns (for lines), and paint (for polygons), which constitute the 3D modelling

The data became part of the publication entitled *"Mining or Food?"* which analyzed the adverse impacts of open pit mining operations on local communities in the Philippines; and the authors of the book recommended alternative courses of action to protect the enivironment and the people's welfare. The book's launching was supported by no less than Senator Aquilino Pimentel, the author of the Philippines' Local Government Code. It was also presented in the British Parliament by a CSO leader of Tebtebba, with the support of MP Claire Short. Formal meetings and dialogues with mining companies were conducted in Manila by the team composed of the authors of the book. ■

Source: PAFID

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