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Paolo Campo

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Une étude de cas à Palawan, Philippines

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Rapporteurs

Professeur Teodoro Villanueva, Université des Philippines-Los Baños
Dr. Denis Gautier, CIRAD

Examineurs

Professeur Frédéric Landy, Université de Paris Ovest Nanterre-La Défense
Dr. Philippe Guizol, CIRAD
Dr. Guy Trébuil, CIRAD
Dr. Christophe Le Page, CIRAD

Directeur de thèse

Dr. François Bousquet, CIRAD

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CHAPTER 1

INTRODUCTION

1.1. Context of the dissertation

1.1.1. *Environment and natural resources management in the Philippines*

After the Philippine revolution in 1986, giving way to a new government and a new constitution, the management of environment and natural resources in the Philippines went into a critical change. In 1991 environment and natural resource management (ENRM) was eventually devolved and decentralized, giving local government units (LGU) the task of managing their own resources, with coordination with the national government. The government department which used to handle this task was divided into smaller units or line agencies to provide assistance to the LGUs. Smaller groups, such as communities, were the target beneficiaries of this change. Or at least that was the plan.

During this period of change, emphasis was put on environmental protection and social justice. The aim was to protect the environment and rehabilitate the natural resources, which was ravaged during the previous government, while being able to improve the lives of the communities who are in direct contact and dependent on these resources. Community-based resource management practices were deployed to ensure that communities directly gain from the protection and rehabilitation of the resources, such as the Community Based Forest Management (CBFM), which was adapted as the main strategy for sustainable forest management in 1995. Through CBFM agreements, the local communities were given tenurial instruments to protect and rehabilitate the forest areas while trying to generate income from the resources found within. A crucial law was also passed to recognize and protect the rights of the Indigenous Peoples (IPs) via the Indigenous Peoples Rights Act of 1997. Within this law, the IP's are provided with tenurial instruments, namely, the Certificate of Ancestral Domain

Title (CAD-T) and the Certificate of Ancestral Land Title (CAL-T), which delineates and recognizes the areas that the IPs have been using by their communities to practice their culture.

And yet, after 20 years, despite gaining headway in terms of laws and policies for ENRM, some of the same problems still persist. There have been a myriad of challenges faced by the local governments and the communities in implementing and following the environmental policies. For example, Elazegui et al. (2001) reported that LGUs, despite being given the responsibility to implement and enforce the environmental policies of the DENR, were provided with insufficient funds to complete their tasks. Moreover, the devolved powers for ENRM to the LGUs have been limited to small-scale mining, which are still subject to the review and supervision of DENR, and forest resources via the CBFM . At any time, the DENR could just as easily supersede these powers (*ibid*). In reality, the LGUs and the communities have very little power to work with in localized ENRM. There are also challenges in terms of the management units, such as the area of jurisdiction of management, especially in cases where the management units cross political boundaries, such as watersheds. DENR's focus has been mainly in regulation, rather than in development, according to Dulce et al. (*ibid.*). Moreover, ENRM in the Philippines has generally remained top-down and that participation of non-government organizations (NGO's) and local communities has been mainly on consultations and there are no guarantees that their inputs would be taken into account in passing new policies and rules for ENRM (Bouquiren and Cabalfin, 1995) As a result, the communities dependent on these natural resources have remained poor, while the environment and its natural resources have continued its decline. There is a growing resentment towards environmental protection, such that communities are equating new environmental protection rules and policies to having much more difficult lives because these new rules tend to reduce their livelihood opportunities. Between the development and the implementation of NRM policies there somehow exists a gap that needs to be bridged in order to efficiently tackle the problems at hand.

1.1.2. *Emphasis on participation for sustainable environment and natural resource management*

Local participation is important because the local people have a better knowledge and understanding of their situation and their environment as compared to outsiders (Narayan, 1995; Dayal et.al., 2000).

Participation involves cooperative effort among the different stakeholders involved in the management of the natural resources. It also implies that the local people are actively involved in the process of decision-making wherein their insights, experiences, knowledge and interests are taken into consideration (Rikken, 1993). Elinor Ostrom and her colleagues at the Workshop in Political Theory and Policy Analysis at Indiana University reviewed numerous NRM case studies compiled from all over the world (Ostrom, 1990; Ostrom et al., 1994). Their findings suggest that one of the key ingredients of long enduring NRM systems is where the local stakeholders who are most affected by the NRM rules are able to participate in the creation, modification, implementation and monitoring of the rules, as well as sanctioning the rule violators. Participation “adds ownership to findings and commitment to action (Dayan et al., *ibid.*)”

The aim of participatory approaches is to let people identify their problems and not outsiders who assume what their problems are (Gosling and Edwards, 1995 as cited by Ockelford and Reed, 2002). Narayan (*ibid.*) explains that the “participation of the people is not something that could be placed at anytime and anywhere in a process. They should be involved from the very beginning to end of a process,” i.e. they should be part of problem-identification to implementation of the solutions. It is believed that local knowledge and technologies is useful for planning and implementation of a program or project because the plan becomes more tailored to the needs of the community, and, in its implementation, the community itself would be the one to manage and control its resources (The Program Support Staff, Upland Development Program, DENR, 1994).

In the Philippines, despite the challenges for local participation in ENRM, there have been some examples wherein genuine participation was achieved and positive results were attained. Fellizar

(1993) emphasized on the importance of community participation in the success of projects or programs when he cited cases of community participation using a community based resource management (CBRM) approach that were successful in the people's efforts for proper natural resource management:

- 1) In the cases of Western Zamboanga Peninsula Subanon Association (WEZPESAI) and the Bigkis-Lakas Alquezar, the members of the community organizations were the ones protecting their own resources by policing its extraction.
- 2) In the case of a Guba, a barrio in Cebu City, a system of cultivation introduced by an external agency was transferred by word of mouth between the farmers when the farmers realized that the system was working for them. Some of these farmers even became trainers to new farmers, government, and NGOs who were interested to learn of this technology.
- 3) In the case of Apo Island in Negros, Siliman University, through the Marine Conservation and Development Program (MCDP), introduced a fish sanctuary project to the locals. At the beginning, the people hardly supported the project because of fear that Siliman University might have ulterior motives in the implementation of the project. However, when the local people were made part of the project, from planning to its implementation, their fears disappeared and supported the project. At the end of the project, the people of Apo Island have full management of the functioning marine reserve of the island.
- 4) A deep-sea fishing corporation in Eastern Samar, initiated by the Philippine Business for Social Progress (PBSP), is being managed by the fisher folk organizations of the area, with the help of local NGOs. This involved the management of wharf and ice plant set-up by the fisher folk organizations themselves. The fisher folk organizations have already started doing deep sea fishing to ease the pressure on coastal fisheries while earning more income as compared to municipal fishing.

1.1.3. The Levelling the Playing Field project and Companion Modelling Approach in Palawan, Philippines

Given the stature of the Palawan province as one of the most famous tourist areas in the Philippines, as well as being one of the most protected areas for its biodiversity, much interest has been generated in research and development initiatives for the management of the environment and natural resources. One example is the Adaptive Collaborative Management of forests project (ACM in Palawan), which was conducted from 1999 to 2002. This project aimed towards improving the implementation of the CBFM program through capacity-building and facilitation of the stakeholders (Devanadera et al., 2004) in three villages in Palawan, namely, San Rafael, Tanabag and Concepcion. Significant improvements in skill and capacity of the stakeholders were reported, such as in documentation and in communicating their opinions to others (Hartanto et al., 2003). The Levelling the Playing Field (LPF) project, the context of the case study used in this research, is a somewhat unofficial continuation of the efforts of the ACM project in the three villages.

From 2004 until 2008, the research and development project, called Levelling the Playing Field (LPF), was implemented by the Center for International Forestry Research (CIFOR) and Centre de coopération internationale en recherche agronomique pour le développement (CIRAD), and funded by European Commission (EC) under the Tropical forests budget line. The project involved three countries, namely, Indonesia, Malaysia and the Philippines, with a total of six study sites: three in Indonesia, two in Malaysia and one in the Philippines. In each of the study sites, the project had local universities as partners in the implementation of the project; in the Philippines, the partner university was the University of the Philippines, Los Baños. The LPF project had the objective of improving renewable resource management through capacity-building and improving communication and coordination among stakeholders including, but not limited to, the local communities (including indigenous peoples), private companies, non-government and government organizations. In the Philippines, the LPF project sought to support the collaborative management of the environment and

natural resources of three villages in the city of Puerto Princesa, Palawan. Palawan, being one of the last frontiers in the Philippines of having well preserved natural resources and biodiversity, has had intense environmental protection and rehabilitation by the national and local government. In 1992, Republic Act 7611 or the Strategic Environmental Plan (SEP) for Palawan was passed to ensure sustainable ENRM and development in the area. This law also led to the creation of another environmental body, the Palawan Council for Sustainable Development (PCSD), which was tasked to employ the strategy for the entire province. This situation is unique because it is the only national mandate that was conceived and implemented for an entire province.

The project site (Figure 1.1) is composed of three contiguous villages – San Rafael, Tanabag and Concepcion – with a combined area of approximately 18,000 ha and contains three landscapes, namely, the uplands, the lowlands and the coastal areas (Figure 1.2).

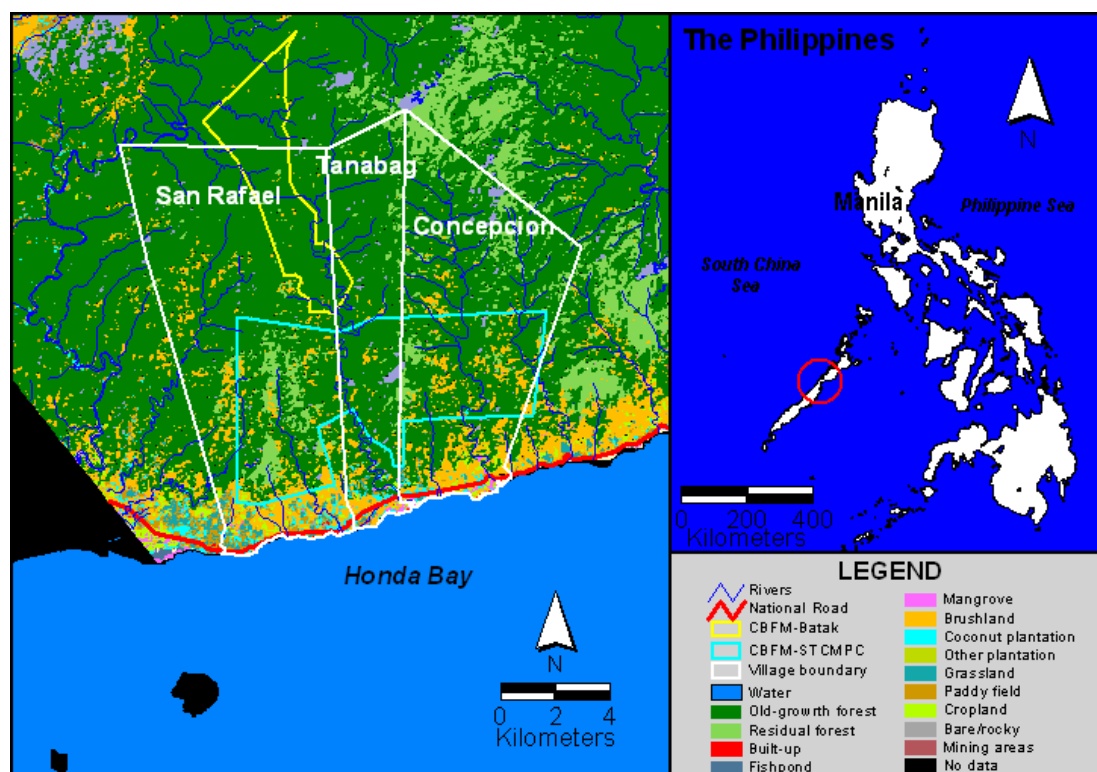


Figure 1. 1 Location and land-use/cover map of study site (Villanueva et al., 2008)



Figure 1. 2 Landscapes found in the three villages (Villanueva et al., 2008)

The upland contains the forest areas where the villagers usually extract non-timber forest products (NTFPs) for livelihood such as honey, almaciga resin, rattan and fallen branches for charcoal. Swidden farms are also located in this area. Coconut plantations and rice paddies are in the lowland areas, as well as backyard vegetable and ornamental gardens of the villagers. Livelihood activities found in the coastal area are fishing and gathering of milkfish fry. There are two types of seasons, the wet season from May to October and the dry season from November until April. The type and frequency of livelihood activities performed during the year are heavily dependent on the seasons. Wind patterns affect fishing, with the Northeast monsoon attaining its peak from December to February, making the open seas difficult and dangerous for fishing. The villagers, estimated at about 3600 inhabitants in 2000, are composed of a small community of indigenous people, called Bataks, and migrants coming from other parts of the Philippines. Initially, the Bataks were a coastal tribe, but were driven uplands as immigration grew. A Batak settlement, named Kalakwasan, was established at the fringes of the forests at the initiative of the government to make the Bataks more accessible to external support and aid. Livelihood-based people's organizations (PO) have been formed within and among the three villages, more notably the San Rafael, Tanabag, Concepcion Multi-purpose Cooperative (STCPMC), which was formed to manage the 5,000 ha CBFM area awarded to the three villages. The CBFM area awarded to the Bataks, having an area of 1,750 ha, is being managed by the Samahan sa Kaunlaran ng Batak sa

Tina Organization (SKBTO). However, even before the LPF project began STCMPC has been inactive due to internal conflict. Mediating institutions, both from government and non-government organizations (GOs and NGOs), have provided livelihood assistance, as well as capacity-building activities for the villagers. Quite recently the Environmentally Critical Areas Network (ECAN) zoning for Palawan province is slowly being implemented by the Palawan Council on Sustainable Development (PCSD), and strong interest has formed among the stakeholders and researchers about the possible impacts of new resource access rules. ECAN zoning is the main strategy of the Republic Act 7611 or the SEP, which delineates the entire province of Palawan into areas with varying degrees of human access and activities. During the course of the LPF project, two groups were institutionalized through the initiative of the project, namely, the Provincial Steering Committee (PrSC) and the Technical Working Groups (TWGs). The PrSC is composed of decision-makers coming from GOs, NGOs and the community. It is tasked to monitor, evaluate and improve on the activities started within the project. The TWGs are composed of villagers and are tasked to develop livelihood programs for their community. Some members of the TWGs are also members of the PrSC. It was envisioned that these groups would be the direct conduit of communication and coordination between the stakeholders and the LPF project and among the stakeholders themselves. Also, it was intended that they would continue the efforts of the project when it ends. Most of the stakeholders involved in the ACM project have also been identified as stakeholders in the LPF project, with the addition of the stakeholders of the upland, lowland and coastal areas outside the CBFM context. Essentially, the range of stakeholders needed to be involved became larger, involving government and non-government organizations and the local communities of the three landscapes. Some members of the ACM research team also joined the LPF project. This meant that there was already social capital among the researchers and the stakeholders to which the project could benefit.

The management of the environment and renewable natural resources in the three villages can be described as having multiple stakeholders with different and competing interests, objectives and

motives. The community groups, government and non-government organizations also have different positions of power that make collaborative management difficult. Laws and environmental policies often lead to confusion and conflicts among the stakeholders for forest, land and water management. For example, the tenurial instruments used by the communities for resource access and use, such as the CBFM agreements and the indigenous people's CAD-T/CAL-T, are in divergence with the ECAN zoning which tend to reduce the effective areas that can be utilized by the communities. The various number of government agencies related to ENRM in Palawan also tends to cause confusion and prolong processes related to ENRM and livelihood development. Although all stakeholders acknowledge the need for sustainable ENRM and are willing to sacrifice for its improvement, there were, however, gaps in the understanding of the roles of the different parties and the expectations for sustainable ENRM were very different; communication and coordination among stakeholders have therefore been difficult. The ENRM situation in the three villages fits well into the theme of intervention of the LPF project. Thus, the LPF approached the situation with the assumption that, aside from capacity-building, to achieve sustainable ENRM it is crucial that the stakeholders are involved equitably in the planning and implementation processes. To this end the LPF project turned to modelling of complex systems approach.

The use of models in policy formulation has been limited partly due to challenges in proper representation of the different perspectives of the stakeholders (Verburg et al., 2006). As Vennix (1996) stated, it is during the model-building process where most insights are gained and, thus, the model-builders stand to learn most from it. Therefore, it has been strongly recommended that the stakeholders, or end users of models, be involved in the modelling process (Verburg et al., 2006; Gonzalez, 2002; Castella et al., 2005). Companion Modelling (ComMod) is an approach for the collective development and use of models for learning and in supporting negotiation and decision making processes among stakeholders in natural resource management. It emphasizes the inclusion of the different points-of-views of the stakeholders to collectively build a shared representation of their

NRM reality. The position of ComMod is that stakeholders, in most cases, have different viewpoints of the world and each of these viewpoints should be properly represented when building the model to make it meaningful to all the stakeholders (Bousquet et al., 1999) and, more importantly, to gain the confidence and trust of the stakeholders in the model for them to use it. This means that the stakeholders are able to define the system according to their perceptions, define how to view these perceptions by means of a spatial representation or viewpoint, define the indicators by which the model would be assessed and analyzed and define the scenarios or management strategies the stakeholder would like to pursue or explore. The stakeholders collectively sort out the knowledge which is relevant for the social interactions and the problem at stake. Depending upon the objectives of the modelling exercise, the model have many uses such as a tool for understanding, simulation and prediction and as a virtual laboratory to support research and as decision support systems (Wainwright and Mulligan, 2003; Barreteau et al., 2001).

Following a two-week training and workshop on Companion Modelling in Bangkok, Thailand in December 2004, the researchers and some of the stakeholders decided that the ComMod approach would be appropriate to meet the challenges of building and using models together with the stakeholders and, in general, meet some of the project objectives to improve the communication and coordination among the stakeholders. Therefore, it is through ComMod that the LPF project aimed to create an environment that can facilitate the different stakeholders in communicating and negotiating their different interests, learning about the consequences of their strategies, and identifying areas of intervention. In the LPF project, it is posited that modelling the complex system of ENRM of the stakeholders may help them gain better understanding of their situation; thereby laying the foundation for discussions on ENRM issues. More specifically:

- 1) Develop a model together with the stakeholders to collectively learn more about the ENRM and livelihood situation in the light of existing and impending rules of access and use of resources. .

A spatially-explicit multi-agent system (MAS) was the modelling framework used in ComMod for the LPF project to model the complex system of environment, natural resources and livelihood management.

- 2) Use the tools that have been developed in the modelling process, i.e. role-playing game and computer simulation, to initiate and stimulate discussion among the stakeholders in finding a balance between sustainable ENRM and livelihood.

1.1.4. Personal background and role in the LPF project

I joined the LPF project as a member of the Philippine team from 2004 to 2008, wherein my role was to be the main investigator for ComMod. Prior to working for the LPF project, I have been involved in environment and natural resource management studies and ComMod since pursuing my Master's Degree in Remote Sensing. During my studies, I was invited to attend trainings on Multi-Agent Systems (MAS) and Companion Modelling (ComMod) being conducted by CIRAD scientists in Thailand for the European Commission's Asia Information Technology and Communications (Asia IT&C) Programme, which I attended from 2002 to 2003. In connection with this, I participated in a research project for the university concerning the multi-stakeholder ENRM case of Loon, in the province of Bohol, Philippines. In this research, I applied the concepts and tools of Remote Sensing, Geographic Information Systems (GIS) and MAS to build a simulation model for the ENRM system of Loon. And from this case study, I developed a methodology for using RS, GIS and MAS for ENRM studies, resulting to my Master's thesis (Campo, 2003). My thesis was later published as a chapter in a book, *Companion Modelling and Multi-Agent Systems for Integrated Natural Resource Management in Asia* (Bousquet, Trébuil and Hardy, 2005), which was a compilation and synthesis of the various ComMod and MAS applications in the region. After which, I began working for another European Union-funded research project, the *Smallholder Agroforestry Options For Degraded Soils (SAFODS)*, wherein I was tasked to develop a MAS simulation model on the agro-forestry adoption strategies of upland farmers of Claveria in the

province of Misamis Oriental, Philippines (Magcale-Macandog et al., 2005). This was also my first opportunity to design and implement a role-playing game based on the simulation model, which was played with the local farmers. Shortly afterwards, I was invited to join the LPF project.

It is from this experience of implementing ComMod in the LPF project and the analysis of its outcomes that I will draw upon the lessons on companion modelling as an approach, as well as from the context of a project component, and use them as the basis of this dissertation.

1.2. Objectives and research questions

During the course of my research, I implemented the Companion Modelling approach for the LPF project in Puerto Princesa City, Palawan. A spatially-explicit multi-agent systems (MAS) model for NRM was collectively developed with the stakeholders, resulting to a role-playing game and a computer simulation that were used for collective learning, planning and negotiation among the stakeholders. Implementing ComMod in a project, such as LPF, presented a unique set-up, however. Normally, the approach is implemented from the ground-up, beginning without any a priori implicit experimental hypothesis (Barreteau et al., 2003a). Moreover, a review of previous ComMod applications suggests that the approach is implemented exclusively, i.e. not being directed under any project. This was not the case for a ComMod process within the LPF. With the evaluation of the project and ComMod, the ComMod evaluation protocol (CEP) and the project's Criteria & Indicators (C&I) were initially used for impact analysis of the different processes of the project involving the stakeholders, in which different causalities or linkages were established between the processes and results. A challenge presented itself as to how to identify or differentiate the impacts between ComMod and the other components of the project. While examining this situation, the relationships between the project and ComMod were being uncovered and, in so doing, a new question emerged: How do we organize the analysis of these two processes in relation to each other, as well as their relation to the context in which they were applied in the field? This is an important question to address as it could also lead to improvements on

how the ComMod approach is implemented in the field under various contexts, such as being a stand-alone intervention initiative among ENRM stakeholders and as a project component. In so doing, this may enhance the quality and the outcomes of such processes for the stakeholders and the researchers employing the approach. A well known analysis framework, the Institutional Analysis and Development (IAD) framework developed by Elinor Ostrom and her colleges at the Workshop in Political Theory and Policy Analysis at Indiana University, seemed well suited to address the question at hand, as it affords structure to interaction spaces among different actors in various contexts, such as in ENRM and project initiatives.

Therefore, in this dissertation the IAD framework will be used to analyze the ComMod experience in the LPF project case study as a process among multiple stakeholders and researchers and as a component of a research and development project. From this analysis, I will investigate how IAD can be used to enhance the ComMod process and its outcomes.

1.2.1. Main concepts used in this research

There were three main concepts that have been used in relation to this dissertation, namely, multi-agent systems (MAS) model, companion modelling (ComMod), as used in the Levelling the Playing Field (LPF) project case study, and the Institutional Analysis and Development (IAD) framework, as used in this dissertation for analyzing the LPF project case study. Below are the brief descriptions of these concepts, which will be presented in more detail in the State of the Art (Chapter 2) of this document. In the course of this dissertation, I will attempt to elucidate the articulation among these three concepts and develop a cohesive framework for implementing and analyzing the companion modelling approach, based on the LPF case study (to be discussed in detail in Chapter 6).

Multi-agents systems model

Although not exclusively, the primary modelling perspective used in the ComMod approach is the multi-agent systems (MAS) for NRM. A MAS is a system model style that represents a complex system

composed of the following components: (1) a space, called the environment, (2) objects that are situated in the environment, (3) a special type of object, called agents that would represent the active entities in the system, (4) relations that link these objects, and consequently the agents and the agents with their common environment, (5) a set of operations that could be performed by the agents to interact, transform or manipulate other objects in the environment, and (6) operators that represent the results when these operations are performed (Ferber, 1999). Each agent is able to act on its environment according to its characteristics, goals, knowledge and certain, but limited perception of the system. An agent may also interact with other agents. The environment is a space with attributes and could also be depicted to evolve or change, such as in a cellular automaton. In the context of natural resource management (NRM), the environment, for example, may be the land or sea cover with biophysical process such as forest or vegetation growth and fish reproduction and migration. The agents may be the stakeholders of the NRM system, such as humans, animals, and government agencies having their own limited perceptions and goals about the environment they are in. The agents' limitations in knowledge and perception, as well as the differences in goals and perception, may lead to miscommunication, lack of coordination and even conflict amidst an ever-changing environment. These are characteristics commonly found in NRM situations with limited resources that are shared among multiple users.

In ComMod, a MAS model could be tangibly implemented in two ways, as a simulation model or as a role playing game (RPG). A MAS simulation model is a computer implementation of the model with its components being represented as computer entities or objects. It simulates a complex system through the passage of time, usually for a period that is impossible or costly to observe in reality. On the other hand, a role playing game is an implementation of a MAS model using a game with players, such as stakeholders, having actions and interactions akin to reality. In this case, the players act as the agents of the MAS model. Although these two tools (simulation model and RPG) could be used individually in the development of the MAS model in ComMod, together they may complement each

other depending on the purpose of the modelling exercise. An example of this complementary relationship of RPG and simulation model is the case wherein the RPG is used as a facilitation tool to explain the MAS model. However, an RPG played with the stakeholders is limited in the number of steps or iterations that can be played and in the number of interactions that can be represented; the simulation model could be used to show the outcomes of the RPG should the game be continued for a longer period or include more features and complex interactions that were not represented in the RPG. Other tools could also be used to support the modelling process such as tools and artefacts developed using participatory GIS and participatory land-use planning tools, etc.

Companion modelling

Companion modelling or ComMod (Barreteau et al., 2003a) is an iterative approach in developing system models, wherein fieldwork and system modelling are closely related and complementary activities. In this approach there is constant interaction between the researchers and stakeholders in an iterative process, such that the model will undergo modifications resulting from these interactions, or even produce a totally different model altogether. The process of validating the model is a series of back-and-forth steps from the field (reality) to the model to be able to take into account the different perceptions of the stakeholders and properly represent them in the model using tools such as simulation models and role playing games as platforms for discussion.

In ComMod, the quality of process of building the model is paramount such that the stakeholders are willing and able to accept the results of the modelling process. Ultimately, the goal of the ComMod approach is to achieve a collective understanding of the complex system with the stakeholders, and to be able to use the newly acquired knowledge in the process of discussion, negotiation and decision-making.

Institutional analysis and development framework

Institutional analysis and development framework is a tool for organizing concepts that could be used to guide researchers in analyzing institutions. It emerged from the synthesis of tens of case studies. It is a language that is meant to provide a more unified meaning to institutions and provide an organization for its analysis. Institutions in this context are defined as “the rules-in-use, including norms and strategies, which govern interactions among actors within a social space to achieve a predefined goal or outcome” (Ostrom et al., 1994). With IAD, these various theories and models used to explain different phenomena may be organized and analysed according to the elements or variables they share in common.

1.2.2. Research questions

With ComMod being applied within the context of a research and development (R&D) project, and interacting with other efforts from the past and present at target sites, we go back to the question of how can we effectively apply the combination of these framework and approach in such a situation? In addition, how can the use of the IAD framework be effective in enhancing the ComMod approach? More specifically, this research will try to focus on the following questions:

- 1) How can the principles of IAD, ComMod and MAS model be articulated to develop an alternative approach that can support/aid the analysis of multi-stakeholder processes for managing the environment, renewable natural resources and livelihoods?
- 2) How and to what extent can this articulation be applied in the context of multi-stakeholder processes which have been externally initiated such as research studies and development projects wherein problems and objectives may have already been identified?

1.2.3. Organization of this dissertation

Chapter 2, or the State of the art, will report on the different concepts used in this research, mainly on Institutional Analysis and Development (IAD) framework, the Companion Modelling Approach

(ComMod) and multi-agent systems (MAS), which includes a brief history of the concepts, how they are used or implemented, and some examples of how they have been used in other researches. The IAD framework will be used to organize the description and analyze the “before” (pre-ComMod) situation of the research study site in Palawan; this will be presented in Chapter 3. From this initial pre-ComMod context, Chapter 4 will expound on the steps undertaken for the ComMod implementation in the three villages in Palawan, within the scope of the LPF project. Using again IAD as a guide, the “after” (post-LPF and ComMod) situation will be presented and analyzed in Chapter 5, in which the outcomes will be linked to the ComMod and LPF processes. The research questions of this dissertation will be addressed in Chapter 6, in which a framework will be proposed for implementing the ComMod Modelling approach, including its evaluation, which has been structured according to IAD. This document will be concluded and the future perspectives related to this study will be presented in Chapter 7.

CHAPTER 2

STATE OF THE ART

Common-pool resources or common property resources (CPR), are natural or man-made resources that have two very important characteristics: first, it is extremely difficult or very expensive to exclude other users from the users (excludability problem), such as trying to fence off a watershed from outsiders; and, second, the consumption of the resource units by one user reduces the opportunity of other users from the same resource (subtractability problem), such as taking water from an irrigation system reduces the available water for other users (Ostrom, 2005; Ostrom et al., 1994); these are just some of the common problems tackled in environment and natural resource management (ENRM). The goal of ENRM is to conserve and protect the environment for its sustainability, while at the same time ensuring that the human users, whose lives are intertwined with their environment, are able to benefit from a sustainable use of the resources; to this end, mechanisms such as policies, rules and strategies, i.e. institutions, are formulated to ensure the sustainability of these resource systems. We can view ENRM as a management of complex adaptive system (CAS) (Berkes, 2006). A complex adaptive system is a special type of complex system. It is a system because it is composed of different parts or components that are structured, interconnected, dynamic and interacting. It is complex because the sum of its parts does not describe the entirety of the system, i.e. the system cannot be simply explained by the decomposition of its parts, with each part analyzed independently. It has properties of emergence, wherein patterns or structures emerge due to the multivariate and multi-level interactions of its parts, and self-organization, wherein these structures or patterns are not due to a central or external control on the system, but rather endogenous (Parker et al., 2003). It is adaptive because it is able to learn from experience and change its behaviours in response to perturbation (Rammel, Stagl and Wilfing, 2007). This takes into account that the system itself is not closed, i.e., it is affected by external

or exogenous factors. The basic elements of a CAS are agents or “semi-autonomous units that seek to maximize their fitness by evolving over time (Dooley, 1996).” The properties and characteristics of CAS are very much applicable or exhibited in ENRM and its processes. To operationalize a CAS for ENRM, i.e., define the system so that it can be observed, measured and analyzed, one can make use of multi-agents systems (MAS) models, more specifically, MAS for NRM (Doran and Palmer, 1993; Lansing and Kremer, 1994; Epstein and Axtell, 1996; Bousquet et al., 1998; Barreteau, 1998; Deadman, 1999; Ferrand, N., 1999; Rouchier et al., 2000; Doran, 2001; Janssen, 2002; Pahl-Wostl, 2002; Parker et al., 2003). In France in particular, a research team based at the Centre de coopération internationale en recherche agronomique pour le développement (CIRAD), called GREEN¹ (Gestion des ressources renouvelables et environnement), had been at the forefront in this field of research.

An MAS, also known as an agent-based model (ABM), is a representation of reality. In general, MAS models for studying ecosystems may be used in developing new algorithm architecture and theoretical constructs, understanding a system by simulating its past and present, and support decision-making processes (Bousquet and Le Page, 2004), such as in ENRM. More specifically, the model can be used as a tool for understanding, simulation and prediction and as a virtual laboratory (Wainwright and Mulligan, 2003; Barreteau et al., 2001). However, the use of models in policy formulation has been limited (Verburg et al., 2006). Reality, such as in the context of ENRM, is subjective and one of the challenges in this respect is how to represent the different perspectives of this reality by the stakeholders (*ibid.*). Moreover, it is during the model-building process where most insights are gained and, thus, the model-builders stand to learn most from it (Vennix, 1996). For the model to be more relevant and meaningful to its end-users, i.e. the stakeholders of the ENRM system, it has been strongly recommended that the stakeholders, or end users of models, participate in the modelling process (Costanza and Ruth, 1998; Moss et al., 2000; Pahl-Wostl, 2002; Gonzalez, 2002; Castella et al., 2005; Verburg et al., 2006). The Companion Modelling (ComMod) approach, in particular, uses a

¹ GREEN website: <http://www.cirad.fr/ur/green>

participative modelling process at the core of its research agenda (Barreteau et al., 2003a; Bousquet et al., 2005; Etienne, 2011), and is advocated by a group of scientists known as commodians (Etienne, 2011). ComMod is an approach for the collective development and use of models for learning and in supporting negotiation and decision making processes among stakeholders in natural resource management. It explicitly adopts a stance wherein knowledge in this process is produced from the bottom up, i.e. it follows a constructivist paradigm, such that there is no external or independent knowledge about the entire system. In line with this stance, one of ComMod's strengths is its emphasis on modelling the different points-of-views of the stakeholders to collectively build a shared representation of their ENRM reality. The position of ComMod is that stakeholders, in most cases, have different viewpoints of the world and each of these viewpoints should be properly represented when building the model to make it meaningful to all the stakeholders (Bousquet et al., 1999). More importantly, the participation of the stakeholders in the model-building process allows them to gain the confidence and trust in the model such that they will use it. Participation, in this context, means that the stakeholders are able to define the system according to their perceptions, define how to view these perceptions by means of a spatial representation or viewpoint, define the indicators by which the model would be assessed and analyzed and define the scenarios or management strategies the stakeholder would like to pursue or explore. The stakeholders collectively sort out the knowledge which is relevant for the social interactions and the problem at stake.

In this case study, ComMod was used to collectively build and use an MAS model of the ENRM and livelihood system of the stakeholders in three villages in Palawan, Philippines. The ComMod process was implemented within a research and development (R&D) project called the Levelling the Playing Field. Because the project had its own method and criteria for analyzing its impacts, the challenge was how to organize the results of the analysis from the context of the project and from the context of the ComMod process so that they could be recognized, distinguished and linked; in this way, the outcomes of the analysis could be enriched. In other words, there was a need of a framework for

analysis. One of the most famous and widely used frameworks of analysis, especially dealing with CPRs and ENRM, is the Institutional Analysis and Development frameworks (IAD) developed by Elinor Ostrom, a 2009 Nobel Prize winner in Economics, and her colleagues at the Workshop in Political Theory and Policy Analysis. The development of the IAD framework itself relied heavily on tens of cases of empirical studies, laboratory experiments and theoretical research. By using the IAD framework in this study, this not only has the potential to organize my analysis of the ComMod process within an R&D project, but it opens opportunities for analysis together with other cases of similar nature. Therefore, MAS, ComMod and IAD are the three main pieces of the puzzle I attempt to articulate together in the context of this dissertation and, thus, I present below the concepts and how they were and are being used in the study of CPRs and ENRM. Owing to the depth of research in the application of these concepts in ENRM, it is more reasonable to elicit the lessons from these studies, accompanied by some examples, and their research perspectives rather than provide in-depth commentaries on individual case studies for each concept.

2.1. Multi-agent systems for NRM

Multi-Agent Systems or MAS is an agent-based model that originated from Distributed Artificial Intelligence, a sub field of Artificial Intelligence (Gilbert and Troitzsch, 1999). MAS is used in different types of applications such as robotics, e.g. robot teams playing soccer, telecommunications and computer animation (Lakhani, 2007).

MAS for natural resource management try to incorporate human behaviour and interaction, and try to assess how these activities affect the system (Bousquet and Le Page, 2004).It takes into account the presence of multiple agents (actors or stakeholders), each with unique views, perspectives and behaviour (Ferber, 1999). An MAS, as illustrated in Figure 2.1, represents a complex system involving the following components: (1) a space, called the environment, (2) objects that are situated in the environment, (3) a special type of object, called agents, that would represent the active entities in the

system, (4) relations that link these objects, and consequently the agents, with their common environment, (5) a set of operations that could be performed by the agents to interact, transform or manipulate other objects in the environment, and (6) operators that represent the results when these operations are performed (Ferber, 1999). The agents, or entities that can make decisions and perform actions, are able to interact with each other, act on its surroundings or environment to satisfy a goal based on their limited knowledge and perception of the system they belong to in a given period of time (Ferber, 1999; Parker et al., 2003). The agents may be modelled as rational agents (*homo economicus*), to have bounded rationality, or according to his or her own rules and behavioural patterns (Bousquet and Le Page, 2004). An agent could also be modelled as being reactionary/reactive that only responds to certain stimuli, or as a learning/intelligent agent, where it has learning mechanisms close to that of a real human (Kindler, 2006) and has its own beliefs, desires and intentions (BDI). The environment – the space where these agents act – could also be modelled if needed, to take into consideration the interactions among the various elements of the space as well as its evolution. One of the methods used to simulate evolution of the environment is cellular automata, wherein units of the environment, called cells, have neighbourhood effects (Goncalves and Diogo, 1994).

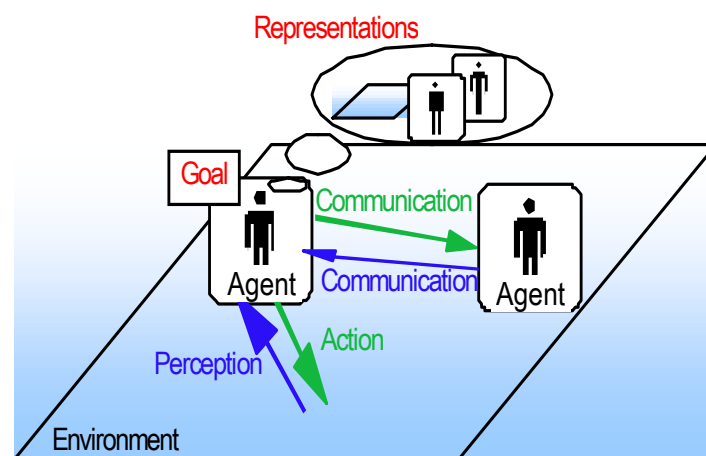


Figure 2. 1 A multi-agent systems (Ferber, 1999)

Given this limitation in knowledge and perception, as well as the differences in goals and perception, miscommunication, lack of coordination and even conflict can arise. In environment and renewable resource management, these situations are all so real and therefore MAS has been used to gain better understanding of different management systems, such as land use change (Castella et al., 2005, 2007; Castella and Verburg, 2007; Boissau and Castella, 2003; D'Aquino et al., 2003, Huigen, 2001), irrigation and water management (Gurung et al., 2006; Barreteau et al., 2004; Barreteau et al., 2003b; Becu et al., 2003a; Dare' and Barreteau, 2003; Feuillette et al., 2003), forest management (Purnomo and Vanclay, 2003) and coastal management (Campo, 2003), and settings such as in negotiation (Barreteau, 2003; Barreteau et al., 2003b,c) and participatory natural resource management (Becu et al., 2003b; Becu et al., 2008; D'Aquino et al., 2002; Bousquet et al., 2001; Rouchier et al., 2000).

2.1.1. Lessons from the use of MAS for ENRM

In this section, I will refer to the reviews on the applications of MAS by Parker et al. (2003) and Matthews et al. (2007) that focused on land use and cover, Bousquet and Le Page (2004) on ecosystem management, Pahl-Wostl (2002) on resource management and Janssen (2005) on ecological economics. From these documents, I will provide a resume on the diverse applications of MAS in these crosscutting fields, the advantages and challenges in employing this modelling perspective and their perspectives for moving forward in the application of MAS.

Shift to MAS modelling

Traditional modelling perspectives making use of mathematics or equations have been found insufficient especially when trying to incorporate social dimensions into a system (Parker et al., 2003). Either these modelling perspectives cannot accommodate the social dimension, or their inclusion run the risk of over-simplification (*ibid.*). There was a need for a new way to represent reality that could accommodate social dimensions, such as human decision-making, actions and interactions, and MAS

models offered a viable alternative to these traditional methods. However, the shift to MAS models does require some paradigm shifts due to the interactions (Bousquet and Le Page, 2004). Three paradigm shifts were offered by Bousquet and Le Page (*ibid.*) in the field of ecosystem management. First, the main issue confronting the scientists are the access and use of renewable natural resources, to which interactions between social and ecological dynamics are examined. However, for many years, this problem has been addressed as dynamics under constraints, either from the perspective of an ecological system under anthropogenic perturbation, or from the perspective of a social system under natural constraints. The new approach, then, is to consider these two components interacting with each other, but they themselves are heterogeneous and evolving, i.e. unconstrained. Another paradigm shift is from a systemic point of view to an organizational one. This takes into account the complexity of the ecological systems that are characterized with properties of self-organization and emergence. Finally, on the modelling tools, the shift is from models of stocks and flows to behaviours and interactions of individuals, or a shift from the usual mathematical equations to represent stocks and flows of information, matter or energy to rule-based interactions among heterogeneous components.

Broad application

Applications of MAS cover a wide area and can either be classified according to the purpose or objective of the model or to the field of inquiry the model was specifically made. In terms of objective or purpose, MAS models could be used as simulated social laboratories (Parker et al., 2003) to which one can test hypotheses. Another way is to construct theories based on MAS models (Bousquet and Le Page, 2004). MAS models can be used as explanatory tools, wherein one can simulate real world observations and offer an explanation to it as well as explore alternative solutions that exhibit the same results as real world observations (Parker et al., 2003; Bousquet and Le Page, 2004). An example of this was on the recreation of the history of the Anasazi Indians (Dean et al., 2002) and the coordination of water management in Bali (Lansing and Kramer, 1994). It can also be used for participation

(Bousquet and Le Page, 2004; Pahl-Wostl, 2002; Janssen, 2005; Parker et al., 2003; Matthews et al., 2007) wherein the flexibility in use and implementation of an MAS model, e.g. computer simulation and role-playing games (RPG), lends well to participatory modelling exercises (Parker et al., 2003) and can be used for tools of learning and even support decision-making processes such as in Companion Modelling (Bousquet and Le Page, 2004). For example, RPGs can be used to communicate and explain a model, which is often considered a black box (Barreteau et al., 2001). MAS is also suitable for modelling complexity, adaptation and emergence (Parker et al., 2003). Modelling dynamic path or paths of path-dependent outcomes can also be done in MAS (*ibid.*). In terms of field of inquiries, MAS models can be used in ecological economics, to which evolution of cooperation, diffusion processes, mental models, learning and land-use and land cover change (LUCC) could be investigated (Janssen, 2005). More specifically in LUCC, MAS can be used for modelling landscape functions and test hypothesis of land-use and settlement patterns (Matthews et al., 2007). Policy analysis and planning could also make use of MAS models to study institutions and test possible impacts of new institutions (Matthews et al., 2007; Bousquet and Le Page, 2004). These are just some of the numerous possibilities to which MAS models can be used.

Advantages

The main advantage of MAS models is its capacity to accommodate social dimensions into the model such as individual decision-making, actions and interactions, to which these micro-interactions could have result unforeseen system-wide behaviour (Parker et al., 2003; Pahl-Wostl, 2002; Matthews et al., 2007). Another advantage is its capability to handle spatial dimension in which interactions between agents may not only occur directly between agents, but also indirectly through the environment they share (Bousquet and Le Page, 2004). For example, when one agent modifies a unit of space, another agent sharing that space will be affected by the modification and consequently may change its

behaviours and actions. As mentioned before, the flexibility of MAS in terms of visual/physical representation and implementation is another asset which opens itself to many doors of possibilities.

Challenges

The authors of the above-mentioned reviews agree that the main challenge of using an MAS model is its validation process. This is due to the fact that there is no established protocol for evaluating its validity and the traditional methods of validation used in equation-based/mathematical models are difficult to implement, especially when the MAS model has a large amount of parameters. However, Bousquet and Le Page (2004) and Pahl-Wostl (2002) offered some strategies to cope with this issue.

Bousquet and Le Page (2004) offered the following strategies:

- 1) Provide rigorous presentations of the structure of the model. Graphic languages such as Unified Modelling Language (UML), Agent UML and Petri Nets. This also allows for the replication of the models even in other programming and simulation platforms.
- 2) Compare the results of the MAS model with other types of models, in which the MAS model is parameterized such that they can be solved mathematically.
- 3) Compare simulated data with observations (also mentioned by Pahl-Wostl, 2002).
- 4) Assess the hypothesis of the model, wherein the model assumptions are reflected in the representation of the agents and the interactions. These can be tested using experimental approaches (Deadman et al., 2000 as cited by Bousquet and Le Page, 2004) or RPGs (Barreteau et al., 2001 as cited by Bousquet and Le Page, 2004)

Pahl-Wostl (2002) also offered three dimensions of validation, with one already mentioned above. The other two are:

- 1) Subject the model to expert opinion (also mentioned by Bousquet et al., 1998 as cited by Parker et al., 2003)

- 2) For participatory models, confront the model vis-à-vis its role to facilitate a process of social learning. (also mentioned by Bousquet et al., 1998 as cited by Parker et al., 2003)

Another challenge in using MAS is the issue of scale (Parker et al., 2003; Bousquet and Le Page, 2004). Although MAS can handle data of different scales and can accommodate different granularities of information, there may be a problem of scale mismatch resulting from the available data, representation of space and management unit, and scopes of institutions. In participatory processes wherein the points-of-views of the stakeholders are considered, stakeholders may view or perceive the world in different scales.

Perspectives in moving forward

There are still a lot of directions to which MAS studies could move forward, such as addressing the challenges mentioned above, delving deeper into the existing areas of interest or explore other fields of inquiry. Because NRM, by nature is interdisciplinary, it is necessary to build an experimental frame which would allow for interdisciplinary analyses of the model (Parker et al., 2003). Also new challenges may arise from this interaction among different disciplines or fields of inquiry such as defining the scope and scale of the model.

2.1.2. Unified Modelling Language

The conception of an MAS for NRM can be represented formally using diagrams such as those used in Unified Modelling Language (UML). UML is a standardized graphical language representation normally used for software design and architecture and is built upon object-oriented (OO) concepts (OMG, 2007) but can also be used in non-software systems, such as MAS. There are several types of UML diagrams, wherein class, activity, sequence and state-transition diagrams are found to be particularly useful for constructing MAS models (Le Page and Bommel, 2005). A class diagram, a representation of the static aspects of the model, is a description of the model showing the characteristics (attributes) and

behaviours (operations) of its entities and the interactions (also called associations) among these entities. An activity diagram, on the other hand, is a representation of the dynamic aspects of the model and it shows the step-by-step procedure of an operation, showing the decision routes an operation entails. A sequence diagram shows the order of operations or processes of the model, and a state-transition diagram describes the changes in state of one entity.

2.1.3. *Special case of MAS for ComMod: Role playing games and computer simulations*

In using MAS models for ComMod, different tools, such as simulation and RPG, can be used as platforms for discussion. An MAS simulation is a computer-assisted implementation of the model with its components being represented as computer entities or objects. A conceptual MAS for NRM, such as those represented by UML diagrams, can be programmed using a simulation platform, such as, CORMAS², Swarm or RePast, or using an object-oriented programming language such as Java, C++ or SmallTalk. Another way to explore the conceptual MAS is through an RPG (Barreteau et al., 2001). In an RPG, players, e.g. stakeholders, are put into a game that simulates real situations. Depending on the purpose of the RPG, players take and act on roles that are based on reality, making real-world decisions according to the roles they play whilst still being in a controlled environment of a game. Through the game, the players may be able to grasp the workings of the MAS, thus allowing understanding of what otherwise would have been a “black box” to most end users (Barreteau et al., 2001). As such, an RPG is a good tool to promote understanding of the conceptual MAS model among its players, and it also serves to validate the model through discussions among the modellers, scientific experts and players.

Simulation and RPG could be used separately in the development of an MAS model, but together they can complement each other depending on the purpose of the MAS modelling exercise. An example of this complementary relationship is the case where RPG is used as a facilitation tool to

² A brief description of the CORMAS platform is found in the CORMAS website, <http://cormas.cirad.fr/en/outil/outil.htm>.

explain the MAS model. An RPG played with the stakeholders is limited in the number of steps or iterations that can be played and in the number of interactions that can be represented. A simulation model could be used to support RPG – e.g. it can project the trend of the outcomes of the RPG if the game is continued for a longer period, or it can include more features and complex interactions that could not be represented in the RPG. Figure 2.2 illustrates the possible articulations between simulation models and RPG in the MAS modelling process for ComMod.

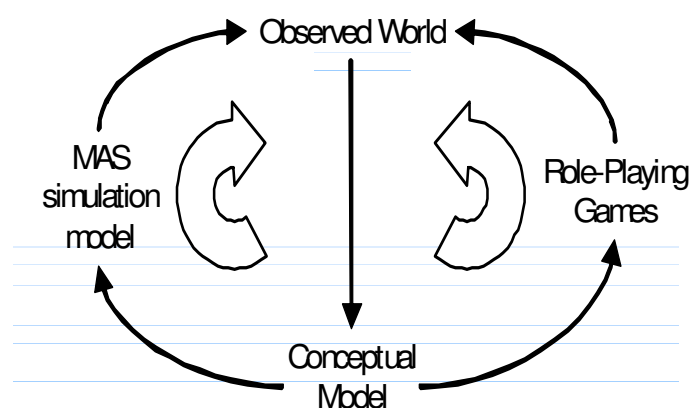


Figure 2. 2 Possible articulations of RPG and simulation model in the modelling process in ComMod (Barreteau et al., 2001)

2.2. Companion modelling approach

2.2.1. *Charter*³

In 2001, a group of scientists involved in research and development for environment and renewable natural resources management using the companion modelling approach (Bousquet et al., 1999), began discussing about their experiences in the field and their commonalities. These scientists were involved in field situations with real stakes and were faced with addressing theoretical and pragmatic questions in the course of their research. After two years, this resulted to a charter for the Companion Modelling (ComMod) approach, finalized on the 23rd of February, 2003 (Barreteau et al., 2003a), which

³ The contents of this section are based heavily on the ComMod Charter version 1.1 finalized on April 5, 2004, which can be found in this website: <http://cormas.cirad.fr/ComMod/en/charter>

elucidates the group's posture in conducting field research and its underlying objectives. The group posits that because of the complex and very dynamic nature of environment and renewable resource management, uncertainties borne out of these complexities and dynamics have to be taken into account and the points of views or perceptions of the scientists and stakeholders of the management system under study are of equal weight and importance. Because of the very nature of the research objects, the approach itself is evolving and has to be subjected to rigor, refutation and improvement; thus, the charter will be periodically updated following the agreement of its signatories.

There are four postures which underlie the ComMod approach: first, the assumptions used for modelling work are subject to refutation such that they are discarded at every field interaction; second, there is no *a priori* implicit experimental hypothesis in the modelling work and it is the ComMod scientist's task to take the necessary steps into revealing these hypotheses; third, the impact of the approach has to be taken into account and analyzed throughout the course of the process in terms of research objectives, quality of the approach, quantified monitoring and evaluation indicators; and, finally, because there is no universally accepted theory of model validation, special attention should be given to the validation process, taking into consideration that this process may be different to that used to validate physical, biological or mathematical models.

The general concept of ComMod is that a collectively-constructed and shared model accompanies the research at every step, hence the name. Although multi-agent systems (MAS) model is not exclusively used as the basis of the simulation tool in ComMod, it has gained a privileged status of use in the approach as it is able to accommodate the complexities of environment and renewable resource management. Usually, the MAS simulation model is accompanied by other tools such as geographical information systems (GIS) and role-playing games (RPGs). At the end of the day, the expected outputs from the ComMod process may be a change in perception, a change in behaviour or a change in actions. More about MAS will be presented in the later sections.

ComMod has two objectives. The first objective of ComMod is to understand complex environments, wherein the modelling deals with the dialectic between the researcher, model and the field, and focuses on the scientific legitimacy of the knowledge produced in such a context. The second objective is to support the collective decision-making process in complex situations. While it considers the first objective as one of its elements, it moves further by striving for the betterment of the decision-making process, such that the process could lead to a better understanding of the actors or decision makers, a facilitated dialogue among the stakeholders and scientists or experts, and possibly a negotiation support system that aims to reduce the gap between diverging viewpoints in conflicting situations. In such a context, the emphasis is on the quality of the decision-making process rather than the quality of the decision itself.

The process of building the model in ComMod is of paramount importance in order to ensure that the stakeholders feel some ownership of the model and therefore consider the model to be relevant to their local context (Bousquet et al., 2007). Moreover, because of its iterative and participative nature, stakeholders are more likely to accept the results of the modelling process. Ultimately, the goal of the ComMod approach is a collective understanding of the complex system among the stakeholders, which could help motivate them to discuss and negotiate resource management schemes together in a more equitable manner.

2.2.2. Process of participatory modelling

Companion modelling (Barreteau et al., 2003a; Barnaud et al., 2006a) involves a participative approach in developing models of complex systems, such as an MAS model. There is constant interaction between researchers and stakeholders in an iterative and potentially cyclical process of field work >> modelling >> simulation >> field work >> modelling and so on (ComMod charter, 2004); this research process may lead to a family of models, in which a model may be similar or totally different from the one that precedes it.

Figure 2.3 illustrates the general steps of a companion modelling process. The first major step is the survey of the problem which involves two parts: (1) the identification of the problem which eventually specifies the theme of the cycle and (2) the analysis of the problem which would identify the specific questions or points of inquiry based on the identified theme. The following step is the collective conceptual modelling of the system under study, wherein the aim is to build a shared representation of the system as well as the problem at stake. This involves the elucidation and accounting of the different perspectives of stakeholders and the experts. The third major step of the modelling process is the participatory simulation, wherein the model is verified, validated and used. The double arrow in Figure 2.3 between conceptual modelling and simulation illustrates the interaction between and among the researchers and stakeholders, such as model validation. The iterations attempt to take into account and properly represent the different perceptions of the stakeholders. In order to properly represent the various perceptions of the stakeholders and build scenarios that reflect their interests and goals, the step-by-step approach of Etienne et al. (2003) may be used as a guide to ensure that all stakeholders' perceptions are included in the model. Through this approach, stakeholders are able to define: 1) the system according to their perception, 2) how to view this perception through spatial representation, 3) the indicators by which the model would be assessed and analyzed, and 4) the scenarios or management strategies the stakeholders would like to pursue or explore. It is between these two steps that new knowledge is produced that could result to a change in perspective, behaviour or even actions and, therefore, analyzed.

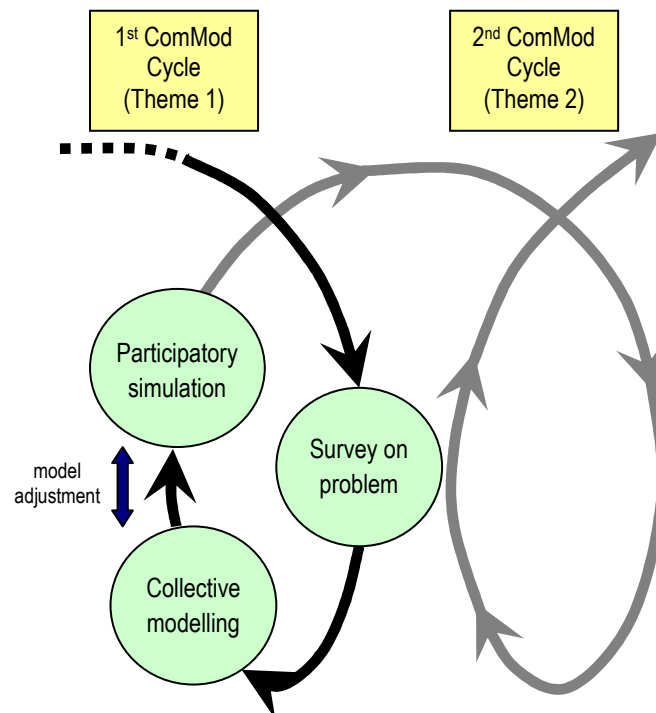


Figure 2. 3 The Companion Modelling approach

During the modelling process, it is conceivable that the model may undergo some modifications and, in some situations, the researcher-stakeholder interactions may even produce a significantly different model altogether. Stakeholders may realize the need to develop a new conceptual model whenever they: 1) do not feel that the model addresses their concerns, 2) do not think it is consistent with their goals, 3) want to address a more specific concern, or 4) have new questions about their system stemming from the learning and negotiation processes. In these cases, a new ComMod cycle begins.

2.2.3. Evaluation

An integral part of the ComMod approach is the evaluation of the process which serves to validate the findings in each of the steps (short-term effects) as well as determine the lasting impact left by the process to the stakeholders (long-term effects). Various methods and tools can be used for evaluating a ComMod process; below are the ones that are relevant to this dissertation.

ComMod Evaluation Protocol

The ComMod Evaluation Protocol (CEP), also known as the Canberra Protocol (CP) (Perez and Aubert, 2007; Etienne, 2011) is a toolkit that is specifically designed for the ComMod process and responds to the third posture of the ComMod charter. This tool allows the evaluator to map the various methods, tools and artefacts used in the process and the process' outputs, such that causal links between process' activities, tools and artefacts and the outputs may be established. In CP, the framework of activities of a process is based on the integrated environmental assessment (IEA) functions for integrated assessment (Hischemoller et al., 2001), with an addition of two activities to specifically characterize a ComMod process, specifically its beginning and its end. These activities are: (1) establishment of procedures, (2) identification of problem, (3) analysis of options, (4) identification of strategies, (5) communication of results and (6) field action.

The toolkit consists of two sets of questionnaires, as well as the interview guidelines, used by an external evaluator for one-on-one interviews. One set of questionnaires is for the ComMod designer-modeller, while the other is for representative stakeholders. These two sets of questionnaires (Appendix A) are designed such that they would extract the same kind of information from the perspectives of the stakeholders and the ComMod designer; thus allowing for comparison and analysis.

The results of the evaluation may also be used to improve future implementations of the approach, as well as the evaluation process itself using the toolkit. For example, in a meta-analysis of the evaluation protocol on 18 cases of ComMod applications in 9 countries (Etienne, 2011), it was found that the protocol's analysis framework was not compatible to monitoring the contexts specific to each case. In the evaluation framework, it was assumed that the context specific factors, such as the socio-economic aspect and power relationships of the stakeholders, only affected by the effects produced by the methods and tools used in the ComMod process. However in reality, these methods are also affected by these context specific factors because they are implemented at a certain place and time with the stakeholders, i.e., within the cultural and historical context of the stakeholders (*ibid.*). Moreover, for most of the 18 cases, the protocol was used after the completion of the ComMod

process, usually after a year. In which case, the quantity and quality of the information gathered from the protocol would have degraded over time. Therefore, it was proposed that the protocol be designed in such a way that it can be implemented within the ComMod process itself. It was also suggested that the improvement of the protocol should consider the individual and collective dimensions, the discrete and continuous gathering of information, and the procedural and contextual impact of the ComMod process. The inclusion of the stakeholders in the evaluation process was also thought to be important, as well as the robustness (e.g. scalability and flexibility), of the protocol to adapt the changes social and environmental situations at the sites. For the ComMod process, the evaluation of the cases using the protocol shed light to some of the main issues encountered in the approach, such as on the legitimacy of the process, artefacts and outcomes of the process, as well as the limitations on time and ambitions of the process.

Criteria and Indicators

The Criteria and Indicators (C&I) method of evaluation was initially developed to assess techniques and processes for forest management (Prabhu et al., 1998). The evaluation is based on the principles (P) of a process or a technique, the criteria (C) to which these principles are to be evaluated, and the indicators (I) that show whether or not a criterion has been satisfied or met. In this method the evaluator/s is/are tasked to rate a set of indicators, which could either have been pre-determined by the scientists or evaluators (top-down), determined by the stakeholders (participatory, bottom-up) or a combination of both. An evaluator for C&I may either be external (e.g. scientist) or internal (stakeholders) to the system. According to the Food and Agriculture Organizations (FAO) of the United Nations website⁴ there are currently 150 countries participating in nine C&I processes all over the world. In this dissertation, C&I was the primary method used to evaluate a research and development project, Levelling the Playing Field (LPF), which included ComMod as one of its approaches. Table 2.1

⁴ FAO website on forestry: <<http://www.fao.org/forestry/ci/16609/en/>>

is an example of the principles (P), criteria (C) and indicators (I) used in the LPF project showing a principle, *Empowerment*, and two criteria to be evaluated under this principle. Each criterion in this particular case has three indicators that could be rated with an ordinal measurement.

Table 2. 1 Sample C&I used for the LPF project

P.1. Empowerment	
C.1.1. Community members committed to collective decision	C.1.2. Community representatives make more proposals about environmental livelihoods, act on list of environmental priorities and learn from experience.
I.1.1.1. Community members select representatives through democratic process	I.1.2.1. Community representatives learnt from their experiences
I.1.1.2. Transparency on decision making process	I.1.2.2 Community acts on a list of environmental priorities
I.1.1.3. Benefit and cost of collective decision is shared	I.1.2.3. Community produce proposals in participatory way and send to the funder/partner

Social and organizational learning theory

Because acquisition of knowledge for both the stakeholders and researchers is one of the key elements of ComMod, it is therefore important to identify what was learned in the ComMod process and how it was brought about. For this study, I will identify and describe this body of knowledge using the theory of social and organizational learning. Organizational learning is “the process by which the organization’s knowledge and value base changes, leading to improved problem solving ability and capacity for

action” (Probst and Büchel, 1997). Within the context of a society, an individual learns from others through observation, imitation and modelling (Ormrod, 1999), and the lessons from the learning process have to be passed on to other members of the organization (or, in this case, to the rest of the stakeholders) for it to be useful. Huber (1991) states that there are four processes or constructs that influence or support organizational learning⁵, namely, (1) knowledge acquisition, (2) information distribution, (3) information interpretation and (4) organizational memory. *Knowledge acquisition* is the process by which knowledge is acquired or obtained. *Information dissemination* is the process by which knowledge and information is transferred or shared to the other members of the organizations, thereby allowing new knowledge to emerge or gain a broader understanding of the organization or system. *Information interpretation* is the process by which distributed information is analyzed in a common or shared context. *Organizational memory* is the repository for the acquired knowledge of the organization, and it can be provided to newcomers entering the organization, even if the original producers of the knowledge are to leave.

2.2.4. Applications

A number of applications of ComMod have been reported in the literature. One of the early examples of the ComMod process was the SelfCormas experiment in the Senegal River valley for multipurpose land use management, wherein the stakeholders designed their own GIS model, RPG, and eventually to a computer simulation (D’Aquino et al., 2002; D’Aquino et al., 2003). A case study on irrigation in the same area established the linkage between MAS simulations and RPGs (Barreteau et al., 2001). A computer-assisted role-playing game, called Sylvopast, was developed for the silvopastoral management in the French Mediterranean forests (Etienne, 2003). These case studies have been instrumental in the development of ComMod and the tools associated with the approach.

⁵ Similar knowledge constructs to that of Huber are used in Knowledge Management Systems (Khadka and Vacik, 2008).

In Southeast Asia, much of the ComMod applications were the result of the Consultative Group on International Agricultural Research (CGIAR) project, Challenge Program on Water and Food (CPWF). These case studies used ComMod to gain better understanding of water issues related to natural resource management. In Thailand ComMod was used to understand the dynamics of land and water use and labour migration as a coping mechanism to eliminate risk in the Lam Dom Yai watershed in Northeast Thailand (Naivinit et al., 2010), to assess impact of land use changes, new credit rules and irrigation water management of the Akha villagers (a group of indigenous people) in the Mae Salep Catchment area in Northern Thailand (Barnaud et al., 2006b), to raise awareness among the stakeholders of the emerging conflict brought about by the establishment of a new national park in the Wang Pha District in Northern Thailand (Barnaud et al., 2008; Dumrongrojwatthana, 2010), and to model the razor clam population dynamics amidst different fishermen practices and facilitate the communication and coordination of the stakeholders (Worrapimphong et al., 2010). In Vietnam, ComMod was used to understand the water quality management for rice and shrimp farming as well as the farmers' decision-making processes in the Bac Lieu Province in the Mekong Delta (Le Canch Dung, 2009). In Bhutan, ComMod was used for understanding and mediation of the water sharing rules in the irrigation system between two villages in the Lingmuteychu catchment (Gurung et al., 2006). Outside the challenge program, ComMod was used to understand the complexity of the Ubon rice seed distribution system in Thailand (Vejpas et al., 2005). In the Philippines, an MAS simulation model, then later on, an RPG based on the simulation model, was developed to understand the adoption of agro-forestry techniques of upland farmers in Claveria (Magcale-Macandog et al. 2005). Many of these ComMod applications made use of computer simulations in conjunction with role-playing games, which sometimes also included GIS and 3D block models to better characterize the relationship of the landscape to the decision-making processes of the stakeholders. Moreover, these cases have involved multiple stakeholders coming from the government sector and private sectors, local communities and indigenous people. Important lessons were gained from these experiences. The cyclical, stepwise

building of the conceptual model, to which the model is continuously confronted with the reality, led not only to the improvement (in terms of validity and accuracy) of the model but also to a better understanding of the system under study. The RPG sessions not only became “laboratories” to which the behaviours and decision-making process of different stakeholders could be observed, but they also enhanced the communication of the model to the stakeholders. The coupling of other methods to the MAS model simulations, such as GIS, improved the understanding of the systems under study. The use of MAS models also allowed the researchers and stakeholders to simulate future scenarios about their system. The ComMod process, however, is very much affected by the cultural contexts to which they were applied. The nature of the stakeholders affected the quality and quantity of information that could be elicited. For example, Thai people normally do not openly criticize someone or something.

The cases presented above are not exhaustive and there are still case studies still ongoing such as in Southeast Asia, South America and Europe⁶. In 2011, a new book on ComMod was released entitled “*Companion Modelling: a participatory approach to support sustainable development*” (Etienne, 2011) which details the ComMod approach and reviews 27 case studies in 9 countries, which included some of the case studies presented above. The environmental issues covered by these case studies were biodiversity, global change, sustainable development, overharvesting, soil fertility, wastage of water, erosion, intensification, ground water pollution and genetic diversity (*ibid.*). Using the Canberra Protocol, 18 cases were assessed and important lessons were gained about the ComMod process, most notably in the difficulties in its implementation. The ComMod charter itself is reflective of the strengths of the approach, which were demonstrated as well in the case studies mentioned above. On the other hand, there were challenges in the implementation of the ComMod approach, as reported in the book (Etienne, 2011). One of the main challenges in implementing ComMod was the issue of

⁶ For more case studies, lists have been compiled in various websites such as the CORMAS website (<http://cormas.cirad.fr/ComMod/en/caseStudies>), Ecole-Commod Project website (http://www.ecole-commod.sc.chula.ac.th/www2/index.php?option=com_docman) and the CGIAR’s Challenge Program (<http://www.waterandfood.org/page/PN25>).

legitimacy. The legitimacy referred here are of two kinds, scientific and social. The issue of scientific legitimacy is linked to the first objective of ComMod wherein the priority is the production of knowledge, whether the knowledge produced in the process is valid or acceptable to the scientific community. The social legitimacy aspect pertains to the second objective of ComMod, which is for consultation or to support decision-making processes. One begins to ask if the process and its outcomes are acceptable to the stakeholders. The key to these issues is the transparency of the process itself, to which the objectives and the hypotheses to be used in the process are clearly stated. This could be further enhanced by having the ComMod researchers declare a clear stance in the key events of the process, as well as a conscious effort to report back to the stakeholders the findings of the process. Another challenge that was reported was on the mastery of tools. Because the ComMod process makes use of models, the ComMod researchers must not only possess scientific knowledge and technical skills to implement the models, but they must also possess skills in facilitation and mediation to encourage and lead the stakeholders in effectively communicating their knowledge and decision-making processes.

To take into account the weaknesses of the approach and for it to move ahead, several recommendations were made for the improvement of the ComMod approach (Etienne, 2011). The first set of recommendations pertains to the development of more formalized methods. The first recommendation refers to the refinement of the ComMod loop into twelve phases, wherein the phases may still follow different orders. The second recommendation pertains to the transferability of the ComMod stance to interested stakeholders. In this case, although still important, the transferability of the technology is much less significant than the stance that should be taken by the prospective ComMod practitioner in employing the approach. A methodological guide was developed by Daré et al. (2009, as cited by Etienne, 2011) centred on seven questions and was drawn from the lessons of 30 case studies. In relation to the proposition on the improvement of the Canberra Protocol, the monitoring and evaluation of the ComMod process could benefit greatly from having a coordinated, multi-headed, transdisciplinary facilitation approach. This acknowledges that it is impossible for one ComMod

researcher to be implementing the ComMod process and observing the key moments at the same time. However, this also raises an issue on how to consolidate the work of the observers, facilitators and the ComMod designers as the roles are now held by different people who should maintain a degree of neutrality from the process but should have sufficient knowledge of the issues at stake. Another area where the ComMod is suggested to undertake is up-scaling, wherein the process would contribute to the process of decision-making. Also, the importance of keeping a record or a “logbook” of an on-going ComMod process as a means to communicate the events and exchanges occurring within is highlighted. This record is a means to promote the process’ transparency to the scientific community and the stakeholders involved. Finally, a new charter is proposed in light of the lessons that have been learned so far.

2.3. Institutional Analysis and Development Framework⁷

2.3.1. Institutions and Institutional Analysis

Because reality is complex, its study is multi-disciplinary. Institutional analysis (IA), in general (Ostrom, 2007; Ostrom, 2005; Aligica and Boettke, 2009), has broad applications in various fields such as in the study of economics, sociology and political science. The close relationships and overlaps shared among these various fields of studies has allowed IA to be used on cross or multi-disciplinary studies, with IA being influenced (cross-pollinated) by these disciplines. However, different disciplines use different languages for communication, and thus, the word “institution” has gained different meanings. To have a meaningful interaction among the disciplines, there is a need to have a common understanding of what is meant by “institution.” Institutional Analysis and Development (IAD) framework is a language that is meant to provide a more unified meaning to institutions and provide an organization for its analysis. Institutions are then defined as “the rules-in-use, including norms and strategies, which govern interactions among actors within a social space to achieve a predefined goal

⁷ This section draws heavily from the publications of Ostrom (1990, 2005, 2006) and Ostrom et al. (1994).

or outcome” (Ostrom et al., 1994; Ostrom, 2005). Similarly, North (1994) defines institutions as “the structure that humans impose on human interactions which shape the performance of societies and economies over time”. This is in contrast to the commonplace use of the word institution as referring to organizations that have been created or formed for a specific purpose (Collins English Dictionary – Complete and Unabridged 10th Edition). In North’s (1994) perspective, institutions are the rules of the game, while organizations are the players.

We can therefore say that institutional analysis is a study of rules, i.e.:

- 1) Study how they shape human interactions and, eventually, the outcomes;
- 2) Design better rules to facilitate these interactions and improve outcomes; and
- 3) Study how to change institutions and its eventual impacts or implications.

The multi-disciplinary approach of institutional analysis gave way to the New Institutional Analysis movement which began in the early 80’s, wherein the focus is to understand the workings of individual and organizational decision-making on economics and management that do not seem to follow traditional theories in fields such as economy and psychology. One of the predominant schools of thought in the New Institutional movement is the institutional economics, with Douglass North as one of its major proponents, which attempts to include the theory of institutions to economics (North, 1992). Rational choice institutionalism, also coming from the field of economics, uses formal logic and methods to study politics and history (Steinmo, 2001). The Sociological institutionalism, on the other hand, view institutions as cultural products, i.e. man-made, that give rise to organization and social order (Immergut, *forthcoming*). Historical institutionalism, often related to the traditional or old institutionalism, stresses explaining real world events and outcomes through the examination of how political institutions have shaped or influenced the political process (Steinmo, 2001).

Going into the methods of institutional analysis, Matsuert (2002) outlined some of the approaches for IA in natural resources research. The stakeholder approach centers on the stakeholders and how they affect the organization or structure of the natural resources situation. This approach deals with the identification of the key stakeholders and their influence to each other, how they can cooperate as well as induce conflicts, and their linkages, i.e. mapping the flow of information and resources among actors. The systems approach, making use of diagrams to map out the flows of resources and information within the system, can be used as an alternative to the stakeholder approach and is suitable to participatory approaches in data collection and analysis. The participatory approach in institutional analysis, with Participatory Rural Appraisal (PRA) being one of the popular methods in this approach, makes use of visual and diagrammatic methods, such as e.g., Venn diagrams and roles, rights and responsibilities matrix, for data collection and analysis and very appropriate when dealing with groups. In-depth qualitative analysis, such as institutional ethnographies and social network and flow analysis, are comprehensive and detailed examination of the workings of research and development. However, its comprehensiveness is also its weakness as its attention to detail is time-consuming and not appropriate for day-to-day project management. Using holistic frameworks, such as context, input, process and product (CIPP) evaluation, and strategic planning approach, are also comprehensive and can be valuable research management tools as it allows for better understanding of the institutional context to which the research is applied. But the complexity of holistic approaches and their inability to account for informal institutions in research and development efforts may dissuade potential users. Hatzis (1997) elaborated further on the use of IA for sustainable development and natural resource management to which he expresses the underlying assumptions, features and hypothesis in IA for NRM as well as provided some insights on its role in interdisciplinary participatory action research.

2.3.2. *Institutional Analysis and Development Framework and Common Pool Resources*

The development of the IAD framework itself began in the early 70's by Ostrom (Ostrom et al., 1994) together with other researchers from the Workshop in Political Theory and Policy Analysis at Indiana University. They were studying how political science paradigms were affecting the conceptualization of public administration and metropolitan organization. After which, for one and a half decades, the group focused on the study of police service delivery in metropolitan areas. In the mid-1980s the National Research Council opened a research panel in the study of common properties, wherein the framework (Figure 2.4) was presented to the panel. This occasion had brought immense influence to the study of common property regimes in various countries. This boom in research on CPR has led to the creation of the International Association for the Study of Commons (IASC)⁸ founded in 1989. Now, the IAD framework influences research in different domains such as studies on socio-ecological systems, micro-biological commons, cooperatives, partnerships among public agencies, international aid, healthcare and education.

In general the institutional analysis and development framework is a tool for organizing concepts that could be used to guide researchers in analyzing institutions, being able to link different theories and models into a coherent structure. Ostrom (Ostrom et al., 1994; Ostrom, 2011) emphasized the distinction between framework, theory and model wherein a framework is the meta-theoretical language which attempts to identify a universal set of elements or variables to which analysts could use to compare different theories. Theories, on the other hand, are concepts used to explain a phenomenon and, therefore, predict its likely outcomes. Because multiple theories can be used to study a phenomenon, the IAD facilitates comparison by having the same sets of variables for analysis among theories. Models are the precisions to explain and test these theories within a set of boundaries or assumptions. Again, multiple models may be used to explain and test a theory. With IAD, these various

⁸ IASC was formerly known as the International Association for the Study on Common Property (IASCP) until it was officially changed in 2008. More information about this can be found in the IASC website (<http://www.iasc-commons.org/about/about-iasc-0>).

theories and models used to explain different phenomena may be organized and analysed according to the elements or variables they share in common.

With its underpinnings on game theory and studying various common pool resources (CPR) case studies of Ostrom et al. (1994), the elements or variables of an institutional analysis were identified and organized into different parts shown in Figure 2.4. The IAD framework may be viewed as having two halves with respect to the direction of study or inquiry, the first half being the action arena and its elements, the patterns of interactions, outcomes and evaluative criteria. The other half is composed of the factors affecting the action arena.

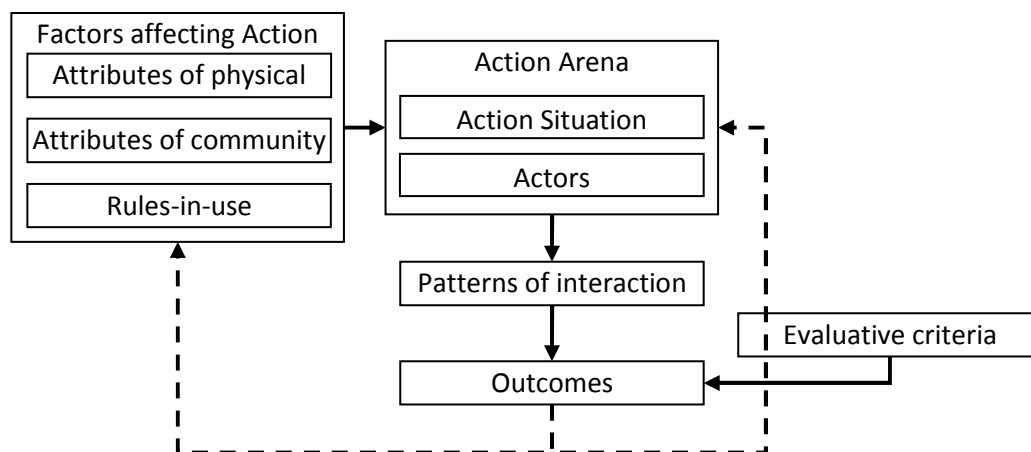


Figure 2. 4 Institutional Analysis and Development framework (Ostrom et al., 1994)

Action Arena, action situation and actors

The action arena is a complex conceptual unit that is usually the focus of analysis, prediction and explanation of behaviours and outcomes within fixed constraints (Ostrom et al., 1994) and IAD can be used to analyze different action arenas in different fields of studies, such as CPR problems in NRM, public services, policy studies, etc. It is composed of two sets of variables, i.e. the actors and the action situation (*ibid.*).

The actors are those who participate in the action situation, wherein they are able to choose and perform a set of actions based on the position they hold in the situation, the information they have about the pay-offs of their actions, knowledge about the possible implications or outcomes of their

actions and the information about the costs and benefits associated to these outcomes. These actors are characterized as having preferences, a degree or level of knowledge and a certain learning capability or technique, a set of criteria to select or make decisions and resources that they bring into the situation. It is from these actor characteristics or variables that an analyst may posit theory or theories of their possible behaviours within the action situation.

The action situation is the social space where individuals, or actors, perform actions and interact with other actors. In CPR settings, the action situation can further be classified into two: appropriation situations, i.e. resource extraction, and provisions situations, wherein mechanisms are established to sustain the resources (Ostrom, 1990). These two faces of CPR situations are intertwined and it is often difficult to determine where one ends and the other begins. However, as prescribed by Ostrom et al. (1994), it is very important to determine to which side of the same coin the analysis would be focused.

The action situation is composed of seven elements or variables (Ostrom et al., 1994):

- 1) Actors – participants in the situation
- 2) Positions – are place holders, in which each position has an associated set of actions limited to that position. A participant holding a certain position may only choose and perform an action from the set of actions associated to the position it is holding
- 3) Actions – e.g. to fish, to farm, to hunt, etc...
- 4) Potential outcomes – the possible implications or effects of actions in relation to outcomes
- 5) Transformation⁹ functions – functions that link actions to outcomes
- 6) Information – may have limitations or incomplete depending on the rules on how information is opened or made available in the situation
- 7) Net costs and benefits – the costs and benefits of actions as well as the outcomes

⁹ The *Transformation function* is more recently referred to as the *Control variable* (Ostrom, 2005).

Interactions, outcomes and evaluative criteria

The task of the IAD analyst is to identify the working parts of the action arena, to which he may employ different theories and models to diagnose the action arena, as well as predict the interactions and outcomes. These interactions and outcomes can then be analyzed using evaluative criteria. To this end, Ostrom (2005; 2006; 2011) suggested several criteria which are positively or negatively related to each other:

- 1) Economic efficiency – refers to the magnitude of improvement on the return rate of investment from an allocation or reallocation of resources or an improved cost-benefit ratio, which is used to determine the economic viability or desirability of public policies; it is important to note that altering the rules affecting the actors influence their behaviours, and thus, on the allocation of resources
- 2) Equity through fiscal equivalence – refers to the institution or policy being able to deliver equity such that those who benefit from a service or resource are the ones who invest on it
- 3) Redistributive equity – refers to the redistribution of resources to poorer individuals; this may be contrary to the target of fiscal equivalence
- 4) Accountability – in a democratic polity, the public officials are held responsible or answerable to the citizens with regards to the development and use of public facilities and resources
- 5) Conformance to general morality – refers to the kind of morality an institutional arrangement promotes or encourages, e.g. institutions that reward those who conform to the rules, while those who cheat are fairly punished. It may be possible that an institution may meet the other criteria but are not applicable or would have adverse effects on the morality of those who are subject to it and, thus, will be open to violations or abuse.
- 6) Adaptability – refers to the concept that the institution or policy is able to adapt to the dynamic local conditions; this criteria is often linked with resilience and sustainability concepts.

With the above-mentioned criteria, it is but inevitable that some trade-offs among the criteria would have to be made when choosing alternative institutional arrangements (Ostrom, 2011; Ostrom, 2005).

Factors affecting the action arena

Another group of variables in the IAD framework is the factors affecting the action arena. One of the factors affecting the action arena is the attributes of the physical world. Although this is not true for all cases, attributes of the physical world have direct impacts on the interactions and outcomes of a situation because many actions and pay-offs are directly anchored to the physical world. Resource use in CPR situations is highly subtractive in terms of units and flows, wherein an individual benefits from a resource at the expense of others. This is complicated by the lack of excludability of a CPR, wherein it is costly or difficult to exclude beneficiaries to a resource; thus the system is vulnerable to free-riders – those who break the rules to maximize their benefits from the CPR. The physical attributes and dynamics of the shared resources also affect the actions of the actors. These attributes would refer to the resource's spatial configuration, mobility (static or mobile - e.g. fish migration) and regenerative rate (which is associated with sustainability), as well as the resilience of a multi-species ecosystem, wherein the state of one resource or species affects the state of another, e.g. productivity, predictability and patchiness.

Another factor is the attribute of the community. Often referred to as “culture”, the attributes of the community are the norms of behaviour of the community, and the level of homogeneity of understanding of the action arena, of the preferences and of the distribution of resources. For example, if the community is composed of people with different moral/societal values, it would be difficult for them to form trust. Or if the community has not common written vernacular language, it would be difficult for them to form a common understanding of the action arena or share their knowledge. This affects their ability to form and sustain effective rules.

The most influential factor affecting the action arena is the rules-in-use and it is often the focus of development or change. Rules, as how it is used in the IAD framework, are prescriptions on what actions are required, prohibited, or permitted and sanctions should the rules are not followed and they could either be formal or informal. They can be broadly classified into seven types, each having an influence on a particular element in the structure of the action arena mentioned above.

Types of rules and levels of analysis

By classifying rules, not only does it allow the analyst to organize the multitude of rules present in an action arena, but it also contributes to the understanding of the structure of the action arena itself (Ostrom, 2005). Listed below are the types of rules and how they affect the different elements of the action arena (*ibid.*):

- 1) Entry and exit rules or boundary rules– determines who can enter or participate in the action arena as well as the rules on the actors leaving the said arena. These rules affect the *Participants* variable.
- 2) Position rules – determines what are the available positions and how an actor obtains or changes position, rank or status within the action arena. These rules affect the *Position* variable.
- 3) Scope rules – determines which outcome variables must, must not or may be affected by a set of actions taken within the action situation; this usually refers to the physical (e.g. resource) or geographical variables of the action arena. These rules affect the *Potential Outcomes* variable.
- 4) Choice rules – given an actor with a position and set of actions, this rule determines what an actor must, must not or may do at decision nodes depending on certain criteria. These rules affect the *Actions* variable.

- 5) Aggregation rules – determines whether the decision of a single participant or of multiple participants is needed for the next action to take place at a decision node. These rules affect the *Control* variable.
- 6) Information rules – defines the authorized channels of communication, the frequency and accuracy of the information being conveyed, the subject or what type of information that is obligated, permitted or prohibited to be communicated among actors of different positions at decision nodes, as well as the official language to which the communication is made. These rules affect the *Information* variable.
- 7) Payoff rules – determines the external rewards or sanctions given to certain actions or outcomes. These rules affect the *Net Cost and Benefits* variable.

Moreover, these rules may be nested into three levels of analysis, i.e. operational, collective-choice and constitutional choice levels (Figure 2.5). At the operational level are the rules that govern the actors' day-to-day actions. For example, if the study is about fishing, here you will have actions and interactions that pertain to fishing, such as acquiring permits and the fishing activity itself. The collective-choice level is where the rules at the operational level are formulated, including who can participate in the action situation at the operational level as well as rules for monitoring and sanctioning at that level. The constitutional-choice level is the level at which rules are formulated to determine who participates in the action situation at the collective-choice level, i.e. who gets to decide what rules to use (or change) at the operational level. It is also at this level where monitoring and sanctioning for the collective-choice rules are determined.

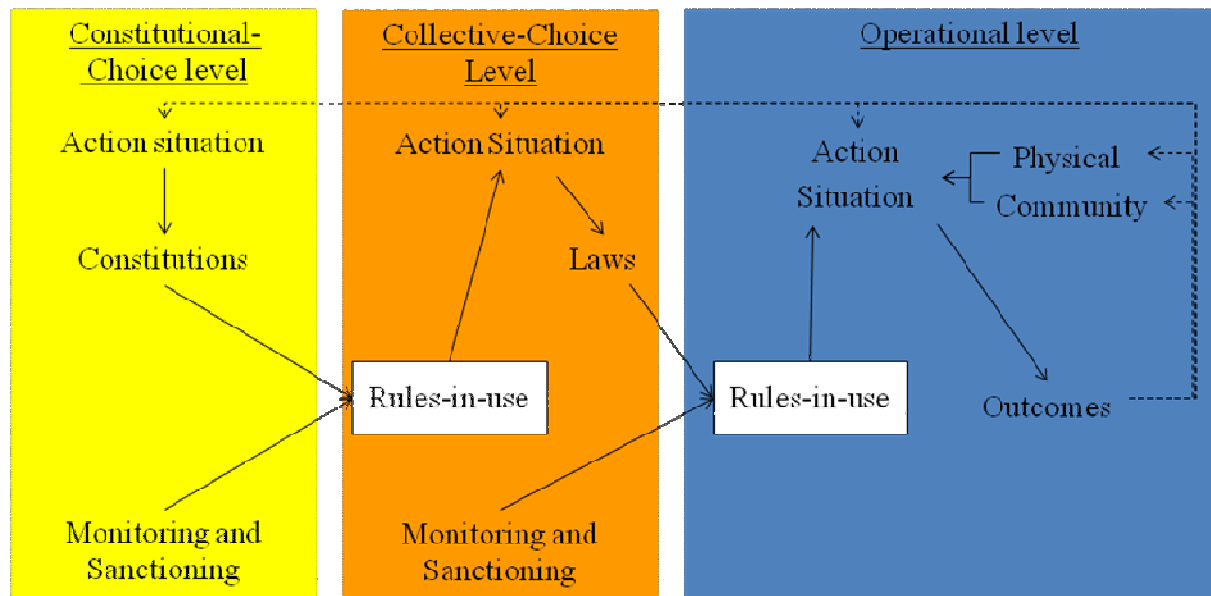


Figure 2. 5 Linkages among the different levels of institutions (Ostrom et al., 1994)

Using the IAD framework

To use the IAD framework for analysis and design, the following steps may be taken (Ostrom, 2005):

- 1) Identify the action arena and its elements or variables. Usually for an IAD analysis of CPR settings, at the minimum, the seven elements and assumptions of the attributes of the community are defined (Ostrom et al., 1994). From here, various theories, such as game theory, micro-economics, transaction cost, social choice, public choice, constitutional and covenantal theory, public goods and CPR theory, theory of collective action, polycentrism, actor models such as rationality and bounded rationality, and concepts of co-evolutionary approach, and evolution of cooperation (Ostrom, 2005), may be used to diagnose and explain the action arena, then predict the interactions and outcomes. These interactions and outcomes are subjected to evaluation via evaluative criteria (see above). In this case the external variables are just inputs and are assumed fixed.

- 2) A step further is to analyse the external variables or the factors affecting the action arena, how their variability affects the performance of the action arena. In this case, the elements of the action arena are assumed fixed.
- 3) Even a step further is to study of linked or nested action arenas, wherein the linkages are either in sequence or simultaneous.

2.3.3. *Design Principles: best practices in the development of institutions for CPR*

Since the IAD framework is also used for designing new institutions, there are said to be eight design principles in order guide the designer into formulating new institutions that would address the problems of the action arena or make the performance of the action arena more efficient. However, Ostrom (1990) herself speculates that more design principles may arise as further scholarly works are completed. From the numerous empirical case studies using IAD done by Ostrom and her colleagues at the Workshop, they have derived these design principles based on the similarities of successfully functioning and long enduring action arenas they have found in their analyses. These design principles are (Ostrom, 2005; Ostrom, 1990):

- 1) Boundaries are clearly defined not only of the CPR in question but also the users who exploit these resources.
- 2) The benefits from resource appropriation are proportionally equivalent to the costs, taking into consideration the local conditions.
- 3) Those who are directly affected by the rules can participate in the making or modifying the rules.
- 4) Those who monitor the state of the resources and the behaviours of the users are partially accountable to the users or they are the users themselves
- 5) Graduated sanctions are administered to the rule violators depending on the severity of the violation by other users or the officials accountable for the users.

- 6) There is quick access to low-cost, local arenas to resolve conflicts between users or between users and officials.
- 7) Resource users are able to formulate and implement local rules with little challenge or approval from higher authorities.
- 8) And for CPRs that are part of larger systems, all of the previously mentioned principles are organized in multiple layers of nested enterprises.

The designer may take these principles in form of guidelines or best practices¹⁰, rather than strict precepts in formulating institutions. For example, an analyst could identify which of these principles are present or absent at the action arena and then work his/her way towards achieving the principles that are lacking whenever possible. These design principles may also change as research in IAD continues and new principles are uncovered¹¹.

2.3.4. *Advancements in the IAD framework*

A more recent version of the IAD framework was presented by Ostrom (2011)¹², illustrated in Figure 2.6, in which the concept of an action arena was reduced to simply that of the action situation. In this case, the actors are implied to be contained within the action situation to minimize confusion. Factors affecting the action situation are now referred to as external or exogenous (Ostrom, 2005) variables; conceptually, the variables remain the same. Furthermore, a feedback path (denoted as an arrow with broken lines in Figure 2.6) has been added between interactions and action situation to indicate that interactions among actors may change the action situation during the process. Also, an arrow between the variables “evaluative criteria” and “interactions” has been added to indicate that the interactions

¹⁰ In a recent master class with Elinor Ostrom in 2011 at Montpellier, France, to which I had the privilege to attend, she mentioned that she would rather have referred to these as best practices in institutional design rather than rigid design principles.

¹¹ In her recent visit to Montpellier, France in 2011, Elinor Ostrom gave a public lecture at the Corum Centre to which she reiterated that the IAD framework and its concepts, such as the design principles, are still a work in progress and, thus, subject to change and improvement.

¹² The presentation of the IAD framework at this point represents the changes that have been made since after the book, “*Rules, Games and Common-pool Resources*,” of Ostrom et al. (1994) was published.

themselves may be analysed using the evaluative criteria. This change however, has been reflected as early as 2005 (Ostrom, 2005). Recently, additional criteria have also been added as provided by McGinnis (2011a):

- 1) Legitimacy - “as seen by participants in decision processes”
- 2) Participation – “tends to increase legitimacy; co-production can be especially effective form of participation”

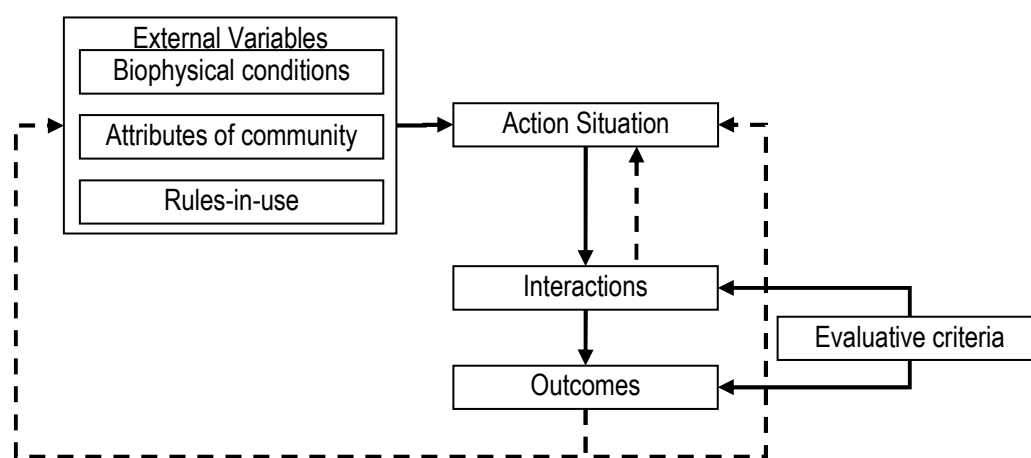


Figure 2. 6 The IAD framework simplified (Ostrom, 2011)

In addition to the general framework, the elements of the action situation are now illustrated as in Figure 2.7. The transformation function in the older version is now referred to as “Control” which describes the amount of control the actor has on the potential outcomes based on his or her actions. The actor’s control may range from absolute to completely none. This variable partly describes the “power” of an actor to affect the outcome, the other variable being the opportunity (the range of outcomes provided by the situation) the actor has, which also varies among actors in a situation. Therefore, in a particular action situation, there is a distribution of power among the actors involved. The external variables referred to in Figure 2.7 are the external variables in Figure 2.4 or the factors affecting the action arena.

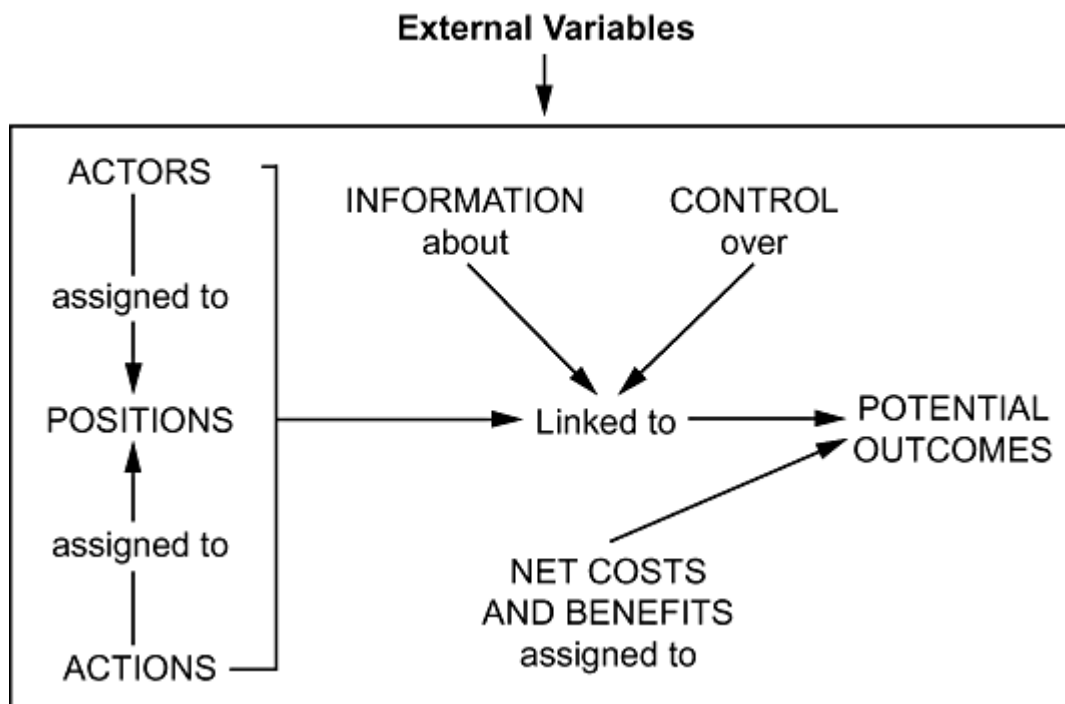


Figure 2. 7 The internal structure of an action situation (Ostrom, 2011)

The changes in the IAD framework are minor and are for clarification purposes. Subsequently, for the purpose of this dissertation, I will use an older version of the framework that still uses the concept of action arenas, which visually show the separation between the actors and the action situation. This separation is practical especially when describing nested action arenas, which may involve several different actors across the different arenas.

2.3.5. *Lessons on the use of IAD in CPR studies*

Since the conception of the IAD framework 30 years ago, there have been a multitude of case studies using framework globally, notably on CPR. And because of the use of the framework, it has allowed the compilation of these case studies into databases for different types of CPR systems thereby making it possible to compare and analyze the cases, such as comparison among different sites within one country, and among different cases all over the world as whole (Ostrom, 2006). These analyses have lead to uncovering, for example, of the IAD design principles, as well as challenge existing notions,

such as the inability of local actors to self-organize and lead to the scenario introduced by Garret Hardin known as “The Tragedy of the Commons” (*ibid.*). There are three major databases that have been related to CPR studies, namely, on inshore fisheries, irrigation and forestry (*ibid.*).

Although IAD attempts to elucidate factors or formulate questions that would universally apply to different fields especially on inquiries on CPR, more and more studies are coming out with revisions to the basic framework, with elements or variables being added that are more specific to the field of inquiry. Lamb (2007) afforded a list on several examples on the modification of the IAD, namely, the works of Koontz (Koontz, 1997; 2006), the Legal-Institutional Analysis Model (LIAM) as described by Lamb, Taylor, Burkardt and Ponds (1998), Wilds (1990), Caughlan (2002), and Burkardt and Ponds (2006). In addition, there are also the works of Rudd (2003), Clement (2009) and, more importantly, Ostrom (2011), to which I would like to provide some of the lessons they have uncovered. In fisheries management, Rudd (2003) elucidated the factors affecting the action arena to which indicators relevant to fisheries studies could be made. He added the variable “capitals assets” to which the outcomes of the interactions directly affect these capitals. He distinguished five capitals relevant to fisheries studies, namely, natural, manufactured, human, social and financial capitals, with these capitals having stocks that generate flows that can be utilized by the actors to attain their objectives. He also included exogenous driving forces that add pressure on these capitals. From his work, Rudd was able to demonstrate to what he refers to as the flexibility of the IAD framework, from which he was able to test build upon the basic structure of IAD and adapt it to his field of inquiry. In so doing, he was able to develop relevant multi-criteria sustainability monitoring and evaluation indicators. Clement (2009a, 2009b) proposed a “politicized” IAD framework, adding factors of political-economic context and discourse as part of the factors affecting the action arena to take into consideration the role of power among the actors involved in the action situation. The discourse variable takes into consideration how the actors view their physical and social environment they are embedded in, which, in turn, shape the rules-in-use. In a sense, this is an explicit acknowledgement of the mental models and points-of-views

of the actors. The political-economic variable takes into consideration that power, driven by political and economic interests, is distributed among the actors of the action arena. Recently, the scope of IAD itself is being extended into a more encompassing framework for socio-ecological systems (SES) studies called Program in Institutional Analysis of Socio-Ecological Systems (PIASES) (McGinnis and Ostrom, 2010). This new framework being developed is to answer criticisms on IAD in that little importance is given to factors that are of interest to ecological scientists as compared to institutions for NRM issues. The amount of “revised” IAD frameworks coming out shows that, although that the framework itself is a work in progress, as expressed by Ostrom (2011), it also shows the robustness of the framework in that it can accommodate context-specific variables without destroying its integrity as a whole.

In early 2011, a special issue of the Policy Studies Journal was published containing what is to be the current “state of the art” of the IAD framework from the perspective of Elinor Ostrom and her colleagues at the Workshop in Political Theory and Policy Analysis (Blomquist and deLeon, 2011). This issue contained seven articles which include a primer on the framework (Ostrom, 2011) with a guide to its use (McGinnis, 2011a). The other six articles focused on the current questions being tackled in IAD showcasing the different areas of interest in IAD research. The areas of interest pertain to the nature of goods and the importance of properly identifying what is at stake in these analyses (Bushouse, 2011; Oakerson and Parks, 2011), the scale or unit of analysis (Oakerson and Parks, 2011; Heikkila, Schlager and Davis, 2011), the nature of the actors and their role in polycentric governance and local public economies (Oakerson and Parks, 2011; Aligica and Boettke, 2011), the levels of action or a vertical IAD analysis based on rules (Bushouse, 2011; Aligica and Boettke, 2011), the structure of rules (grammar of rules) (Siddiki et al., 2011; Bushouse, 2011), adjacent action situations (McGinnis, 2011b). The cases presented in this special issue were cross-cutting in that they overlapped the different areas of interest. I would like to refer to select articles in this collection and highlight some of the lessons and innovations presented that may be of significance to the nature and development of this study. In Bushouse’s “Governance Structures: Using IAD to Understand Variation in Service Delivery for Club

Goods with Information Asymmetry” she used IAD in a non-conventional way, i.e. using IAD to analyse toll or club goods¹³, instead of the usual CPR. In this case, she introduced new concepts on produce-consumer transaction information situation in relation to the consumption of goods, specifically on the quality of the good or service before, during and after its consumption. The work of McGinnis (2011b), “Networks of Adjacent Action Situations in Polycentric Governance,” investigates on an aspect of the IAD framework wherein little attention has been given in the past, i.e. adjacent action situations. He states that, although most analysts would focus on only one action situation, it is indeed rare that action situations are isolated and, in most cases, are part of larger nested action situations. These action situations affect each other on how institutions are formed or changed, and there are flows of information and resources between adjacent action situations. Moreover, actors might be shared between two or more action situations, with the actors having different roles in each action situation.

The IAD framework is far from being a finished product, as Elinor Ostrom herself reiterates (Ostrom, 2011; Blomquist and deLeon, 2011). With the myriad applications of IAD in different fields of studies, Ostrom (2011) and Blomquist and deLeon (2011) offered some perspectives in moving forward with the development of the framework. Ostrom (2011) suggests on developing methods for analyzing evolution of action situations with respect to changes in ecological conditions and social or political settings. Furthermore, in light of technology developments in computing and modelling, she suggests an exploration of the impacts of complex ecological or social settings on behaviour, such as those environments where spatial distribution and dynamics of resources may play an important role in the behaviours and actions of the actors and situations where actors have different powers to harvest resources or to contribute to the production of a public good. Field experiments that examine how those familiar with diverse resource systems are able to cope (or do not cope) with diverse rules for organizing harvesting was also suggested to be an important step in IAD studies. On the other hand,

¹³ In contrast to CPRs, toll goods are resources or services in which it is easy to exclude other potential users but the subtractability on the resources is low (Ostrom et al., 1994)

Blomquist and deLeon (2011) suggested on using the IAD framework to other types of issues, as exemplified in the work of Bushouse (2011), to diversify its field of implementation. Also, the attention to polycentricity might encourage scholars to include in their analysis the private and non-profit sectors. Finally, the studies on adjacent action situations as explored by McGinnis (2011b), more specifically on the interaction of institutional arrangements and organizations, such as between government and non-governmental actors, should be given more focus.

2.4. Orientations

It is interesting to see that one of the common themes among the three main concepts presented is participation, which clearly emphasizes its importance and rightful place in research efforts on ENRM studies, which almost always involve the stakeholders. Another common theme is the demand for interdisciplinary approaches wherein the challenge is to develop methods and tools that allow for interdisciplinary interactions as well as for analysis. The commonalities and synergy of the concepts hint on their possible articulations.

The various concepts presented in this chapter are the pieces of the puzzle to which I will attempt to put together into a coherent structure. In this situation, I aim to establish the linkages between IAD and ComMod, as well as the linkage between MAS and the IAD to complete the circle among these concepts through the analysis of the ComMod case study in Palawan, Philippines. It should be noted that my research first involved the construction of an MAS model using the ComMod approach. The use of the IAD framework came at a later time when challenges were encountered in analyzing the outcomes of the process. The implication of this research trajectory will be evident as I present the research context in the next chapter.

CHAPTER 3

RESEARCH CONTEXT: THE ENVIRONMENT AND NATURAL RESOURCE MANAGEMENT IN PALAWAN BEFORE THE COMPANION MODELLING PROCESS¹⁴

Since 1991, some responsibilities of managing the environment and natural resources (ENR) in the Philippines, among other responsibilities of the national government, has been devolved to the local government units (LGUs) through Republic Act 7160 or the Local Government Code, in accordance to the 1987 Philippine Constitution. This supposedly gave LGUs more autonomy and less dependence on the national government. From an ENR perspective, this means that the delivery of basic services for the environment, such as community-based forestry projects become the responsibility of the LGUs. Also, the enforcement and monitoring of environmental laws and reclassification of agricultural lands is now under their responsibility. This code also has a provision that would allow members of the civil society, such as NGOs and the local communities through People's Organizations (POs), to participate in local governance. In this case, they are mandatorily provided seats in local special bodies such as local development councils, e.g. Barangay Development Council (BDC) and City Development Council (CDC). The devolution of ENR management in the Philippines should have paved way for a more localized tackling of ENR issues, which would allow the local sector, those who are the closest to the resources, to respond to their situation more efficiently. But the devolution of ENRM was also a big leap from the previous model of state-controlled and managed national patrimony, thus, it has had challenges in its practice especially with changing the engrained mindsets of bureaucrats who still harbor a centrally-oriented management paradigm (Brillantes, 2002).

¹⁴ Much of the information and data in this chapter were gathered from the baseline studies of the LPF (Devanadera et al., 2004, Campo et al., 2005) and the ComMod process, supported by other external studies and documents.

In the City of Puerto Princesa in Palawan, various stakeholders aim for a devolved ENRM as depicted in Figure 3.1, wherein the key stakeholders are striving to coordinate and cooperate towards a sustainable management of ENR. However, as with other villages and cities in the Philippines, ENR in Puerto Princesa is not immune to issues and conflicts. One of these issues is with regards to communication and coordination among the major stakeholders, an issue that the Levelling the Playing Field project with a Companion Modelling process attempted to address for three villages in the city. To set-up the context to which the ComMod approach and the Levelling the Playing Field project will be conducted in the three villages, I will focus my examination on the ENRM and livelihood system of the villages, wherein I will present the established institutions and rules-in-use that govern the extraction and use of natural resources, the characteristics of the stakeholders themselves and the various roles they take in ENR management, and bring into light the possible explanations as to why these challenges in coordination and cooperation among the stakeholders persist. The inquiry will be structured according to the variables proposed by the Institutional Analysis and Development framework (Ostrom, 2005). In the succeeding sections, I will fulfill the variables that define or describe the working parts of the ENRM and livelihood action arena at two levels of IAD analysis, i.e., the operational level, where appropriation of natural resources occur, and the collective-choice level, where the rules for appropriation are made. At each level, I will present first the exogenous variables or the factors that affect the action arena to provide a background on what is at stake. This is followed by the description of the variables of the action arena itself, i.e. the elements of the action situation and the actors that are involved in it. For the last set of variables, i.e. the patterns of interactions and outcomes, rather than predict these variables as what is prescribed in an IAD analysis (Ostrom, 1990; Ostrom et al., 1994), I will instead present actual accounts of the experiences of the actors in the action situation.

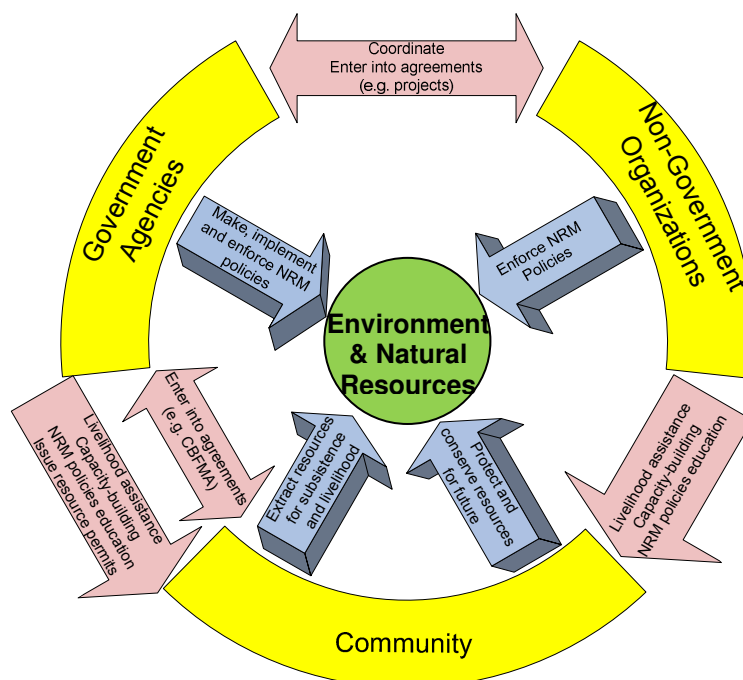


Figure 3. 1 Actions and interactions of the stakeholders in ENRM in Palawan, Philippines (Villanueva et al., 2008)

3.1. Action Arena at the operational level: natural resource extraction and use

3.1.1. Factors affecting the action arena

Physical/material conditions

The study site, composed of three rural villages, namely, San Rafael, Tanabag and Concepcion, in the city of Puerto Princesa (9° 44' N, 118° 44' E), Palawan province, Philippines (location shown in Figure 3.2), have a combined area of about 18,111 hectares. The three villages are situated approximately 67 km from the Puerto Princesa city proper and the travel time via the national road is approximately 1.5 hours. The landscape in the three villages is composed mostly of upland or forest areas, a very small portion of lowland areas, and the rest are coastal areas. Figure 3.3 shows the elevations below 100, or areas that could be described as lowlands, and above 100 meters, or areas that could be described as uplands. Figure 3.4 depicts the land-use / cover of the study site. Figure 3.5 are actual photos of the three landscapes. The primary growth forests are mostly covered by guijo (*Shorea guiso*), narig (*Vatica*

manggachapui) and *Dipterocarpus* sp., as well as dao (*Dracontamelon dao*), kalantas (*Toona calantas*) and amugis (*Koordersiodendron pinnatum*) (Hartanto et al., 2005). Residual forests contain tree species such as taluto (*Pterocymbium tincotirium*), agosip (*Symplocos ahernii*), sanglai (*Ahernia glandulosa*), alupag (*Litchi chinensis*), anilau (*Colona serratifolia*), and pagsahingin (*Canarium asperum*) (*ibid.*). The forest area is also a source for non-timber forest products (NTFPs) such as almaciga resin from bagtik (*Agathis damarra*), rattan, honey, nito (*Lygodium spp.*) and wild pigs (*Sus barbatus palawensis*). Dead wood for making charcoal is also sourced in the forest areas. Tree plantations for gmelina and other tree species are found in the upland areas within the community-based forest management (CBFM) area of the three villages (to be discussed in detail in the succeeding sections). Swidden farming, which is mostly done for subsistence rice production, is practiced in the upland areas. Parts of the lowland areas are used as rain-fed rice paddies with some areas for vegetable production. There used to be an irrigation system for the paddy fields but this irrigation system is no longer used due to severe damage. As a result, farmers rely on rain to irrigate their farms. Other land uses of the lowland area are coconut plantations for production of copra and roof shingles and location of community settlements. Within the community settlements, backyard gardening (vegetables, flowers and ornamental plants) and livestock-raising (usually pigs and chicken) are practiced by the locals. Roadsides are sometimes used for setting up small stalls for selling vegetables and ornamental plants to passers-by. Aquatic resources, such as fish, octopus, squid, crabs, shellfish, are mainly sourced in the coastal areas 5 to 7km from the shoreline. Milkfish fingerlings are abundantly found in coastlines during the months of April to June and August to October. Coastal areas were also used for seaweed farming until its practice was stopped in 2005 prompted by heavy losses due to diseases and theft.

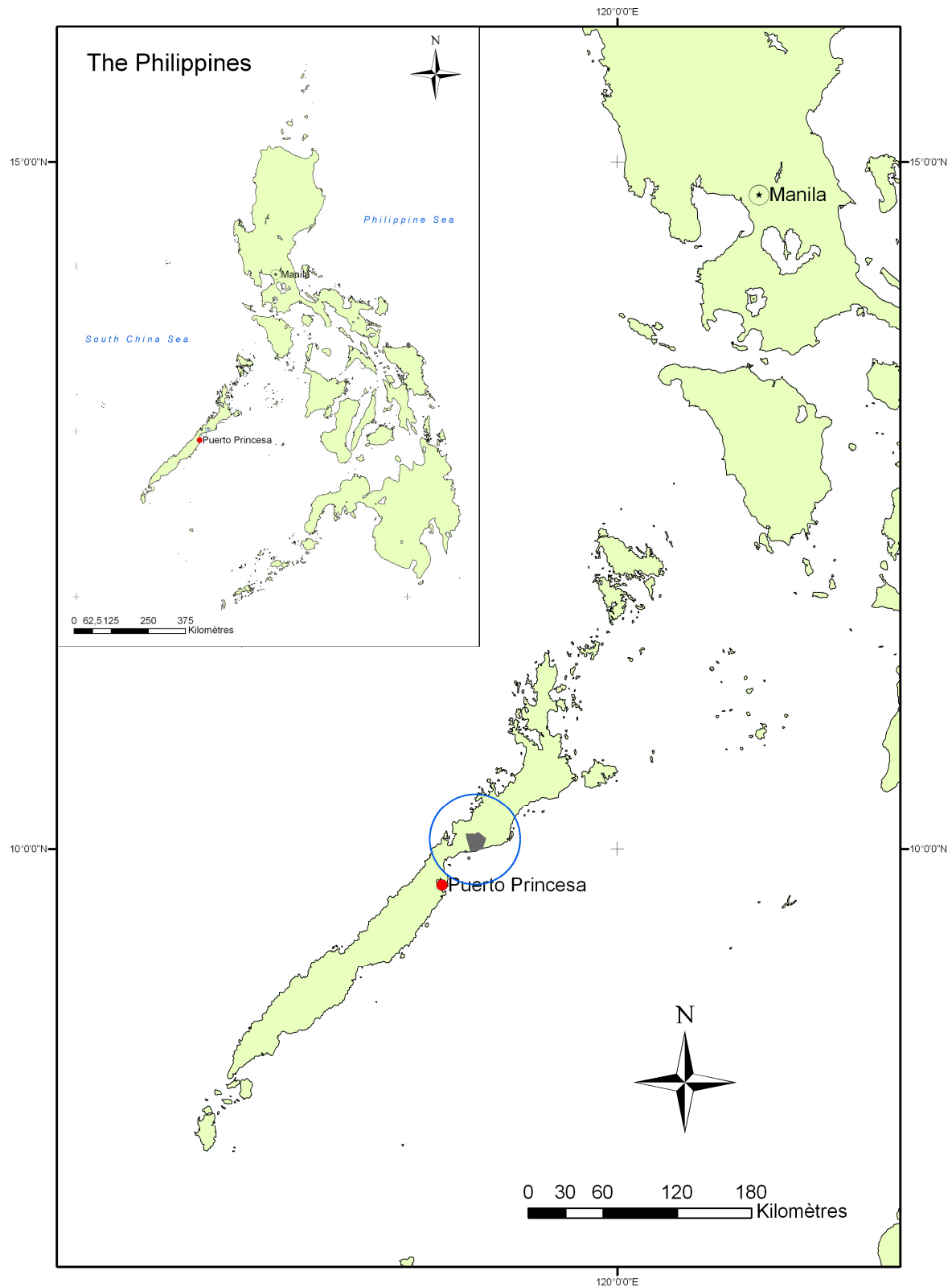


Figure 3. 2 Location map of the City of Puerto Princesa and the study site. The study site is the gray area encircled in blue. (Digital data provided was by the GIS section of the Palawan Council for Sustainable Development and map layout was done in ArcGIS 9)

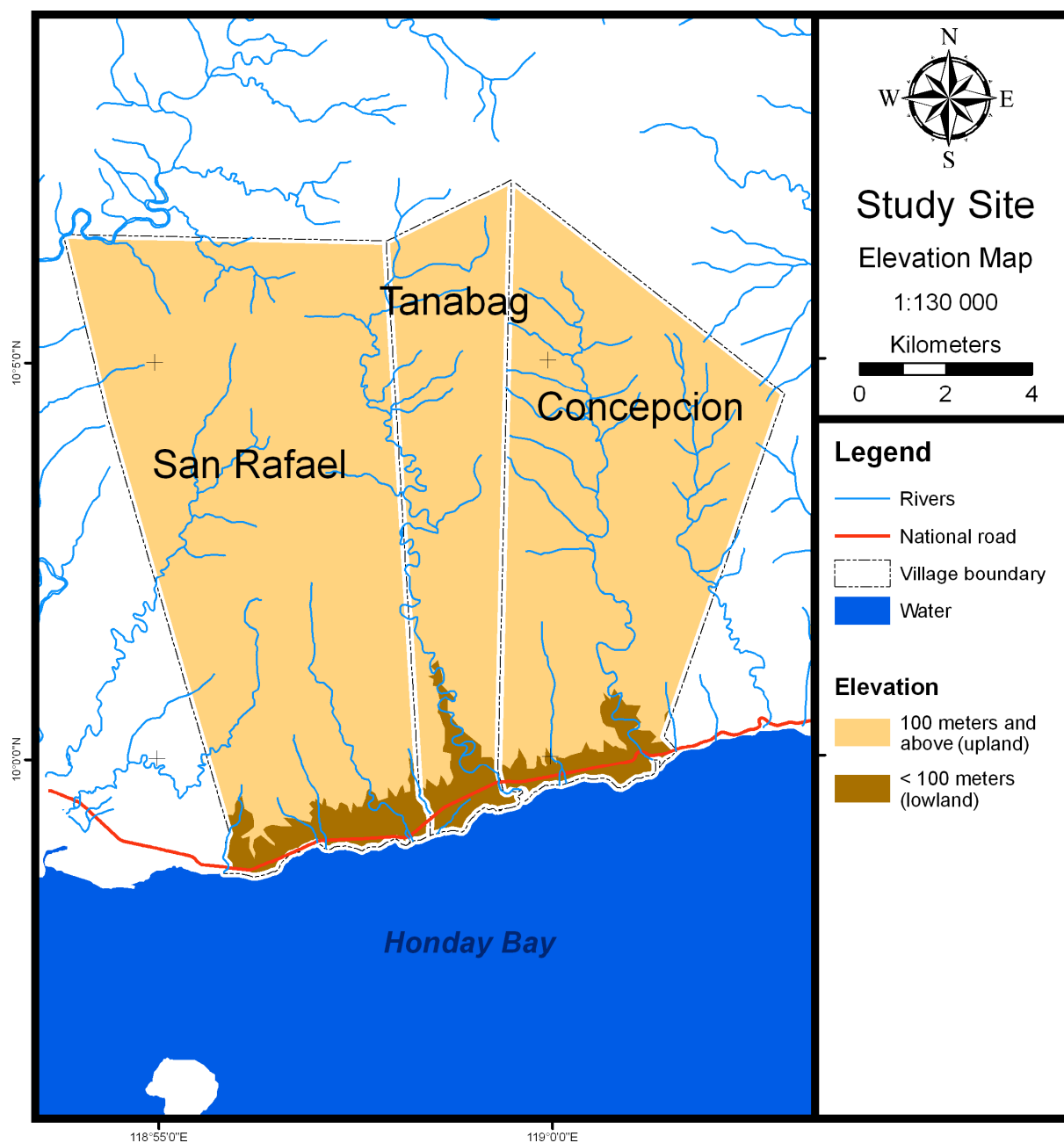


Figure 3. 3 Simplified depiction of elevation map of the study site. (Digital data provided was by the GIS section of the Palawan Council for Sustainable Development and map layout was done in ArcGIS 9)

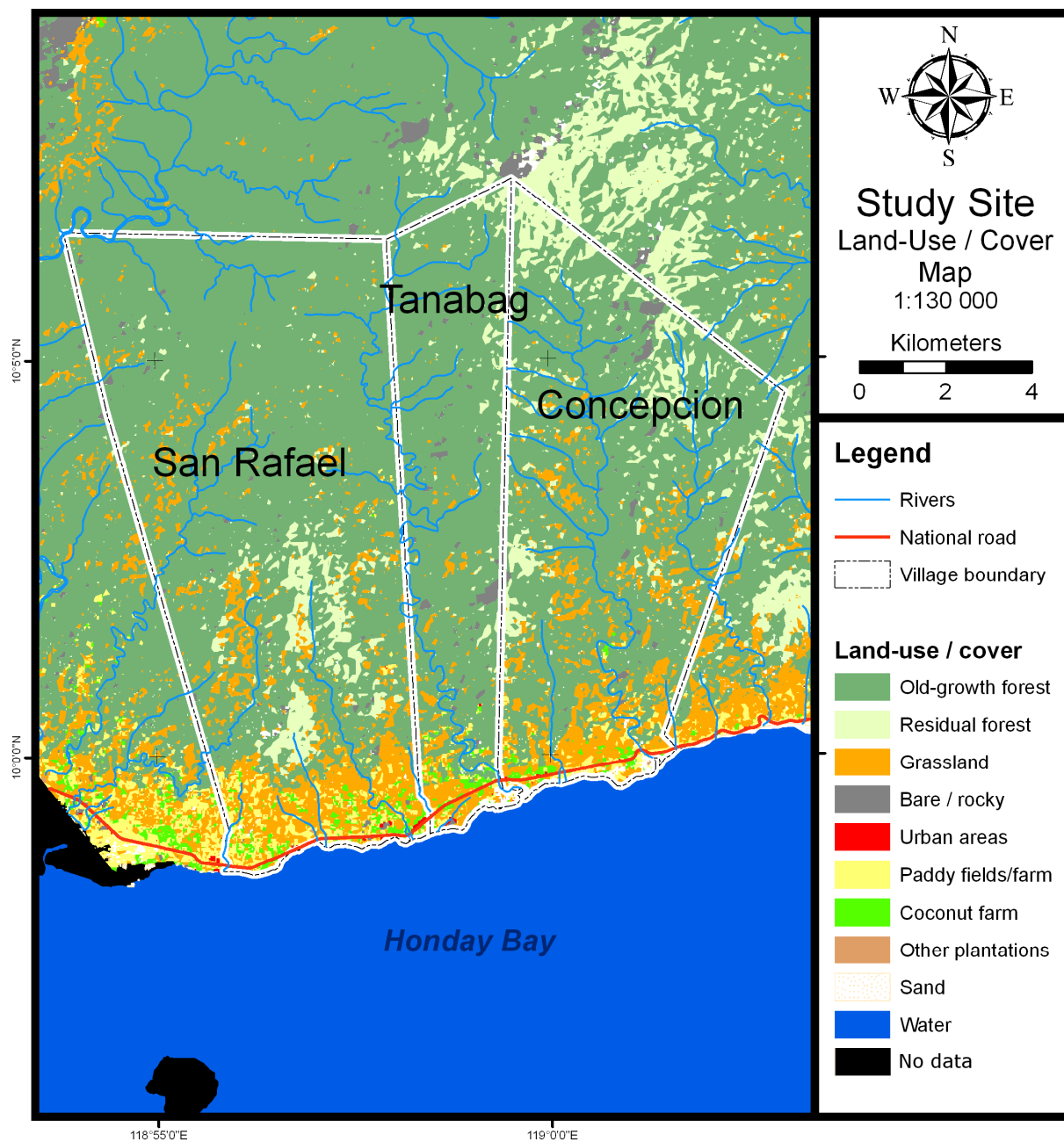


Figure 3. 4 Land-use / cover map of the study site. (The land-use / cover data was derived from LandSat TM satellite data of 1992 and provided by the GIS section of the Palawan Council for Sustainable Development. Map layout was done in ArcGIS 9)



Figure 3. 5 Landscapes found in the three villages

The area has a tropical climate and experiences two seasons, the wet season which is from May until October, and the dry season, which is from November to April. These seasons are caused by two wind systems: *Amihan*, or the cool northeast monsoon corresponds to the wet season, while *Habagat*, or the southwest monsoon, corresponds to the dry season of the country. Seasons and weather play important roles in the livelihood practices of the local community as seasons affect the growth and availability of natural resources, such as honey production of bees and migration and breeding patterns of aquatic resources. It also affects (human) demands for resources, e.g. demand for roof shingles made of nipa and coconut leaves is low during the dry season, while strong rains and winds during inclement weather reduce accessibility of steep and high areas in the forest and fishing areas far from the coastline.

Despite the large number of groups tasked to support management of the natural resources in the city, there is little data available to quantify and characterize the natural resources both on land and sea such as resource stock, bio-capacity and regeneration models. Personal accounts of the community members give an indication of the scarcity of the resources wherein the scarcity is perceived as a function of location and travelling distance required to acquire the needed resources, i.e. they have had to move further into the sea or into the forest areas to find the resources they need.

Attributes of community

The local community residing within the three villages is composed of indigenous people (IPs) – the Bataks, and migrants or people from different parts of the Philippines who have come and settled in the area. Usually, a household in the three villages is composed of the core family with some extended family members. It is not unusual to find a household composed of three different generations.

The Bataks are a semi-nomadic tribe whose culture is deeply rooted to the forest and its resources. Prior to 1954 or before the establishment of any legally-recognized migrant village in the area, the Bataks were settled at the foot of the mountains at a place that is now known as the village of San Rafael. During their settlement in the lowland and coastal areas, their subsistence was partly based on aquatic resources aside from that of the forest. At the time of increasing in-migration of outsiders and them not being open to the idea of interacting with the migrants at that time, the Bataks moved inlands, deeper into the forests travelling as far as the northern fringes of their CBFM area at the west side of the Palawan peninsula (Figure 3.6). Having gone so far deep into the upland areas, it became difficult for the local government to provide basic services to the Bataks, such as health care and education. Therefore, in 1998, the LGU finally convinced the Bataks to go down from the uplands and semi-permanently settle at their small community or *sitio* called Kalakwasan, which has existed since the 1950's, within the boundaries of Tanabag (Figure 3.6). Today, many Bataks still travel to northern parts of their CBFM area to tend their swidden farms during the farming season and return to Kalakwasan after harvesting is finished, although some of them occasionally stay there. Their settlement in Kalakwasan meant that they were now more accessible to government services and support. But this also opened them to outside influence. Animistic religion was practiced by the Bataks until Christian missionaries from South Korea came and evangelized the community and established a community chapel. Currently, they are practicing their Christian faith with a mix of their old traditions. They have also been exposed to cultural and environmental tourism to which they now demand payment for performing their traditional dances for tourists or as guides for mountain trekkers. Despite the presence of health care workers in their area, who travel from the city proper to the settlement

whenever funds were available, the population of the Bataks in Tanabag, estimated to be less than 300, has been on a decline in recent years (Novellino, 2008; Boissière and Liswanti, 2006). The Batak community, being located in the valleys and forest areas of the money, are limited to gathering NTFPs for trading and, swidden farming, hunting and raising chickens for their subsistence. Sometimes they sell their hunted wild pigs to augment their income.

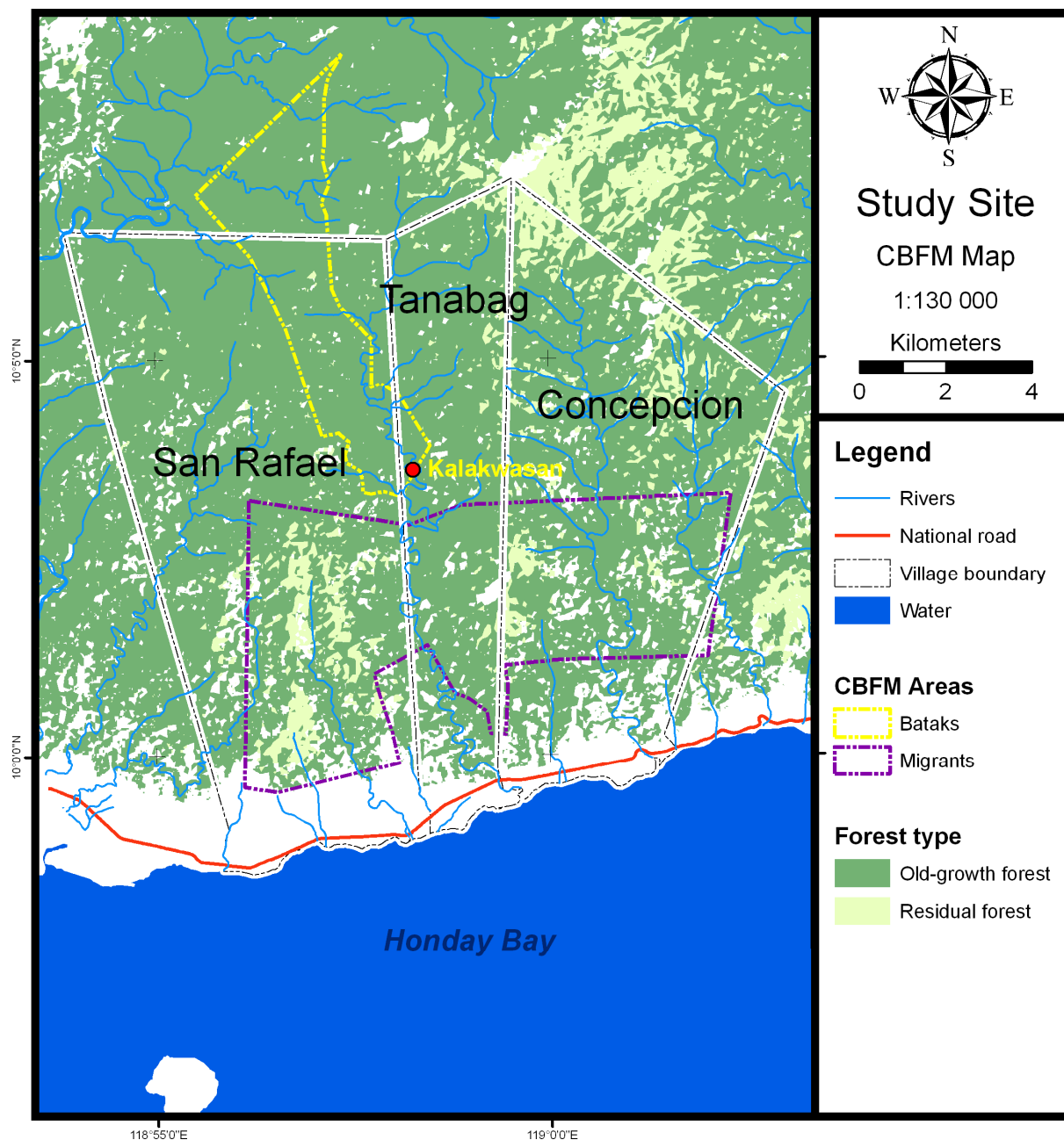


Figure 3. 6 Location map of the Bataks' Kalakwasan settlement and the CBFM areas of the Bataks and migrants.

(The land-use / cover data was derived from LandSat TM satellite data of 1992 and provided by the GIS section of the Palawan Council for Sustainable Development. Map layout was done in ArcGIS 9)

The migrants, who started coming to the area in the 1950's, have their settlements located in the fringes of the uplands up to the coastal areas. Due to their proximity to different resources, they practice more livelihood activities, such as fishing, paddy rice farming, raising livestock, making roof

shingles from dried leaves of coconut and nipa, gathering milkfish fingerlings sold to traders, vegetable and ornamental plants gardening, charcoal-making and trade. They also used to gather NTFPs through their CBFM agreement until a country-wide review of CBFM agreements stopped their CBFM operations. Also, many of them practice multiple livelihood activities at any given time to meet their daily needs. Many of them practice multiple livelihood activities at any given time to meet their daily needs. As such they do not see themselves as being tied to a particular resource, and consequently, to a particular livelihood. For example, an individual can be both a fisherman and a farmer. They also perceive that the forest and its resources are always available, and yet, they choose to gather NTFPs as a last resort. "*Bayanihan*" or the practice of helping other members of the community without expecting compensation is still practiced by the Bataks and the migrants but is declining (in the opinion of the migrants, at least). In the past, this practice was applied during rice harvest, moving someone's entire house from one location to another, or building infrastructures for the community. Nowadays, people are hired during rice harvest with payments in cash or rice.

As reported by Boissière and Liswanti (2006) and as observed during the ComMod field exercises, a co-dependent relationship exists between the Bataks and the migrant communities, wherein both sides rely on the services of each other for their livelihoods. However, despite their co-dependency, there is growing animosity between the groups. The Bataks are viewed by the migrants as lazy and ignorant since most of them are still unable to read and write and, despite the attention and support provided to the Bataks by GOs, NGOs and philanthropists, they have remained poor. The migrants, on the other hand, are viewed by the Bataks as people who take advantage of them wherein migrant traders buy their goods below the market price. Migrants are also often seen as violators of the extraction rules, e.g. gathering NTFPs inside the CBFM of Bataks and using destructive methods at unsustainable rates. Thus the migrants are considered as threats to the survival of the Batak community. In situations where the Bataks are with the migrants or are facing government officials, they are more subdued and take on a more formal and polite stance. The Bataks explained that, although

they are used to interacting with the migrants and other outsiders, they also respect their authority. Some Bataks do feel a sense of inferiority compared to the migrants because of their lack of literacy. Only a handful of people are receiving formal education. While some adults receive informal education from volunteer workers who visit their village every so often, the children would go to school located in the lowland settlements. Given the remote location, the Batak children often miss school, especially during the wet season when inclement weather makes it extremely difficult for them to travel.

Rules-in-use

“All lands of the public domain, waters, minerals, coal, petroleum, and other mineral oils, all forces of potential energy, fisheries, forests or timber, wildlife, flora and fauna, and other natural resources are owned by the State. With the exception of agricultural lands, all other natural resources shall not be alienated. The exploration, development, and utilization of natural resources shall be under the full control and supervision of the State. The State may directly undertake such activities, or it may enter into co-production, joint venture, or production-sharing agreements with Filipino citizens, or corporations or associations at least sixty per centum of whose capital is owned by such citizens.”

- Section 2, Article XII of the Philippine Constitution of 1987

The Philippine constitution of 1987 reiterated the Regalian Doctrine. This consequently meant that all resource appropriation required for livelihood activities of the communities required tenurial instruments such as agreements, licenses and permits. With the Executive Order No. 263, the Community-Based Forest Management (CBFM) program was adopted to be the main strategy by Philippine Government since 1995 for sustainable management of the forest areas of the country, together with the DENR

Administrative Order 96-29 of 1996 that provided its implementing rules and regulations. The CBFM agreement is the main tenurial instrument of communities for access of the forest areas and extracting or utilizing resources found within. The agreement is for 25 years and renewable for another 25 years. In order to enter into this agreement, the community must have a People's Organization (PO) that would manage the CBFM area. For the villages of San Rafael, Tanabag and Concepcion, they formed the San Rafael, Tanabag and Concepcion Multi-Purpose Cooperative (STCMPC) to manage an area covering 5006 ha and mostly covered by residual forests (Figure 3.6). The Bataks (IP) of Tanabag village have their own CBFM area with a size of 3,458 ha, covered mostly of old-growth forest with small patches of residual forests (Figure 3.6), which is managed by their organization, *Samahan sa Kaunlaran ng Batak sa Tina organization (SKBTO)*. The Bataks' CBFM area is in fact only a part of their Ancestral Domain claim of 5,000 ha. Within this agreement, PO members can perform agro-forestry activities and collect NTFPs while doing reforestation work and protecting their area against illegal activities. To be able to acquire the NTFPs and wood products, two documents must be submitted, i.e. an Annual Work Plan and Community Resource Management that describes what they plan to do for their CBFM area, e.g. activities they will perform for the rehabilitation of their forest areas, the types of natural resources to be extracted, their estimated quantities and how they plan to use these resources. These documents require the approval of DENR, through its line agency Community Environment and Natural Resources Office (CENRO), and the Philippine Council for Sustainable Development (PCSD). The products acquired within the CBFM area are subject to forest charges which have to be paid before the products are released. Aside from the activities within the CBFM agreement, the communities are also allowed to gather dead trees for making charcoal for household use. Those who opt to sell charcoal to the city proper have a quota and check-points along the road have been set-up to check the quantities of charcoal being brought outside the community. If someone is found to be in violation of the agreement, the products are confiscated and the violator is made to pay a fine depending on the gravity of the offense. In 2005, however, the secretary of DENR at that time cancelled all the CBFM

agreements and, since 2006, only CBFM agreements in the regions 9, 10 and eleven have been restored; Palawan is in Region 4. With regards to logging, since 1991, commercial logging in primary forests has been banned through DENR Administrative Order No. 24 and only allowed in secondary forests and plantations (Bugayong, 2006). In 2004, following a flooding disaster in Aurora and Quezon provinces, the president at that time ordered the cancellation of all logging permits in those provinces, and suspended all other logging permits throughout the country (*ibid.*). Since 2005, only the logging permits in regions 9, 10 and 11 have been restored to address the local demand for wood (*ibid.*).

Under the Fisheries Code of 1998, fishermen need permits from the city LGU to fish within the city waters, in which they declare the size of their fishing boats and equipment. Fishermen from other villages may fish in the areas fronting the three villages as the permits are city wide. Active gears and use of explosives or poisonous chemicals are strictly prohibited. Violation of the fisheries code would lead to automatic revocation of the license, permit or lease, monetary fine, confiscation of the catch and fishing gear and possible imprisonment depending on the gravity of the offense.

The communities are able to form groups, called Peoples' Organizations (PO), for their respective livelihoods such as a fishermen's organization and farmers' organization. These organizations, in coordination with their respective village councils, may also enter into agreements with the city local government units and NGOs for trainings and projects for the village, such as the CBFM program. Incidentally, the benefits of these trainings are often limited to the members and not to the whole community (Villanueva and Gamutia, 2005).

Bataks still follow their ancient traditions of land and resource use despite their exposure to migrants, NGOs and GOs. They still hold the belief that land and the resources it contains belongs to everyone, but at the same time, because spirits of nature still reside in them, these resources should be protected. Their concept of land and resource security is more about land-use rights rather than ownership (Boissière and Liswanti, 2006; Novellino, 2008). This concept is contrary to the popular concept of land-ownership to secure resource security, which is often associated with the migrants.

They follow the concept of “first come, first served” when it comes to establishing areas for extracting resources. However, once they have established the right to extract resource in an area, such as almaciga resin, they go back to the same place for extracting resources until it is no longer viable. This is much the same as in using land for swidden farms. Typically, each Batak family is entitled to use a hectare of land for swidden farming. However, rather than cleaning forest areas for new farms, they instead go back to their old fallow lands, which is often ready by the time they go back. In cases such as a new plot of land is going to be opened for farming, the decision is still made collectively by the community. This collective decision making process also applies to extraction of natural resources. In the case of rattan extraction, gathering of rattan sticks are done when there is demand from the migrants. Otherwise, they do not collect rattan because they believe that it is going to rot and be wasted if they are just going to store it for a long time, especially during the rainy season. They also collect a particular type of NTFP depending on the collective decision of the community. For example, if they decide to collect honey, all able-bodied community members will collect honey. All their NTFPs are then sold to middle-men who are members of the migrant community or exchanged for other goods such as rice, salt, sugar, coffee and cigarettes at small stores located in the migrant settlements. All the earnings of the Batak community are gathered together and equitably shared to all.

Table 3.1 summarizes the types of rules at the operational level of the action arena, i.e. resource appropriation, as outlined in the IAD framework.

Table 3. 1 Summary of rules at the operational level

Types of Rules	Natural resource extraction and use
Position	- Membership to the migrant PO, STCMPC, is usually reserved to the community members of the three villages; membership to the Batak PO, SKBTO, is reserved to the members of the Batak community.
Boundary	- In general, any Filipino citizen can participate in the action situation

	<ul style="list-style-type: none"> - Gathering NTFPs require that the individual is a member of the PO managing the CBFM area - Gathering of NTFPs is allowed only in CBFM areas for those who hold permits, i.e. members of the PO managing the CBFM areas
Choice	<ul style="list-style-type: none"> - Fishing choice is limited to the equipment that are allowed to be used by fishermen as defined by the Fisheries Code of 1991 - Bataks gather a certain type of NTFP based on the agreement made by the whole community and as required by their cultural practices / traditions. - In CBFM areas, these are defined in their management plan for the CBFM area designed by the PO and as approved by the DENR, through its LGU line agency, and PCSD.
Aggregation	<ul style="list-style-type: none"> - For the Batak community, they collectively decide which livelihood activities to perform.
Scope	<ul style="list-style-type: none"> - Gathering NTFPs are only allowed in CBFM areas. - Agro-forestry was allowed in CBFM areas until the logging ban in 2004. - Commercial fishing is prohibited in fish/marine sanctuaries or reserves.
Information	<ul style="list-style-type: none"> - Fish stock inventory is only available to members of the fishermen's organization - Information about costs involved and income generated from livelihoods is known only to those who practice it. It is an individual's choice whether or not to divulge the information to others should someone ask.
Pay-off	<ul style="list-style-type: none"> - Gains of POs are shared among its members. - Benefits are equitably shared among the Bataks. - There are quotas or limits for selling charcoal and gathering NTFPs - Forest charges for gathering resources in forest areas have to be paid before resources can be claimed.

	<ul style="list-style-type: none"> - Penalties for breaking law involve arrest/jail term, confiscation of goods and equipment, fines and revocation of license, lease or permits. - Conformance to the rules is monitored by the provincial LGU, specifically the Kilusang Sagip Kalikasan (KSK), the province's environmental watchdog. Volunteers from the communities may also help in this task by reporting violations.
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3.1.2. *The Actors and the action situation: livelihood practices of the local community*

The main stakeholders involved in the appropriation of resources are the migrants and the Bataks who inhabit the three villages. According to the 1999 census, there are a total of 3597 inhabitants in the villages, of which 1575 are from San Rafael, 457 from Tanabag, and 1565 from Concepcion (Hartanto et al., 2005). About 55% of the inhabitants are women (*ibid.*). It is difficult to get the exact number of the Bataks since they are semi-nomadic and they move from different locations within their CBFM area to tend to their swidden farms and other activities. For example, in 2005, Boissière and Liswanti (2006) counted 136 inhabitants (63 females and 73 males) from 33 different households¹⁵ staying at their semi-permanent settlement, Kalakwasan, while in 2008, Novellino (2008) counted 153 members from 31 households. In general, however, the Bataks are estimated to be less than 300 individuals in total and declining (Novellino, 2008).

The local community is engaged in several livelihood and subsistence activities within its own and in adjacent villages, many of these activities require the extraction and use of renewable natural resources. The Batak community is limited to gathering NTFPs for trading due to the location of their CBFM being in the upland areas, although sometimes they sell their hunted wild pigs to augment their income. Despite the cancellation of the CBFM agreements in 2005 all over the country, the Bataks were still allowed to continue with their operations as they are dependent on the natural resources for their survival. Migrants living in the lowland areas are open to much more resources from the upland,

¹⁵ The average size of households in the three villages is about six individuals with two to three children and an extended family member.

lowland and coastal areas, thus they are able to practice more livelihood activities, such as fishing, paddy rice farming, livestock-raising, roof shingles-making, gathering milkfish fingerlings sold to traders, vegetable and ornamental plants gardening, charcoal-making and trade. Migrants used to gather NTFPs and have agro-forestry activities through their CBFM agreement until the suspension of all logging permits in 2004 and cancellation of all CBFM agreements in 2005 that effectively halted their CBFM operations.

The decision-making processes of the community members on subsistence and livelihood are dependent on their old practices, gender, individual preferences, social relationships and availability of capital, both monetary and equipment-wise, as well as the rate of returns of different livelihood activities. Special events, such as school graduations and village fiestas, also lead to the community members to prioritize livelihoods with quick gains. Migrants gather NTFPs when no other viable livelihood activity. Farm land owners prefer not to rent out their lands for others to use because they do not want to waste their properties. They till their lands even if they incur losses in the process. The market for some commodities, such as fish, vegetables and livestock are often within the villages and nearby areas. Some of the community members act as traders who buy the commodities from other community members and then sold in bulk at the city proper. The Bataks' decision making process is affected by seasonal availability (e.g. honey), demand (e.g. rattan) and supply (e.g. almaciga resin). Gathering honey during the summer season is prioritized as this is perceived to be a high-value commodity that is easy to sell. Rattan is gathered only when there is demand from the local traders. Almaciga is gathered throughout the year and regularly sold to a local trader. Bataks would sometimes combine the gathering of different NTFPs depending on the situation and their own physical capacity. It is often the case that the equipment used by the communities in their livelihood activities are fashioned with materials found around their environment, except for equipment that they cannot make themselves such as nets and boats for fishing.

Information about livelihood activities is also limited and privy only to those groups who practice it. For example, fish inventory information, if and when available, are only provided to members of the Fishermen's organization. Discussions about earnings from livelihoods normally occur among family members, relatives or close friends only. If a project is entered by a PO, they are the direct benefactors of the benefits of such projects; very minimal benefits are shared to the entire community. Milkfish fingerlings are sold to traders living within the village. In turn the traders sell the fingerlings to fishpond owners outside the province. They acquire their skills in the different livelihoods through their parents, relatives or friends.

GOs and NGOs provide assistance to the local community in form of livelihood projects and trainings for livelihoods, financial assistance or provision of equipment, depending on the requests or proposals of the community. These trainings include enhancement of the community's knowledge and skills to increase their productivity or to introduce alternative livelihood activities, such as seaweed farming and production of fish commodities by using fish pens.

Table 3.2 is the summary of the characteristics of the community members for their livelihood activities, while in Table 3.3 summarizes the livelihood activities of the inhabitants of the three villages presented as the seven elements of the action situation of the IAD framework.

Table 3. 2 The actors of the action situation for natural resource extraction and use

Actors	Number	Preferences	Information level and learning capability	Selection Criteria	Resources
Migrants	Around 3600 individuals	- Preferences are affected by group affiliations	Normally, they do not keep records of the	Amount of income generated (and	Income, handmade equipment for

	With less than 300 Bataks individuals	and social relationships, old practices, age, gender - gathering non-timber forest products (NTFPs) is the last resort. - Distance from markets, measured as an added cost, also affects their preferences.	costs and income generated from livelihood activities.	not profit margin), gender, seasonality of resources, and ease of livelihood are the criteria used for making decisions	conducting livelihood
Bataks		- Cultural tradition - Distance from markets, measured as an added cost, also affects their preferences.	Indigenous knowledge; although most are unable to read and write, they rely on the memory of the Batak community,	Demand from the migrants, seasonality of resources, and traditional practices, - They are limited to extraction of	Income generated from gathering NTFPs, They make their own equipment for their livelihood activities

			most especially the elders. However, the number of elders is decreasing.	NTFPs for livelihood due to their closeness to the resource. First come first serve basis when staking claim to a resource.	
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Table 3. 3 The seven elements of the action situation for utilizing natural resources for livelihood activities in the three villages

Element	Migrants	Bataks
Positions	Resource appropriators	
Actions	Farm, fish, gather NTFPs, seaweed farming, vegetable gardening, ornamental gardening, make shingles, make copra, make charcoal, raise hogs, gathering milkfish fry	Gather NTFPs, make charcoal
Potential outcomes (To be investigated more in the implementation of ComMod, the results of which will be	<ul style="list-style-type: none"> - The supply and demands of natural resources vary by season and social events. This leads to variation of livelihoods of an inhabitant throughout the year. - Resource scarcity may occur when inhabitants gather the same 	

presented in Chapter 5.)	type of resources in the same area. Unsustainable practices, such as overharvesting may add to this problem.
Control	<ul style="list-style-type: none"> - Bataks have a village meeting to discuss and decide which resources to be gathered, or which areas to open for swidden farming and gathering resources. - The migrants are able to gather the resources they want without needing the permission of other community members.
Information	<ul style="list-style-type: none"> - Knowledge about livelihood activities and its peculiarities are limited to those who already practice it and are only passed down among families and friends. - The actors normally do not keep track of their net income from livelihood activities. - Information on how seasons and weather affect availability of resources is not widely known; therefore many resort to trial and error. - There is limited information on market prices as well.
Cost and Benefits (To be investigated more in the implementation of ComMod. The results of which will be presented in Chapter 5.)	<ul style="list-style-type: none"> - Each resource has an attached selling price that varies by season, the equipment used for livelihood have corresponding costs; permits and forest charges are also present. - Graduated punishment for rule violators which include fines, revocation of license, leases and permits, confiscation of goods and equipment, and even jail term. - Local violators are sanctioned by the village council. For bigger offences, these are brought to the attention of the authorities such

	as the police and the KSK.
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3.1.3. *Patterns and outcomes of interactions*

Increasing difficulties in carrying out these activities due to diminishing resources and formal rules in natural resources access and use becoming stricter, the situation demands attention to achieve a sustainable equilibrium between ENR protection and natural resource utilization for subsistence and livelihood. Though various mechanisms for interaction exist among stakeholders, both formal and informal and at multiple levels of governance and social hierarchy, success has been minimal. Several challenges arise from the interactions of the different stakeholders in performing their livelihood activities caused by the complex interaction among the different rules, individual and community habits or culture and attitude, climate change and the existing mindsets for NRM. Below are some examples to which the communities have had experienced in the context of doing their livelihoods, classified according to the evaluative criteria provided by the IAD framework.

Adaptability

Although there are no definitive resource inventory present for both land and water resources, the scarcity of the resources are being reported by the community members. They have expressed that it is more difficult for them to gather resources, such that they have to venture further out into to the sea or go deeper into the forests to fulfill their tasks. They say that, in some occasions, they go home empty handed.

Limitations in knowledge and information transfer with regards to livelihood activities limits the opportunities of the inhabitants. Information about livelihoods and availability of resources are not often shared among community members; knowledge and skills are only passed within close social relationships. This limits an individual's opportunity to acquire knowledge and skills in other livelihood activities. Interviews with the community revealed that this situation have discouraged some of them

from pursuing other livelihood activities of interest. The Bataks, being limited by their location and tenurial instrument, are seeking alternative livelihoods but they do not know where to start.

There is a gap in knowledge among community members about existing rules to which they can be taken advantaged. For example, beach-front properties were rapidly being converted to resorts or were sold to non-locals for building vacation houses. The new owners then fence out the property, including the beach area, to keep out the public. This practice had reduced the beach-fronts used for public recreation and parking areas for fishing boats. Some fishermen claim that some of them have to park their boats in nearby villages due to the difficulty of finding parking spaces within their own villages, while there are others who avoid fishing altogether. This practice is, in fact, illegal but the residents were not aware that this was the case and therefore were taken advantaged.

Impact of climate or weather events have had drastic impacts on the livelihoods of the inhabitants of the three villages. In 1998, there was a fish pen project between the local fishermen of Concepcion village and the Bureau of Fisheries and the City Agriculture office, in which heavy rains and floods destroyed much of the structures that were built (Villanueva and Gamutia, 2005). Hardly anything was recovered and the project was unable to recover, which eventually led to its end. Another example reported by Novellino (2008) was the combined effect of El Niño and La Niña from 1999 to 2000, which greatly reduced the food production and NTFP collection throughout the three villages. This event forced the migrants to encroach on the Bataks' territory and used unsustainable methods for collecting NTFPs, putting further pressure on the Bataks who had already very little to begin with. With the food crisis, the Bataks were forced to go into alternative livelihoods to obtain money for food, such as selling small trees for charcoal. NGOs tried to alleviate the problem by lending the Bataks rice which, under the agreement, they have to pay back later on. This effort eventually failed because the Bataks were unable to pay the back the rice they have borrowed (*ibid.*).

Equity through fiscal equivalence

Because NTFP collection requires a considerable amount of resources, which the Bataks do not often have, they usually borrow the resources from the migrants. In turn, they have to sell their commodities to these migrants, wherein they have no control over the prices the migrants dictate. The Bataks feel shortchanged in the transaction but they have no other choice. Travelling to the city proper themselves to sell their goods are much too expensive considering the transportation costs and possible overnight accommodation costs. Moreover, only few of them have had only a few experiences in being in the city center.

Accountability

Recently, most of the agreements entered into by the community by the POs have not ended well. Based on the baseline study of contracts and agreements of the LPF project at the site (Villanueva and Gamutia, 2005), internal problems debilitated much of the efforts put in by the different stakeholders, most especially on transparency involving money and decision-making and pursuance of self-interest. Issues with the use of money or distribution of benefits among the POs have created strife among the members. Moreover, the failure to deliver the expected benefits from these projects has discouraged many of the members from participating any further. The common assessment among the failed projects was that the POs were not ready to manage projects (*ibid.*).

Other examples not falling within any of the evaluative criteria

Rules not in conjuncture with cultural practices. The CBFM program is perceived to be in conflict with the cultural practices of the Bataks as it limits their activities within the provisions of the agreement, such as swidden farming, which is deeply rooted in the Bataks' culture (Novellino, 2008). Moreover, as Novellino (*ibid.*) explained, because most Bataks are illiterate, it has been difficult for them to submit the required documents, i.e. the Community Resource Management Framework and Annual Work Plan, to utilize and manage the resources within their CBFM area (*ibid.*). This was made even worse by the fact that these documents were and still are subject to strict and specific format and content. This difficulty

resulted to the Bataks' recent failure to submit the required documents thus preventing them to gather NTFPs. They have since then asked the assistance of local NGO, Haribon-Palawan, for assistance in completing these documents.

Pending laws. There are several laws that are already in existence but are not yet applied or applicable to the site. The implementation of these laws may have strong social and environmental impact on the inhabitants of the three villages:

1. Strategic Environmental Plan (SEP) and the environmentally-critical areas network (ECAN) for Palawan

The main strategies of the SEP are (from the PCSD website: http://www.pcsd.ph/sep_law/ecan.htm):

- Forest conservation and protection through the imposition of a total commercial logging ban in all areas of maximum protection and in such other restricted use zones as the Palawan Council for Sustainable Development (PCSD) may provide
- Protection of watersheds
- Preservation of biological diversity
- Protection of tribal people and the preservation of their culture
- Maintenance of maximum sustainable yield
- Protection of rare and endangered species and their habitat
- Provision of areas for environmental and ecological research, education and training
- Provision of areas for tourism and recreation

To implement the strategies, the terrestrial and coastal/marine areas of the province of Palawan, are classified according to the Environmentally Critical Areas Network (ECAN) zoning. Through ECAN, Palawan is mapped into three classifications for the terrestrial zone and two classifications for the coastal/marine zone, wherein each classification has attached rules of access and

use. For the terrestrial zone, the core zone, which serves to protect intact forests, endangered habitats and habitats of endangered and rare species, cannot be disturbed except for collection of forest products by IPs for ceremonial and medicinal purposes, the buffer zone allows regulated use, and the multiple-use zone are regarded as alienable and disposable lands. The buffer zone is further sub classified into restricted, controlled and traditional use zones. Table 3.4 summarizes the characterization of these zones.

Table 3. 4 The ECAN zones and their main characteristics (translated from the ECAN Booklet distributed by PCSD to the communities)

Type of Zone	Elevation	Slope	Plant Growth	Use
Core	Above 1000 meters	Above 50%	Primary growth forest	Habitat for endangered species
Restricted	500-1000 meters	35%-50%	Secondary forest	10 meters of buffer to protect the core zone
Controlled	100-500 meters	19%-35%	Communal forest	Forest trees plantations to protect the restricted and core zones
Traditional use	Below 100 meters	Above 18% but below 100 meter elevation	Edges of intact forests	Plantations for woody trees
Multiple use	Alienable & Disposable	18% and below		For rehabilitation; settlement areas;

				arable lands; development projects; industrialization areas
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For the coastal/marine zone, the classifications are the core zone, which includes sanctuaries of rare and endangered species, selected coral reefs, sea grass and mangrove ecosystem reserves and are free from any human activity, and the multiple use zone, which serves as the buffer zone to the core. This is a development area which allows fishery, mariculture, recreation, rehabilitation of small islands and mangrove ecosystem, education and research.

The implementation of the ECAN zones is done on a stepwise basis, being applied to several areas at a time as the delineated zones still have to be validated with the communities; the ECAN zones have not yet been applied to the three villages under study. According to the accounts of one of the stakeholders from PCSD in the LPF project, in the areas where the zones have been officially delineated, several IP groups have begun complaining about the designation of core zones within their ancestral domain such that they were having a hard time trying to survive whilst following the law.

2. Indigenous people's rights act

The Indigenous People's Rights Act (IPRA) of 1997 or Republic Act 8371 is a national law that acknowledges the way of life of the indigenous groups and seeks to uphold their rights and protect them from external abuse, as well as allow self-governance. Part of this law is the tenurial instruments called Certificate of Ancestral Domain title (CAD-T) and the Certificate of Ancestral Land Title (CAL-T). Although not perfect, this law attempted to recognize and protect the rights of the IPs, including the lands to which they are culturally attached. From the perspective of IPs, this is a more powerful

instrument as this allows them to perform their traditions according to their culture, including swidden farming. The Bataks are unable to obtain their CAD-T due to lack of funds needed for the process to proceed. For this reason, no official mapping or delineation of the Batak's ancestral domain is available. In an attempt to preserve their culture, they have since opted for a CBFM agreement to allow them to continue practicing their cultural activities, as well as for their subsistence and livelihood, within the forest area, such as collecting NTFPS albeit without swidden farming (Boissière and Liswanti, 2006; Novellino, 2008).

3.2. Action Arena at the collective-choice level: policy design and implementation process for natural resource extraction and use

3.2.1. Factors affecting the action arena

Physical/Material conditions

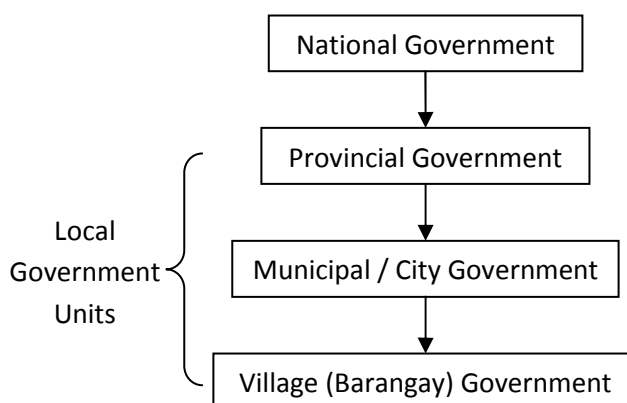
The study site is 67km or 1.5hrs travel from the city proper to which all the city government units and most NGO offices are located. This poses logistical issues with coordination and delivery of services among the stakeholders involved. Because travel and communication involves funds, the delivery of services from the city proper to rural communities as a whole is limited. From the point of view of the communities, the GOs and NGOs are inaccessible partly due to their physical location in relation to the community.

Attributes of the community

The Bataks and migrants perceive themselves as lacking in literacy to competently participate in situations such as in environment and natural resources management (ENRM) planning activities. Based on field interviews, they often say that they know very little to say something substantial in ENRM planning activities; this perceived gap in knowledge about ENRM is also one of the reasons why the Bataks and migrants view external groups such as GOs and NGOs as inaccessible.

Rules-in-use

Prior to the Local Government Code (LGC) of 1991 or Republic Act 7160, the Philippines has had a long history of centralized ENRM owing from the dictatorship government of Ferdinand Marcos, although some attempts have been made for community-based management, such as the Integrated Social Forestry Program (ISFP) of 1982. Since the implementation of the LGC, some responsibilities for ENRM were devolved to local government units. In theory, this should have opened the door for opportunities for LGUs, NGOs and local communities to work together towards sustainable ENRM. Governance was now classified into four levels: national, provincial, municipal/city, and village (or Barangay) levels, with the provincial, municipal or city and village levels corresponding to the local government units (Figure 3.7). Consequently, line agencies for the Department of Environment and Natural Resources, the Department of Agriculture and the Bureau of Fisheries and Aquatic Resources were created for regional¹⁶, provincial and municipal/city levels to assist the LGUs in fulfilling their tasks as well as enforce the agenda and policies of the main agencies. Each local government unit is governed by a council, with its members duly selected through democratic elections within the level's territorial jurisdiction.



**Figure 3. 7 Territorial and political subdivisions of the
Philippine government (excluding autonomous regions,
adapted from Manalo, 2001)**

¹⁶ A region is an administrative division in the Philippines used to group or organize the provinces in the Philippines for convenience and does not have a separate local government unit; the Palawan province is in Region 4.

The devolved functions of DENR to the LGUs, as stated in the LGC are the following:

1) At the municipal level:

- “Extension and on-site research services and facilities related to agriculture and fishery activities which include dispersal of livestock and poultry, fingerlings, and other seeding materials for aquaculture; rice, corn, and vegetable seed farms; medicinal plant gardens; fruit tree, coconut, and other kinds of seedling nurseries; demonstration farms; quality control of copra and improvement and development of local distribution channels, preferably through cooperatives; inter-barangay irrigation system; water and soil resource utilization and conservation projects; and enforcement of fishery laws in municipal waters including the conservation of mangroves; (Chapter 2, Section 17 of the LGC, 1991)”
- “Pursuant to national policies and subject to supervision, control and review of the DENR, implementation of community-based forestry projects which include integrated social forestry programs and similar projects; management and control of communal forests with an area not exceeding fifty (50) square kilometers; establishment of tree parks, greenbelts, and similar forest development projects (Chapter 2, Section 17 of the LGC, 1991);”

2) At the provincial level, “Pursuant to national policies and subject to supervision, control and review of the DENR, enforcement of forestry laws limited to community-based forestry projects, pollution control law, small-scale mining law, and other laws on the protection of the environment; and mini-hydro electric projects for local purposes (Chapter 2, Section 17 of the LGC, 1991);”

- 3) At the city level, both the functions of the provincial and municipal levels are considered (Chapter 2, Section 17 of the LGC, 1991).
- 4) “The environment and natural resources management officer (ENRO) of the LGUs shall take charge of the office on environment and natural resources and shall be in the frontline of the delivery of services concerning the environment and natural resources. However, the position is optional for provincial, city, and municipal governments (Elazuegi et al., 2001)”.
- 5) “LGUs have a share from the proceeds by any government-owned or –controlled corporation engaged in utilization of national wealth to be allocated to the province (20%), component city/municipality (45%) and village (35%). If the natural resources cover more than two LGUs, sharing is based on population (70%) and land area (30%). This share should be utilized for local development and livelihood projects (Elazuegi et al., 2001)”.

There are no DENR functions on devolved to the level of the village level but village officials may be deputized by DENR “to perform environmental functions including forest protection upon prior consultation with the local Chief Executives (Section 5 of the DENR-DILG¹⁷ Joint Memorandum Circular No. 98-01).”

The case of Palawan province is unique, however, because of the existence of the Palawan Council for Sustainable Development (PCSD), which was created under the Strategic Environmental Plan for Palawan (SEP). It is a Republic Act or national law passed in 1992, which has the entire Palawan province as its scope. PCSD, being the main agency overseeing all development activities in Palawan (Devanadera et al., 2002), emphasizes the participation of LGUs, NGOs and local community in ENRM, which is mainly implemented through consultations. This ultimately means that, for every local ordinance passed within the province, it will have to pass through PCSD for approval to ensure that it's in line with the agency's agenda.

¹⁷ Department of the Interior and Local Government

At the local level, aside from the village councils being able to formulate its own rules for environmental protection, village assemblies participated in by the local community are conducted to disseminate information, such as prospective livelihood projects, and to make decisions for the village. Voting is practiced during decision-making in village assemblies; majority wins. Village assemblies are also used for public consultation by GOs and NGOs. Since these are only consultation, the consultants are not partners in decision-making; the final decisions are still made by the respective GOs. In Table 3.5 is the summary of the rules in use at the collective-choice level for policy/rule formulation and negotiation related to resource access and use.

Table 3. 5 Summary of rules at the collective-choice level

Types of Rules	Policy formulation and negotiation (collective)
Position	<ul style="list-style-type: none"> - The LGU council members at the level of province, city and village are chosen through elections. - Membership in the local development councils of the LGUs are stipulated in the LGC. The LGU council members at each administrative level are also members of the local development council at that level, with representatives from local NGOs. - At the village level village officials may be perform environmental duties, including forest protection provided that they are deputized by DENR for such function. In such a case, local communities may be able to decide on local policies designed at that level, through village assemblies.
Boundary	<ul style="list-style-type: none"> - For IPs, this is based on their traditional/cultural practices limited to the CBFM agreement. Migrant PO members, are also bounded by the CBFM agreement.
Choice	<ul style="list-style-type: none"> - Decisions are made in line with the national government's NRM strategy and

	<p>the SEP.</p> <ul style="list-style-type: none"> - Public consultations are made through village assemblies. However, the final decision to include ideas and proposals of the local communities still rests upon the government agency designing and implementing the policy. Modifications to policies are later made depending on the reaction from the community after the policies have been implemented. - Management plans for CBFM are prepared by the PO managing the area with the assistance of NGOs. - Ordinances formulated at the village level may be voted upon by the community through village assemblies. - For IPs, their choices or decisions are based on their traditional/cultural practices limited to the provisions of the CBFM agreement.
Aggregation	<ul style="list-style-type: none"> - For GOs, this depends on the mandates attributed by the law to these agencies. Often, these agencies would have a council for decision-making. - Plans, policies or rules proposed at lower level LGU require the approval of the higher LGU and PCSD. - For decisions required at the village level, decisions are made thru voting; majority wins. This is true for IPs as well. Otherwise, local communities and NGOs, in practice, participate in ENRM matters in a consultative capacity.
Scope	<ul style="list-style-type: none"> - LGUs can participate in communal forest management and small-scale mining projects up to the city level. Environmental protection and law enforcement may occur up to the village level. - Applicability of the rules are within the area of jurisdiction of the administrative levels, national, regional, provincial, city/municipal, or village levels.

	<ul style="list-style-type: none"> - NRM plans and policies made at lower levels require the approval of the higher governing body. For example, NRM plans by the BDC require the approval of the city LGU and PCSD to ensure that these plans and policies are in line with the overall ENRM strategy of the city and that of the province. In the case of the CBFM, it can reach the national level, such as in the case of Devanadera et al. (2002) - For IPs and migrants, their participation in ENRM is limited to what is covered by the mandates of the CBFM agreement.
Information	<ul style="list-style-type: none"> - Dissemination/teaching of existing and new laws/regulations are made thru village assemblies by the respective GOs with the assistance of NGOs - Environmental awareness is promoted thru community programs/projects, special subjects in schools and multimedia (e.g., radio programs, newsprint) - For IPs, this is based on their cultural practices for accumulating, disseminating, and storing of knowledge and information.
Pay-off	<ul style="list-style-type: none"> - Elected officials are provided with salaries. - Any elected official found to be in gross violation of the rules may be disciplined, suspended or removed from office depending on the violation.

3.2.2. *The actors and the action situation: development of rules for local ENRM*

The stakeholders involved in policy design processes are the offices of the LGUs at city and village levels, NGOs, the local community through POs and the national government agencies including their line agencies at the local level (provincial and community). In the context of the LPF project, based on the LPF baseline studies (Devanadera et al., 2004), the list of major stakeholders involved in the ENRM and livelihood situation of the three villages are found in Table 3.6.

Table 3. 6 LPF Philippines project stakeholders

Government Offices	Non-Government Organizations	Local Community
Philippine Council for Sustainable Development (PCSD)	Budyong Rural Development Foundation Incorporated (BRDFI)	San Rafael, Tanabag, Concepcion Multi-Purpose Cooperative (STCMPC)
Puerto Princesa City Local Government Unit (PPC-LGU)	Environmental Legal Assistance Center (ELAC)	Samahan sa Kaunlaran ng Batak sa Tina Organization
Department of Environment and Natural Resources – Provincial Environmental and Natural Resources Office (DENR-PENRO)	Nagkakaisang Tribo ng Palawan (NATRIPAL)	Batak village council
Department of Environment and Natural Resources – Community Environmental and Natural Resources Office (DENR-CENRO)	Haribon-Palawan	Fishermen's organization
City Environmental and Natural Resources Office (City-ENRO)	Fundacion Santiago	Bataks
Bureau of Fisheries and Aquatic Resources-Fisheries Resource		Migrants

Management Program (BFAR-FRMP)		
Bureau of Fisheries and Aquatic Resources-Regional Training Center (BFAR-RTC Region 4)		
Department of Agrarian Reform (DAR)		
National Commission on Indigenous Peoples (NCIP)		
Kilusang Sagip Kalikasan (KSK)		
Provincial Planning Division Office (PPDO)		
Three village councils (San Rafael, Tanabag and Concepcion)		

Decades of centralized management of ENR has made ENRM decentralization a tough challenge, and that there are still prevailing attitudes that are manifested despite the shift to a decentralized ENRM two decades ago which limits the actual participation of the LGUs, NGOs and the local community in ENRM. To this day, the state control is still perceived as imperative for sustainable ENRM and that the responsibility to manage ENR cannot be left to the local community alone. On the other hand, the local communities perceive that they do not have the capacity to participate in ENRM as

they see themselves as having little knowledge and experience in such processes. Table 3.7 summarizes the characteristics of these stakeholders.

Table 3. 7 The actors involved in the development of rules for local ENRM within the context of the LPF project

Actors	Number	Preferences	Information level and learning capability	Selection Criteria	Resources
GOs	12 agencies	ENRM strategies and plans are communicated and discussed with the local community, wherein the GOs see themselves as teachers and that it is their duty to teach the local community on proper sustainable	Knowledge of laws and rules for ENRM	Environmental protection is the priority but politics may be a deciding factor.	Technical capacity to map areas and limited resources for information, dissemination

		ENRM and the local community itself has accepted its role as students in this situation.			
NGOs	5 organizations	Protection of ENR and better quality of life of the communities	Specific to the thrust of the organization	According to the thrust or agenda of each organization	Technical expertise and equipment for their specialization or domain
Local community	2 types	They strive for ENR protection and sustainability as well. However, when hunger comes, they do what they can to survive, even if it is illegal or contrary to their way of living.	They perceive themselves to have little or no knowledge, although their actions on their livelihoods and proximity (physical and cultural) reflect their knowledge of		Local knowledge and skills for ENRM

			ENRM.		
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DENR still oversees and control community-based forestry and watershed management projects, such as CBFM (Catacutan et al., 2001) and top-down policy-making with sweeping scope still occurs. With the LGC, policy promotion and law enforcement are now devolved to the LGUs. The devolved functions of the DENR to the LGUs in ENRM are limited to communal forest management and small-scale mining operations. Table 3.5 or the summary of rules of the action situation mirrors the elements of the action situation at the collective-choice level of ENRM in the three villages.

The IPRA law would have allowed the Bataks to self-govern their ancestral domain. However, since they have yet to get their CAD-T, they are now subject to the rules and regulations of their CBFM agreement with DENR. Table 3.8 is a summary of the action situation at the collective-choice level of the action arena.

Table 3. 8 The seven elements of the actions situation for policy design and implementation process for natural resource extraction and use

Element	
Positions	<ul style="list-style-type: none"> - Member in the LGU council - Member in the Local Development Council (village, city, provincial levels)
Actions	<ul style="list-style-type: none"> - Formulate, validate and negotiate new rules and policies for the environment and natural resources
Potential outcomes	<ul style="list-style-type: none"> - Formulation of new regulations and laws occur at different levels – at the national level (DENR), provincial level (PCSD, DENR-PENRO, provincial LGU), city level (city LGU, DENR-CENRO). - Orders or decrees coming from higher administrative levels can stop operations of projects and programs at lower levels such as

	<p>nationwide cancellation of CBFM agreements and suspension logging permits</p> <ul style="list-style-type: none"> - Rules formulated at lower administrative levels may be superseded by those from higher administrative levels. - Since lower level proposals, programs or projects require approval from the higher administrative levels, higher levels may not give its approval or delay the process.
Control	<ul style="list-style-type: none"> - DENR still controls ENRM management - LGUs participation in ENRM are limited to management of communal forests and small-scale mining operations - Environmental protection and law enforcement is the responsibility of the LGUs up to the village level - NGOs and communities participate in ENRM policy/rule formulation on a consultative basis only
Information	<ul style="list-style-type: none"> - Outcomes from the process are disseminated through various means such as special subjects in schools, radio broadcasts and newsprints. - Documentation of formal discussions are done and provided to the participants.
Cost and benefits	<ul style="list-style-type: none"> - Negative outcomes in terms of livelihood opportunities for the locals may reduce the decision-makers' credibility or reputation. In turn, those who are elected into positions, may get less votes come election time. Conversely, positive outcomes increase the election chances of someone running for re-election.

3.2.3. *Patterns and outcomes of interactions*

Ultimately, the Department of Environment and Natural Resources still controls much of the functions for management of the ENR in the Philippines. The devolved functions to the LGUs are limited to policy enforcement rather than localized formulation and decision making. The LGC itself is found to be deficient in its thrust for devolution of ENRM responsibilities to the LGUs (Catacutan et al., 2001; Hartanto et al., 2005). Although the lower levels of governance are able to implement its own rules, there have been cases wherein higher level laws or rules that could supersede the lower order rules were implemented top down, thus violating their own rules for policy design which requires consultation with the affected stakeholders. For example, in 1998 there was a city ordinance banning the practice of swidden farming without public consultation, as described by Novellino (2008). The ban had adverse effects on the Bataks who regularly perform swidden farming as part of their subsistence activities and, more importantly, as part of their culture as Bataks. This ban resulted to a drastic decrease of the Bataks' agricultural production with being able to utilize only their existing farm lands. They were no longer allowed to return and clear their old fallowed lands because, due to the long fallowing cycle, trees have regrown on these lands thus the land has been reclassified as forest. This effect was worsened with the combined impact of El Niño and La Niña which had a severe impact on their remaining farm lands. This event also highlights the reactionary response of policy-makers to sudden turn of events rather than actually having contingency plans set-up for such occurrences.

With the LGC, DENR line agency offices for local government units were created to handle the different functions of ENRM used to be held by the national government. Although this means that the basic services for ENRM has been brought closer to rural communities with the LGU offices located in the city, from the perspective of the communities, this may not be close enough. Most, if not all, of these LGU offices are located in the city proper where time, money and effort are needed in order for the stakeholders to interact with each other. Money in this case is very limited; thus visits from the LGU to the communities or vice-versa are limited as well. Although mobile phones are available, only a few of

the inhabitants own one, and the signal reception is spotty at best. Moreover, this “distance” is not only physical but also has a mental and social aspect. Individuals who hold a position in the government are regarded higher and thus a barrier or gap exists between that individual and the community. The higher position this individual holds, the larger is this gap. Also, with this position, community members have the perception that people working for these offices are more experienced and know more about ENRM than that of the community. So this perceived gap in knowledge and experience adds to this “distance.” Also, because of the sheer number of LGUs and NGOs involved, this has created a confusing communication network characterized by the overlapping of functions of the different local government units, including PCSD. Not only is the community lost in the communication game, but the GOs and NGOs as well. In actual discussions, such as in Provincial Steering Committee meetings, and informal conversations with the stakeholders, the GO and NGO representatives have expressed that sometimes they can’t even keep track of each other’s activities, projects or programs, which may have redundant or even conflicting themes.

Somewhat contrary to the concept of the LGC, the existence of PCSD adds another level of bureaucracy in the development and implementation of ENRM policies in Palawan as all rules, policies and ordinances within the province have to pass through this organization before it is made acceptable for implementation. If the drive of the LGU and PCSD are not congruent, this could cause delays in procedures, for example, in approval of programs or projects. An example of this is the case of the local PO, the San Rafael, Tanabag and Concepcion Multi-Purpose Cooperative (STCMPC), wherein it negotiated for some of the provisions of their CBFM agreement with DENR-CENRO (Devanadera et al., 2002). The process of negotiation took four years, which reached up to the national level of DENR, and a lot of resources were spent, such that some members of the STCMPC started using their own money and resources just for the process to move forward. The process reached the national level of DENR because some of the proposed changes have implications for all CBFM agreements in the Philippines. For example, the reduction of forest charges cannot be changed locally because this has been

standardized for all CBFM agreements throughout the country. This is problematic because this does not take into consideration the local conditions, such as the logistical costs for CBFM activities which vary from place to place. Moreover, PCSD did not want to endorse the proposals forwarded by the PO because it had a different agenda, which had delayed greatly the process. Devanadera et al. (2002) explains in detail what had transpired during this negotiation process.

When ECAN zones are delineated on the map, it undergoes a validation and consultation process with the local inhabitants and its implementation is gradual over the different villages of Palawan. Although the ECAN zones of the three villages under study were still to be validated with the communities, the experiences of other communities already under the ECAN zones were emerging, i.e. there were complaints. According to the accounts of one of the stakeholders from PCSD in the LPF project, several IP groups have been complaining about the designation of core zones within their ancestral domain such that they were having a hard time trying to survive whilst following the law. To PCSD's credit, they have heard the complaint and have started reviewing the provisions of ECAN to address the concerns of the IP. But this also highlights the weakness of public consultation and GOs taking a reactionary response to problems with the rules, as opposed to establishing real partnerships in collective policy-design and implementation which could minimize or avoid the traps illustrated above.

Sudden stoppage and reviews of laws and ENRM programs highlights the instability of tenurial instruments accorded to the community, which then could have adverse effects on the communities' livelihood activities. One example is the suspension of the logging permits all over the country in 2004 in reaction to the devastating floods in Aurora and Quezon provinces, such that the POs cannot harvest in their agro-forestry plantations. This was aggravated by the nationwide review of the CBFM agreements in 2005 (Villanueva and Gamutia, 2005) thereby stopping all activities related to the CBFM program. This meant that no member of the cooperative is able to utilize or reap any gains from his or her investments within the CBFM program. Since the IP rely on forest products for their subsistence, they are still able to obtain permit to gather NTFPs. For this reason, migrants began hiring the Bataks to

collect NTFPs for them; thus changing their roles of being gatherers to traders and essentially changing their social relationships and perceptions of each other. Based on my observations and discussions with the LGUs who assisted in the establishment of the CBFM for the migrant PO were trying their best to revive the CBFM agreement because they have already invested a lot of effort, time and resources in establishing and maintaining it that it would be a shame to lose everything in the end.

Concepts or perceptions of the real world also have an effect on the types of rules made which may not be compatible with the culture of the communities. For example, the concept of tenurial instruments, such as the CBFM agreement and CAD-T/CAL-T, is contrary to how the Bataks view their reality, such that it does not make sense to them (Novellino, 2000). Moreover, the limitations provided by the CBFM agreement do not seem to jive with their culture, such that it hampers the Bataks' activities related to practicing their traditions, subsistence and livelihood.

Mindsets, coupled with self-interest, attitudes and political favors or obligations, places politics into a very crucial role in ENRM, not only in the three villages, but for ENRM in the Philippines as a whole. This power play extends from the smallest unit of governance, i.e. the village level¹⁸, to the national level. People would jokingly say that national policies and laws are based on whoever is sitting on the head of DENR and his whims.

3.3. The challenges of local ENRM for the villages of San Rafael, Tanabag and Concepcion

The road towards real sustainable ENR and livelihood management is still a long and arduous process where stakeholders face many challenges ahead not only in the three villages under study, but also for the rest of the villages in the Philippines facing the same dilemmas. This is because the devolution of ENRM responsibilities had been limited and little improvement had been realized on how rules are

¹⁸ An example of this was during the LPF project wherein one of the village captains tried to prevent the implementation of the project by not agreeing to it and refusing to sign the memorandum of understanding because he does not believe it will be fruitful. Eventually, his decision was overruled by the desire of his community to proceed with the project, but only after almost one year of delay. This was decision was made through voting in a village assembly.

made and implemented on the ground. In this case study alone, many issues of policy-making have to be addressed and many factors have to be considered.

First, I look back to Ostrom's (2005) design principles which were the shared commonalities among long-enduring action arenas she and her colleagues at the Workshop in Political Theory uncovered in the tens of empirical studies they have reviewed. These principles were intended as a guide for analysts in designing policy recommendations, and they can be applied for this case study to compare this action arena with the long-enduring action arenas.

- 1) Boundaries are clearly defined not only of the common-pool resource (CPR) in question but also the users who exploit these resources.
- 2) Those who monitor the state of the resources and the behaviours of the users are partially accountable to the users or they are the users themselves.

In this case study, boundaries for CBFMs have been set for the users and the extents of the accessible areas for resource appropriation were delineated on paper. However, physical delineation, e.g. markers on the ground, was not easy to establish and maintain. Moreover, despite that they have been given the responsibility to police their areas of jurisdiction, i.e. their CBFM areas, they were not provided with the resources and equipment to perform such tasks. In the water, marine/fish sanctuaries in the municipal waters are marked with buoys. However, again, the inhabitants do not have the capacity to police the waters effectively. The inhabitants have had difficulties keeping out outsiders. Therefore, problem of free-riders occur frequently.

- 3) The benefits from resource appropriation are proportionally equivalent to the costs, taking into consideration the local conditions.

At the beginning of the LPF project, information about this aspect was not fully known. This was one of the aspects of the action arena which were eventually investigated during the ComMod process.

- 4) Those who are directly affected by the rules can participate in the making or modifying the rules.

The locals can only formulate rules that pertain to environmental protection within the extents of their villages. They can formulate plans for socio-economic projects at the level of the village council, through the Barangay (village) development councils but, because the resources of the villages are limited, they are unable to carry-out the plans and they have to ask outside their villages, e.g. the LGU, NGOs and philanthropists, for assistance. Moreover, these projects still need the approval of the LGUs and PCSD.

- 5) Graduated sanctions are administered to the rule violators depending on the severity of the violation by other users or the officials accountable for the users.

Graduated sanctions are available.

- 6) There is quick access to low-cost, local arenas to resolve conflicts between users or between users and officials.

Conflicts among the village inhabitants are dealt by the village council. When the conflicts are between inhabitants of different villages, the village councils of the villages to which the inhabitants belong come together and resolve the issue. When the conflict cannot be resolved locally, then these are brought to the local authorities / the police.

- 7) Resource users are able to formulate and implement local rules with little challenge or approval from higher authorities.

For localized strategies among a small number of villagers, they may probably be able to keep these strategies to themselves. However, efforts that require mobilization of the community, this is clearly not the case for the three villages. For one thing, any development action by the locals automatically requires the approval of the PCSD.

- 8) And for CPRs that are part of larger systems, all of the previously mentioned principles are organized in multiple layers of nested enterprises.

This aspect was not investigated. At the very least, based on observations, especially with the trading practices of the inhabitants, the CPRs within the extent of the village boundaries, it can be said they are part of a larger system.

Going beyond the design principles, there are other aspects that we should consider. First off, attention should be focused on the mindsets of the stakeholders, especially policy designers, regarding ENRM and livelihoods. Reality is that the environment is a shared space between living things, including humans; therefore its management should take into account the complex interactions between the environment and its inhabitants, such as human dependency on the natural resources. Laws focusing too much on environmental protection only undermine and disenfranchise the inhabitants, especially those who have few options for subsistence and livelihood. This could lead to disastrous results such as increase of illegal or unsustainable activities or disintegration of the culture of those whose lives are defined by the entirety of the land they live in.

The possible social implications or repercussions of rules should be taken into account as these rules may alter human behavior, which in turn may threaten social relationships within and among different types of stakeholders.

Communication among stakeholders should be made efficient especially when you consider proximity. Proximity in this sense is not only about physical distance but as well as the level of understanding and social relationships that exist between the actors. Navigating through lengthy and confusing communication networks involving many different types of stakeholders slows down or even halts the process of sustainable ENR and livelihood management.

Trust is a very important factor in the success of efforts for sustainable ENRM. Its breakdown will almost certainly lead to the dissolution of any effort or project. Therefore, building trust among stakeholders is a priority for any effort, agreement or project to sustain it and proper mechanisms must be set-up to ensure transparency in the processes involving multiple stakeholders.

Rules with sweeping scope also disenfranchise resource-dependent communities; therefore they should be robustly designed such that they can accommodate or can be adapted to local conditions with not being open to much abuse. For this to happen, real partnerships in the policy-making process should be established and not only by participation through consultation. Proper acknowledgement of indigenous knowledge and skills, such as those of the Bataks, is important because they may hold the key towards sustainable livelihood and ENRM.

Current laws or rules should be reviewed and they should take into account the perspectives of the stakeholders who will be most affected as they may not view the real world the same way. But at the same time, these reviews should not mean the complete stoppage of activities related to these rules because life goes on, whether or not these rules are in effect.

It is with the above described local conditions that the LPF project with Companion Modelling will try to address the issues of communication, specifically in the facilitation of communication through stakeholder forums where collective understanding or their reality, discussion and partnerships in

management are encouraged and promoted through participatory modelling. As demonstrated in this chapter, IAD was not used so much in predicting the interactions and outcomes of the action arena, as what is normally prescribed in IAD analysis. Instead, examples in the field were provided to highlight these variables. Moreover, it is in the implementation of the ComMod process, which will be described in the next chapter (Chapter 4), wherein some variables, such as the variables pertaining to the action arena, the interactions and outcomes, will be tackled in more detail. The ComMod exercise in this case, however, was not intended to predict the interactions and outcomes, but to collectively gain better understanding of the system and explore the possible futures that could arise from maintaining the status quo, as well as the possible interactions and outcomes when the variables of the action arena and its exogenous factors are varied. The results of the ComMod exercise will be presented in Chapter 5.

CHAPTER 4

FIELD METHODS: THE COMPANION MODELLING APPROACH IN PUERTO PRINCESA, PALAWAN

The ComMod process for Palawan aimed to collectively develop a model about the environment and natural resource management (ENRM) and livelihood activities of the stakeholders to better understand it, and later use this model to initiate and stimulate discussion among the stakeholders in its attempt to find a balance between ENRM and livelihood. This chapter on field methods presents the activities that were done for the ComMod process as well as the data gathered during these activities. The first section of this chapter presents how ComMod fits into the overall Levelling the Playing Field (LPF) project process and its data and results that were available. The second section presents the steps of ComMod in Palawan and the results for each of its activities, wherein each activity is described in terms of the objectives, participants, methods and tools used. Finally, this chapter is closed with some preliminary conclusions on the challenges in the execution of the ComMod approach in Palawan.

4.1. Pre-ComMod site conditions

4.1.1. Data availability

The ComMod process in Palawan began on the second LPF project year at a time when many of the data for the baseline studies were still being gathered, analyzed or the reports being written. However, reports of some studies completed on the first project year, made available through the LPF Philippines Country Report Year 1 (Devanadera et al., 2004), were used during the ComMod implementation. The household survey data, which contained demographic information, resources and resource use for livelihoods from interviews of 20% of the local population, were used to plan for the data gathering

activities of ComMod. ComMod also benefited from the initial capacity building activities or interventions of the project with the stakeholders. The result of the “*Visioning*” activity with the stakeholders, to which the goals of the stakeholders for their community in the next 25 years were identified and related to the LPF project goals, provided the possible directions of the ComMod process for Palawan. The visioning activity, aside from formally recognizing the communities’ goals, was also the venue to identify the problems and challenges that could hinder in the attainment of these goals. The problems were then prioritized and technical working groups (TWGs), composed of community members, were formed to address these problems.

Aside from those available from the LPF project, there were also data and information acquired from the stakeholders. The raw and unverified dataset of the three villages from the Community-Based Monitoring System (CBMS) of the Puerto Princesa City Planning Office, which were collected in 2003, contained demographic information on the three villages under study. The Comprehensive Land-Use Plan (CLUP) for 2001-2010 of the City of Puerto Princesa was also provided by the same office and contained basic information about the city as well as the strategies for management for the next 25 years. The land-use/land cover map and other basic topographic information of the study site were provided by the Palawan Council for Sustainable Development (PCSD). The land-use map was derived from LandSat TM satellite data of 1992. The topographic map was derived from National Mapping and Resource Information Authority 1:50,000 maps dated 1988. These data were used for the spatial representation of the MAS simulation model, which will be described later in this chapter.

4.1.2. Stakeholder identification and participation

The LPF project’s scope comprised three different landscapes which subsequently required a stakeholder analysis. The stakeholder identification and analysis baseline study of the LPF project, which also contained an institutional analysis using the 4Rs method (Reed et al., 2009), provided the list of the major stakeholders to be involved in the LPF project as well as the relationships among the

stakeholders. The main method used for the analysis was the *Who-Counts-Most* matrix, a tool that was originally intended to identify the main forest stakeholders by means of ranking the forest actors according to seven human dimensions for sustainable forest management, namely, proximity to forest, pre-existing rights, dependency, poverty, local knowledge, forest/Culture integration and power deficits (Colfer et al., 1999). Later on, this was made more precise using Venn Diagrams (Appendix B.1) prepared by representatives from the local community, government and non-government organizations. The major stakeholders, identified using the aforementioned method, are listed in Table 4.1 and it is within this set of LPF stakeholders that the ComMod approach was applied. In this case, aside from the LPF-identified stakeholders, at each key activity of the ComMod process, the participants were asked if there were any stakeholders that were missing from the process and should be invited, as well as asked those who were present that felt that they should not be part of the identified key stakeholders.

Table 4. 1 LPF Philippines project key stakeholders and their salient roles in ENRM and livelihood

Stakeholder	Roles
<i>Government Organizations</i>	
Philippine Council for Sustainable Development (PCSD)	Oversees all development projects in the province of Palawan; main government organization that implements the Strategic Environmental Plan (SEP) law for Palawan; enforces environmental laws
Puerto Princesa City Local Government Unit (PPC-LGU)	Enforce the national environmental laws and device ordinances (rules) for its protection
Department of Environment and Natural Resources – Provincial Environmental and	Enforce ENRM laws for forests and manage communal forests at the provincial level

Natural Resources Office (DENR-PENRO)	
Department of Environment and Natural Resources – Community Environmental and Natural Resources Office (DENR-CENRO)	Enforce ENRM laws for forests and manage communal forests at the community level, including community-based forest management (CBFM) areas
City Environmental and Natural Resources Office (City-ENRO)	Enforce ENRM laws for forests and manage communal forests at the city level
Bureau of Fisheries and Aquatic Resources-Fisheries Resource Management Program (BFAR-FRMP)	Enforce fisheries law and coastal resource management; build database on fisheries information
Bureau of Fisheries and Aquatic Resources-Regional Training Center (BFAR-RTC Region 4)	Provide trainings and technologies for fisheries and aquatic related livelihood activities
Department of Agrarian Reform (DAR)	Main implementing agency for the comprehensive agrarian reform program of the national government; agricultural land distribution
National Commission on Indigenous Peoples (NCIP)	Main implementing agency of the Indigenous Peoples Rights Act; assists indigenous groups in acquiring their certificate of ancestral domain title (CAD-T) and certificate of ancestral land title (CAL-T)
Kilusang Sagip Kalikasan (KSK)	Environmental watchdog of the Palawan province; arrests

	law violators related to the environment
Provincial Planning Division Office (PPDO)	Planning office for development at the provincial level; provides capacity-building trainings related to planning
Three village councils (San Rafael, Tanabag and Concepcion)	Assist the villages in socio-economic projects or activities; enforce environmental laws; may arrest law violators
<i>Non-Government Organizations</i>	
Budyong Rural Development Foundation Incorporated (BRDFI)	Provides livelihood capacity building and assistance to communities
Environmental Legal Assistance Center (ELAC)	Provide legal assistance to communities in relation to environmental laws; disseminates environmental laws to the communities; assists in arrests of law violators
Nagkakaisang Tribo ng Palawan (NATRIPAL)	Advocacy on the rights and assistance in livelihood for the Indigenous Peoples (IPs)
Haribon-Palawan	Provide communities with capacity-building trainings; monitors illegal activities; focused on the protection of coastal resources and IPs
Fundacion Santiago	Provides financial assistance to communities through lending; provides training for fund management
<i>Local Community</i>	

San Rafael, Tanabag, Concepcion Multi-Purpose Cooperative (STCMPC)	Community cooperative that is tasked to manage its CBFM area, including its rehabilitation and resource extraction
Samahan sa Kaunlaran ng Batak sa Tina Organization (SKBTO)	Community group of the Bataks tasked to manage its CBFM area, including its rehabilitation and resource extraction
Batak village council	Although this group has no political powers, its function is similar to the village councils, at the level of the Batak community
Fishermen's organization	Manage and protect the coastal/fisheries areas
Bataks	Resource users and environmental protectors
Migrants	Resource users and environmental protectors

Although all types of LPF stakeholders identified above were able to participate in the ComMod process, in most occasions, they were not involved at the same time. It was only during the last activities of the process that all types of stakeholders were able to sit down together and involved themselves in discussion about livelihood and ENRM. Three representatives from local government offices (Table 4.2) participated in the implementation of the approach in the field. Depending upon the situation, they acted as resource persons, facilitators or assistants during different activities of the ComMod process. These representatives are already known by the community as they have been involved in past activities and projects involving the communities, and as such, have built rapport with the community members. Two local forums, whose creations were initiated and facilitated by the LPF

project, were also identified to participate in the ComMod process, namely, the Provincial Steering Committee (PrSC) and the technical working groups (TWGs). The PrSC, composed of decision-makers from government and non-government organizations and community members (members are listed in Appendix B.2) was embodied to be one of the forums to which the stakeholders could discuss and negotiate about ENRM within the LPF project, including ComMod. It was also tasked to monitor, evaluate and improve the activities started within the framework of the project, especially after the project ends. The TWGs, composed of community members, were tasked to develop livelihood programs for the communities. Aside from participating in the ComMod activities, the TWGs were also tapped to assist with the logistics for LPF and ComMod, such as inviting participants and preparing the workshop locations or the food for the participants in the activities. The linkages between the LGUs, NGOs, and local community with the PrSC and TWG are described in Figure 4.1. The lines connecting the different stakeholders were envisioned to be bi-directional paths of communication. The involvement of these particular stakeholders in the ComMod process may have had implications in terms of influence on the stakeholders, and consequently may have impacted the process, and will be discussed in the later chapters.

Table 4. 2 Representative stakeholders tapped to assist in the ComMod implementation

Name	Affiliation	Position
Mr. T	Puerto Princesa City Planning Office	City Planning officer
Mr. C	Department of Environment and Natural Resources-Provincial Environment and Natural Resources Office (Region IV)	Provincial CBFM coordinator
Mr. P	Philippine Council for Sustainable Development	Project Development officer

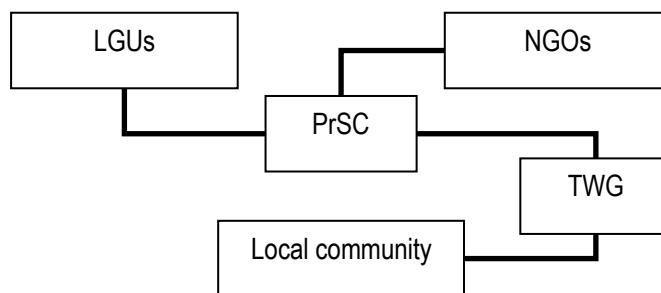


Figure 4. 1 The linkages among the different stakeholders vis-à-vis the LPF-initiated forums

4.2. Companion modelling process in Puerto Princesa, Palawan

Each ComMod process is unique, with each process being influenced by local situations. In the case of ComMod in Palawan, the process flow evolved over time, which began with a rough conceptualization (Appendix B.4) to the final process flow illustrated in Figure 4.2. This evolution was brought about by the results of discussions with the research team and the stakeholders during the implementation of the approach.

A ComMod team was formed to plan and execute the activities for ComMod composed of the principal investigator, the head of the LPF-Philippines research team, the LPF-Philippines field assistant, and the three representative stakeholders. In preparation for activities requiring coordination within the ComMod team, such as conducting a role playing game (RPG), the team practiced the activity to familiarize themselves with the roles that were needed to be played. This allowed the team members to be flexible in the roles they played and exchanged roles whenever possible, which was especially important when exhaustion sets in on some of the team members. This was expected as some activities, such as Focus Group Discussions (FGDs) and RPG sessions, lasted for six hours a day repeated over several consecutive days. For each of the ComMod activities involving the stakeholders, invitations written in the local language (sample in Appendix B.3) were sent out to the participants, which included the objectives and the target participants of the said activity. In the case of the indigenous people, with most of them being unable to read, they were informed directly by the LPF-Philippines field assistant or by a TWG member. If an activity was to be conducted with the local

community, another letter was sent to the village leaders as courtesy, as well as an invitation for them if they wish to observe the said activity. This was done to ensure transparency of the process with the stakeholders. After each activity, the ComMod team would have a debriefing session to evaluate the day's activities and make logistical adjustments when necessary. When important decisions cannot be made immediately other LPF researchers and scientists were consulted. On scheduling, whenever there was conflict with other LPF activities, final decisions were made by the LPF-Philippines national coordinator. Below are the detailed descriptions of each step of the ComMod process as described in Figure 4.2, including the outcomes for each of the activities:

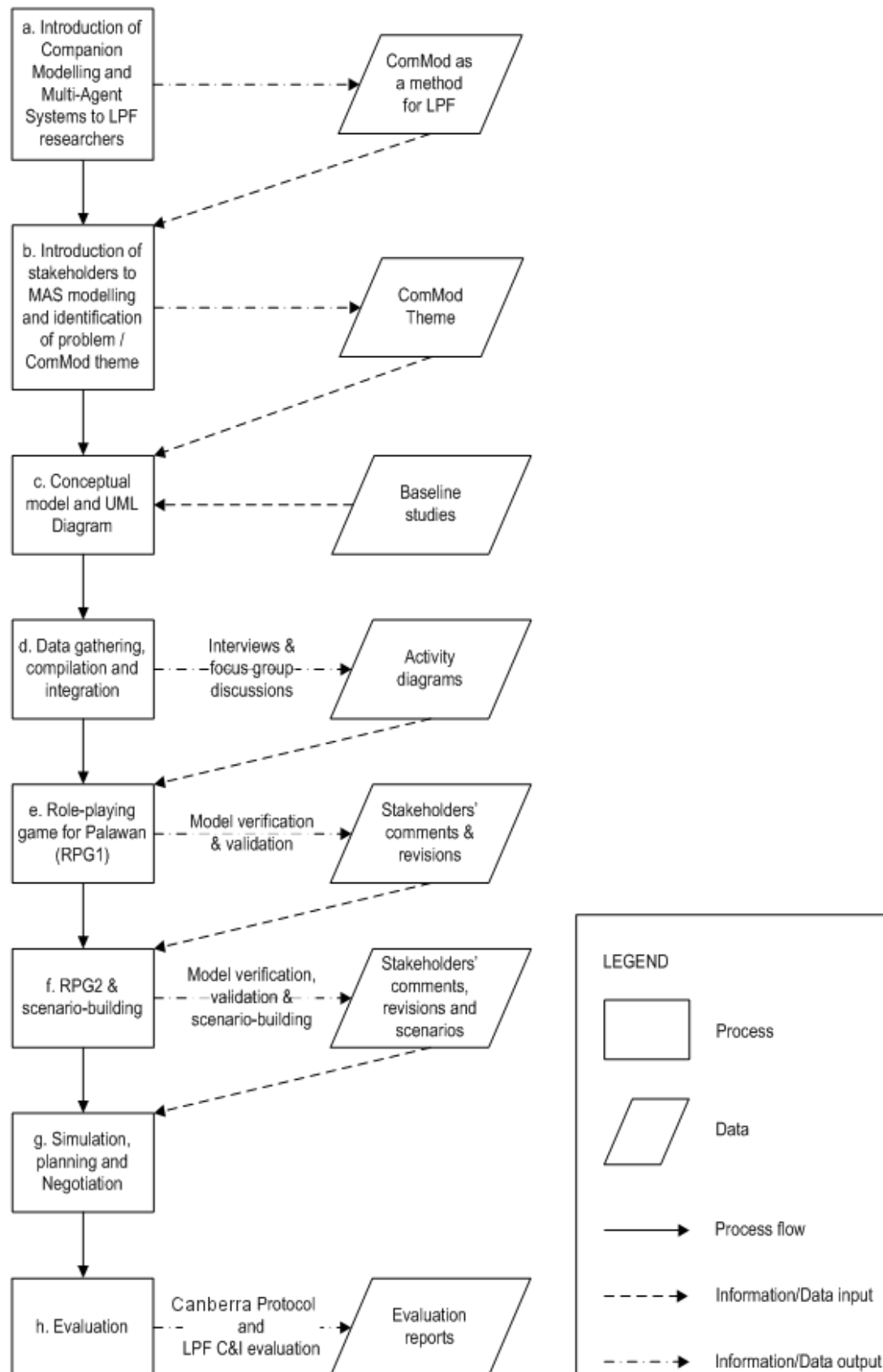


Figure 4. 2 ComMod implementation in Palawan

4.2.1. *Introduction of Companion Modelling and Multi-Agent Systems and training on Facilitation for LPF researchers*

The ComMod approach, initially, had not been identified as one of the methods to be used in the LPF project. The project leader, Dr. Philippe Guizol, was the only one familiar with the method. Thus, from December 13 to 22, 2004, a ComMod training workshop was organized by Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) and Center for International Forestry Research (CIFOR) scientists to introduce the approach to the LPF teams from Indonesia, Malaysia and the Philippines and familiarize themselves to its principles, objectives, capabilities and limitations. This workshop was also the forum in which the LPF researchers discussed whether or not implementing the approach would contribute towards attaining the goals of each of the project sites. Together with the LPF teams were some stakeholders from the study sites who were invited as part of the capacity-building efforts of the project. In the Philippines, as mentioned in the preceding section, three stakeholders coming from different government agencies participated in the training as well as in deciding whether or not it would be fruitful to implement the ComMod approach in the Philippines study area. My role in this training was of two aspects: first, as the potential principal investigator for the implementation of the ComMod approach in the Philippines study site wherein, together with the LPF Philippines team, we conceptualized the implementation of the ComMod approach in Palawan; and, second, as a resource person on the topic of developing role-playing games (RPGs) in the Asian region, which was based on my previous experience in another research project involving MAS and ComMod (Magcale-Macandog et al., 2005).

An important tool introduced during this workshop was a role-playing game (RPG) called *CherIng*¹⁹, a generic RPG developed by Dr. Michel Etienne and Christophe Le Page²⁰. In the *CherIng* game, players are to gather a generic resource, called *Ing*, from a plot in the computer/digital game

¹⁹ *CherIng* is also a play on the word “sharing.”

²⁰ Michel Etienne is an agronomist and plant ecologist from the Institut national de la recherche agronomique (INRA) in Avignon, France, while Christophe Le Page is a modeler from the Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) in Montpellier, France.

board, as shown in Figure 4.3a. The colors in the game board represent the amount of resources present in a certain plot with white having no resource and dark green having the most *Ing*. The colors of the plots change when the amounts of *Ing* in the plots change. The players are to assume that *Ing* is essential to their lives. There is also a game master who explains the rules of the game and controls the rounds. For each round of the game, a player is given a short time to choose a plot in the game board while taking into consideration that others are doing the same thing. Because the players would be making their choices all at the same time, none of them will know what the others have chosen. Their choices are then marked on the game board and the collection of choices is shown briefly for everyone to see. After which, the pay-offs, or the amount of *Ing* they got in their plot of choice, are computed, as well as the effect of the extraction of *Ing* on the environment or the game board. An example of the result of extraction is shown in Figure 4.3b. The resulting board is then shown to the players, which will then be used in the following round. An entire game is played with five rounds. After a game, the rules of the game are changed, more specifically, the rules of interaction between players. This change in rules represents a different scenario of the game. In total, there are four different scenarios that are played with the stakeholders, which are the following:

- 1) The players are not allowed to interact with the other players. Their choices would be theirs alone.
- 2) Before the start of the game, the players are grouped randomly and each group is given time to discuss within their respective groups a group strategy in terms of how or where they will extract the *Ing*, but they are not obligated or forced to do so. Also, a group is not allowed to discuss with players outside their group. It is only before the actual game starts that the groups are allowed to discuss with each other, i.e., during the game, no more interaction is allowed between any of the players within a group.
- 3) The same groups are retained as in the second scenario. Before the game, the groups are given some time to discuss among the members of the group, in which they may discuss a new group

strategy. However, during this time period, the groups may also discuss with other groups about their strategy, if they have any, and they may establish agreements with other groups. Again, they are not forced to do it.

- 4) The fourth scenario has the same rules as the third scenario. However, a moratorium in the extraction of *Ing* would be imposed during the game by the game master. The groups are now made to discuss together how they would meet the requirements of the moratorium, as well as the punishment for violations.

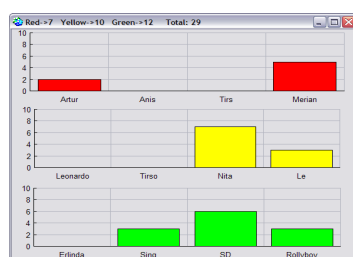
After each game, the results of the game are shown to the players, i.e. the final state of the environment or the game board (Figure 4.3b), the total amount of *Ing* each player got after five rounds (Figure 4.3c), and total amount of *Ing* in the game board at every round (Figure 4.3d). After all the scenarios have been played, all the results from the different scenarios are compiled and discussed together.



(a) game board (and initial state) of Chering game



(b) example of game board after extraction



(c) total *Ing* of each player



(d) total *Ing* of game board per round

Figure 4. 3 Chering game visualization tools

The *CherIn* game, with its four scenarios, was played with the workshop participants. After the discussions, the different LPF country teams were asked of its relevance, if there was any, to their study sites. Although it was not obligatory, the Philippine research team found it to be relevant to its case and planned to include it in the Palawan ComMod process.

After the ComMod training, the LPF researchers participated in another capacity-building activity – a training on the art of multi-stakeholder facilitation, which was conducted in Kuala Lumpur, Malaysia from January 31 to February 5, 2005. In this training, the LPF researchers were taught about the principles and tools for effective multi-stakeholder facilitation, which would be very important during the intervention activities of the project. One of the notable tools presented in the training is the Process Design (sample in Appendix B.5) which serves as a guide for the facilitator and the participants in the organization and execution of an activity, for example, a workshop. This tool was adopted in the ComMod process wherein the planning for each workshop began with making a process design in order to determine the preparations needed to execute the activity. Then, at the beginning of each workshop, this was presented to the participants to provide information on the objectives of the workshop, the activities and the timetable. During the workshop, the process design was reviewed from time to time as a reminder.

Although it was already decided that the LPF-Philippines research team would try to implement the ComMod approach with the stakeholders, there was still a question of whether or not the stakeholders themselves would understand, accept and support the modelling process. To answer this question, an introductory workshop for MAS and Companion Modelling for the Palawan stakeholders was organized to determine their acceptance of and commitment to the modelling process and ensure its smooth implementation.

4.2.2. *Introduction of Companion Modelling and Multi-Agent Systems to the stakeholders and identification of the ComMod theme*

Companion modelling, being a participatory approach, should promote an environment in which the stakeholders feel that they are on equal footing, with each person's opinion is of equal importance, transparent and they have a sense of control over the process. To this end, it is important that the stakeholders are able to decide whether or not to go through the ComMod process. However, before they can make this decision, they should have an idea of what is ComMod. Thus, in the case of the LPF project, the key LPF stakeholders were invited for a workshop to introduce the methods and tools in this participatory modelling exercise, clarify their roles in this process, decide whether or not to implement the approach, and then identify the aspects of reality the model should depict.

The introductory workshop was conducted as four sessions of a day-long activity, with each session having a specific target group (listed in Table 4.3). There is an overlap in representation of stakeholders in the workshop sessions so that each type of stakeholder would be able to experience an activity with another type of stakeholder. For example, the session for the Provincial Steering Committee (PrSC) has representation from both the local community, i.e. TWG members, and from the local government agencies. Representatives for the Batak community were initially invited to participate in the session with the three villages, but, due to miscommunication, they were absent. So another session was organized for the Bataks later in the year at their community site called Sitio Kalakwasan. In the session with the Bataks, due to inclement weather and not having regular electricity at their site, their introduction to MAS only involved playing and discussing the results of the *Cherlng* game, as well as its significance to them, if there was any.

Table 4. 3 Number of participants in the introductory workshop

Group/Session	No. of participants	Day (2005)	Location
PrSC	12	March 29	Puerto Princesa City (PPC) proper
GOs and NGOs	15	March 30	PPC proper
Community	20	April 1	San Rafael, PPC
Bataks	12	August 3	Sitio Kalakwasan in Tanabag, PPC

To avoid confusing the stakeholders with too many terms, the ComMod process was introduced and referred to as the MAS modelling process with the explanation that the process of building and using the model would be together with the stakeholders. This process was briefly explained to the participants as a process that would involve activities such as data-gathering through interviews or focus group discussions, model validation through role-playing games, scenario-building and discussion of the results through simulation and then negotiating for new management or strategies for ENRM together with all the types of stakeholders.

The introductory workshop, the process design of which is shown in Appendix B.4a, was organized with having a slide presentation about MAS (sample slides in Appendix B.6), demonstration of a sample MAS computer simulation (Campo, 2005), as well as playing an RPG called *CherIng* in the morning. In the afternoon, a debriefing on the *CherIng* game was conducted to which the participants were asked the following questions:

- 1) How can MAS modeling be of help to you and/or your organization?
- 2) What are the lessons you have learned from this workshop?
- 3) Would you like to build a MAS model for your community?

4) What would you like to see in the model?

Except for one, the rest of the participants agreed that it would be beneficial for them to conduct a participatory modelling exercise among the stakeholders because they believed that they would learn a great deal from the model and the process. It was the village head of Tanabag who disagreed to the concept of the process because he thought it to be only theoretical and what the community needed were actions, i.e. pre-defined livelihood programs and infrastructures. However, he said that if his constituents deem it to be beneficial to the village then he has to agree with it. His disinterest in the process showed in his lack of participation in any of the succeeding ComMod activities despite all invitations and sent members of his village council in his stead. Following the acceptance and expression of support from the rest of the stakeholders, the workshop proceeded with the question on what they would like to see in the model. The LPF researchers also had some ideas that they would like to see in the model and were suggested to the stakeholders, such as the effect of the Environmentally-Critical Areas Network (ECAN) zoning. It was important during this time that the stakeholders were made aware of the limitations of the modelling process and the capabilities of the model in consideration of the scope of the reality to be modelled, data availability, and the overall goal of the modelling exercise from the point of view of not only of the stakeholders, but also that of the LPF project to obtain realistic expectations. In summary, based on the ComMod team's interpretation, the stakeholders wanted to see the model show the interactions (effects and feedbacks) of their livelihoods and the rules governing management and use, such as ECAN, on their natural resources as shown in Figure 4.4. This was to be the theme of the first ComMod cycle in Puerto Princesa, Palawan.

After the approval of the stakeholders was given, and the theme of the modelling process had been identified, the process of building the MAS model for Palawan was begun. The MAS model for Puerto Princesa was conceptualized based on the identified ComMod theme and this was realized through the use of Unified Modelling Language (UML) diagrams.

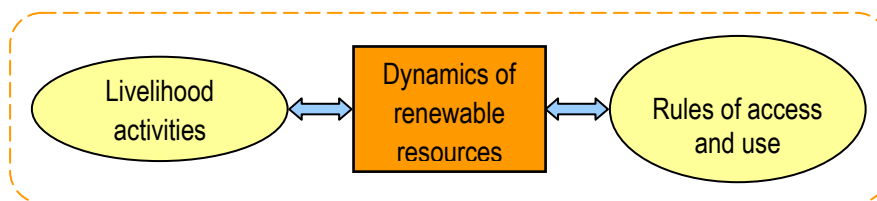


Figure 4. 4 First ComMod theme in Puerto Princesa, Palawan

4.2.3. *Conceptual model and Unified Modelling Language diagrams*

One of the initial steps in the conceptualization of the MAS model was to determine the self-perception of the members of the local community with regards to the individual's livelihood practices and his or her relationship with the natural resources. After the introductory workshop, 29 local community members coming from the three villages, including four Bataks, were individually interviewed. The interviews focused on the community's relationship with its environment and an overview of the types of livelihoods, including their practices and the associated natural resources. It was apparent that they viewed themselves as natural resource-users, able to utilize any of the natural resources that are available to them in the three landscapes. Sixteen livelihood activities were identified that had direct impact on the natural resources, either positively or negatively. They do not view themselves as having the typical notion of a major livelihood, e.g. farming or fishing only, and that they are not dependent on one particular natural resource. Most of them practice combinations of livelihood activities, although usually done at a smaller scale, throughout the year depending on several factors, such as weather, season and financial situation. They view this practice of having a combination of small livelihood activities throughout the year, which they refer to as "sidelines," as their major livelihood activity. This information was important as it provided an insight as to how the local community and their livelihoods would be conceptualized in the MAS model. The baseline studies of the LPF project (Devanadera et al., 2004; Campo et al., 2005) were reviewed, in particular the stakeholder identification and analysis, the socio-economic survey and analysis, as well as the results of the "Visioning" exercise of the

stakeholders, wherein the vision and mission of all the stakeholders were identified through the facilitation of the LPF Philippines research team. This review was done to determine the roles played by the different stakeholders in natural resource management and the livelihood activities practiced by the local community and the linkages among the key stakeholders. Moreover, this was done to keep the objectives of the modelling process in line with the goals and expectations of the stakeholders and that of the LPF project.

Figure 4. 5 Class diagram of the ENRM system for the villages of San Rafael, Tanabag and Concepcion

Synthesizing the information from the stakeholder analysis and the information gathered from the individual interviews with the community, an initial conceptual model of the ENRM system for the three villages was constructed. Following the framework for building UML diagrams, a class diagram that depicted the main entities in the ENRM arena and their linkages (as shown in Figure 4.5) was constructed. From the diagram, three major entities were identified: the **Villager** – a general representation a member of the local community, the **MediatingOrganizations** (or mediating organization) – representing the various GOs and NGOs assisting the local community in their livelihood activities as well as ensuring sustainable management of natural resources, and the basic unit of space, the **Cell**. The **Villager** has attributes such as income and gender. There are two kinds or subclasses of **Villager**, i.e. the subclass **Migrant** and the subclass **IP** (indigenous person). The **Migrant** subclass, aside from actions and operations it inherits from the general class **Villager**, such as *raiseAnimals* and *collectNTFP*, has a set of operations unique to its own such as *farmSeaweed*, *growOrnamentals*, *collectMilkfishFry*, etc., while the **IP** subclass only has operations inherited from the general class **Villager**. Groups or organizations in the local community are represented in the MAS model as classes of groups composed of instances of the class **Villager**. An instance of the **Villager** class may belong to a group of **HouseHold**, **Village**, **VillageCouncil**, and/or **PO** (people's organization). The **Cell**, the building block of the landscape, is covered by the class **Cover**, i.e. the natural resource or land use that is present in the **Cell**. The class **Cover** has several subclasses depending on the kind of resource, either it is renewable, as in the case of **WaterWithVegetation** and **LandWithVegetation**, or not as in the case of **WaterWithoutVegetation** and **LandWithoutVegetation**. Part of the management of the landscape in Puerto Princesa involves identifying or delineating space into management units, represented by the class **ManagementUnit**. The **ManagementUnit** has several subclasses and an instance of the class **Cell** may belong to none or to several management unit subclasses simultaneously. Government organizations, represented by the class **GO**, and non-government organizations, or the class **NGO**, belong to the superclass

Mediating Organizations (or mediating organizations). In principle, the management of the natural resources in the three villages is done with the cooperation and coordination amongst the local community, i.e. through the village councils and the POs, the GOs and the NGOs. The class **Weather** is a global entity that exists and affects the system. Not all information about the elements in Figure 4.5 is known, however. So, after building the initial conceptual MAS model, i.e. the partially fulfilled class diagram, it was important to determine the possible values of the attributes of the different entities. Moreover, since the class diagram describes the static aspect of the system, it was also equally important to describe its dynamics, i.e. the actions and interactions among the entities in the model, and its sequence. Additional field data gathering activities were needed to fill in the gaps in the description of the model.

4.2.4. *Data gathering, compilation and integration*

The data gathering activity for building the MAS model was to supplement the data and information that have already been collected and synthesized during the baseline studies of the LPF project. In order to describe the entities of the MAS model it is important to determine the attributes of the entities (static description) as well as their operations (dynamic description). For social (or human) agents, their decision-making processes should be identified as well. In the case of the three villages, the initial assumption was that the locals use the same set of livelihood activities and that they share the natural resources across the three landscapes within the boundaries of the villages. Based on the interview on self-perception, however, there were differences as well as peculiarities in the practice of a certain livelihood activity across the different landscapes among the three villages, such as the time and frequency of practice and the number of individuals who are engaged in the livelihood activity in each village. After discussions with other LPF researchers, the focus group discussion (FGD), a rapid, cost effective data-gathering method in which a carefully selected group of respondents discuss a specific subject (Kumar, 1987), was chosen to solicit the information needed in the MAS model.

The FGD was conducted in order to determine which of the livelihood activities present in the site were perceived to be widely practiced and have significant impact on the state of the natural resources, who performs these livelihood activities, when are these activities done, where these activities are carried out and what are the steps to execute such activities. A set of FGD guide questions (listed in Appendix B.7) was prepared and reviewed with the ComMod team and ten FGD sessions were conducted for the local community, wherein three FGD sessions were conducted for each village and one session for the Batak community (summarized in Table 4.4). The three sessions for each village, except for Concepcion village and the Bataks, correspond to the three landscapes in the study site, such that:

- The first session corresponds to locals who were engaged in livelihood activities in the uplands alone and those who are engaged in both the upland and lowland livelihoods.
- The second session corresponds to locals who were engaged in livelihood activities in the lowlands alone and those who were engaged in livelihood activities in both the lowland and coastal areas.
- The third sessions corresponds to locals who were engaged in livelihood activities in the coastal areas alone, in both coastal and uplands, and in all three landscapes.

Table 4. 4 Livelihood activities discussed per FGD session

Date	Barangay	Livelihood activities discussed
2 May 2005 AM	San Rafael	Swidden rice cultivation in the uplands and rice paddy cultivation in the lowlands
2 May 2005 PM	San Rafael	Seaweed farming
3 May 2005 AM	San Rafael	Fishing and milkfish fry gathering in the coastal areas

4 May 2005 AM	Tanabag	Swidden rice cultivation and charcoal-making in the uplands
4 May 2005 PM	Tanabag	Coconut shingles-making and pig-raising in the lowlands
5 May 2005 AM	Tanabag	Copra-making in the lowlands; hunting and gathering Almaciga resin in the uplands
5 August 2005 AM	Concepcion	Copra-making, coconut shingles making, vinegar making, animal raising (including pig) and gardening (vegetable and ornamental plants) all in the lowlands
5 August 2005 PM	Concepcion	Swidden rice cultivation, and honey, rattan and Almaciga resin collection in the uplands
7 August 2005 AM	Concepcion	Fishing (including octopus and squid, gathering of shells and crabs, fish pen operation in the coastal areas
4 August 2005 AM	Sitio Kalakwasan in Tanabag	Honey, rattan and Almaciga resin collection in the uplands

This division of participants was done to determine the factors affecting the decision-making process of the villagers in terms of how they prioritize, choose or change livelihood activities across landscapes. However, this technique of dividing the participants proved to be difficult in terms of finding the appropriate participants for a session and there was too much heterogeneity of participants within a session. Therefore, with the FGD sessions for Concepcion, which transpired at a later time due to the LPF regional meeting that was held in Puerto Princesa in May, 2005, the participants were limited to eight and were divided to lowland, upland and coastal areas accordingly. Also, a day was set aside for

individual interviews to clarify some of the data and information gathered from the previous FGD sessions.

The duration for each session was about four hours. At the beginning of each session, the objectives of the LPF project, the ComMod process and the FGD were presented to the participants. They were given the opportunity to ask questions or clarifications before the session starts. During the FGD proper, they were asked to identify the livelihood activities present in the landscape (depending on the session) and later rank these livelihood activities according to the frequency of practice, i.e. from the most to the least practiced. The group would discuss each of the livelihood activities in the list beginning from the top then going down the list until the last has been discussed or the planned duration of the activity runs out. In the latter case, the participants were given the choice whether to continue or not. Data on the *When*, *Where*, and *How* of an activity were detailed using seasonal calendars and maps. Included in the discussions are the decision-making processes involved in carrying out livelihood activities. For each livelihood activity, the participants were asked about the factors which they consider when making decisions as well as how are these factors prioritized. They were also asked why they have chosen or why would they choose a particular livelihood activity over another especially when changing livelihood activities. From the discussions in the FGDs, UML activity diagrams were constructed by the ComMod team for each of the livelihood activity that was discussed (Appendix B.8).

Based on the discussion during FGDs, the following were inferred about the livelihood practices of the local community:

- 1) Livelihood choices were usually based on the seasons. Also, an individual was more likely to be practicing more than one livelihood activity throughout the year. Aside from seasons, factors leading to the choice of a new livelihood were the required capital (the lower, the better), the speed of getting the returns (the faster, the better) and the amount of returns (the higher, the

better). There were also factors that pertain to social relationships such as those inherited from parents or relatives and those practiced by friends.

- 2) Rice cultivation, either lowland or upland, and fishing were viewed to be for subsistence or food security. However, those engaged in fishing were more likely to sell their catch if given the opportunity and it is usually within the local community only. Rice farmers would only sell their harvest, albeit within the community and nearby villages, if there was an immediate need for money.
- 3) Activities for the purpose of acquiring income included copra production, roof shingles-making, nito-weaving, ornamental and flower plants gardening, charcoal production, milkfish fry-catching and animal-raising (mostly pigs, although some include chickens, cows and goats). Most of these activities were done with other members of the household. The products from these livelihood activities were sold to traders usually coming from within the community themselves who, in turn, sold most of the products at the city proper.
- 4) For the migrants, gathering non-timber forest products (NTFPs) was viewed to be a reliable source of income because the forest is perceived to be always present and the NTFPs available. However, because this livelihood is physically demanding, its practice was limited only to the able-bodied men of the community. Furthermore, the current restrictions or quotas in gathering NTFPs limit the potential returns of the activity. NTFPs were sold to traders who usually belong within the community themselves, which are then sold at the city proper.

A similar activity was also carried out with GOs and NGOs, referred to in the model as mediating organizations, wherein individual interviews, lasting for about one to one and a half hours, were conducted with one or two resource persons from each of the major stakeholders. This set of interviews focused on the organizations' activities on ENRM and the steps on how these are accomplished. Also, this activity was partly a validation of the institutional analysis and stakeholder

analysis of the LPF project. The guide questions and the highlights of the interviews are provided in Appendix B.9. From the interviews, it was gathered that:

- 1) Despite being identified as a major stakeholder by the LPF project, NATRIPAL refused the idea that it was a major stakeholder in the study site, with it having been involved in only two activities in the area. Also, the organization had been avoiding participation in any of the LPF activities because it thought that it had no useful information to provide to the project. Despite this, the organization was still invited in the succeeding activities of the LPF project, including that of the ComMod activities.
- 2) Most of the community intervention activities in the past of these mediating organizations, such as livelihood projects and technical trainings, were developed based on the requests of the local communities. However, due to budget constraints, these organizations were not able to fully monitor the results of these activities.

Overall, the data gathering activity with the stakeholders allowed the clarification and detailing of the model interactions and entity operations and attributes, which allowed the construction of UML activity diagrams for each of the major livelihoods identified in the FGDs.

4.2.5. Role-playing game for Palawan

The first role playing game workshop, the process design of which is shown in Appendix B.5b, and involving the local community, Bataks included, was an activity to validate or check if the data and information about the livelihoods had been properly incorporated and articulated into the model, such that the RPG resembles or mirrors the community's reality in terms of decision-making for livelihoods, as well as if the outcomes of the game were realistic. The role-playing game for Palawan, referred to as RPG1, was focused on the livelihood activities of the stakeholders and its effects on the natural resources, as illustrated within the red box in Figure 4.6. The game mechanics of RPG1 were inspired

by the *Cherlng* game such that they both focused on the utilization of resources in a shared environment or space amidst changing rules on resource access and use. The perceived advantage of this approach was that players who have played the *Cherlng* game in the past would be able to learn the game quickly; thus facilitating the game play. Below are the game details of RPG1.

Differences between RPG1 and the *CherIng* game

The *CherIng* game and RPG1 have the following differences:

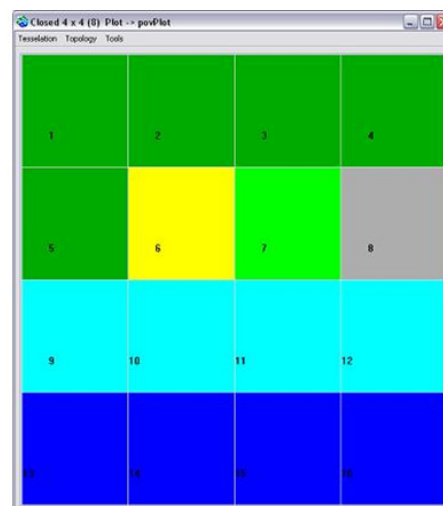
- 1) There are more types of resources present in RPG1, which were also associated to different landscapes and livelihood activities.
- 2) The extraction of resources for different livelihood activities lead to varying monetary costs and pay-offs in RPG1.
- 3) The concept of season is introduced in RPG1 with time being represented as months of the year in the game. An entire game itself is played for a total of 12 steps or the equivalent of one year.
- 4) There was a concrete goal in the game, i.e. to earn at least the monthly living expenses required for a household of 6 members. This objective was decided upon by the game designer such that it would be similar to the concept used in the *CherIng* game wherein the resource *Ing* was said to be essential to a player's survival.

Game Materials

- 1) Game board – the game board (Figure 4.7a) is made of paper with 16 squares or plots. Each plot is numbered from 1 to 16. Each plot has a land type, with corresponding colors, and resources, with corresponding livelihood activities. The livelihood activities are shown as pictures on the plot, which also appears on the livelihood cards. The game board also has a corresponding representation in the computer RPG model programmed in the CORMAS platform (Figure 4.7b).



(a)



(b)

Figure 4. 7 Game Board: (a) physical game board; (b) virtual game board

- 2) Income card (Figure 4.8) – the income card, given to each player, contains the plot and livelihood choices of each player for every step. This is also where the income for the livelihood of each step is written. The income card contains the 12 months of the year, corresponding to the 12 steps of the game. At the end of the game, the total income of each player is computed and written in the game card for the players to see.

Name		Village / Organization			
Month	Activity & Location	Gross Income	Livelihood Expenses	Net Income	Net income minus monthly household expenses
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					
TOTAL					

Figure 4. 8 Income Card

- 3) Livelihood card (Figure 4.9a, translated from the local language, Filipino; currency in Philippine Pesos) – each player, when choosing a livelihood, also chooses the corresponding card. This card contains the initial and maintaining capital of a livelihood activity. This serves as a reminder for the player the livelihood that he or she is engaged in. Also, if the player wishes to go back to a livelihood he or she has done before, there is no need to pay the initial capital again. To help the player, a picture corresponding to the livelihood is printed on the card.
- 4) Crop/livestock card (Figure 4.9b) - some livelihood activities take some time before income is received, i.e. copra-making, farming, and livestock-raising. This card is used as a counter for the players to keep track of the time they will receive income from the above-mentioned livelihood activities.
- 5) Land card (Figure 4.9c) – this card is used to keep track of farm lands that have been rented out to someone else. Each land card is half a hectare. A player who has this card may go into farming. He or she may lease his land to someone else. In this case the players can negotiate for the price of the rent. The land owner is written on the land card, and the tenant's name, if necessary.


<p>Fishing</p> <p>Initial capital: Php 15,900</p> <p>Additional expenses: Php 1,050.00</p> 	<p>Type: _____</p> <p>Age: _____</p>	<p>Land: 0.5 hectares</p> <p>Owner: _____</p> <p>Tenant: _____</p>
(a)	(b)	(c)

Figure 4. 9 (a) Livelihood card; (b) Crop/Livestock card; (c) Land card

- 6) Game folder (Figure 4.10) - each player is given a folder to put in all the cards, i.e. income, livelihood, crop/livestock and land cards. This is used for organization.



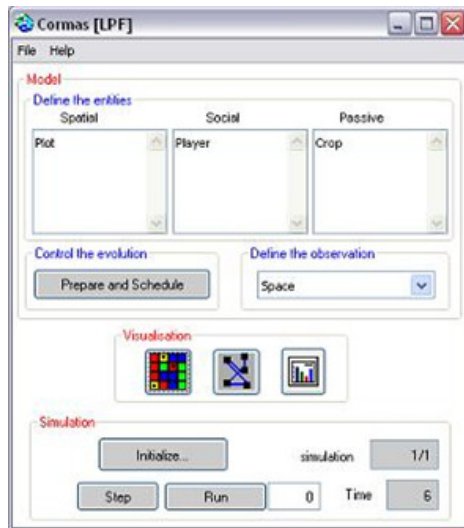
Figure 4. 10 Game folder

- 7) Game markers (Figure 4.11) – sticks that are used to mark plots that shouldn't be accessed (this is only for the revised version of RPG1).

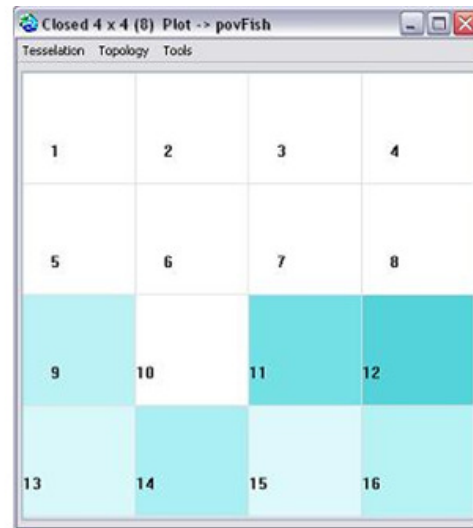


Figure 4. 11 Game markers

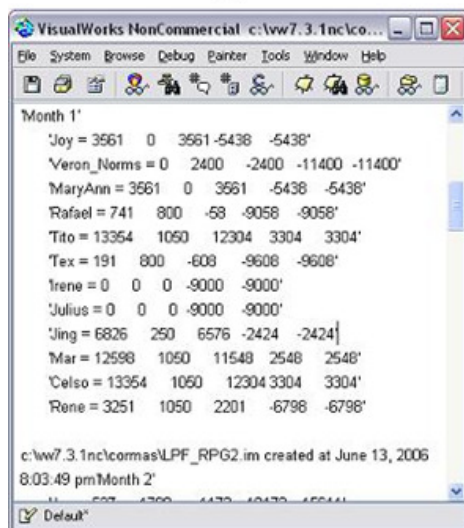
- 8) RPG computer model (Figure 4.12) – a game interface of the RPG was programmed inside CORMAS. This is used to display the game choices of the players (Figure 4.12a), to compute the income of each player (Figure 4.12b), and to show the impact of their choices on their environment (Figure 4.12b and Figure 4.12d).



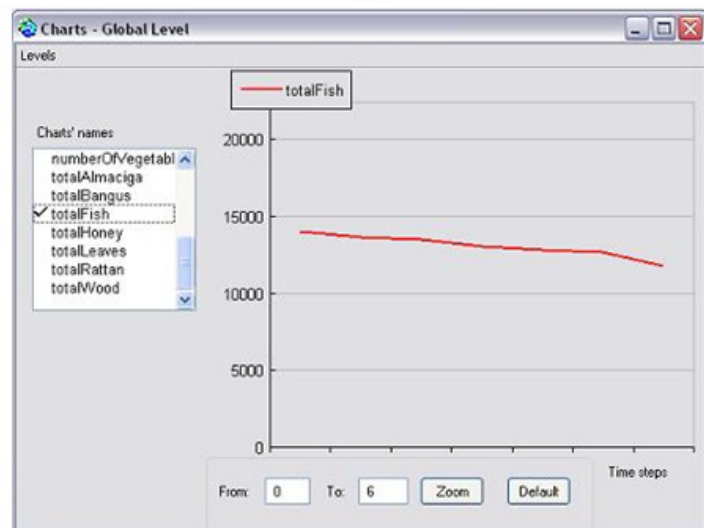
(a)



(b)



(c)



(d)

Figure 4. 12 RPG-computer model interface: (a) control panel; (b) virtual game board; (c) computation window; (d) charts window

- 9) Laptop and projector – used to display game results to players for discussion. No projector was used during the RPG sessions with the Bataks.

Game mechanics

- 1) A round or step of the game is equivalent to one month. The game is played for one year or 12 steps.
- 2) There are 12 livelihood activities to choose from: raising livestock, making copra, fishing, farming, catching milkfish fry, making charcoal, gathering almaciga resin, gathering honey, gathering rattan, making (roof) shingles, flower gardening, and seaweed farming. Seaweed farming was removed in the revised and replaced by vegetable gardening.
- 3) Each player may only choose one type of livelihood at each month.
- 4) He or she may choose to retain the livelihood he has chosen from the previous round, or opt to change to a new livelihood. A player may also go back to a livelihood he or she has done before.
- 5) Every month income is reduced by Php 6,000 (US\$120) when played with the Bataks, or Php 9,000 (US\$180) when played with the migrants, to take into consideration the household expenses. These values were computed by the game participants. It is assumed that the only source of income of the players is through the income they make. Food from other sources such as farms or backyard vegetable gardens is not considered. All of this was done to simplify the game.

Step-by-step process of the RPG1

Game preparations:

- 1) The players are seated randomly in the playing area. Game assistants distribute the game folders containing the income card to the players. The players write their names and village

name (or organization for RPG sessions with GOs, NGOs and PrSC). Game assistants collect the game folders according to the seating arrangement of the players and return them to the game master.

- 2) The game master records the names of the players in order of the seating then returns the game folders to the players.
- 3) 2 land cards are given randomly in the game.

Steps of the round:

- 1) The game starts with each player choosing a livelihood he or she would like to engage in and gets the corresponding livelihood card. Players assume that they already have the necessary materials to do the livelihood so they no longer pay the initial capital of the livelihood activity they have chosen. Players who have chosen livestock-raising, copra-making, and farming are given crop/livestock cards.
- 2) The players choose the plot in the game board where they would like to conduct their livelihood. They write their choices for livelihood and plot on the second column of the income card. When done, they put their income and other cards they have in their game folders,
- 3) The game assistants collect the game folders according to seating arrangement and give them to the game master.
- 4) The game master enters the players' choices in the RPG-computer model. When done, he or she displays, for about 10 to 15 seconds the plots where the players have chosen through the RPG-computer model environment window (Figure 4.13).

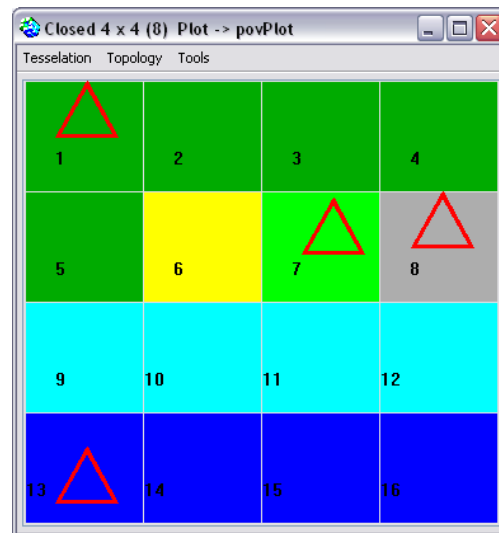


Figure 4. 13 Environment window showing players' choices (shown as red triangles in the plots)

- 5) The game master runs the RPG-computer model; thus computing the players' incomes. With help from the game assistants, the game master records the income results, considering the applicable deductions, on the players' income cards.
- 6) The players are given about a minute to reflect on the results of the round.
- 7) The steps for the succeeding rounds are almost the same as those in the first round, except that the players have a choice to retain or change their livelihoods. Should a player change his or her livelihood activity to a new one, initial capital costs are now considered.
- 8) The game ends after the month of December. At the end of the game, the cumulative income of each player is computed and recorded. The results, such as income of each player (Figure 4.14) and impact on the resources (Figure 4.12), are compiled and presented for discussion.

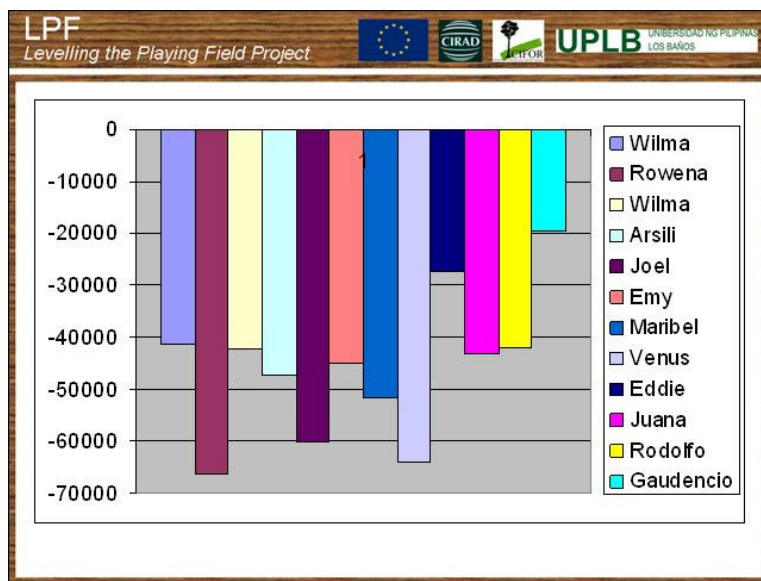


Figure 4. 14 Presentation of results: each player's cumulative income

Gaming process with the stakeholders

Prior to using the game in the field, to verify the game, RPG1 was first played with some forestry students from the University of the Philippines Los Baños, wherein the weaknesses and strengths in the game design as well as the correctness of the computations were examined. A second test was done with the ComMod team to improve the logistical efficiency during game play, as well as for partial validation of the actions (livelihoods) and outcomes. Finally, the workshop was organized for the community stakeholders with the primary goal of validating the MAS model using RPG1. Each village and the Batak community had an RPG1 session, which allowed more participants to validate the RPG, and consequently, the MAS model. There were 12 participants per session, or 48 in total. From the point of view of the researchers, this provided them the opportunity to observe the decision-making processes of the locals from each of the villages and determine if they vary across the villages. The series of workshops were scheduled from March 4 – 7, 2006, wherein the sessions for the migrants were conducted at a local beach resort, while the session for the Bataks was conducted in Sitio Kalakwasan. The sessions were started with stating the objectives of the LPF project, ComMod process and the workshop. This was followed with a recollection of the previous ComMod activity. Because the

preceding ComMod activity was conducted between May and August of the previous year, photos and videos of the previous activity were shown to the stakeholders to help them recall what had happened before. After which, RPG1 was played and its results were discussed with the stakeholders. The indicators used to present the results were the net-income, shown in their income cards and then compiled into charts, and the resource stocks during and after the game, shown as charts as well as maps. Also, for each round, the positions of the players in the game board were shown after everyone has chosen a livelihood and a particular cell on the board; this demonstrated which areas of the board were being utilized for livelihood activities. The identities of the players on the board, however, were not revealed.

Outcomes of the validation process

In terms of validation, the following changes were proposed by the participants:

- 1) Remove the seaweed farming livelihood from the game as this was no longer practiced by the local community. According to the participants, they incurred heavy losses due to their crops being afflicted by a disease, which eventually led them to believe that their community waters was not appropriate for such livelihood. Moreover, they had trouble with thieves stealing their crops at night.
- 2) Add a buy-and-sell (trading) activity, in which many of the local community were thought to be practicing often.
- 3) Add vegetable gardening as this seems to be an emerging livelihood among locals and many of the participants were interested in its impact.
- 4) In reality, paddy field owners cultivate their own lands even if they incur losses just to avoid wasting it or what Filipino's would say to be "*sayang*." They do not have these parcels leased to other people. Therefore, the option in the game to lease paddy fields was irrelevant.

- 5) The investment costs of some of the livelihoods were reassessed and proposed to be lowered because it was often that they fashion their own equipment from materials found in their homes or they borrow from a relative or a neighbour.

Follow-up interviews were done to clarify some points in the discussions as well as gather new information related to the proposed changes in the model, notably on the proposed additions to the game. The role-playing game was subsequently revised according to the proposed changes, while taking into consideration the integrity of the model and game, as well as the objectives of the ComMod process for the LPF project. The changes included the revision of the investment cost and pay-offs of several livelihoods, removal of the option of paddy-owners to lease their lands, the removal of seaweed farming and adding vegetable gardening to the game. With regards to trading, it was evident from the interviews that a substantial number of commodities, such as banana, fish, NTFPs, cashew, rice, charcoal, roof shingles, etc., are traded among the locals, albeit intermittently. This is because trading is done whenever there is an opportunity, which depended on the available capital and on the demand and supply of the goods. Trading of goods on a regular and on a much larger scale, such as cashew and NTFPs, were done only by a few individuals as it requires high capital. Trading was a more complex activity than initially anticipated and its inclusion into the game was not going to be simple. One of the main considerations was that there would be a need to study the practice of trading among the villagers as it involved different goods, markets and impacts on the resources, which extended beyond the limits of the three villages. This would have required additional time and funding from the LPF project, which, at that time, were already limited. Another challenge was how to implement the activity within the role-playing game. Adding “buy-and-sell” or trading, with its different commodities, to the 12 livelihood options in the game would only further complicate it. Thus, trading was not included in the revised game.

Workshop evaluation

This workshop was also an opportunity to test a participatory evaluation process wherein the workshop would be assessed by the stakeholders. Since this was the first time to implement a participatory evaluation of a workshop, the participatory evaluation process itself was assessed for its effectiveness. Initially, it was planned to use a set of criteria and indicators for evaluating the workshop. This was later changed into a predefined set of evaluation question (Appendix B.10), which was divided into three main categories: (1) lessons about the game and the entire activity, (2) logistics and (3) the evaluation process. The assessment of the evaluation process provided an opportunity for the stakeholders to delete, add or modify the questions related to the lessons and logistics of a ComMod activity in order to improve the quality of the evaluation. And so, the day's activity was evaluated using a set of pre-defined evaluation questions and the process design was reviewed to determine if the activity's objectives were met. Each session was ended with a concluding remark from the LPF team, citing the possible subsequent ComMod activity.

4.2.6. *Revised role-playing game for Palawan and the scenario-building workshop*

With the revisions of RPG1, the game had to be revalidated with the stakeholders and a workshop (the process design of which is found in Appendix B.5c) was organized for this purpose. The revised game is now referred to as RPG2. In addition to validating RPG2, the workshop was also intended to conduct a scenario-building exercise using RPG2, which was viewed as the first step towards ENRM discussions and negotiation with the stakeholders. Participants for this workshop were representatives from all types of stakeholders, although each had separate sessions as shown in Table 4.5. Two rounds of RPG2 were played in each session wherein the first round was used to validate the RPG and its changes, and the second to introduce a scenario in RPG2, similar to what was done in the *Cherlng* game. With the limited time for gaming and discussion, RPG2 was played with only six time steps representing the months of January until June in both cycles of the game. The scenario introduced in RPG2 involves having a no-access zone or cell in the open access areas in the game board, i.e. forest,

coastal and deep sea cells, as chosen by the game master. This choice depended on the frequency of activities in the open access areas; the higher the frequency in an area of cells, the more likely a cell from that area would be declared no-access in the succeeding round. The results of the first round, which was considered as the base scenario, and second round were then compared and discussed with the stakeholders using the same set of indicators used to assess the results of RPG1 and an additional indicator, the number of players in a particular livelihood.

Table 4. 5 Participants of the RPG2 and scenario-building workshop

Date (2006)	Stakeholder	No. of Participants	Location
June 11	Migrants	24 with 2 observers	San Rafael
12	Bataks	14	San Rafael
13	NGOs	5	Puerto Princesa city proper
14	GOs	13	Puerto Princesa city proper
15	PrSC	6	Puerto Princesa city proper

During the scenario-building segment of the workshop, scenarios were identified by the participants by completing the phrase “What if...?” which indicated the aspects of their livelihood and their natural resources they had interests or concerns. Together with each identified scenario, they were also asked what indicators to use, as well as how they would like the results of these indicators presented to analyze the scenarios’ outcomes. In general, the scenarios the participants have identified can be grouped according to (changes or additions in) policies, availability of resources, availability of livelihood activities (both existing and introducing new ones), (change in) attitudes of resource-users in

terms of resource extraction, introduction of new resource extraction methods and technologies, peace and order and effects of external forces, such as inflation.

After identifying the scenarios, the participants were asked if RPG2 was valid and whether or not they would use the MAS model (both the RPG and the planned computer simulation) in actual ENRM discussion and negotiation processes. As much as they affirmed the validity of the game and its results and appreciated its value in learning and planning processes, they pointed out that it will not be possible for them as individuals to participate in actual ENRM planning processes because it is the Barangay Development Council (BDC), a committee formed in accordance to the (Philippine) Republic Act 7160 or the Philippine Local Government Code of 1991, that executes such processes, and is composed of all the members of the village council, representatives of non-governmental organizations operating in the village who shall constitute not less than one fourth ($\frac{1}{4}$) of the members of the fully organized council and a representative of the congressman. This was an unexpected development because I had the assumption that, with the Provincial Steering Committee, composed of decision makers at different administrative levels, NGOs involved with the community, and the community Technical Working Groups, it would have been possible to discuss about ENRM planning processes within the PrSC and TWG forums. The issue could have been rectified by engaging the BDCs of the three villages into the process, but, unfortunately, the BDCs for the three villages had not been formed at that time and there was no definitive schedule as to when they will be convened. The LPF project itself had been trying to facilitate the formation of a unified development council for the three villages and develop a unified village development plan, but had yet to succeed in this effort up to the time of the modelling process. However, the participants suggested that they write and sign an endorsement letter promoting the use of the MAS model in the ENRM planning process of the BDC. Moreover, they suggested that a gaming session with the BDC should be arranged so that its members would know, appreciate and use the model for ENRM planning processes. The participants felt that this action was acceptable because they viewed that the model was able to deliver the stakeholders' concerns and

interest in livelihood and ENRM to the appropriate channel, i.e. the BDC. This sentiment was shared by all participants in all the workshop sessions. With the help of the LPF research team, an endorsement letter for BDC was drafted and all the participants signed this letter in support of the MAS model. It should be noted that, based on the membership requirements of the BDC as stated on the local government code, many of the participants in the ComMod process would have had been members of the BDC. The significance of this situation is that the stakeholders, especially the communities, recognized that there is a specific forum for ENRM and livelihood planning and negotiation.

The workshop was ended with an assessment of the day's activities using the same evaluation questions from the RPG1 workshop. Except for the recommendation to include the BDC into the ComMod process, the rest of the evaluation results were similar to that of the RPG1 workshop.

The plan was to program these scenarios into a computer simulation and the results of which were to be presented to the stakeholders using the indicators and presentation methods they have suggested for each scenario.

4.2.7. Water resource management planning and negotiation (WRMPN) workshop

The plan for the stakeholders after the RPG2 workshop was to present and discuss the results of the scenarios identified using computer simulation which would have involved all types of stakeholders in one workshop session. From this, a new set of scenarios or even strategies for ENRM were envisioned to be developed. However, due to LPF time and budget constraints, this activity had be integrated with another LPF activity in which the stakeholders were to develop specific plans for water resource management for the three villages. The decision for the LPF project to focus on water resource originated from one of the first activities of the LPF project, Visioning, wherein one of the problems identified was on water resource, i.e. its availability and distribution in the communities. It was seen that water resource would be a critical factor on the sustainability of the newly planned livelihood projects of the TWG, therefore the LPF project decided to put its attention to this issue. As a result of the change in

trajectory of the ComMod process, several considerations had to be addressed: first, since the MAS model was only indirectly related to water resource management, i.e. several of the livelihood options in the model require a reliable water source for sustainability, this linkage had to be established in the workshop; and, second, the WRMPN was planned for only two days. This meant that there would not be enough time to present all the scenarios identified in the RPG2 workshop and, therefore, only the salient scenarios were to be presented.

With the support of the MAS computer simulation, the main objective of the WRMPN workshop was to bring all the stakeholders together and jointly develop and agree on a strategy or plan to build a reliable and sustainable water resource system for household and livelihood consumption of the three villages. A total of 26 individuals representing the different stakeholders (4 from San Rafael, 4 from Tanabag, 3 from Concepcion, 2 Bataks, 11 GO representatives and 2 NGO) attended the 2-day workshop from 6 – 7 June, 2007. The migrant participants were either TWG members or village councilors, while most of the mediating organization representatives had participated in previous ComMod activities. During this workshop, handouts about the ComMod process in Palawan were distributed to the participants; these handouts were requested by the participants of the previous workshop so that they could review what has been done and learned so far.

Based on the process design for this workshop (presented Appendix B.5d), the water resource management planning process for this workshop could be broken down into steps and elaborated more precisely in the succeeding texts:

- 1) Establish the importance or purpose of the workshop using computer simulation;
- 2) Learn about how to make plans collectively;
- 3) Involve the participants in actual planning situations;
- 4) Establish commitments among the participants and to their plans.

Similar to previous ComMod workshops, the WRMPN workshop was ended with an evaluation.

Computer Simulation

A computer simulation, based on RPG2, was programmed using the CORMAS platform as an extension of the game, allowing inclusion of features of the model that were not included in the game as well as being able to observe the model for a longer period. Now, agents could have multiple livelihood activities at the same time and a map of the actual study site was used as the environment for the simulation. Also, each agent in the computer simulation represented an individual that could belong to a household. A household could contain from one to four agents earning for a family of five to six members. The amounts of resources in the environment were assumed since there were no available data except for land and sea cover types, which were provided by the PCSD. This assumption was thought to be acceptable since the model did not aim to predict, but rather show the trend or rate of depletion of resources. The number of agents in the computer simulation was taken from the Community-Based Monitoring System 2003 data compiled by the City Planning Department of Puerto Princesa City. Considering that the extraction rules given in the PCSD Resolution No. 05-250 or the Revised guidelines in implementing the ECAN zoning amending PCSD Resolution Nos. 94-44 & 99-144 were vague and do not provide exact quotas or limitations on resource extraction as these have not been established at the time this activity was done, it was assumed that only the extraction of NTFPs in core zones and rattan in restricted areas were not allowed. The built-in visualization tools of CORMAS were used to view the computer simulation and its results, similar to those used in the RPG1 and RPG2. Figure 4.15a shows the land and sea cover of the study site with each cell or square representing an area of 4 ha.; Figure 4.15b depicts the initial state of a resource, for example fish stock (cells in shades of blue). The red dots in the figures are the migrant agents, while the blue dots are the Batak agents; Figure 4.15c depicts the final state of a resource, e.g. fish stock (cells in shades of blue); and Figure 4.15d is a sample chart showing the population of almaciga gatherers over time. The

verification process was done prior to the workshop and involved running the simulation on a randomly generated environment and checking it for correctness of computations and bugs in the programming. This synthetic environment was randomly generated but contained all basic characteristics of the environment that were to be used in the actual simulations. The scenarios from the RPG2 workshop were then programmed into the simulation and again verified using the synthetic environment. There was much difficulty, however, to find data for the variables on the environment which was needed to initialize the simulation as many of these data were unavailable before the time of the WRMPN workshop. Basically, the data that can be gathered for the simulation were the land-use/land cover map, village boundaries, CBFM boundaries, ECAN boundaries and demographic data. Growth models of natural resources were also unavailable. Therefore, simple models of growth and resource stocks were assumed in the simulation. Since the goal of the simulation was to present trends and was not intended to be a prediction model, a concept that was emphasized since the beginning of the modelling process with the stakeholders, these assumptions were decided by the ComMod team to be acceptable for its intended purpose. However, these assumptions also limited the model's usefulness in deriving more conclusive results.

Four scenarios were presented with two factors taken into consideration, namely, the implementation of ECAN zoning and changing of livelihood activities. Changing of livelihoods was chosen as this was a recurring theme in the scenarios identified by the stakeholders in the previous ComMod session, while ECAN zoning was chosen because of the heightened interest from both the stakeholders and the LPF researchers anticipating its implementation at the three villages at that time. More specifically, the scenarios presented to the stakeholders were:

- 1) No change in livelihood – the status quo; the agents will not change their current set of livelihood activities, whether or not they are losing money from such an activity.

- 2) Change livelihood – the agents are able to remember the previous incomes they have generated from the different livelihoods they were or are engaged in and change their livelihood preferences accordingly. Other factors affecting the preference are gender, as some activities can only be done by men, and seasons, as some activities are seasonal. Among the livelihood options, the agents choose the livelihood activity with the highest preference.
- 3) No change in livelihood + ECAN – the same agent behavior as in 1) but this time, with the ECAN implemented, some areas in the landscape are not accessible.
- 4) Change livelihood + ECAN – the same agent behavior as in 2) but this time with ECAN implemented.

Each scenario in the computer simulation was run to represent 10 years. The results were discussed with the stakeholders and were related to the management of water resources for livelihood purposes. This was done by associating the socio-economic and environmental (i.e. natural resources) impact of the different livelihoods, as seen in the scenarios. From the model, the value or importance of the livelihoods on ornamental plants and vegetable gardening were highlighted because these were also the prospective livelihood projects planned by the TWGs. From there, the importance of the water resource on the planned livelihoods, mainly on its sustainability, was examined. It was only upon establishing the link between water resource management and livelihood that the head of the LPF Philippines team opened an interactive general discussion on the planning process for natural resources, wherein he engaged the participants to express their ideas on its importance as well as the significant aspects that should be kept in mind during the planning process.

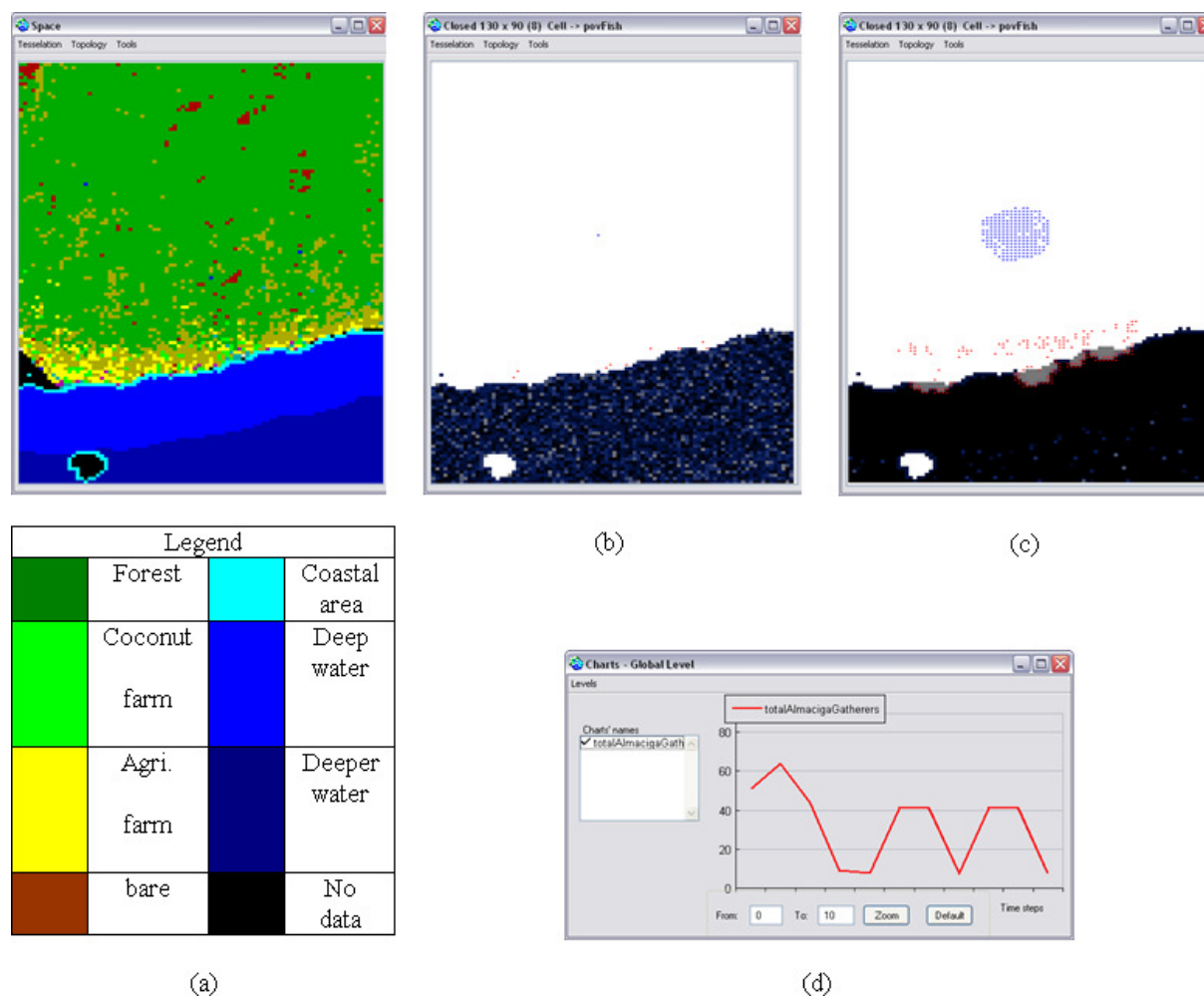


Figure 4. 15 The computer simulation interface

Plan of action

The interactive general discussion about natural resource management planning was the opening to the group discussions to which the participants began planning for a more specific resource – water – that they could realistically execute collectively given their current capacities and resources. It was assumed in the LPF project that the three villages would have the same source of water for their water distribution system and that they could device a unified water distribution management system or strategy. In reality, however, the three villages do not share the same watershed and have different levels of water distribution systems. As pointed out by one of the participants, only Concepcion and Tanabag belong to the same watershed. Also, only Concepcion village had an existing water

distribution system connected to houses which were located beside the national road, but not to those in the inner parts of the village. San Rafael and Tanabag have yet to have water distribution infrastructures. Therefore it was agreed by the participants that a unified plan or strategy was not possible and they decided to draft plans for each village. They, however, did not discount the possibility of having a unified water resource management system in the future. Thus, the groups for the planning exercise were divided according to village with the GO and NGO representatives distributed among these three groups. The first group activity of the planning process consisted of collectively identifying the existing and potential problems or obstacles that they might encounter in the future regarding water resource and its management and then develop strategies or options to address them. Each group presented the results of their discussions to the rest of the participants, thereby giving them the opportunity to observe the similarities and differences among their results. At the beginning of the second workshop day, a synthesis was made by the head of the LPF Philippine team on the results of the group discussions based on what were presented the previous day. It appeared that all groups shared a common problem with funding despite having identified different problems and strategies on water resource management. The participants agreed with this finding and, thus, this was made as the theme of the second day of the workshop. The specific goal for the second day was to identify strategies to address the problem at hand, i.e. lack of funding, and then choose among these strategies which they think would be most appropriate for their case. In order to guide them at this stage, a plan of action (POA) template was provided in which each group would fill-up the necessary information in the template. Each group's POA (Appendix B.11) were then presented and discussed with all the participants. In general, the villages of San Rafael and Tanabag wanted to address the issue of non-existent water distribution system, while Concepcion wanted to expand its infrastructure to sustain the system throughout the dry months when water becomes scarce. What was common among the three POAs was that they recognized the need to form a local organization to manage the water distribution system, but this aspect was prioritized differently among the POAs and thus the funding needed to

carry out the initial steps of the POAs were also different. The discussions were most relevant as the representatives from the mediating organizations were able to share their knowledge on who to ask for financial support from the government agencies and philanthropists, when to ask for financial support, and the proper process in requesting financial supports or grants. For every POA, specific individuals were identified to carry out specific tasks. It was important that they were committed to completing these tasks therefore an oral agreement was made among the participants, especially with those specific tasks and responsibilities, to carry out their responsibilities until its completion.

Workshop evaluation

With 20 participants on the second day of the workshop, the usual evaluation method employed previous ComMod workshops would have been inefficient. Thus, the workshop was evaluated using an evaluation sheet prepared by me, and edited by the LPF team. The evaluation was divided into five sections:

- 1) Fulfillment of the workshop objectives
- 2) Process of planning
- 3) Feelings before, during and after the workshop
- 4) Logistics of the workshop
- 5) Additional MAS questions

The evaluation sheets consisted of statements to which the participants were given five choices ranging from “strongly agreeing” to “strongly disagreeing” (with the statement). There was also an option for “No Comment.” For some items in the evaluation sheet, specifically on the accommodation and transportation, there was also a “Not Applicable” option as some of the participants live in the city proper and were no longer provided with those items. A brief explanation of the evaluation sheet was given, as well as an option to whether or not the evaluator identifies himself/herself on the evaluation

sheet. The participants were given 15 minutes to complete the evaluation forms. A sample of the workshop evaluation sheet is found in Appendix B.12.

In general, the results showed that participants were satisfied with the workshop in that they have learned a lot from the process and that were inspired to carry out their respective POAs. Some stressed the importance of collaborative planning, in which they had the opportunity to get acquainted and bond with the other stakeholders. A participant suggested that the Palawan City Water District should have been invited. Since it was not part of the major stakeholders initially identified in the LPF project, the said organization was overlooked. With regards to the questions on MAS modelling and its future, they do want to continue the process as the model helped them learn more but most were unable to specify on which direction the model would focus. One participant did suggest to build a model on marketing of goods, while another suggested using the model for information and education campaign. There were some evaluation items where the responses needed elaboration, but most of the replies were very general. Unfortunately, there was no longer an opportunity to get more details. Prior to the evaluation process, this was the last ComMod activity held with the stakeholders.

4.2.8. Evaluation of the ComMod process

ComMod for Palawan was being evaluated throughout its process through short assessments at the end of the workshops. This exercise provided snapshots of the impact and value of the ComMod activities to the stakeholders. On a broader scale, however, two evaluation tools of different contexts were used at the end of the LPF project to assess the first ComMod cycle in Palawan.

The Canberra protocol (CP), conducted from 6 to 14 February, 2008, was the first evaluation tool employed and it focused on the Palawan ComMod process as a particular instance of the ComMod approach. Individual interviews were conducted by an external evaluator for 12 community members (3 from each village and 3 Bataks) and 12 representatives from the meditating organizations. Being the principal investigator and modeller in the ComMod process, I was also interviewed as part of the CP.

Two 2-hour FGD sessions (process design presented in Appendix B.5e) were also conducted with the community, with six participants each. The participants of the FGDs were different from those that were interviewed and the purpose of which was to view the impact of the ComMod process from a group's point of view and determine if there were biases introduced in the results between that of individual interviews and FGDs. In the workshop I was a resource person for the ComMod process in Palawan, in which I stated my perceptions on what had transpired in the Palawan ComMod process, including my initial objectives and expectations. The participants then compared my objectives, expectations and perceptions with theirs. The results of the CP will be presented and discussed in detail in the succeeding chapter

The other evaluation tool, the Criteria and Indicators (C&I) that was specifically designed for the LPF project, was employed for the entire LPF project, in which the ComMod process was considered as one of its components. These C&I were based on the project's log frame, a document for organizing and communicating the results of the project to the funding agency, the European Commission. Of the 29 indicators, three were for the ComMod process:

- 1) Simulation tools (model, game, facilitation game) exist and presented
- 2) Key actors understand and recognized the usefulness of the simulation tools
- 3) Key actor's behaviour are influenced by tools

The indicators (I) for ComMod were in relation to the LPF criterion (C) "Scientists able to communicate and influence development actors by using simple simulation approaches" for the principle (P) of reinforcement. These indicators were to be answered with an affirmative or a negative response, with the responses for the second and third indicators needing explanation.

Three participatory assessment workshop sessions using C&I, a session each for the migrants with 15 participants, the Bataks with 12 participants and the mediating organizations with 18 participants, were conducted on 12-13 and 15 of February, 2008, respectively, where I was one of the

facilitators during the group discussions. During the workshop sessions, the stakeholders were also invited to add and rate their own C&I to the list; none was suggested for ComMod. The responses to all the three indicators were affirmative. The C&I evaluation activity marked the conclusion of the LPF project, including the ComMod process, in the study site.

4.3. Summary of the ComMod process in Palawan

In summary, the Companion Modelling process in Palawan was implemented from the end 2004 until the beginning of 2008, with the process being implemented by a core team consisting of six members, namely, me as the main investigator, the LPF Philippines national coordinator, LPF Philippines field assistant and three representatives from government organizations identified as key stakeholders. The key stakeholders came from government organizations, non-government organizations and the community members of the three villages under study. A multi-agent systems model was the main modelling perspective used in the ComMod process to represent the ENRM and livelihood situation. The process represented one ComMod cycle consisting of a total of eight phases, beginning with the familiarization of with the process of the researchers involved and the stakeholders and ending with its evaluation together with the stakeholders. To introduce the process to the stakeholders, a presentation and a role-playing game, i.e., *CherIng*, were used. Within the model building process, various methods were employed, with different artefacts accompanying or produced by these methods: data gathering activities consisted of review of literature, stakeholder interviews and focus group discussions; conceptualization of the MAS model was achieved through the use of UML diagrams; and the implementation of the MAS model were through RPGs and a computer simulation model. The RPG for Palawan was then used to learn and discuss about the ENRM system of the three villages in relation to the inhabitant's livelihood activities. Moving further, the RPG was then used as a platform to start discussing about scenarios relating to ENRM and livelihood activities of the stakeholders. The ComMod process culminated in a joint LPF-ComMod workshop on water resource management planning and

negotiation. The researchers involved in the ComMod process also had to undergo capacity-building in order to implement the process, i.e. on ComMod and in multi-stakeholder facilitation, which led to the use of two important auxiliary tools in the ComMod process for Palawan, i.e. the *Cherlng game*, which was used to introduce the concept of RPGs to the stakeholders, and the Process Design, which were used to plan for the ComMod activities. To monitor and evaluate the ComMod process, evaluation questions were used at key activities in the process, e.g. workshops, to determine the efficacy of the methods used and the lessons learned during the ComMod process. As a whole, the ComMod process for Palawan was evaluated using the Canberra Protocol (CP) for the ComMod approach and the Criteria and Indicators (C&I) evaluation specially designed for the LPF project.

In the Palawan ComMod process, there would seem to be a discrepancy in the outcome of the RPG2 and scenario-building workshop, which was an endorsement letter to the Barangay Development Council (BDC) and the Water Resource Management Planning and Negotiation (WRMPN) Workshop, wherein the WRMPN workshop was an activity of LPF with support from ComMod. The endorsement letter, which expresses the workshop participants' support for the use of the MAS model in the ENRM discussion and planning activities of the BDC, was made because all participants agreed and said that ENRM discussion and planning activities for the community is a matter that can only be addressed at the level of the BDC. At that time, the BDC had not been formed. And yet, the WRMPN workshop was conducted and its outcomes, the Plan of Actions (POA) of each village on water collection and distribution system for household and livelihood use, were collectively agreed upon and supported by the workshop participants, many of which were also participants in the RPG2 and scenario-building workshop. I would like to offer two possible reasons for this occurrence. First, it may have been a case wherein the stakeholders waited to see the outcome of the WRMPN workshop. Since the outcomes were community projects for infrastructure, the LGU and NGO participants were willing to support the POAs. Had the outcome been different, for example an effort or advocacy to change an ENRM institution (e.g. policy or ordinance), the response of the stakeholders may have not been the same,

maybe an outright rejection of the outcome by some of the workshop participants or redirecting the matter back to the BDC. The second probable explanation to this discrepancy is that it may have been a case where the stakeholders themselves may not have wanted to continue with the process themselves. Rather than to categorically state this desire to stop the process, they have opted to redirect the matter to the BDC. Since the BDC as a group was non-existent at that time, the only option for the ComMod process to proceed was to wait until the BDC has been formed. However, because ComMod was only a project component while LPF is a project, a bigger entity so-to-speak, this could have had given the project more leeway to proceed with their intended activities. It should be said that neither explanations can be proven nor validated at this point. However, this issue was raised because it may be an important aspect in the articulation between ComMod and a research and development project in general. I intend to go back into this matter in my discussion for Chapter 6.

This whole process had been a learning experience for both the stakeholders and the researchers involved. Therefore, it is very important at this point to interpret what had transpired in the field. This means that there is a need to identify the learning process and what exactly was learned. More importantly, there is a need to determine how the learning process and its artefacts have affected or influenced the stakeholders, including the researchers, throughout the implementation of the approach. To this end, the concept of organizational learning will be used to frame the inquiry. In addition, the Institutional Analysis and Development framework would be used to structure the lessons from the process, i.e., determine the levels of the action arena – constitutional, collective-choice or operational level – to which the lessons are linked. Moreover, since ComMod for Palawan, was the first known instance that the ComMod approach was used as a component to a bigger research and development project, the articulation between the two will also have to be analyzed. At any case, the outcomes of the evaluation process, i.e. workshop evaluations, CP and C&I, as well as observations during the ComMod process will be used as the source of information for the inquiries in the next chapter, Lessons from the Companion Modelling process in Palawan, Philippines.

CHAPTER 5

LESSONS FROM THE COMPANION MODELLING PROCESS IN PALAWAN, PHILIPPINES

The LPF project employed the companion modelling approach to collectively build a shared MAS model of their environment and natural resources (ENR) and livelihood system, which would be used to investigate the linkages among the livelihoods, institutions and natural resources of the three villages of San Rafael, Tanabag and Concepcion. Since the ComMod process, lessons were obtained about the ENR and livelihood management action arena of the three villages, on the impacts of the LPF and ComMod on the action arena and on ComMod as a component in a research and development project, I present these lessons based on the tools and artefacts used in conducting the ComMod process in Palawan, Philippines. First, I examine the lessons about the ENR and livelihood management in the three villages, more specifically on the outcomes of the interactions among the stakeholders at the operational level, i.e. doing livelihoods, amidst a dynamic environment and evolving institutions. These outcomes are examined using the results of the MAS models for Palawan, i.e. the role-playing game (RPG) and computer simulation. Then, I analyze the researcher-stakeholder interactions within the ComMod and LPF processes, e.g. RPGs, discussions, monitoring exercises and interviews, as well as its outcomes. The lessons from the processes are examined from the perspective of the organizational learning theory. Finally, I dissect the interactions and its outcomes between ComMod and the LPF through the eyes of the different stakeholders using the results of the evaluation tools used to analyze the two, namely, the Canberra Protocol (CP) and the Criteria & Indicators (C&I) for the LPF project.

5.1. ENR and livelihoods: the multi-agent systems model for Palawan

The MAS model for Palawan was about the interrelationships among, the livelihoods, the dynamic resource environment and the institutions or rules-in-use at the operational level of the ENR and livelihood action arena. To understand and analyze the interactions and outcomes in this action arena together with the stakeholders, role-playing game and computer simulation were used as platforms for discussions. In these processes of model-building, role-playing, simulating and discussions, the stakeholders and the researchers have gained a better understanding of the action arena under study.

5.1.1. RPG1

The first role playing game workshop for Palawan, Philippines was designed primarily to validate the MAS model, i.e. its data, information and conceptualizations. And, in doing so, there were several important lessons to be learned about the action arena on ENR and livelihood management for the three villages based on the results of the RPG1, observations during the game and discussions that ensued afterwards. One of the main elements of the game that was discussed with the stakeholders was the indicator for their individual incomes, wherein it was determined whether the outcomes were correct or possible to achieve in reality and how the incomes were computed or what were the factors that contributed to the game's generated incomes. Although there was no map or resource inventory shown in the game, it was through the discussions that linkages were established between the environment, with its associated resources, and the livelihoods. It was important to qualify the results of the game especially to livelihoods that involved gathering resources, such as fishing, and gathering almaciga resin, rattan and honey, because some players would have very little or no income at all from the livelihood, while others would have high returns.

Below are the inferences that were extracted from the four RPG1 gaming sessions – one for each village and one for the Bataks:

- 1) They were associating their reality to the game.

- a. Although there were no explicit rules about village boundaries in the game, many of the players in RPG1 consciously limited their choice of livelihood in the game to the limitations of the landscapes within the confines of their respective villages. In correlation with the previous statement, during the game, most of the players did not experiment on other livelihoods besides those that they already practice or have practiced in reality. For example, Zernan of San Rafael (Figure 5.1a) and Ricky and Ronald of Concepcion (Figure 5.1c) mostly do fishing in real life, while Criscencia (Figure 5.1d) raises chickens; and so they did the same in the game. For the migrants, they argued that they do not know how to do the other livelihoods. For the Bataks, they reasoned that the other livelihoods were not part of their custom, have little or no knowledge on how to do them, and that their livelihoods were constrained within their ancestral domain. Some may even had implemented strategies that they do in real life. For example, Nelia of Concepcion village (Figure 5.1c) was into making copra and roof shingles throughout the game. One of the possible materials for making roof shingles is coconut leaves which is readily found in coconut plantations; the other material used for roof shingles is nipa palm leaves. However, there were those who did try to do something other than their usual livelihoods, such as Florenda and Asuncion of San Rafael (Figure 5.1a) wherein they said they were curious with the outcomes if they were able to fish, and went into fishing for 8 out of the 12 rounds of the game.
- b. It was observed during the game session with the Bataks that some of them seemed to be copying each other's livelihood choices. For example, if there was one person gathering almaciga resin, there were others who would follow suit. This was later confirmed during the discussion to which they reasoned that, normally, when gathering a specific NTFP, the tribe holds a meeting to decide which commodity to gather in the forest. This decision was based on the season as well as the demand from the migrants. The rest of the community

then follows whatever was decided during these meetings. In fact, some of the Bataks said that during the game they were trying to observe and follow the choices of the tribe chief as he was the one who calls and heads these meetings²¹.

- 2) Securing and maximization of the income. In the game, net income, which was recorded in the income card, was the main indicator used to assess the effectiveness of the livelihoods in meeting the typical living expenses of a family as well as an indirect indicator of the impact of livelihood activities on the resource stock. During the discussion, the participants admitted that, in reality, most of them do not keep records of their expenditures and returns from their livelihoods, thus most of them were unaware of their actual net income from a livelihood activity; they were unaware that some of their livelihood activities, such as gathering NTFPs, had very minimal returns and might not be enough to meet their needs. For example, the possible maximum net income from gathering rattan was about US\$ 23/month while household monthly expenses could reach up to US\$ 136²² for the Bataks and US\$ 205 for the migrants. The game also showed that some livelihoods with high investment costs require a longer period to recoup the investment, such as in the case of fishing which requires an initial investment of US\$ 361 for purchase of a boat and equipment. Thus, jumping from one livelihood to another after being discouraged from the initial losses may actually be worse in the end. This was the case, for example, for Rowena and Joel of Tanabag (Figure 5.1c) who had 7 and 6 unique livelihood activities, respectively, in the game, and Crisologo of San Rafael (Figure 5.1a) who had 7 unique livelihoods. So they said that a good strategy was to find the right balance of several livelihood activities during the year, that is, for them not to only concentrate on just one livelihood, especially for livelihoods with minimal returns like charcoal-making as in the case of Rolando of Concepcion (Figure 5.1c) and Tanasio of San Rafael (Figure 5.1a), but also avoid

²¹ This is a difficult task to do in the game because the players are asked to decide all at the same time and independently.

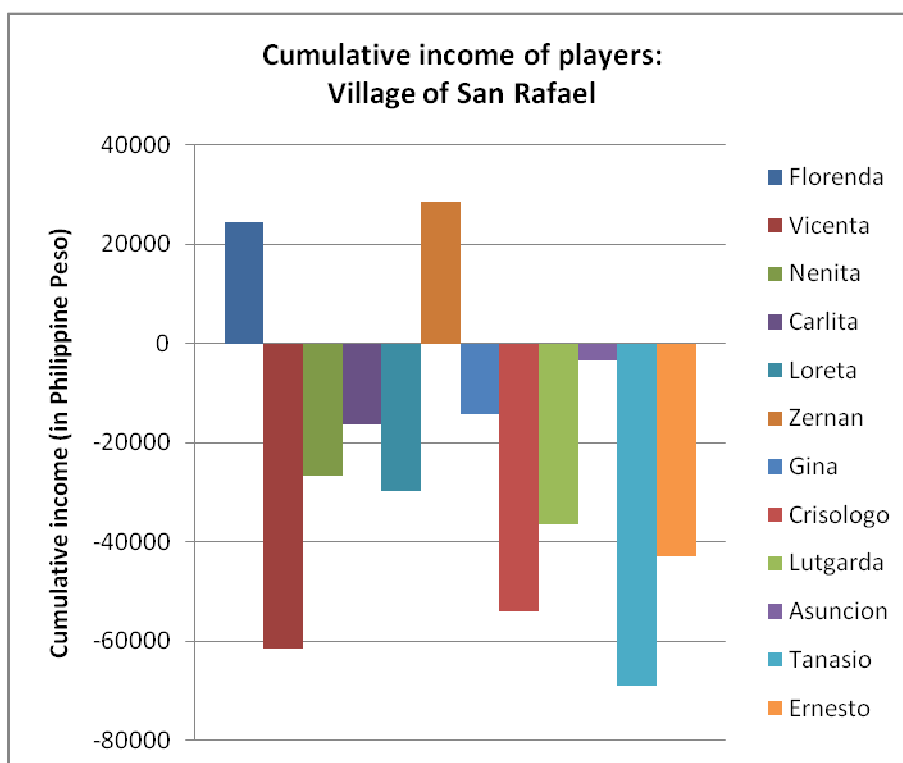
²² This value was computed together with the players assuming a household size of about 6 members and that there was no other source of food except the ones they buy using their income.

changing to too many different livelihood activities throughout the year. There were others who had taken a different strategy wherein they preferred to have a regular source of income.

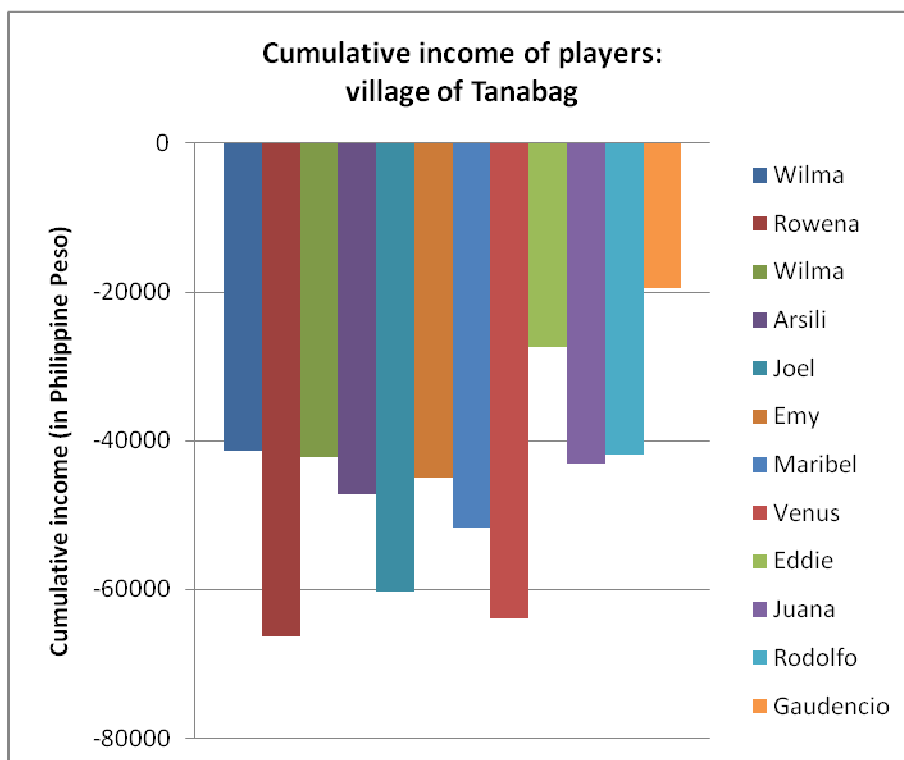
Ornamental gardening had a probable maximum income of US\$ 136/month but varies throughout the year and that could go as low as US\$ 68/month. Despite this, players who regularly engaged in this livelihood in the game – Loreta of San Rafael, Wilma and Juana of Tanabag, and Noralyn, Cynthia and Elena of Concepcion – preferred this livelihood because, according to them, even if there was the possibility of low net returns, at least there would be returns, unlike in other livelihoods such as fishing, wherein it was possible to end up empty handed.

- 3) Bataks are not lazy. There was a prevailing assumption among the migrants that the reason behind the Bataks being always in debt, in spite of all the external support they have received, was because they were thought to be lazy and mismanaged their income. But as demonstrated in the game, the net income generated from gathering NTFPs, the Bataks' only income-generating activity, and compounded by the scarcity of food for subsistence found in their environment, was not enough to meet their needs. This is significant because it shows that the prevailing assumption may not be entirely correct and that there may be other reasons for the situation of the Bataks.
- 4) Migrants control the prices. During the discussions with the Bataks, they expressed their reliance on the migrant traders when it comes to pricing, i.e. they have no control over the price. They were limited to trading with the migrants because they seldom go to the city, which involves additional overhead costs as well as time.
- 5) Migrants do not gather NTFP. Despite seeing the forest as a stable source of resources to generate income as it is always there, very few of the migrants gather NTFPs. The first reason being that the community-based forest management (CBFM) agreement of San Rafael, Tanabag and Concepcion Multi-Purpose Cooperative (STCMPC), which has provisions for this

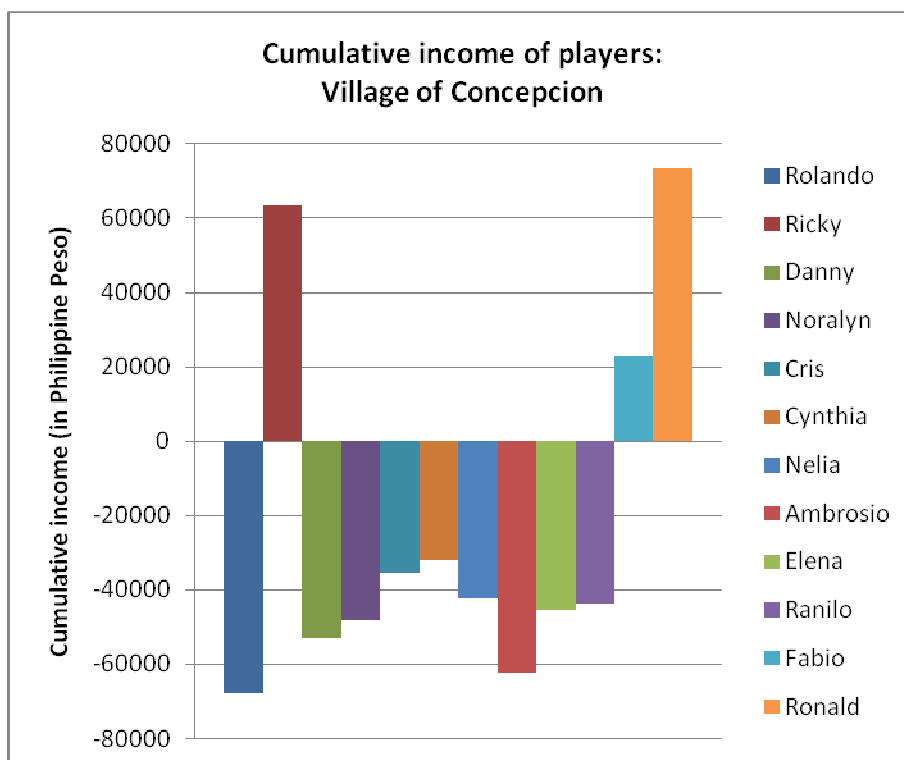
activity, has been put on hold, they also said that it involves hard work and only done as a last resort. This was clearly seen in the RPG1 wherein in San Rafael, only 1 player gathered rattan for 6 rounds, 2 players gathered rattan for 3 rounds, and 1 player gathered almaciga resin for 2 months. In Tanabag 1 player gathered rattan and another gathered almaciga resin for 2 months and 1 player gathered honey once. In Concepcion only 1 player gathered almaciga for 6 months. This was a totally different situation from the Bataks, wherein the Tribe's livelihood activities are tied directly to its identity. With the growing number of undocumented illegal gatherers, who practice unsustainable means of gathering the resources, and loggers entering their CBFM area, the Bataks were being forced deeper into the forest, making the task much more difficult and dangerous. They have expressed their fears for the future wherein there would be no more resources left for their children and their children's children.



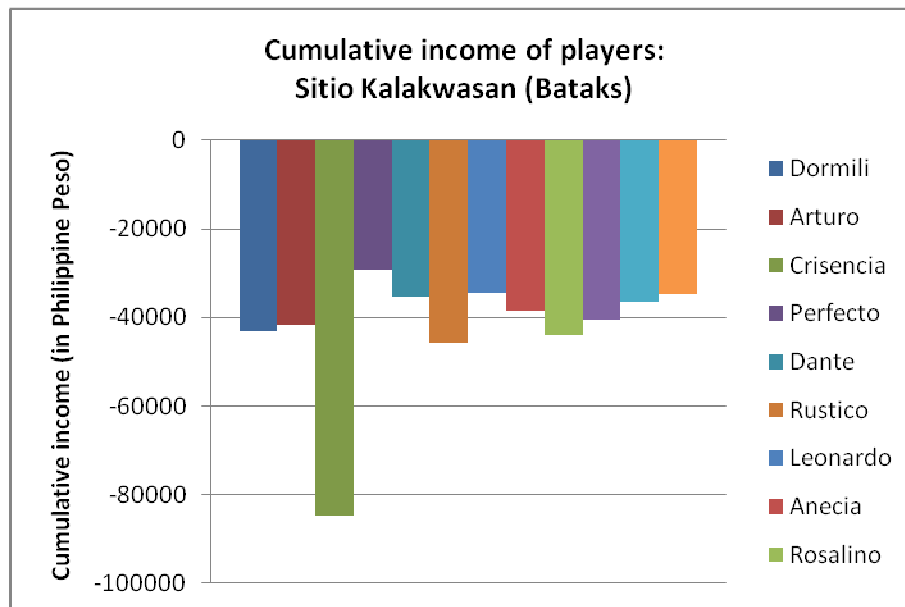
(a)



(b)



(c)



(d)

Figure 5. 1 Cumulative income of players of each village at the end of the RPG1 game: (a) San Rafael ; (b) Tanabag; (c) Concepcion; (d) Sitio Kalakwasan (the Bataks)

5.1.2. RPG2

RPG2 was the result of the modifications proposed by the community stakeholders who participated in the RPG1 gaming sessions. Recalling the main characteristics of RPG2, just like in RPG1, a player still plays for a household consisting of 6 members and only one livelihood can be played at a time, the market was assumed to be perfect wherein all goods are sold at a fixed price. The major modification for RPG2 involved the introduction of a new livelihood option, i.e. vegetable gardening, to replace seaweed farming. In the gaming sessions with the Bataks, there were 14 participants, while the gaming session for the migrants had 24 participants. Since RPG2 can only accommodate 12 players at a time, the extra participants were paired with the other players.

In RPG2, two scenarios were played, with the first scenario being the status quo, while the second scenario involved reducing access to one of the cells often utilized in the first scenario. For the Bataks, since they were limited to the forest area, meant that one of the forest cells was not allowed to

be accessed. As a result, there was a clear change in the livelihood activities of the players as shown by Figure 5.2. From an average of 6 players gathering almaciga resin, it reduced to an average of 1.33 on the second scenario. There was also a reduction in the number of honey gatherers, from an average of 1.83 to 1.17. They changed their activities to rattan gathering, which showed a change from an average number of 1.5 to 5.67 practitioners, and an increase of livestock raisers from an average of 2.5 to 3.5 practitioners. The effect of this change in livelihoods had a negative impact on the income of the Batak players such that most of them performed worse in the second scenario compared to the first (Figure 5.3), but it had a positive impact on the resources, such as in the example shown in Figure 5.4. Although almaciga resin was thought to be a more stable source of income as its demand is more consistent throughout the year, and it does not rot unlike rattan so that it can be stored in case that there were no immediate buyers, indicative of the results in the first scenario, the shift from gathering almaciga resin to rattan was due to the fact that almaciga resin was viewed to be a more scarce resource than rattan, taking into consideration that the trees from which the resin is collected were limited and takes longer to grow; therefore, seeing that their current level of extraction may not be sustainable, they wanted to protect it for the future of their children. From the discussions, the Bataks, by nature will follow the rules. This was confirmed by one of the stakeholder members of the ComMod team, who had been working with or involved with the Bataks for the past decade. Therefore, should a law that effectively reduces the Bataks' access to their resources, it would have a negative impact on their livelihoods, which was not a good sign considering that they were already struggling in their current situation.

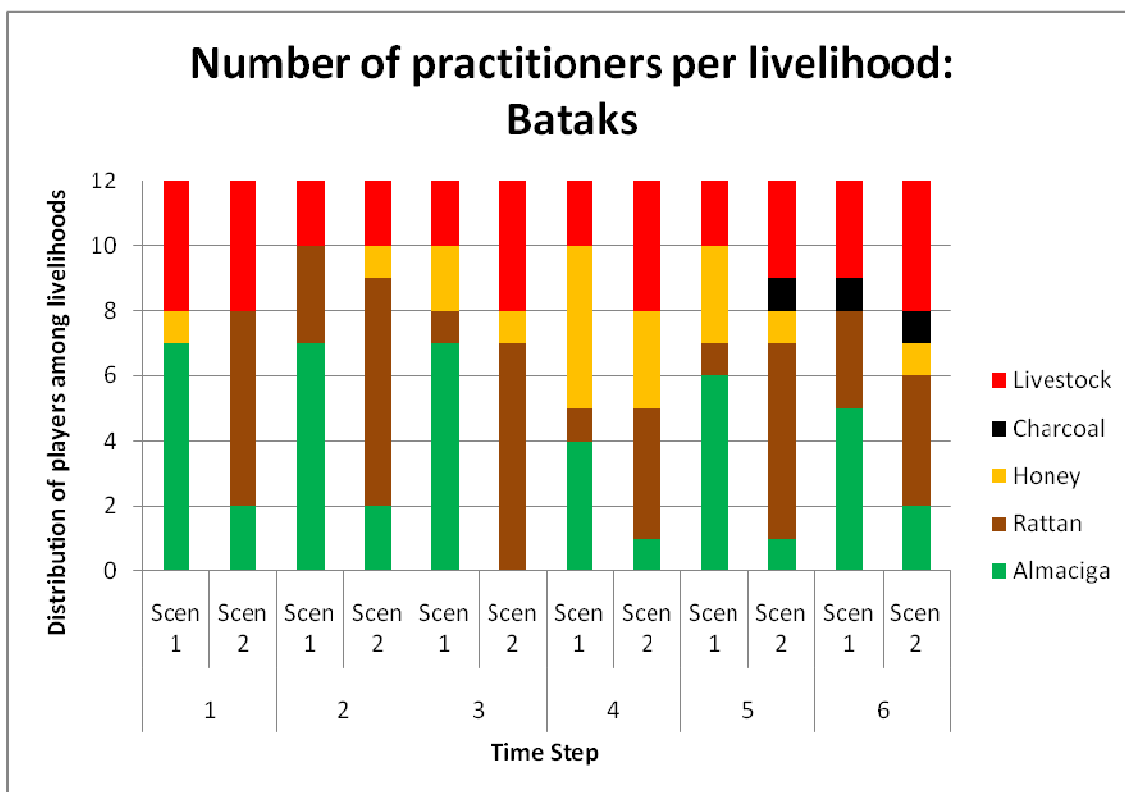


Figure 5. 2 The number of Batak practitioners per livelihood in scenarios 1 and 2

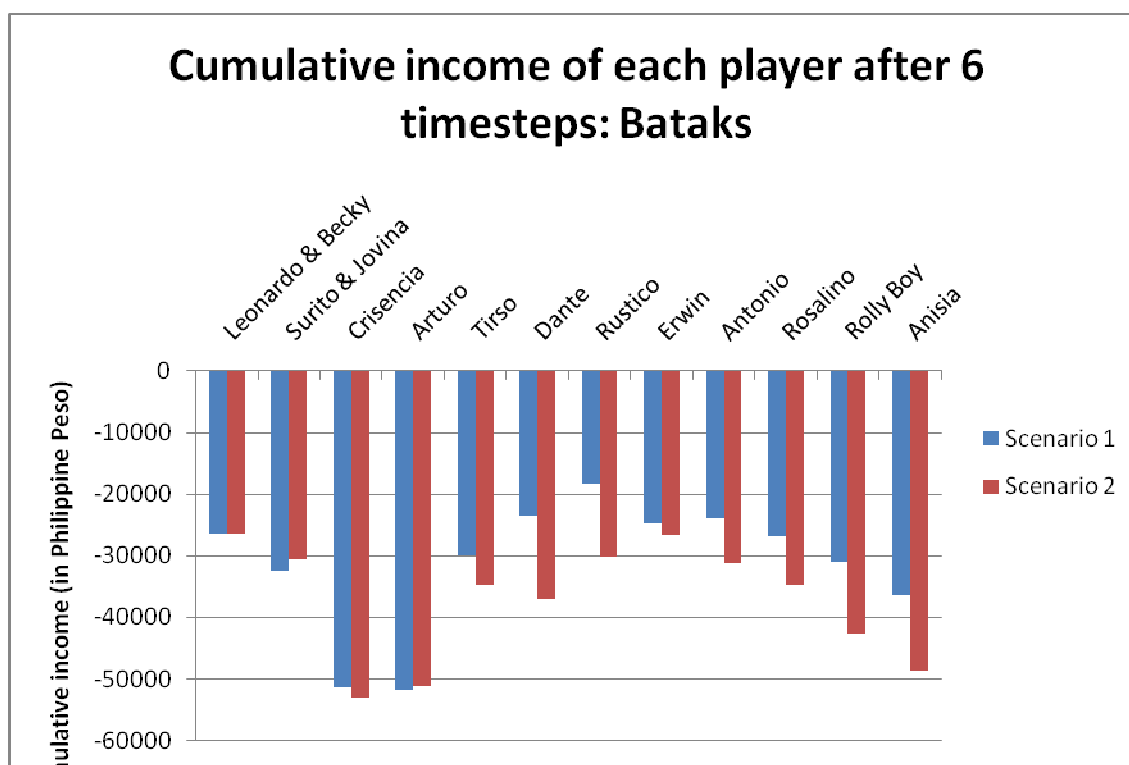
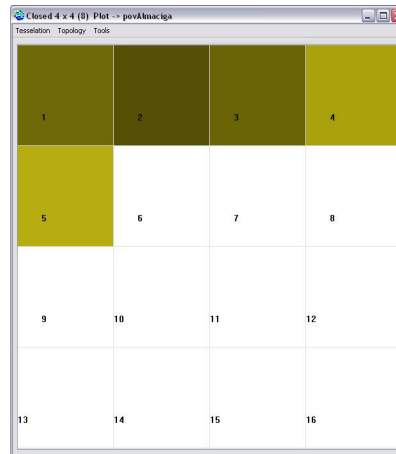
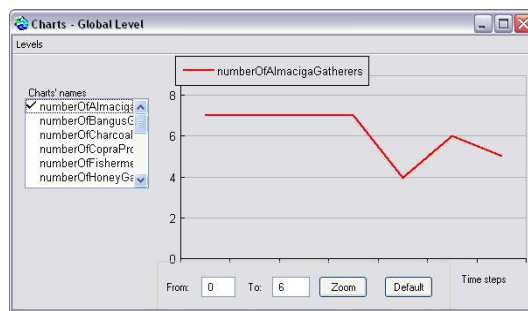


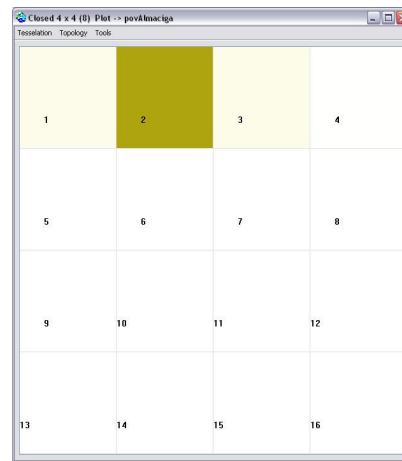
Figure 5. 3 The cumulative net income of the each Batak player for scenarios 1 and 2



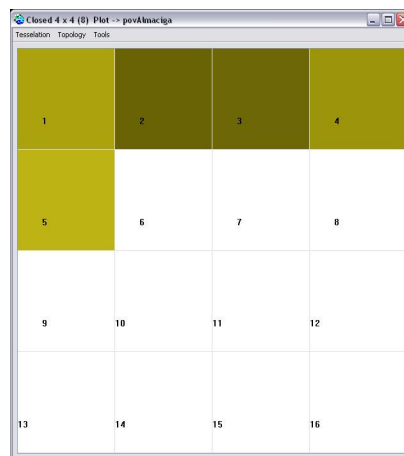
(a)



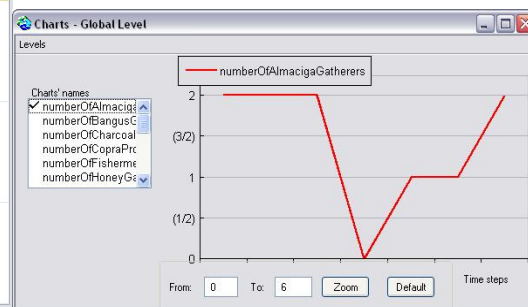
(b)



(c)



(d)



(e)

Figure 5. 4 Example of the effect of change in the number of practitioners vis-à-vis the amount of resources with the environment showing the distribution of resources at (a) initial state, (c) final state in scenrio 1, and (e) final state in scenario 2, wherein the darker the color of an area the more resources it contains. The number of livelihood practitioners associated to the resource is shown in (b) for scenario 1 and (d) for scenario 2. This example is for the resource *almaciga resin*

In contrast, the migrants would have a better chance of coping with the same scenario. From Figure 5.5, it can be seen that, except for one, the players performed better in the second scenario. This was brought about by the shift into fishing from other livelihoods as shown in Figure 5.6. The players noticed that in the first scenario, the only person who was fishing throughout the game was doing better than the rest; towards the end of the first scenario, other tried to follow suit but it was too late; and so during the second scenario, many shifted to fishing. The issue that becomes evident was the sustainability of fishing. Comparing the fish stock for the first and second scenario, as shown in Figure 5.7, the fish stock in the first scenario (Figure 5.7a) was increasing when there was only 1 or 2 people doing it for the most part of the game. But by the second scenario (Figure 5.7b), there was significant decline in the fish stock after only 6 steps. There was also the number of livelihoods practiced by the players in which it decreased from an average of 6.67 different livelihoods per round in the first scenario to an average of 5 on the second scenario. The ability of the migrants to decide and strategize their livelihood activities based on the information available to them, such as memories of past experiences, either of themselves or of others, has a significant impact on their livelihood strategies and eventually on their livelihoods and the resources.

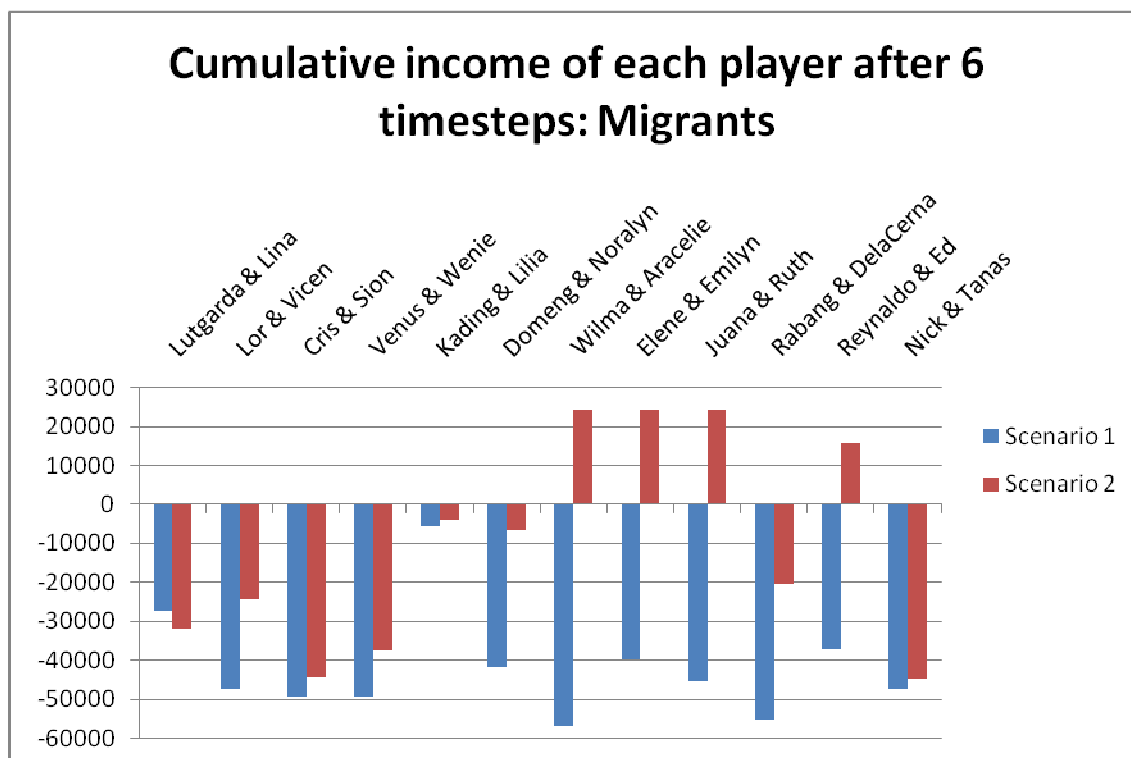


Figure 5. 5 The cumulative net income of the each migrant player/team for scenarios 1 and 2

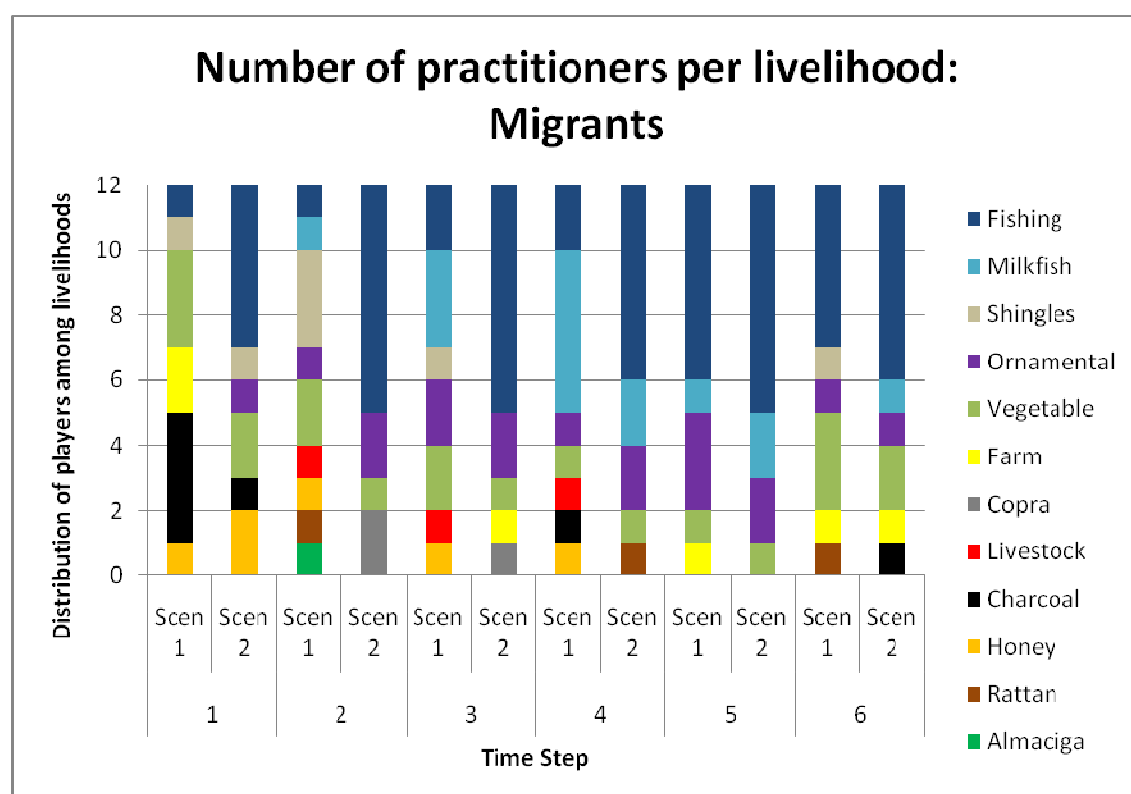
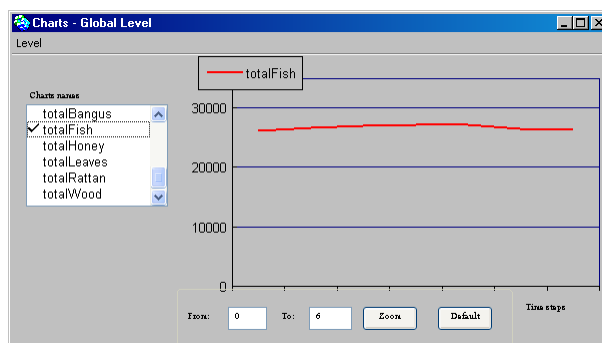
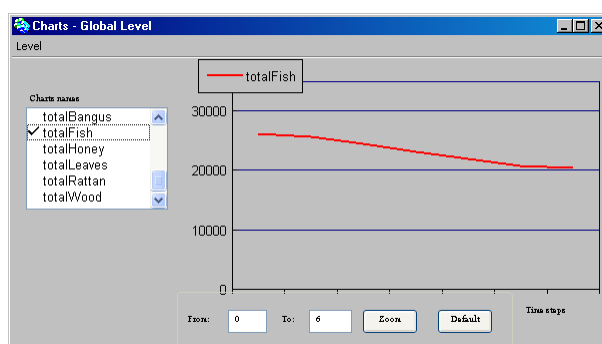


Figure 5. 6 The number of migrant practitioners per livelihood in scenarios 1 and 2



(a)



(b)

Figure 5.7 Total fish units remaining in the environment after 6 time steps for (a) Scenario 1; and (b) Scenario 2

5.1.3. Computer simulation

The computer simulation was introduced in the Water Resource Management Planning and Negotiation (WRMPN) workshop with the objective of establishing the linkage between the livelihood mini-projects of the community and need for establishing and managing a sustainable water resource system. This time, the computer simulation used real data about the three villages, such as population and land-use map of the three villages. Also, in the simulation, the agents were able to practice more than one livelihood at a time and the agents were grouped into households. The computer simulation had four scenarios based on two factors, one dealt with the individual's ability to choose livelihoods based on past experiences and the other was about the implementation of the Environmentally Critical Areas Network (ECAN) zones in the three villages. Originally, several scenarios were envisioned to be

simulated using the computer simulation, however, due to time and financial constraints, The main indicators used to analyze the scenarios were the inventory on the resources (example in Figure 5.8), the number of practitioners of each livelihood (example in Figure 5.9) and the average cumulative net income of the households: one for the migrants (Figure 5.10) and one for the Bataks (Figure 5.11). The simulation for each scenario was run for 120 time steps or the equivalent of 10 years. The charts presented in this document are the average of 20 repetitions for each scenario (the graphs showing the standard deviations are shown in Appendix C). From the scenario results the following general observations were made:

- 1) It can be seen on Figure 5.8, with the current practices and pricing of NTFPs, gathering and selling these raw materials as a sole source of income, which was the case of the Bataks, was not practical as the net income generated was not enough to meet the living costs of the locals. There were more practical options for livelihood wherein they have potential to earn beyond the average cost of living, such as ornamental and vegetable gardening. Unfortunately, these livelihoods would still be problematic for the Bataks because, like the same way with NTFPs, they have to contend with obstacles such as transportation and marketing. This emphasizes the need of the Bataks to be introduced to alternative livelihoods that are appropriate or acceptable to them in terms of their culture as well as social situation and geographical location.
- 2) The agents in the simulation were programmed to change livelihood based on preferences. If they had a low or negative income from a certain livelihood, the preference on that livelihood is decreased. The graph in Figure 5.9 shows that those who switched to vegetable gardening preferred to stay in that livelihood than change to something else. Furthermore, this shift in livelihoods has an overall positive effect on resources stocks such as almaciga resin (Figure 5.8) as the pressure on the limited resources is reduced. Assuming that the market for vegetable and ornamental plants gardening is perfect and the livelihood itself is sustainable,

they have the potential of being stable sources of income because they can be done throughout the year. In reality however, the main obstacle is the sustainability of these livelihoods because they require a stable source of water. Also for ornamental plants, the market was limited to a small number of regular clients and buyers that pass by the road where the products were usually sold, although some sell them in market places in nearby villages or in the city proper.

- 3) Better management of information between locals (availability/access) and within an individual (memory/storage/records) would help them make more informed decisions in their livelihood practices, which could lead to better income. It can be seen from Figure 5.10 that if the agents were able to remember their income from their livelihoods, thus changing their preferences and deciding accordingly, they were able to significantly increase their net income to meet and even earn above the average monthly expenses. But this factor is dependent on the available livelihood choices. As we can see in Figure 5.11, the Bataks had no other choice except for those livelihoods that they already had, i.e. they do not have the same livelihood opportunities as the migrants.

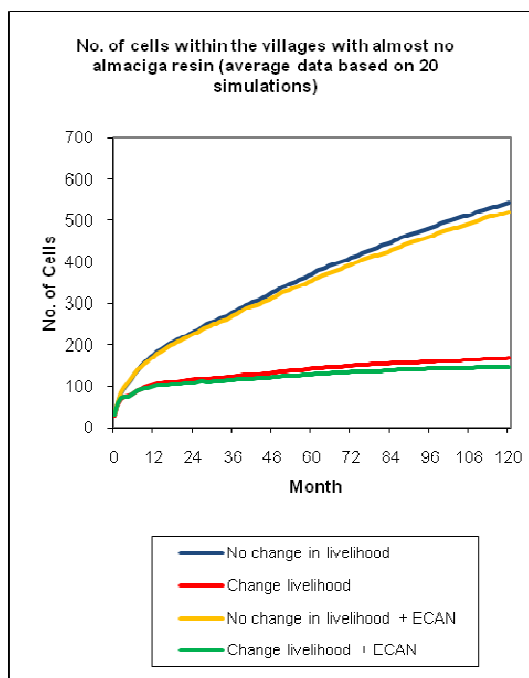


Figure 5. 8 Inventory of areas or cells in the three villages with almost no almaciga resin (1 Cell = 4 ha)

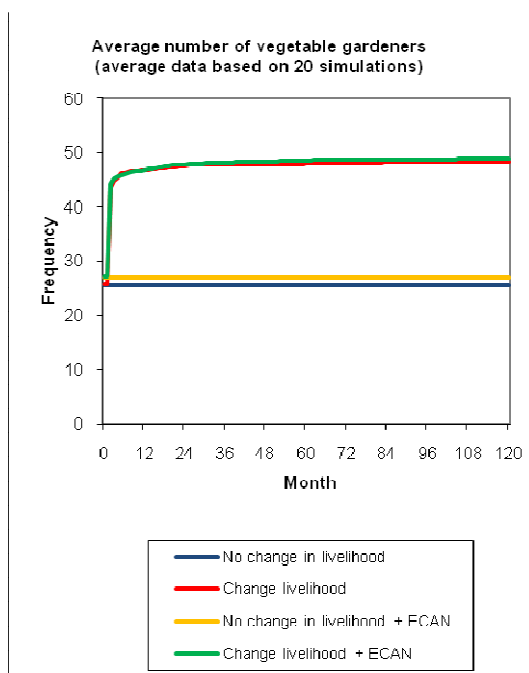


Figure 5. 9 Average number of vegetable gardeners

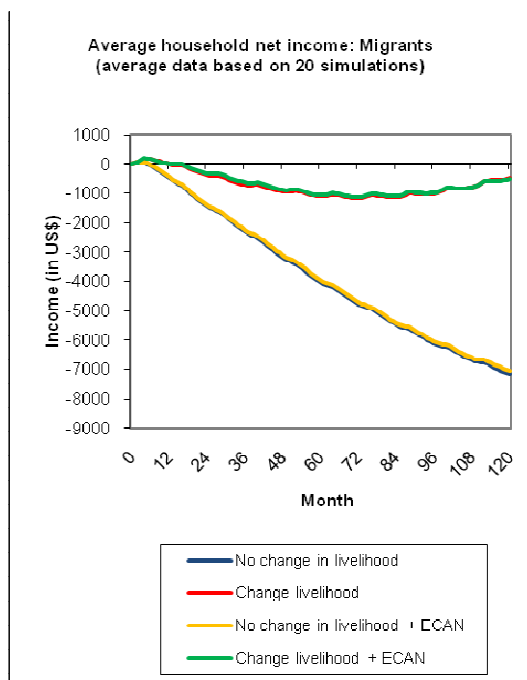


Figure 5. 10 Average household cumulative net income of Migrants

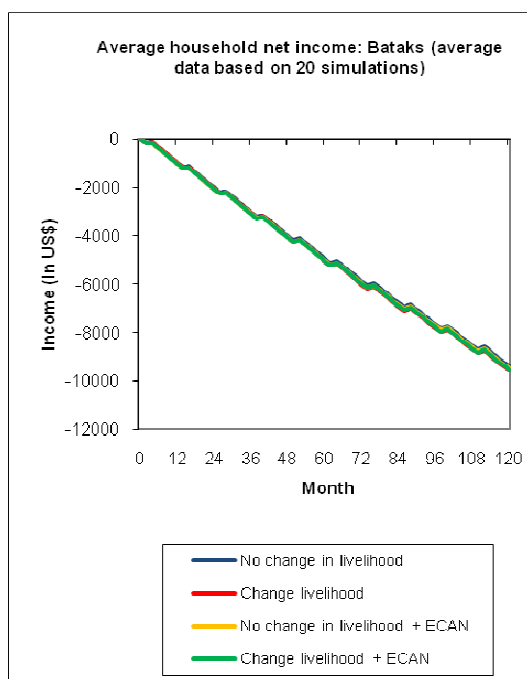


Figure 5. 11 Average household cumulative net income of Bataks

On the effects of ECAN zoning, the main issue was that there was insufficient data available to derive conclusive or reliable results. The accuracy of the ECAN zones depicted in the simulation environment cannot be ascertained. Despite repeated requests for data from the Palawan Council for

Sustainable Development (PCSD), I was informed that the ECAN zones within the three villages had not been identified and that no validation process had taken place at that moment. Moreover, the rules for access and use were vague, without any specific conditions for extraction, such as a specific list of permitted activities and limitations to these activities. For example, how does one consider an extraction activity to be for household or cultural purposes, as opposed to being for a commercial purpose? Rather than create a false impression about the effects of ECAN based on inaccurate and vague information, I thought it was best to qualify the results of the simulation with the stakeholders wherein I stated that the results of the simulations with ECAN were inconclusive at best and that more data and information need to be gathered to make reliable inferences. One may ask why present it in the first place if it were inaccurate or inconclusive? Since the ECAN zoning was one of the critical issues that was of interest to the stakeholders and LPF researchers, the purpose of presenting the ECAN scenarios was to show that there was effort put into trying to address the issue within the process, rather than just completely ignoring the issue altogether.

These general observations were presented to the stakeholders to validate if they were correct or in agreement to what they have perceived in the presentation and comparison of results. They agreed to these observations and it was at this point that the connection between the importance of the model and the workshop was made, i.e. one of the solutions to the dilemma between natural resource and livelihood sustainability is to strengthen the capacity of the locals to engage in high-potential alternative livelihoods, which in turn will reduce pressure on the remaining natural resources. Prior to the WRMPN workshop, having been inspired and supported by the findings from the market studies of LPF as well as that of the RPG, the TWGs have been organizing several livelihood projects on ornamental gardening and vegetable gardening with focus on off-season produce that command higher prices. In both cases, water was one of the important resources that need to be made available and sustained to make the livelihoods viable and, therefore, it should be planned, agreed upon and carried out with the cooperation of all the stakeholders.

5.2. Organizational learning: impact of LPF and ComMod on the action arena

Prior to the LPF project, it was often the case that the different non-government (NGOs) and government organizations (GOs), and even among the different units of the local government (LGUs), that there was lack of coordination among each other, from information dissemination to project implementation. There have been cases wherein an organization was unaware of the actions or activities of other organizations. Also, projects of GOs and/or NGOs with the community were normally implemented together with a People's Organization (POs), which is composed of some community members, with the support of the village council. Usually, the fruits of these projects were only limited to the members of the POs involved and not the entire community, such as capacity-building exercises, information dissemination, livelihood programs and financial and/or material support. The network for communication between the mediating organizations and the community was often confusing and limited Figure 5.12a²³. The main objective of the LPF project, therefore, was to improve the communication among different stakeholders and, thus, moving closer to a more sustainable ENR that supports the community's livelihood. To attain this, the project had to affect different levels of ENR and livelihood management of the three villages, at the grassroots level with the actions of the community (operational) and at the level of policy formulation (collective choice). To this end, the LPF project assisted in organizing two crucial groups that brought the different stakeholders in closer contact: first, the Provincial Steering Committee (PrSC) served as the forum for different stakeholders to formulate and discuss potential policies that would support livelihoods while sustaining the environment and natural resources and eventually influence policy-making itself within the province; and, second, the Technical Working Groups (TWGs) that directly worked with the community in identifying, planning and implementing livelihood and environment and natural resources management (ENRM) programs for the community. Advantages may be seen with bringing in these groups into the playing field (action arena):

²³ Figure 5.12 is my interpretation of the communication and interaction network among the stakeholders as a result of my immersion into the process. This figure had not been validated as of this time and I do not have the necessary data, information and tools to do so. Also, Figure 5.12b is an expanded version of Figure 4.1 presented in Chapter 4.

first, information and efforts may be coordinated through the PrSC and TWG, such that other organizations may avoid redundant actions, support existing efforts or create new ones based on the information collected from other stakeholders; second, linkages may be made clearer for the stakeholders, especially the communities, as well as new linkages created because stakeholders that do not normally cross paths were now brought together through the and, in effect, may expand their networks by using the networks of the other members of the group.

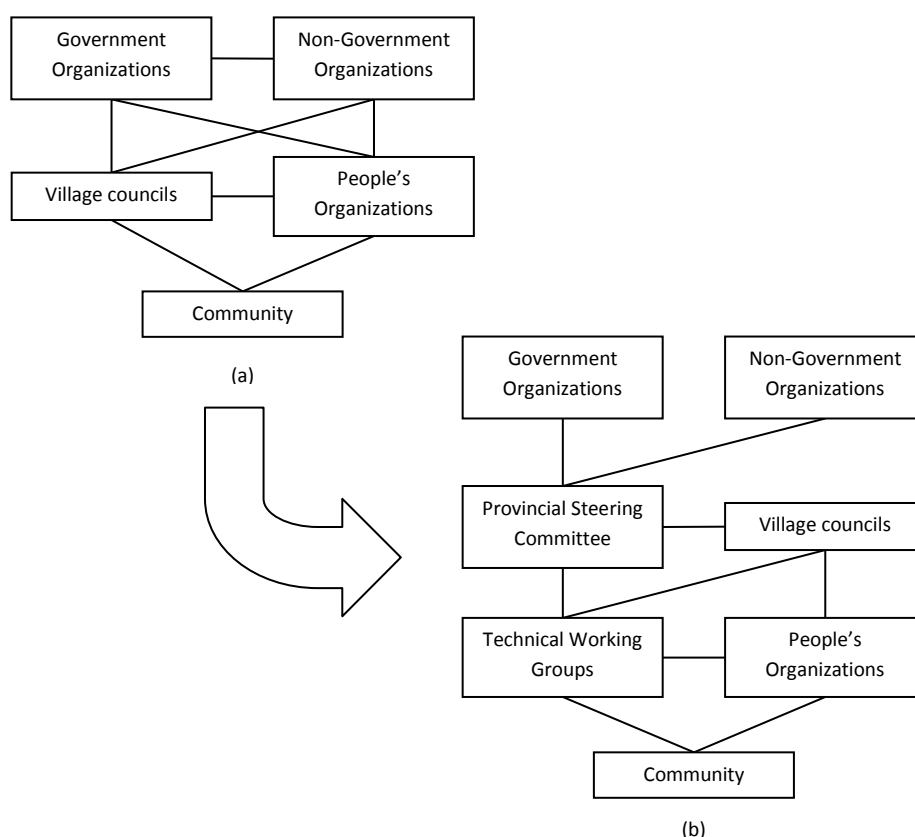


Figure 5. 12 Communication network between mediating organizations and the community (a) before and (b) during LPF implementation

In support of these actions, the LPF conducted various capacity-building programs for the TWGs, such as visioning, organizational management and project planning and implementation. Also, regular meetings and workshops were conducted involving the PrSC, TWGs and the community. It was

in this context that the Companion Modelling (ComMod) was implemented; this became one of the venues to which different stakeholders were exposed to each other through multi-stakeholder exercises and to environments or situations that promote or facilitate collective learning through active participation in the modelling process. Because collective learning is one of the pillars of the ComMod approach, it is necessary to determine if learning occurred, what was learned in the process, who learned it, how it was learned and to what extent, and what was its impact to the system under study.

“Learning concepts applied to whole social entities, can be found mainly in work on organizational learning wherein such concepts emphasize the development of shared meanings and practices that characterize the social entity as a whole (Pahl-Wostl et al., 2007).” We can view the ENRM and livelihood systems of the three villages as a whole body of social entities, and processes that contribute or support learning in this group or its subset, such as participants in a ComMod process, could be analyzed through the perspective of organizational learning. From this perspective, we can picture the ENRM system as being analogous to an organization with the stakeholders as its members and the natural resources are one of the resources needed to sustain itself. The individual members of this organization may change, e.g. migration, or they may take on new roles, such as when persons holding formal positions are replaced, but the organization itself remains intact. The livelihoods are the means to make use of these resources for the survival of its members. The institutions or rules-in-use for livelihood and ENRM are the controls to maintain the organization as a whole and sustain the available resources for the future. In order for this organization to survive, it has to be able to learn to adapt to the changes of the natural resources at any given time, including surprises, such as calamities, and long term trends, such as dwindling resources. In other words, the stakeholders have to undergo a process of organizational learning. Although it would be extremely difficult to engage each individual in this group to a ComMod process, it is through its representative members, i.e. key stakeholder representatives, that organizational learning could be initiated. At this point, I would like to bring into attention the ongoing debate on the concept of social learning. Reed et al. (2010) raised an issue on

the misconception on the term social learning that is propagating in many researches and projects, which tends to limit the understanding and use of social learning, in general, and reduces the capacity to analyze processes associated to it. One of the points raised, which is also significant for ComMod and the discussion below, is that it is important to make the distinction between the concept of social learning and the methods or processes that could promote or support social learning, with the latter not being able to guarantee that social learning will actually occur (Reed et al., 2010). For example, participatory processes may promote or facilitate social learning, but it does not guarantee that social learning will take place. Moreover, there are cases wherein non-participatory processes lead to social learning. This distinction between the concept and methods would allow for a better understanding of processes for social learning and a more critical evaluation their outcomes (*ibid.*). Social learning was derived from organizational learning (Etienne, 2011) and I would like to raise the same distinction for ComMod in the context of organizational learning. The ComMod approach could support organizational or social learning, but it cannot guarantee that such processes will occur within the ComMod environment; it is based on this concept that the ComMod process is examined from the perspective of organizational learning. I now recall what Huber (1991) proposed as four processes or constructs that influence or support organizational learning, namely, knowledge acquisition, information distribution, information interpretation and organizational memory. Below I present how ComMod is able to contribute to each of these constructs and provide examples from the ComMod experience in Palawan, Philippines.

In order to gain a better understanding on how the lessons from the ComMod processes translate into the action arena, i.e. how these lessons can impact the actors (stakeholders) and the action situation, I will classify the lessons according to the levels of analysis provided by the IAD framework, mainly on the operational level, where resource appropriation occurs, and the collective-choice level, where rules for the operational level are discussed and made. By making this distinction, it

would be possible to relate these lessons from the ComMod process to the evolution of the action arena in this case study.

5.2.1. *Knowledge acquisition*

It is the process by which knowledge is acquired or obtained. The process of participatory model-building, the essence of ComMod, may employ different methods of acquiring knowledge and information, such as review of literature, baseline studies, interviews and FGDs to construct the model. What is significant in ComMod is the cycle for the construction of the conceptual model using the acquired information and knowledge, and its validation through participatory simulation, e.g. RPGs and simulation. In this case, an RPG or simulation becomes in itself a virtual laboratory through which the system under study can be observed in a controlled environment and therefore allow knowledge or information, not acquired through typical methods, to be revealed. From the previous section on the MAS model for Palawan, it can be seen how the MAS model, specifically the artefacts used to operationalize the model, namely, RPG1, RPG2 and the computer simulation, as well as the discussions that followed afterwards, was able to uncover knowledge and information about the stakeholders, their behaviours, strategies and interrelationships with each other and their environment, as well information about the dynamics of the system, which would have been difficult to determine or identify using traditional data gathering methods, such as literature reviews, surveys and interviews.

5.2.2. *Information dissemination*

It is the process by which knowledge and information is transferred or shared to the other members of the organizations, thereby allowing new knowledge to emerge or gain a broader understanding of the organization or system. In ComMod, since many of the activities involve many stakeholders of different types, forums in which information and knowledge are shared among other stakeholders become vehicles to transfer knowledge, both individual and collective. This knowledge may refer to indigenous knowledge in sustaining resources, best practices for livelihood, information about market prices of

goods, information about the state and dynamics of the environment and natural resources, information about productive alternative livelihoods, information about risks, knowledge and information about existing and pending policies, rules and strategies, etc. Moreover, the use of tools, such as RPGs and simulation, make it possible to synthesize different types of information and knowledge into digestible forms for the stakeholders. Examples of this process in the field site are the following:

- a. At the operational level, the FGDs, having participants with different livelihood backgrounds, was a venue to which they were able to learn from each other about the particulars of a livelihood, such as the required equipment, associated costs, potential returns and seasonality. Much of the information discussed during the FGDs was privy to only those who practice them since these were usually discussed only within certain social contexts such as belonging to specific livelihood groups, e.g. fishermen's organization, or belonging to a circle of friends or family. The TWG appreciated the importance of the information and, thus, requested the data from the ComMod team and then used it in their livelihood planning activities. Since then, they have planned for livelihood programs in vegetable and ornamental plants gardening.
- b. At the operational level, the observed interactions and discussions from RPG1 and RPG2 emphasized the dependency of the Bataks and the migrants in marketing NTFPs. Migrants provided the capital for NTFP gathering activities of the Bataks and were obliged to sell the NTFPs to the person who had provided the capital. But, unlike in RPG1 and RPG2, the NTFPs were often bought at prices very much lower than the prevailing price. Mediating organizations and some migrants have acknowledged this situation and have proposed several options in order to address the problem, such as creating a cooperative that would purchase the Bataks' goods at fair prices. However, since the returns of NTFP-gathering were quite meager compared to their actual needs, as revealed by the MAS model and as attested by the Bataks themselves, at

the collective choice level they have also asked the mediating organizations during the Water Resource Management Planning and Negotiation (WRMPN) workshop to help them determine alternative livelihood activities which were appropriate and acceptable for their community. The mediating organizations since then promised the Bataks that they will respond to this need soon.

- c. At the operational level, as a result of the ComMod process, they said that they have influenced other people, such as their relatives, friends and neighbours, to also practice the same or similar livelihood activities that they have learned about through the process.

5.2.3. *Information interpretation*

It is the process by which distributed information is analyzed in a common or shared context. ComMod strives to develop a shared model among the stakeholders wherein the different perspectives of the stakeholders are considered and are taken into account. The use of shared models in ComMod allows information from diverse fields to be compiled and analyzed simultaneously in a coherent manner. For example, MAS models are able to depict the linkages and interrelationships among the different elements of reality and can be analyzed from different stakeholder points of views or perspectives through the use of stakeholder-relevant indicators. In the Palawan ComMod:

- a. At the operational level, the stakeholders were able to use what they have learned from the RPGs in order to strategize their livelihood choices in the succeeding iterations of the game. Moreover, during the CP evaluation some of the respondents said that they have begun practicing other livelihood activities based on these games.
- b. At the operational and collective choice levels, the stakeholders have begun to understand the effects of their livelihoods and their decisions in livelihoods, as well as the rules of access and use of resources and have linked them to the state and

dynamics of their resources. This was an indication of systems thinking among stakeholders (Senge, 1990) such that they now seek to visualize their future through the interrelationships of these factors. This was revealed in the diversity of the scenarios and the indicators (to analyze the scenarios) identified by the stakeholders during the RPG2 and scenario-building workshop, with 15 unique responses to 8 different aspects of ENR and livelihood management (the list of scenarios identified by stakeholders may be found in Appendix B.13).

- c. Corollary to the previous statement, the stakeholders have realized the urgency to embark in alternative sources for livelihoods. The villagers have started new livelihood programs for their communities, i.e. off-season vegetable and ornamental plants cultivation, and the major stakeholders realized the need to establish mechanisms to sustain these livelihood programs. The lessons learned have transcended from the operational level to collective choice, such that the 20 participants of the second day of the WRMPN workshop collectively planned for water distribution systems for each of the three villages in which they identified an action plan for each of the villages. These actions plans contained a list of tasks, timetables and the person or people responsible for the tasks.
- d. At the collective choice level, the mediating organizations realized the potential of RPG and simulation as effective teaching tools for stakeholders as these tools were able to show the linkage between the states of natural resources with livelihood activities across different landscapes. As a result, at least five organizations have requested to be trained in the development and use of these tools so that they can use it in other villages in Palawan, namely PCSD, DENR-PENRO, DENR-CENRO, LGU-City Planning Office and ELAC. Unfortunately, due to time and financial constraints of the project, this plan was not put into fruition.

5.2.4. Organizational memory

It is the repository for the acquired knowledge of the organization, and it can be provided to newcomers entering the organization, even if the original producers of the knowledge are to leave. In ComMod, the model itself and the tools associated with the model, such as RPGs, simulations, GIS and database management systems, maps and charts, become the repository for different types of knowledge. In the case of the MAS model in Palawan, it contained information about the livelihood activities, maps of various themes (e.g. political boundaries, land-use, topography, etc.), and the rules of resource access and use. This model could then be used to transfer the knowledge acquired in the ComMod process to new stakeholders entering the ENR and livelihood management system, such as the Barangay Development Council (BDC). This transfer can work for both the operational level (livelihood & ENRM actions) and collective choice level (policy planning and negotiation).

With this new body knowledge and regular exposures to different stakeholders in LPF multi-stakeholder activities, changes in attitudes have also been observed among the community members wherein they have increased confidence to participate in multi-stakeholder discussions well as strengthened belief that their participation is beneficial to the process. These observations were later validated in the evaluation for LPF and ComMod, which will be discussed in the succeeding section. In Table 5.1 I summarize the effects or changes brought about by LPF, which includes ComMod, to the different action arenas identified in Chapter 4.

Table 5. 1 Contribution of ComMod to the changes observed in the action arena

		IAD levels of analysis	
		Collective Choice (Policy design, planning and negotiation for ENRM)	Operational (ENR and livelihood management)
5	Action	Stakeholders were provided a space	The lessons from ComMod contribute

	situation	to participate in ENR & livelihood management negotiations; improved communication and dissemination of knowledge and information; for actors, new knowledge, attitudes and behaviours (individual and collective)	to the Technical Working Groups' planning and implementation of their ENR and livelihood programs for the community; improved communication and dissemination of knowledge and information; more sustainable approaches to livelihood actions/operations; for actors, new knowledge, attitudes and behaviours (individual and collective)
	Attributes of the community	Expanded information / communications network; Increased confidence in participating in collective discussions	Expanded information / communications network through involvement of different community members in the ComMod process
	Patterns of interactions	Improved communication for collective negotiation and planning in negotiation forums such as PrSC and TWG New strategies in ENRM & livelihood planning	New strategies in ENRM & livelihood actions; stakeholder participants sharing the lessons to other members of their community
	Outcomes	Endorsement of the use of MAS model in ENRM & livelihood planning;	Better understanding of their ENR and livelihood system; increased

		increased interest and participation in collective learning and discussion forums	initiative to engage in other livelihood activities other than what they have been used to
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5.3. Companion Modelling in a development project

5.3.1. LPF-ComMod interaction

In the LPF project it was believed that, aside from capacity-building, to achieve sustainable ENRM it is crucial that the stakeholders are involved equitably in the planning and implementation processes; to this end it must address the issues on communication and coordination among the stakeholders. The LPF project had a two-fold strategy in addressing the deficiencies in communication and coordination of the stakeholders in the system. The first focus of LPF project was to increase the technical capacity and the knowledge of the stakeholders, most especially the local community, so that they would have the initiative, confidence and knowledge to participate in discussions relating to ENRM and livelihood with different stakeholders, as well as address their local issues and concerns at the community level. This in turn would increase the resources they bring into their practices and decision-making processes for livelihood and ENRM. The second focus was that of building negotiation forums, i.e. the Provincial Steering Committee (PrSC) and the Technical Working Groups (TWGs), in order to facilitate the process of collaboration.

The LPF project did not start from scratch in its efforts to capacitate the stakeholders. A previous development effort, the Adaptive Collaborative (ACM) project (Hartanto et al., 2003) of the Center for International Forestry Research (CIFOR), was present in the area until 2002 and worked with the thirteen groups of stakeholders of the CBFM, which included the STCMPC. In this study, the interaction between ACM and LPF and between LPF and ComMod through shared actors in these processes demonstrate how past efforts could be used as foundations for future research and development endeavours (Figure 5.13).

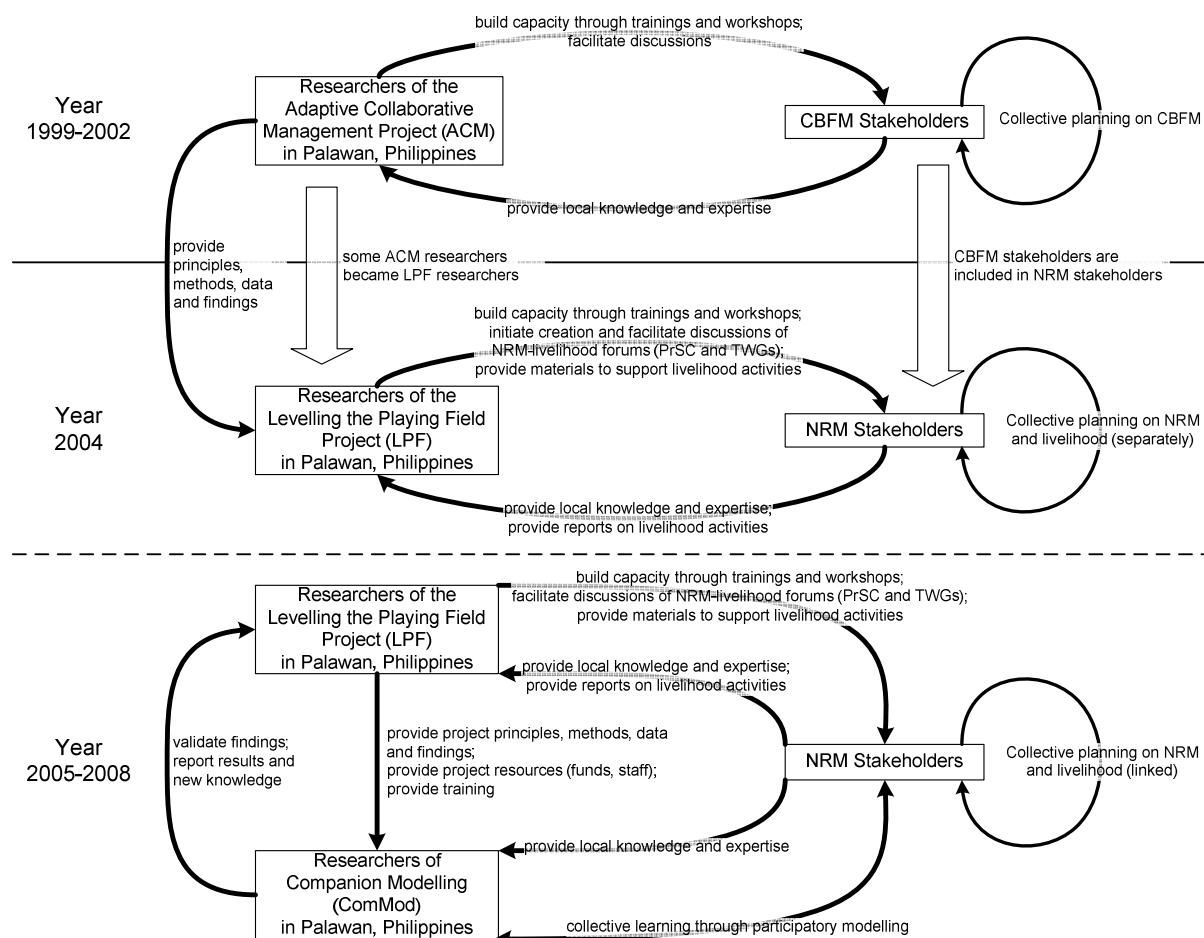


Figure 5. 13 Stakeholder-researcher interactions in the implementation of LPF and ComMod at the study site

The stakeholder network established during the ACM project was tapped to participate in the efforts of the LPF project, bringing with them their knowledge and experiences from the ACM project. Some researchers from the ACM project also worked for the LPF project. The reports containing the findings and impacts of the ACM project were revisited and used as a guide in the future activities of the LPF project. Building upon the results of the ACM project, the LPF team sought to reinforce and expand the scope of ENRM in terms of the area, which now includes three landscapes and not only the CBFM, and, consequently, the types of natural resources and the types of stakeholders involved in these three landscapes and its resources. All in all, there were about twelve GOs and five NGOs together with the three villages that were involved with the LPF project. Capacity-building activities for the local community were conducted, such as training on alternative livelihood activities and organizational

management. Later on, during the launch of micro-projects or livelihood programs which were identified, discussed, planned and implemented by the TWGs themselves with the facilitation of the LPF team, the LPF project further supported these efforts by means of providing materials, such as plastic bags and vegetable and plant materials, to help them get started. To support the efforts of the project in terms of capacity-building and improving communication and coordination among stakeholders, the LPF project implemented a Companion Modelling (ComMod) process, which involved the major stakeholders. This process was meant to enhance and expand the understanding of the stakeholders about their ENRM and livelihood and then establishing the linkage between these two systems. In doing so, it was hoped that a sustainable balance between ENRM and livelihood would be actively sought and found through discussion and negotiation among the stakeholders. The ComMod process, in return, received support from the LPF project by means of additional capacity-building activities for the ComMod team and being furnished with the findings and results of the baseline studies, aside from manpower and financial support.

5.3.2. *Added value of ComMod*

To examine the impact of the ComMod and LPF in the study site in more detail let me present Table 5.2 in which I summarize the observed changes of the two processes, structured according to the IAD framework. In this table, I classify the impacts according to the IAD variables, and then further sub-classified them according to the levels of analysis, namely, constitutional choice, collective choice and operational levels. This table also classifies the results based on the levels of analysis of institutions (or rules-in-use). From Table 5.2 we can see that the results of the ComMod process were there to support the LPF initiatives both in the collective-choice and operational levels, as to be expected. With this kind of synergy between LPF and ComMod, it might be possible that the stakeholders themselves may not be able to differentiate the ComMod process and its impacts from the rest of the LPF activities. To

verify this, we go deeper and compare how the stakeholders perceived LPF vis-à-vis ComMod using the evaluative tools of ComMod and LPF.

Table 5. 2 Contributions of the LPF project and ComMod to the changes in the action arena

	LPF	ComMod
Action situation	<p><i>Constitutional Choice:</i></p> <p>Inclusion of new negotiation forums into the ENRM and livelihood policy-planning process</p> <p><i>Collective Choice:</i></p> <p>Improved communication & negotiation for ENRM & Livelihood planning through capacity-building and negotiation forums</p> <p><i>Operational:</i></p> <p>Enhanced capacity of the community for engaging in livelihoods and ENRM activities</p>	<p><i>Collective Choice:</i></p> <p>Linked livelihood & ENR management planning</p> <p><i>Operational:</i></p> <p>Sustainable livelihood actions/operations</p> <p><i>Collective choice and Operational:</i></p> <p>Platform for ENR & Livelihood learning and management discussion (MAS model)</p>
Actors	<p><i>Constitutional Choice:</i></p> <p>New negotiation forums: Provincial Steering Committee and Technical Working Groups</p> <p><i>Collective Choice and Operational choice:</i></p>	<p><i>Collective Choice and Operational choice:</i></p> <p>Increased confidence and capability in engaging in multi-stakeholder discussions and planning, especially for community members</p>

	Increased confidence and capability in engaging in multi-stakeholder discussions and planning, especially for community members	
Patterns of interactions	<p><i>Collective choice:</i></p> <p>Expanded network for knowledge acquisition and dissemination</p> <p>Water resource management planning and negotiation workshop</p> <p><i>Operational:</i></p> <p>Expanded network for knowledge acquisition and dissemination</p> <p>Collective discussions (mission-vision)</p> <p>Trainings in livelihood, organizational management and planning</p>	<p><i>Collective choice:</i></p> <p>Scenario-building</p> <p>Water resource management planning and negotiation workshop</p> <p><i>Operational:</i></p> <p>Expanded network for knowledge acquisition and dissemination through collective discussions/workshops using role playing games and computer simulation</p>
Evaluative criteria	<p><i>Collective choice and Operational:</i></p> <p>Accomplishments based on the LPF log-frame (using Criteria & Indicators evaluation based on three principles, namely, empowerment, environmental</p>	<p><i>Collective choice and Operational:</i></p> <p>Knowledge acquired, change in perceptions, attitudes, behaviours and actions (using workshop evaluations, Canberra Protocol)</p>

	mediation and reinforcement)	
Outcomes	<p><i>Collective choice:</i></p> <p>Water Resource Management Plans of Actions</p> <p><i>Operational:</i></p> <p>Livelihood programs (micro-projects); increased confidence of stakeholders, especially community members, to participate in multi-stakeholder negotiations;</p>	<p><i>Collective choice:</i></p> <p>Endorsement of the use of MAS model in ENRM & livelihood planning;</p> <p>Contributed to the Water Resource Management Plans of Actions</p> <p><i>Operational:</i></p> <p>New knowledge: better understanding of the ENR and livelihood system through the MAS model</p> <p>New attitudes and behaviours:</p> <ul style="list-style-type: none"> - New livelihood and ENRM strategies (individual & community) - Increased confidence in collective discussions and livelihood choices - Continued participation in the ComMod process

Now, I look into the results of the CP wherein in-depth one-on-one interviews were conducted by an external evaluator. The interviewees consisted of 12 stakeholders from the villages, including 3 members of the Batak tribe, 12 representatives from the meditating organizations, and me, the researcher-modeller tasked to implement the ComMod approach for the LPF project. From the

interviews, the objectives and lessons from the ComMod process were elucidated from the point of view of the interviewees, which were then compiled in a table (Table 5.3) and then compared. From the perspective of the modeller-researcher, the initial and main objective of the ComMod process was not specific to livelihood or to NRM, but was in line with the principles of the ComMod approach, that is to be able to build a model that takes into account the different points of views of the stakeholder involved and offer an alternative platform that could support discussion and, possibly, negotiation among stakeholders on NRM issues. It was only in the implementation of the approach that the focus and objectives were identified by the stakeholders, which were then reflected in the modeller-researcher's objectives for specific modelling activities and in the perceived objectives of the stakeholders of the ComMod process. The stakeholders' perceived objectives and lessons from ComMod were in agreement with the modeller-researcher's, except for the mediating organizations who did not perceive coordination of activities or development of a water management plan as being part of the objectives of ComMod despite their participation in activities related to these aspects. Moreover, they perceived the RPG and computer simulation to be more of teaching tools for the villagers on how to manage natural resources rather than a tool for mutual understanding and platform for discussion.

Table 5. 3 The objectives of ComMod and its lessons through different points-of-views. (Numbers in parentheses indicate the number of concrete responses received from the CP evaluation of 12 villagers and 12 representatives from mediating organizations.)

	Modeller-researcher	Villagers	Mediating organizations
Objectives	General: - Develop an alternative to very formal negotiation such that the stakeholders are able to talk	- Improve livelihood (1) - Protect/preserve resources (3) - Sharpen minds (2)	- Improve livelihood (1) - Sustainability of resources (1)

	<p>and negotiate</p> <ul style="list-style-type: none"> - Have a representation of all <p>Specific to activity:</p> <p><i>Role Playing Games</i></p> <ul style="list-style-type: none"> - Discuss and learn about livelihood activities and strategies with the stakeholders - Discuss, learn and establish NRM scenarios with stakeholders - Evaluate an activity <p><i>Water Resource Management Planning and Negotiation (WRMPN) workshop</i></p> <ul style="list-style-type: none"> - Link the RPG with the computer simulation - Understand the effect of ECAN - Learn to make a plan together - Establish agreements within communities and with the mediating organizations 	<ul style="list-style-type: none"> - Coordination of activities (1) - Water management plan (1) 	<ul style="list-style-type: none"> - Evaluation (1)
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Lessons	<p>Specific to activity:</p> <p><i>Introduction</i></p> <ul style="list-style-type: none"> - Stakeholders had difficulty in understanding the sample simulation model <p><i>Focus Group Discussions</i></p> <ul style="list-style-type: none"> - Learn about each others' livelihoods <p><i>Role Playing Games</i></p> <ul style="list-style-type: none"> - Players tested livelihoods - NGOs and GOs would propose livelihoods in the future <p><i>WRMPN</i></p> <ul style="list-style-type: none"> - The objectives for the workshop were met except for ECAN. The computer simulation wasn't able to show its effect on livelihood and natural resources 	<ul style="list-style-type: none"> - Options for livelihood - Improved interaction among each other - Linkages with agencies - Action plan for water 	<ul style="list-style-type: none"> - Show to the villagers the over-exploitation of resources, i.e. the depletion of resources if there is no shift in livelihood
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The villagers' perceptions on the objectives of LPF, as seen from the Canberra protocol (CP) (summarised in Figure 5.14), were similar to those of ComMod. This was not the case, however, for the mediating organizations where, of the 12 respondents in the CP, only three were able to provide concrete answers, and the construction of charts as in Figure 5.14 was ineffective. It was observed during the CP interviews that those from the mediating organizations showed lack of interest in the processes of LPF and ComMod.

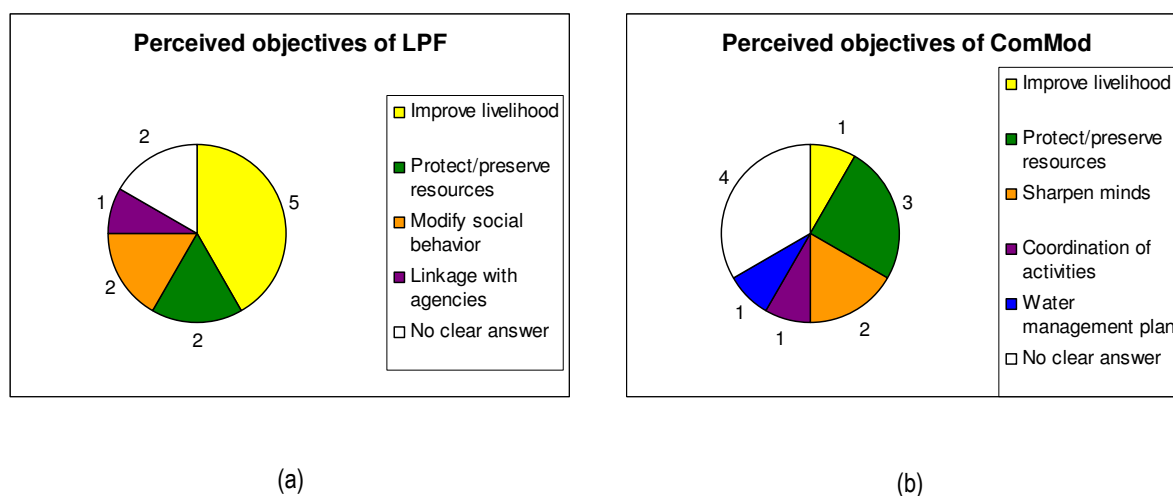


Figure 5. 14 Objectives of the LPF project and ComMod as perceived by 12 Canberra Protocol respondents from the community (note that the aspects that are similar between (a) and (b) are shown in the same color.)

In Figure 5.15, we see the distinction between the lessons learned in the development component of LPF and the ComMod process, as well as the relationships between the lessons in the two processes (as indicated by the use of the same colours for similar aspects between Figures 5.15a and 5.15b). We see that 4 (or 33%) of the respondents thought that the LPF was successful in empowering them, that is, they learned to stand up and voice their opinions. On the other hand, through ComMod, 7 (or 58%) of the respondents learned their livelihood options, i.e. they were able to determine the viability of their livelihoods and thought of alternatives. This was confirmed by the results of the C&I evaluation, in which I was one of the facilitators of the process, wherein the respondents said that the ComMod process was a reminder as well as a guide to the stakeholders to protect their

environment by reducing the pressure on the resources and encouraging them to find alternative livelihood activities, such as vegetable-gardening. Of the three (or 25%) respondents from the mediating organizations who were able to provide concrete insights about LPF and ComMod, they learned from LPF about the livelihood needs of the people and the need for water distribution systems in the villages, and about the right people to help them meet their needs. In short, they learned what the villagers have learned from the process. This indicates that the mediating organizations had little or nothing to learn from the LPF development component and have become uninterested in the process. On the other hand, they found RPGs and computer simulations, rather than ComMod, to be something that was of value, but beyond their ability to do on their own. The RPGs used in the ComMod process, including *CherInq*, were well received by the stakeholders, as they have expressed in many occasions, because they found them to be entertaining and yet very informative and relevant to their situation; thus their participation in such activities have been consistent. This level of interest and participation has allowed them to be more receptive to learning (Ormrod, 1999). They understand that modelling provides an abstraction of the reality, with which the stakeholders can express their points of view. The virtuality of the artefacts facilitates the mediation, alleviating the tensions and simplifying the messages. Moreover, they see its potential for teaching villagers about depletion of resources. Thus they expect to learn from the ComMod process, at least from its tools, to the extent that they have requested further training in the development of RPGs and computer simulations. Evidence from the CP showed that the mediating organizations still had a very strong mindset in which they were the resource managers and the villagers were there to be taught to carry out the management schemes. It further suggests that the mediating organizations view the LPF project as being in direct competition with their work and, thus, may have resentment towards LPF for having the financial capability of performing tasks, such as “teaching” about resource protection and conservation and supporting the development of alternative livelihoods, which they could have been doing had they had the resources. This supports the observation of the CP external evaluator that there was lack of support and lacklustre participation

among the mediating organizations in the LPF project. As for ComMod, the uniqueness of the tools developed in the process, i.e. RPG and computer simulation, makes it more acceptable to the stakeholders, especially to the mediating organizations, since they view it as something new and therefore not in competition with their own method. Approaches that espouse participation beyond consultation, such as in the efforts of LPF and ComMod, may not fit easily with the current management mind set and strategy of the decision-makers – government organizations, as well as the institutional environment within the given action arena.

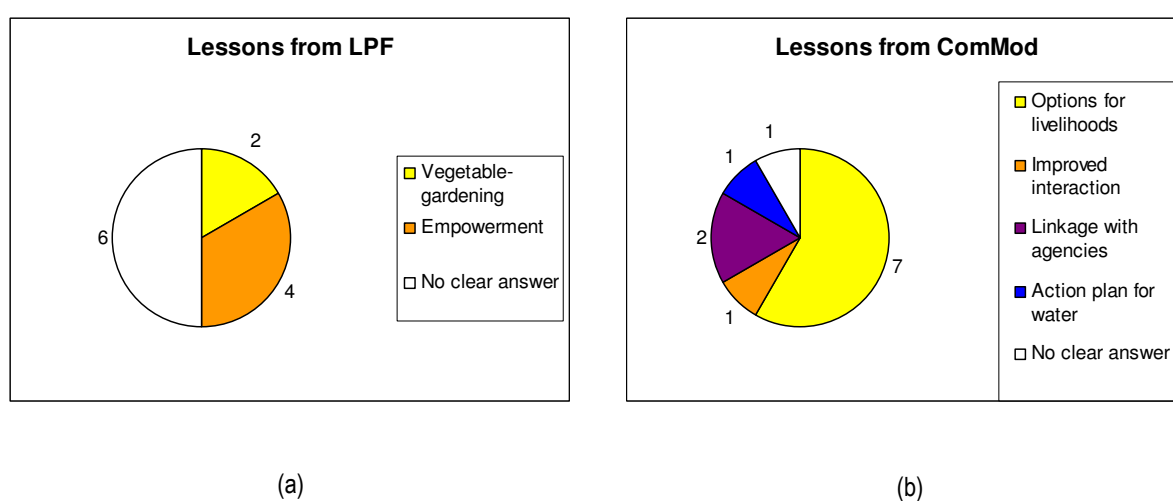


Figure 5. 15 Lessons learned from the LPF project and ComMod by 12 Canberra Protocol respondents from the community (Note that the aspects that are similar between (a) and (b), and that of Figure 5.14 are shown in the same color.)

The concept of deutero-learning of Argyris and Schön (1978) or process learning of Probst and Büchel (1997), wherein organizations learn to recognize the need to learn and the need to set-up environments for learning to occur, supports the LPF objective of “levelling the playing field”. However, in reality, only a portion of the stakeholders have become aware and accepting of the importance of real collaborative management. The concept of collaborative management was not reinforced equally among the different groups of stakeholders in this particular case of ComMod, such that only the villagers have recognised and support collaborative discussion and negotiation of livelihood and NRM

schemes, while the mediating organizations have remained apprehensive to participate in such activities; thus the playing field was still unlevelled. Another possible limiting factor for ComMod is the institutional arrangement present at the site. In the case of Palawan, during the discussion about the use of MAS, RPGs and computer simulations in their NRM planning, the stakeholders pointed out that it was only at the level of the Barangay Development Council (BDC) that NRM planning for the villages may be carried out. The model, now being the organizational memory, was available and was endorsed by the stakeholders, but its use in NRM planning ultimately depends upon the BDC. Since the BDC was yet to be convened at the time of the ComMod process, it is uncertain whether the model will be used in the future.

5.4. What have I learned after undergoing though these processes?

Companion Modelling offers a unique way of collective learning such that stakeholders are exposed to innovative learning environments, e.g. role-playing games. The stakeholders learn about each other and get a better understanding of the system. They also get information from interviews and FGDs, which is not easily available otherwise. The tools produced in the process, e.g. RPG and computer simulation, are not the end products of the process but become part of the process itself, fostering relevant discussion among the stakeholders in an environment that makes them feel that one stakeholder's view is as important as that of the others and at the same time feel relaxed and confident in voicing their opinions. This was especially the case with the migrants in Palawan, when dealing with members of the local government units. The ComMod tools, such as RPGs and computer simulations, gained support from the stakeholders because the model, which was the basis of the process, was technically theirs. In the case of RPGs, the interest of the stakeholders was attracted because they were entertaining and, yet, very informative and useful, thus facilitating the discussions among different types of stakeholders. It also stirred their minds, making think about their current situation and decision-making processes.

ComMod carried out as part of a development project will benefit from the resources of the project and its impacts. At the same time it will also inherit the difficulties experienced and face the same challenges by the project, such as deficiencies on resources or lack of support by stakeholders. Special attention should be given to the understanding of stakeholder behaviour, most especially to the mindsets or mental models of stakeholders that influence their motivation to participate in development processes. An incomplete implementation of the process may perpetuate, or even worse, support mindsets that hinder or prevent learning.

The experience in implementing the ComMod approach for the LPF project emphasises the importance of the evaluation process throughout the approach. Participatory evaluation at different scales, and different times, starting from individual workshops and up to the evaluation of the entire ComMod cycle, encourages the stakeholders to be more critical of their situation and express their views about their situation. In addition, it provides the researchers and stakeholders the ability to analyse and adapt the approach to the changing conditions. Evaluation methods that consider the points of views of both the stakeholders and researchers allow a more holistic approach towards revealing the actual impacts of the process, allowing them to identify causal relationships between the results and the steps of the process. Therefore, there is an added value in developing evaluation methods for ComMod at the beginning of a development project.

The implementation of ComMod with the LPF project did pose a serious challenge to the principles of ComMod itself. The Palawan ComMod trajectory was heavily influenced by the constraints of the LPF project, most especially in the choice for stakeholders to be involved in the process, financial and the time and scheduling constraints. A very good example of this was the Water Resource Management Planning and Negotiation (WRMPN) workshop. The Palawan ComMod, by itself, may or may not have reached the stage of the WRMPN workshop, but because of financial and time constraints, this trajectory was changed. Although this was not in any way intentional nor was it foreseen, this occurrence may have compromised the integrity (underlying principles) of the ComMod

process. The question that comes into mind is that whether or not it is possible to implement the ComMod approach to a research and development project in general? I will attempt to answer this question in the next chapter. Another issue I would also like to raise is on the possible sources of biases in the responses of the stakeholders involved in the process. First is the inclusion of three government representatives in the ComMod team. Although their contributions to the process were invaluable, their presence, and having government positions, may have influenced the responses, behaviours and actions of the stakeholders during the process, such that the stakeholders, especially those from the communities, may have intentionally hidden some aspects of themselves or changed their actions. Second, I may also be a possible source of bias, especially during the monitoring and evaluation processes of ComMod and LPF. In most of these activities, I have been physically present in the venue and may be involved in some way in the process, such as being a facilitator or observer. This could have influenced the responses of the stakeholders. Although I could never prove that these events actually occurred, it is important to take these factors into consideration when determining the ComMod team and their roles in the implementation of the approach in the field.

The institutional analysis and development framework had allowed me to identify, organize, analyze and present the results in a systematic manner and the evaluation tools allowed for pinpointing the possible causalities of the changes due to ComMod and due to LPF in the ENR and livelihood management systems of the three villages under study. By doing so, this has allowed me to link the changes in the different variables of the action arena to the processes of Companion Modelling. Moreover this has given rise to the idea that the ComMod process and research and development project to which it was under, created new, albeit temporary, action arenas linked to the action arena under study. The question now is how do we integrate these tools and lessons into a coherent framework and provide a more systematic and logical way of organizing activities and analyzing the results of a ComMod process implemented in a manner similar to the case presented in this study? This question would be the main focus of the succeeding chapter.

CHAPTER 6

THE COMMOD IMPLEMENTATION AND INSTITUTIONAL ANALYSIS FRAMEWORK

In this chapter I intend to answer the research questions that were raised in the first chapter, namely:

- 1) How can the principles of Institutional Analysis and Development (IAD) framework, Companion Modelling (ComMod) and Multi-Agent Systems (MAS) model be articulated to develop an alternative approach that can support/aid the analysis of multi-stakeholder processes for managing the environment, renewable natural resources and livelihoods?
- 2) How and to what extent can this articulation be applied in the context of multi-stakeholder processes which have been externally initiated such as research studies and development projects wherein problems and objectives may have already been identified?

In order to answer these questions, I will build upon the Palawan ComMod experience in which a MAS model of the environment, natural resources management (ENRM) and livelihood system was collectively developed and used by key stakeholders in a multi-stakeholder setting. The Palawan setting was complex: it involved a wide range of ENRM and livelihood stakeholders including representatives of different government organizations from different administrative hierarchies, non-government organizations with different focus of intervention, and the community members composed of migrants and indigenous peoples; this range of stakeholders provided different points-of-views, attitudes/mindsets and knowledge on environment and natural resources (ENR) and livelihood management; these stakeholders also exhibited different levels of power or influence over the situation or to other stakeholders. The stakeholders were also subject to institutions that were initially intended to

provide space for collaborative natural resource management, but however failed to deliver on its promise. The Palawan ComMod was also a component of a research and development project – Levelling the Playing Field, to which ComMod, together with other project components worked towards improving the communication and coordination among the different stakeholders, in the hope that an equitable space of discussion, negotiation and decision-making, would lead to more sustainable ENRM practices. ComMod, in this case, offered a different approach towards capacity-building in which these various stakeholders were exposed to collective learning environments through the participatory development of a MAS model, and the active and interactive use of the model through role-playing games (RPGs) and computer simulation. In the analysis of the impacts of the Palawan ComMod, the IAD framework was used to organize and guide the analysis process. Drawing upon the lessons and experiences from Palawan ComMod, I strive to build a framework, the ComMod Implementation and Institutional Analysis Framework (CIAF), that exemplify the articulation among MAS, ComMod and IAD. This framework is intended to accompany a ComMod process, from its design, to implementation and to the evaluation or analysis of its impacts. Moreover, in the elucidation of the details of this framework, I present the extent and limitations of the articulations, including the context of ComMod conducted together with a research and development project and attempt to answer the questions that have been raised in the other previous chapters.

6.1. Nested action arenas

An action arena is often part of a larger system of nested action arenas in which adjacent action arenas influence each other (McGinnis, 2011b). In the case of the ComMod process in the LPF project, we can consider the LPF project as an action arena, an interaction space that was created between the stakeholders and the project researchers (the actors) in which development and capacity-building activities (action situation) are worked out among the actors (Figure 6.1). The same could be said about the Palawan ComMod process wherein it was an action arena created between the stakeholders and

the ComMod researchers where the stakeholders and researchers (the actors), participate in a modelling exercise (the action situation) (Figure 6.1). Because ComMod is a component of the LPF project, they are directly linked. Both the LPF and ComMod action arena are also associated with the NRM action arena (Figure 6.1). The lines of influence (designated by double-headed arrows in Figure 6.1) connect the three action arenas. The lines of influence may refer to the resources that flow or shared between two or three of the arenas; these resources may be knowledge and skills (including methods, technology and artefacts), funds, manpower, equipment, social networks. Knowledge flows across action arenas such that this body of knowledge could be shared, verified, validated and its overall quality improved as it moves from one arena to another. The lines of influence may also refer to outcomes from these arenas, such as plans, strategies and decisions, which may impact other action arenas through their common variables, such as the same physical (geographical) environment. The lines of influence may also refer the shared actors, either partly or wholly, among the arenas with the actors bringing with them their internal characteristics such as attitudes, behaviours, mental models and power/influence in the arenas in which they participate; these internal characteristics may hamper or catalyze the flows within and across action arenas. Moreover, changes in the actors' internal characteristics brought about by interactions within one action arena may influence the other action arenas as they shift roles from one action arena to another. This aspect of the actors is very critical, especially to multi-stakeholder action arenas where there may exist a large variation of power or influence across the different types of stakeholders, as well as across the actors within a type of stakeholder. Since different actors would have different levels of power or influence, the internal changes of the "stronger" actors would have greater impact across the action arenas. These internal characteristics may be difficult to detect or even measure because, most of the time, these are exhibited subtly or are intentionally hidden. Attention, nevertheless, should be given to reduce or avoid reinforcing influential mindsets that tend to slow down or block positive flows within and across action arenas. Finally, there is also the case of externalities (shown as an arrow with text box at the bottom of

Figure 6.1) that could potentially introduce drastic changes to the interactions within an action arena as well as the flows across the action arenas, either positively or negatively, such as new research and development projects, new rules and regulations on resource access and use from the upper levels of the legislative hierarchy, and calamities, either natural or man-made. In this case, ComMod is suitable to the ever changing landscape of ENR and livelihood management situations as it has the facility to adapt itself to the current circumstances of the stakeholders.

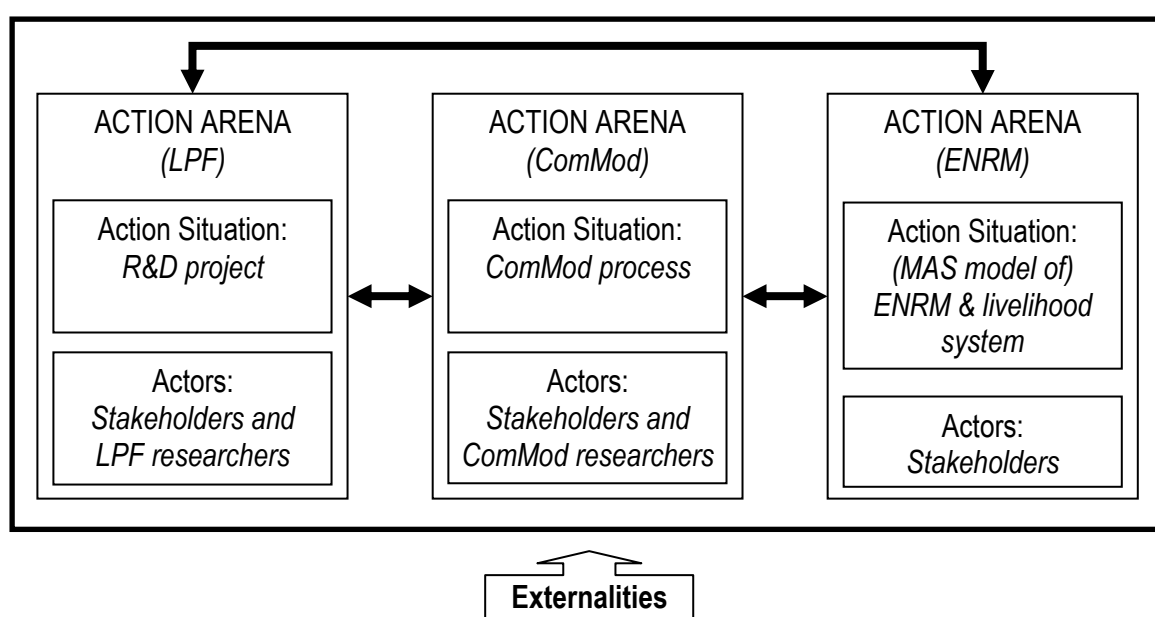


Figure 6. 1 Nested action arenas for R&D projects involving ComMod and MAS models: example of the ComMod in the LPF project

In the succeeding sections, I will examine the temporary action arenas created by the ComMod process and research and development projects vis-à-vis the target ENRM action arena in more detail.

6.2. Modified IAD for ComMod

Before I present the details of CIAF, first I recall the two main concepts used in developing it, namely the IAD framework and the ComMod approach. The IAD framework, visualized in Figure 6.2, identifies and arranges the general variables that are commonly used to describe and analyze interaction spaces among actors, or what is called the action arena. The framework is mainly divided

into two sets of variables. The first half, referring to the action arena itself, contains two variables: the action situation and the actors. The action situation is the structure and context of the interactions, while the actors are those that participate in the action situation. It is from this description of the action arena the analyst applies different theories and models to predict, evaluate and explain the action arena's likely interactions and outcomes. For further analysis of the action arena the second set of variables, known as exogenous variables or factors affecting the action arena, are studied. This set is composed of three variables, namely, the attributes of the physical world, the attributes of the community and the rules-in-use. Studying the exogenous variables involves determining how the action arena is affected when the exogenous variables are changed. In addition, rules-in-use are configured and can be analyzed according to three levels, namely, operational, collective-choice and constitutional levels.

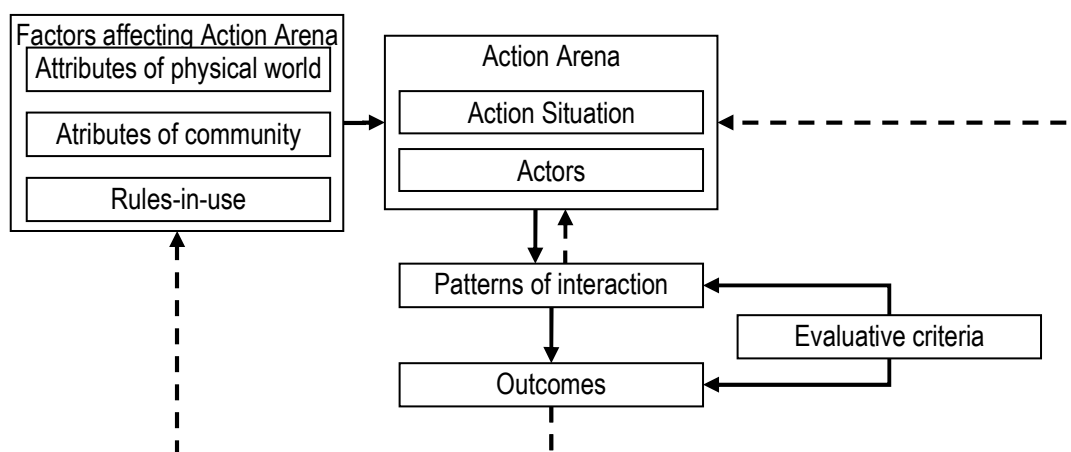


Figure 6. 2 Institutional Analysis and Development framework (Ostrom, 2005). The solid arrows represent direct impact or effect, while the dashed arrows represent feedbacks that could change the values of the variables or change the structure of the action arena

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on processes rather than on variables as in the IAD framework. ComMod is a process of collaboratively building and using a model between the target stakeholders and the ComMod scientists/researchers, in order to understand the stakeholders' complex environment, and possibly to support negotiation and decision-making processes related to its management. A ComMod process may contain one or more cycles, and one cycle is composed of three sub-processes, namely, problem identification and analysis,

conceptual modelling and participatory modelling. The sub-process “Problem identification and analysis” defines the context and scope of a ComMod cycle. Conceptual modelling involves the collaborative construction of a “shared” representation of the complex environment under study, in which the perspectives of the stakeholders as well as the scientists are taken into consideration. Participatory modelling involves the implementation of the model into a usable platform for learning and discussion, such as a computer simulation or a role-playing game. There is a back-and-forth interaction, shown as double-headed arrow in Figure 6.3, between the conceptual modelling and participatory modelling sub-processes in which the model itself is subjected to verification, validation and refutation at each interaction. This interaction could lead to the modification of the model, possibly into a family of models, or into a new model altogether. In the case of a new model, a new ComMod cycle begins (represented by the gray arrows).

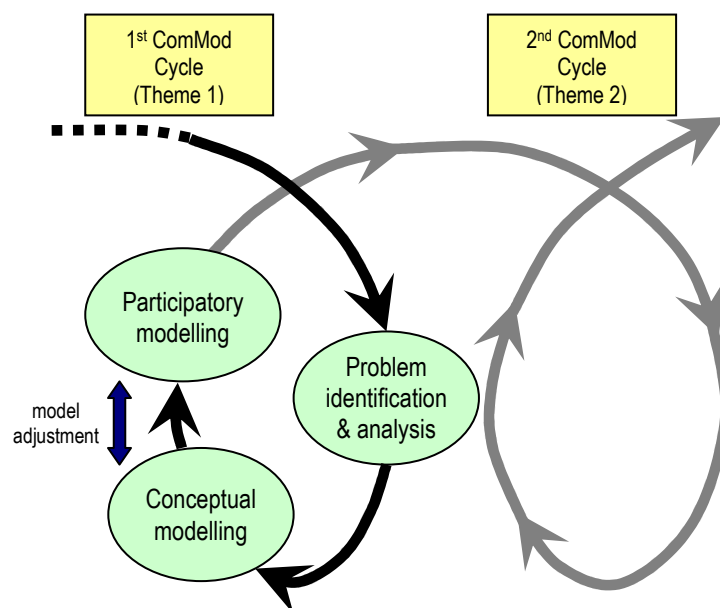


Figure 6. 3 The Companion Modelling process

Companion modelling has been applied in different countries under various conditions. And although there is a tool to evaluate these instantiations, called the Canberra Protocol (CP), this activity is not explicitly defined. Moreover, since ComMod is a dynamic process, it should have the facility to be monitored and evaluated dynamically as well. This would allow the researchers to pinpoint causal

effects between the observed changes in the system and the different steps related to the process. Therefore, ComMod could benefit from a structuring that Institutional Analysis and Development (IAD) framework offers such that IAD could help identify and describe the elements of a target system involved in the steps of ComMod. For common-pool resources (CPR) problems, an IAD analysis would provide a snapshot of a side of the natural resource management (NRM) system under study, either the appropriation side or the provision side (Ostrom et al., 1994)²⁴. Admittedly, separating the system to its appropriation and provision sides is not an easy task (*ibid.*). To this end, the different techniques and tools in ComMod could be used to analyze simultaneously the different levels of analysis of IAD as well the different sides of the action arena. In addition, because it is prescribed that IAD analysis be performed by experts, the analysis is often limited to their points-of-views. ComMod in this case, could be an avenue for participatory IAD analysis with the inclusion of stakeholders in the process, giving the IAD analysis the potential to be more meaningful to the stakeholders and not just to scientists or experts alone. In this dissertation I will focus on the advantages of framing the ComMod approach using the IAD framework.

In applying the IAD framework to ComMod, I follow several key principles or guidelines in its design in order to retain the essence of the ComMod approach. First is that the process should have a legitimate space for intervention with the stakeholders. This means that the process is socially and legally recognized and accepted so that its outcomes could be recognized and accepted as well. Although this is not a guarantee that the things decided or accomplished within the ComMod process will be implemented by the stakeholders themselves, it may reduce any legal and/or social complications that may lead to the failure of the process, e.g. not implementing the plans or following on the agreements. Second is that the process is stakeholder driven. This means that the trajectory of the ComMod process is the result of discussions among the actors of the ComMod action arena; there is a

²⁴ Appropriation is when resources are consumed, while provision is when actions are taken to create or sustain resource production (Ostrom et al., 1994).

facility or space that could accommodate the perspectives and situations of all the stakeholders involved, including the ComMod researchers. Finally, the monitoring and evaluation of ComMod and its associated model or models are embedded in the process and, thus, they are dynamic and evolving. Different methods and tools could be used to monitor and evaluate ComMod, but the important aspect of this is that the criteria to which the process and the model would be assessed are relevant to the actors of the ComMod action arena.

The ComMod process is an interaction space between the stakeholders the ComMod researchers/scientists, i.e. an action arena, albeit temporary. In this action arena, a model accompanying the ComMod process is explicitly developed, used and evolves together with the process. To explicate the use and evolution of the model within this interaction space, I will identify this artefact into the ComMod action arena, thusly illustrated in Figure 6.4. In this figure, several elements were added, namely, the model, which is embedded in the action arena and linked with the action situation, and the dashed arrows (in red) going from the outcomes to the “Model” and the “Evaluative Criteria” variables. These arrows signify that these variables are hypothetically dynamically changing with the ComMod process. Hypothetically because these variables may or may not change at all depending on how the process progresses during its implementation. Given the variables afforded by the IAD framework and the phases or sub-processes of ComMod, the question arises on how do these variables of the ComMod action arena figure into or relate to the sub-processes of ComMod?

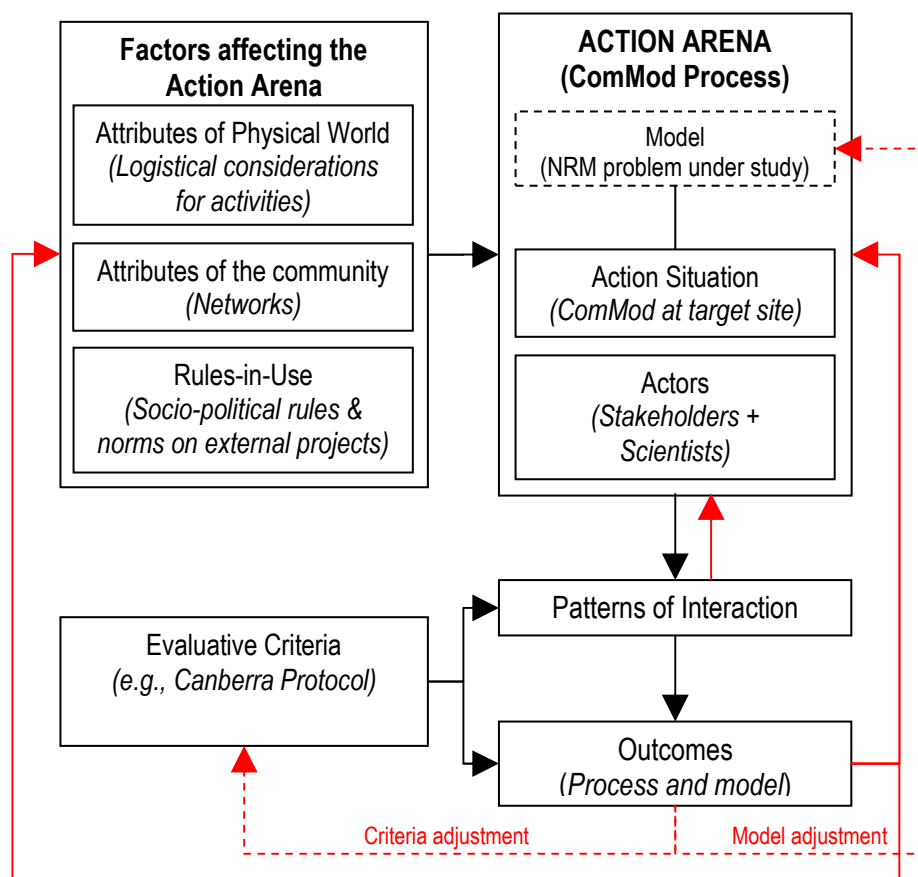


Figure 6. 4 The ComMod action arena and its IAD variables

I parse the ComMod process cycle into its sub-processes and apply the elements of IAD to the sub-processes of ComMod; this is illustrated in Figure 6.5. Below I explain in detail the meaning of the IAD variables as applied to the ComMod sub-processes.

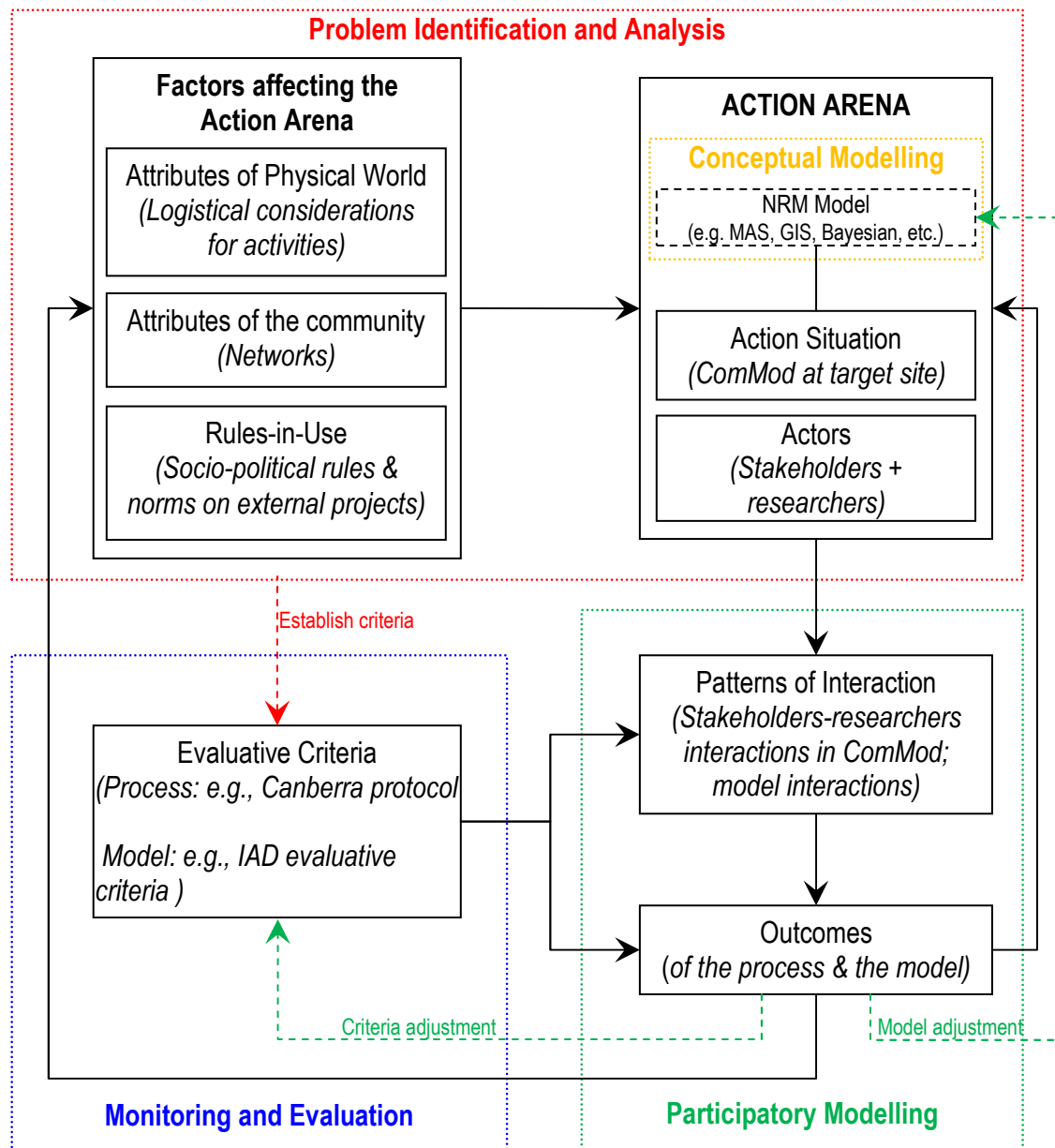


Figure 6. 5 The ComMod cycle with its IAD variables identified

6.2.1. Problem identification and analysis (red square in Figure 6.5)

This sub-process is the beginning of a ComMod cycle wherein the objectives and scope of this particular instantiation, also known as the ComMod Theme, are identified. Aside from conducting baseline studies to gather data and information and identify the target stakeholders, integral to this sub-process is the conceptualization of a rudimentary representation of the system under study, which then supports the identification of the problem or questions the process will attempt to address. This

rudimentary model of the NRM problem under study could be constructed using the IAD variables as a guide, considering both the NRM action arena as well as the factors affecting it. The inquiries would lead to a partial fulfilment of the variables; this can be done by the ComMod researcher, but it could also be done together with the stakeholders. Another crucial aspect to consider when initializing a ComMod process pertains to ComMod being an external entity/force trying to enter and participate in an existing system and, more specifically, to its acceptability, legitimacy and temporary integration into this system. To this I propose that several aspects of the system should be analyzed at the context of employing ComMod with the target stakeholders and the target site. It is important for the researchers employing ComMod to determine if the process will be accepted by the stakeholders; equally, if the socio-cultural (and political) structure of the stakeholders allow for such processes to take place and, if so, to what extent. To this end, a review of past projects or initiatives at the target site is recommended, focusing mainly on arrangements, interactions and impacts of externally initiated projects. External in this case means that the initiator is not typically a part of the stakeholders of the target system. Insights could also be gained from how internally initiated projects are implemented. But much more than that, it is imperative that the stakeholders approve the ComMod initiative themselves, be it through informal or formal means. There are cases wherein the stakeholders themselves will require a formal recognition of an external project or effort such as acquiring permits, memorandum of agreements or memorandum of understandings. Local rules regarding the entry of external initiatives should obviously be identified and respected. This could also provide an insight on the “openness” of the system to accept external initiatives.

Attention should also be given to the factors that could affect the logistical implementation of ComMod at the target site as these could facilitate or hamper the process, and require careful planning to overcome the challenges or enhance the outcomes of the process. Physical/environmental configurations and limitations at the target site can be a challenge for ComMod researchers and stakeholders. For example, with the ComMod implementation in Palawan, the stakeholders were not

located in the same place; the mediating institutions were located at the Puerto Princesa city proper, the migrants were located 67 km away from the city proper and the Bataks were located in the isolated upland areas of the Tanabag village which takes about 2-3 hours of walk from the village proper.

Inclement weather tends to worsen this situation. Availability of stakeholders, especially during annual events at the target site, such as religious feasts and celebrations, should also be taken into account as this would affect the scheduling of activities. The schedule of release of funds for the ComMod process should also be taken into account when planning the ComMod process. These aspects tend to challenge the implementation of the process and creative means of dealing with these challenges are often required. But, on the other hand, there are also factors that could facilitate ComMod such as existing social and political networks among the stakeholders who can distribute information and assist with the logistics, such as what TWGs in LPF contributed to the ComMod process. Previously compiled data and studies at the study by site could reduce future data gathering activities and contribute to the conceptualization of the model as well as in the efficient implementation of interventions / interactions among stakeholders and scientists.

The product of this sub-process is the ComMod theme, or the “Action Arena” and its exogenous factors in IAD parlance, to which the participatory modelling exercise will be focused. This also sets the scope of the ComMod inquiry, wherein its goals and expectations are identified, discussed and even negotiated. The scope, goals and expectations of the ComMod inquiry can later be used as one of the indicators for evaluating the ComMod process (depicted as the dashed arrow in red originating from the “Problem identification and analysis” box to the “Evaluative Criteria” box). And, as mentioned earlier, it is also during this inquiry that scientists and stakeholders begin constructing a rudimentary conceptual model which the ComMod scientists could later build upon during the conceptual modelling sub-process. Having the rudimentary model and the scope of the ComMod process, and together with the stakeholders, the “Evaluative Criteria” for the model could also be established, wherein the model is to be subjected to different criteria of performance according to the perspectives of the stakeholders.

Since the ComMod researcher is part of this process as well, he may also have his own criteria to assess the performance of the model, such as using the IAD evaluative criteria.

Below is an exploratory view of the steps on how this sub-process would unfold:

- 1) Introduce the ComMod process to the target stakeholders, i.e. its objectives, what can be done within the process and its limitations.
- 2) Build a rudimentary model of the system under study that can be discussed together with the stakeholders, e.g. a model that could be visually represented such as using simple conceptual diagrams, flow charts, simplified UML diagrams, etc. The IAD variables can be used to identify the components of the system. Another possible option is to use the general description of MAS as described by Ferber (1999).
- 3) Elucidate a list of problems or issues that are perceived by the target stakeholders about the system. The ComMod scientist could also provide his own insights about the system based on the rudimentary model. The IAD design principles (Ostrom, 1990) (explained in pages 58-59 of this document), a set of characteristics of long enduring action arenas, as observed by Ostrom and her colleagues from the tens of empirical case studies they have reviewed, can be used as a point of comparison between the NRM system under study to that of successfully functioning and long enduring action arenas. However, this should not only be the set of criteria to which the NRM system should be assessed, as the stakeholders may have their own views on how the NRM system should perform.
- 4) In this list, identify which of the problems that could be addressed by ComMod, given its own limitations (e.g. budget, timeframe, etc.), i.e. the ComMod process can potentially have a legitimate impact in addressing that problem. From this reduced list, identify which problem or problems the target stakeholders would like the ComMod process to address and how, i.e. which ComMod objective to adopt. This will be the ComMod theme. In addition, identify the stakeholders or actors to be involved in the process.

- 5) Get the approval of the actors-stakeholders on the ComMod process, either informally, formally or both, as needed or required.
- 6) Level the expectations among the target stakeholders, especially for multi-stakeholder action arenas, and the researchers, i.e. what can be done within the process, as well the stakeholders' and researchers' expected outcomes.
- 7) Set-up monitoring and evaluative criteria for both the process and the model, taking into consideration the stakeholders' and researchers' perspectives.
- 8) Together with the target stakeholders, discuss and plan the succeeding activity. A partial fulfilment of a process design could be made together with the stakeholders, such as identifying the objectives and the stakeholders to be involved in the activity. This approach into planning succeeding activities in the subsequent sub-processes is recommended to ensure that the process remains stakeholder-driven.

6.2.2. *Conceptual modelling (orange square in Figure 6.5)*

In ComMod, there is an explicit construction and use of a model that would accompany the process. Based on the ComMod theme identified in the previous sub-process, the ComMod scientists would build upon this theme, filling in the details and information gaps necessary for developing the model. Eventually, this model would be one of the artefacts in the participatory model construction, use and analysis of the system under study. The cyclical nature of ComMod allows for mutual feedback between the outcomes of the conceptual and participatory modelling sub-processes, which would also lead to building a “shared” model among the stakeholders and the researchers as the models are adjusted to accommodate their proposed modifications or changes.

The type of model to be constructed depends on the ComMod theme and it is the ComMod scientists' responsibility to choose which kind of modelling perspective to use in achieving the objectives and meeting the expectations of everyone involved. What is important in the choice is that

the modelling perspective or perspectives chosen would allow the model itself to be clearly presented, developed and discussed with the stakeholders to answer the queries of the stakeholders and scientists alike.

6.2.3. *Participatory modelling (green square in Figure 6.5)*

One of the key differences between doing an IAD analysis to that of Companion Modelling is that, instead of the IAD analyst trying to explain and predict the interactions and outcomes of the action arena using observations generalized in theories and models, in ComMod the researchers and the stakeholders aim to understand these interactions and outcomes by collectively building a model of the NRM action arena progressively, in which the perspectives of all the actors involved are included in the model and not just that of the researchers'; thus allowing participatory analysis of the NRM action arena in the process because the evaluative criteria are of relevance to the actors themselves. If the modelling perspective to be used is multi-agent systems, the NRM action arena itself could be recreated through simulations and role-playing games (RPGs), and the interactions and outcomes could then be observed, analyzed or discussed within this setting. Moreover, rather than the IAD analyst formulating recommendations on how to improve the performance of the action arena, the ComMod actors themselves can negotiate and device strategies or solutions to address the problem/s at hand.

In participatory modelling, several interactions between the scientists and stakeholders may occur: collectively build the model, verify and validate it, identify the methods, tools or artefacts to discuss and evaluate the models and use these model artefacts for understanding, analyzing and discussing the system under study. It is important to remember that, depending on the type of modelling perspective used such as simulations, the model itself may have its own outcomes aside from the outcomes of the interactions between the scientists and the stakeholders. Therefore, it is important that the scientists as well as the stakeholders are able to differentiate the outcomes between the model and

the process therefore minimizing the confusion when the model and the ComMod process are analyzed. To achieve this, evaluation methods or techniques need to be set-up that would guide the evaluators – the scientists and/or the stakeholders – in distinguishing the different outcomes. This evaluation may lead to modifications in the model, modifications in the evaluative criteria for both the process and the model and for planning the next step in the process.

6.2.4. *Participatory Monitoring and Evaluation (blue square in Figure 6.5)*

In the original version of the ComMod process, as shown in Figure 6.3, the evaluation process is not explicitly identified. In practice, however, this sub-process is conducted for every instantiation of ComMod. Moreover, it is only recently that a common tool, the Canberra Protocol (CP), is being employed for the more recent applications of ComMod. With evaluation being a key activity in the ComMod process I therefore propose that for CIAF the evaluation sub-process to be explicitly defined. By doing so, the scientists will be able to design the methods and corresponding tools appropriate to the different sub-process. I propose several key concepts in evaluating ComMod which could guide the ComMod researchers in the evaluation sub-process, namely, evaluation is embedded in the process, it is for the ComMod process and the model, and it is participatory. These three concepts go hand-in-hand in conducting an evaluation process that fits the principles of the ComMod approach.

Because the trajectory of the ComMod process is dependent upon the needs of the stakeholders and the objectives of the ComMod exercise, there should be a facility that allows the scientists and stakeholders to determine if each of the activities undertaken for ComMod is able to meet its objectives and intended outcomes; thus monitoring and evaluation is prescribed to be performed at several levels:

- 1) evaluation at the level of a sub-process, i.e. problem identification and analysis and participatory modelling;
- 2) monitoring at the level of a specific activity, e.g. workshops, interviews, surveys, etc.;

- 3) evaluation at the level of a ComMod cycle;
- 4) and, if there are several ComMod cycles, evaluation for the entire ComMod process.

At the “Problem identification and analysis” sub-process it may not be enough to determine the context to which the process would be applied but there may be a need to evaluate how and to what extent the process could contribute to the improvement of the system, i.e. identify the areas or avenues of intervention for learning and negotiation. In IAD, there is a set of characteristics that describe an efficient or well functioning system known as the Design Principles (Ostrom, 1990) which ComMod researchers could use to compare with the current state of the NRM system under study and determine the strengths and weaknesses of the system. As an example, in Chapter 3 of this dissertation I used the IAD design principles to partly assess the condition of the ENRM and livelihood system of the case study in Palawan by examining the state of the action arena and then determining if its current state exhibited the same characteristics described by the design principles. In this particular case study, many of the characteristics of the Design Principles were missing or were only partially attained, which hinted that the system was not performing adequately in comparison. The examples given in Chapter 3 on the real world experiences of the stakeholders, especially the community members, would attest this inadequacy. This exercise then could reveal the avenues, to which the ComMod process may contribute to the understanding of the system, facilitate discussions and negotiations and support decision-making processes. This should not be taken, however, as the only set of criteria to which the NRM system would be evaluated because stakeholders may have their own perceptions about the performance of the NRM system, its strengths and weaknesses and strategies on how it can or should be improved according to their needs, priorities and capabilities. Because the stakeholders are able to identify and choose the problem or problems to address, they may be more motivated in addressing them as opposed to somebody else telling them what they should and should not do, which might make them lose interest immediately.

In conceptual modelling, the evaluation or analysis of the sub-process lies more on the ComMod researchers than on the stakeholders, because, at this step, it is the task of the ComMod researchers to decide what kind of modelling perspective to adapt in order to accommodate the data and information gathered as well as to report and discuss the findings back to the stakeholders and to the scientific community. Using standardized graphic languages, such as the Unified Modelling Language, would provide an opportunity for the scientific community to view, examine, and probably even replicate the model in order to attest its validity. Using standardized languages is important because it would allow the model to be analyzed by scientists from different fields or perspectives.

For the participatory modelling sub-process, we can again examine the model and the sub-process. It should be noted that this sub-process may consist of one or more activities depending on the progression of the sub-process vis-à-vis the objectives of the ComMod process. In the “problem identification and analysis” sub-process, the researchers and scientists would have established the criteria to which the model could be evaluated, such that the variables of the model to be examined as well as the method of presenting them, e.g., maps, charts, illustration of communication networks, would be established together with the stakeholders. This takes into account the points-of-views of the stakeholders and researchers in viewing, understanding and discussing the model. Aside from the stakeholders- researchers identified evaluative criteria, one particular set of criteria that can be used to analyze the outcomes of the model are the IAD evaluative criteria. The IAD evaluative criteria consists of eight elements, namely, economic efficiency, equity through fiscal equivalence, redistributive equity, accountability, conformance to general morality, adaptability, legitimacy and participation. In analyzing the sub-process, the methods and the artefacts used to present and discuss the model with the stakeholders are examined such that they are linked with the outcomes of the process, e.g. lessons, decisions and agreements; thereby establishing the causalities of the changes brought about by the process. The CP has the facilities to achieve this objective, but to make it more relevant to the ongoing process, it has to be conducted stepwise after each participatory activity within the sub-process and it is

to be fulfilled together with the stakeholders. This is different from the usual way the CP is carried out, wherein an external evaluator carries out the CP evaluation at the end of the ComMod process, but conducting a CP in a stepwise manner together with the stakeholders would allow the refinement of the methods and artefacts for future activities within the sub-process. Monitoring at the level of an activity to determine the progression of the participatory modelling sub-process would guide the next activities to be planned and adjusted accordingly to the demands or needs of the researchers and the stakeholders. For example in ComMod for LPF, monitoring was achieved using a Process Design and a set of evaluation questions. It is possible that within the process of evaluation itself that new criteria or adjustment of the criteria for the model and process may arise.

Evaluating the ComMod cycle and the entire ComMod process brings everything to full circle. This sub-process allows the scientists to determine the successes and deficiencies of the process within the context of the situation as well as ComMod as a participatory modelling approach in general, which may lead to adjustments or improvements in the employment of ComMod in other situations. In this case the CP would fit this objective wherein there is an external (independent) evaluator that implements the protocol at the end of the ComMod process; this could also serve as a validation of the findings of the participatory evaluation activities embedded in ComMod. The findings of the CP could also be linked to the action arena, wherein the processes of ComMod and its outcomes could be linked to the different IAD variables, as well as at the different levels of IAD analysis, namely, operational, collective-choice and constitutional-choice levels. For example, the main concepts examined by CP on the stakeholders are perceptions of the issue, learning, relations and practices. The outcomes from the examination of perceptions, learning and relations could be linked to the “Actor” and/or “Attributes of the Community” variable, while the practices could be linked to the “Action Situation” and/or “Rules-In-Use”.

Since ComMod is not just for the sake of science and the scientists that practice them, the results of ComMod should be assessed together with the stakeholders because the stakeholders may offer different perspectives of the same idea and may give different levels of importance to the different

aspects of the same problem and may approach solutions differently as well. Furthermore, stakeholders having the opportunity to participate in this very crucial sub-process in ComMod could strengthen the trust among different stakeholders as well as with the scientists and, therefore, they would have more confidence in the results of the evaluation. There are multitudes of methods for evaluation involving stakeholder participation, but what should be achieved is a balance between the interests of scientists and the stakeholders such that mutual respect and recognition of each others' role in the ComMod process is established. But because the ComMod approach itself puts much significance to its participatory aspect, this characteristic of evaluation is almost implied.

6.3. The special case of multi-agent systems models for CIAF

An array of modelling perspectives can be used for the Companion Modelling process. However, a multi-agent systems model offers a perspective of reality that closely fits with the structure offered by the IAD framework. Recalling the elements of a MAS model (Figure 6.6), it is composed of the following components: (1) a space, called the environment, (2) objects that are situated in the environment, (3) a special type of object, called agents, that would represent the active entities in the system, (4) relations that link these objects, and consequently the agents, with their common environment, (5) a set of operations that could be performed by the agents to interact, transform or manipulate other objects in the environment, and (6) operators that represent the results when these operations are performed (Ferber, 1999). The similarities between the structure of IAD and that of a MAS model are striking such that we can relate the IAD variables to the components of a MAS model (Figure 6.7). The action arena (of the reality or the system under study) and the factors affecting it can be viewed as a static description of a MAS model (the red box in Figure 6.7), wherein the action situation is the management of (an) environment or natural resource. The actors of the action arena are the agents²⁵ in the MAS model or the players in a role-playing game, wherein they have a set of characteristics (referred to as

²⁵ Agents in MAS models are not only limited to human agents. Depending on the purpose of the model, agents may also represent animals, for example, that could interact among themselves or with humans.

“attributes” in a MAS model) and a set of actions or behaviours defined in the action situation (referred to as “operations” in a MAS model) that allow them to interact with other agents and objects in their environment. The attributes of the physical world could be represented as an environment, as well as passive objects. This environment could be a simple static space with attributes, but it can also be a representation of a complex, evolving environment that could depict biophysical processes such as hydrological processes or growth processes for renewable natural resources. The rules-in-use may be programmed as conditions in the operations of the agents or the rules of the role-playing game, while the attributes of the community may be one of the elements of the decision making-processes of the agents or players. The interactions that occur within the action situation with the actors and its outcomes can be recreated as a simulation or a role-playing game in MAS (the green box in Figure 6.7). To analyze these interactions and outcomes, indicators and points-of-views usually applied to MAS models (the blue box in Figure 6.7) can be used to detect the behaviour of the different variables of the action arena over time, such as the attributes of the actors (agents) or the attributes of the physical world (environment). The performance of the model (or the action arena) can then be analyzed through evaluative criteria developed together with the stakeholders, which may also include the IAD evaluative criteria. In the context of ComMod, this has several advantages: through MAS, scientists and stakeholders are provided with a more holistic approach to viewing, analyzing and discussing the problem at hand; with simulations, the factors affecting the action arena and the action arena itself could be simultaneously analyzed; and, although it is not necessary but depending on the requirements of the modelling exercise, the dynamic interactions between the two sides of the action arena, namely the provision and the appropriation sides, could also be simulated, thus alleviating the difficulty of having to separately analyze them. Provision scenarios (e.g. building infrastructures, reforestation activities, etc.) and appropriation scenarios (e.g. new strategies for harvesting, new technologies for farming, new rules for resource access and use, etc.) can be implemented within the simulation or RPG, either separately or jointly, to investigate how they may affect the action arena. The MAS model

can also be used to test for resilience of the system via sensitivity analysis. Multiple variables can be analyzed or correlated by varying their values within the simulation or RPG space. Moreover, the results of the MAS model can be used as input to support negotiations and decision-making among stakeholders. With computer simulations and role playing games as the realizations of a MAS model, the model and its result could be presented in a much more accessible form that may greatly facilitate the understanding and discussion of the system under study, as well as the identification of (physically) suitable, (legally) feasible and (socially) acceptable solutions for most, if not all, of the stakeholders. The aim here is not to build a very accurate model for prediction, but rather to explore the possible futures and test possible solutions to enhance/catalyze favourable futures, avoid/reduce the risk of adverse outcomes or both.

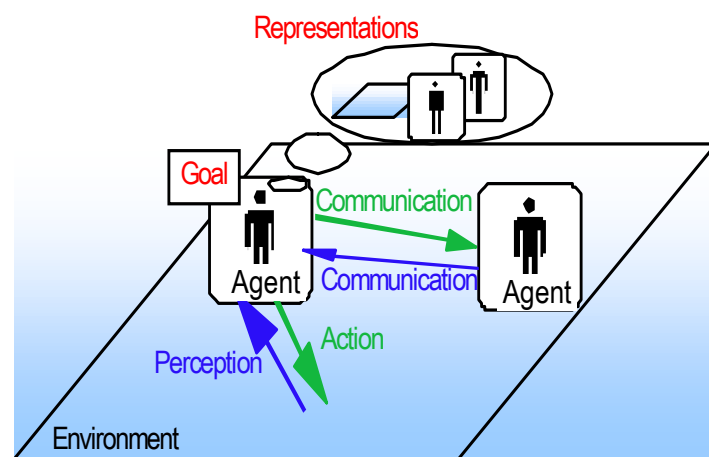


Figure 6. 6 A multi-agent systems (Ferber, 1999)

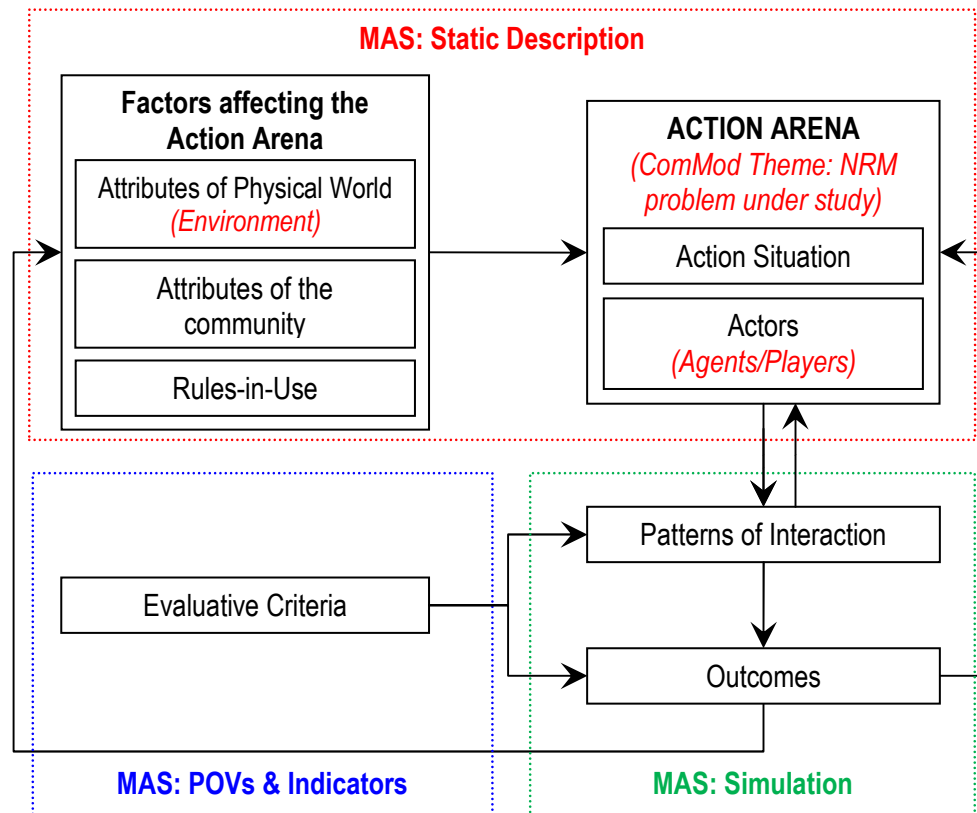


Figure 6. 7 MAS model in ComMod vis-à-vis IAD

6.4. Companion Modelling for research and development projects

The second research questions raised in this dissertation was how and to what extent can the ComMod-IAD-MAS articulation, i.e. the CIAF, be applied in the context of multi-stakeholder processes which have been externally initiated such as research studies and development projects wherein problems and objectives may have already been identified? In the previous chapter, a more important question surfaced brought about by the sudden shift in trajectory of the Palawan ComMod process, which is whether it is even possible to implement ComMod together with a research and development (R&D) project without ComMod losing its integrity, i.e. deviate from its underlying principles? To answer the latter question first, R&D projects, in which problems and objectives may have already been identified, need not be in conflict with the principles of ComMod. They can be harmonized and even have a synergistic relationship. The considerations here would be how these problems and objectives are identified as well as how these aspects are addressed in the course of the project. If these

problems and objectives are identified together with the stakeholders, then ComMod could support the R&D process. However, if during the course of the project that these aspects are addressed independently from ComMod, then conflict may arise, especially if the new actions or processes to address the problems and objectives are not in line with the ComMod trajectory that was planned together with the stakeholders. So how do we address the stakeholder-identified problems and the stakeholder initiatives that address the problems in a ComMod-R&D project configuration?

Using the IAD framework, I illustrate the relationship of ComMod and the R&D project as adjacent action arenas in Figure 6.8. In this configuration, the project (researchers) itself could be considered as a stakeholder in the process, wherein its point of views, objectives and goals may be taken into consideration in the multi-stakeholder-researcher interactions. Several key aspects between ComMod and R&D project interaction have to be considered: the synergy of principles, interdependency of activities and mutual impacts of the logistical and logical (or scientific) aspects among the different methods employed in the project. I expound on this using the factors affecting the action arena. The attributes of the physical world is composed of resources such as knowledge, funds, manpower, time, etc. Some of these resources are common pool resources, i.e. they are subtractable goods, and they are shared among the different project components, including ComMod. The attributes of the community (the researchers) for the R&D project and ComMod may be heterogeneous because the researchers may come from different disciplines and may subscribe to different schools of thought. This emphasizes that the choice of the ComMod team, the R&D project team, and the interrelationship between the two should be such that there are no direct conflicts in terms of scientific principles or paradigms and approaches, or more importantly, they are able to support or enhance each other's efforts. And in relation to the previous statement, the rules-in-use, e.g. project principles, objectives, priorities and potential or expected outcomes, of ComMod and the R&D project should be harmonized such that the outcomes of the ComMod process are able to complement or enhance the project processes and vice versa. Synergy of principles does not necessarily mean that the ComMod and the

R&D project's objectives are the same. Rather, the driving mechanisms of the trajectory of the two complement each other, i.e. a synergetic relationship. More specifically, because the ComMod trajectory depends on the perspectives and needs of the stakeholders, which may change over time, the project trajectory, and ultimately the project components or methods used in the project, have to be responsive to these changes as well. This is similar to the case of the LPF project and Palawan ComMod wherein there were no definite stakeholder projects or activities initially designed or identified and the stakeholders themselves were able to identify, prioritize and choose which problems or issues to address. The LPF project was there to support these stakeholder initiatives and ComMod was able to support some of these initiatives.

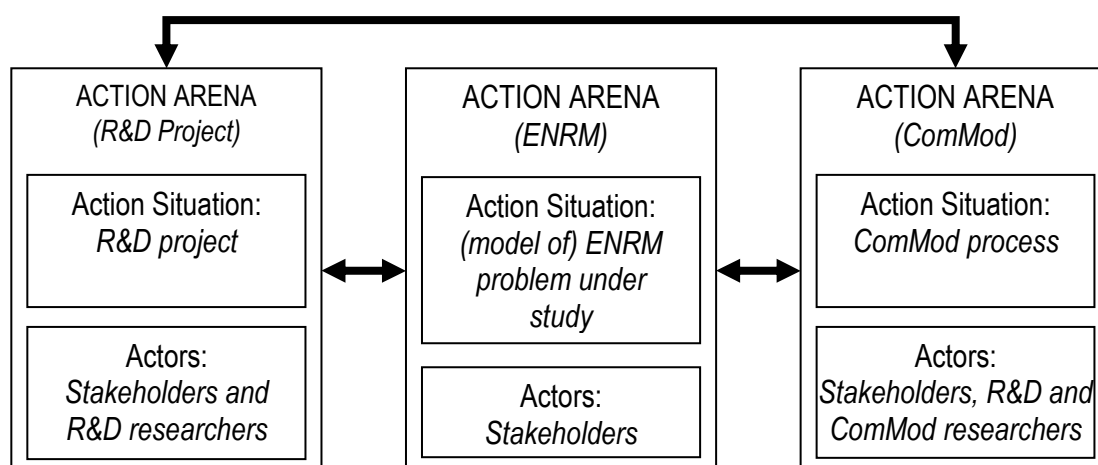


Figure 6. 8 A ComMod-R&D project configuration

In order not to confuse between the outcomes of ComMod and other activities of the project, a set of evaluative criteria and methods is suggested to be used to distinguish among them, but at the same time include criteria on how the activities were able to influence each other. For example, in the LPF project and its ComMod process, the C&I for the project and CP were used in combination to determine, validate and link the outcomes of the two processes. There is value in distinguishing the accomplishments of the different activities of an R&D project, notably in the scientific reporting of the results. This allows the scientists to determine if each of the activities were able to contribute to the process, how these contributions were achieved and how much was in fact contributed to merit its

inclusion within the project. It also helps in understanding how the changes or impacts in the system were achieved, reveal the weaknesses of the methods used and work towards improving their future applications. The above-mentioned considerations are critical in creating a road map of the project to ensure efficiency and maximized outputs.

6.4.1. *Principles and guidelines*

In order to develop a sequence of activities related to the initialization of ComMod within a research and development project, several key aspects were taken into consideration:

- 1) By definition, the trajectory of Companion modelling go with the perceptions of the stakeholders which may change during the project lifetime; therefore, its activities may not be as set or as predictable as other project components. The project trajectory should mirror this aspect.
- 2) The researchers or scientists involved in the research and development project are also stakeholders in the ComMod process and their points-of-views should be well considered in the planning and execution of ComMod. Indicators and other monitoring artefacts should include those that are relevant to the stakeholders, other project scientists/researchers and the ComMod researcher.
- 3) ComMod's influence or impacts to the project's processes and outcomes will depend on how it is implemented in the project. To recall, ComMod has two objectives: first, to understand complex environments; and, second, to support collective-decision making processes. For the first objective, ComMod could be used at the beginning of the project as a research component, e.g. as part of baseline studies, wherein the lessons from the process could be used for further planning of the succeeding steps of the project. However, the ComMod process in this context may also have outcomes that are internal, e.g. changes in attitudes, behaviours, mental models or actions of the actors in the action arena, which in turn could impact the action arena as actors interact with each other. The nature and magnitude of the

effects of ComMod on the actors depend on the power or extent of influence each actor has.

With the second ComMod objective, the ComMod process would be more integrated in the development process of an R&D project, more specifically on negotiation processes, and ComMod's role becomes more prominent. Aside from influencing the actors internally, the ComMod process now has a direct role in negotiation and decision-making processes, e.g. to facilitate and support it. It is possible that the internal changes in actors might be manifested during these processes; therefore attention should be given to ensure equitable negotiation and decision-making among them.

- 4) There are resources, e.g. knowledge and skills, funding, manpower and equipment that flow among the different project components, which can also extend among adjacent arenas in a nested network of action arenas. Management of these flows are needed to ensure that the utility of these resources can be maximized and competition for these resources is minimized.

6.4.2. *Sequence of activities*

The steps to be undertaken for designing a ComMod process within a research and development (R&D) project are similar to those of designing a ComMod process with the stakeholders, with the main difference being that we now have to consider that the project researchers are part of the stakeholders in the ComMod process and that the ComMod and the project would work synergistically in order to reach a common collective goal (e.g. mission-vision of the community). Given that the ComMod and R&D project configuration I proposed above would consist of activities that are dependent on the contextual situation in the field, it is not possible to develop a complete sequence of activities.

Nevertheless, below I offer general steps for ComMod-R&D project configuration:

- 1) Determine the avenues to which the project will contribute or support the NRM action arena.

This can be achieved by examining the variables of the target action arena and the exogenous factors affecting it, paying particular attention to the rules-in-use. The examination of rules-in-

use would show if the target action arena is open to intervention, while the examination of the action arena might reveal the paths of influence or intervention (depicted as the double arrow between the ENRM action arena and the R&D project in Figure 6.8). The stakeholders and the project researchers will then decide what issue or issues to address, a project theme.

- 2) Together with the stakeholders, determine how a ComMod process would contribute or support the project theme (depicted as the double arrow between the ComMod and R&D project, as well as the double arrow between ComMod and the ENRM action arena in Figure 6.8), keeping in mind the two objectives of ComMod. This could also be “problem identification and analysis” step of ComMod resulting to the ComMod theme.
- 3) Accomplish the legal and social requirements and arrangements, such as memorandum of agreements or understanding, if there are any, for the R&D project, including ComMod, prior to executing the project. There are cases wherein the stakeholders will require the project and its processes to have a legal or social recognition, such as in the case of LPF project, before it is allowed.
- 4) Determine and lay-out the project components’ general objectives, pre-requirements and potential outcomes. We can organize, classify or “map” the entries to these aspects according to the IAD variables; this would also allow us to identify which activities have similar or complementary objectives and outcomes. The pre-requirements refer to conditions that are needed to be satisfied before a project component or activity is executed; the pre-requirements can be satisfied by one or more outputs from different project components. Take note that each project component may have several activities, with each activity having its own pre-requirements. The potential outputs refer to the modification in the values of the IAD variables, such as changes in the actors (e.g. acquired skills or knowledge, changes in behaviour), changes in the composition of actors (e.g. creation of a new organization), changes in the action situation or interaction among stakeholders (e.g. stakeholder mini-projects), changes in

the external variables (e.g. a new physical infrastructure, natural disasters, a new law or rule), etc.

- 5) A general schedule or sequence of activities or events may be planned from the “mapping” done in the previous step. This schedule will most likely to change depending on the outcomes of the activities.
- 6) For each project component or method, including ComMod, monitors or indicators need to be set-up to determine what has been accomplished and report the findings to the different components of a project, or to the project as a whole. A synthesis of these indicators or monitors could later be used to support the project's overall evaluation process.
- 7) Execute the project component activities, including ComMod, the stakeholders and employ the project and ComMod monitoring artefacts. At each ComMod or project activity, additional or improved indicators or monitoring artefacts could be established together with the stakeholders, including other project scientists/researchers, which should be reported back to the entire project. Use these monitoring artefacts to plan for the next steps of ComMod and other project components.
- 8) At the end of the ComMod process and the project, evaluate ComMod vis-à-vis the other project components, as well as the project in general, using the evaluation indicators or monitors established at the beginning and during the process.

6.5. Discussion

6.5.1. Synthesis of the ComMod Implementation and Institutional Analysis Framework

The differences of ComMod and IAD could be explicated based on how they are applied in practice. First, the IAD framework is an analysis of variables wherein the concepts of dynamics related to policy processes are implied, such that institutional, social and biophysical factors are seen as inputs to the decision-making process of the actors (McGinnis and Ostrom, 2010). The ComMod process, on the

other hand, focuses on the processes that lead to these changes. Moreover, IAD analysis is often limited to the analyst, and the recommendations to improve the action arena are formulated based on the analyst's point-of-view, whilst in ComMod, stakeholder participation in the analysis is feasible and even encouraged, such that the strategies and solutions due to the process are products of discussions and negotiations among the stakeholders with the support of the ComMod researchers. Finally, an IAD analyst works into predicting the interactions and outcomes of the NRM action arena, while in ComMod, the idea is to recreate the NRM interactions and outcomes in an interactive model in order to understand the mechanisms that drive the system and explore the possible futures that may arise if the status quo is maintained or if changes occur within the system - either stakeholder-driven or brought about by external factors.

Therefore, there is an added value in applying the Institutional Analysis and Development (IAD) framework to the Companion Modelling (ComMod) approach, as well as using multi-agent systems (MAS) models in this configuration. As an answer to the first research question, the ComMod Interaction and Analysis Framework, as elucidated in this chapter, demonstrated the articulation between MAS, ComMod and the IAD framework. As described in Figure 6.9, there is synergy among the three concepts such that they mutually benefit from each other to enrich the value of the process of analysis. IAD brings into the table the variables and structure to which ComMod and MAS models could make use to guide its implementation and analysis. But, at the same time, ComMod opens the possibility of involving the stakeholders in an institutional analysis using a model as a platform of discovery and discussion. Moreover, a MAS model can be used to represent the action arena and dynamically present, analyze and even discuss the interactions and outcomes of the action arena to the possible end-users of the analysis, i.e. the actors or the stakeholders of the action arena.

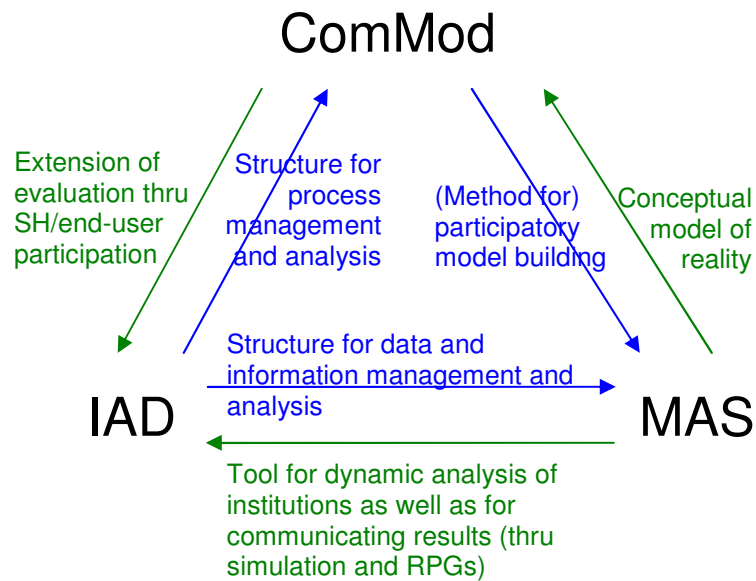


Figure 6. 9 The potential interactions among MAS, ComMod and IAD

6.5.2. Nested action arenas, Companion Modelling and research and development projects

Companion Modelling and research and development (R&D) projects, in general, create temporary action arenas adjacent to the target action arena; thus creating lines of influence between the project (or ComMod) and the target action arena. When Companion Modelling is applied together with an R&D project, a line of influence connects ComMod and the R&D project, while at the same time, ComMod and the R&D project are also connected (influences and influenced by) the target action arena, as shown in Figure 6.8. The ComMod-R&D configuration thus allows two available lines of influence to the target action arena. Should one of the temporary action arenas is paused, stopped or leaves, then there would still be a pathway or option that remains to support the target action arena. For the case of ComMod, because it responds to the needs and desires of the stakeholders, it can accompany the stakeholders to the directions which they want to pursue. But, this also means that, if the stakeholders decide at a certain point in time that they no longer want to continue or participate in the process, the ComMod process would be then be paused until the appropriate contextual situation comes that would allow the process to continue, i.e., the line of influence between ComMod and the target action arena is

blocked or closed indefinitely. On the other hand, a research and development project may have other methods, tools or techniques that could potentially give it more options to move forward, interact and support the stakeholders. Conversely, it may also happen that the stakeholders no longer wish to participate in the R&D process; the ComMod action arena still present can still interact with target action arena. In this situation wherein one side of the ComMod-R&D project configuration is blocked while the other side is still able to interact, the interactions with the target action arena might prompt the stakeholders to unblock or re-open the line of influence that has been closed, or probably even create a new space or action arena for new interactions to take place. Moving further, we know that action arenas are rarely isolated and are connected in a network of nested action arenas, wherein it is possible that some of these action arenas may also be research and/or development projects themselves. This gives ComMod, and R&D projects in general, the opportunity to connect and interact with other actions arenas, thus expanding its lines of influence that could potentially enrich or support the different action arenas in the network of nested action arenas.

Action arenas created by ComMod, and R&D projects in general, are only temporary, i.e. they will end at some point. They take with them the lines of influence as they leave, including the technologies and resources that drive the flows in these lines of influence. This creates a challenge of how to continue activities or initiatives that were created within these temporary interaction spaces. It is often the case where stakeholders would request that projects continue because they are aware that most initiatives started in these interaction spaces are eventually lost as the projects leave. Many projects nowadays are also very much aware of this challenge such that they try to develop mechanisms that would be embedded in the target action arena to continue whatever it is that was started. In the case of LPF, it created the Provincial Steering Committee and the TWGs for this purpose, while others train the stakeholders to learn knowledge and skills or “transfer technologies” to the stakeholders. However, most of the driving mechanisms for these initiatives, which were used to be provided by the R&D projects, are not enough or absent within the target action arena itself, or there is

only weak institutional support for these initiatives; thus, despite best efforts to continue these initiatives, they will eventually cease. This is now the new challenge, which is how to sustain the initiatives started by ComMod or R&D projects in the target action arenas.

6.5.3. *Contributions to the state of the art*

The articulation of MAS, ComMod and the IAD framework, resulting to the CIAF, had provided the opportunity for this research to respond to some of the suggestions on prospective research agenda in the three key concepts. Parker et al. (2003) suggested that an interdisciplinary experimental framework for analysis be developed. The IAD framework is a tool for analysis that was developed to aid researchers of different disciplines with the use a common language. When articulated with MAS, the IAD framework opens MAS models for analysis by different disciplines. With the participatory aspect of ComMod applied to its monitoring and evaluation as described in the CIAF, the shared representation of the ENRM problem under study, i.e. the model, and the interdisciplinary applicability of the IAD framework, provides for a transdisciplinary approach for monitoring and evaluation of ComMod, as earlier suggested by Etienne (2011). In this case, the stakeholders do not only have the opportunity to identify the indicators to monitor and evaluate the process that are relevant to them, but they are also able to participate in the evaluation process as well. Moreover, it was suggested by Etienne (*ibid.*) that the protocol for ComMod evaluation should be modified such that it is able to adapt to the changes in the social and environmental situations at the sites. This was accomplished in the CIAF by embedding monitoring and evaluation within the ComMod process. The use of the IAD framework in this research demonstrated the “flexibility” of IAD such that it can be adapted to specific applications or disciplines but still retain its integrity as whole, similar to what was done by Koontz (Koontz, 1997; 2006), Lamb, Taylor, Burkardt and Ponds (1998), Wilds (1990), Caughlan (2002), Burkardt and Ponds (2006), Rudd (2003), Clement (2009) and Ostrom (2011). In the case of CIAF, a variable “model” was introduced to explicitly recognize the development, use and evolution of a model in ComMod. CIAF also illustrated

the potential evolution of the evaluative criteria used for the ComMod process and the model through the outcomes of the multi-stakeholder-researcher interactions in the process. Furthermore, this research responds to the proposition that the IAD framework be used in innovative ways (Blomquist and deLeon, 2011) as well as to study adjacent action arenas (McGinnis, 2011b). This research demonstrated the use of the IAD framework to enrich the analysis of processes that create temporary action arenas between researchers and stakeholders, e.g. ComMod and research and development (R&D) projects, which may not have been done before. The framework was then used to analyze the network of adjacent action arenas involving permanent ENRM action arenas and the temporary action arenas created in ComMod and R&D projects, which highlighted the potential opportunities and challenges to ComMod and other R&D projects in the field.

CHAPTER 7

CONCLUSIONS

This dissertation was inspired by my experience in carrying out the Companion Modelling (ComMod) approach in Palawan, Philippines, in which a multi-agent systems (MAS) model was co-developed in a multi-stakeholder setting. This implementation was unique in the sense that it was the first instantiation of the ComMod approach as a component of a research and development project (R&D) – Levelling the Playing Field (LPF) in Asia. Moreover, the adoption of ComMod approach into the project transpired after the project had begun. A pure ComMod approach implementation in itself is a challenging endeavour, with the process needing to adapt to the evolving contextual situation of the stakeholders involved in the process. With the Palawan ComMod, one more contextual element had to be considered, i.e., the LPF project. This configuration between ComMod and LPF had important implications. The first implication relates to the dynamics between ComMod and LPF – the underlying principles of the processes, the objectives and the methods, techniques and artefacts used to address the objectives of ComMod and LPF. Would they have conflicting principles, objectives and methods through the course of the project? The second implication was that the outcomes of the project and the ComMod process would be interspersed with each other and the challenge was how to distinguish, organize and analyze the outcomes or impacts of ComMod in the field, as well with that of the other project activities and processes. By examining these implications, it would bring into light the theoretic and practical considerations of employing a ComMod-R&D project configuration and the value or values of such configuration. Since this was the first time ComMod was applied within the context of a research and development project, there was no existing framework within the ComMod approach that can be used to analyze this configuration. I accepted and responded to this emergent challenge by searching for an analysis framework that could accommodate the analysis of a ComMod process and

an R&D project simultaneously. This search had led me to the Institutional Analysis and Development (IAD) framework developed by Elinor Ostrom and her colleagues at the Workshop in Political Theory and Policy Analysis. A review of the development and application of the IAD framework revealed that, in the context of CPR and ENRM, the framework focused mainly on investigating “permanent” interaction spaces in CPR and ENRM case studies, as opposed to “temporary” interaction spaces that are created in ComMod and R&D project processes. Nonetheless, because of the conceptual correspondences between the IAD framework, ComMod process and MAS models, this hinted on how the framework could be applied into the context of “temporary” action arenas created in ComMod and R&D projects.

This dissertation synthesises how the IAD framework was applied in the analysis of the ComMod-LPF project configuration into a general framework for implementing and analyzing a pure ComMod process and a ComMod-R&D project configuration, as well as the relationship between the IAD framework variables and that of a MAS model. Important lessons have emerged from the process of realizing this dissertation, which hopefully would be able to guide future ComMod implementers.

7.1. Companion modelling and multi-agent systems in the field

Developing MAS models using the ComMod approach has its advantages, as echoed by its practitioners as well as the stakeholders who have been involved in its processes. For example in the case of the Palawan ComMod experience, the modelling process provided a conducive environment from which collective-learning could take place, wherein the participants were able to learn in an interesting and engaging manner. Through the ComMod processes and its artefacts, i.e., simulation and role playing games (RPGs), the stakeholders and researchers alike learned about the livelihood practices of the communities, the interrelationships of the different stakeholders, their different perceptions about themselves and about other stakeholders, their behaviours and approaches or strategies in light of the ENRM and livelihood situations they faced. From the lessons of the ComMod process, the stakeholders, specifically the community members, have started developing or changing

their strategies in their livelihood actions, even sharing these lessons to other people in the community. The community participants have also gained more confidence in engaging themselves in to multi-stakeholder discussions related to ENRM and livelihood, which were brought about by having a better understanding of their system and validation of some of their knowledge through others' experiences. The artefacts and tools developed and used in the process, i.e., computer simulation and RPGs, were well received by the stakeholders because they know that they have actively participated in the development of these tools, that these tools were able to capture and represent their realities, and they were able to learn from them in an active and interactive manner. The outcomes from the Palawan ComMod are some of the shared responses among many ComMod experiences.

In as much as the ComMod Palawan had similar positive outcomes with many other ComMod experiences, it also shared some of its challenges. For example, the Palawan ComMod had to contend with insufficient data to address one of the issues raised in the process, which was on ECAN zoning, so much so that, at the end of the process, no reliable or conclusive results could be presented for this issue. Another challenge was how to approach a multi-stakeholder process involving participants from different social spheres, i.e., from government organizations, non-government organizations and community members, both migrants and indigenous peoples. This heterogeneity amounted to different perceptions or mindsets, different behaviours, and even politics, which could have affected their level of or commitment to participation in the process, and eventually to the trajectory of the Palawan ComMod process. Site-specific conditions also affected the implementation of the approach, such as location of the stakeholders and the stakeholders' availability to participate in the different activities for ComMod with respect to the seasons and social events. Rather than be daunted by these challenges, these aspects should be factored into the planning of a ComMod process. At the end of the day, the contextual factors, which are site-specific, guarantee that no two ComMod processes would be the same in terms of trajectories and outcomes because the process tries to adapt to these contextual factors and its evolution.

7.2. Companion modelling and research and development projects

Implementing the ComMod approach in a research and development (R&D) project has its advantages. In the Palawan ComMod, the LPF project was able to contribute to the ComMod researchers and to the process itself and vice versa. The ComMod researchers were able to receive critical capacity-building trainings, i.e., trainings in ComMod and Multi-stakeholder facilitation, in which the knowledge, skills and artefacts gained from these trainings were used in the implementation of the approach, such as the use of the *Cherlng* RPG and the Process Design. Some of the researchers involved in the project, having been involved with the stakeholders in the past and having already established rapport and a network of contacts facilitated the ComMod implementation. Moreover, the stakeholder forums, specifically the Technical Working Groups, were able to contribute to the logistics wherein they were able to help in the distribution of information and invitations to the different stakeholders, prepare the venues for the activities, including food, transportation and accommodation for the participants and ComMod researchers. The ComMod process was able to make use of the baseline studies conducted by the LPF project which provided part of the data and information needed for the model. Conversely, the ComMod process was able to provide data and information to the other activities of the project as well as validate some of its findings. These are just some of the possible advantages of a ComMod-R&D project configuration. This configuration may also provide more paths to which the ComMod and R&D project may interact with the stakeholders. Should one process is blocked or closed by the stakeholders, the interactions of the other process may re-open or produce new paths for interaction.

This configuration also poses some challenges to the implementation of ComMod and the R&D project. This is because the stance of ComMod in its approach of addressing the issues of the stakeholders is not mainstream and may not be in line with many R&D approaches, specifically in defining its trajectory. In this case, the ComMod process' trajectory is dependent on the perspectives and needs of stakeholders, which may change over time. This means that specific milestones at certain periods of time, which are usually expected in R&D projects, are difficult, if not impossible, to set or

identify in a ComMod approach. Parallel activities between the project and ComMod activities, such as in the case of Palawan, may be detrimental because this may suddenly introduce new conditions or situations to which the ComMod process or the project may not be able to adjust immediately amidst project constraints. Thus a synergistic relationship between ComMod and the R&D project is suggested, not only in terms of activities, but also in principles and methods to be used. There is also the issue of project-resource sharing among the different project components in terms of funding, time and manpower availability. To a certain degree, this could be viewed or considered as a common-pool resource problem among the different project components, including ComMod; a real challenge for the project manager!

7.3. The ComMod implementation and institutional analysis framework (CIAF)

Since its inception, the Companion Modelling (ComMod) approach has been growing in use for collaborative natural resource management initiatives in various countries such as France, Senegal, Thailand, Reunion Island, Madagascar and Australia. With its growth we would expect improvements in its application based on experiences in the past as well as anticipating the future. In this respect, the articulation of the ComMod approach, IAD framework and MAS models, i.e. the CIAF, is a step towards enhancing the ComMod approach by providing a framework wherein the ComMod processes and its results can be organized, managed and analyzed by researchers of different disciplines, as well as stakeholders, using a common language. This framework extends to the analysis of a ComMod-R&D project configuration, a prospect for the future implementations of the approach that was demonstrated in the LPF-ComMod experience. This configuration acknowledges the presence of temporary action arenas created by a ComMod process, or R&D projects in general, in a network of nested action arenas on the ground; thus opening the door for ComMod and other R&D projects to interact with other action arenas in the network. The analysis for a ComMod-R&D project configuration can be extended to accommodate multiple-arena interactions. The CIAF moves further by proposing steps that would

integrate monitoring and evaluation of a ComMod process within the process itself, thereby allowing the monitoring and evaluation sub-process to evolve and adapt with the ComMod process. This integration also emphasizes on the participation of the stakeholders in the identification and use of indicators to analyze the ComMod process' impacts and plan its trajectory.

Just like the IAD framework, I envisage the CIAF presented in this document as something that would evolve over time as it is tested on more cases on ComMod. Since the IAD framework was applied to the Palawan ComMod *ex post* with the CIAF as its outcome, this opens the opportunity to compare past ComMod experiences using CIAF, and probably even develop ComMod design principles similar to that of the IAD design principles. For example, it could investigate the contextual conditions that facilitate ComMod processes, which in turn could guide future ComMod researchers.

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LIST OF ABBREVIATIONS

Acronym	Description
ACM	Adaptive Collaborative Management
Asia IT&C	Asia Information Technology and Communications
BDC	Barangay Development Council
BFAR-FRMP	Bureau of Fisheries and Aquatic Resources-Fisheries Resource Management Program
BFAR-RTC	Bureau of Fisheries and Aquatic Resources-Regional Training Center (Region 4)
BRDFI	Budyong Rural Development Foundation Incorporated
C&I	Criteria & Indicators
CAD-T	Certificate of Ancestral Domain Title
CAL-T	Certificate of Ancestral Land Title
CAS	Complex Adaptive System
CDC	City Development Council
CGIAR	Consultative Group on International Agricultural Research
CIFOR	Center for International Forestry Research
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement
CBFM	Community-Based Forest Management
CBMS	Community-Based Monitoring System
CBRM	Community-Based Resource Management
CEP	ComMod evaluation protocol
CIAF	ComMod Implementation and Institutional Analysis Framework

ComMod	Companion Modelling
CIPP	Context, input, process and product
City-ENRO	City Environmental and Natural Resources Office
CLUP	Comprehensive Land-Use Plan
CP	Canberra Protocol
CPR	Common-pool resource
CPWF	Challenge Program on Water and Food
DAR	Department of Agrarian Reform
DENR	Department of Environment and Natural Resources
DENR-CENRO	Department of Environment and Natural Resources – Community Environmental and Natural Resources Office
DENR-PENRO	Department of Environment and Natural Resources – Provincial Environmental and Natural Resources Office
DILG	Department of the Interior and Local Government
EC	European Commission
ECAN	Environmentally Critical Areas Network
ELAC	Environmental Legal Assistance Center
ENR	Environment and natural resources
ENRM	Environment and natural resource management
FAO	Food and Agriculture Organizations
FGDs	Focus Group Discussions
GIS	Geographic Information Systems
GO	Government organizations
GREEN	Gestion des ressources renouvelables et environnement

IA	Institutional Analysis
IAD	Institutional Analysis and Development
IASC	International Association for the Study of Commons
INRA	Institut national de la recherche agronomique
IP	Indigenous peoples
IPRA	Indigenous People's Rights Act
ISFP	Integrated Social Forestry Program
KSK	Kilusang Sagip Kalikasan
LGC	Local Government Code
LGU	Local government unit
LIAM	Legal-Institutional Analysis Model
LPF	Levelling the Playing Field
LUCC	Land-use and land cover change
MAS	Multi-agent systems
MCDP	Marine Conservation and Development Program
NATRIPAL	Nagkakaisang Tribo ng Palawan
NCIP	National Commission on Indigenous Peoples
NGO	Non-government organizations
NRM	Natural Resource Management
NTFPs	Non-timber forest products
OO	Object-oriented
PBSP	Philippine Business for Social Progress
PCSD	Palawan Council for Sustainable Development
PO	People's Organizations

POA	Plan of Action
PPC-LGU	Puerto Princesa City Local Government Unit
PPDO	Provincial Planning Division Office
PRA	Participatory Rural Appraisal
PrSC	Provincial Steering Committee
R&D	Research and development
RPG	Role-playing game
SAFODS	Smallholder Agroforestry Options For Degraded Soils
SEP	Strategic Environmental Plan
SKBTO	Samahan sa Kaunlaran ng Batak sa Tina Organization
STCMPC	San Rafael, Tanabag, Concepcion Multi-purpose Cooperative
TWGs	Technical Working Groups
UML	Unified Modelling Language
WEZPESAI	Western Zamboanga Peninsula Subanon Association
WRMPN	Water resource management planning and negotiation

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APPENDICES

Appendix A Canberra Protocol

Participants Evaluation Framework (PEF)

The Participant Evaluation Framework mirrors questions from the Designers Questionnaire (DQ) to assess how the participants' experiences correspond to the project team's perception of how the project was carried out. The left column – 'Designer Questions' – are the original questions selected from the Designer Questionnaire that are relevant to conducting this comparable assessment (the numbering system matches the designers questionnaire and therefore is not consecutive in this framework). The 'Corresponding Participant Questionnaire Guide' stipulates what information needs to be collected from participants. **This line of questioning must be rephrased by the project team and local translator (if necessary), with assistance from the evaluator, to tailor the questions to the local project context. It should be used as a guide only.** A large degree of freedom is left to the project team to structure the questionnaire as appropriately as possible for their specific project context.

The result of this tailoring process will be a questionnaire to be taken to the field to interview participants. The project team will select between 1 to 3 methods – including the model and RPG - to interview the participants about. The questionnaire will consist of:

1. Questions relating to the 'Initial Context Table'.
2. Questions relating to the 'Method Table'; which in this document encompasses the 'Artifact Table'. This is based on the idea that in the minds of the participants, methods and artifacts are not separated; they exist as a single event. Questions relating to the method may be repeated a number of times for one participant if they are being interviewed about more than one method: the interview may focus on one method and then progress to the next. For example, after all questions relating to the model have been answered, the same questions are then asked about the RPG. Alternatively, questions can be posed simultaneously for the model and RPG, depending on the project team's preference. It is recommended that photographs be used to assist the interviewee in refreshing their memory and reflecting on what the method was about.
3. Questions concerning the participant's general reflections on the project (or part of the project which involved the ComMod approach if the participants are involved in a larger project). General reflection questions do not mirror the Designers Questionnaire.

The order of questions is flexible and will need to be rearranged by the project team and evaluator to ensure the interview flows as effectively as possible. Additional probing questions should be included in the questionnaire where necessary in case a question fails to elicit a response from the participant. **Ensure that the questionnaire devised by the project team indicates what number each question corresponds to in the Participant Evaluation Framework to assist with analysis.** Also confirm that all bullet points are accounted for in the questionnaire.

An important point for the interviewer to consider when conducting the interviews is that there are four ideas or concepts that are of particular interest to the ComMod evaluation project. The interviewer should listen out for these ideas and attempt to explore these concepts further with the interviewee:

- (i) **Perception of the issue:** what is the interviewee's individual perception of the issue (which the project focuses on) and what does he/she consider the collective perception of the issue to be? How did this change throughout the project or, more specifically, the ComMod process?
- (ii) **Learning:** what did the participant learn individually and what was learnt collectively (socially, environmentally, economically, politically, cognitively etc)?
- (iii) **Relations:** what relations did the interviewee have with other stakeholders (including non-participants) and how did these relations change throughout the project (particularly the ComMod process)? How did the interviewee interact with other stakeholders (including non-participants) and how did the interviewee perceive others to interact. Were there alliances, conflict etc? How did these interactions change?
- (iv) **Practices:** did the interviewee develop or change any of his/her practices or actions, such as the way they live their daily life or through the real-life application of new or alternate strategies.

The interviewer should follow these steps in conducting the interview:

1. Work through the questionnaire designed by the project team, local translators (if necessary) and evaluator.
2. If any of the four concepts listed above ('perception of the issue', 'learning', 'relations' or 'practices') emerge through the interviewee's response, try to explore them further.
3. It is possible to ignore questions in the questionnaire if they have already been adequately covered through the interviewer probing the interviewee's responses.
4. Probing questions should be included in the questionnaire and should be asked when the main questions fail to elicit a response which may be easier for the interviewee to answer.

The table below should be filled out for each interview conducted and a copy of the interview questionnaire should be submitted to the evaluator. It would also be helpful to make a note of which questions in the questionnaire proved difficult to answer.

Participants Evaluation Framework	
Project Name:	
Location:	
Project Team Members and Roles (such as project designer, team leader):	
Interviewer:	
Interviewee (representing what stakeholder group):	

Length of Interview:	
Date of Interview:	
Evaluator:	

Initial Context Table

Designer Questions	Corresponding Participant Questionnaire Guide
Physical System	
C1. Resource(s) at stake (specify)	<ul style="list-style-type: none"> At the beginning of the project what did the participants regard the issue(s) or resource(s) at stake to be.
Socio-Political Setting	
C3. Who are the stakeholders involved? Why and how were they selected?	<ul style="list-style-type: none"> Why is the stakeholder participating in the project. What is their motivation to be involved. Who else can he/she recall that is participating (in terms of social groups not personally). Why are they participating.
C4. Are there any stakeholders who should be participating in the project but are not? Explain	<ul style="list-style-type: none"> Is there anyone you else the participant thinks should be involved in the project but is not. Why should they be involved/why aren't they participating.
C6. At the beginning, who was considered formally responsible for the issue (resource) at stake?	<ul style="list-style-type: none"> Who does the participant consider to be responsible for managing the issue or resource (mentioned in question 1).
Objectives	
C9. What are your project objectives?	<ul style="list-style-type: none"> What does the participant consider the project to be about (generally speaking).

<u>Method Table</u>	
Designer Questions	Corresponding Participant Questionnaire Guide
Identify the Method	
2. Purpose	<ul style="list-style-type: none"> What type of interaction did the participant have with the project, what aspect(s) of the project was he/she involved in. <i>This can be answered by the project team.</i>
3. Period of implementation (approximately)	<ul style="list-style-type: none"> When did the participant have this interaction. <i>This can be answered by the project team.</i>
Why did you use this Method	
5. What outcomes did you expect in terms of:	<ul style="list-style-type: none"> Was the method useful to the participant in any way. How was it useful to them. Did the participant apply this to their daily life. (This relates to practices). How did the participant interact with the other participants. Did this change through the method (for example through using the model or RPG). (This relates to relations). Did the participant learn anything through the method (i.e. through using the model or the RPG). Did the participant learn from the other participants.
<ul style="list-style-type: none"> Learning 	
<ul style="list-style-type: none"> New relations 	
<ul style="list-style-type: none"> New practices within the group 	
<ul style="list-style-type: none"> New practices outside the group 	
How was this method implemented?	
6. Briefly describe the method	<ul style="list-style-type: none"> What are the participant's impressions and thoughts on what happened through interacting with the method (i.e. when the model or RPG was used).

11. Of the stakeholders identified in the context, who is not participating and why?	<ul style="list-style-type: none"> Who does the participant think should have participated but didn't, or should have been involved but wasn't.
13. If a facilitator was used, how did he/she interact with the team members and/or participants? What general attitude (posture or approach) did he/she adopt?	<ul style="list-style-type: none"> What did the participant like about the way the method was facilitated. What did the participant dislike about the way the method was facilitated.
Results of the Method	
15. How do the outcomes compare with the underlying assumptions stated above?	<ul style="list-style-type: none"> What did the participant like about it. What did the participant dislike about it. How does the participant think the method could have been done differently to improve it.

General Reflection Questions

These questions do not respond to the Designers Questionnaire

R1. A question should be posed relating to the project team's definition of where a loop finishes and a new loop begins to ascertain how the project team's perceptions of what happened in the project corresponds to the participants' experiences. For example: "How did the way you think about the issue change from when you used the model to when you used the RPG? Did anything else change, such as the way you interacted with the other participants, the way you learnt, or did you change your actions in daily life?"

R2. What does the participant know about what is happening next in terms of the project. Where is the project at now?

R3. Did the participant feel that his/her contribution to the project was valued. For example, did he/she feel their personal opinions were taken into consideration by the other participants? Did he/she think their level of involvement/participation had an effect on the way the project developed? In the interview it is important to check that it is known what the interviewee means when they talk about their contribution.

Designers Questionnaire (DQ)	
Project Name:	
Location:	
Project Team Members and Roles (such as project designer, team leader):	
Evaluation Date:	
Evaluator:	

Instructions

Save an original version of the Designers Questionnaire (DQ) as a template that you can copy and paste to complete the evaluation. The designers' questionnaire is to be filled out by the project designer (or another member of the project team). The framework consists of four tables:

- **Initial Context Table:** captures the designers' initial perceptions of the context around which the project was designed.
- **Method Table:** each method used in the project requires a Method Table to be completed. This highlights the importance of ensuring that you save a clean version of the framework as a template as this table (and the Artifact Table) will need to be copied and pasted for each method used. You work through the methods used in your project in chronological order, assigning a unique number to each Method Table (beginning at 1 for the first method). For each method that uses an artifact, the Artifact Table is to be completed.

- **Artifact Table:** is linked to the Method Table and captures how you perceive a specific artifact to impact on the participatory and learning process. This table will also need to be cut and pasted for every artifact used in your project.
- **Contextual Change Table:** records how the context changed over the life of the project. This table is to be used in conjunction with the Method Table to prompt you to reflect on how specific methods impacted on the context.

It is important to read the instructions for each table to ensure they are filled in correctly. After reviewing what is needed for each table, you can complete the Designers Questionnaire as follows:

1. Initial Context Table
2. Method Table
 - Did this method use an artifact:
 - Yes – Complete the Artifact Table for each artifact used and then go to step 3.
 - No – Go to Step 3.
3. Record in the Contextual Change Table how the method impacted on the context (if necessary). Repeat step 2 for the next method used.

In addition to filling in the Designers Questionnaire, the project team should ensure that the completed Task 2 document – Canvas de Montfavet – and all relevant project documents are sent to the evaluator (prior to their first meeting) so that he/she can gain an understanding of the project. Once the Designer Questionnaire has been filled in and reviewed by the evaluator, a storyboard will be constructed by the project team and evaluator together. The storyboard will include a timeline of the project, methods implemented (including those intended but not implemented), artifacts used, stakeholders involved and what interactions took place between them. This will provide a graphical representation of the project process and will also act as a quality control mechanism in terms of how the process was presented in the Designers Questionnaire. The project team will then communicate to the evaluator where and why a ‘loop’ (or cycle) begins and ends (also to be represented on the storyboard). The project team’s explanation of loops as they occur in their particular project can then be explored further if necessary. The next step involves working with the Participant Evaluation Framework (PEF) to gain an understanding of the participants’ experiences of the project.

Initial Context

Fill in the 'Initial Context Table' below to describe your initial perceptions of the context around which the project was designed. The Contextual Change Table (found later in this document) will encapsulate how the context actually changed and how your perceptions of the context changed over the life of the project.

<u>Initial Context Table</u>			
Contextual Aspect	Initial perceptions of the context around which the project was designed		
Physical System			
C1. At the beginning, what were considered to be the resource(s) at stake (specify)?	<input type="checkbox"/> Forest: <input type="checkbox"/> Land/soil: <input type="checkbox"/> Water: <input type="checkbox"/> Crop:	<input type="checkbox"/> Livestock: <input type="checkbox"/> Wildlife: <input type="checkbox"/> Health: <input type="checkbox"/> Other:	
C2. At the beginning what was the scale of focus of the project?	<input type="checkbox"/> Local <input type="checkbox"/> Regional <input type="checkbox"/> National	<input type="checkbox"/> International <input type="checkbox"/> Other, explain:	
Socio-Political Setting			
C3. Who are the stakeholders involved? Why and how did they become involved in the project?	Who? Select from the Appendix – Stakeholder list	Why were they selected?	How were they identified?

Continue...			
C4. At the beginning of the project, were there any stakeholders who you knew should have participated but didn't?			
C5. At the beginning, what relations between stakeholders could be identified? (such as alliances, conflicts, coalitions) Explain.			
C6. At the beginning, who was considered formally responsible for the issue (or resource) at stake?			
C7. Formalized/legal context: What were the main public policies and legal standards regulating the issues at stake? Explain their effectiveness.			

C8. Why was the project initiated?		
Objectives		
C9. At the beginning, what were your project objectives?		
C10. At the beginning, who participated in the design of the project?		
C11. What influenced your selection of methods to be implemented in the project?		
C12. A priori, what was the added value of using the approach(es) implemented? Explain	Approach used	What is the added value? Explain
	<input type="checkbox"/> ComMod Approach	
	<input type="checkbox"/> Other (specify):	

Process

- In chronological order outline each method you used in your project. From the Activity list following, specify which activity this method corresponds to. This is to be achieved by filling in the 'Method Table' which requires you to allocate a number to each method used; beginning at 1 for the first method. It is anticipated that each method will fall into one activity type. If, however, a particular method overlaps activity types highlight (using bold or underline) what the more dominant 'focus' of the method is.
- For methods that use an artifact, complete the 'Artifact Table' for each artifact used.
- Every time a 'Field Action' (Activity FA) is carried out in your project, include a brief description of what the action is and the steps involved. The Method Table does not need to be completed for this activity (unless you think appropriate). Ensure that you indicate where Field Actions chronologically occur in the project.
- Each time you finish filling in a Method Table for a specific method, update the 'Contextual Change Table' found later in this document, then continue on to the next method implemented in your project.

Activity List

These activities are based on the functions of an Integrated Environmental Assessment (IEA). The two defining features of an IEA are: (i) that it seeks to provide information of use to significant decision-makers and (ii) it brings together a broader set of areas, methods, styles of study, or degrees of uncertainty than a single research discipline. Methods used in the ComMod process will overlap these activities, however, it is anticipated that the main focus of a method will fall into one activity.

Activity 0 (zero): Establish Procedures (this is not part of an IEA)

This involves establishing how the project process is going to be carried out. It may include communicating and discussing with stakeholders what the ComMod approach is, what tools and method will be used, how interactions are to take place. This includes receiving an agreement (or refusal) to proceed with the process. It may also involve establishing partnerships.

Activity IP: Identification of Problem (Sorting out the character, underlying causes and implication of the issues)

This is about working out what the problem is: the nature, causes and implications. It involves learning about the current situation.

Activity AO: Analysis of Options (Identifying and evaluating management options)

This is concerned with exploring options and strategies to manage the resource. It involves experiential learning as participants assess impacts of different solutions. Models (and role playing games), for example, provide information about effectiveness, efficiency and equity of management options (Hischemoller et al. 2001).

Activity IS: Identification of Strategies (Establishing objectives and strategies)

This activity identifies strategies to manage the resource and involves a choice, or ranking, of values. It involves negotiations which may take place through meetings. A model may also be used in this activity, for example: "given a clear set of preferences, models are useful in assessing complex tradeoffs between conflicting interests" (Hischemoller et al 2001: 61). This activity differs from 'Analysis of Options' in that a focus is on ranking strategies (through comparison perhaps) rather than exploring possibilities.

Activity CR: Communication of Results

Communicate the results. For example, if the process has led to a management plan (which may involve one or more potential strategies) these results need to be communicated to others not involved in the process. This may be through a business plan (in report form) or through the use of a model shown to higher level institutions or scientists.

Activity FA: Field Action (this is not part of an IEA)

Implementation of an action that is an outcome of the project (such as setting up an institution to manage a resource).

Reference

Hischemoller, R., Tol, R., Vellinga, P. (2001) 'The Relevance of Participatory Approaches in Integrated Environmental Assessment', *Integrated Assessment* 2: 57 –72.

Found at: www.uni-hamburg.de/Wiss/FB/15/Sustainability/iapia.pdf

This table is to be completed for each method used.

Method Table	
What Activity does this method correspond to? (If the method overlaps activities highlight the dominant activity type.)	<input type="checkbox"/> Activity O: Establishing Procedures <input type="checkbox"/> Activity IS: Identification of Strategies <input type="checkbox"/> Activity IP: Identification of Problem <input type="checkbox"/> Activity CR: Communication of Results <input type="checkbox"/> Activity AO: Analysis of Options <input type="checkbox"/> Activity FA: Field Action
Identify the Method	
Assign a number to this method (begin at 1 for the first method you use)	Method Number []
1. What is the method? (select from the Appendix – Method list)	
2. Purpose	

3. Period of implementation (approximately)	Start date:	Finish date:
Why this Method was used		
4. Was this method intended in the original design of the project?	<input type="checkbox"/> Yes <input type="checkbox"/> No. Briefly describe what method you did intend to use and why you didn't use it:	
5. What outcomes did you expect in terms of:	Type of outcome (Select from the Appendix – Context list)	Brief description of expected outcome
Learning		
New relations		
New practices within the group		
New practices outside the group		

How this method was implemented		
6. Briefly describe the method		
7. What are the underlying theoretical assumptions of the method, or how does this method fit into your overall approach?		
8. Who participated in the selection of the method?		
9. Who participated in the implementation of the method? Why?		
10. Who are the participants?	Who? (Select from the Appendix – Stakeholder list)	How many?

11. Of the stakeholders identified in the context, who is not participating and why?		
12. What 'type' of participation are the participants expected to engage in? (you can choose more than one response)	<input type="checkbox"/> Cognitive: create distance between the participant and the problem at hand (such as through a RPG) so that information can be considered and new alternatives can be explored creatively. Debate and argumentation is restricted. <input type="checkbox"/> Argumentative: participate through debate and dialogue; explore the problem through identification, confrontation and integration of divergent viewpoints. <input type="checkbox"/> Relational: to enhance communication (as used in icebreaker activities) <input type="checkbox"/> Non-specific <input type="checkbox"/> Other, briefly describe:	
13. If a facilitator was used, how did he/she interact with the team members and/or participants? What general attitude (posture or		

approach) did he/she adopt?		
Results of the Method		
14. Referring back to question 5, how do the results of the method compare with what was expected:	Type of outcome achieved (Select from the Appendix – Context list)	What were the results of the method?
Learning		
New relations		
New practices within the group		

New practices outside the group				
15. How do the outcomes compare with the underlying assumptions stated above?	What went right?	What went wrong?	How could you improve the method?	
16. How did the outcomes of the method impact on the context? (Including relations between stakeholders)				
17. What artifacts were used in the method and why? List them and complete the Artifact Table following.	Name of Artifact			
	Select from the Appendix –Artifact list			
18. Did this method conclude a sequence?	[] No. Update the Context Change Table (if necessary) and begin the next method.			
	[] Yes. Update the Context Change Table (if necessary) and continue to the next question (18).			
19. If this method concludes a sequence, what are the overall outcomes of the sequence and how do they compare with the project objectives?	What went right?	What went wrong?	What could have been done differently?	

20. Do the series of sequences conclude here?	<input type="checkbox"/> No. Begin describing the next method of the next sequence. <input type="checkbox"/> Yes. Explain why (then continue to question 20):		
21. If the series of sequences conclude here:	What are the next steps?	What are the challenges?	What are the opportunities?
22. What are the most visible effects of the project? (social, environmental etc)			

This table is to be completed for each Artifact used.

Artifact Table	
What method number does this artifact correspond to?	Method Number []
1. What is the artifact? Select from the Appendix – Artifact list	
2. Why was it used?	
3. Was it accepted by participants	<input type="checkbox"/> Not presented <input type="checkbox"/> Yes <input type="checkbox"/> No. Explain:
4. Influence of the artifact on improved sharing of information among participants (project team included):	<input type="checkbox"/> Equality: participants equally shared informational resources associated with the artifact. <input type="checkbox"/> Credibility: the artifact and associated informational resources were credible to the participants. <input type="checkbox"/> Formal/informal agreements emerged between participants concerning the sharing of resources associated with the artifact as an indicator of social learning. <input type="checkbox"/> Other, explain:

	<p>Comments:</p>
<p>5. Influence of the artifact on improved relationships between participants (project team included):</p>	<p><input type="checkbox"/> Improve communication</p> <p><input type="checkbox"/> Increase ability of participants to understand each other</p> <p><input type="checkbox"/> Facilitate acknowledgement of expert and local knowledge.</p> <p><input type="checkbox"/> Other, explain</p> <p>Comments:</p>
<p>6. Influence of the artifact on the outcomes of the participatory process:</p>	<p><input type="checkbox"/> Improve the amount of knowledge</p> <p><input type="checkbox"/> Improve the quality of knowledge</p>

	<input type="checkbox"/> Explore broader range of alternatives <input type="checkbox"/> Test more alternatives <input type="checkbox"/> Effective integration of different components of the system <input type="checkbox"/> Other, explain: Comments:	
7. In your opinion, what is	Criteria	Scale

the degree of 'usability' of the artifact in terms of the following criteria:	Low Usability		Neutral		High Usability
	User Friendly: simplicity of the artifact and easiness to interact with				
	1	2	3	4	5
	Effectiveness: capacity of participants to complete the task				
	1	2	3	4	5
	Efficiency: resources consumed to complete task				
	1	2	3	4	5
	Satisfaction: users reactions – comfort, attitude				
	1	2	3	4	5

Contextual Change

The table below is intended to encapsulate how the context changed throughout the project. It should be completed while outlining the methods used in the project. This will prompt you to reflect on how each method impacted on the project context, or on your perceptions of the project context. The question “At what method number did this change?” refers to the number you allocate to each method (see the ‘Method Table’)

<u>Contextual Change Table</u>		
Contextual Aspect	At what method number did this change?	Explain <i>why</i> and <i>how</i> this changed?
Physical System		
CC1. Resource(s) at stake?	[]	
	[]	
	[]	
	[]	
	[]	

CC2. Scale of focus of the project.	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
Socio-Political Setting		
CC3. Who are the stakeholders involved? Why and how were they selected?	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
CC4. Are there any stakeholders who should be participating in the project but are not? Explain	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
CC5. What relations between stakeholders can be identified?(alliances, conflicts, coalitions)	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	

	<input type="checkbox"/>	
	<input type="checkbox"/>	
CC6. Who is considered formally responsible for the issue (or resource) at stake?	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
CC8. Did the nature of conflict surrounding the resource at stake change?	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
Objectives		
CC9. What are your updated project objectives?	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	

CC11. Did you change the design of your project?	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	

Appendix

Important: The following lists are not exhaustive and are to be used as a guide only. In all questions that refer to these lists, it is possible to include responses that do not feature here.

Context	Stakeholders	Methods	Artifacts
Social	Local Residents	Role Playing Game	Game board
Economic	Local Government	Ethnographic survey	3D map
Political	National Government	Delphi Survey	ABM simulation
Environment	NGO	Collective mapping	Photos

Cultural	Technical Services	Computer modeling	UML
Legal	Traditional Organisations	Other	Cognitive Map
Other	Project Team		Other
	Scientific Expert		
	Contractors		
	Land Owners		
	Other		

Appendix B LPF-ComMod Field Data

B.1 Venn diagrams from the LPF stakeholder analysis (Mallion and Gamutia, 2004)

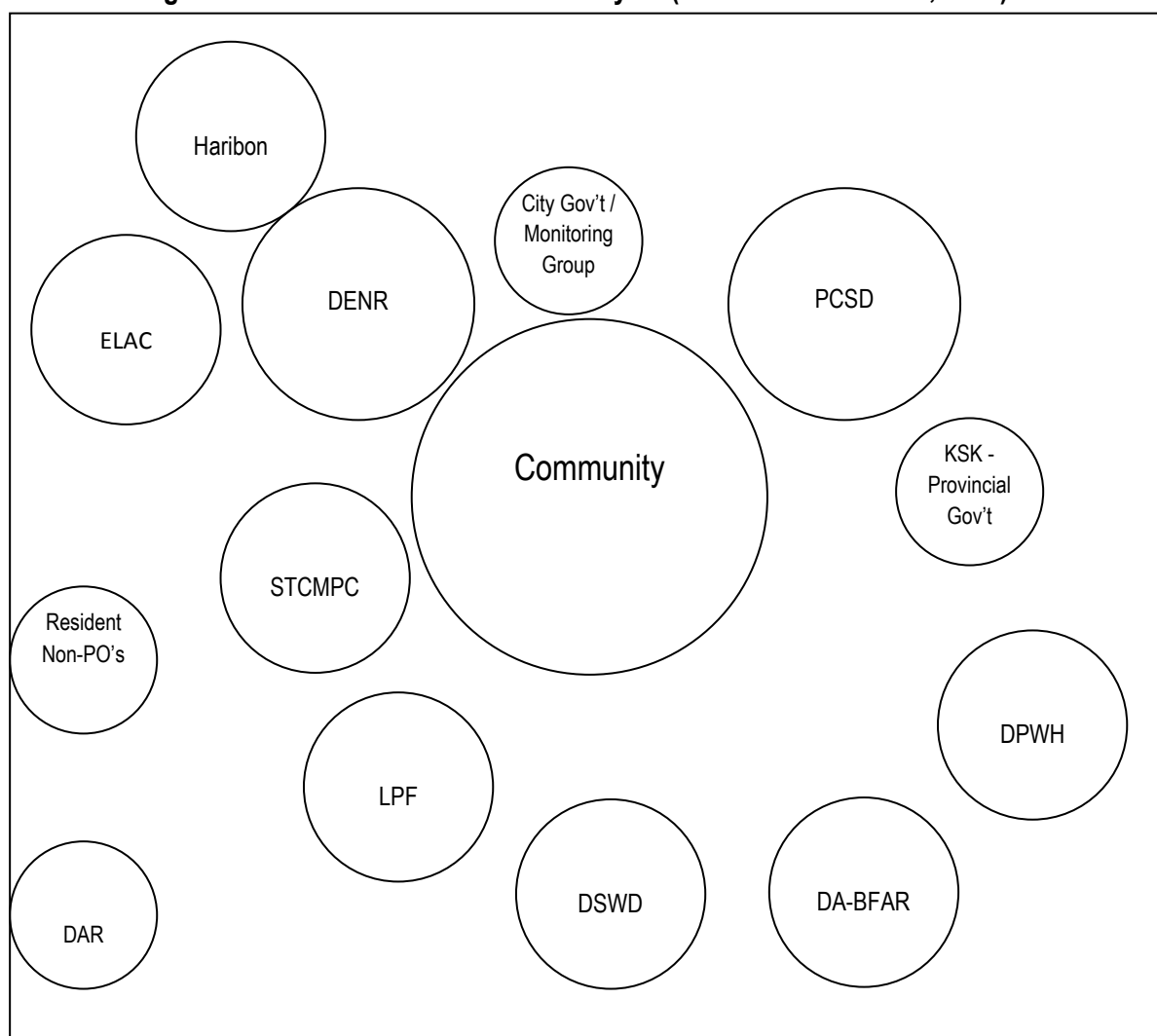


Figure 1 Venn diagram showing the relevance of the different government and non-government organizations to the community and their resources: Community workshop, Stage 1.

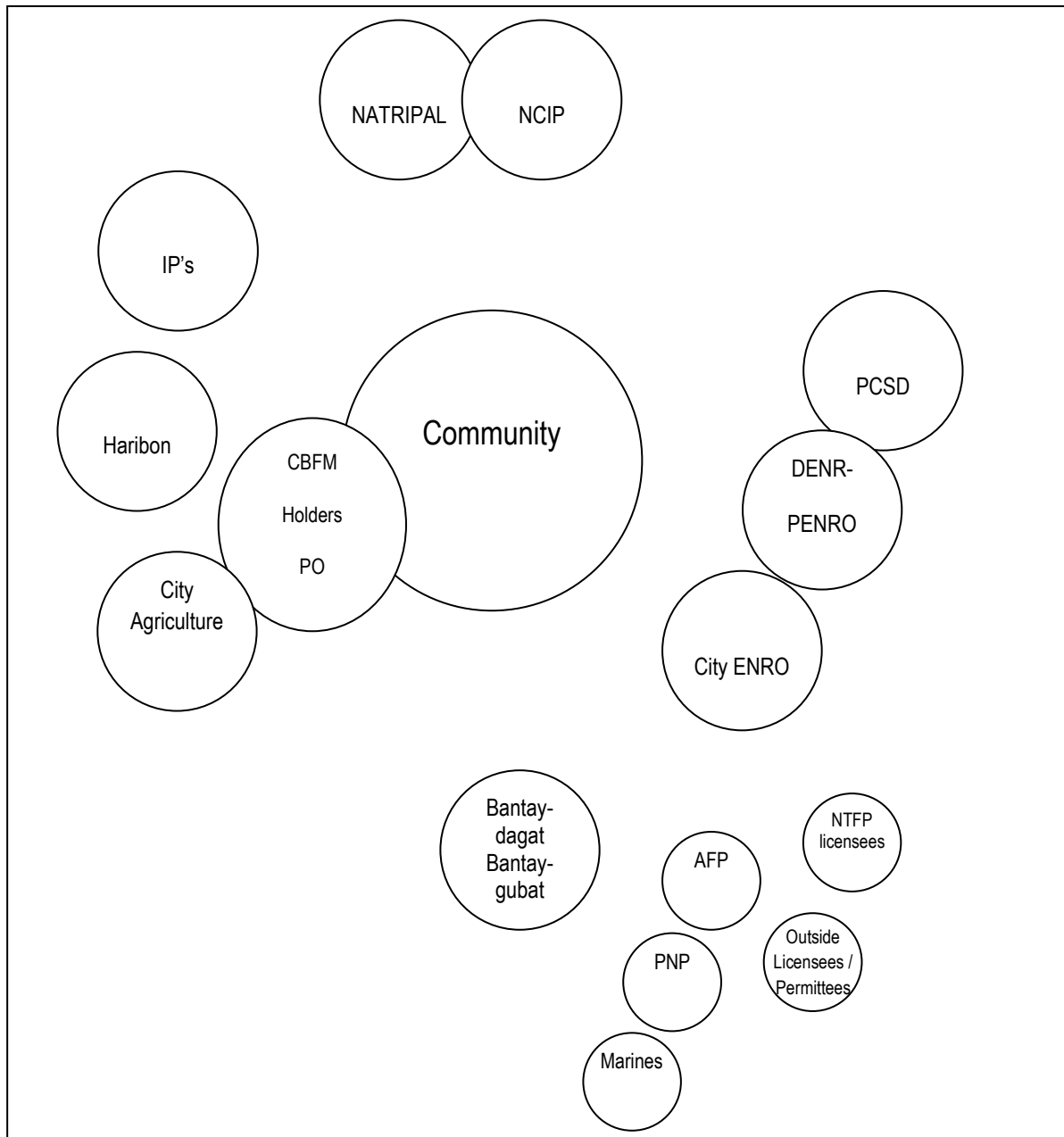


Figure 2 Venn Diagram showing the relevance of the different government and non-government organizations to the community and their resources: Government and non-government institutional workshop, Stage 2.

B.2 Members of the Provincial Steering Committee (PrSC)

Chair: Dir. Nelson P. Devanadera
PCSDS, Executive Director

Vice-Chair: Engr. Jovenee C. Sagun
City Planning, Officer-In-Charge

Sub-Committees:

Upland –	Mr. Raymundo Crisostomo PENRO Officer, DENR
Lowland –	Mr. Nelson Salvador Provincial Agriculture Officer
Coastal -	Mr. Rueben Jardin Provincial Officer - DA-BFAR
Livelihood and Marketing –	Engr. Elmer T. Ferry Agricultural Center Chief III, DA-PAES
Local Governance -	Mr. Ricardo Z. Austria Provincial DILG Officer

Members:

Mr. Halid Dawili – DILG, City level

Dr. Teodoro Villanueva – LPF Representative

Ms. Doodee Devanadera – LPF Representative

Hon. Melquiades Rodriguez – Brgy. Captain of San Rafael

Hon. Epitacio Abrea – Brgy. Captain of Tanabag

Hon. Candido Canete – Brgy. Captain of Concepcion

Mr. Zernan Teodoro – Technical Working Group, San Rafael

Mr. Gaudencio Osano – Technical Working Group, Tanabag

Ms. Beatriz Dacles – Technical working Group, Concepcion

B.3 Sample of invitation letters of MAS activities sent to different stakeholders

English version

Dear _____,

Greetings....

The Levelling the Playing Field Project is in its 3rd year of implementation. During this period, a computer modeling process will be implemented as a tool to come up with a socio-ecological model of the project site. It will consider the different landscapes, namely the upland, lowland, and coastal landscapes, in the three research areas – barangays San Rafael, Tanabag and Concepcion – located in Puerto Princesa City.

In relation to this, LPF staff will be conducting a workshop to present the computer model of the three barangays that has been constructed based on the previous activities of the LPF project pertaining to the MAS modeling process. From this presentation, the model would be validated by the participants in terms of its appropriateness and ability to mirror reality of the three barangays. Also, in this workshop, the first scenario-building activity would be conducted.

We would like to invite you as a member of the Provincial Steering Committee to take part in this activity and be a part of this learning process and planning for the betterment of the three barangays as well as the better management of their natural resources. The workshop would be conducted on _____, from _____ at _____, Puerto Princesa City.

Thank you very much for your cooperation in this matter.

Very Truly Yours,

DR. TEODORO R. VILLANUEVA

Professor and National Coordinator, LPF Project

Filipino version

Isang maka-kalikasang pagbati.

Sa ikatlong taon ng pagpapatupad ng proyektong Levelling the Playing Field itinatuloy ng proyekto ang *modelling process* para alamin ang mga kasalukuyang sitwasyon at bumuo ng modelo ng kagubatan, kapatagan, karagatan sa tatlong pinapag-aralang mga barangay, ang San Rafael, Tanabag, at Concepcion, sa siyudad ng Puerto Princesa.

Kaugnay nito, ako at ang aking mga kasama ay magsasagawa ng *workshop* na gaganapin sa ika-__ ng ____, ____ ng umaga sa _____. Ang layunin ng *workshop* na ito ay siyasatin kung ang mga datos na nakuha mula sa nakalipas na mga gawain para sa *modelling process* ay maayos na naisalin sa modelo sa pamamagitan ng paggamit ng *role-playing game* (RPG). Layunin din nito na suriin ang *modelling process* sa tulong ng mga (participants) at pag-usapan kung paano ito mapapabuti sa pamamagitan ng paggamit ng *Criteria & Indicators* (C&I). Sapagkat itong C&I ay gagamitin pa lang sa unang pagkakataon, nais din namin na ito ay masubukan, suriin at humingi ng mga mungkahi mula sa mga dadalo ng *workshop*.

Inaanyahan po namin kayo na makibahagi sa mga gawain at talakayan na gagawin sa loob ng *workshop* na ito.

Sa mga susunod na araw, nais din naming kapanayamin ang ilan sa mga lumahok sa nasabing *workshop* para sa mga karagdagang katanungan kung sakaling kailangan ng klaripikasyon o karagdagang impormasyon tungkol sa *workshop*.

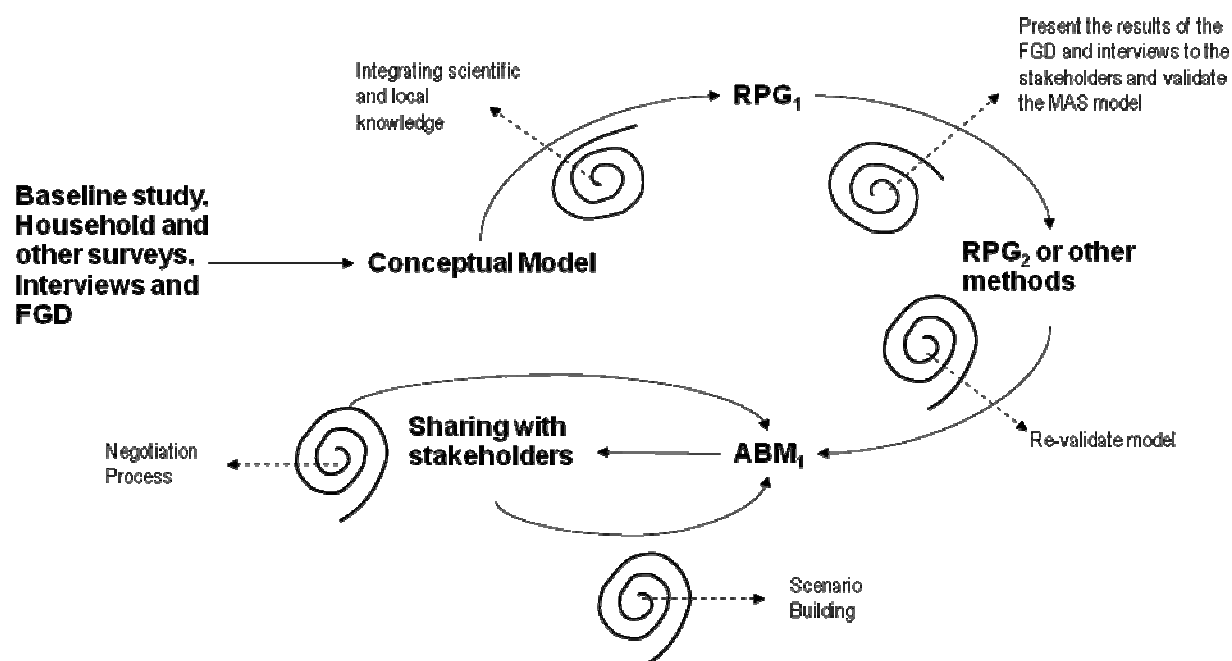
Maraming salamat po sa inyong walang sawang kooperasyon at pagsuporta sa proyekto.

Sumasainyo,

TEODORO R. VILLANUEVA

Propesor at National Coordinator, LPF Project

B.4 Initial conceptualization of the participatory MAS modelling process for Palawan, Philippines made and presented at the LPF training workshop on ComMod in 2004 at Bangkok, Thailand



B.5 Process designs of the MAS activities

a. Introduction to MAS

TOPIC	Introduction to the MAS Modeling Process for the LPF Project		
OBJECTIVES	Formally introduce to the participants the MAS Modeling process, it's objectives, and the tools, methods and activities to be applied in the process		
DURATION	6 hrs	Participants	15
PROCESS/FLOW	METHODS		
<p>– Registration starts at 8:30 am –</p> <p>CONCRETE EXPERIENCE (<i>Start at 9:00 am</i>)</p> <p>Explain objectives of the workshop (5min)</p> <p>Presentation about MAS modeling (45min)</p> <p>CherIng Game:</p> <p>CherIng Game: Rules (10min)</p> <p>CherIng Game: Scenario 1 (20min)</p> <p>CherIng Game: Scenario 2 (20min)</p> <p>– Coffee Break (20min) –</p> <p>CherIng Game: Scenario 3 (20min)</p> <p>CherIng Game: Scenario 4 (20min)</p> <p>OBSERVE AND REFLECT (<i>Start at 11:40 am</i>)</p> <p>Debriefing of CherIng Game (20min)</p> <p>– Break for lunch at 12 pm –</p> <p>ANALYSES (<i>Start at 1:00 pm</i>)</p> <p>Discussion question: “How can MAS modeling be of help to you and/or your organization?” (15 min)</p> <p>Discussion question: “What are the lessons you have learned from this workshop?” (15 min)</p> <p>Clarify ideas if there is a need (10min)</p> <p>CONCLUSION (<i>Start at 1:40 pm</i>)</p> <p>Discussion question: “What would you like to see in the model?” (20min)</p> <p>Closing of the program.</p> <p>– End of workshop at 2:20 pm –</p>			<p>Brainstorming (?)</p> <p>Meta-cards (?)</p> <p>CherIng game</p> <p>Materials:</p> <p>Projector</p> <p>Projector canvass (for the display of projector)</p> <p>Video Camera</p> <p>Tape recorder</p> <p>Generator and gas (?)</p> <p>Markers (20pcs – different colors)</p> <p>Paper cards (cartolina for meta-cards)</p> <p>Flipchart or manila paper</p> <p>Flipchart stand (buy, make or just post on the wall or board?)</p> <p>Masking tape</p>

b. RPG1

TOPIC	Role Playing Game Session 1: Data Validation
OBJECTIVES	Validate the data that has been gathered from the community regarding their livelihood practices as well as the decisions involved in performing

		these livelihood activities using a role-playing game (RPG); Test the criteria and indicators (C&I) that would help analyze, critique and improve activities related to ComMod such as RPGs; and Introduce to the community the concept and importance of analyzing activities using C&I.	
DURATION	7 hours	PARTICIPANTS	12 Barangay members (3 of which are members of TWG)
PROCESS/FLOW			METHODS
<p>– Registration starts at 9 am –</p> <p>CONCRETE EXPERIENCE (<i>Start at 9:30 am</i>) Recall/review the LPF project objectives. (10 min) Recall/review the MAS modelling objectives and process. (10 min) State the objectives of the day's activity. (10 min) RPG (2 hrs)</p> <p>– Break for lunch at 12 pm –</p> <p>OBSERVE AND REFLECT (<i>Start at 1 pm</i>) Debriefing of the RPG session, i.e. discussion of results of the RPG. (1 hr) Observers present their observations about the activity to the group. (20 min)</p> <p>ANALYSES (<i>Start at 2:20 pm</i>) Analyze the day's activity (i.e. the previous steps of the process) using C&I and get suggestions for improvement. (40 min) – serve snacks at 3 pm – Analyze the C&I used in the activity and get suggestions for improvement. (40 min).</p> <p>CONCLUSION (<i>Start at 3:40 pm</i>) The facilitator then summarizes what has been discussed during the day's activity. S/he then invites the group to ask questions regarding the activity conducted, about the MAS modelling process, and/or about the LPF project. Discuss if the objectives for this activity were met. Also, the facilitator asks the group if it is possible to interview some of the players should there be further questions from the researchers that require individual responses. (15 min) The researcher/s would then present the next step in the MAS modelling process and invite the participants for the succeeding activities. (5 min)</p> <p>– End of workshop at 4 pm –</p>			<p>Presentation Group recollection Group discussion RPG</p> <p>Materials: LCD projector RPG game materials Permanent markers (different colors) Manila paper</p> <p>Roles/People involved for workshop: Facilitator Recorder Observers (2 persons)</p> <p>Roles/People involved for RPG: Game master Game assistant Observers (2 persons)</p>

c. RPG2

TOPIC	Computer Model Presentation and 1 st Scenario Building		
OBJECTIVES	To present and validate the computer model Conduct the 1 st scenario-building activity		
DURATION		PARTICIPANTS	20 participants
PROCESS/FLOW			METHODS

<p>CONCRETE EXPERIENCE Recall/review the LPF project objectives. Recall/review the MAS modelling objectives and process. State the objectives of the day's activity. Computer model presentation</p> <p>OBSERVE AND REFLECT Discussion on the validity of the computer model Scenario-building</p> <p>ANALYSES Analyze the computer model and scenario-building activity in relation to the past MAS activities Analyze the day's activity using C&I and get suggestions for improvement. Analyze the C&I used in the activity and get suggestions for improvement.</p> <p>CONCLUSION The facilitator then summarizes what has been discussed during the day's activity. S/he then invites the group to ask questions regarding the activity conducted, about the MAS modelling process, and/or about the LPF project. Discuss if the objectives for this activity</p>	<p>Presentation Plenary / Group Discussion (others ?)</p> <p>Materials: LCD projector Permanent markers (different colors) Manila paper</p>
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d. Water resource management planning and negotiation (WRMPN) workshop

TOPIC		MAS for Water Resource Management Planning and Negotiations	
OBJECTIVES		<p>To be able to make the participants experience working together thru collective planning and negotiations for water resource management.</p> <p>To be able to take the lessons learned from the MAS modelling process and apply them in real situations by means of developing plans of actions and strategies.</p> <p>To be able to, at the end of the workshop, develop arrangements and agreements among stakeholders to implement the plans of actions and strategies</p>	
DURATION	2 Days	PARTICIPANTS	<p>(1 rep per GO and NGO + PrSC)</p> <p>(4 reps per Barangay: 1 TWG member, 1 Council member, 1 commoner)</p> <p>(2 reps from Bataks)</p>
PROCESS/FLOW		METHODS	
<p>– Registration starts at 8:30 am –</p> <p>Day 1</p> <p>CONCRETE EXPERIENCE AM Session 1: Review of MAS process and the activities that have been</p>		<p>Presentation Group recollection Group discussion Other facilitation methods, e.g. world cafe (?)</p> <p>Materials:</p>	

<p>undertaken (possibly a PowerPoint presentation)</p> <p>Session 2: (Group work 1) participants are divided into 4 groups and discuss what lessons and methods in the process which can be used for future activities of the participants with special focus on water resource management.</p> <p>PM</p> <p>Session 3: Presentation of MAS computer model and scenarios, and its relation to water resource management</p> <p>Session 4: (Group work 2) again, participants are divided into the same groups to discuss the implications of the scenarios in their water resource management planning</p> <p><i>Assignment at the end of the day:</i> Each group will be asked to prepare a presentation for the following day. The presentation would be a synthesis of the group works and it would contain issues in water management which are of importance and should be given attention to, as well as the possible methods or actions on how to address such issues,</p> <p>- End of Day 1 at 5:00 pm –</p> <p>Day 2</p> <p>OBSERVE AND REFLECT</p> <p>AM</p> <p>Session 1: Review of Day 1 activities.</p> <p>Session 2: (Group Work 3) Presentation of the groups.</p> <p>ANALYSES</p> <p>PM</p> <p>Session 3 part A: (Group work 4) The entire group will synthesize the work of the smaller groups. This time, they will start discussing resource management plans, strategies or Plans of Actions (POA). More specifically:</p> <p>Identify a strategy or strategies in managing their water resource.</p> <p>Determine the technical, social, financial, and organizational/structural requirements in order to implement the management plan for the said resource.</p> <p>CONCLUSION</p> <p>Session 3 part B: They would be asked to discuss on possible agreements between stakeholders in order to implement the plans they have created, i.e. they would organize themselves and identify their roles and responsibilities in the implementation of the strategy/strategies. This would also include identifying initial activities and target dates for the accomplishment of the said activities. This could also include planning for the next meeting.</p>	<p>LCD projector</p> <p>Permanent markers (different colors)</p> <p>Manila paper</p> <p>Roles/People involved for workshop:</p> <p>Facilitator</p> <p>Recorder</p> <p>Observers (2 persons)</p>
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<p>Session 4: Discussion the future of MAS modelling in the project site if they have anything in mind.</p> <p><i>Assignment at the end of the day:</i> Complete the evaluation of the workshop.</p> <p>- End of Day 2 at 5:00 pm –</p>	
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e. ComMod Evaluation Protocol

TOPIC		ComMod Evaluation	
OBJECTIVES		1) To determine what the participants have learned/remember 2) To determine if there are changes in the stakeholders (ex. relationships, partnerships) 3) To determine what could be the possible use of the method and/or tools.	
DURATION	2 hours	PARTICIPANTS	8 members of the community
PROCESS/FLOW		METHODS	
<p>– Starts at 10am (1:30pm for afternoon session) –</p> <p>CONCRETE EXPERIENCE (30 min)</p> <p>Activity 0: Objectives of the activity (2min)</p> <p>Activity 1: Build the MAS process (by discussion then manila paper) (18 min)</p> <p>Activity 2: Reporting (while LPF staff comments on the report) (10min)</p> <p>OBSERVE AND REFLECT (45 min)</p> <p>Activity 3: Paolo explains the facts (10 min)</p> <p>Activity 4: collective discussion</p> <p>Question 1: What do you remember about the MAS modelling?</p> <p>Question 2: (Did this modelling process have any impact on the community (individual and/or collective, depending on the answers?) Did this change something in you? How? Are there any new relationships among stakeholders? (Do these new relationships have any impact?)</p> <p>Question 3: How close to the reality are the games? (How realistic were the games?)</p> <p>Question 4: What was the overall objective/s of the MAS modelling process?</p> <p>ANALYSES (15 min)</p> <p>Activity 5: Paolo states the objectives of the MAS modelling process (5 min)</p> <p>Activity 6: Collective discussion</p> <p>Question 5: What is the reaction to the objectives stated by the participants and those stated by Paolo?</p>		1) collective discussion 2) reporting Facilitator: Ted Villanueva Manila paper, 2 markers	

CONCLUSION (30 min) Activity 7: Collective discussion Question 6: Can the tools, RPG and computer simulation, be used again, for what purpose, which players and why these players? Question 7: How can we improve the process? - End at 12:00 pm (3:30pm for afternoon session) –	
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B.6 Sample slides from the presentation to introduce MAS and ComMod to the stakeholders (translated from the local language, Filipino)

LPF
Levelling the Playing Field Project

What is a Model?

A *model* is a simple representation of reality.

A *computer model* is a model that functions or runs inside a computer.

LPF
Levelling the Playing Field Project

What are the different interactions that can be observed?

A – Agents
O – Objects in the *environment*

B.7 FGD guide questions

The following are the FGD questions used to elucidate information on the livelihood practices of the community (translated from the local language, Filipino):

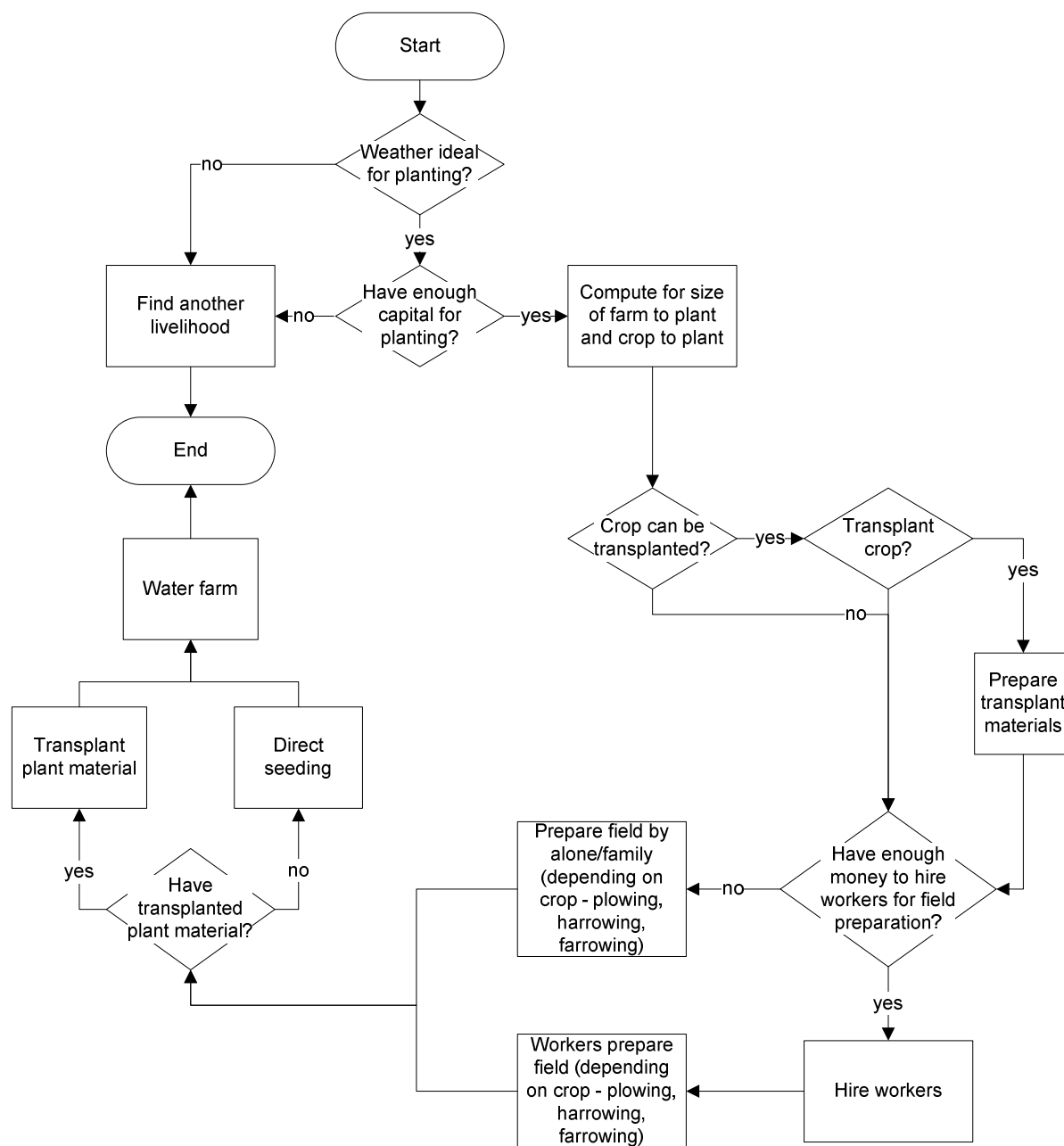
- 1) What are the major resource-use activities that are performed within the community?
- 2) What are the sub-activities that make-up or are related to perform this activity? What is the order or sequence of these sub-activities? What is the frequency, duration, distance (from starting point, what is the starting point?), extent (boundaries) and at what period are these sub-activities performed? (need maps)
- 3) What is the frequency, duration, distance, extent and at what period that the activity is performed? What are the costs involved when performing this activity (e.g. materials, equipment (whether bought or rented), additional labor, rent of land)?
- 4) What are the decisions that you have to make while performing this activity? What are the factors that you consider when making this decision? How important are these factors?
- 5) Who are the people that could influence your decisions? How and how much do they affect your decisions?
- 6) Are there existing rules or guidelines that affect your decisions or actions when performing this activity? What are they and how do they affect your decisions?
- 7) Is there any person or group of persons that you encounter while performing this activity? Who are they? Do they affect your actions and decisions? How?
- 8) What are the problems that you have encountered when performing this activity? Are there any people involved? Who are they? How do you cope or deal with the situation and what is the usual result of this?
- 9) Aside from seasonal changes, when or how else do you decide to change the activity you are usually performing? What are the factors that determine whether you stay or change your activity? How much is the importance of each factor? Are your actions, decisions or activities affected by special occasions or events? What are these occasions or events and how do they affect you?
- 10) How do you choose which activity you would like to perform? What are the activities you usually go into? Why?

Questions 2 to 8 were asked for each livelihood activity, while questions 1, 9 and 10 were asked for the entire session. Some of the questions were related and were grouped together during the FGD.

B.8 UML activity diagrams of the identified livelihood activities in the three communities in Puerto Princesa, Palawan constructed by the ComMod team

Figure 1 Lowland Farming

Preparations



Maintenance of existing farms

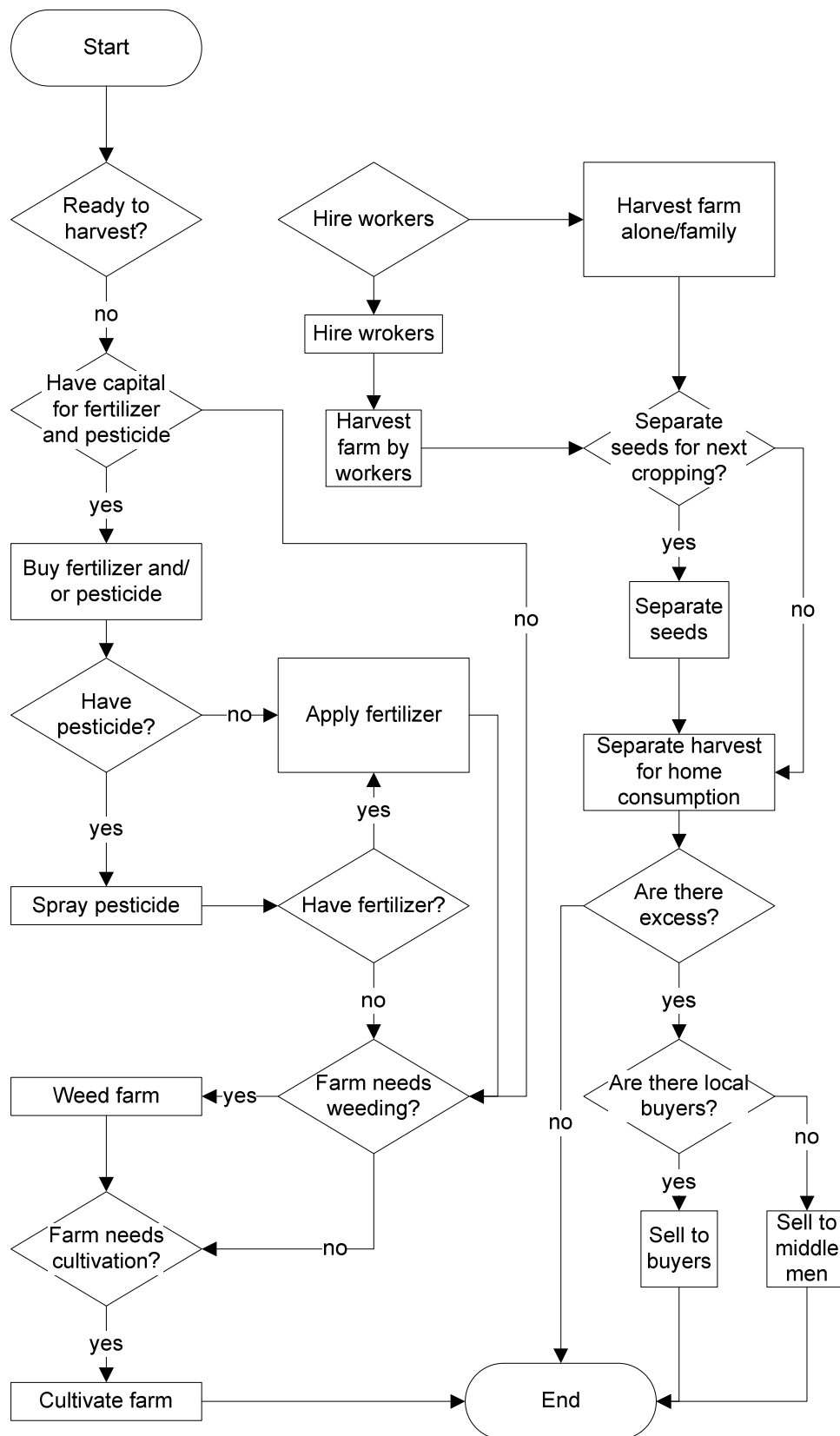
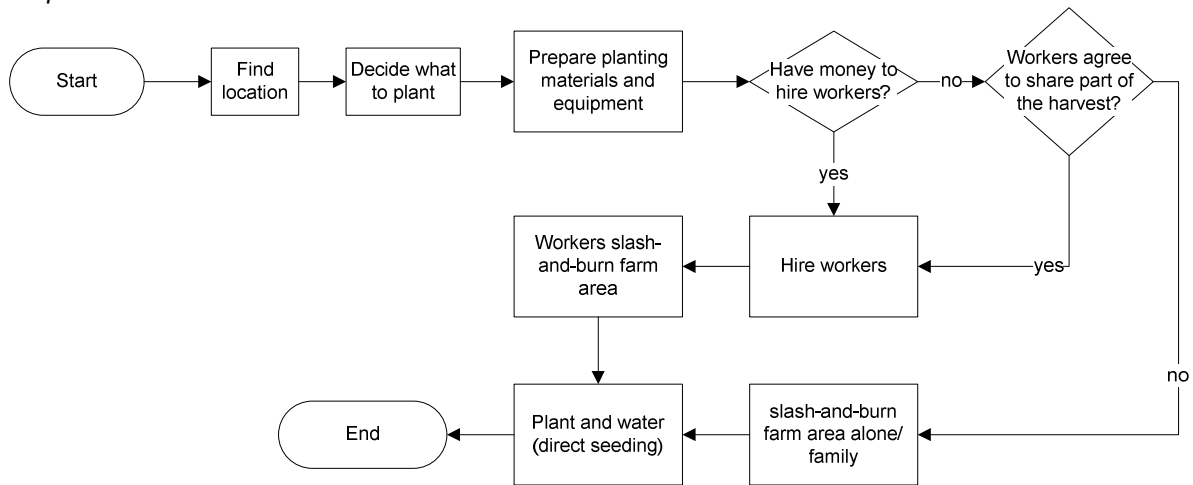


Figure 2 Upland/Swidden Farming
Preparations



Maintenance of existing farms

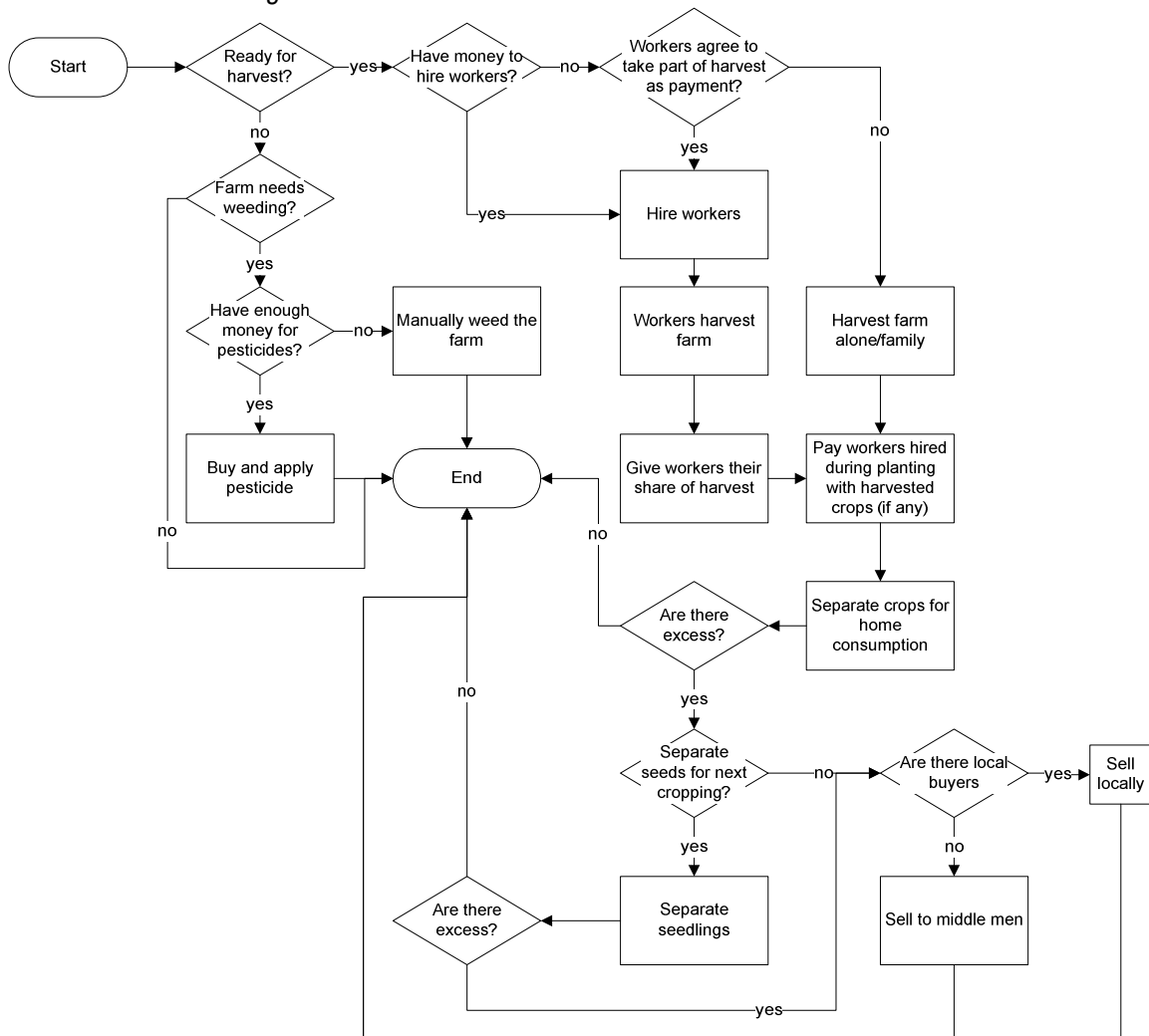


Figure 3 Fishing Preparations

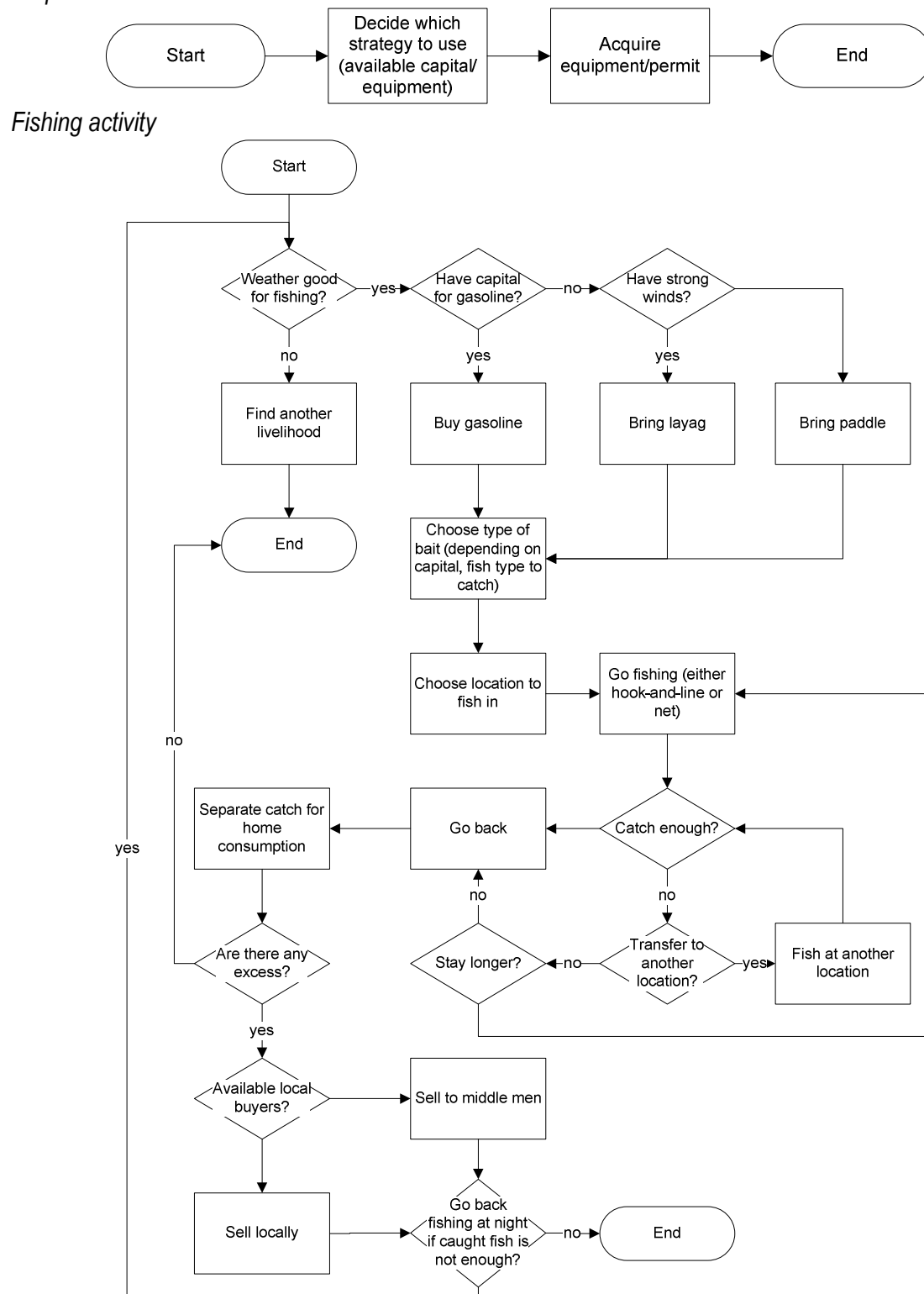


Figure 4 Seaweed farming

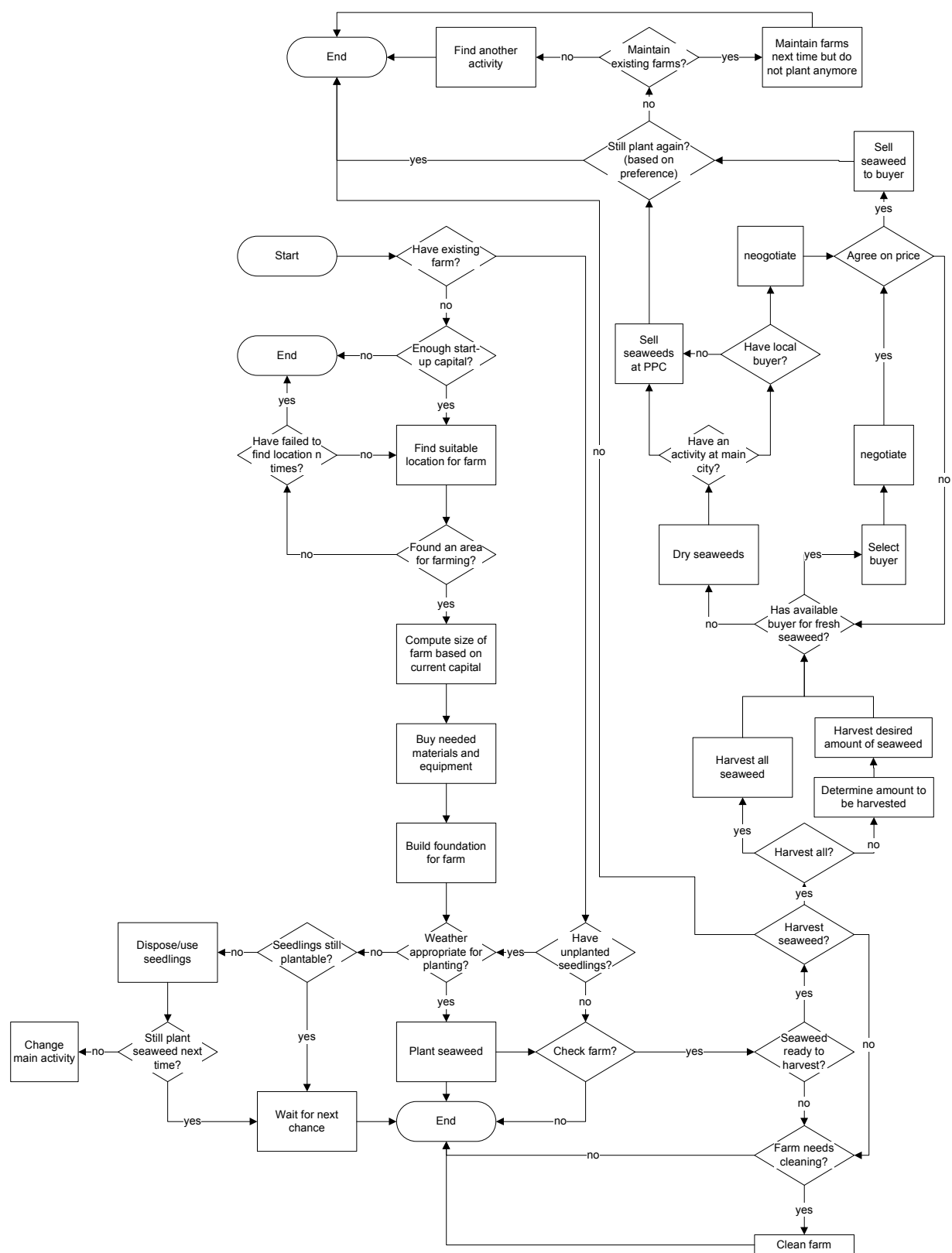


Figure 5 Milkfish fry catching

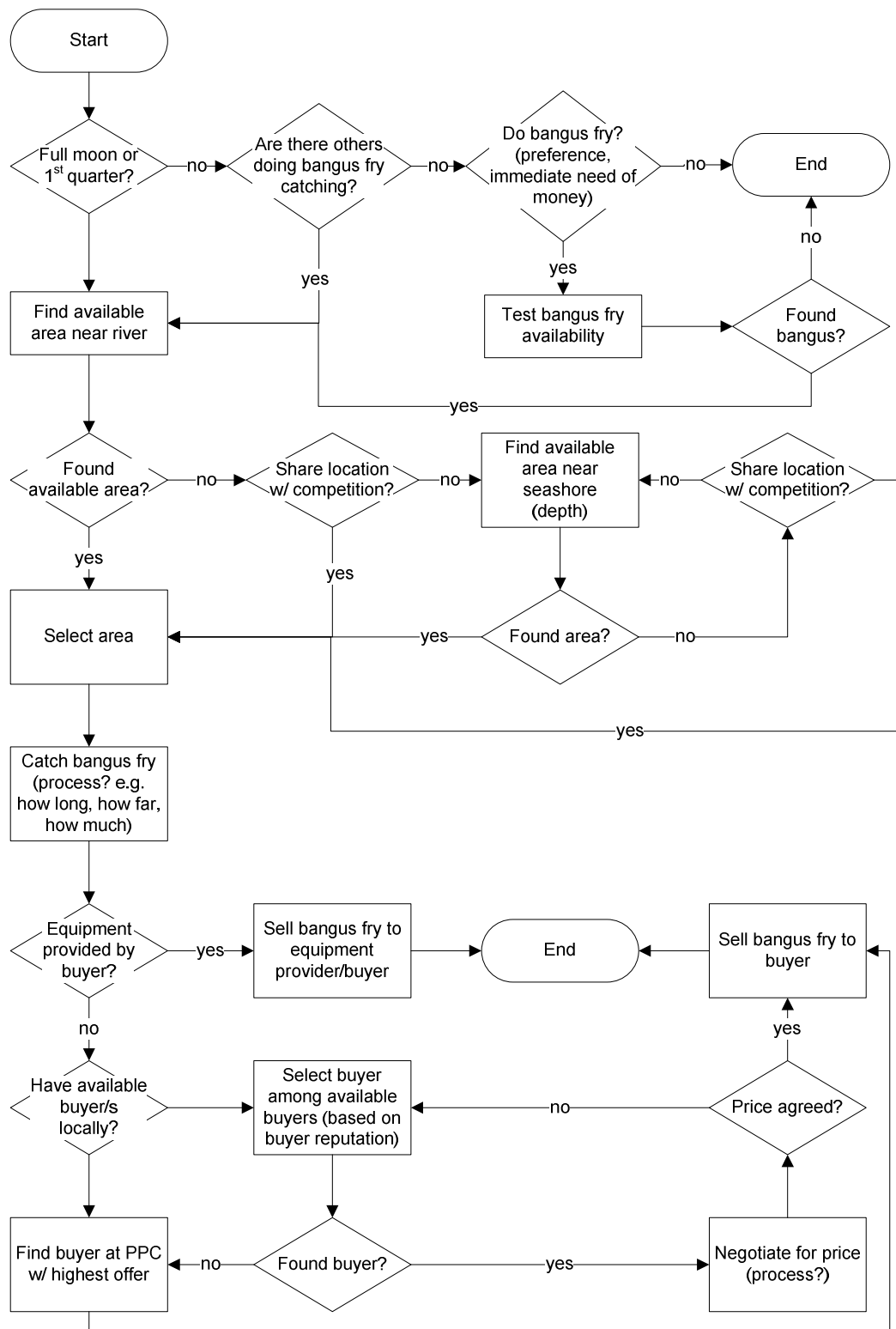


Figure 6 Charcoal-making

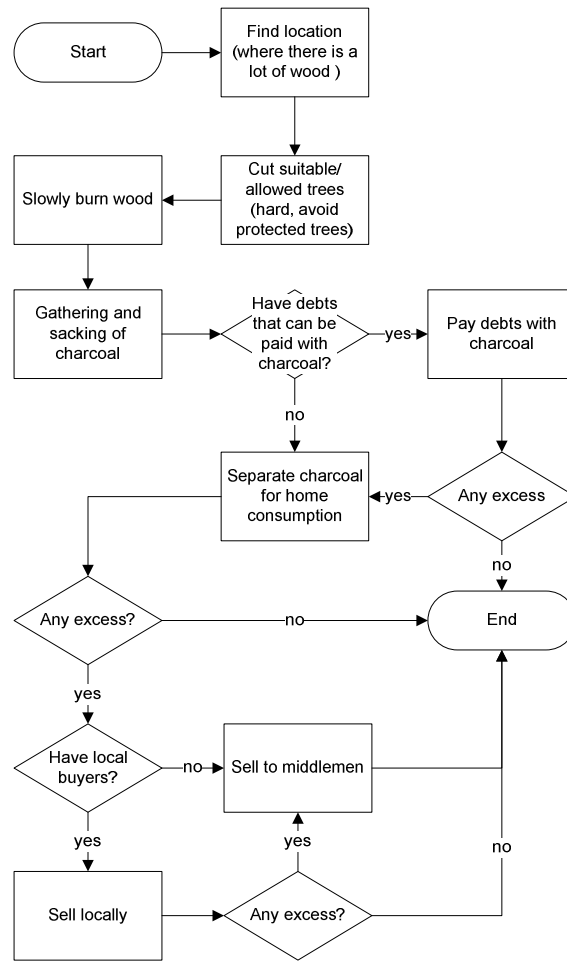


Figure 7 Resin collection

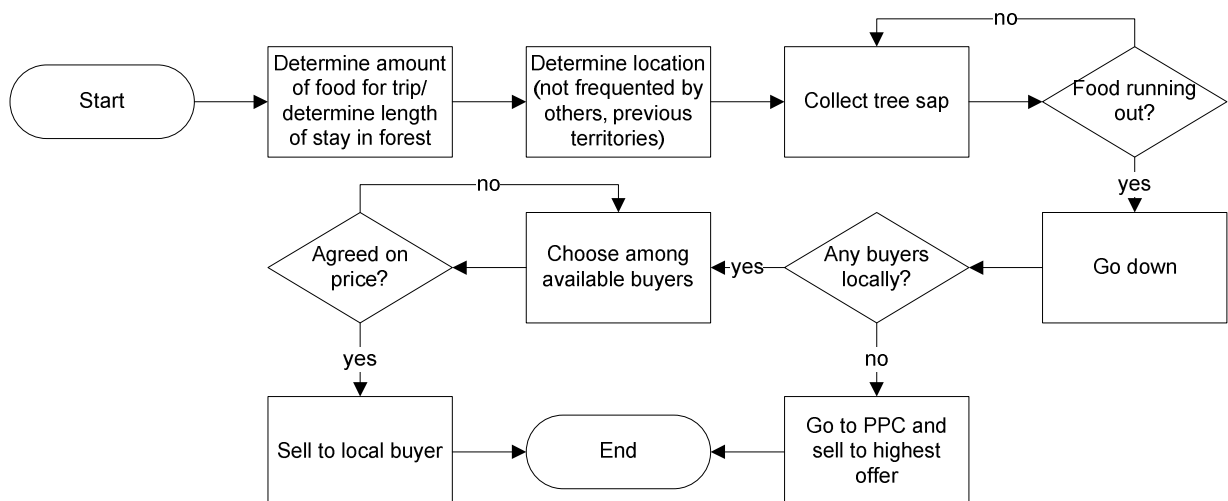


Figure 8 Copra-making

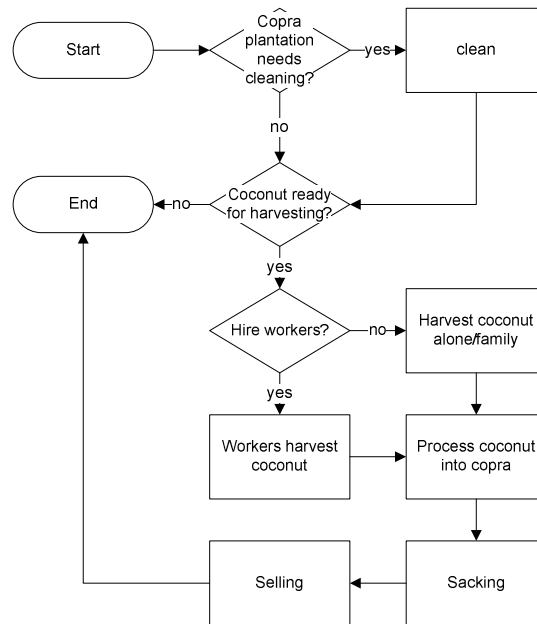


Figure 9 Coconut shingles making

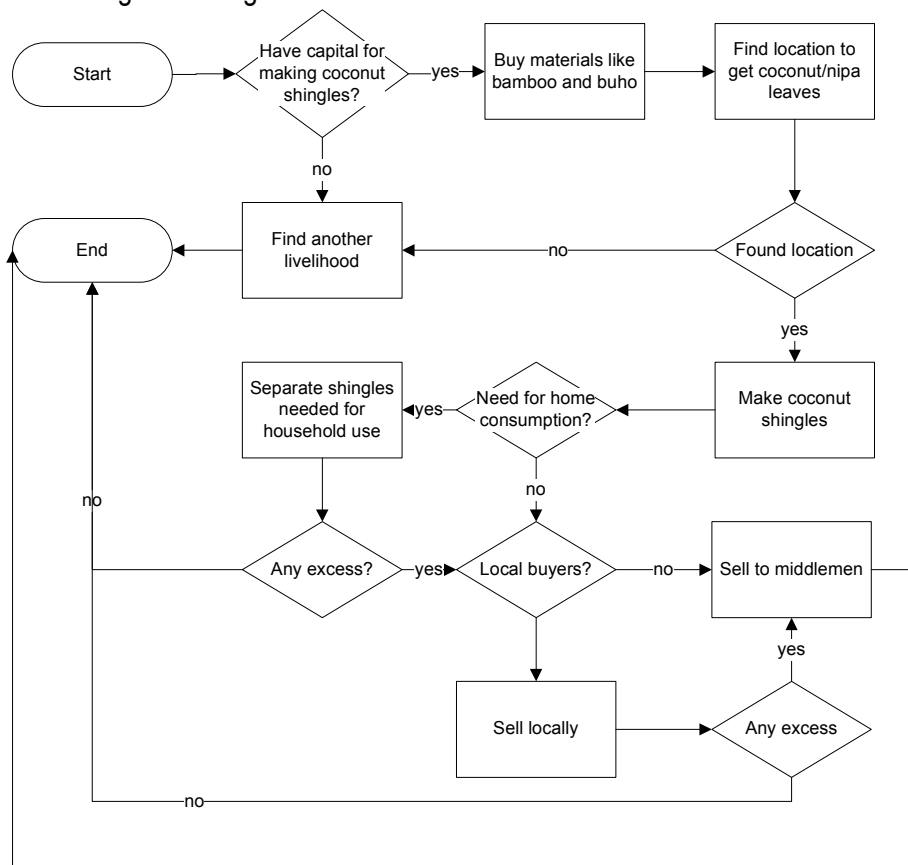
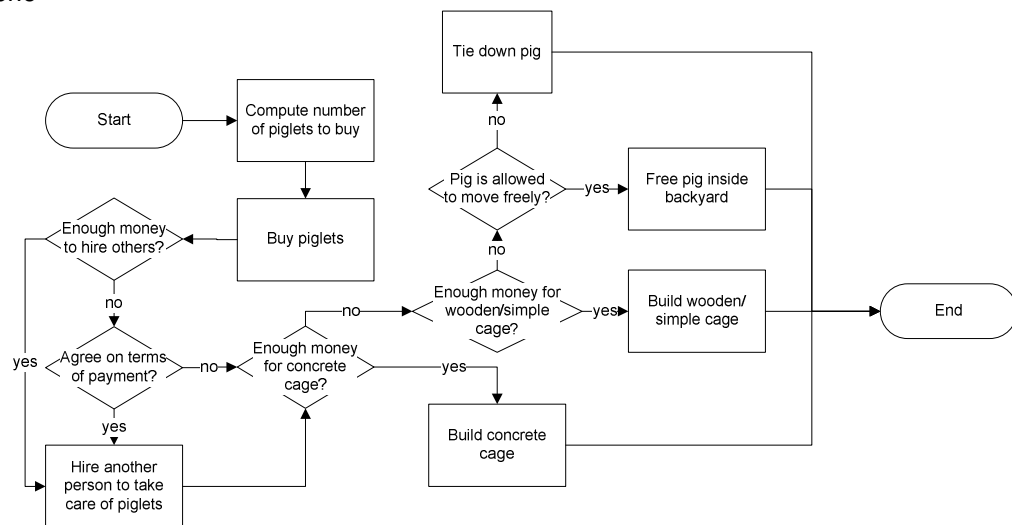
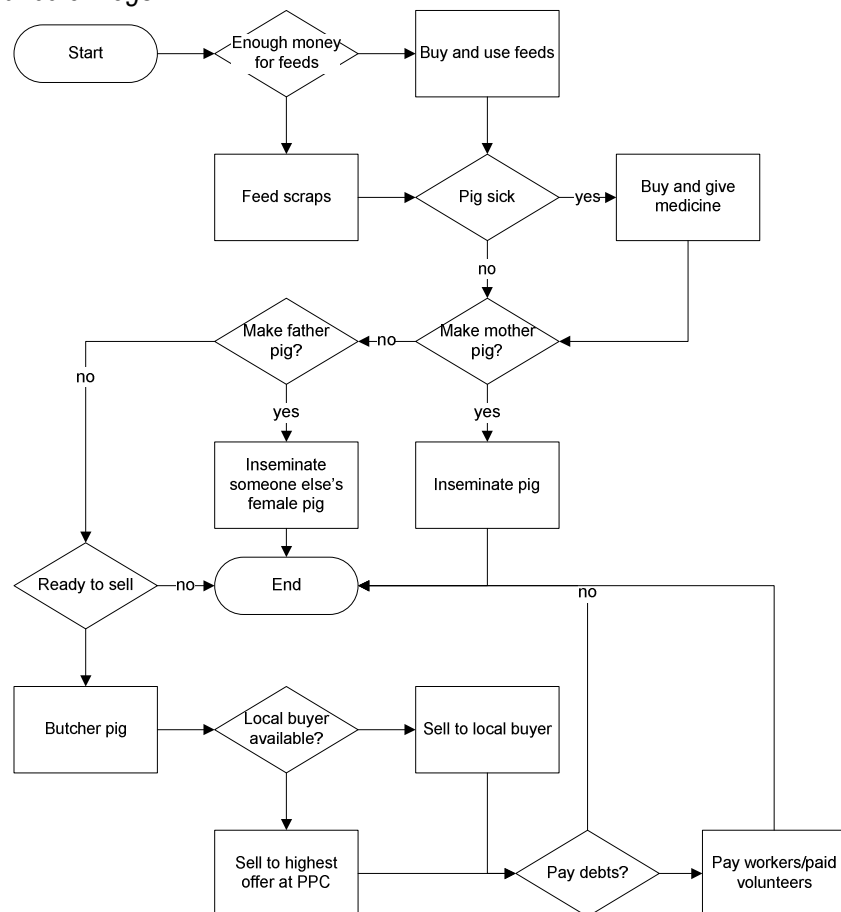


Figure 10 Hog-raising
Preparations



Caring/maintenance of hogs



B.9 Interview questions for GOs and NGOs and the highlights of the interviews

The guide questions used for the interview were as follows:

- 1) How or what does your office contribute to the management of natural resources in the study area?
- 2) What are the specific activities that you perform with regards to NRM? What is the duration, frequency, distance and extent are these activities performed?
- 3) How are these activities planned, implemented, monitored and revised? Who are the people/institutions involved in these processes? What is or what is the extent of their involvement?
- 4) How is coordination performed when other people/institutions are involved? Who communicates what? Who or what institution makes the final decisions?
- 5) Is your organization following a specific law, objective or strategy when performing these activities? What are they? Who formulated them? How are they formulated? How much of it are followed?

Highlights of the interviews with GO and NGO representatives

Government organizations

PCSD

- This government agency is tasked to implement the Strategic Environmental Plan (SEP) Act (RA 7611) and the Environmentally Critical Areas Network zoning. The ECAN zones would be integrated into the Comprehensive Land Use Plan (CLUP) of the municipalities of Palawan. It is promoting the ECAN as a development tool.
- It is the highest body for making policies regarding environmental management in Palawan.
- It also provides resource persons and training designers for trainings depending on the requests.
- Also involved in environmental education thru a multi-media approach such as radio programs, leaflets and on-site campaigns. It is also involved in establishing Coastal Resource Management Learning Center as a model for other barangays.
- Although this organization is a consultative body for LGUs, it also provides assistance in implementation of laws and regulations because of the limited resources of the LGUs.
- Through collaborations with other organizations, it comes up with projects such as the Malampaya Wetlands Project and the Calamianes Mangrove Project.
- It is also a counterpart in the management of the Balabak area together with Sulusulawesi.
- It collaborates with different organizations at multi-levels – sometimes being proponents to projects, or sometimes it is involved in data-sharing.
- Develops tools for monitoring of ECAN
- It conducts the province-wide State of the Environment yearly.

PENRO

- This government agency is responsible for establishing Community-Based Forest Management (CBFM).
- It handles applications for special uses of lands for tourism purposes.
- It has a mangrove reforestation program wherein contractors are paid to plant mangroves in validated areas within the barangays. PENRO then evaluates the planted mangroves.

- It is responsible for conducting the training on Environmental Performance Monitoring.

CENRO

- This government agency is focused on forestry lands and its protection. They enforce the laws and files charges against violators.
- It also has information campaigns about DENR programs and environmental awareness through schools and barangay assemblies. This activity is done yearly in each barangay, although hot-spots are prioritized.
- It also monitors compliance to ECC of different establishments thru scheduled and random inspections.
- CENRO facilitated the GMA project in establishing water systems – impounding dams.
- Aside from its regular activities on protection works, it is also involved in the following activities:
 - Distribution of vegetable seeds, fruit tree seedlings and fertilizers to each PO per CBFM.
 - Participated in conducting the training on Environmental Performance Monitoring (EPM). This EPM was to be used as basis for policy-making in CBFM areas.
 - In the coastal areas of Honda Bay, mangrove reforestation was done and different livelihood programs, such as crab-fattening, lamayo, sea cucumber culture and micro-lending, were monitored.
 - Reforestation projects
 - Conducts trainings on forestry laws and regulations together with other government agencies such as KSK and Bantay Gubat.

City ENRO

- This office is composed of several sectors:
 - Land Management
 - Mines and Geosciences Management
 - Protected Areas Management
 - Environmental Management
 - Forest Management
- It is one of the lead or support agencies in the following programs:
 - Pista Y Ang Kagueban (“Feast of the Forest”) – a yearly community-based reforestation activity
 - Love Affair with Nature – similar to Pista Y Ang Kagueban but is done in coastal areas
- This office is also responsible for validating areas that are to be used for certain uses such as mangrove reforestation, small-scale mining, etc, and identifies conflicts, especially with the ECAN zones.
- It was also involved in establishing task forces to implement laws/ordinances and apprehend violators, together with other government agencies:
 - Task Force Sagip Buhay Ilang (as support agency) – wildlife
 - Task Force Sagip Hangin (as lead agency) – air quality

City Agriculture

- This government agency is mainly concerned with food sustainability
- It has two divisions - fisheries and agriculture
- Technicians are assigned to each barangay to oversee the status of these barangays
- The agriculture sector is involved in the following activities:
 - It provides technical assistance such as trainings to community members:

- Capacity-building
 - Rice and corn farming
 - Pest management of fruit trees
 - Food processing
 - Ornamental gardening
- It also provide and/or loan materials such as rice and corn seeds, pesticides and fertilizers
- It also provides vegetable seeds yearly every Nutrition month
- This agency also sells/loans discounted seedlings of fruit trees such as mango, citrus, and cacao.
- It also set-up the tractor pool for farmers
- This agency is also involved with irrigation systems in the barangays by providing estimates for repair and sometimes providing materials for repairs of dams.
- This agency is also assisting the STCMPC.
- The fisheries sector is involved in the following activities:
 - It oversees the social, livelihood and physical conditions of the component barangays of the FRMP project in Honda Bay, such as Brgys. San Rafael, Tanabag and Concepcion
 - As part of its extension work, it provides assistance in livelihood thru capacity-building such as providing trainings on livelihood activities in the coastal areas such as capture, mariculture, post-harvest/processing
 - It was also consulted for the PCRA of component barangays of FRMP project in Honda Bay
 - It is also involved in the establishment of fish sanctuaries by facilitating the process and providing the funding.
 - Also involved in passing ordinances as a consultative body for technical information.
 - It also assists in drafting management plans by facilitating the process and presenting the data.
 - Information dissemination by this sector is done thru multi-media means such as conducting symposiums, radio promotions, leaflets, participation in major events, design modules for trainings, conduct trainings, and billboards.
 - Every start of the year, this sector conducts consultative meetings/information dissemination campaigns at each barangay. This activity also provides an opportunity for this agency to hear out the concerns of the community. At the end of the year, the barangays are revisited, if there is a chance to do so.

BFAR-FRMP

- The interventions of this agency at the study site are mostly related to integrated coastal resource management.
- It was involved in the upland reforestation project together with the LGU.
- It was also involved in the milkfish culture project in Brgy. Concepcion.
- It is involved in resource enhancement projects implemented continuously throughout the year, together with other government agencies, such as City ENRO. The activities they are involved with are on mangrove reforestation and nursery, riverbanks rehabilitation and establishment of fish sanctuaries.
- Monitoring of projects of BFAR-FRMP is contracted to NGOs such as Fundacion Santiago.
- Its livelihood projects, such as seaweed farming, stem from proposals from the community through POs organized by NGOs. Together with other agencies, they conduct trainings for POs.

BFAR-Regional Training Center (RTC)

- This agency covers Region IV-B.
- Involvement of projects with other agencies are at multi-level:
 - Provides funds
 - Provides technical assistance
 - Provides resource persons
- Trainings are regularly conducted every year but not necessarily in the same areas. A list of priority areas, which have been validated by the same office, and those areas who have submitted advance requests are prioritized.
- For the Upland Reforestation project of FRMP, this agency is tasked to validate areas of reforestation and monitor them. They give trainings for livelihood activities identified thru the FRMP project such as the Milkfish Fishpen Culture in Brgy. Concepcion and the seaweed farming in Tanabag. They also provide materials for rehabilitation such as seaweed if area was affected by storms or pests.
- Information dissemination is done together with other BFAR offices by means of radio programs, organizing forums, attending meetings and visits to schools.

Kilusan Sagip Kalikasan (KSK)

- This is a province-wide task force whose task it so protect and enhance the environment through community development.
- The agency apprehends violators of environmental laws with the assistance of the Philippine National Police, Western Command, the communities and volunteers.
- It also tries to educate communities thru information drives. They have a program in Citizen Welfare Training Service (in lieu of Reserved Officer Training Corps) wherein college students are taught aspects about the environmental and environmental laws. This is done with the assistance of DENR-BFAR, PCSO, Haribon, selected staff from Palawan State University and volunteers in giving lectures.
- It also has a monthly newsletter that lists apprehensions of violators and other updates.
- It is also promoting community-based law enforcement.

NCIP

- This agency's main task is to delineate the ancestral domains of Palawan.
- In delineating the ancestral domains they perform the following activities:
 - Facilitates IPs in making work and environmental plans
 - Social preparation of IPs thru document preparation, census on genealogy and defining the extent of ancestral domain thru self delineation
 - Conduct field validation and conflict resolution
 - Boundary survey
 - Preparation and submission of reports
- The activities of this agency are conducted with the help of NGOs in the area and local IP organizations.
- Processing of ancestral domain claims is expensive thus funding from outside organizations is needed to speed up the process.

Provincial Planning Development Office (PPDO)

- This agency's main task is to facilitate the process of making plans by different organizations.
- The agency has five divisions:

- Plans and programs - The planning process normally takes 2 days and the outputs are a list of projects and some project details. Planning is done with the cooperation of different sectors and is done yearly in an area.
 - Research – The Community-Based Management System (CBMS) was developed by this division. It also conducts monitoring of surveys. It also provides training to enumerators.
 - GIS – This division maps existing infrastructures and provide land-use maps
 - Water – This division assists the community in developing barangay environmental sanitation project/plan wherein the management of the project is at barangay level with assistance from this division. It is also involved in the planning, monitoring and evaluation of water systems.
 - Energy – Involved in making energy management plan. Also, it conducts studies on alternative energy sources, such as solar and wind. It has linkages with other agencies and organizations, such as the Department of Energy, UP Solair, Shell, and Paleco.
 - This agency also provides students with reference materials.
- Non-Government Organizations

ELAC

- The main goal of this non-government agency is to educate the communities about environmental laws. However, due to resource constraints, they are focused mainly on forest resources. ELAC is involved with almost the entire Palawan area.
- The organization provides para-legal training to communities with regards to environmental laws. The kinds of laws discussed in these trainings are based on the requests of the community.
- The group also organizes public dialogues in the communities, especially if there are violators of the laws within the community.
- This agency also assists in the implementation of the laws by being part of the apprehension of violators and helping in filing cases against them.

Haribon Palawan

- Assisting the indigenous people (IPs) through the following activities
 - Assists in meeting the requirements for ancestral domain claims by delineating the boundaries of the claim, re-organizing and re-structuring the constitution and by-laws of the IPs and documents the application.
 - Involved in capacity-building of IPs by conducting leadership trainings and, together with the Department of Education, provide non-formal education to IPs.
 - Assists IPs in acquiring temporary permits for gathering non-timber forest products while the ancestral domain claim hasn't been approved.
- This non-government organization was also hired by BFAR through the FRMP project to oversee the coastal resource management of coastal barangays.
 - It conducted coral surveys for the PCRA of coastal barangays.
 - Organize public hearings for establishment of fish sanctuaries.
 - Together with BFAR, it performs stock enhancement.
 - Develop tools to monitor resources, the organizations and livelihood programs.
 - Organize POs
 - Provide technical assistance to POs such as trainings on field methods and skill, providing equipment, and assists in licensing.

- One of its future projects would involve coral gardening and enhancement, to which they would be conducting trainings on coral gardening.

Budyong Rural Development Foundation Incorporated (BFRDI)

- This NGO assists communities by facilitating the process of the making and submitting project proposals.
- It conducts trainings on leadership, management and proposal-making for the community.
- Also, it is involved in assisting in developing livelihood activities for the community by means of conducting technical trainings.
- Some of the previous activities of this organization were:
 - Help organize the community for the CBFM project. They also provided technical assistance and worked on the documents related to the project.
 - Cleaning-up rivers, planting of plants, and related activities within protected areas.
 - Establishment of furniture shop in San Rafael.
 - Assisted in the construction of the barangay development plan of San Rafael prior to the LPF project.
 - In Ulugan Bay, it assisted in the mangrove reforestation of the area, helped establish cooperatives, and provided capacity-building trainings.
- Efforts of the organization are based on the requests of the communities.
- At the moment, this NGO is currently looking into the possibilities of seaweed production. Also, it is trying to retrieve the traditional rice variety by establishing seed banks and providing the seeds.

Fundacion Santiago

- This NGO is contracted by the FRMP project to promote business and livelihood enterprises.
- It micro-finances good-performing cooperatives and provides livelihood loans. Funds come from USAID.
- It is also involved in community organizing and establishment of cooperatives.
- Monitoring of livelihood activities are monitored by Fundacion Santiago, the cooperative and the individual members. The process is facilitated by Fundacion Santiago.
- It also supports mariculture development such as seaweed farming.
- It provides trainings on financial management and livelihood techniques. The trainings on livelihood depend on the request of the POs or of the community. Some of the trainings this NGO provides are the following:
 - Leadership
 - Values formation
 - Policy formation
 - Food processing
 - Marketing
 - Product design/packaging

Natripal

- It is an IP organization that has membership coming from the entire Palawan province.
- It has refused to be identified as a major stakeholder in the study site of LPF in Palawan, Philippines.
- It was said that the organization has had few activities in the study site, more specifically in San Rafael:

- 1) Assisted the Tagbanuas of San Rafael in acquiring their ancestral domain claim in 1991, but it was done when Natripal was still called Tribal Filipino Apostolate
 - 2) Established the Natripal store in San Rafael
 - 3) Training for honey in San Rafael
- Earlier this year, a proposed project for honey was made to the Tagbanuas of San Rafael with the funding coming from the embassy of Finland. This project stemmed from the fact that the participants of the training for honey in 2004 in San Rafael requested for financial assistance but, the project proposal itself was later turned down by the same group.
 - This non-government organization develops project proposals and provides technical assistance, such as trainings, to IPs if the project is approved and acquires funding.

B.10 Workshop evaluation questions (translated from Filipino)

Questions about the workshop:

(RPG)

1. What parts of the game are relevant to the way you conduct your livelihood activities?
2. What parts of the game are not relevant to the way you conduct your livelihood activities?
3. Which parts of the game that should be removed?
4. What can be added to the game?
5. What do you consider when deciding to change your livelihood activity for another?
6. There are livelihood activities in the game that you are never going to choose. Why?
7. Are the rules of the game clear?
8. Were the game materials effective?

(Lessons from workshop)

1. Did you learn anything from this exercise?
2. Are the lessons you learned applicable in your everyday life?
3. Are the lessons you learned applicable in your community?
4. If the lessons you have learned are not applicable to you or your community, to whom would it be more applicable?

(Organization of workshop)

1. Are the time, place, day, invitations and transportation acceptable?
2. Are the ideas presented in the workshop effectively expressed?

(Objectives of the workshop)

1. Were we able to fulfill our objectives of the workshop? If yes, how? If not, why?

Questions about the workshop evaluation questions:

1. What aspects of the workshop should we evaluate? In other words, how can we say that the workshop was successful?
2. Were the evaluation questions appropriate to properly evaluate the workshop?
3. What questions should we be asking to properly evaluate activities such as this workshop?
4. Which is better, evaluate the activity as a group or evaluate the activity individually by means of an interview?
5. Is this process of evaluating the activity important?
6. What are the possible obstacles we might be facing when evaluating the activity and how do we avoid them?

B.11 Plan of Actions of the three villages

Village of San Rafael

GOAL: To have sufficient and sustainable potable Water Supply.

PROBLEM: Lack of funds for the construction of additional water reservoir and repair/maintenance of the existing water system

SOLUTIONS:

1. Organization of Barangay Water District
2. Fund Sourcing
3. Water Management
4. Water Usage Regulatory Fees
5. Construction/Installation of Water Reservoir and Pipelines

STRATEGIES:

1. Organizational meetings/Consultations;
2. Capability Building;
3. Coordination/Linkaging

Activities	Responsibility	Resources	Time Frame	Duration
Organization of Village Water District	Village councilor Corazon Dalabajan with LPF TWG	Snack (800.00)	June 16, 2007	1 day
1. Facilitate meeting of Village Council with LPF TWG to discuss the matter				
2. Coordination with the PPC Water District and other agencies concerned.	Village captain Rodriguez and LPF TWG	Fare/Office supplies (500.00)	July 3-5, 2007	3 days
3. Information dissemination to prospective members of Village Water District and scheduling of meeting/ training	Village councilor Zeny Bantog and Village captain Rodriguez		July 3-5, 2007	3 days
4. Organizational meeting / training	LPF TWG	Snacks (4,000)	July 18-19	2 days
5. Formulation of By-Laws and other pertinent documents.	Village Water District	Office Supplies (1,500)	July 20-21	2 days
6. Implementation of plans/policies	Village Water District	Money for operation	August onward	
7. Registration to SEC or other agencies concerned	Village Water District	Travel expenses and registration fees (15000)	July to August 2007	45 days
8. Monitoring	Village Council		Sept. - onward	
Total		21,800.00		

Village of Tanabag

Problem: Lack of funding for the establishment of a Level 3 water distribution

Solutions:

1. Approach politicians/government officials
2. Borrow from the Agricultural Community Enhancement Fund (DA)
3. Apply for a grant from philanthropist organizations such as Peace and Equity Foundation
4. Coordinate with the Local Water District about its Expansion Program

Strategy: Approach politicians/government officials

Activities	Responsibility	Resources	Time frame	Duration
a. Coordination with all village officers and council members	LPF TWG / LPF field assistant (Suzy)	Time	June 12, 2007	July 12, 2007
b. Confirm with the village captain if there is already a program or plan underway for of a level 3 water distribution system	Village councilor Dancil	Time	June 12, 2007	June 13, 2007
c. Ask for aid from the City Engineering office to build or review the program	LPF / LPF field assistant (Suzy)	Time	June 12, 2007	July 12, 2007
d. Build a program for Level 3 water distribution system	LPF TWG / LPF field assistant (Suzy)	Time	July 12, 2007	August 12, 2007
e. Prepare to discuss with government official	Village councilors Venus, Dancil and Osano, LPF field assistant (Suzy)	Time, money	August 15, 2007	August 30, 2007
f. Follow-up request from government official	Village councilors Venus, Dancil and Osano, LPF field assistant (Suzy)	Time, money	August 30, 2007	October 31, 2007
g. Ask someone to craft the details of construction and specifications of	Village councilor Venus, LPF field assistant (Suzy)		October 31, 2007	November 30, 2007

materials and supplies				
h. Establishment of a Village Water Management Board				

Village of Concepcion

PROBLEM: Lack of funds

SOLUTION: Incremental search for funds for the village (20% Barangay Development Fund), LPF, city government, Congressman Mitra, loan (ACEP)

STRATEGY: First is to acquire one tank then form a People's Organization to continue the rest of the plan

Activities	Responsibility	Resources	Time frame	Duration
1. Identify the overall plan = 5 tanks for water storage	Village council		April 2008	1 month
2. Divide the plan into smaller projects (mini-projects)				
3. Estimate the costs of the mini-projects and identify the source of funding for each mini-project				
4. Start the first mini-project = 1 tank with distribution lines	Village council		May 17, 2008	1 month
5. After finishing the first tank, organize the community to form a People's Organization				

Activities for the mini-project

Activities	Responsibility	Resources	Expected date of accomplishment	Expected output
Rough estimate of 1 tank Tank = Php 100,000 Distribution pipeline = Php 50,000				
1. Draft a village resolution for sourcing of funds	Village Councilor Apdon		June 16, 2007	Approved village resolution
2. Send the resolution to the people concerned (Example: Congressman Mitra and others)	Village Councilor Apdon		June 30, 2007	Village resolutions are received and acknowledged
3. Follow-up	Village Councilor Apdon		February 2008	Request approved or there is funding

B.12 Water resource management planning and negotiation (WRMPN) workshop evaluation sheet

WORKSHOP EVALUATION

Name (optional): _____

Organisation/Village: _____

Objectives

1) The objectives of this workshop were met.

a. I experienced collective planning and negotiation for managing water resource.

☐ Strongly agree

☐ Agree

☐ Okay on average

☐ Disagree

☐ Strongly disagree

☐ No Comment

b. I learned a lot from the process of MAS modelling.

☐ Strongly agree

☐ Agree

☐ Okay on average

☐ Disagree

☐ Strongly disagree

☐ No Comment

c. We were able to make a plan for water resource management.

☐ Strongly agree

☐ Agree

☐ Okay on average

☐ Disagree

☐ Strongly disagree

☐ No Comment

d. We were able to establish an agreement and discussion on how to accomplish the plan.

☐ Strongly agree

☐ Agree

☐ Okay on average

☐ Disagree

☐ Strongly disagree

☐ No Comment

Process

2) I learned something from this process.

☐ Strongly agree

☐ Agree

☐ Okay on average

☐ Disagree

☐ Strongly disagree

☐ No Comment

What I have learned were:

3) This is an effective method of planning.

☐ Strongly agree

☐ Agree

☐ Okay on average

☐ Disagree

☐ Strongly disagree

☐ No Comment

4) This method of planning for natural resources is essential.

☐ Strongly agree

☐ Agree

☐ Okay on average

☐ Disagree

☐ Strongly disagree

☐ No Comment

5) I would recommend this method of planning to others:

a. Within my community

☐ Strongly agree

☐ Agree

☐ Okay on average

☐ Disagree

☐ Strongly disagree

☐ No Comment

b. With colleagues at work

☐ Strongly agree

☐ Agree

☐ Okay on average

☐ Disagree

☐ Strongly disagree

☐ No Comment

6) The people invited to participate in this workshop are appropriate.

☐ Strongly agree

☐ Agree

☐ Okay on average

☐ Disagree

☐ Strongly disagree

☐ No Comment

The participants that are inappropriate for this workshop were:

7) The computer model contributed to the discussion in the workshop.

☐ Strongly agree
☐ Agree

☐ Okay on average
☐ Disagree

☐ Strongly disagree
☐ No Comment

It contributed (or did not contribute) because:

8) This process of planning may be improved by:

Feelings

9) I was not wary or afraid when I found out that I was participating in a planning activity together with different kinds of stakeholders.

☐ Strongly agree
☐ Agree

☐ Okay on average
☐ Disagree

☐ Strongly disagree
☐ No Comment

10) I was at ease or confident when discussing and planning with the different kinds of stakeholders.

☐ Strongly agree
☐ Agree

☐ Okay on average
☐ Disagree

☐ Strongly disagree
☐ No Comment

11) I have become more confident or at ease with discussing and planning with different kinds of stakeholders now that I have gained more experience with this kind of process.

☐ Strongly agree
☐ Agree

☐ Okay on average
☐ Disagree

☐ Strongly disagree
☐ No Comment

12) I am willing to participate in the succeeding planning activities.

☐ Strongly agree
☐ Agree

☐ Okay on average
☐ Disagree

☐ Strongly disagree
☐ No Comment

Workshop organization

13) This workshop was well organized:

a. Food

☐ Strongly agree
☐ Agree

☐ Okay on average
☐ Disagree

☐ Strongly disagree
☐ No Comment

b. Accommodations

☐ Strongly agree
☐ Agree

☐ Okay on average
☐ Disagree

☐ Strongly disagree
☐ No Comment

☐ Not applicable

c. Transportation

- | | | | |
|---|--|--|---|
| <input type="checkbox"/> Strongly agree | <input type="checkbox"/> Okay on average | <input type="checkbox"/> Strongly disagree | <input type="checkbox"/> Not applicable |
| <input type="checkbox"/> Agree | <input type="checkbox"/> Disagree | <input type="checkbox"/> No Comment | |

d. Materials used in the workshop (Example: paper, writing materials, etc.)

- | | | |
|---|--|--|
| <input type="checkbox"/> Strongly agree | <input type="checkbox"/> Okay on average | <input type="checkbox"/> Strongly disagree |
| <input type="checkbox"/> Agree | <input type="checkbox"/> Disagree | <input type="checkbox"/> No Comment |

e. Schedule

- | | | |
|---|--|--|
| <input type="checkbox"/> Strongly agree | <input type="checkbox"/> Okay on average | <input type="checkbox"/> Strongly disagree |
| <input type="checkbox"/> Agree | <input type="checkbox"/> Disagree | <input type="checkbox"/> No Comment |

f. Duration of the workshop

- | | | |
|---|--|--|
| <input type="checkbox"/> Strongly agree | <input type="checkbox"/> Okay on average | <input type="checkbox"/> Strongly disagree |
| <input type="checkbox"/> Agree | <input type="checkbox"/> Disagree | <input type="checkbox"/> No Comment |

Additional comments about the workshop:

B.13 Scenarios identified by the stakeholders in the scenario-building activity (mostly translated from Filipino)

Types of scenarios:

- 1) Policies and policy changes
- 2) Availability of natural resources
- 3) Number of resources users
- 4) Availability of livelihood activities (existing and introduction of new ones)
- 5) Attitudes of resource-users
- 6) Resource extraction technology/methods,
- 7) Peace and order
- 8) External forces such as inflation.

Scenarios and possible indicators identified per RPG2 session

Community (Migrants)

- 1) Effects of depletion of resources
 - may be the base scenario
 - indicators:
 - amount of debt/income
 - over-population
 - movement of people when doing livelihood
 - amount of resources gathered
 - distance in locating resources
- 2) Effects of foreshore leases
 - changing of livelihood
- 3) Effects of having no capital
 - changing of livelihood
 - lack of human activity / lack of movement of people
- 4) Effects of putting a ban on gathering NTFPs and milkfish fry
 - effects on income
 - effects on health
- 5) What if there are no more people?
- 6) Misuse of capital
- 7) Effects of having too many restrictions
 - effects on livelihood of the community
 - effects from the point-of-view of the government – professional cheaters
- 8) Effects of villages having electricity
 - cost of living on a daily basis
 - efficiency of performing a livelihood (e.g. making shingles at night)
- 9) Effects of arresting people who are into small illegal activities without introducing alternative livelihoods.
 - Livelihood
- 10) What if people have grown old?

Bataks

- 1) A lot of places are made inaccessible?
 - Number of people into illegal activities
 - Hunger and health issues
- 2) What if Bataks have alternative livelihoods?
 - Quality of life
 - Level of education and health
- 3) What if the Batak village is officially declared a tourist destination?
 - Income from new livelihood activities – handicrafts, vegetable-selling, inns for tourists
- 4) What if the natural resources are depleted?
 - amount of resources gathered
 - number of people engaged a certain livelihood
 - income
- 5) What if prices increase like that for rice?
 - quality of houses
 - begging
 - number of people who can't buy rice or people eating root crops

NGOs

- 1) What if the NTFP resources are depleted? What would be the effects of alternative livelihood projects such as nipa plantation? What if there is no more rattan? What if the trees for almaciga resin are already dead?
- 2) What if there are no more trees and it is illegal to engage in charcoal-making and swidden-farming?
 - price of charcoal
 - disasters such as floods
- 3) What if there are available funds for capital?
 - What are livelihood activities people can engage in and earn?
- 4) What if most tourist areas are owned by foreigners? What if foreigners become stakeholders in the tourist business, how do we legally solve problems that may arise? What if the foreigners are in cahoots with GOs?
 - access rights
- 5) What if there are many (tourist) resorts?
 - employment
 - access rights
 - pollution
 - fish resource
- 6) What if the Claim of Ancestral Domain - Certificate (CAD-C) is awarded?
 - utilization and management of resources such as rattan and almaciga resin
 - land-ownership and land-grabbing
 - effects on livelihood
 - penalties and violators (?)
- 7) What if the government needs its lands, such as for mining areas, and declares some areas to be no-access areas?

- displacement of people / resettlement areas
- loss of access rights
- income
- state of natural resources

GOs

- 1) Effects of changing the methods of extraction of NTFPs
 - 2) Effects of utilizing coconut wastes as charcoal.
 - 3) What if everyone became fishermen?
 - 4) What if all beaches are made into resorts?
 - income
 - expenses
 - ports for fisherfolks
 - 5) Implementation of "One Barangay, One Product"
 - 6) What if the peace and order situation in Palawan worsens?
 - amount of production
 - 7) What if the forest resources are depleted?
 - income of indigenous people
 - 8) What if the existing situation continues? What if the people don't accept the MAS model for the three barangays?
-
- 9) What if the CAD-C is awarded in the three barangays?
 - management of resources within the ancestral domain claim by the Bataks
 - income of the Bataks – would it be sustainable?
-
- 10) What if there are factories in the three barangays?
 - effects on the economy/income of the people
 - effects on the environment
 - 11) What if gathering of NTFPs is banned?
 - 12) What if the ECAN zoning is implemented?
 - effects on the indigenous people and migrants
 - effects on the resources
 - 13) What if there are times "closed-season" in fishing is declared?
 - volume of fish
 - income

PrSC

- 1) What if ECAN is implemented?
- 2) What if livelihood opportunities become more limited?
- 3) What if the fisher folk lose all access to the coastline due to foreign ownership of these areas?
- 4) Effects of increase in in-migration into the three barangays
- 5) What if quarrying is done above the rivers?
- 6) What if Palawan is opened to mining?
- 7) Effects of increase in forest occupants

- 8) Total ban on fishing
 - food production
 - income/livelihood
 - resources
- 9) Effects of community-based eco-tourism – Dolphin Sighting and Bataks
 - livelihood
 - resource protection
 - effects on the forest
- 10) What if all the people became rich?

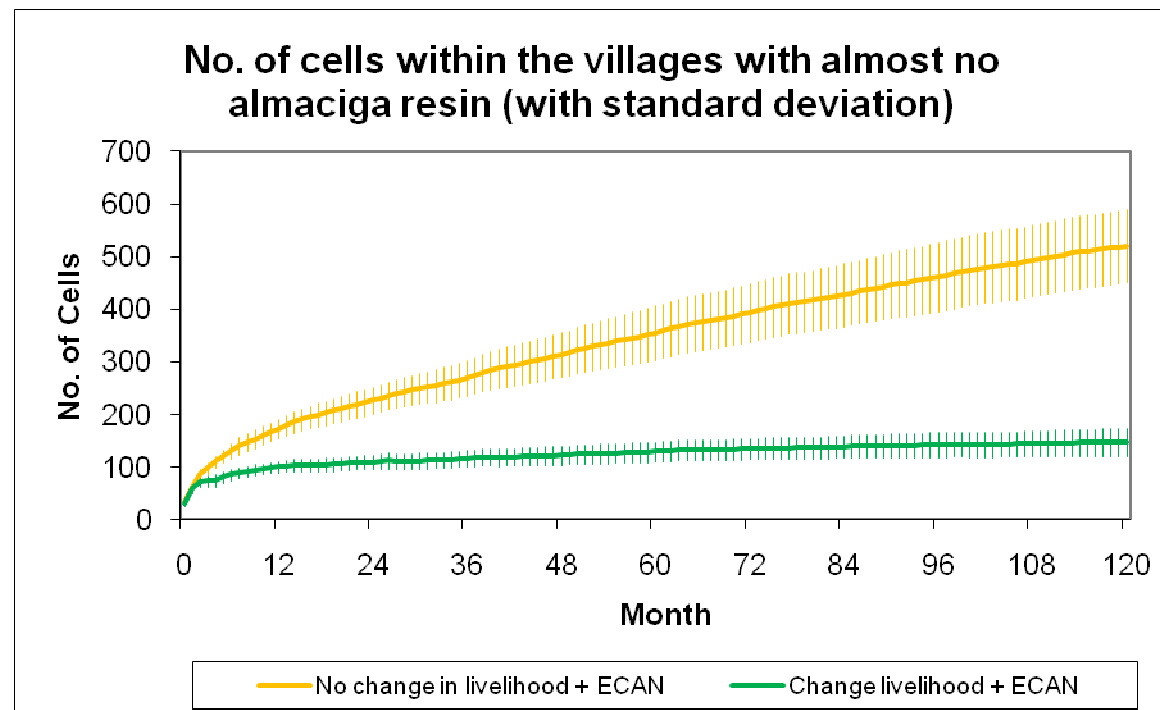
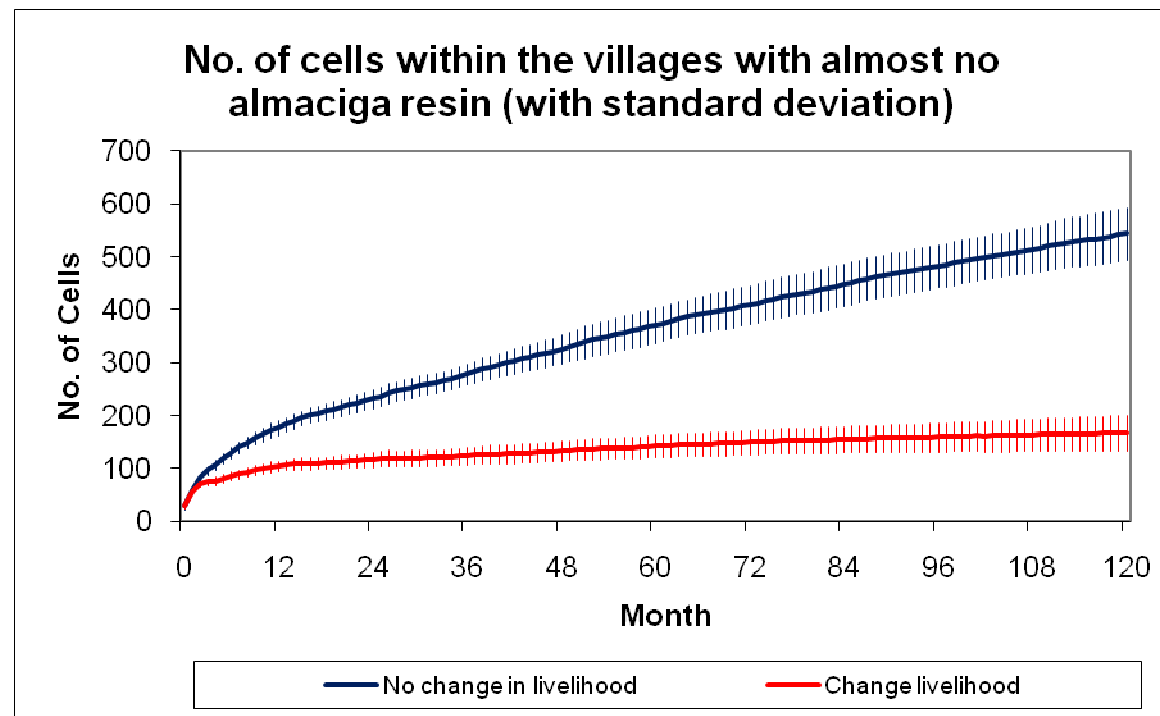
Table 1 shows the unique scenarios identified from all the RPG2 sessions as well as the possible data requirements.

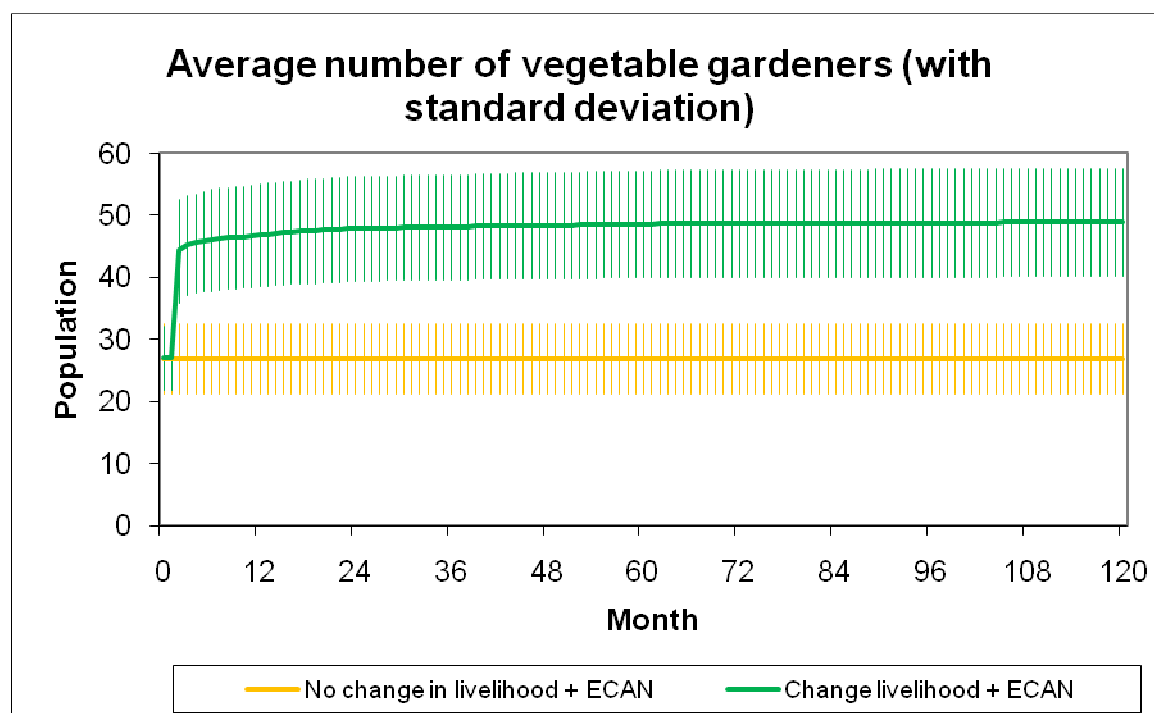
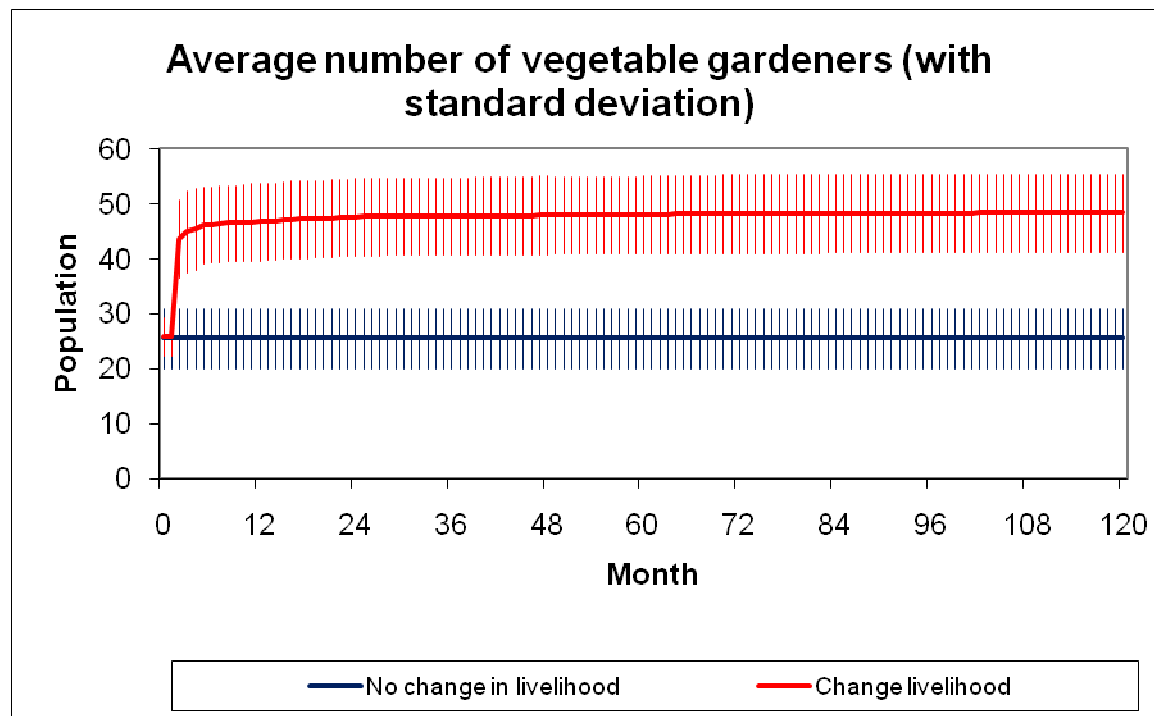
Table 1. Summary of scenarios identifies and possible data requirements

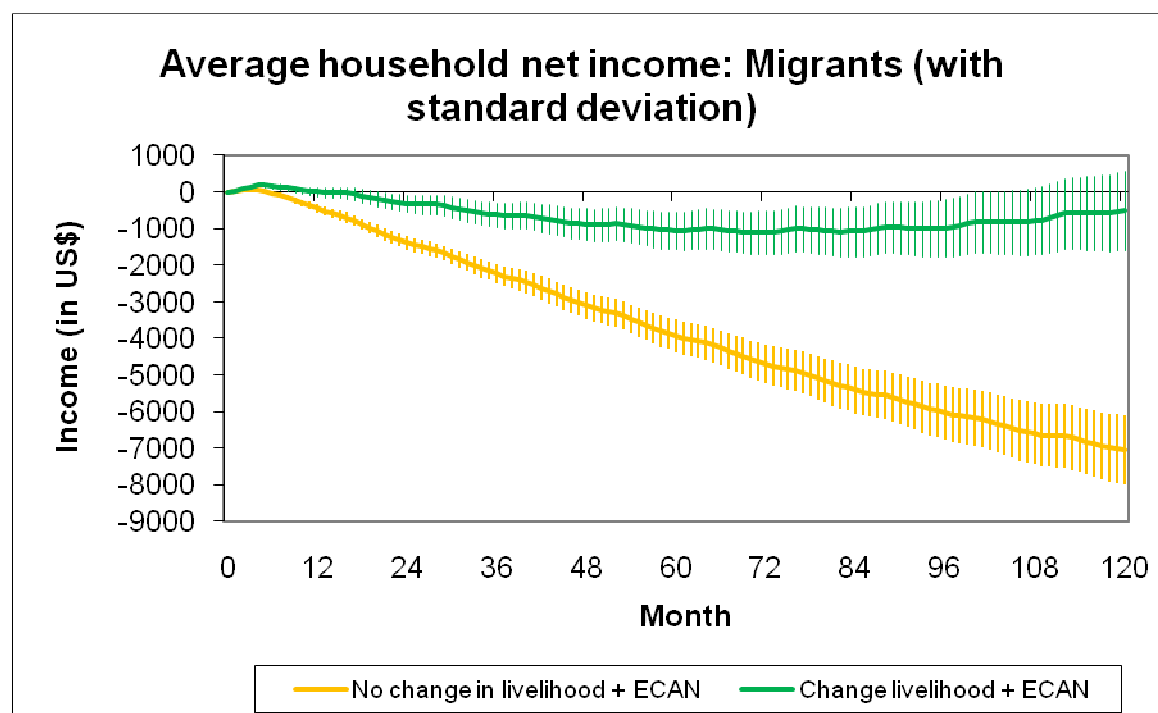
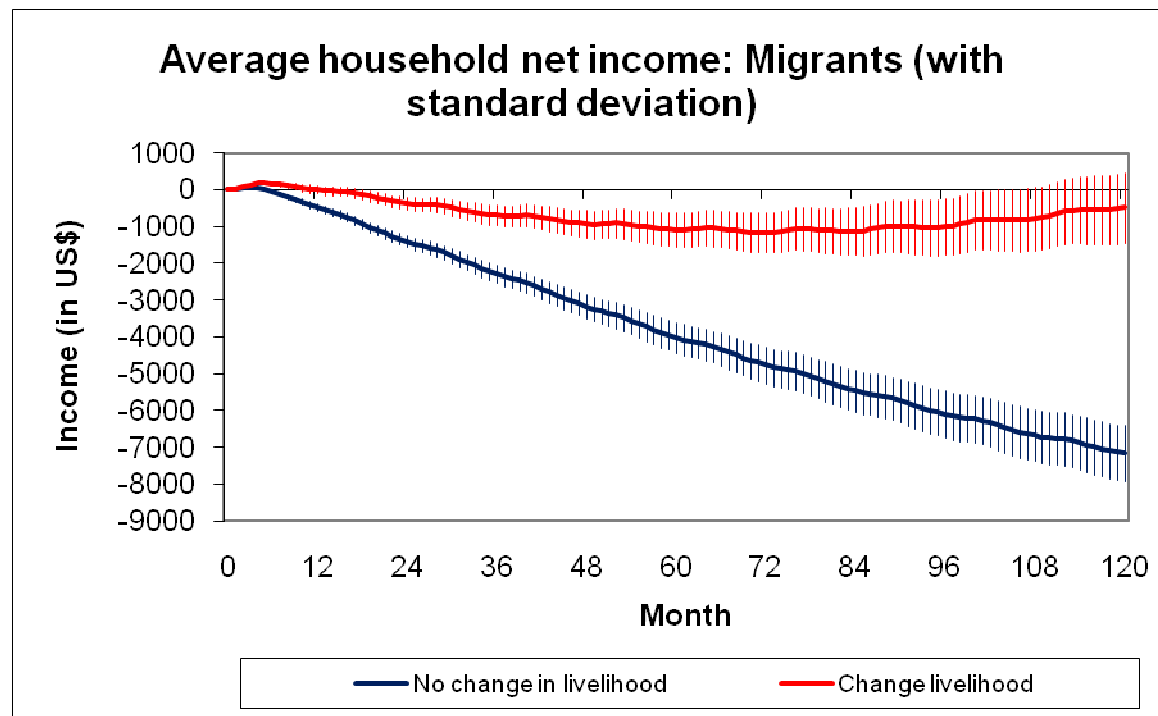
Unique Scenarios	Data requirements
Depletion of resources	Erosion & flood models
Increase of foreshore leases/ownership by foreigners of beaches/beaches being turned into resorts	Maps of beaches
Capital – lack, existence of funds, misuse	
Reduction of livelihood options / restrictions in resource extraction	
Restrictions on areas / ECAN / CAD-C (ADC) / decrease/change in access rights	ECAN Map, new/proposed policies
Mining	Maps of mining areas, kind of quarry, effects of quarry, data on operations/processes
Population increase / absence	Population growth rate
Change in capability of resource extraction – new technology, methods	
Change in livelihood choices – age	
Introduction of alternative livelihood options	
Increase/establishment of Eco-tourism / Tourism	
Factories	Average pollution contributed by factories
Increase in prices/inflation	Inflation rate
Peace and Order	Crime incidence rate
Increase in income	

Appendix C Results of Palawan computer simulation with standard deviation

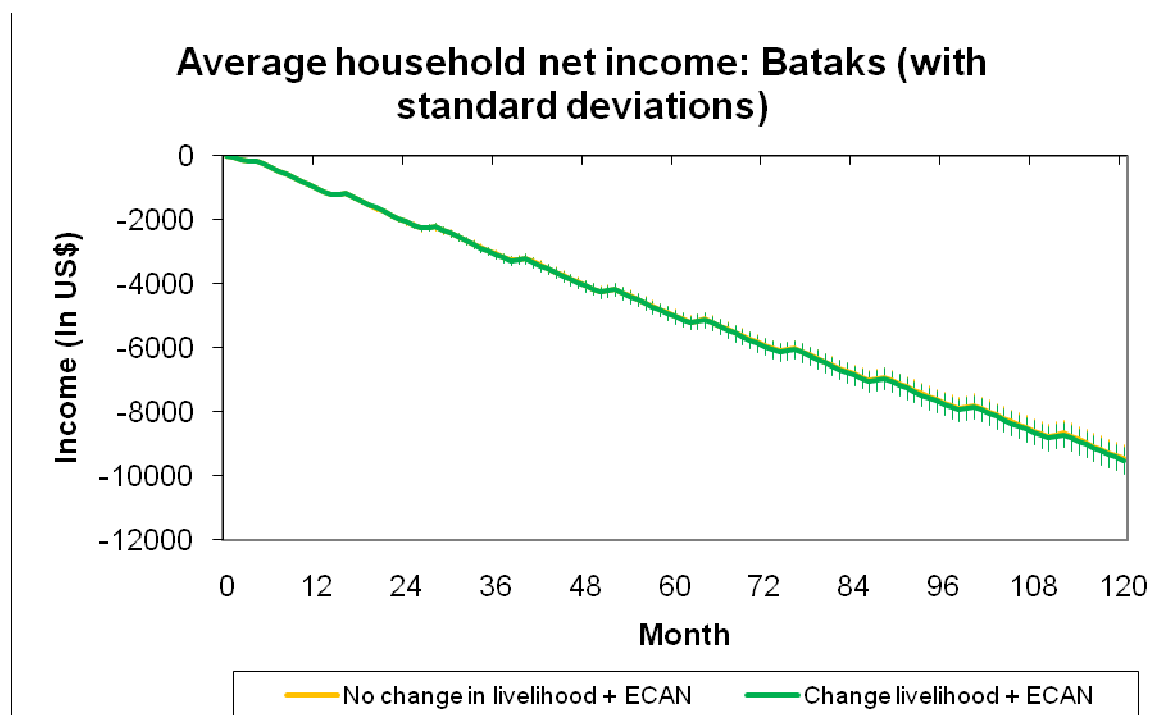
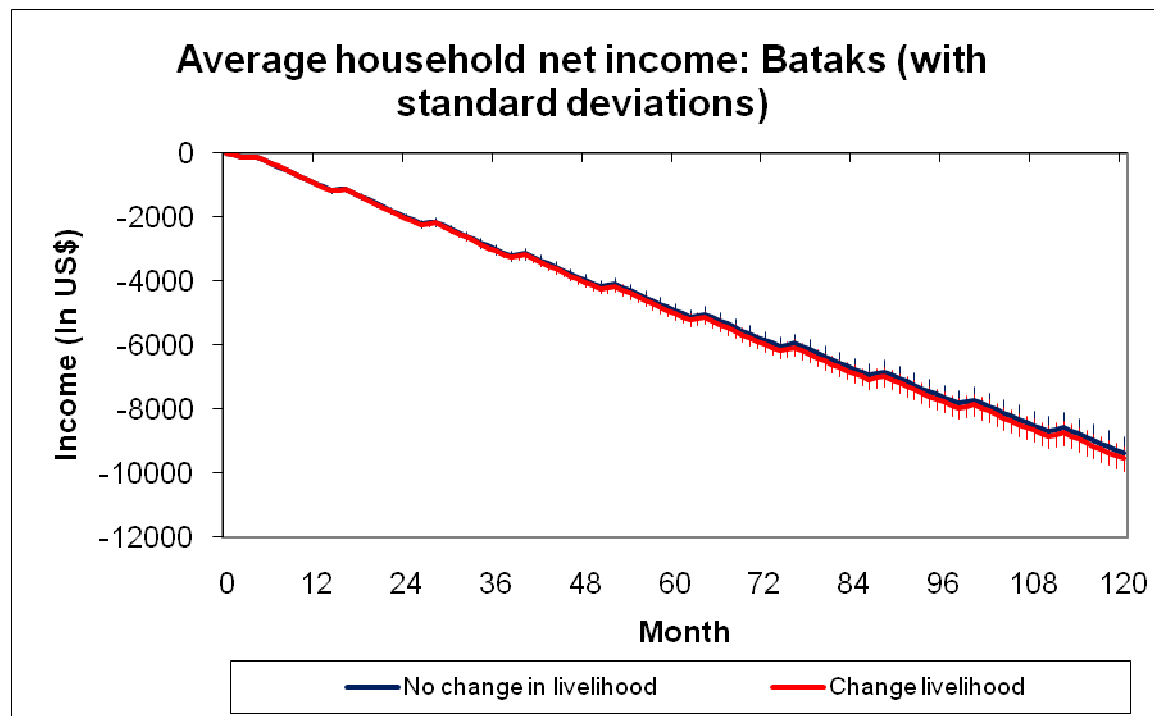
Number of cells with almost no Almaciga resin



Average number of vegetable gardeners

Average household cumulative net income of Migrants

Average household cumulative net income of Bataks



PUBLICATIONS DURING THE COURSE OF THIS RESEARCH

Journal articles (International):

- Campo, P.C.**, Bousquet, F., and Villanueva, T.R. 2010. Modelling with stakeholders within a development project. Environmental Modelling & Software 25 (2010), 1302-1321.
- Campo, P.C.**, Mendoza, G.A., Guizol, P., Villanueva, T.R., and Bousquet, F. 2009. Exploring management strategies for community-based forests using multi-agent systems: a case study in Palawan, Philippines. Journal of Environmental Management 90 (2009), 3607-3615.

Conferences (International):

- Campo, P.C.**, and Villanueva, T.R. 2007. Companion modeling for exploring natural resources management strategies in Palawan, Philippines. Paper presented at the IUFRO Conference on Improving the Triple Bottom Line Returns from Small-scale Forestry on 17-21 June 2007 in Ormoc, Leyte, Philippines.
- Campo, P.C.**, and Villanueva, T.R. 2006. Multi-Agent Systems (MAS) Modelling to Improve the Management of Common Renewable Resources in Palawan, Philippines. Paper presented at the 11th Biennial Global Conference of The International Association for the Study of Common Property (IASCP) on 19–23 June 2006 in Bali, Indonesia.

Poster:

- Campo, P.C.** 2011. Using Institutional Analysis and Development Framework on Implementing the Companion Modelling Approach to Assess the Action Arenas of Research and Development Projects. Elinor Ostrom Master Class 21 June 2011. Agropolis International, Montpellier, France.

Project booklet:

- Villanueva, T.R., **Campo, P.C.**, Guizol, P., 2008. Empowering renewable resources dependent people: lessons learnt from the LPF site in Palawan. Center for International Forestry Research, Bogor Barat, Indonesia.

Companion Modelling Implementation and Institutional Analysis Framework: A case study in Palawan, Philippines

SUMMARY

The Companion Modelling (ComMod) approach was developed by a group of scientists involved in research and development for environment and renewable natural resources management. These scientists were involved in field situations with real stakes and were faced with addressing theoretical and pragmatic questions in the course of their research. Since its inception, the use of ComMod had been rapidly increasing, and it is constantly subjected to new field conditions and contexts. In Palawan, Philippines, a multi-agent systems (MAS) model was developed using the ComMod approach, wherein ComMod was implemented as one of the components of a research and development (R&D) project; a new configuration for ComMod implementation at that time. Emerging from this configuration was a challenge to analyze the impact of ComMod in the field vis-à-vis the R&D project. The Institutional Analysis and Development (IAD) framework proved to be instrumental in addressing this challenge. Drawing upon the lessons of the Palawan ComMod experience, this research synthesizes the articulation among ComMod, IAD and MAS – the ComMod Implementation and Institutional Analysis Framework (CIAF). With CIAF, ComMod processes and its results can be organized, managed and analyzed by researchers of different disciplines, as well as stakeholders, using a common language. CIAF extends to the analysis of a ComMod-R&D project configuration, a prospect for future ComMod implementations. The CIAF also proposes steps that integrate participatory monitoring and evaluation of a ComMod process within itself, thereby allowing the monitoring and evaluation sub-process to evolve and adapt with the ComMod process.

Key words

Companion Modelling implementation, institutional analysis, multi-agent systems, environment and natural resource management, research and development projects

Thesis in human, economic and regional geography

Laboratoire Gecko (Laboratoire de Géographie Comparée des Suds et des Nords),
EA 375, Université Paris X, 92000 Nanterre.

Un cadre pour la mise en œuvre de la Modélisation d'Accompagnement et de l'Analyse Institutionnelle: Une étude de cas à Palawan, Philippines

RÉSUMÉ

L'approche de modélisation d'accompagnement (ComMod) a été élaborée par un groupe de scientifiques impliqués dans la recherche et de développement pour l'environnement et la gestion des ressources naturelles renouvelables. Ils ont été confrontés à des enjeux similaires sur divers terrains auxquels ils ont apportés des réponses théoriques et pragmatiques. Aujourd'hui, l'utilisation croissante de ComMod, s'opère dans des conditions de terrain de plus en plus diversifiés. A Palawan, aux Philippines, un modèle de simulation multi-agent (SMA) a été développé en utilisant l'approche ComMod comme l'une des composantes d'un projet de recherche et de développement (R&D). Cette imbrication représentait une nouvelle configuration de mise en œuvre d'une approche ComMod, et représentait un défi pour l'analyse des impacts de ComMod sur le terrain vis-à-vis d'un projet R&D. Le cadre d'Institutional Analysis and Development (IAD) s'est avéré essentiel pour relever ce défi. S'appuyant sur les leçons de l'expérience ComMod Palawan, cette recherche synthétise l'articulation entre ComMod, IAD et SMA et a abouti au développement d'un cadre pour la mise en œuvre de ComMod et de l'analyse institutionnelle (CIAF). Avec le CIAF, les processus ComMod et leurs résultats sont organisés, gérés et analysés par des chercheurs de différentes disciplines, ainsi que par les autres participants aux processus. L'usage du CIAF est par ailleurs adapté à l'analyse de configuration ComMod-projet R&D, laissant entrevoir de nouvelles opportunités de mise en œuvre de ComMod. Le CIAF propose enfin différentes étapes pour intégrer le suivi et l'évaluation participatifs dans des processus ComMod.

Mots clés

Mise en œuvre modélisation d'accompagnement, l'analyse institutionnelle, systèmes multi-agents, gestion des l'environnement et ressources naturelles, projets de recherche et de développement

Thèse en géographie humaine, économique et régionale

Laboratoire Gecko (Laboratoire de Géographie Comparée des Suds et des Nords),
EA 375, Université Paris Ouest Nanterre La Défense, 92000 Nanterre