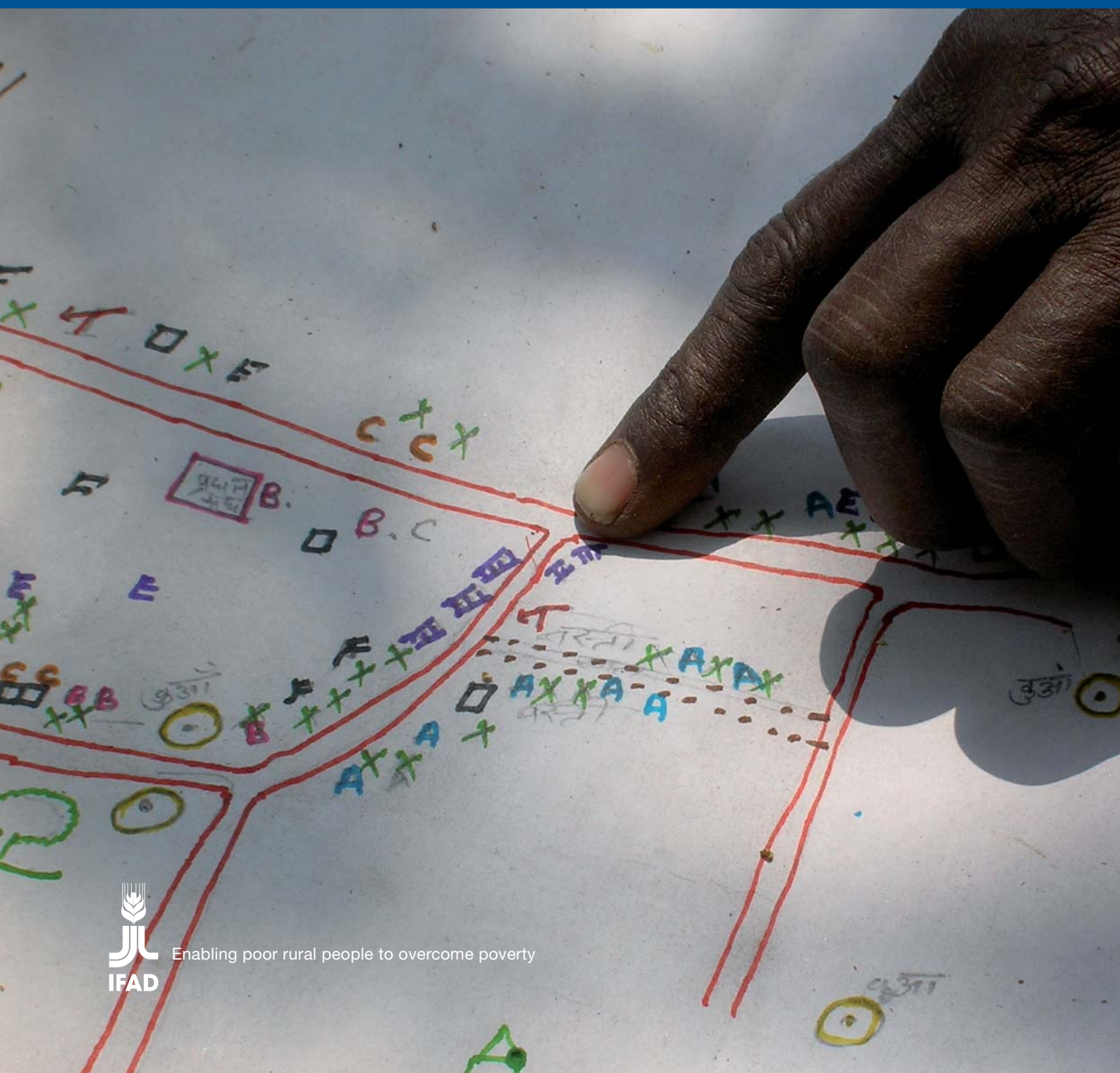


Good practices in participatory mapping

A review prepared for the
International Fund for
Agricultural Development (IFAD)



Enabling poor rural people to overcome poverty

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Cover:

Participatory evaluation of community empowerment project
for access to land, Uttar Pradesh, India.

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Table of contents

Foreword	2
Introduction	4
1. What is participatory mapping?	6
2. Participatory mapping applications	8
3. Participatory mapping tools	13
Hands-on mapping	13
Participatory mapping using scale maps and images	14
Participatory 3-D models (P3DM)	15
Geographic Information Systems (GIS)	17
Multimedia and Internet-based mapping	17
4. Participatory mapping best practices and processes	20
Presence of enabling or disabling environments	20
Roles of development intermediaries	25
Awareness of mapping impacts	28
The importance of process	30
5. Conclusions	39
Annex A. Matrix of participatory mapping tools	40
Annex B. IFAD related projects and documents consulted in the writing of this review	51
Bibliography	53
Boxes	
Box 1 Cultural mapping in Peru	8
Box 2 Participatory land-use planning (PLUP) in Thailand	9
Box 3 Mapping ancestral domains in Northern Mindanao (a PAFID-IFAD project)	10
Box 4 Talking maps in Peru	11
Box 5 GIS and conflict resolution in Ghana	12
Box 6 Conflicting mapping legislation in the Philippines	21
Box 7 Steps for community land delimitation in Mozambique	22
Box 8 Action Against Hunger (AAH) mapping in Nicaragua	25
Box 9 Ingredients for sound relationships	26
Box 10 Free, prior and informed consent	28
Box 11 Reaching consensus on boundaries in Albania	29
Box 12 Six stage mapping process	30
Box 13 Questions to determine the purpose for creating a map	33
Box 14 Gender and decision-making	34
Box 15 Participatory mapping for planning: IFAD's process in Tunisia	35
Box 16 Gradations of participation	36
Box 17 Questions to ask when evaluating participatory maps	37

Foreword

The International Fund for Agricultural Development (IFAD) is an international financial institution and a specialized United Nations agency dedicated to eradicating rural poverty in developing countries. Working with poor rural people, governments, donors, non-governmental organizations (NGOs) and many other partners, IFAD focuses on country-specific solutions to empower poor rural women and men to achieve higher incomes and improved food security. One of the challenges IFAD continues to face in agricultural and rural development work is identifying effective ways to involve poor communities, particularly the poorest and most vulnerable, in planning, managing and making decisions about their natural resources.

This is especially important in dealing with pastoralists, indigenous peoples and forest dwellers that find themselves and their livelihoods disproportionately threatened by climate change, environmental degradation and conflict related to access to land and natural resources. The ongoing uncertainties brought about by climate change and climate variability (such as the timing and intensity of weather patterns) increase their vulnerability and intensify pressure on their resource base and conflicts among resource users. Because a key asset for pastoralists, indigenous peoples and forest dwellers is their knowledge of the local environment, an approach is needed to ensure that this collective wisdom will influence their capacity for planning and managing natural resources.

To address these concerns, IFAD, in collaboration with the International Land Coalition (ILC), has implemented since October 2006 the project 'Development of Decision Tools for Participatory Mapping in Specific Livelihoods Systems (Pastoralists, Indigenous Peoples, Forest Dwellers)'. Participatory mapping is not new to IFAD; it has been undertaken to varying degrees in a large number of projects. However, within the institution there remains limited knowledge about how a systematic approach could contribute to addressing conflict-related issues and improving community ownership in sustainable environmental and natural resource management. This project aims to i) create a better understanding of the potential for participatory mapping to empower vulnerable groups to sustainably manage their resources; and ii) develop an IFAD-wide approach to participatory mapping to enable a more systemic implementation of these activities within IFAD-supported programmes.

This review was prepared by Jon Corbett, University of British Columbia Okanagan, in collaboration with the Consultative Group¹ of the project. The review is intended to strengthen IFAD's knowledge about participatory mapping tools and provide the basis for developing IFAD's step-by-step methodology. The review has been compiled from an extensive desk review, knowledge gained from the International Workshop on P-Mapping and Forestry organized by the ILC and the National Association of Communal Forest and Pasture (NACFP),² and field visits to Kenya, Mali and Sudan.

Our role as responsible development partners is to support local communities to solve their challenges in managing their natural resources in a sustainable manner. If such support is not provided, achieving the MDGs – particularly MDG 1 (eradicate extreme poverty and hunger) and 7 (ensure environmental sustainability) – is at risk. IFAD is committed to joining efforts with our development partners to ensure that affected communities are empowered to engage in the decision-making processes regarding the natural resources upon which their survival depends.

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On behalf of

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² The 'Sharing Knowledge on Participatory Mapping for Forest and Pasture Areas' Workshop was held in Tirana from 27 to 31 May 2007.

Introduction

“Maps are more than pieces of paper. They are stories, conversations, lives and songs lived out in a place and are inseparable from the political and cultural contexts in which they are used.”

Warren, 2004

The past 20 years have witnessed an explosion of participatory mapping initiatives throughout the world, in both developing and developed countries. Participatory mapping is, in its broadest sense, the creation of maps by local communities – often with the involvement of supporting organizations including governments (at various levels), non-governmental organizations (NGOs), universities and other actors engaged in development and land-related planning. The International Fund for Agricultural Development (IFAD) supports many projects that use participatory mapping processes and tools to assist in resource decision-making, a number of which were used in this review.

Participatory maps provide a valuable visual representation of what a community perceives as its place and the significant features within it. These include depictions of natural physical features and resources and socio-cultural features known by the community. Participatory mapping is multidisciplinary. What makes it significantly different from traditional cartography and map-making is the process by which the maps are created and the uses to which they are subsequently put. Participatory mapping focuses on providing the skills and expertise

for community members to create the maps themselves, to represent the spatial knowledge of community members and to ensure that community members determine the ownership of the maps and how and to whom to communicate the information that the maps provide. The participatory mapping process can influence the internal dynamics of a community. This process can contribute to building community cohesion, help stimulate community members to engage in land-related decision-making, raise awareness about pressing land-related issues and ultimately contribute to empowering local communities and their members.

The general aims and specific objectives of participatory mapping initiatives vary significantly. This variation is directly related to the end-use to which these maps will be put, which in turn is influenced by the audience that will view and make decisions about the content of these maps. Maps may be made exclusively for internal community consumption or (more commonly) they may be used to communicate local land-related knowledge to outsiders. Many examples of IFAD projects referenced in this document focus on using maps as a mechanism to facilitate the communication of community spatial information to project management and local government to better target development interventions.

Participatory mapping projects can also take on an advocacy role and actively seek recognition for community spaces through identifying traditional lands and resources, demarcating ancestral domain and, in some

cases, being used as a mechanism to secure tenure. Participatory maps play an important role in helping marginalized groups (including indigenous, pastoralist and forest dwellers) work towards legal recognition of customary land rights. NGOs, from small local ones to large international ones, often play a crucial role as interlocutors, trainers, advocates and facilitators in community-mapping initiatives. A number of projects supported by the International Land Coalition (ILC) focus on the role of maps for advocacy.

Often participatory mapping initiatives are initiated by outsider groups and the maps produced will contribute to an outsider's agenda. In IFAD's case, that might include using the maps to assist in collaborative spatial planning exercises, land-related research and analysis, amelioration of land and resource conflicts, or assessing local development potential. The levels of community involvement and control over the mapping process vary considerably among projects. It should be noted that maps are increasingly being created by marginalized communities on their own initiative and without the impetus from outsiders. This is especially the case with indigenous First Nations communities in Western Canada who see the potential for participatory maps to document their historical and cultural association with the land in order to influence land claims and stimulate interest of local spatial knowledge among their communities' youth.

Participatory mapping uses a range of tools including data collection tools that are commonly associated with Participatory Learning and Action (PLA) initiatives. These tools include mental mapping, ground mapping, participatory sketch mapping, transect mapping and participatory 3-dimensional modelling. Recently participatory mapping initiatives have begun to use more technically advanced geographic information technologies including Global Positioning Systems (GPS), aerial photos and remote-sensed images (from satellites), Geographic Information Systems (GIS) and other digital computer-based technologies.

The breadth of tools available makes participatory mapping highly flexible and valuable in development initiatives. Yet these mapping initiatives can be ineffective and generate confusion and conflict if implemented without a working knowledge of cartography, participatory development processes and community facilitation and organization skills.

This report will review existing knowledge related to participatory mapping and recent developments. Specifically

- Section 1 will define the main features of participatory mapping;
- Section 2 will discuss key applications of participatory mapping;
- Section 3 will present specific tools used in participatory mapping, including their strengths and weaknesses;
- Section 4 will identify good practices and explore the significance of process in participatory mapping initiatives.

1. What is participatory mapping?

“Maps are not neutral instruments but have both cadastral and political contexts.”

Cooke, 2003 (p. 266).

Since the 1970s, development efforts have sought to support and promote community engagement in decision-making through the creation and use of diverse participatory methodologies that gather, analyse and communicate community information. These methods are incorporated into broader development models which have matured from the extractive Rapid Rural Appraisal (RRA) through Participatory Rural Appraisal (PRA), culminating in Participatory Learning and Action (PLA). These are commonly understood as a “growing family of approaches, methods, attitudes and beliefs that enable people to express and analyse the realities of their lives and conditions, to plan themselves what action to take and to monitor and evaluate the results” (Chambers, 1997, p. 102). Many IFAD projects with a land-use management and community engagement component use these tools to inform the project delivery process.

Of all the participatory development methods that have been adopted, adapted and applied in a development context, it is “participatory mapping that has been the most widespread” (Chambers, 2006, p.1). There are a rapidly growing number of participatory mapping initiatives throughout the world. These initiatives are often referred to using different terms including participatory mapping, indigenous mapping,

counter mapping and community mapping. Though there are differences among initiatives in their methods, applications and users, the common theme linking them is that the process of map-making is undertaken by a group of non-experts who are associated with one another based on a shared interest. For the sake of simplicity, this report will refer to these different mapping types generically as participatory mapping.

Participatory mapping is a map-making process that attempts to make visible the association between land and local communities by using the commonly understood and recognized language of cartography.

As with any type of map, participatory maps present spatial information at various scales. They can depict detailed information of village layout and infrastructure (e.g. rivers, roads, transport or the location of individual houses). They can also be used to depict a large area (e.g. the full extent of a community’s traditional use areas, including information related to natural resource distribution and territorial boundaries). Indigenous peoples, forest dwellers and pastoralists often inhabit large areas that until recently have been considered marginal; however, these areas are increasingly being valued for the resources that they contain. Participatory maps are not confined to simply presenting geographic feature information; they can also illustrate important social, cultural and historical knowledge including, for example, information related to land-use occupancy and mythology, demography,



Participatory mapping by Bakgalagadi pastoralists and San hunter-gatherers in Botswana

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ethno-linguistic groups, health patterns and wealth distributions.

Participatory mapping projects have proliferated throughout the world over the past 20 years, from Southeast Asia (i.e. Indonesia and the Philippines) through Central Asia, Africa, Europe, North, South and Central America to Australasia. Many different types of communities have undertaken mapping projects, ranging from relatively prosperous urban groups in northern Europe and America to forest-dwelling indigenous groups in the tropics.

Participatory maps often represent a socially or culturally distinct understanding of landscape and include information that is excluded from mainstream maps, which usually represent the views of the dominant sectors of society. This type of map can pose alternatives to the languages and images of the existing power structures and become a medium of empowerment by allowing local communities to represent themselves spatially. Participatory maps often differ considerably from mainstream maps in content, appearance and methodology.

Criteria used to recognize and denote community maps include the following:

- *Participatory mapping is defined by the process of production.* Participatory maps are planned around a common goal and strategy for use and are often made with input from an entire community in an open and inclusive process. The higher the level of participation by all members of the community, the more beneficial the outcome because the final map will reflect the collective experience of the group producing the map.
- *Participatory mapping is defined by a product that represents the agenda of the community.* It is map production undertaken by communities to show information that is relevant and important to their needs and is for their use.
- *Participatory mapping is defined by the content of the maps which depicts local knowledge and information.* The maps contain a community's place names, symbols, scales and priority features and represent local knowledge systems.
- *Participatory mapping is not defined by the level of compliance with formal cartographic conventions.* Participatory maps are not confined by formal media; a community map may be a drawing in the sand or may be incorporated into a sophisticated computer-based GIS. Whereas regular maps seek conformity, community maps embrace diversity in presentation and content. That said, to be useful for outside groups, such as state authorities, the closer the maps follow recognized cartographic conventions, the greater the likelihood that they will be seen as effective communication tools.

2. Participatory mapping applications

“More indigenous territory has been claimed by maps than by guns. This assertion has its corollary: more indigenous territory can be defended and reclaimed by maps than by guns.”

Nietschmann, 1995 (p. 37).

Although there are many reasons why a community might engage in a participatory mapping process, this report identifies six broad purposes for initiating a participatory mapping project. These six purposes directly support IFAD’s vision of livelihood security and poverty reduction laid out in its

Strategic Framework 2007-10. Specifically, IFAD seeks to

- work with national partners to design and implement innovative programmes and projects that fit within national policies and systems. These initiatives respond to the needs, priorities, opportunities and constraints identified by poor rural people.
- enable poor rural people to access the assets, services and opportunities they need to overcome poverty. Furthermore, IFAD helps them build their knowledge, skills and organizations so they can lead their own development and influence

Box 1 **Cultural mapping in Peru**

The Southern Highlands Development Project is an IFAD operation in Peru that started in April 2005. It uses community mapping techniques to plan the support the project will provide communities for increasing the value of their natural and physical assets. The project uses cultural maps that are designs or models prepared by the communities to indicate their perceptions of the past, present and future of the local environment and surrounding areas. In their cultural map of the future, they express what they would like their community to become and in a public presentation they express what kind of support they need from the project to achieve that. Cultural maps are elaborated by the communities with the support of a facilitator who is someone from the same community who has been trained by the project. This planning instrument is being used for

- improving the management of natural resources;
- documenting tangible and intangible resources, such as cultural features or traditions of the communities;
- identifying economic initiatives based on the resources.

One rural municipality has used cultural maps for planning its Annual Plan of Operations.

Box 2

Participatory land-use planning (PLUP) in Thailand

PLUP is a technique to involve community members in exploring and contributing to local and regional land-use planning issues. It begins with a series of participatory mapping processes to classify natural resources at the village level. Puginier (2001) describes a PLUP process initiated in a number of villages in Mae Hong Son province, Thailand. The aims of the project were improved sustainable use of land, water and forests, rehabilitation of watershed catchment areas and intensified agricultural production on suitable land. Three-dimensional topographic models were used for demarcating highland areas under shifting cultivation, areas of permanent cultivation, community forest available for use and conservation/watershed forest. These models were used to generate discussion among community members and to develop local management strategies. Information derived from these processes was incorporated into a GIS. Despite successes at the local level, there were difficulties in scaling up results from the local level into regional level decision-making processes. Puginier notes that this is because of the lack of a legal framework necessary for these tools to be formally recognized and implemented at the regional level.

the decisions and policies that affect their lives.

- test new and innovative approaches to reducing poverty and share the related knowledge widely with IFAD member countries and other partners to replicate and scale up successful approaches.

The six purposes for initiating a participatory mapping project that support this vision are described below.

1. To help communities articulate and communicate spatial knowledge to external agencies

Participatory maps have proved to be an effective, legitimate and convincing media to demonstrate to external agencies how a community values, understands and interacts with its traditional lands and immediate space. Maps present complex information in a well understood and easily accessible format. This enables groups with language and cultural barriers and differences in land-related values and world views to easily communicate and understand the information presented. In the words of Doug Aberley (1993, p. 4), "maps can show a vision... more clearly than thousands of words." This, in turn, can contribute to a community's ability

to influence public policies and institutions and exercise greater negotiating power in the market (an explicit aim of IFAD).

2. To allow communities to record and archive local knowledge

Local communities, and indigenous groups in particular, are increasingly using participatory maps to record and store important local knowledge and cultural information. Development and rapid removal from traditional land bases have encouraged indigenous groups, and organizations working with them, to use mapping projects to collect and preserve cultural histories and to record their elders' knowledge about their land. This information is being recorded in the fear that it will otherwise be lost as the older generations pass away and traditional ways of life change. Having a clear record of local spatial knowledge will enhance the capabilities of poor and indigenous communities to inform and thus influence a more culturally sensitive approach to development.

3. To assist communities in land-use planning and resource management

Participatory maps can be a medium to help plan the management of traditional lands and make community knowledge about lands and

Box 3

Mapping ancestral domains in Northern Mindanao (a PAFID-IFAD project)

The Philippine Association for Intercultural Development (PAFID) is a social development organization that for 30 years has assisted indigenous communities in regaining and securing their ancestral domains. Although the Philippine Government, through the Department of Environment and Natural Resources (DENR), has already recognized some ancestral domain claims in Northern Mindanao, the boundaries of these domains have not been properly identified and mapped. This situation has caused frustration within the communities whose claims have been either rejected or ignored for nearly a decade.

The PAFID-IFAD project was implemented for three years (2003-2006) and its overall goal was to bring about full recognition of the rights of indigenous communities over their ancestral domains. The project provided support to the indigenous peoples' communities that had initiated negotiations with the government for the legal recognition of their ancestral domains in the Caraga region of Northern Mindanao. The project focused on achieving its aims using (i) participatory community mapping; (ii) ancestral domains management planning; and (iii) capacity-building. The project benefited some 12,000 indigenous peoples from 1,600 families in nine communities, for a combined claim of about 100,000 hectares of ancestral domains.

resources visible to outsiders. They have helped communities communicate their long, but often invisible, history of managing resources. This might include identifying and locating specific natural resources such as forest products, medicinal plants, grazing lands, water sources, hunting and fishing grounds, fuel sources and building materials (McCall, 2002). Maps can also be an excellent medium to articulate and communicate desired management plans to regional planners (e.g. for input into bioregional maps) (Aberley, 1993). With the rapid uptake of participatory GIS technologies, participatory mapping projects are increasingly beginning to contribute to planning and managing local resources by enabling community information to be incorporated directly into, and compared with, government planning information and processes. Articulating these management systems through maps can increase a community's ability to access productive natural resources and technologies as well as promote decentralized management of those resources (an explicit aim of IFAD).

4. To enable communities to advocate for change

Within the broad participatory mapping toolbox, counter-mapping is the map-making process whereby local communities appropriate the state's techniques of formal mapping and make their own maps to bolster the legitimacy of customary claims to land and resources (Peluso, 1995). These maps are viewed as alternatives to those used by government, industry and other competing outside groups. They become a tool in a broader strategy for advocacy. They present communities' claims, which often do not coincide with the government's ideas of who has rights to particular areas of land.

In a number of cases throughout the world (but particularly where indigenous people and their land claims are prevalent), counter-maps have been used to demarcate and demand ownership over areas of customary land that have been appropriated by the state. For example, in British Columbia in Canada, the Gitksan and Wet'suwet'en First Nation bands have used maps in their attempts to have their native sovereignty recognized by provincial and federal governments. At times, participatory mapping initiatives have

Box 4

Talking maps in Peru

The Management of Natural Resources in the Southern Highlands Project (MARENASS), cofinanced by IFAD and the Ministry of Agriculture of Peru, has developed a participatory mapping methodology called Talking Maps. It depicts layers of information documenting past, present and future scenarios that reflect the most important aspects of the local territory and the management of natural resources.

From the experience of MARENASS, the maps depicting the past show that natural resources were better managed and conserved 20 to 30 years ago. Maps of the present highlight the problems that communities face, including a shortage of resources, conflict and poverty. Maps of the future envision the hopes and dreams of the community; they are used to encourage community members to plan and commit to positive change.

The Talking Maps project has successfully contributed to local communities evaluating their current circumstances and strategizing on how to improve things in the future. Furthermore, the maps have contributed to solving a number of long-term land-related conflicts.

succeeded in empowering grassroots efforts to hold governments accountable for poor decisions related to land and resource use and allocation. In the case of counter-maps, map-making has become a form of political action that is capable of bringing about change.

5. To increase the capacity within communities

Often the benefits of participatory mapping initiatives are far wider and more intangible than those that result simply from map production and use. One of the greatest strengths of these initiatives is the ability of the mapping process to bring community members together to share their ideas and visions, which can contribute to building community cohesion (see Alcorn, 2000). With indigenous people in particular, when elders share traditional place names and histories with other members of the community through the map-making process, it can generate a resurgence of interest in their local knowledge, especially among community youth. This can help a community sustain a sense of place and a connection to the land which in turn will help reinforce a sense of identity.

The map-making process can also act as a focus for discussions that will assist with recognizing assets, concerns and issues within

the community. Discussions might raise community awareness about local and regional environmental issues or amplify community capacity to manage and protect lands. During the course of these discussions, a community can formulate a common vision, which in turn may help develop an effective community-based plan for future land-related development. Participatory mapping is not simply about being an expert cartographer, but about community building.

Once a community has a clear understanding of its own identity and a vision for the future, it will be in a stronger position to effectively communicate and deal with external agencies and it will be more likely to be involved in planning for its own future (all of which are important aims of IFAD).

6. To address resource-related conflict

Participatory mapping can be used to manage (i.e. avoid and reduce) conflicts between a community and outsiders and to address internal conflicts. Maps can represent a conflict graphically, placing the parties in relation to the problem and in relation to each other. Through delineating boundaries of competing groups that represent overlapping land claims (especially where rights and responsibilities over land and

Box 5

GIS and conflict resolution in Ghana

Peter Kyem (2004) writes about a dispute that began when some inhabitants of a town in the Ashanti Region of Ghana raised objections to an attempt by a forestry company to log a local forest, the Aboma Forest Reserve. Some of the town's inhabitants were against the logging and some were supportive of it. Kyem invited representatives of the two groups to attempt to manage the conflict using GIS.

Meetings were held with the parties to understand their concerns and learn about their demands. The opposing parties created separate suitability maps for logging and preservation during these meetings. Thereafter, each suitability map was ranked by the two groups and a quantity of the top-ranked cells were selected. Using this information, Kyem specifically identified areas of conflicting claims that were then targeted for negotiation and compromise. This approach helped the parties concentrate on the issues at hand and prevented the conflict from expanding beyond its original scope.

resources are unclear), these select areas of tension are made visible. This process can help identify key areas of conflict and help narrow the tension to identifiable, and subsequently manageable, units. When people with different viewpoints map their situation together, they learn about each other's experiences and perceptions.

Peter Kyem, an expert on mapping and conflict, notes that participatory mapping applications can be very productive in the early stages of a dispute with a spatial dimension. This is because the substance of the conflict is still limited to issues that are distributed in space and can be mapped and analysed. He notes that when a conflict is prolonged, the original case becomes entangled with derivative issues that have little or no connection to the disagreement that started the dispute. At this stage, what may be driving the conflict or sustaining the dispute may be non-spatial but highly entrenched positions based on values.

Peter Kyem also recognizes that participatory mapping is an effective (and non-problematic) tool at the post-conflict settlement stage. Mapping applications can be used to assist the parties in exploring what they have in common in determining what they can do jointly for themselves or the community and in showing the consequences

of each of their antagonistic positions, which can also help seal the agreement.

Despite the apparent positive benefits of participatory mapping initiatives, a number of negative consequences might also arise. While these maps contribute to community cohesion, they can also be an agent for conflict and disagreement between different groups within a community and between different communities. Documenting sensitive information using the community mapping process might also serve to make that information more vulnerable to exploitation; this is particularly the case when maps draw attention to valuable natural resources or archaeological sites. Great care needs to be taken when implementing participatory mapping initiatives. These issues will be discussed in more detail in Section 4 of this report.

3. Participatory mapping tools

“Indigenous communities and conservation organizations are increasingly turning to mapping and spatial information technologies such as geographic information systems, softcopy photogrammetry and global positioning systems for implementing their strategies to strengthen tenure security over resources and improve natural resource management.”

Poole, 1995 (p. 2).

A broad range of participatory mapping tools exists. The choice of which to use will be determined by the way in which the map will be employed, the perceived impact the mapping tools will have on the target audience and the available resources (e.g. financial, human and equipment).

This section broadly describes some of the principal tools used in participatory mapping initiatives (a more detailed description of the tools is found in Appendix A). They range from low-cost, low resource-input activities (such as hands-on mapping) to high-cost and high resource-input programmes (such as developing and deploying GIS) and are presented here in order of increasing complexity and material requirements.

Hands-on mapping

Description: Hands-on mapping includes basic mapping methods in which community members draw maps from memory on the

ground (ground mapping) and paper (sketch mapping). These maps represent key community-identified features on the land from a bird’s eye view. They do not rely on exact measurements, a consistent scale or geo-referencing, yet they do show the relative size and position of features. These maps have been commonly used in RRA, PRA and PLA initiatives. Hands-on mapping techniques (i.e. both ground and sketch maps) are often used in IFAD-supported projects and were a central component of community engagement activities in IFAD projects in Kenya, Mali and Sudan.

Uses: Hands-on mapping techniques are a good starting point for framing important land-based issues. They can help provide a broad picture of issues and events covering a large area and can be useful to introduce and acquaint a community with maps and build confidence in using the cartographic medium. They can help plan subsequent mapping activities and engage non-expert users. This approach to mapping is especially useful when engaging non-literate communities and those from marginal livelihood systems including indigenous peoples, forest dwellers and pastoralists.

Strengths: Hands-on mapping techniques are low-cost and not dependent on technology. They can be delivered in a short time frame and provide tangible short-term outcomes.

Drawbacks: The final map outputs are not geo-referenced and can only be transposed onto a scale map with difficulty. This makes them less useful when locational accuracy is important (e.g. when there is a need to



Community involved in ground mapping activity in IFAD Mount Kenya East Pilot Project (MKEPP)

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determine the size of an area or make other quantitative measurements). This lack of cartographic accuracy undermines their credibility with government officials and thus diminishes their potential for advocacy. Although the final map can be photographed, the long-term usefulness of ground maps is further undermined by their impermanence and fragility.

Implications for IFAD: The low-cost, low-training requirements and ease of delivery of hands-on mapping make this a useful tool for initially engaging communities – particularly

non-literate groups. It is a useful process for determining and extracting community views and information. This type of mapping is already commonly used in IFAD projects and is often a component of broader PLA initiatives. However, the overall impacts of the mapping process are minimal in relation to long-term change and empowerment of communities engaged in the process.

Participatory mapping using scale maps and images

Description: Local knowledge is identified through conversation and then drawn directly onto a photocopied map or remote-sensed

image (or else onto clear plastic sheets placed on top of the map). The position of features is determined by looking at their position relative to natural landmarks (e.g. rivers, mountains, lakes). This method is commonly used where accurate and affordable scale maps are available. This method also works well with aerial and satellite images, which can be particularly helpful when working with people who cannot read a topographic map and with non-literate communities, including those from marginal livelihood systems (e.g. indigenous peoples, forest dwellers and pastoralists). Additional information can be located on the map using GPS data gathered in the field.

Uses: Scale mapping techniques are a good format for communicating community information to decision-makers because they use formal cartographic protocols (e.g. coordinate systems and projections). Information can be incorporated into other mapping tools (including GIS) and GPS data can be easily transposed onto these scale maps. When accuracy is required but scale maps are not available, they can be made using survey equipment including compasses and GPS tools. This approach to participatory mapping is important in regions where accurate topographic or other scale maps are not available, such as in remote and marginal areas which often tend to be inhabited by indigenous peoples, forest dwellers and pastoralists. The time and energy required to create scale maps from scratch are considerable.

Strengths: This mapping approach is relatively cheap and fast and still provides an accurate spatial representation of local knowledge (particularly if the information drawn on the map is 'ground-truthed' using a GPS). The resulting map can be used to determine quantitative information (e.g. distance and direction).

Drawbacks: In some countries, access to accurate scale maps is regulated and difficult. Furthermore, maps in some areas might not be accurate or up-to-date. A final drawback is that using scale maps requires understanding

formal cartographic protocols (e.g. scale, orientation and coordinate systems) which can be challenging for non-literate people.

Implications for IFAD: Scale maps and images have particular potential for adoption in IFAD projects. The field application is straightforward, engaging and relatively cheap (there are some photocopying and pen costs). This process also permits the collection of geo-referenced spatial information that can be imported directly into project GIS systems. As with hands-on mapping, the impacts of this mapping process are minimal in relation to long-term change and empowerment of communities engaged in the process.

Participatory 3-D models (P3DM)

Description: Participatory 3-D modelling is a community-based method that integrates local spatial knowledge with data on land elevation and sea depth to produce stand-alone, scaled and geo-referenced models. P3DM are scale relief models created from the contours of a topographic map. Sheets of cardboard are cut in the shape of the contour lines and pasted on top of each other to create a three-dimensional representation of topography. Geographic features can be identified on the model using pushpins (for points), coloured string (for lines) and paint (for areas). Data depicted on the model can be extracted, digitized and incorporated into a GIS. On completion of the exercise, the model remains with the community.

Uses: As with many forms of participatory mapping, P3DM can be used to encourage the re-discovery and visualization of local community knowledge. This is particularly the case with the models in their encouragement of intergenerational dialogue. The process requires a large degree of community involvement, which can help build a greater sense of community cohesion, especially when used as part of a community land-related planning process. The model can accommodate overlapping



Ogiek Peoples visualizing their traditional lands using a physical 1:10,000-scale 3-dimensional cardboard model. Nessuit, Kenya

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layers of information (i.e. it functions like a rudimentary GIS) and the data depicted on the model can be extracted, digitized, plotted and incorporated into a GIS. The finished 3-D model can become a permanent installation depicting community spatial knowledge and is often displayed in a community centre. The models are reusable for multiple planning exercises and their sheer size means that they cannot be removed from the location where they were created.

Strengths: The 3-D aspect of the model is intuitive and understandable. This is important for non-literate groups.

Drawbacks: Creating the model is labour-intensive and time-consuming, yet the time required to create the model can also be interpreted as a strength of the activity because people spend time together during which discussion of important spatial knowledge takes place. Storage and transport of the model can be difficult, which makes it more difficult to immediately communicate community information to decision-makers.

Implications for IFAD: Though P3DM has been successfully applied in a broad range of locations and circumstances, including in IFAD-related projects, the process requires a

substantial investment of time and a moderate investment in materials and staff training to facilitate the process. Given the wide geographic area that many IFAD projects cover, it would be complex and expensive to scale up the process to a regional level.

Geographic Information Systems (GIS)

Description: GIS are computer hardware and software technologies that are used for storing, retrieving, mapping and analysing geographic data. GIS technology has been long regarded as complicated, costly and used primarily by experts. Since the 1990s, the participatory GIS (PGIS) movement has sought to integrate local knowledge and qualitative data into GIS for community use. PGIS practitioners (who are often technology intermediaries from outside the community) work with local communities to democratize the use of the technologies. GIS technologies increasingly are being used to address land-related issues with examples springing up around the global South (see *Participatory Learning and Action 54* special issue 'Mapping for Change: Practice, technologies and communication' for examples). Interestingly, these applications usually have been adopted without significant redesign of GIS. To an extent, this reflects the flexible nature of GIS software.

Uses: GIS are used to store, retrieve, analyse and present spatial (or land-related) information. They can integrate local spatial and non-spatial data to support discussion and decision-making processes. Their strength in working with precise geo-referenced information makes them very attractive for project management. Projects reviewed in Albania, Kenya and Mali all had management expertise in developing and deploying GIS to plan and manage project activities. A remaining challenge is how to make these tools more accessible and useful for community members.

Strengths: The analytical functionality of GIS can be used for designing the management of natural resources and lands. Maps produced using GIS also convey a sense of authority which makes them a valuable tool for advocacy (especially important for indigenous peoples, forest dwellers and pastoralists) and for influencing land-related decision-making processes.

Drawbacks: GIS have a steep learning curve, even for people with extensive computer knowledge. They require continual updating of software and re-training. Projects and other users need to recognize that there are long-term operating costs – not just start-up outlay. These expenditures make GIS too expensive for many communities to buy and maintain.

Implications for IFAD: GIS is employed in a wide range of IFAD projects that address natural resource issues; however, they tend to be operated exclusively by experts located in the project office. There are many pragmatic reasons for this, not the least of which are the high level of training required to operate the system and the cost of the equipment. Nonetheless, IFAD projects might learn from other innovative PGIS projects that include community spatial data and that transfer skills to community members to store, manage and retrieve information.

Multimedia and Internet-based mapping

Description: Maps are frequently supplemented with the written word, but this can be an imperfect medium to represent local knowledge, especially for indigenous peoples, forest dwellers and pastoralists who are more likely to be non-literate and accustomed to communicating orally. Much local knowledge about the land is transmitted in the form of stories and legends that use metaphor and sophisticated terminology that might be lost if the information is transcribed. Multimedia and Internet-based mapping can combine the usefulness of maps with other embedded digital media, such as



Participatory 3D modelling, Vietnam.

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video, images and audio, which can be better at documenting the complexities and the oral and visual aspects of local knowledge. This form of participatory mapping is becoming increasingly popular in either stand-alone systems or through the Internet and can be used to communicate complex, qualitative local knowledge related to the landscape.

Uses: This form of mapping supports local communities in expressing, documenting and communicating their traditional and contemporary land-related knowledge using a medium that is closer to traditional oral

systems of knowledge transfer. It integrates local spatial and non-spatial data to support discussion and decision-making processes. It facilitates communicating land-related traditional knowledge with outsiders and within the community (particularly between generations) in an accessible and engaging format (especially video).

Strengths: This is an excellent system for communicating local knowledge in a very engaging format, combined with effective transfer of tangible computer-based skills to community members. It is easy for the end user to access and learn about local knowledge. It is also easier and cheaper than the more complex GIS.

Drawbacks: This approach remains expensive for many communities. Training is required to understand the computer equipment, as well as video production, photographic editing and file management software. This approach is more complex to grasp than using scale maps or making sketch and ground maps. There is a danger that practitioners focus too much on the technology to the detriment of the participatory process. In many remote communities, access to the electricity required to run the equipment is intermittent or totally unavailable.

Implications for IFAD: Though multimedia and Internet-based mapping is still a relatively new area of interest in participatory mapping, it might be of particular interest to IFAD because it enhances the capabilities of the poor and their organizations to communicate their development priorities using their own voices, which in turn has the potential to effectively influence public institutions and decision-makers. However, the cost of training people to implement and support the system and the costs of software and hardware remain high. In order to reduce these costs, resources (both hardware and human) could be centralized and served through regional nodes, such as telecentres.

As a general rule, the more that advanced technologies are employed (particularly computer-based mapping tools such as GIS and Internet-based mapping), the greater the risk that a community will fail to take ownership and long-term management of the

maps. Furthermore, the more technologically advanced the mapping system, the greater the requirement for long-term resources (e.g. human, financial and equipment) to update and maintain those mapping systems. This situation calls into question the long-term sustainability of these more high-tech projects in the community. However, potential drawbacks need to be weighed against the potential impact, range of audience and persuasiveness of the map product, which might be stronger when presented in the digital medium than when presented using less cartographically conventional tools, such as ground and sketch mapping. Finding a balance between the intended purpose of the map, the available resources, capacity in the community and the duration of commitment to the project is vital to achieving a successful participatory mapping initiative.

4. Participatory mapping best practices and processes

“The medium and means of mapping, whether ground, paper or GIS, and the mode of facilitation influence who takes part, the nature of outcomes and power relationships. Much depends on the behaviour and attitudes of facilitators and who controls the process.”

Chambers, 2006 (p. 1).

The impact of participatory mapping initiatives can be positive as well as negative. The outcomes are influenced by a number of interacting factors. These include the presence of enabling or disabling political and decision-making environments, the role of external intermediaries in the mapping process and the complexity of the relationships that develop and evolve among the involved stakeholders. Though some of these factors are beyond the control of those groups involved in planning and realizing the mapping initiative, some can be directly influenced by the process and methods employed. It is therefore important to identify best practices and to adapt them to suit individual participatory mapping initiatives so that the initiatives might be more likely to succeed and ultimately contribute to positive development outcomes for local communities.

Presence of enabling or disabling environments

A formidable challenge to realizing the potential offered by participatory mapping initiatives is the widespread lack of effective administrative mechanisms and structures that would allow the outcome of the initiatives to be incorporated into and influence mainstream decision-making processes.

Although in some countries legislation has created the space for participatory mapping practice to influence land-related decision-making processes (e.g. Bolivia, Indonesia and Mozambique), the lack of enabling environments or the presence of disabling, and at times contradictory, legal and regulatory instruments present a serious obstacle to the legislation’s widespread adoption, application and influence (see Box 6). Accordingly, the disconnection between formal (i.e. government) and traditional (i.e. community) institutions may have to be reconciled first in order to facilitate enabling environments that allow effective participatory mapping to take place.

There is a reciprocal relationship between participatory mapping and good governance. An environment of good governance, and the underlying, though elusive, value of ‘political will’ are necessary preconditions for participatory mapping to function in a meaningful and effective manner. Community mapping can also support effective good governance – it can be a practical mechanism that supports and encourages accountability, legitimacy, transparency, responsiveness,

Box 6

Conflicting mapping legislation in the Philippines

In the Philippines, conflicting legislation is limiting the production of participatory maps to geodetic engineers. In 1997, the Indigenous People's Rights Act (IPRA) of the Philippines established the rights of indigenous peoples to file claims and secure titles over ancestral lands or domains. The law institutionalized the leading role of the community in conducting all mapping and survey activities of traditional lands and territories by adopting the principle of "self-delineation". A year later, this has been challenged by the Philippine Geodetic Engineering Act of 1998 or Republic Act No. 8560 regulating the mapping practice and limiting the use of geodetic instruments, the conduct of land surveys and the preparation of GIS to licensed geodetic engineers.

Some NGOs working with indigenous communities have been able to adapt to the constraint by recruiting geodetic engineers (Rambaldi, 2007).

participation, respect for rights, equity, local usability and other dimensions of good governance. The political climate in which participatory mapping initiatives take place must be considered. Good practice includes developing working relationships with government and decision-makers and including them in the design, implementation and results of participatory mapping initiatives. However, as Liversage (2007) notes, an enabling policy and legislative framework is not enough to ensure successful participatory mapping; there is also a requirement for grass-roots motivation and mobilization and strong political will at every level and among all stakeholders.

An example of an enabling environment – Mozambique

Liversage (2007) describes how Mozambique has undergone radical political and institutional change in recent years. New pro-poor land policies and laws were introduced in the 1990s that included specific regulations and techniques for dealing with rural land parcels, including the methodology for registering community land tenure rights. Participatory mapping procedures have been successfully standardized, regulated and used to identify and delimit community lands (see Box 7).

Liversage speculates that Mozambique might be the only example of

institutionalized participatory mapping in the world. One of the primary driving forces behind this mapping movement is the rise in the number of private concessions throughout Mozambique. Concessions can be granted to individuals from outside of the community, but they are required to undertake a community consultation prior to the concession being granted. Because there is little vacant land in Mozambique and most land is used by a community, private investment in land has to occur through partnerships with communities. Participatory mapping has been vital in facilitating this process and has been well supported by the government.

Despite Mozambique being one of the few examples of a supportive political environment for participatory mapping, Liversage identifies a number of shortfalls in the overall process:

- Government and civil society service providers lack capacity to facilitate delimitations, consultations and establishment of partnerships;
- Government corruption and interference in community delimitations and consultations;
- Community delimitations are not being done properly;
- Lack of clarity on the status of communities to enter into legal agreements;

Box 7

Steps for community land delimitation in Mozambique

1. A community makes a request for land delimitation to the district administration and an interdisciplinary team of external facilitators is appointed (i.e. combinations of government, NGOs and the private sector).
2. The community receives information on the land law, its land rights and the land delimitation process.
3. The community selects representatives to liaise with the external facilitators and oversee the delimitation.
4. PRA activities are conducted by community facilitators with various community interest groups (e.g. women, men, youth, new settlers) on the history of occupation and use, social interest groups and community organizations and long-term development vision. A report is produced by the facilitators.
5. Participatory mapping is undertaken by community interest groups with the support of a facilitator. The maps include community boundaries, land use and occupancy, common-use areas, existing and new concessions and vision of future development.
6. Boundaries and common-use areas (e.g. forests and grazing) are confirmed with neighbouring communities. Elders or external mediators are called to conduct conflict mediation if there are boundary disputes.
7. Surveying of community boundaries and common use areas takes place. These are then mapped on a topographic map using a suitable scale. Where a boundary cannot be identified on a map, the boundary is surveyed using hand-held GPS.
8. A memorandum describing the boundary is produced by community members supported by facilitators.
9. Information is validated at community meetings and signed by the community, facilitation team, neighbours and district administration representatives.
10. A Community Delimitation Certificate is issued by the government, and all information, including the map, is registered and filed.
11. The Provincial Service of Geography and Cadastre (SPGC) confirms that a proper consultation has been done.
12. A new concession is granted by the government.

Adapted from Liversage, 2007

- Women's land rights are not being adequately addressed;
- The financial sustainability of this community land registration process is not being adequately addressed; they are still largely dependent on donor inputs.

An example of a disabling environment – Malaysia

Indigenous communities in Malaysia, like those throughout the world, have

close ties to the land and see themselves as an intrinsic component of the ecosystem. Adrian Lasimbang (2004) writes that land is seen not only as a means of production and livelihood, but also as part of indigenous peoples' spiritual and cultural traditions.

Many of these communities' land-related rights are not recognized by the government in Malaysia. The most critical issue they face is lack of control over traditional land and resources. The threat from logging activities,



Spatial planning, Indonesia

© J. Corbett/UBC O

the gazettement³ of protected areas for forest reserves and national parks, conversion of forest to oil palm plantations and other government-driven development plans have served to alienate many communities from their traditional lands. Most of the land planning and decision-making processes are carried out by the government in isolation and do not involve the communities impacted by the development. Partially in response to these shortcomings, local communities have used participatory mapping as a key tool in the struggle to gain recognition and tenurial rights over their traditional lands.

Lasimbang notes that the inception of community mapping in Malaysia can be traced back to a workshop held in 1994 that was organized by Keruan, a local NGO in

Sarawak, with support from partners in Canada. Later in 1995, Keruan conducted its first field mapping survey training with two other local NGOs: IDEAL (Institute for the Development of Alternative Living) based in Sarawak and PACOS (Partners of Community Organizations) based in Sabah. Since 1995, the majority of participatory mapping initiatives have been carried out by communities with technical assistance provided by several other local NGOs, including the Borneo Resources Institute (BRIMAS) and Sahabat Alam Malaysia (SAM).

³ In the context of forests, gazettement usually indicates that a forested area has been designated for protection by the state or other public authorities according to relevant legislation in force.

From 1995-2005, there was widespread application of participatory mapping initiatives in local communities throughout Malaysia. Advanced mapping technologies also became increasingly incorporated into these initiatives. Participatory maps advanced from using compass and tape surveys to create hand-plotted maps to applying modern GPS mapping and using sophisticated GIS software. This move towards digital mapping technologies has necessitated a greater role for partners with stronger technical skills. These types of computer-generated maps were also initially very effective in influencing decision-making processes in the court of law.

Partially in response to the proliferation of participatory mapping initiatives, the Sarawak government amended the Surveyor's Act, which now requires that all maps to be used in a court of law be produced only by an authorized surveyor. This amendment makes participatory maps produced by communities illegal and unacceptable in the courts. It has created an unsupportive environment for participatory mapping. Although many of the NGOs and community groups continue to make maps, they recognize that their potential to influence change is now more limited.

Participatory mapping's contribution to good governance – Indonesia

As already mentioned, community mapping can also support effective good governance. (McCall, 2004).

One example of participatory mapping having this type of influence is from Indonesia. Over the past 10 years, 1.5 million hectares of land have been mapped by local communities. Communities from nearly every region of Indonesia, including Kalimantan, Java, Sulawesi and Sumatra, have been trained in the technical and facilitation skills required to undertake participatory mapping. The community maps have been used to address multiple objectives, including community organization and awareness-building, helping to resolve land-related conflict,

communicating important spatial information to government (particularly at the district level), delimiting conservation areas and helping to mitigate the impacts of business development initiatives related to plantations, mining and forestry.

The Indonesian Community Mapping Network (Jaringan Kerja Pemetaan Partisipatif or JKPP), established in 1996 in Bogor, West Java, has been instrumental in achieving these goals. Initially, participatory mapping in Indonesia was viewed as a clandestine activity. More recently it has become a useful medium for communities to communicate land-related information to government, for governments to develop a better understanding of community lands, and for communities to communicate their land-related needs for the future. For example, in West Kutai, East Kalimantan, the district government encouraged local communities to create maps to inform the government of complex boundary issues. To achieve this, the government worked together with local NGOs and community groups.

Representatives from JKPP point out that one of the principal benefits of participatory mapping is increased community awareness of their own rights regarding natural resources and of regional development and planning processes. These maps have also provided an important medium to facilitate networking with local and national institutions. As a result, government at all levels has developed a clearer understanding of local communities' relationship to their traditional territories and their desire to engage in the planning process. In the future, JKPP will use mapping as the basis for participatory spatial planning at the district and provincial levels (an example of this is a project in Sekadau District in Aceh which is supported by the ILC).

Unlike in Mozambique, participatory mapping in Indonesia has not been institutionalized or standardized by the government. Rather it has retained its original counter-mapping nature and continues to be eclectic, employing different mapping tools

Box 8

Action Against Hunger (AAH) mapping in Nicaragua

AAH, which is an ILC partner, has an approach to participatory mapping that is centred on strengthening local capacities through the transfer of knowledge, validation and dissemination of tools and participatory methodologies that enable the long-term management of the territory and natural resources and local resolution of conflicts. One of the AAH interventions focuses on using mapping to link the community experience with land governance and administration of the local municipality. Municipalities and communities can be strengthened by using such methodologies.

and using various processes depending on the individual circumstances. Yet unlike in Malaysia, participatory mapping in Indonesia has been effective in communicating spatial information to an appreciative government audience and has subsequently been successful in influencing land-related planning and decision-making.

Roles of development intermediaries

Good participatory mapping practice should focus on the ethical behaviour of all stakeholders involved in the initiative. The participatory aspect requires that the community assume as much control as possible over decision-making, management and responsibility for all stages of the mapping process. This is especially true with projects that work with indigenous communities. Indigenous communities historically have been removed or marginalized from decision-making processes, particularly those related to land use and planning. Enabling indigenous communities to engage in IFAD-related development initiatives requires that specific attention be given to incorporating an empowerment aspect into participatory mapping initiatives and passing on as much responsibility as possible to the community.

The importance of development intermediaries

While a willingness to engage in a participatory mapping initiative is ultimately a community's decision (see Box 10), its decision to engage and the choice of mapping tool to be used are often heavily influenced by the level of support the community receives from development partners, governments (at various levels), NGOs, community-based organizations (CBOs), universities and other actors. It is important (especially if empowerment of marginalized communities is an intended outcome of the mapping initiative) that external groups be committed to supporting the initiative for the long term and prepared to build capacity to a point where community members can begin to take an ownership role. Strategic alliances between development intermediaries (such as IFAD) and local NGOs and CBOs are often best positioned to be able to provide this level of mapping expertise, ongoing support and commitment to the community taking control of the process (see for example the role of JKPP in Indonesia, Environmental Research Mapping and Information Systems in Africa (ERMIS) in Kenya, or PAFID in the Philippines). To get the community to this point begins with a commitment to build on the community's existing assets and capacities and from there requires three fundamental ingredients – transparency, trust and time (see Box 9). Transparency and time are prerequisites for establishing trust.

Box 9 Ingredients for sound relationships

Transparency refers to the type of communication necessary for good participatory mapping practice. It implies timeliness, clarity, accountability, the use of simple and understandable language, transparent procedures (e.g. open meetings) and capacity-building in use of and access to technology. It respects the need for communities engaging in the process to be informed of all the potential drawbacks that might be associated with using the tools.

Time is needed to build meaningful relationships between intermediaries and communities, and during implementation to maximize the positive impacts from the initiative and to enable local communities to take ownership of the tools and products produced. There needs to be clear recognition of the need for a substantial investment of time. Tight time frames, imposed to meet outsiders' agendas, often serve to undermine a project. They might also disempower communities by preventing them from fully understanding the technologies or fully exploring their potential benefits.

Trust refers to the relationships between different groups and individuals. It is a critical ingredient for undertaking participatory mapping. Barbara Misztal (1995) writes that trust makes life predictable, it creates a sense of community and it makes it easier for people to work together. The need for trust appears to exert a discipline on practitioners. Without the appropriate behaviours and attitudes for developing this trust, participatory mapping practice is difficult indeed.



Participatory evaluation of community empowerment project for access to land, Uttar Pradesh, India.

Commitment to community control

The overarching principle of participatory mapping initiatives is that any external stakeholder turns authority and decision-making control over to the community so they can direct the map-making process and the map's use. Otherwise, community mapping may only strengthen the organization, NGO, researcher, or government agency that facilitates the mapping (Alcorn 2000). This is often a hard thing for experts to do, yet the focus should be on experts supporting skill transfer and enabling community members to control the mapping process.

Respect for community needs

As with any development initiative, participatory mapping projects can be lengthy and require a considerable input of time from participants. Often this is precious time for community members, especially during busy periods of the year in agricultural communities. They include the sowing or harvesting periods. It is important to note that if a mapping initiative is initiated by outsider groups, it should be introduced in a pre-planning stage so that community members can determine whether they want to engage in the initiative at all and, if so, can select a time of year that is best suited for them.

Support for community intellectual property

This point is closely linked to the commitment to community control; the information contained in a map will often include local knowledge over which the community should maintain its rights. This is particularly the case with sensitive knowledge when working with indigenous peoples. Because a map might have been produced with the facilitation of outsider groups does not give those groups the right to take ownership over the information contained on the map, nor to remove the map from the community. Removal of any map-related information needs to be done with the express permission of the community. Maps produced by the community should be considered "on loan" to the development

intermediaries unless otherwise specified in an agreement.

Gender sensitivity

As noted in the process section of this report, sensitivity to the role of women in the mapping process and the need for their voices to be included in the map is of great importance to the overall outcome of the participatory mapping initiative. Women often have a unique perspective about a community's land and a relationship with it that is different than men's. If women are not explicitly invited to be involved with the mapping process, there is a danger that the final map will only reflect the knowledge and views of the men in a community. Similarly, other social groups (e.g. the youth or the poor) might be excluded from the process. Care needs to be taken to identify these groups in a pre-planning stage to ensure that they are included in the mapping process.

Clearly defined roles for stakeholders

When a participatory mapping initiative is undertaken with outsider facilitation, there is the risk that power inequalities between stakeholders prevent or inhibit those who are more vulnerable from fully expressing their views. This situation in turn might influence the nature and content of information presented on the map, the validity of the information and how the map is ultimately used. At the start of the mapping process, it is important to carefully define and agree upon the roles of the different stakeholders so that everyone involved in the project has a clear idea of his or her own role and responsibilities and those of others. These agreements are best drawn up in a written document.

It cannot be assumed that facilitators from within the community are less biased about power relations than outside facilitators. On the contrary, outside facilitation can be less prone to influence by internal community power structures. Generally, a combination of internal and external facilitation is the optimum combination.

Box 10

Free, prior and informed consent

Development projects and operations have had, and continue to have, a devastating impact on indigenous peoples. The concept of indigenous peoples' right to free, prior and informed consent (FPIC) is gaining increasing currency in international law. As Anne Haira, a lawyer from New Zealand, states "FPIC gives indigenous communities the power to veto projects and to negotiate under what conditions they can proceed. It requires that indigenous communities be fully informed of all project risks and impacts and that their consent be acquired before the implementation of any project." This idea must be given serious consideration before any development intermediary initiates a participatory mapping initiative or activity.

Long-term commitment to initiatives

Maps represent a snapshot in history. The information, relevance and significance of a map change over time. Unless the map is produced for a single purpose with the expectation that it might be used just once, it is important for the information to be updated. Alix Flavelle (2002), citing First Nations communities in Northern Canada, notes that some communities have been making their maps for over 15 years and they continue to add information. Making and updating these maps is a long-term activity, regardless of the tools or technologies used.

Successful participatory mapping initiatives are dependent on a long-term commitment by all stakeholders to the mapping process. This means that there is a need to support organizations that take responsibility to raise the capacity of community members and continue to provide long-term support (e.g. moral, financial and informational). One of the criticisms identified by NGOs in Malaysia is that donor agencies often only fund mapping initiatives over the short term; it has proven difficult to maintain long-term support and commitment to participatory mapping initiatives.

Awareness of mapping impacts

A number of unintended negative consequences and conflicts can occur as a direct result of participatory mapping

initiatives. These risks need to be communicated to the community at the outset of the project because knowing about them might influence the community's willingness to engage in a mapping project. These potential issues are discussed below.

Boundaries and conflict

Participatory mapping initiatives can contribute to conflict, especially when boundaries that in the past have been contested, undeclared, overlapping, fuzzy and permeable are represented on a map using a definitive line that suggests a sense of authority, inflexibility and permanency. This is a concern among Canadian First Nations communities involved in the treaty process in British Columbia, Canada. These communities are expected to draw firm boundaries around their traditional lands. In the past, these boundaries were not enforced and communities jointly managed resources. The use of formal boundaries required by the treaty process is directly contributing to tensions between neighbouring communities.

This potential conflict is especially likely if mapping initiatives are undertaken on a community-by-community basis and do not involve all the communities that have a stake in the area, region or resources depicted on the map. Boundaries need to be discussed, negotiated and confirmed collaboratively. A participatory map should not present the views and enhance the position of a single community at the expense of other

Box 11

Reaching consensus on boundaries in Albania

The critical issue of transferring forest lands to community control and the required boundary delineation between communities was discussed during an ILC-sponsored workshop in Albania that was designed to support the national NGO National Association for Communal Forest and Pasture (NACFP) to better promote securing land rights in forestry areas. Albanian customary law states that community land boundaries are marked by natural features (e.g. rivers, ridges or other notable physical features) or with three easily distinguished stones. The village boundaries are mapped using a GPS and then plotted onto a 1:25,000 topographic map. The map depicting the boundaries is then approved by all the Village Councils impacted by the information on the map and by the Commune Council. These maps are formal documents designed to protect the rights of forest users, although they are not legally binding. The process used in preparing the maps directly strengthens the links between forest users and governmental institutions.

communities that have a stake in the land and resources depicted on a map. If the process does not allow for discussion and verbal exchange among different users of the land and resources, mapping initiatives can contribute to both inter- and intra-community tensions.

This is why many mapping projects, such as those undertaken by Mac Chapin and the Centre for International Forestry Research, work on mapping at the watershed, district or regional level and not just at the level of a single community (see Box 11). Furthermore, Giacomo Rambaldi notes that a number of participatory 3-D models produced in Thailand in the 1980s took place at the village level and that very few considered the broader picture of watershed and intra-village dynamics. This contributed to the limited success of participatory mapping in Thailand, which had no impact at levels higher than the village in the 1980s and 1990s.

Participatory maps' ability to present local knowledge

Local knowledge is alive, dynamic and embedded in community place names, practices, institutions, relationships and ritual. Often it is unwritten and instead is preserved and communicated orally in the form of stories, songs, folklore, proverbs, dances, myths, rituals, community laws,

local taxonomy and agricultural practices. Formal traditional systems (e.g. ceremonies, festivals and other processes) facilitate the transfer of some of this knowledge.

For indigenous peoples, forest dwellers and pastoralists, maps are not a traditional way of representing and communicating land-related information. Robert Rundstrom (1995) notes that "the Western or European-derived system for gathering and using geographical information is in numerous ways incompatible with corresponding systems developed by indigenous people... [this] technology, when applied cross-culturally, is essentially a tool for... assimilation and, as such, is the newest link in a long chain of attempts by western societies to subsume or destroy indigenous cultures." A community needs to be aware that maps may represent their land-related knowledge imperfectly before they engage in a participatory mapping initiative.

Documenting sensitive information

Documenting sensitive information using participatory mapping might also serve to make that information more vulnerable to exploitation; this is particularly the case when maps draw attention to high-value natural resources, sites of important cultural value or archaeological sites. Maps make this

Box 12

Six stage mapping process

Ground preparation: During the months leading up to the start of formal project activities, project leaders and indigenous authorities visit communities to explain the objectives and importance of the mapping work and to discuss the methodology to be used.

First workshop – orientation and training: Project staff and indigenous leaders bring together the surveyors and the technical team and explain to them the objectives and methodology of the mapping project.

First fieldwork – gathering data and sketch mapping: Surveyors visit communities in their areas to gather detailed information.

Second workshop – transcription of data onto new maps: Surveyors arrive from the field with information on significant land features in their region.

Second fieldwork– verification of data: Surveyors return to the communities with the draft maps to verify the details on them, answer questions and fill in gaps. Villagers have an opportunity to take a critical look at the maps and discuss issues surrounding their territory.

Third workshop – correcting and completing final maps: Surveyors reunite with the cartographers to incorporate information that has been verified in the field and put the draft maps in final form.

Adapted from 'Indigenous Landscapes: A Study in Ethnocartography', by Chapin, Lamb and Bill Threlkeld, 2001.

information visible to outsiders and therefore open to misuse. Furthermore, there might be information within the community that is 'owned' by certain individuals and families; this information cannot be shared with other community members. It is important to take these ideas into consideration when embarking on a participatory mapping initiative.

This concern can be partially overcome by enabling the community to take ownership over the process. If they control the content of the map and are informed of the potential pitfalls before the mapping process is complete, they are much less likely to expose this potentially sensitive material.

The importance of process

There are as many philosophical and technical differences in implementing participatory mapping initiatives as there are practitioners. It is therefore impossible to

present a single definitive process. There are, however, key elements that emerge as being essential in implementing a successful mapping initiative. Perhaps the point of greatest importance is that participatory mapping initiatives should be driven by process and not by products, technology or tools. Successful creation of maps is best achieved through skilful and open community organization and decision-making and less through employing rigorous cartographic principles and mapping science.

This section will identify some of the broad steps typically adopted in the deployment of participatory mapping initiatives.

Common participatory mapping processes

A participatory mapping process may follow a highly structured approach. These processes are typically associated with initiatives that involve collaboration between local communities and outsider groups who already have experience with a specific approach or participatory mapping



techniques (one such structured approach from Mozambique is documented in Box 7). These groups might include government institutions, development projects, universities and NGOs. Another example of a structured approach is the ethnocartography model created by Chapin and Threlkeld (2001). This process has been used widely, and with much success, to create paper-based and GIS maps with indigenous communities throughout the Americas and Southeast Asia. This approach follows a clear six-stage process (see Box 12).

The benefits of the structured process are that it is transferable and straightforward to follow. Also, there already exists a knowledge base that development intermediaries and community members can draw on for advice.

Community involved in ground mapping activity in IFAD Mount Kenya East Pilot Project (MKEPP)

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A highly structured approach may, however, sacrifice flexibility. A successful participatory mapping process ideally should be developed or tailored directly with community members to suit the needs and requirements of each community. Other participatory mapping initiatives can be significantly less structured. However, a disorganized and unfocused process is likely to undermine a mapping initiative and alienate community members. People like to have in mind an achievable road map and set of long-term objectives. It is important to

have a clear structure in place before initiating or engaging in a participatory mapping project. It is also necessary to be flexible and adaptive to be able to adjust to individual community requirements and unexpected circumstances as they arise.

Most participatory mapping processes loosely follow the steps identified in Chapin, Lamb and Threlkeld's approach described in Box 12. These steps are discussed in more detail below.

1. Preparing the community for the mapping activity

Prior to commencing a mapping activity, it is important to provide the community with sufficient information about participatory mapping (e.g. why mapping, what maps are and how they are made and used), the range of tools available (i.e. from sketch maps to sophisticated computer-based mapping systems), the process required to create the map (e.g. how much time, effort and resources are required) and the map's potential uses. At this point, it is also important to consider what map scale the activity will use. From Giacomo Rambaldi's experience, individuals can comfortably work with maps at scales larger than 1:10,000 (e.g. they can quite precisely locate their household). At 1:20,000, the connection between the map and the real world is lost.

This information is best presented in a community meeting or series of meetings. The meetings also give community members a forum to discuss the relevance of the participatory map-making process to the issues facing the community. If this project is being initiated or facilitated by outsiders, this initial meeting is also an opportune moment for the outsiders to introduce themselves and begin to build a relationship with community members.

At this stage of the process it is also important for the facilitator to identify some of the risks associated with mapping these lands. These include making valuable resources potentially visible to people who might then exploit the resources, creating

unrealistic expectations of what can be achieved using a map, or including contested boundaries on maps that might aggravate groups disputing the location of those boundaries. It is important that community members discuss these issues at an early stage so that the information to be collected and included on the map can be tailored to avoid these potentially negative consequences.

Only when community members have this information will they be able to make an informed decision about whether they are prepared to invest the amount of time and energy required by the participatory mapping process.

2. Determining the purpose(s) of making a map

People's time is precious; it is therefore important for community members to determine at the outset the purpose, or purposes, for creating a map and to have a strategy about how the map might be used to address issues faced by the community. This step is a key component of any participatory mapping initiative. It will determine what type of map should be used and the information that will be presented on the map.

This step needs to be completed before the community spends time producing a map that might not clearly address its needs. The initial meeting, described in Step 1, is an ideal opportunity to determine the map's purpose(s). Box 13 presents questions a facilitator might ask to stimulate thought and discussion about the map's purpose(s).

At this decision-making stage, it is vital to involve as many people in the community as possible. A commitment to broad community involvement is important in getting people to think through issues collectively, share important knowledge and memories and debate relevant issues. If community members do not have these discussions or if pressing issues related to their land are left unresolved, they can undermine the legitimacy of the map at a later stage in the process.

Box 13

Questions to determine the purpose for creating a map

Determining the purpose for creating a participatory map will require careful facilitation by either a trained community member or an outside intermediary. Suggested questions to stimulate discussion and decision-making include

- Why do we want to make a map?
- Who do we want to show it to?
- What are some of our most important land-related issues?
- What can we use the map for in the short term?
- What can we use the map for in the long term?
- Is there a predefined reason for creating the map?

In most cases, communities will have multiple purposes for creating a map. What is important during this process is that community members think clearly and articulate why they are creating the maps.

Adapted from Flavelle, 2002.

Community buy-in and control depends on having a broad cross-section of community members engaged in this decision-making stage. The larger the proportion of community members involved, the better the maps will represent the views and interests of the entire community. If they are involved at this early stage it is also more likely that the community will take ownership over the map, which will result in the maps having a greater legitimacy both within the community and with outsiders.

If the community meeting is large, it is often best to split into smaller groups. These groups can be determined by gender, age and/or socio-economic status so that everyone is comfortable and able to contribute to the group in which they are working (see Box 14 for an example of how small groups can be used to encourage women's participation).

During each of these decision-making steps, it is important for community members and other stakeholders engaged in the mapping process to ask who is leading the process of making decisions about the map. As Alcorn (2000) notes, it is important to identify whether decisions are being made

by community members through consensus, by a local leader or an institution, or by outside NGOs, researchers, or government. The intent is to enable community members to take control of this process (see Box 16).

After a clear set of purposes have been determined, community members must decide what information to incorporate into the map to satisfy the identified purposes of the mapping initiative. This might include documenting information about the location of natural features (e.g. rivers, mountains or pasture lands), man-made features (e.g. village sites, roads or agricultural areas), resources (e.g. different forest types, hunting areas or grazing sites) and sites of important cultural or historical value (e.g. boundaries, grave sites or areas with spiritual significance). It may also include identifying or highlighting the location of areas of potential conflict, land-use change, development and other contemporary and pressing land-related issues.

Before information collection begins, the community must decide on some fundamental map-related issues. These include

- who from the community will be involved in making the map;

Box 14

Gender and decision-making

Women can find it hard to engage in mapping activities when they are in the presence of men, as they may feel inhibited. It can be useful to separate the genders and create two separate maps. This can often provide useful insights into any differences between men's and women's priorities or value attached to particular areas and resources. It is likely the maps will differ in many aspects. Using this technique will result in a more complete final picture than if only one gender's map had been used. It may also encourage more active participation from all participants.



Box 15

Participatory mapping for planning: IFAD's process in Tunisia

The IFAD-supported Agropastoral Development and Local Initiatives Promotion Programme for the South-East (PROESUD) used participatory mapping as a basis for initiating a community-based programming process to link integrated development with a better management of communities' natural pasture resources. Participatory mapping was found to be a highly useful tool for understanding community territories and for establishing trust and cooperation between project staff and community members. It was the starting point of a process that resulted in a shared vision of the community's long-term pastoral resources management and in the collective identification of territory-based project actions.

As a result, the project developed an operational guide describing a successful mapping methodology developed and implemented in Tunisia. The methodology used by this approach is called *Lecture Socio Foncière des Terroirs*. Methodological steps implemented in the PRODESUD were the following:

- Step I. Preparation and background data gathering;
- Step II. Participatory planning (including the mapping);
- Step III. Participatory programming;
- Step IV. Community organization;
- Step V. Implementation and monitoring and evaluation.

- symbols that will be included in the map (these can be modified later in the process);
- the language in which the map and legend will be presented;
- whether the community intends to map its entire territory or focus on areas of special significance.

3. *Collecting information*

This step and the next step (i.e. 'Creating the map and determining the legend') are vast topics and the mechanics and techniques for collecting information and creating maps will depend on the chosen process and type of map that is being made. It is beyond the scope of this report to discuss the details of this particular step. But it is important to note that community members may need thorough training in surveying, mapping techniques and specialized mapping equipment (e.g. GPS and compasses) before the process of data collection begins. It is also important to identify individuals (preferably elders in the community) who can take responsibility for managing and supporting

the individuals involved with collecting the information in the field.

Excellent resources for the hands-on creation of participatory maps include the 'Mapping Our Land' handbook by Alix Flavelle (2002) and 'Chief Kerry's Moose: A Guidebook to Land Use and Occupancy Mapping, Research Design and Data Collection' by Terry Tobias (2000). The IFAD-designed 'Guide opérationnel pour l'élaboration et la mise en oeuvre du plan de développement participatif avec les communautés agro-pastorales', created by the PROESUD project (Box 15) provides a good mapping overview in French. For a guide on P3DM there is no better resource than 'Participatory 3-Dimensional Modelling: Guiding Principles and Applications' by Giacomo Rambaldi and Jasmin Callosa-Tarr (2002).

4. *Creating the map and determining the legend*

As mentioned earlier, this is a potentially complex step too detailed to cover in this review. One noteworthy point, however, is the significance of the community in

Box 16

Gradations of participation

As participatory mapping becomes increasingly popular, wide variations are beginning to emerge in how participation is interpreted and implemented. The commonly held view is that mapping initiatives need to be flexible and not prescriptive, but there has been considerable debate over inconsistent approaches to participatory mapping. This friction brings into question the meaningfulness and authenticity of some initiatives.

Arnstein (1969) developed a diagnostic model to help understand the significant gradations of participation employed by different agencies and processes. Arnstein refers to her model as an eight-rung 'ladder of participation'. Each rung on the ladder corresponds to the extent of citizens' power in determining the end product.

The bottom two rungs illustrate non-participation, where power holders intend to manipulate participants. The next rungs of the ladder refer to tokenism, where participation is employed but community views and ideas are not necessarily acted upon. The top rungs of the ladder involve citizens taking various degrees of control over decision-making processes, managerial power and responsibilities. Although the top rung is ambitious, it is considered to be a worthy goal for which to strive. However, it is also important to note that different levels of community participation are likely to be appropriate in different circumstances and it may not always be appropriate to consider citizens' control as the goal.

determining the map's legend. As Giacomo Rambaldi (2005) notes, "the preparation of the legend, particularly the selection of features to display and the way they are depicted and textually defined, assumes a key role in determining its final intellectual ownership, its resulting message, and its usefulness in the process."

5. *Analysing and evaluating the information*

If community members are going to engage in a participatory mapping initiative, they should endeavour to do it well. An incomplete or inaccurate set of maps is unlikely to serve their best interests. The map needs to accurately represent the views and knowledge of the community.

Once the community has created the map, it is important for facilitators to lead a discussion to evaluate and verify the overall quality, completeness, accuracy and relevance of the mapped data. This step is of particular importance if

- the map was made partially by outsiders;
- the map was made by just one group in the community (e.g. youth);

- any part of the map-making process involved the map leaving the community.

At this stage, community members (even if they were not directly involved in the map-making process) should have the right to add, remove or modify the information presented on the map. Box 17 presents questions that a facilitator might ask to stimulate community evaluation of the map.

6. *Using and communicating the community's spatial information*

Maps are powerful and engaging visual tools that excel in communicating local knowledge. They offer a readily understandable language that can be interpreted by people from all backgrounds.

Using the community's maps to communicate information to decision-makers and other groups outside the community is perhaps the most significant component of the participatory mapping process and also one of the most complex and difficult to achieve. If a community has contributed its time and energy into creating a map, it is important that they see that their investment

Box 17

Questions to ask when evaluating participatory maps

The map needs to accurately represent the views and knowledge of the community. It is therefore important to allow community members to evaluate its content and usefulness.

- Should more information have been included on the map?
- Is any information incomplete?
- Is the information displayed on the map accurate?
- What are the most important parts represented on the map?
- What areas need to be improved or addressed?
- If genders were separated, what are the main differences represented on the maps and why do you think this is?



Participatory mapping by Bakgalagadi pastoralists and San hunter-gatherers in Botswana

is respected and that the completed maps are used to serve the purpose(s) identified during Step 2 of this process. It is important that the mapping initiative does not become a process whereby “community meetings are held, local input is gathered, reports are produced and top-down planning is maintained” (Harris & Weiner 2002).

Over time, new potential uses for the maps will develop once the community has a clearer idea of how the maps might be used and as new circumstances arise to which the maps might be applied. As identified earlier in this report, using the maps needs to be part of a broad and well-defined strategy. The map by itself is unlikely to solve any land-related issues, but when the map is incorporated and used as part of a clear land-related plan, it will be more likely to help initiate change. The successful use of the map is also directly related to the presence of enabling and disabling legislative and political environments.

Once a map has been created, it is often put into a public arena. As Jo Abbot et al. (1993) recognize, this turns local knowledge into public knowledge and conceivably takes it out of local control. It is important that communities are aware of this and try to develop regulations that control how the map is used and distributed. Community members need to be clear about who will use the final map and who authorizes its use. The ownership issue has been a critical and recurrent issue in many participatory mapping initiatives (Alcorn, 2000).

5. Conclusions

“Mapping processes can be used to help secure access to land and natural resources, to facilitate the management of these resources and to support community advocacy on land-related issues. In other words, mapping is increasingly playing a role in the empowerment of people and communities.”

Di Gessa, 2008

This review is intended to provide a broad background in the use of participatory mapping processes and the range of tools available to practitioners. It draws on a number of examples from around the world, with special attention given to projects supported by IFAD and the ILC. The review is not intended to be exhaustive, but rather to give the reader a greater appreciation of how participatory mapping has evolved from a relatively simplistic PRA tool into a community of practice spanning a range of sophisticated technologies and processes. With the emergence of new cartographic tools and new media for distributing spatial information, the participatory mapping community has evolved to incorporate and use these technologies to suit the agenda of the communities with whom they work. This development has recently given rise to the increasingly common use of GIS and Internet technologies. These tools present new challenges when used in both development and community contexts.

This review is designed to pave the way for a second document, the IFAD Adaptive Approach to Participatory Mapping, that describes a step-by-step process for designing, preparing, implementing and evaluating participatory mapping initiatives within IFAD projects. The approach draws on the fundamental principles of participatory mapping described in this document and examines in greater depth the complexities of implementing these principles.⁴ In addition, it clearly articulates the practicalities of implementing participatory mapping initiatives while strengthening institutional mechanisms for long-term sustainability of community initiatives.

⁴ These are free, prior and informed consent (FPIC), commitment to community control, accommodation of community needs, support for community intellectual property, commitment to an inclusive process, and long-term commitment to mapping initiatives.

Matrix of participatory mapping tools

Ground mapping

Description	Uses/Users	Strengths	Weaknesses	Resources
<p>A basic mapping method that involves community members drawing maps on the ground from memory using any available materials, such as plants, rocks or household tools. The final product is kept for a short time only</p> <p>Commonly used in RRA-, PRA- and PLA-related initiatives</p>	<p>Good for beginning to frame principal land-based decision-making issues</p> <p>Helpful in acquainting community members with maps. Helps build confidence</p> <p>Users:</p> <p>Application for broad range of users – e.g. community members, researchers, development intermediaries and NGOs</p> <p>This activity is often outsider motivated or initiated</p>	<p>Useful to engage non-expert users</p> <p>Low-cost and not technology dependent</p> <p>Tangible short-term outcomes</p> <p>Most participants can relate to product</p> <p>Easily facilitated</p> <p>Tactile – can walk around and interact with the product</p>	<p>Product not replicable (can't copy or produce for dissemination)</p> <p>Impermanent and fragile (also weather dependent!)</p> <p>Not produced to scale; not accurate or precise</p> <p>The medium used (i.e. the ground) might affect buy-in and product consequently might lack credibility as a formal decision-making document</p>	<p>Informants use raw materials like soil, pebbles, sticks and leaves</p> <p>Open space</p> <p>Optional coloured sand</p> <p>Large sheets of paper to draw finished map</p> <p>Cameras can also be useful to photograph the finished product</p>

Sketch mapping

Description	Uses/Users	Strengths	Weaknesses	Resources
<p>Sketch maps are freehand drawings. They are drawn on large pieces of paper and from memory. They represent the land from a bird's eye view. They involve drawing key community-identified features. They 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</p>	<p>Good to stimulate and inform internal community discussions related to broad-level landuse patterns, resource distribution, areas of conflict, problems and planning</p> <p>Very useful in getting a broad picture of issues and events covering large areas</p>	<p>Useful to engage non-expert users with little training</p> <p>Low-cost and not technology dependent</p> <p>Tangible short-term outcomes</p> <p>Easily facilitated</p> <p>More detailed and permanent than ground maps</p>	<p>Outputs are not geo-referenced and can only be transposed onto a scale map with much difficulty</p> <p>Not useful when locational accuracy is important – when one needs to determine the size of an area or make other quantitative measurements</p> <p>Lack of accuracy undermines credibility with government officials</p>	<p>Large-sized sheets of paper, pencils and coloured pens</p> <p>This activity is particularly sensitive to the composition of the participating group (especially in relation to gender, age and status factors)</p>
<p>Commonly associated with RRA-, PRA- and PLA-related initiatives</p>	<p>Can be used to help plan subsequent mapping activities</p> <p>Users: Application for broad range of users – e.g. community members, researchers, development intermediaries and NGOs</p>	<p>Easily adopted and replicated at community level</p>		

Transect mapping

Description	Uses/Users	Strengths	Weaknesses	Resources
<p>A spatial cross-section of a community, depicting geographic features (e.g. infrastructure, local markets, schools) as well as land use types and vegetation zones observed along an imaginary line. Activities involve questioning community members and walking and mapping transects</p> <p>A transect aims to cover as many of the ecological, production and social groups along the defined route as possible</p>	<p>Good to stimulate and inform internal community discussions related to broad-level landuse patterns, resource distribution, conflicts, problems and planning</p> <p>Helps analyse linkages, transitions, patterns and interrelationships of land use and different ecological zones along the transect</p> <p>To have broad application and benefit, needs to be combined with 2-D maps</p> <p>Users: Researchers, development intermediaries, villagers, community members and particularly farmers</p>	<p>Useful to engage non-expert users with little training</p> <p>Low-cost and not technology dependent</p> <p>Community members can relate to product</p> <p>Tangible short-term outcomes</p> <p>Easily facilitated and replicated</p> <p>Relates well to participants' everyday movements and activities (because it tracks their travels at ground level – not aerially as with sketch maps)</p> <p>Gives good perspective for low to high elevation cross-sections</p>	<p>Outputs are not geo-referenced and can only be transposed onto a scale map when combined with GPS data</p> <p>Not useful when locational accuracy is important – when one needs to determine the size of an area or make other quantitative measurements</p> <p>Lack of accuracy undermines credibility with government officials</p> <p>Provides a limited perspective of the landscape</p>	<p>Paper and coloured pencils</p> <p>Depending on size of area to be covered and terrain, a transect can be done on foot, animal, cart or motor vehicle</p>

Scale mapping – drawing information on existing scale maps

Description	Uses/Users	Strengths	Weaknesses	Resources
<p>Scale maps present accurate georeferenced data. A scale map means that a distance measured anywhere on the map always represents (depending on the scale) the equivalent distance on the ground – e.g. 1cm on the map equals 1km on the ground. Scale maps are often referred to as ‘base maps’ by practitioners</p> <hr/> <p>This method is commonly used where accurate and affordable scale maps are available (especially in Canada) and people are familiar with them. Local knowledge is gathered in conversation around a map and is then drawn directly upon the map (or else onto mylar sheets placed on top of the map). The position of features is determined by looking at their position relative to natural landmarks (e.g. rivers, mountains, lakes)</p>	<p>Good format to communicate community information to decision-makers because it uses formal cartographic protocols (e.g. coordinate systems, projections)</p> <hr/> <p>Information on the map can be easily verified on the ground</p> <hr/> <p>Information can be incorporated into other mapping tools (including GIS)</p> <hr/> <p>GPS data can be easily transposed onto scale maps</p>	<p>After initial orientation with the map, it provides an understandable and accurate representation of an area</p> <hr/> <p>If maps are available and relatively cheap, this tool is fast compared to other participatory mapping techniques (such as creating a scale map by surveyors)</p> <hr/> <p>Low-cost and not technology dependent</p> <hr/> <p>Tangible short-term outcomes</p> <hr/> <p>Easily facilitated</p> <hr/> <p>Relatively accurate portrayal of local knowledge</p> <hr/> <p>Can be used to determine quantitative information (such as distance areas and direction)</p>	<p>In many countries (especially developing countries), access to accurate scale maps is heavily regulated and difficult</p> <hr/> <p>Lack of accuracy</p> <hr/> <p>Training is required to understand formal cartographic protocols (e.g. scale, orientation, coordinate systems, projections) for their use</p> <hr/> <p>More complex to grasp than sketch, transect and ground mapping</p>	<p>Scale maps (usually the most up-to-date maps are not required – the key information needed on the maps is the location of natural features, such as rivers, ridges)</p> <hr/> <p>Large-sized sheets of mylar (transparent plastic sheets), pencils and/or coloured pens</p>

Scale mapping – making scale maps using survey techniques

Description	Uses/Users	Strengths	Weaknesses	Resources
<p>Scale maps represent a more sophisticated participatory mapping method aimed at presenting accurate georeferenced data. A scale map means that a distance measured anywhere on the map always represents (depending on the scale) the equivalent distance on the ground – e.g. 1cm on the map equals 1km on the ground. Scale maps are often referred to as 'base maps' by practitioners</p> <hr/> <p>Where scale maps are not available but are required by the purpose of the participatory mapping initiative, they can be made from scratch using a range of equipment including compass and GPS tools. The finished map can then be used to incorporate and communicate local spatial knowledge</p> <hr/> <p>It should be noted that this is often a last resort measure because the time and energy required to create a scale map from scratch are considerable</p>	<p>Good format to communicate community information to decision-makers because it uses formal cartographic protocols (e.g. scale, orientation, coordinate systems)</p> <hr/> <p>Information on the map can be easily verified on the ground</p> <hr/> <p>Information can be incorporated into other mapping tools (including GIS)</p> <hr/> <p>GPS data can be easily transposed onto scale maps</p>	<p>On completion, the maps have a relatively accurate portrayal of community lands that otherwise would not be available</p> <hr/> <p>Can be used to determine quantitative information (such as distance, areas and direction)</p>	<p>Substantial requirements for equipment as well as training in its use</p> <hr/> <p>They are prone to error</p> <hr/> <p>Requires long-term commitment (time consuming and hard work)</p> <hr/> <p>More complex to grasp than using existing scale maps or making sketch, transect and ground maps</p>	<p>Compass, distance measuring devices such as a GPS</p>

Participatory 3-D modelling (P3DM)

Description	Uses/Users	Strengths	Weaknesses	Resources
<p>P3DM are stand-alone scale relief models created from the template of a topographic map. Pieces of cardboard are cut in the shape of the contour lines and pasted on top of each other. The model is then finished with wire, plaster and paint</p>	<p>Good to stimulate and inform internal community discussions related to broadlevel landuse patterns, resource distribution, conflicts, problems and planning</p>	<p>Reusable for multiple planning exercises</p> <p>Low-cost and not technology dependent</p> <p>Effective in portraying relatively extensive and remote areas</p>	<p>In many countries (especially developing countries), access to accurate topographic maps is regulated and difficult</p> <p>Labour-intensive and relatively time consuming when compared to using existing scale maps</p>	<p>Topographic map</p> <p>Pushpins, coloured string, paint, plaster and chicken wire</p> <p>Can also be useful to photograph the finished product</p>
<p>Geographic features are depicted on the model using pushpins (for points), coloured string (for lines) and paint (for areas). On completion, a scaled and georeferenced grid can be applied to allow the data to be transposed back onto a scale map or else imported into a GIS</p>	<p>Finished model can become an installation depicting community spatial knowledge and presented in a museum or community centre – it can become a symbol of community pride</p> <p>Data depicted on the model can be extracted, digitized and plotted</p> <p>Initial creation of the community model is in itself a community activity with positive community-building outcomes (also a good tool to learn about map topography)</p>	<p>Can accommodate overlapping layers of information (functions like a rudimentary GIS)</p> <p>The 3-D aspect of the model is intuitive and understandable; this means all community members can contribute either information or labour</p> <p>The information on the model can be easily transposed and replicated in a GIS</p>	<p>Storage and transport of the model can be difficult. Makes immediate communication of community information to decision-makers difficult. The information must be transferred to another medium (e.g. paper maps, photos or GIS) to make it more portable</p>	

GPS mapping

Description	Uses/Users	Strengths	Weaknesses	Resources
<p>Global Positioning System (GPS) is a satellite-based positioning system. A GPS receiver is carried to a position in the field and used to capture an exact location on the earth using a known coordinate system such as latitude and longitude. Data are stored in digital format</p>	<p>Used to capture and store geographic coordinates related to local features (e.g. boundaries or point locations) and then locate these points on accurate scale maps</p>	<p>Provides accurate (within 15 metres accuracy) geographic data</p>	<p>Still relatively expensive for many communities</p>	<p>GPS receiver</p>
<p>Recently these technologies have become far more accurate, accessible, cheap and easy to use. As a result, there is a proliferation of their use in participatory mapping initiatives</p>	<p>Increasingly used by communities in surveying large areas quickly and making accurate scale maps which are recognized by official agencies</p> <p>Helps add accurate locational information of geographic features onto scale maps, geo-referenced P3DMs (and other less technology-rich community mapping methods), as well as aerial and remote-sensed images and GIS</p>	<p>After initial training, receivers are relatively easy to operate</p> <p>Increasingly affordable</p> <p>Relatively lower technology requirements than other computer-based mapping techniques and therefore lower cost</p>	<p>Training is required to understand the equipment as well as formal cartographic protocols (e.g. scale, orientation, coordinate systems, projections) for its use</p> <p>Equipment requires batteries (which is an additional expense)</p> <p>GPS receivers can be monopolized by men</p> <p>Getting direct line of site to satellites sometimes hard in heavily forested areas</p>	<p>Scale maps on which to plot the GPS points</p> <p>Logbook is useful to record and back-up key way points</p> <p>Waterproof box for storing the GPS receiver, a set of spare batteries and a compass</p>

Using aerial and remote sensing images

Description	Uses/Users	Strengths	Weaknesses	Resources
<p>Aerial photography and remote sensing involves gathering pictures (often referred to as images if they are in digital form) from about the earth's surface using cameras on airplanes and satellite sensors from space</p>	<p>Good format to communicate community information to decision-makers because it uses formal cartographic protocols (e.g. coordinate systems, projections)</p>	<p>Effective in mapping relatively large and difficult to access areas. Can provide broad overview of community land use – watershed level</p>	<p>Still can be expensive and images are not readily available. May be difficult to obtain permission for access in some countries (i.e. may be under military control)</p>	<p>Aerial photos and remote sensed images</p>
<p>These images can be georeferenced and turned into air photo/satellite maps and used in much the same way as scale maps (discussed above). Distortion in the image is corrected and the height data (i.e. topography) can be interpolated. Scale, orientation, coordinate system and contour lines are shown, making air photo maps excellent base maps for participatory mapping initiatives</p>	<p>Information on the map can be easily verified on the ground</p>	<p>Increasingly easy and cheap to access and download from the Web</p>	<p>No legend – have to interpret objects. Certain images are sometimes difficult to read and interpret</p>	<p>Large sized mylar transparencies, tracing paper, pencils, coloured pens and tape</p>
<p>Mylar transparencies can be overlaid on the photomap to delineate land use and other significant features. Information on the transparencies can be scanned or digitized and georeferenced later</p>	<p>GPS data can be easily transposed onto images</p> <p>If images of the same area have been taken at different points in time, they can provide an excellent way of understanding the extent of land use change over time. These comparisons can be an excellent stimulus for community discussion and strategizing</p>	<p>Can be engaging, offering community members views and perspective of their area that they may never have experienced before. Landmarks may even be recognizable</p>	<p>Does not always clearly depict the features important to community members (e.g. certain forest types or individual trees)</p>	<p>Sources of data could be difficult for some community members to relate to (e.g. orbiting satellites far outside earth's atmosphere)</p>
<p>Recently these data (particularly slightly outdated satellite images) have become more accessible and cheaper (and in some cases free). As a result, there is a proliferation of their use in participatory mapping initiatives</p>				

Multimedia mapping

Description	Uses/Users	Strengths	Weaknesses	Resources
<p>Interactive, computer-based maps that link digital video, photos and written text with maps. They can be used to communicate complex, qualitative local knowledge related to the landscape</p> <hr/> <p>The digital hyperlinked map of the community's traditional lands consists of points, lines and polygons that can be clicked on to link the viewer to related multimedia and textual information</p>	<p>To support local communities in expressing, documenting and communicating their traditional and contemporary land-related knowledge using a medium that is closer to the traditional oral systems of knowledge transfer</p> <hr/> <p>Integrates local spatial and nonspatial data to support discussion and decision-making processes</p> <hr/> <p>For communicating land-related traditional knowledge with outsiders and within the community, particularly between generations in an accessible and engaging format (especially video)</p>	<p>Very engaging format, excellent system for communicating local knowledge</p> <hr/> <p>Combined with tangible computer-based skill transfer to community members</p> <hr/> <p>Potential to package and sell production material once trained</p> <hr/> <p>Easy for end-user to access and learn about local knowledge</p> <hr/> <p>Relatively easy to develop and deploy than more complex GIS initiatives</p>	<p>Expensive for many communities (important to not forget long-term operating costs in addition to start-up outlay)</p> <hr/> <p>Training required to understand the equipment as well as formal cartographic protocols</p> <hr/> <p>Long-term commitment (i.e. time-consuming)</p> <hr/> <p>More complex to grasp than using existing scale maps or making sketch, transect and ground maps</p> <hr/> <p>Video production, photographic editing and file management training required</p> <hr/> <p>There is a danger that practitioners focus too much on the technology to the detriment of the participatory process</p> <hr/> <p>In many remote communities, access to the electricity required to run the equipment is intermittent or altogether unavailable</p>	<p>Video and camera equipment</p> <hr/> <p>Digital image of map</p> <hr/> <p>Computers and software</p>

Participatory geographic information systems (PGIS)

Description	Uses/Users	Strengths	Weaknesses	Resources
Participatory GIS are computer-based systems that capture, manage, analyse, store and present geo-referenced spatial information. They include spatial data management tools that can work with aerial photographs, satellite imagery, Global Positioning Systems (GPS) and other digital data	To store, retrieve, analyse and present spatial (or land-related) information Used to explore community-driven questions, many of which can be answered using the analytical functionality of PGIS	Good at displaying precise georeferenced information (either on-screen or as part of tailored paper-based maps) Can use sophisticated database tools to analyse data and create precise quantitative data (e.g. area, distance and orientation). This data can be very important for managing natural resources and traditional lands Maps and data produced by PGIS initiatives communicate information easily, convey a sense of authority and are often highly convincing	Steep learning curve (even for people with extensive computer knowledge) Requires continual updating of software and retraining (need to recognize long-term operating costs in addition to start-up outlay) Expensive for many communities Training required to understand the equipment as well as formal cartographic protocols (e.g. scale, orientation, coordinate systems, projections) for their use Long-term commitment (i.e. time-consuming) The persuasiveness of the GIS medium can create a false sense of legitimacy – GIS products are only as accurate as the data used to create them Danger that practitioners will focus on the technology to the detriment of community participation	Computers, GIS software and data sets In many remote communities, access to the electricity required to run the equipment is intermittent or altogether unavailable
GIS technology has long been regarded as complicated and costly and a technology that is primarily used by experts. Since the 1990s, the PGIS movement has sought to integrate local knowledge and qualitative data into GIS for community use	Can integrate local spatial and non-spatial data to support discussion and decision-making processes			
PGIS practitioners (who are often intermediaries from outside the community) work with local communities to democratize the use of the technology and to enable them to communicate their spatial information to influence planning and policy-making. Practitioners place the control for access and use of culturally sensitive spatial data in the hands of those who generated these, thereby protecting traditional knowledge and wisdom from external exploitation				

Internet-based mapping

Description	Uses/Users	Strengths	Weaknesses	Resources
<p>Internet-based mapping is the newest arena for participatory mapping initiatives. Developed (and some developing) countries are seeing an explosion of communities using web-based applications (e.g. Google Maps and Google Earth) to document and present local spatial knowledge</p>	<p>Using the Internet, these maps are very efficient at visualizing and delivering rich multimedia geo-referenced community knowledge to a wide (i.e. international) audience</p>	<p>These mapping tools are currently free to use and the information free to access</p>	<p>Initial financial outlay and ongoing costs are too expensive for many communities</p>	<p>Digital cameras, video, recording devices, computers</p>
<p>Similar to multimedia mapping, these interactive maps allow users to click on map features in order to access other multimedia information. Map data are based on local knowledge that has been documented by community members using digital video, digital photos and written text, stored on computers and managed and communicated through the interface of an interactive map. What makes these maps particularly powerful is their ability to communicate community knowledge over the Internet and thereby reach a wide audience</p>	<p>Provides easy access to GIS-related functionality</p> <p>Maps, identifies, defines and edits place entries</p> <p>Provides a database and directory of local and nearby locations that users can discover and visit</p>	<p>Compared to a fullblown GIS, these tools are relatively simple to understand and manage</p> <p>Can capture and present multiple perspectives of a landscape</p> <p>Similar to GIS technologies but simpler to understand and manage</p> <p>Relatively simple to update information</p>	<p>Requires high speed Internet access. This remains a challenge for many developing countries outside of urban areas</p> <p>Turns local knowledge into public knowledge and conceivably takes it out of local control</p> <p>Training required to master the equipment</p> <p>Danger that practitioners will focus on the technology to the detriment of community participation</p> <p>In many remote communities, access to the electricity required to run the equipment is intermittent or altogether unavailable</p>	<p>High speed Internet access</p>

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