



Perspectives on Collaborative Land Use Planning in Mamberamo Raya Regency, Papua, Indonesia

Case studies from Burmeso, Kwerba, Metaweja, Papasena, and Yoke

Project Report

Michael Padmanaba • Manuel Boissière • Ermayanti • Hendi Sumantri • Ramadhani Achdiawan

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Important Notice: Information contained therein comes from local communities in 6 villages and officials from the regency and district. This is not from official data from the local government. This report presents the perspectives of the local community and government with regard to natural resource management, land use and development planning, to be used as deemed fit.

Project Report

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Summary

This research is a collaboration between *Conservation International* (CI) Indonesia, the *Center for International Forestry Research* (CIFOR), and the *Centre de coopération Internationale en Recherche Agronomique pour le Développement* (CIRAD) with funding from *Agence Française pour le Développement* (AFD) and has been implemented for two years since May 2010. The fieldwork was conducted in 6 villages in the jurisdiction of Mamberamo Raya Regency namely Burmeso, Yoke, Kwerba, Metaweja, and Papasena 1 and 2. Mamberamo was chosen because its 8 million hectare watershed contains a high level of biodiversity and a large number of plant and animal species endemic to Papua. It is also a designated low carbon development area.

The research objective was to support the formulation of the land use plan through a participatory approach, taking into consideration local developmental needs as well as forest conservation. The methods used comprised interviews with key resource persons (village head, customary and clan leaders), focus group discussions (FGD), household and demographic surveys, participatory mapping and ground checks. Data was analyzed using SPSS, ArcGIS and Max QDA.

The research objective also included developing current and future land use maps based on the perceptions of the local communities in the six research villages. However, information contained in the maps – especially related to village boundaries – needs to be corroborated with neighboring villages not included in the research.

In addition to the maps, this research also provides information on the background of local communities (history of the villages, population, number of clans

and groups, etc.) including the local perspectives on changes occurring in Mamberamo. We document how local perceptions compare with 10 years ago, what the local livelihoods are and how important the forest and natural resources are for fulfilling local people's needs. We also tried to understand how the local people guard and manage their natural resources and their territories, what activities and events endanger the forest and their livelihoods and how they cope with these perceived threats.

Villagers have a diverse perspective on forest and natural resources including forest dynamics that are important for their livelihoods. Despite this diversity, all six villages agreed that forest is vital for their livelihoods. In Burmeso, to give an example, the villagers' perceptions are largely influenced by ongoing changes in-line with the development of a regency administrative capital. A comprehensive view of all six research sites has been summarized and compared with the perspectives of the local government authorities, i.e., the Public Services Units working on the regency's development planning. We would like to synergize and link ideas from the local government (*Pemerintah Daerah*, or *Pemda*) on land use planning with local community perceptions of the forest, natural resources, and traditional land use.

We expect that the result of the discussions and negotiations between local government and local communities can be used for further development projects that would look at the financial, social, and ecological feasibility of a proposal related to infrastructure development (i.e., access to isolated villages). These issues were discussed in more detail during the final project workshop in Kasonaweja and could be discussed further with potential donors (AFD, USAID, Norway government).

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1. Introduction

1.1 Background

History of the Mamberamo Raya Regency

The formation of Mamberamo Raya Regency is an event that all respondents interviewed in Kasonaweja, whether regional officials or traditional council, consider important. During activities conducted in the surveyed villages, the villagers showed a strong sense of pride and ownership of the regency, as most of the effort in creating the new regency came from local communities. The first local election was held in 2010.

The historical information that is presented here is based on interviews with officials in Kasonaweja. Several dates mentioned in this report are based on the respondents' recollection and may be incorrect. According to the respondents, the regency's history can be segmented into two periods: before and after the official designation of Mamberamo Raya Regency in 2007.

Pre Mamberamo Raya Regency (up to 2004)

The Dutch colonial administration, in 1910, designated Hollandia as the capital city of Papua, which was located in Jayapura's current location. Between the years 1963 and 1969, Hollandia was renamed Kota Baru and Soekarnopura, and renamed Jayapura in 1970. However, Jayapura Regency was inaugurated in 1958.

In 1962, the Jayapura Regency was divided into three districts: Upper Mamberamo in Dabra, Lower Mamberamo in Trimuris, and Sarmi district in Sarmi.

Middle Mamberamo district in Kasonaweja was added in 1973 and, up to 2004, the four districts were still included in the Jayapura Regency. In 2004 decentralization created two new regencies Sarmi and Waropen. In 2005, two districts were added in the Sarmi Regency: Kustra and Rouffaer.

Post Mamberamo Raya Regency (2004 – 2012)

The process of creating the new regency began when the Sarmi status was officially recognized as regency. The people of Mamberamo, supported by local

officials from Kasonaweja and Sarmi, sent a proposal to the President of the Republic of Indonesia to initiate the process for the inauguration of the Mamberamo Raya Regency and its separation from Sarmi and Waropen regencies. Those most influential in the process were the traditional council, the youth, intellectuals and government officials.

In 2007, the process was completed and the new regency was endorsed through the Republic of Indonesia Act No. 19/2007 on the Inauguration of the Mamberamo Raya Regency. Until 2010 the Mamberamo Raya Regency was administered by a 'caretaker' appointed at the provincial level. The first local election for the regency head took place in 2010. The regency head commenced his term in office in early 2011, definitively consolidating the creation of the regency.

The Mamberamo Raya Regency covers eight districts: Upper Mamberamo, Middle Mamberamo, Lower Mamberamo, Mid-east Mamberamo, and Rouffaer (ex-Sarmi Regency), Sawai, Benuki, and Upper Waropen (ex-Waropen Regency). The estimated population is 23,000.

The eight districts in Mamberamo Raya Regency, mentioned above, were included because of accessibility and inter-communal relations. In addition, there is a common perception that the benefits of development and management of natural resources is not yet optimum and not reaching the grass roots.

In 2006, there were 56 villages, but they were still administered by their former regencies. In 2007 two new villages were added to the Mamberamo Raya Regency, while another, Kowa village of the Upper Mamberamo district, was recognized by a decision of the regency head, but in absence of regional ordinance.

Since 2004, CI and CIFOR have collaborated in Multidisciplinary Landscape Assessment (MLA) training in Mamberamo to study the local community's perceptions of biodiversity. With the

Table 1. Districts in the Mamberamo Raya Regency

| District | Capital | Number of villages | Former regency |
|--------------------|------------|--------------------|----------------|
| Upper Mamberamo | Dabra | 9 | Sarmi |
| Middle Mamberamo | Kasonaweja | 11 | Sarmi |
| Lower Mamberamo | Trimuris | 7 | Sarmi |
| Mid-east Mamberamo | Kustra | 7 | Sarmi |
| Rouffaer | Kay | 6 | Sarmi |
| Sawai | Poiwai | 6 | Waropen |
| Benuki | Gesa Baru | 6 | Waropen |
| Upper Waropen | Barapasi | 7 | Waropen |
| Total | | 59 | |

MLA, we tried to identify how local communities utilize natural resources available to them. This approach can provide decision makers with information on local community perceptions, more specifically on what they value as being important, so that local community participation can be mobilized in decision making.

In 2006, we adapted the MLA to be more relevant to conservation issues in order to involve the local community in the management of natural resources inside a conservation area. With a participatory method, we tried to understand where important species to them, as well as other important places, were located. We also conducted field surveys to draw a map that captures land use with areas for farming, hunting, sacred places and other places of significance.

From the results of the 2006 activities, CI had an agreement with local communities (Community Conservation Agreement) to conserve natural resources in specified areas. This kind of agreement could be utilized in the district (*Distrik*) or regency (*Kabupaten*) and be included in spatial planning (*Rencana Tata Ruang Wilayah* –RTRW) at the regency level. This concept led us to new policy specific activities related to socio-ecological assessment in several pilot villages in Mamberamo Raya Regency (*Kabupaten Mamberamo Raya*). Finally, our objective was to provide decision makers with recommendations that would help incorporate local community perceptions into development activities in the regency.

1.2 Objective: Collaborative Land Use Planning (CLUP) in Mamberamo

The stakeholders involved in this research were government institutions/agencies such as the Natural Resources Conservation Agency (*Balai Besar Konservasi Sumber Daya Alam* –BBKSDA) and the Natural Resources and Environmental Management Agency (*Badan Pengelolaan Sumber Daya Alam dan Lingkungan Hidup* – BPSDALH) of the Province of Papua and *Yayasan Lingkungan Hidup* (YALI) Papua, a local NGO based in Jayapura.

The objective of the activity was to support the drafting of the RTRW through a participatory approach taking into consideration development needs as well as forest conservation. We followed two approaches: in the first we used the actual RTRW, developed from a top-down approach from the provincial government to lower level authorities and in the second we collected information from the local communities for decision makers (bottom up), with the agreement of the local people. We tried to find a consensus between these two approaches and to propose a method by which information from the village and from the field could be collected.

Interviews and secondary data collection were also conducted at the regency and provincial levels, particularly with regional government authorities and development institutions that work on RTRW and natural resources management.

1.3 Summary of the first phase report

The first phase of the research concentrated on secondary data collection regarding the implementation of land use planning and natural resource management from government institutions at the central and regional levels, and according to practitioners, as well as NGOs. Information collected was used as discussion material for the development of future land use planning, particularly programs that respond to climate change issues. The data was collected by two consultants who had experience in land use planning. This was done during the first half of 2010. The details of which are as follows:

- A review of the application for the RTRW was conducted at the national, provincial and regency levels, identifying parties that have significant roles to play in the formulation of RTRW, as well as reviewing potential conflict and opportunities for conservation in the development process;
- The latest RTRW documents were assessed for their relevance to local livelihoods (which depend on natural resources) in the context of the global issue of climate change; and
- A workshop was conducted to discuss the concept of collaborative land use planning while at the same time raising environmental awareness to support sustainable land use planning and sustainable development.

Implementation of spatial planning in the Province of Papua

It is generally accepted that land hosts natural resources that have limitations in supporting human activity. Therefore in land use, physical characteristics, such as natural resource potentials and its risk for disaster, ought to be identified at the onset.

In line with the above-mentioned principle, Act No. 26/2007 on spatial planning stipulates that land use planning needs to take into consideration environmental supportive capacity and threshold. Environmental supportive capacity is defined as the ability of the environment to support local livelihoods, other living beings, and the balance between the two.

The land's supportive capacity is a major variable required to determine the balance between conservation and land that can be cultivated. The determinants for conservation areas refer to four

main variables, i.e., land gradient, erosion potential, rainfall, and altitude (above sea level). The same variables are used to determine supporting and cultivation areas.

In addition to using the supportive capacity of land as a main determining factor for spatial planning, other considerations used include: the village location, the Ministry of Forestry's policy on authorizing the designation of forest and waterways (including the designation of conservation areas), the quality of land cover, the potential for disaster, the permits issued and the forest area estimates for each regency.

The Ministry of Forestry classifies forest and waterways into: conservation areas (*Kawasan Suaka Alam* / *Kawasan Pelestarian Alam* – KSA/KPA), protected forest (*Hutan Lindung* –, HL), limited production forest (*Hutan Produksi Terbatas* – HPT), permanent production forest (*Hutan Produksi* – HP), production forest for conversion (*Hutan Produksi Konversi* – HPK), and areas for miscellaneous use (*Area Peruntukan Lain* – APL). To be consistent with development needs, and within the widening framework of decentralization, the proportions of each land use were updated. The APL, which includes settlements, agricultural land, plantations, airports, harbors, etc., has increased.

Integration of the Provincial Land Use Plan into the Regency Plan

The RTRW of the Province of Papua is currently in the process of being legalized. The policy directions that are contained in the provincial document will serve as a reference for the regencies in formulating their plans. In drafting the RTRW, each regency must accommodate core directives that are encapsulated in the provincial RTRW, and then elaborate them to a determined level of detail, and complete them according to the characteristics of the area.

The objective of spatial planning is essentially to provide directions for the possible future layout of the land. Land use planning is formulated according to the regional development vision and mission, concerns, and development potential, as well as strategic issues that have been deliberated and adopted by the various stakeholders. The regency vision and mission for development should be aligned with that of the province. Hence, the formulation of the objectives of spatial planning at

the regency level ought to accommodate objectives stipulated in the provincial-level plan, particularly fundamental issues, and be a consensus of all provincial-level stakeholders.

Two important concerns that need to be a reference in formulating the objectives of the regency land use plan are: sustainable development and village-based land use planning.

Each regency is tied to its commitment to adhere to the Papua Green Policy (forest in 70% of the total area), by still giving space for village activities. Large-scale activities still have room to be developed, with careful consideration for the environmental supportive capacity and threshold. As specified in the directives regarding land conversion, conversion of un-forested HPK areas is prioritized, and when in HPK forested areas, focus should be on secondary forest areas according to commitments at the international, national, and regional levels, and with community participation in forest conservation.

The Papua Green Commitment is clearly incorporated into the spatial structure and planning. The spatial structure of the province of Papua prioritizes a multimodal transportation system, which optimizes the use of air, sea, and river rather than the development of new roads that would have greater impact on the forest functions. This concept may require further detailed elaboration

in the development of transportation systems in each regency.

The spatial planning puts emphasis on forest conservation, including peat lands, swamp forests, and lowland forests. These are administered following the principles of community-based green investment, in the form of sustainable plantations and conserved forests, according to the feasibility and capacity of the land. This directive requires more detailed elaboration at the regency-level RTRW. Detailed information is necessary to identify the location and conditions of forested areas, including peat land, swamp forests, and lowland forests. Information on the village community is also necessary including how natural resources are locally managed. By taking into consideration the gaps between policy (or regulations) in spatial planning and the need to develop a community-based Green Papua, measures need to be taken to reduce the gaps and meet development needs at the regency level.

Data Requirements

The adequacy of the information collected will determine the quality of the regency's RTRW. Information required can be in the form of spatial or non-spatial data collected from government authorities at the central, provincial, or regency level or based on field surveys and results of previous research.

2. Methods for field activities

The workshop, held in Jayapura in May 2010, helped us to prepare a research program and decide on the approach that would be used to select the research location and conduct activities in the field.

For this purpose, we divided the activities into three groups:

1. Determining the research location
2. Field data collection, and
3. Analysis of field data.

A summary of the activities of groups 1 and 2 in this research can be seen in Figure 1.

2.1 Selection of research location

In order to determine the location where this research was to be conducted, we used a multivariate analysis (SPSS17) statistical method. The criteria used to determine the research location were the type of ecosystem, topography, access to the regency, population, and land use zoning.

We used secondary data available from the Central Statistical Bureau (*Biro Pusat Statistik* or BPS) of Papua Province. At the time (2010), only 58 villages in the Mamberamo Raya Regency were registered with BPS. Subsequently we rejected 18 of the 58 villages due to incomplete data. The remaining 40

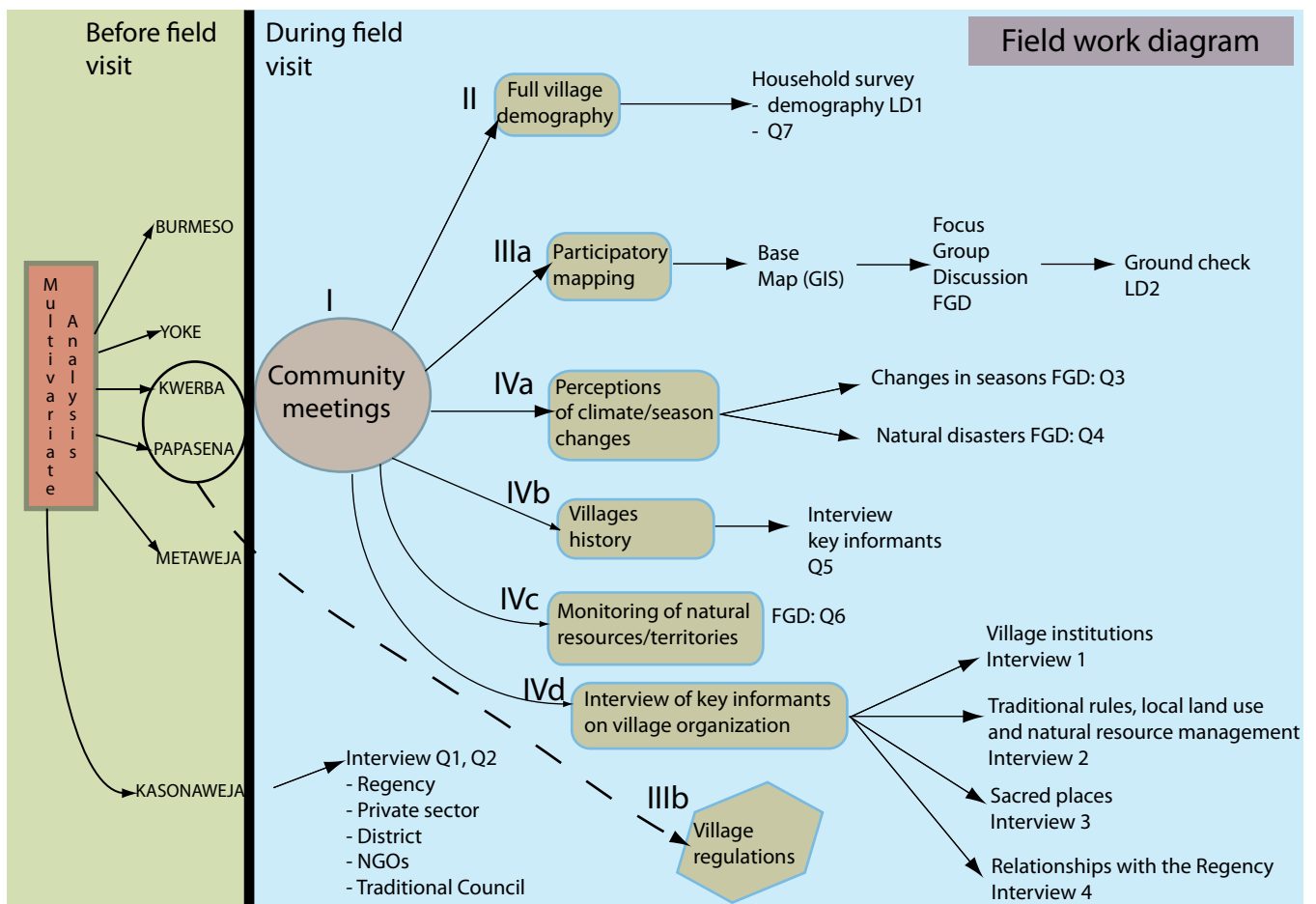


Figure 1. Fieldwork Diagram

Table 2. Villages in Mamberamo Raya Regency used as preliminary information in selecting our research locations

| No. | Village | District | No. | Village | District |
|-----|--------------|--------------------|-----|---------------|--------------------|
| 1 | Bagusa | Lower Mamberamo | 21 | Kustra | Mid-east Mamberamo |
| 2 | Baudi | Lower Mamberamo | 22 | Noyadi | Mid-east Mamberamo |
| 3 | Kapeso | Lower Mamberamo | 23 | Obogoi | Mid-east Mamberamo |
| 4 | Swaseso | Lower Mamberamo | 24 | Tuwao | Mid-east Mamberamo |
| 5 | Trimuris | Lower Mamberamo | 25 | Wakayadi | Mid-east Mamberamo |
| 6 | Warembori | Lower Mamberamo | 26 | Dabra | Upper Mamberamo |
| 7 | Yoke | Lower Mamberamo | 27 | Fokri/Baso | Upper Mamberamo |
| 8 | Anggreso | Middle Mamberamo | 28 | Fuao | Upper Mamberamo |
| 9 | Babija | Middle Mamberamo | 29 | Papasena 1 | Upper Mamberamo |
| 10 | Burmeso | Middle Mamberamo | 30 | Papasena 2 | Upper Mamberamo |
| 11 | Danau Bira | Middle Mamberamo | 31 | Bareri | Rouffaer |
| 12 | Kasonaweja | Middle Mamberamo | 32 | Fona | Rouffaer |
| 13 | Kwerba | Middle Mamberamo | 33 | Haya | Rouffaer |
| 14 | Marine Valen | Middle Mamberamo | 34 | Kayi/Kay Seta | Rouffaer |
| 15 | Metaweja | Middle Mamberamo | 35 | Sikari | Rouffaer |
| 16 | Murumarei | Middle Mamberamo | 36 | Tyai | Rouffaer |
| 17 | Namunaweja | Middle Mamberamo | 37 | Anasi | Sawai |
| 18 | Sasawakwesar | Middle Mamberamo | 38 | Bonoi | Sawai |
| 19 | Biri | Mid-east Mamberamo | 39 | Sorabi | Sawai |
| 20 | Ery | Mid-east Mamberamo | 40 | Tamakuri | Sawai |

villages, used for statistical analysis, are presented in Table 1.

Biodiversity data were obtained from an index provided by the consultants mobilized at the initial phase of this research (see the chapter on ‘Summary of the First Report’). In the index, data on geology, altitude, and land cover were incorporated. The biodiversity index was processed using Arc View 3.2 software.

All variables were processed with multi-correspondence analysis to determine the various village typologies. The results show that 30 villages (of 40) in Mamberamo Raya Regency could be classified into 4 typologies:

- Typology 1: villages located inside protected forests with medium access
- Typology 2: villages located inside limited production forest with high biodiversity and easy access

- Typology 3: villages located inside a production forest and conservation area with low biodiversity and difficult access
- Typology 4: villages located inside production forests for conversion

As there were only two villages classified under typology 4, we decided to exclude this typology from the village selection process. The 6 villages chosen for field activities were selected randomly based on the first three typologies. The selection was cross-referenced with former surveys in years 2004 and 2006.

The selected villages were: Burmeso (typology 1), Yoke (typology 3), Kwerba (typology 3), Papasena 1 and 2 (typology 3), and Metaweja (typology 3). All field activities were implemented in the 6 villages, and interviews with regional government authorities on their perceptions of RTRW and the role of the local communities in the management of natural resources, were conducted in Kasonaweja.

Table 3. The 30 villages grouped by typology

| Typology 1: protected forest, medium access | | | Typology 3: production forest, bio-reserve, low biodiversity, difficult access | | |
|---|--------------|------------------|---|--------------|--------------------|
| No. | Village | District | No. | Village | District |
| 1 | Baudi | Lower Mamberamo | 5 | Metaweja | Middle Mamberamo |
| 2 | Kasonaweja | Middle Mamberamo | 6 | Sasawakwesar | Middle Mamberamo |
| 3 | Burmeso | Middle Mamberamo | 7 | Biri | Mid-east Mamberamo |
| 4 | Kay | Rouffaer | 8 | Eri | Mid-east Mamberamo |
| Typology 2: limited production forest, high biodiversity, easy access | | | 9 | Noyadi | Mid-east Mamberamo |
| No. | Village | District | 10 | Obogoi | Mid-east Mamberamo |
| 1 | Kapeso | Lower Mamberamo | 11 | Tuwao | Mid-east Mamberamo |
| 2 | Swaseso | Lower Mamberamo | 12 | Wakayadi | Mid-east Mamberamo |
| 3 | Murumarei | Middle Mamberamo | 13 | Papasena 1 | Upper Mamberamo |
| 4 | Marina Valen | Middle Mamberamo | 14 | Papasena 2 | Upper Mamberamo |
| 5 | Fokri/Baso | Upper Mamberamo | 15 | Bareri | Rouffaer |
| Typology 3: production forest, bio-reserve, low biodiversity, difficult access | | | 16 | Sikari | Rouffaer |
| No. | Village | District | 17 | Tayai | Rouffaer |
| 1 | Warembori | Lower Mamberamo | 18 | Sorabi | Sawai |
| 2 | Yoke | Lower Mamberamo | 19 | Tamakuri | Sawai |
| 3 | Babija | Middle Mamberamo | Typology 4: conversion forest | | |
| 4 | Kwerba | Middle Mamberamo | No. | Village | District |
| | | | 1 | Dabra | Upper Mamberamo |
| | | | 2 | Bonoi | Sawai |

Table 4. Research Activity Schedule

| Date | 21 October - 20 November 2010 | 20 April - 15 May 2011 | 12 July -12 August 2011 | 20-21 March 2012 |
|-----------------|-------------------------------|--------------------------|--------------------------------|------------------|
| Village | Kasonaweja, Burmeso | Yoke, Kwerba, Kasonaweja | Metaweja, Papasena, Kasonaweja | Kasonaweja |
| Activity | Data Collection | Data Collection | Data Collection | Workshop |

2.2 Field Data Collection

Field activities were divided into three sessions of data collection and a workshop to disseminate the results of this research to the stakeholders involved.

The field activities are outlined in Figure 1. Each type of activity is described below, with a full description and data sheet examples provided separately in the Guidebook.

Meeting with Local Communities

Before each field activity was initiated, the researcher team surveyed the village to meet the village officials and elders, to give them information about the research and the proposed schedule for the activities and to ask for permission to conduct the research. Only in Metaweja were we unable to give prior notice due to the field conditions; it took a three-day trek overland and by boat to reach the village.

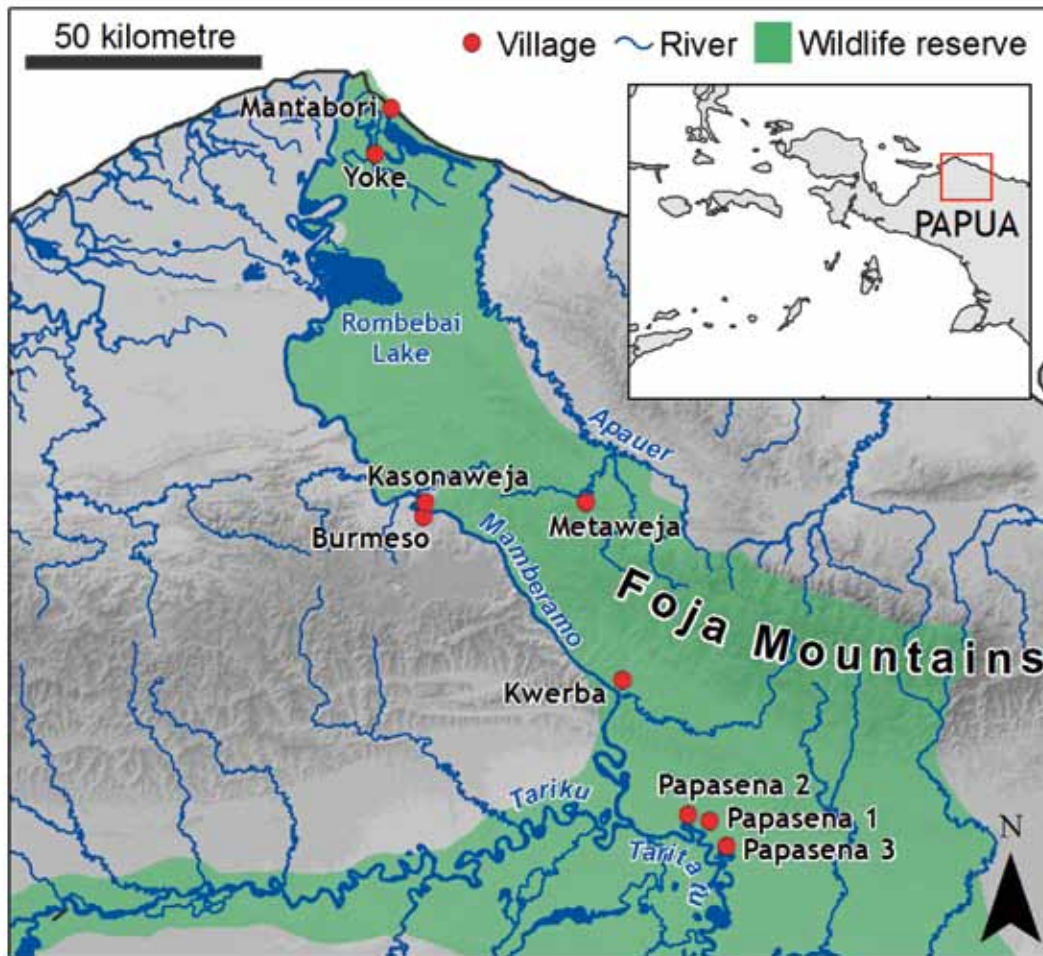


Figure 2. Location of the 6 research villages in Mamberamo Raya Regency

A team of 6-7 people spent between three weeks and a month collecting data in each village. Two researchers conducted demographic and household surveys, 2 or 3 were assigned to a mapping survey (using participatory methods and field verification), while the others interviewed key informants and groups of villagers (FGD) on specific topics such as climate change, natural disasters, and monitoring.

Before starting we had a meeting with the villagers to explain the rationale for our activities and discuss several logistical issues regarding payment and compensation for lodging etc. In these meetings, we collected information on the village: language, ethnic groups and their boundaries, and we planned the activities for the weeks ahead.

We meet three times on average with all the community in each village:

- At the beginning
- During the survey we arranged a meeting to provide preliminary results or any other information or to ask for clarification, and
- At the end to give back the preliminary research results, original sketch of the participatory map, and for the closing session.

When needed, we added meetings, particularly when a significant part of the local community was not present at the first meeting. In Yoke, as the village is divided into two (Yoke and Mantabori) there were two introductory meetings. As the villagers in Mantabori were still unclear about the reasons for our presence, an additional meeting was held with them.

Participatory Mapping

Mapping was the most time consuming of all activities. The participatory mapping is divided into two types of sub-activities:

#1 Gender-based group mapping: the respondents were divided based on gender and age (men, older and younger, and women, older and younger) due to the distinct set of information that the respective groups possess. The men usually had better information on areas far from the village, where they patrol or hunt; whereas the women had more accurate knowledge of the more proximate areas where they collect forest products and cultivate. The base maps showed the position of new and old villages, and all streams and rivers identified by the four groups.

After the base map was completed, the research team, together with villagers, identified forest products (limited to 10 animal species and 10 plant species) and other landscape attributes. Each group incorporated all these attributes into the map. The village traditional boundaries were also drawn in, however, they have yet to be corroborated with the local government and neighboring villages. After this process, the research team then combined the two maps into one natural resource map.

Three types of map were produced: a current and a future land use map, and a clan map (only for the villages that were requesting it). They were drawn by a combined team (men and women) as well as village officials and traditional leaders. From the current land use map we could assess the present situation according to the local community, and also their aspirations for future land use. The future land use map includes the groups' plans and perceptions of development in their territory, and the zoning for conservation for future generations and demarcation of sacred areas. These maps are not the official RTRW map, but only for further discussion with the local government and negotiations with other villages on their boundaries and development plans.

#2 Ground check: on completion of the draft map, the team went to the field, accompanied by local representatives to verify the draft map. The team used Global Positioning System (GPS) to position, in particular, the rivers/streams and important landmarks (lakes, sacred areas etc.).

At the end of the field activities, two copies of the map were made: one was left in the village as evidence, and the other was brought to Jakarta/Bogor to be digitalized and improved. The team gave each village the improved map when they returned for the next survey.

Focus Group Discussions (FGD)

For the group discussions the villagers were divided into four focus groups: women, young and old, and men, young and old. In the FGDs, semi-open ended questionnaires were used. The topics included the local perceptions of climate variability (a more common local term, 'seasonal variability', was used instead of 'climate variability'), natural disaster (some natural disasters are linked to climatic change, but some like earthquakes, coastal erosion, and tsunamis are unrelated), and on monitoring.

- **Climate variability:** we tried to understand and differentiate the different seasons in the village, particular natural events, and what was considered to be regular or extraordinary events (i.e., flash floods or prolonged drought)
- **Natural Disasters:** we recorded all disasters that the villagers could recall, their impact and how local people coped, and
- **Monitoring:** this relates to how local communities guard and assess the availability of important natural resources, and how they patrol their territory.

Interviews

Two types of interview were conducted in each research village:

- **Household Survey:** In each village, we conducted two types of demographic survey. An 'overall survey' conducted in every household of each village with simple straightforward questions (respondent's name, family members, clan, and ethnic group). Then, we randomly selected 30% of all households for a more detailed survey (age, level of education, main occupation, side occupation). Every time a household survey was conducted, we also used a questionnaire to ask about local perceptions on threats to the environment and the community's livelihoods, how to overcome them, and whether there were any positive externalities to the threats. Information on activities for cultivation and the gathering of forest products were also

collected, as well as local knowledge on three forest resources selected by the respondents.

- **Interviews with key resource persons** – Key resource persons were village officials (village head, secretary of the village, etc), traditional leaders including clan leaders and *Ondoafi* (head of all clans in the village). The interviews were on village history (important historical events, village organization, ethnic groups, and language), relations with the regency and district, and customary rules, particularly with regard to places considered sacred.

2.3 Data Analysis Method

Data entry

All data entries were entered at CIFOR Bogor and CI Jakarta. Several consultants assisted in the data entry process using Excel. The research team verified each data entry. The names of informants were coded to maintain confidentiality.

Data Analysis

Data was analyzed using two methods and three software programs:

- All qualitative data were processed with MaxQDA software that manages qualitative data, based on keywords. This helped the team to cluster data from the entire village and from the local authorities in accordance with the requirements of this report.
- All qualitative data were processed with SPSS 17 software: the team was able to analyze the demographic data and to make a comparative analysis between demographic data and results from the household surveys (threats to the forest, river, and to local livelihoods, etc.).
- Several demographic data were handled using Excel, as they did not need to be compared with the household survey.

Mapping

Participatory mapping is a vital component of the project. Geographic Information System (GIS) was used to prepare a base map, analyze field data and compile a final map of the traditional village boundaries and key natural resources compiled by the local communities. Other software used included **ArcGIS-ArcView** of the Environmental Systems Research Institute (ESRI) and **ERDAS Imagine** to prepare satellite images. As a reference

for our mapping data and the satellite images we had utilized, we used the Ministry of Forestry's 2006 land coverage map, forest area and waterway map, and river network map; village map from the Statistical Bureau of the Province of Papua; and topographical as well as satellite images from Landsat TM 5 and ETM+ 7 path/row 102/61, 102/62, 103/61 and 103/62 of the years 2008-2009.

1. **Compilation of the base map**
The base map was compiled from existing maps and digitalized Landsat satellite imagery at a scale of 1:50,000. The villagers then added land marks such as major rivers and their tributaries, lakes, mountain ranges, roads (if any) and the village location. Due to the vast areas of the village territories the base map was prepared on 4 pages (upper left, upper right, lower left, and lower right), with the village center as the focal point. As a backup, we prepared base maps at a smaller scale, 1:100,000 and 1:200,000.
2. **Field Data Analysis**
Field data comprised GPS points obtained from the ground check and sketch maps that demarcated clan boundaries, natural resources, and current and future land use as a result of local community participatory mapping. In the first phase, GPS data from river points were downloaded using Mapsource software, whereas sketched maps were scanned and saved in JPEG format. During the second phase, the delineation of rivers and streams was based on GPS points using Landsat satellite imagery. The third phase was the input of the sketched map into GIS, starting from the geo-correction process with JPEG format and the GIS base map as reference. Then we delineated clan boundaries, land use, and digitized natural resources (animal and plant) based on the revised sketch map. The fourth phase was a joint field survey team verification of the delineated data to ensure accuracy and was revised where necessary. The process of delineation and digitizing was done on-screen and saved in the shape files format.
3. **Compilation of a finalized map**
The final maps consist of three themes: the clan territory map, current and future land use maps. Information on the maps includes mountains, rivers and streams, lakes, and distribution of natural resources (plants and animals), village location, abandoned villages, huts, sacred places etc. The map legend is written in the local

language, Indonesian, and English. Scientific names (to specify animals and plants) have also been included. Names of the rivers, villages, mountains, lakes, and clans (specifically for the

clan territory map) are included on the maps. For the map layout we used ArcGIS software at a scale of 1:50,000 and a paper size of A0 (depending on the size of the respective villages).

3. Results

Location

Mamberamo Raya Regency is geographically located between 137° 46 and 140° 19 longitudes and 01° 28 and 3° 50 latitudes and covers an area of 31,000 Km². Spatial borders of the regency are as follows:

- North: Pacific Ocean
- East: Sarmi Regency
- South: Puncak Jaya Regency and Tolikara Regency
- West: Waropen Regency and Yapen Waropen Regency

Mamberamo Raya Regency, in the province of Papua, was inaugurated, based on the Republic of Indonesia Act No. 19/2007 on the Inauguration of the Mamberamo Raya Regency on March 15, 2007.

Based on the Ministry of Forestry's forest and water designation map, updated in 2010, Mamberamo Raya Regency covers a total area of 2,719,132 hectares of forest lands. The forests consist of 475,640 hectares of protected forests, 936,306 hectares of conservation area, 532,386 hectares of limited production forests, 603,621 hectares of permanent production forests, and 171,179 hectares of conversion production forests.

Biophysical Description (forest, topography, and accessibility)

Data on ecosystems and biodiversity in Papua is limited. Especially in Mamberamo, research activities have rarely been undertaken until recently. Previous research has focused essentially on flora, fauna, and ecosystems.

The Mamberamo watershed is a large area of 7.8 million hectares and is formed by Tariku (also known as Rouffaer) River that converges on the Taritatu (also known as Idenburg) River, which flows into the Mamberamo River. The Mamberamo River flows from the southeast to the northwest and its estuary is on the northern coast of Papua where it flows into the Pacific Ocean. The river starts in the Jayawijaya Mountains (the highest mountain has an elevation of 5,000 meters above sea level).

The eastern part of the Mamberamo watershed is in the Foja Mountains (2,200 meters above sea level), which is renowned for its rich biodiversity. The mountain is located at the center of the Mamberamo-Foja Wildlife Reserve covering an area of 2 million hectares. The reserve expands from the edges of the Tariku and Taritatu rivers in the south to the eastern banks of the Mamberamo River up until the northern mangroves.

Mamberamo watershed is composed of several unique ecosystems including swamp forest, lowland forest, hill forest, sago forest, riverine tidal forest, dipterocarps forest, and old secondary forest. The area runs from the Jayawijaya Mountains, Tariku and Taritatu rivers that cross a wide plain with permanent and non-permanent swamp forest, where both rivers meet (at the mouth of the Tariku). Mamberamo River starts in this lowland plain; its rapids are called "dangerous areas" by the local communities. After running into Lake Rombebai, Mamberamo River enters another swampy lowland plain until it reaches the Pacific Ocean.

About 90% of the Mamberamo watershed is natural forest, rich with natural resources. All ecosystems in Mamberamo exhibit unique fauna, with two species of crocodile, three species of cassowary, birds of paradise, cockatoos, hornbill, parrots, crowned pigeon, tree kangaroos, etc. The richest flora is generally found in the hills and mountains, whereas in the swamp and mangrove areas, there is less diverse flora.

The Mamberamo Raya Regency is located in the middle of Mamberamo watershed with its capital, Kasonaweja, still inside the conservation area and bordering the production forest. The capital is in the process (2012) of being moved across the Mamberamo to Burmeso, in the production forest. With a population of about 23,000 located in 59 villages, the settlements are concentrated on the banks of larger rivers (Tariku, Taritatu and Mamberamo). Several villages are located in the mountain areas and accessible only by foot. In

general, accessibility in Mamberamo Raya Regency is primarily via waterways, footpaths, and small airstrips. There are no paved roads except those built in the regency capital.

All six surveyed villages are located in different ecosystems. Parts of their forests are old secondary forest as the local community activities are not too destructive (low density population). They also have complex river systems in their territories, and forests on the riverbanks are common. The six villages, from the upper to the lower reaches, are described as follows.

- **Papasena: 1,700 sq km**
Forests in Papasena range from the lowlands to the mountains and contain high biodiversity. Papasena has an important semi-permanent swamp forest in the southwest of the village territory, whilst the north and northeast are hilly terrains in the foothills of Foja Mountains. The people of Papasena have customary rights over Foja Mountains together with the Kwerba. In Papasena sago grows naturally and is part of the semi-permanent swamp forests. The main natural resources are freshwater fish, crocodiles, wild pig, and birds (birds of paradise, cassowary, crowned pigeon, cockatoo, hornbill, *maleo*, etc.). In this report, Papasena refers to both Papasena 1 and Papasena 2 villages which both have the same ancestral history and occupy the same territory. We therefore combined the information from these 2 villages in our analyses.
- **Kwerba: 1,100 sq km**
Like Papasena, Kwerba territory ranges from the shores of the Mamberamo up to Foja Mountains. The Kwerba territory contains hill and mountain forests with a high degree of plant biodiversity such as species of Dipterocarps, Fijian longan, iron wood, and many others. Wild animals are also abundant and are comparable to the situation in Metaweja.
- **Burmeso: 1,500 sq km**
Burmeso is the only surveyed village situated on the west of the Mamberamo River outside the conservation area. Large-scale logging company and road developer have established their operations in this village. The forest in Burmeso is hilly with difficult terrain (steep slopes). All

streams converge on the Mamberamo River.

The forest in Burmeso is home to many valuable species such as iron wood, Fijian longan, and Agathis. There are still many wild animals in the forest, but logging activities have damaged the forest and the local community is now finding it more difficult to hunt.

- **Metaweja: 300 sq km**
Metaweja is situated in the middle of the Mamberamo-Foja Wildlife Reserve and in the hills between the Mamberamo and Apauer Rivers. In Metaweja, the rivers flow to the Apauer River that runs parallel to the Mamberamo. Access is difficult because of the rugged terrain and extremely steep slopes. All routes to the village must cross the river (with many boulders), which is prone to flash floods. But the local community is currently constructing an airstrip. The fish in the river have been depleted because of unsustainable harvesting, but other wild animals are still abundant and diverse. Wild pig, cassowaries, snakes, birds of paradise and crowned pigeon can be found close to the village. Forests dominated by Agathis trees on the mountain tops are usually sacred grounds for the local community.
- **Yoke: 1,400 sq km**
There are two settlements: one is located in mangrove forests (Yoke, old village) and the other is on the beach (Mantabori, new village). The area is large and expands from Lake Rombebai (the biggest lake in Mamberamo watershed) until the northern coast. The area is a mix of swamp forests and mangrove, rich in natural resources, particularly fishes and crustaceans that are the staple food and main source of income for the villagers. Yoke is also inside the Mamberamo-Foja Wildlife Reserve. Part of the Yoke territory is in salt water (mangrove) and the other is in freshwater (permanent swamps between Yoke village and Lake Rombebai). Both ecosystems have highly diverse fish populations, however, they may be in danger if the planned widening of the channel between the Mamberamo River and the swamp or between Apauer River and Lake Tabaresia, takes place. The mud seepage from the river to the mangroves and swamps would threaten the freshwater fish population.

3.1 Seasons, according to local community perceptions

All of the surveyed villages have only two seasons dry and wet. There are, however, differences in the duration of the seasons.

In addition to these two seasons, Yoke villagers also recognize what they call ‘west’ and ‘east wind’ seasons.

For each season, local people conduct activities related to a diverse range of livelihoods. However, in general, there are several activities conducted during one particular season.

Dry season: preparations for new gardens such as land clearing, particularly in Papasena, Kwerba, and, to a lesser extent, Burmeso are the main activities. Crocodile hunting is also conducted during the dry season, as they are more visible in the receding waters and therefore easier to catch.

Wet season: the majority of the people in the six villages begin planting their gardens during the wet season. They plant mostly yams, cassava, groundnuts, string beans, chilies, banana, and sugarcane. There are no permanent irrigation systems so they are highly dependent on the rain, rivers and/or streams closest to the garden for water.

Other activities such as harvesting sago, hunting (wild chicken, wild pig, cassowary, tree kangaroos) and collecting forest products (firewood, resin, and *genemo*), fishing, crabbing, and harvesting bivalves occur year-round.

Other Seasons

Apart from the dry and wet seasons, local communities recognize other seasons, although they might actually be weather patterns related to the seasons. In Burmeso, Kwerba and Papasena, located on the banks of the Mamberamo River, big floods happen on average once every five years. The last big flood was in 2009. In Yoke, the local community do not recognize other seasons apart from those which occur annually.

Irregular seasons also occur. In Burmeso, there was no clear pattern of change between the dry and wet seasons throughout the period 2000-2010. The Kwerba people said that the only irregular season that had occurred in the village was a prolonged dry season for almost the whole year in 1995, although it has never happened again (2011). In Metaweja there were windstorms three times within seven months in 2011. Papasena used to experience a cycle of big floods once every 15 years, but the cycle has recently become shorter and is now every five years and sometimes annually.

Table 5. Seasonality perceived in the surveyed villages (focus group discussions with women, young and old, and men, young and old) (blue=wet month, orange= dry month, white= unclear)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Papasena | Blue | Blue | Blue | Blue | Blue | White | Orange | Orange | Orange | White | White | Blue |
| Kwerba | Blue | Orange | Orange | Blue | White | White | White | Orange | Orange | Orange | Orange | Orange |
| Burmeso | White | White | White | White | White | Orange | Orange | Orange | White | Blue | Blue | Blue |
| Metaweja | Blue | White | Orange | Orange | Orange | White | White | White | Orange | Orange | Blue | Blue |
| Yoke | Blue | Blue | Blue | Orange | Orange | Orange | Orange | Orange | Orange | Blue | Blue | Blue |

Table 6. Population of the research villages

| | Kwerba | Burmeso | Metaweja | Papasena 1 and 2 | Yoke |
|---------------------|------------|------------|------------|------------------|------------|
| Number of household | 54 | 145 | 44 | 110 | 64 |
| Population | | | | | |
| Male | 179 | 467 | 169 | 309 | 183 |
| Female | 190 | 448 | 129 | 301 | 156 |
| Total | 369 | 915 | 298 | 610 | 339 |

3.2 Demography (population, sex, age, education)

The results of the census of the six research villages are presented in Table 6. Burmeso has the highest population with 915 people in 145 households while Metaweja is the least populated with 298 people in 44 households. In general the male population is larger in all the villages except Kwerba where females (190) outnumbered the males (179) by 11.

Information on the level of education and the community occupations were gathered through a random household survey involving 44 households in Burmeso and 30 households in each of the other villages. Table 7 shows that of a total of 164 surveyed households, the education level of the respondents in Burmeso is the highest; almost half of the

respondents in Burmeso have attained high school or university level. In Yoke all respondents went through formal education ranging from primary to high school. In Metaweja and Papasena, most respondents do not have a formal educational background (47% in Metaweja and 40% in Papasena). In Kwerba almost 25% of the respondents had never gone through formal education and most (40%) went through primary education only.

3.3 Occupation

The household survey results of the 164 respondents in the six villages show that there are several occupations, as presented in Table 8. Farmer is the most common occupation for most of the respondents, especially in Kwerba, Burmeso and Metaweja. In Yoke, Papasena 1, and Papasena 2, the

Table 7. Education levels in the research villages

| Education | Kwerba | | Burmeso | | Metaweja | | Papasena 1 and 2 | | Yoke | |
|-----------------------|--------|-------|---------|-------|----------|-------|------------------|-------|-------|-------|
| | Total | % | Total | % | Total | % | Total | % | Total | % |
| No formal education | 7 | 23.33 | 2 | 4.55 | 14 | 46.67 | 12 | 40.00 | | |
| Primary | 12 | 40.00 | 13 | 29.55 | 7 | 23.33 | 10 | 33.33 | 20 | 66.67 |
| Secondary | 4 | 13.33 | 9 | 20.45 | | | 3 | 10.00 | 7 | 23.33 |
| High school | 6 | 20.00 | 19 | 43.18 | 7 | 23.33 | 4 | 13.33 | 3 | 10.00 |
| Tertiary/University | 1 | 3.33 | 1 | 2.27 | 2 | 6.67 | 1 | 3.33 | | |
| Number of Respondents | 30 | 100 | 44 | 100 | 30 | 100 | 30 | 100 | 30 | 100 |

Table 8. Main occupations in the research villages

| Occupation | Kwerba | | Burmeso | | Metaweja | | Papasena 1 and 2 | | Yoke | |
|--------------------------|-----------|------------|-----------|------------|-----------|------------|------------------|------------|-----------|------------|
| | Total | % | Total | % | Total | % | Total | % | Total | % |
| Village administrator | 3 | 10 | 2 | 4.55 | 3 | 10 | 1 | 3.33 | 1 | 3.33 |
| Hunter | | | | | 3 | 10 | | | | |
| Services provider | 2 | 6.67 | 3 | 6.82 | | | 3 | 10 | 1 | 3.33 |
| Fisherman | | | | | 2 | 6.67 | 14 | 46.67 | 27 | 90 |
| Trader | | | 13 | 29.55 | | | | | | |
| Farmer | 20 | 66.67 | 18 | 40.91 | 16 | 53.33 | 10 | 33.33 | | |
| Civil servant | 3 | 10 | 8 | 18.18 | 5 | 16.67 | 2 | 6.67 | 1 | 3.33 |
| Private sector | 1 | 3.33 | | | | | | | | |
| Unemployed | 1 | 3.33 | | | 1 | 3.33 | | | | |
| Total respondents | 30 | 100 | 44 | 100 | 30 | 100 | 30 | 100 | 30 | 100 |

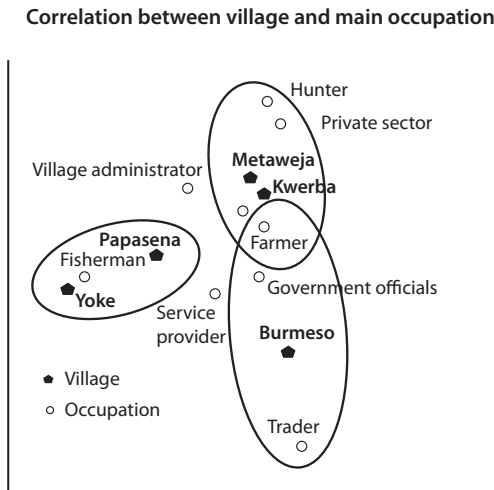


Figure 3. Correlation between villages and types of occupation

most common livelihood is fishing, both in fresh and saltwater. Occupations in formal sectors such as village administrators and civil servants occur in all villages although their numbers are not significant. This is largely due to the lower level of formal education (refer to Table 7).

Figure 3 illustrates the occupation trends in the research villages. Apart from agriculture, some people in Burmeso rely on trade, but they are all migrants such as Bugis and Buton from South Sulawesi. Civil servants and village administrators are the next

Composition of ethnic groups in the 6 villages

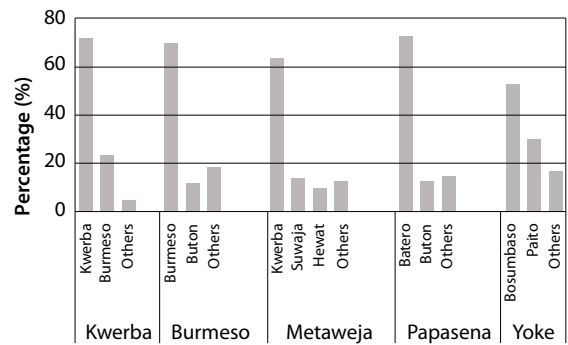


Figure 4. Composition of main ethnic groups in the six villages

most common occupations of some of the Kwerba (10%) and Metaweja (10%) respondents, in addition to hunting.

Although the main livelihoods are farming and fishing, local communities in the six villages still depend highly on forest resources for daily subsistence such as for food, construction materials, goods for trade, medicines, traditional ceremonies, etc. The participants in the focus group discussions (men, old and young, women, old and young) in the six villages, described the various resources from the forest, both timber and non-timber, which are important for their livelihoods. They therefore guard these resources from any outside interference.

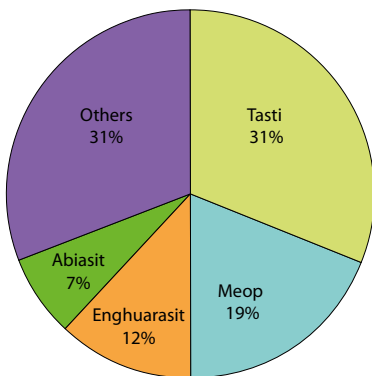
Table 9. The number of ethnic groups and clans in the six research villages

| | Kwerba | Burmeso | Metaweja | Papasena 1 and 2 | Yoke |
|-------------------------|--------|---------|----------|------------------|------|
| Number of ethnic groups | 6 | 25 | 14 | 20 | 21 |
| Number of clans | 15 | 49 | 17 | 33 | 36 |

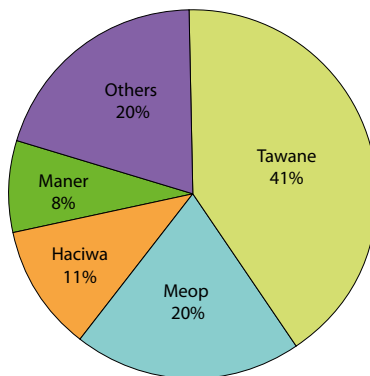
Table 10. Organizations in the village and their institutional structure

| Institution | Institutional Structure |
|-------------|--|
| Village | Village head; village secretary; village treasurer; functional heads (<i>Kepala Urusan</i>) for: governance, development, finance and general affairs; village planning body (<i>Badan Perencanaan Kampung</i> or <i>Baperkam</i>); village consultative body (<i>Badan Musyawarah Kampung</i> or <i>Bamuskam</i>); women's organization; youth organization |
| Traditional | <i>Ondoafi</i> , clan leaders |
| Church | priest; the head of religious board; members |

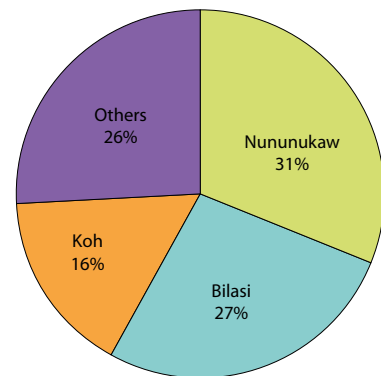
Clan composition in Burmeso



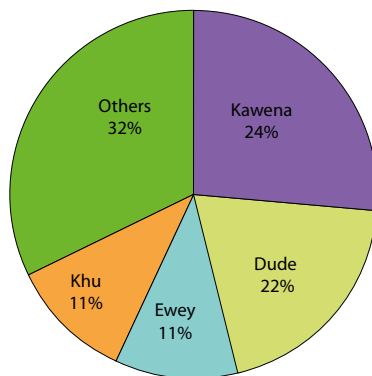
Clan composition in Kwerba



Clan composition in Metaweja



Clan composition in Papasena



Clan composition in Yoke

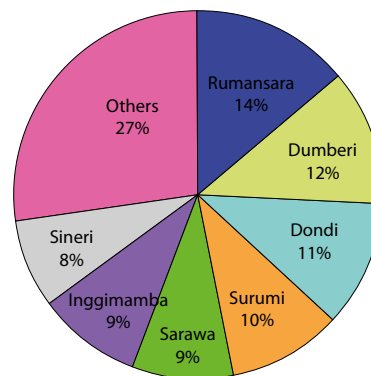


Figure 5. Main clans in the six villages

3.4 Ethnic groups and clans

From the five charts in Figure 5, it can be concluded that indigenous people dominate the population in the different villages, with very few new comers.

3.5 Village organization

The results of the interviews with key community leaders, i.e., village heads, *Ondoafi*, and the clan leaders in the six villages, show no significant difference in the organization of the villages. The organization of a village is under the “three pillars” of leadership, which represent the village (village head), *Ondoafi*, and the church (priest/minister). Each organization has its own functions and is mutually supportive.

Village Institutions

The village head and his/her staff have duties and responsibilities concerning relations with the government both at the district and regency levels.

1. Managing government programs that are developed at the district, regency, provincial, or central levels. Example: road construction, public buildings and housing development, markets, and distributing financial and other material support from the government to the villagers.
2. To convey the community aspirations to the district or regency head such as local needs for permanent housing in the village.
3. Troubleshoot issues in the village (in coordination with the *Ondoafi*)

Traditional Institutions

Ondoafi and the clan leaders have duties related to traditional ceremonies and the management of resources on their customary lands.

1. Supervise and control the management of natural resources, extraction of plants (both timber and non-timber) and animals. Anyone who wants to extract natural resources for commercial purposes must seek permission from the clan leader or *Ondoafi*. Both determine whether authorization will be granted or not, where and how much natural resource is allowed to be extracted. There are no written regulations only verbal and a person's willingness to comply. The clan leaders are responsible for their clan's territories whereas the *Ondoafi* is responsible for the territory of the entire village.
2. Acting as guardians for the local institutions, including ceremonies and maintaining cordial relations with the *Ondoafi* from other villages.
3. Acting as arbiter for disputes that arise between clans as well as those related to culture and the extraction of natural resources involving other villages.
4. Assisting the government with development programs in the village

3.5.3 Church

The priests/ministers together with the church members serve the local community in religious affairs. The church is part of the "three pillars" of leadership in the village and takes part in joint decisions with the *Ondoafi* and the village administrators.

3.6 RTGL and RTRW: perspectives from the regency and village

• Definition of RTGL and RTRW

All this information was gathered from interviews with official and villagers

In general, all information on land use planning (*Rencana Tata Guna Lahan* – RTGL) and spatial planning (*Rencana Tata Ruang Wilayah* – RTRW) are under the authority of the Regional Development Planning Agency (*Badan Perencanaan Pembangunan Daerah* – BAPPEDA) at the regency level. Almost all local government official respondents suggested that it is best to enquire directly with BAPPEDA.

However, the definitions of RTGL and RTRW and differences between them remain unclear for most officials.

According to BAPPEDA, the RTRW refers to what has been determined in spatial planning at the central and provincial levels and the regency government follows instruction from the former two. Having been completed at the regency level, a draft of the RTRW is sent to the provincial and central governments, and a regency government ordinance needs to be issued. The RTRW of Mamberamo Raya Regency was drafted in November 2010, but until March 2012, it was still in the process of consultation at the provincial and central government levels.

According to an officer of the Agricultural Regency Service, the RTGL of Mamberamo Raya Regency is presently being drafted by BAPPEDA and includes inputs from the Public Works and Forestry Services. The RTGL document is an important part of the RTRW and not merely an annex to it.

Among all data required for the development of an RTRW, those which have been compiled by BAPPEDA include data related to the Mamberamo watershed, conservation area, road development (ongoing and planned), review of forest use in Mamberamo, the development plan for forest resource use, and supporting documents (maps and reports) to support the RTRW.

According to the head of BAPPEDA, the following information is required to draft the regency RTRW:

- General physical description, land use, demography, proof of local community support, disaster areas, economic activities, and infrastructure
- Strategic issues
- Aim, policy, and land use strategies
- Spatial structure design (urban systems, transportation systems, energy infrastructure systems, telecommunications, clean water access, and environmental), and
- Area pattern planning (regional/RTGL).

The RTRW of Mamberamo Raya Regency has reached the final stage and is being processed for further consultation with BAPPEDA at the Papua provincial level. The RTRW of Papua Province is also presently under review for due diligence and

consultation with the Ministry of the Internal Affairs and the National Development Planning Agency (*Badan Perencanaan Pembangunan Nasional* – BAPPENAS). Should there be revisions from the central government, BAPPEDA of the Papua Province needs to comply.

The latest draft of the RTRW of Mamberamo Raya Regency needs to be improved in BAPPEDA's work plan, and the necessary revisions include:

- Data collection on all village boundary maps
- Revision of the RTRW with all Public Service Units (*Satuan Kerja Perangkat Daerah* – SKPD), particularly Public Works, Forestry, Agriculture, Industry, Trade and Cooperatives Services, and
- Coordination with the Forestry Service to improve the RTGL

Data required for the RTRW of Mamberamo Raya Regency have been compiled from various sources (related public services) as well as the wider community including NGOs (i.e., YALI, WWF, CI, and others). The officials responsible for collecting the data are consultants assisted by BAPPEDA staff. All data compiled will be analyzed by the consultant with support from other data (such as satellite imageries). All analyzed data will be encapsulated in the RTRW document.

An academic analysis, with the support of universities and public review will then be conducted after the RTRW draft is completed, to secure local community support. Public review will be obtained by requesting the *Ondoafi*/clan leaders/village heads to review the document on behalf of the community and then pass the document to government officials in Kasonaweja. Government officials may also visit the villages to initiate discussion.

- **Local community involvement in decision-making**

Before a decision can be made on development programs, at the regency level, such as in the formulation of the RTRW document, consultants are engaged to collect data such as coordinates and demographic data of the villages and districts. For the Agricultural Service, soil data, from all villages, must be obtained. Other data that needs to be collected include climate, infrastructure and supporting data such as socio-cultural data of the local communities. Data on cultivated plant species

must also be collected. Based on an interview with a BAPPEDA officer, data collection at the village level has only been conducted in a few villages i.e., Burmeso, Kwerba, and Murumerei. Data collected so far includes population, area, natural resources, and the village economy.

The local community participates in the management of natural resources through the following activities:

- Participatory mapping of community forest was conducted in 2011 and will be conducted again in 2012
- Development of sago cultivation (a work plan is being developed)
- Development of oil palm plantation (a work plan is being developed)
- Forest concession through community development; home ownership plans
- Development of eaglewood cultivation in Obogoi Village (Middle Mamberamo district) covering an area of 10 hectares (2011)
- A crocodile farm (circumference of 900 m) in the swamps between the sago gardens in Sikari Village (wild, natural habitat), first phase was implemented in 2010
- In 2010, the Forestry Service both at the Papua Province and Mamberamo Raya Regency levels, together with the local communities, placed marker stones that indicate the boundaries of the protected forest areas; they are also able to act as guardians to ensure that there are no logging activities by the local communities or companies in the protected areas, and
- Training programs have been provided by the Agricultural Service for the farmers and fishing communities, to help them better manage cultivation and fisheries, during routine visits to the village every three months.

Local community involvement in development programs is not yet optimal. What is happening today is that the local community comes forward with proposals for activities and asks the local government for financial assistance. Unfortunately, this often does not result in the expected outcome due to limited human resources (nearly all public services) and the difficulty local government has in controlling the development and implementation of the programs being undertaken in the regency.

When providing contractors with a license for the management of natural resources (such as forest concessions or road development etc.), it is very important to involve local communities who have the customary land rights. The deliberation/discussion/negotiation and agreement between the contractors and the local community representatives (clan leaders, village head, etc.) usually takes place prior to the commencement of activities. Here the role of the local government is more that of a facilitator (sometimes working together with the customary council of Mamberamo Raya), and at the end would decide on issuing the license or permit to the contractor should the local community agree.

- **Participation of the local community in the RTRW**

A description of how the local community is involved in the drafting of the regency RTRW was obtained from interviews with resource persons from BAPPEDA, Forestry Service, Agricultural Service, Public Works Service, the Regency Secretariat, and the Mamberamo Raya Regency Parliament in Kasonaweja. Local community involvement in development programs is needed, for instance for road development in opening access from the villages to the regency capital. The role of the local government is to advise the public, for instance to explain which areas can be cleared and which cannot. Before implementing the development program, the local government needs to consult the village representatives.

Participatory mapping is an alternative way of involving the local community in the process of drafting the RTRW, such as the participatory mapping of a village area. In addition, the involvement of the local community is needed as the local community holds customary land rights (*Hak Ulayat*) to the territory it resides in. The land allocation for development always involves the local community, however, prior to the finalization of the Environment and Construction Plan (*Rencana Tata Bangunan dan Lingkungan – RTBL*) document, familiarization consultations with the local village communities should be undertaken. Valuable feedback can be obtained from these consultations, particularly with regard to which part of their customary land can be used for development activities.

The issuance of natural resource concession permits and public infrastructure development also requires local community (*Ondoafi*, village head, public figure, the church, youth, and others) involvement. In principle, the local communities should be the direct beneficiaries.

What usually happens is that only compensation is paid to the local community when their customary lands or natural resources are extracted by outsiders. The value of the compensation depends on the negotiation between the relevant local government services, the company, and the local community. The type of compensation, beside monetary, can also be in the form of employment with the company.

The budget to finance regency development programs comes from central government or the regency government's resources. The central government's budget is from the special autonomy package, proceeds from the extraction of natural resources, general budget allocation (*Dana Alokasi Umum – DAU*), special budget allocation (*Dana Alokasi Khusus – DAK*), and reforestation funds. While the regency government funds come from local taxes, company taxes, third party taxes, etc.

Meanwhile the interviews with key resource persons (village heads, *Ondoafi*, and clan leaders) of the six surveyed villages show that the local communities have not yet been fully involved in data collection for drafting the RTRW. Most villagers do not understand what RTRW is, and the outreach to introduce RTRW has never been conducted by the regency officials to all surveyed villages except Burmeso where the regency BAPPEDA officials, a consultant team (from outside Papua) and the University of Papua (UNIPA) have introduced the RTRW. In the other five surveyed villages, the information that reached them was about development programs such as the road works in Papasena and the development of an eco-tourism village in Yoke. However, up until April 2011, there had been little to no progress with these plans.

- **Regulations on the management of natural resources**

According to BAPPEDA, Public Works Service, Forestry Service, and Agricultural Service of the Mamberamo Raya Regency, the administration of natural resources in the conservation areas refers to the laws that were decreed by the central government,

including those that were issued by the Ministry of Forestry. In this regard, BAPPEDA only organize and monitor programs but does not have authority to issue permits of any sort and only has a technical supervisory role together with the Forestry Service of the regency government. However, according to PT. Mamberamo Alas Mandiri (MAM, logging company), the central government also has the authority to change the function of the forest although it will require justification based on in-depth technical considerations.

For conversion and production forests, the benchmark used, besides that of central government, is also the regulations endorsed at the provincial level. BAPPEDA supervises the programs implemented by the Mamberamo Raya Regency Forestry Service in the conversion forest and requests progress reports on the natural resources that were extracted from the production forest. PT. MAM for instance, conducts its activities guided by the regulations issued by the central government and a field survey is periodically conducted by a technical team from the Forestry Service of Papua Province and Mamberamo Raya Regency.

Based on the interviews with officials from the Public Works Service, until mid-2011 when this research was carried out, regional ordinance which govern natural resources made by both the government and parliament of the Mamberamo Raya Regency was yet to reach the stage of endorsement and as such remains a draft of the regional regulation.

An example of the draft of the regional regulation is one that governs the legal management of timber and the mining of coal and energy. The benchmarks from the central and provincial levels were therefore still used. BAPPEDA and the Forestry Service at the Mamberamo Raya Regency aim to have the regional regulation governing natural resources adopted by 2012.

From the local community point of view, recorded through interviews with the head of the Mamberamo Raya Customary Council, logging and hunting in community-protected forests for example, forest in the vicinity of the Timon River (the old Burmeso community village), has always been prohibited. This prohibition has been passed down through the generations. Concerning company activities in the production forests, the local communities have received assistance in the form of compensation and

infrastructure. However, they also need capacity building programs in developing alternative methods for sustainable natural resource management.

Opportunity cost between conservation and development

- **Regency government: anticipating shifts in land use**

Shifts in land use in the Mamberamo Raya Regency in the future must be prudently planned, and how land can be used according to its designation based on the principle that it would benefit the entire population of the regency. It may also need to consider how the natural forests in Mamberamo – which is renowned worldwide – can be protected so that it can bring about positive impact not only to the people of Mamberamo, but also the people of Papua and even the world. In responding to this challenge, there needs to be policy that specifically addresses land use management. In the five and twenty year planning documents, the government of the Mamberamo Raya Regency will focus on the use of lands within the watershed and continue to supervise conservation areas. In addition, the government is preparing a regional government ordinance on land use by companies such as those with concession permits and others.

The authority to change the land use allocation lies with the central government; therefore what can be done at the regency level is to synchronize what has been planned by the central government. The regency government can propose changes in land use, however, in Papua, this can be an issue linked to contradictions between government regulations and customary laws which considers all forest to belong to the indigenous communities. Building cordial relations between the local communities that have ownership by virtue of customary rights with the Mamberamo Raya Customary Council needs to be maintained as the local communities still respect the traditional leadership.

To avoid such sensitive issues forestry management could be conducted through REDD+ (Reducing Emission from Deforestation and Degradation) scheme. The provincial government of Papua could devise a plan to develop REDD+ in Papua, one of which has been conducted in Mamberamo Raya (Sawai and Benuki), but not yet implemented due to the complex mechanisms and because the RTRW has designated the area for palm oil plantation.

- **Regency government support in conservation**

The government of the Mamberamo Raya Regency is very supportive of conservation efforts, as this has become a global issue. Conservation should ideally give space for the local community to live in and to maintain their livelihoods while conserving the forest. Development programs, such as roads and housing, should also be directed so that it does not damage the forest and the environment.

The government is giving public outreach programs for the villagers on how to limit the use of land and resources so that the villages do not extend into the reserve areas. In the future, the government plans to create enclaves and the Forestry Service will construct and guard the sentry posts, together with related agencies i.e., the Natural Resources Conservation Agency in Papua Province. This program will be conducted in several areas prone to encroachment to reduce activities that may damage the reserve. As the community's logging activities, for their daily needs, will be restricted, the program will also find ways to compensate them. The principle is that they need to feel the direct financial benefits for conserving the forest. The role of the government is to:

- Issue local government ordinance together with the local parliament, cognizant to central government regulations
- Provide supervision and a control program which adheres to rules that have received a consensus between the local communities, local government and regional parliament
- Encourage the strengthening of the local economy such as crocodile farming in Sikari Village, and
- Increase the frequency of consultations with the local community and prepare compensation for their cooperation in not cutting the forest as well as implementing alternative development partnership programs with remuneration.

- **Regency Perceptions on Conservation and Development**

The government of Mamberamo Raya Regency understands that it needs to build synergy between development needs and principles of conservation. Conversely, efforts in conservation need to be implemented in such a way that guarantees sustainable development, without reducing the natural resource benefits for the local communities. In practice, infrastructure such as roads, buildings

and housing, including land clearance for plantations and other requirements need to be in accordance with designated land use regulations and should be sustainable. Intensification is much better than extensification (in terms of forest clearance) and agricultural technologies that ensure greater yields without the need for vast areas should be applied. The regency government plans to bolster efforts to elevate the status of the Mamberamo Foja Wildlife Reserve to national park. It is expected that this would increase the marketability of local produce.

However, the efforts to achieve harmony between conservation and development has its own unique challenges, such as expansion of decentralization of authority that often results in the increase of natural resource exploitation and can potentially cause environmental degradation. In this regard, the government needs to carefully consider development priorities. The idea of opening a coalmine in Mamberamo needs to be reconsidered, as there are many alternative sources of natural resources that can fulfill the needs of Mamberamo's relatively small population. Eco-tourism could be developed as a viable alternative source of income. The high level of biodiversity and outstanding landscapes offer immense opportunities for tourism.

- **Local community perceptions of the regional government plans for land conversion**

The villagers from the six villages have sufficient understanding of the Mamberamo Raya Regency development plans for land conversion.

In Burmeso, the local community understands that the plan is to open an oil palm plantation, coal mine, and construct an airstrip, even though the first two plans still remain unclear. The local community wants an international airport to be built and the proposed site is between two old settlements, Timon and Sarie (see the future participatory land use map of Burmeso Village).

In Kwerba, Metaweja and Papasena, the villagers are aware of plans to build a road connecting Kasonaweja with other areas in the upper parts of the Mamberamo River. The Kwerba community does not agree with the plans to build a road that would pass through their territory. They are concerned that the forest and forest resources – including their protected area – will be damaged by the project. It has thus been proposed that the road be built outside

the Kwerba territory west of the Mamberamo River, clearly outside of the conservation area.

Metaweja supports the road development, which would connect them to Kasonaweja, reduce their isolation, and increase access to other villages and the regency administration center. To accommodate common local community interests, the local villagers (in Metaweja) have proposed to change the current conservation area status to national park. In Indonesia, limited road construction is permitted in national parks but not in wildlife reserves.

In Papasena, the villagers agree with the proposed plan to build a road that would cut through Papasena territory (which is still within the Mamberamo Foja Wildlife Reserve) connecting Burmeso, Sikari and Fuao. The main stipulation would be that the road should not pass through their sacred areas. They believe that the road will help the local community in marketing their products in Kasonaweja, the regency capital. It is too far and difficult to go to Kasonaweja by boat along the Mamberamo River.

Most importantly, all the communities want to have a dialogue with the regency government and contractors to discuss the development plans and to reach an agreement that is beneficial to all parties. In Yoke, the local community has never heard of the government's land conversion plans, but are aware that Yoke is an area that is protected by the government. The development program in Yoke is the provision of housing for the local population. The aim is to move the Mantabori coastal village to a location near Yoke (Pondusubua) to avert the loss of life and property in the event of a tsunami. However, the Mantabori community does not agree and would prefer that the housing development be in Mantabori, but built in a place further from the coast.

Sacred areas and official recognition by the government

All interviewed respondents comprising the village heads, *Ondoafi* and the clan leaders in Burmeso, Kwerba, Metaweja, Papasena, and Yoke voiced their endorsement of official government recognition of the sacred areas in their territories and to formalize them as areas that are protected by law. The local communities currently guard their sacred areas from trespasses. They believe it would be much better if the government and the local communities together

guarded and protected these areas. The government regulations to protect the sacred areas must be sensitive to the local customs concerning the sacred areas, particularly taboos.

Official government recognition of sacred areas as protected areas is particularly important as the local community youth are losing their cultural awareness and the cultural significance of these areas. The youth, nowadays, only know the location, but not the history and folklore behind the sacred areas. Missionary activities in the 1950s also frequently taught alternative views on the local history. The elders often carefully select who they will pass on traditional historical accounts and even on many occasions in their dying moments.

3.7 Perceptions of threats to the forest and livelihoods

Comparison between the past and present living standards

Household surveys were conducted in 44 households in Burmeso, and 30 each in Kwerba, Metaweja, Papasena, and Yoke, with a total of 164 households. The majority (95.7%) of the respondents said that the present living standards are much better than ten years ago. Only 1.9% of respondents think it's worse and 2.4% think that there is no change. The reason for 60.4% of the respondents thinking their living standards are much better today is because of direct cash assistance from the local government and from the companies. While 59% attribute their better living standards, in addition to the direct cash assistance, to infrastructure development such as roads and housing; while 64% said that the building of a community center, church, and schools as well as the provision of social services (medicine, education, and chaplain) have helped to improve their living standards.

The majority of respondents in Metaweja (73.3%), Papasena (70%), and Yoke (83.33%) said that direct cash assistance made their lives better, while the majority of respondents in Burmeso (70.4%), Papasena (76.7%), and Yoke (93.3%) said that infrastructure had helped to improve their lives.

The future change in forest area

With an area of 7.8 million hectares (90% is forested), forests in Mamberamo are considered by all respondents, except one who did not answer,

to be vital to their livelihoods. Forest is primarily important for food (according to 152/164 respondents, all villages combined): sago grows wild or is planted, but villagers also look for bush meat in the forest, and they collect leaves of *genemo* (*Gnetum gnemon*), and fruits there. In all the villages combined, a significant portion of the people interviewed (152/164) explained that forest is also important to regulate water flow, prevent floods and erosion, and provide clean water. However, in Metaweja and Yoke, a majority of the villagers (39/60) also considered that forest is important because of its function as a source of construction material. To a lower extent, forest is considered important as a reserve of products for the future generations (16/164), as a shelter (34/164) and for agriculture (42/164). Forest also provides benefits as a source of commercial goods, areas for cultivation, an income for mining. But forests are also important as sacred areas.

What will happen to Mamberamo's forests in the next decade? Table 11 presents local community perceptions of the possible changes to the forest areas and the contributing factors.

Most of the respondents (144/164), all villages combined, consider that forest in their territories will be reduced. Only some villagers in Papasena (14/30) and Yoke (4/30) consider that no change will happen. When asked about the reasons why forest cover is changing, the answers given by 164 villagers show a direct link between changes in forest area and a combination of stressors. The main ones are: new settlements; development of physical infrastructures; activities from the private sector; land clearance for new gardens. And to a lower extent, villagers also identified: log harvesting; population growth; forests sustainably use; and forest protected by villagers.

When asked about what the private sector is, villagers always referred to mining, logging, and industrial plantations, even when they don't experience it themselves directly: they can observe the activities and impact on other neighbor villages.

The predicted causes of forest loss vary little among the six villages. In Kwerba villagers consider gardens and new settlements as the main reason. Infrastructure development and needs for new settlements are the main reason according to Metaweja. In Yoke the main cause is the need for new

Table 11. Perceptions of the six villages on the change of forest area in the next decade

| | Perceptions of the change of forest area in the next decade | | | Total |
|------------------|---|------------|-----------|------------|
| | Depleted | Reduced | No change | |
| Kwerba | 0 | 29 | 1 | 30 |
| Burmeso | 1 | 43 | 0 | 44 |
| Metaweja | 0 | 30 | 0 | 30 |
| Papasena 1 and 2 | 0 | 16 | 14 | 30 |
| Yoke | 0 | 26 | 4 | 30 |
| Total | 1 | 144 | 19 | 164 |

settlements. Villagers from Papasena who consider that forest area will remain the same think that they will continue to use the forest resources sustainably and be able to control any external activity on their territory.

Changes in village and garden area

Apart from the changes in forest area, local people have their own views on future changes in the size of their village and gardens. In the next ten years, the people in the six villages – especially from Kwerba, Burmeso, and Metaweja – consider that their village area will increase. So too will their cultivated areas, particularly according to the villagers in Kwerba, Metaweja, and Papasena. They believe that changes in the size of the village and gardens will be caused by an increase in the population that will exert more pressure on resources and settlements. Villagers think that the size of their garden areas is still adequate and will be able to support the local community needs for the next ten years. To build new houses, local people do not need to clear more land, and land clearance may only occur in garden areas. Meanwhile respondents who view that both the size of the village and their gardens will be reduced think it is because of the development of the regency center in Burmeso, and the creation of new job opportunities with less reliance on agriculture produce.

Human activities that harm forest and conservation

According to 164 respondents in the six villages, 11 types of human activities were considered to be potentially harmful to the forest and conservation. Table 13 illustrates the results from the interviews

Table 12. Perceptions of changes of village and garden area for the next ten years in the six villages

| Perceptions of changes in village area in the next ten years | | | | | Total |
|--|-----------|----------|-----------|------------|------------|
| Don't know | Reduced | Constant | Increased | | |
| Kwerba | 4 | 0 | 0 | 26 | 30 |
| Burmeso | 8 | 1 | 0 | 35 | 44 |
| Metaweja | 9 | 1 | 0 | 20 | 30 |
| Papasena 1 and 2 | 9 | 0 | 6 | 15 | 30 |
| Yoke | 13 | 0 | 5 | 12 | 30 |
| Total | 43 | 2 | 11 | 108 | 164 |

| Perceptions of changes in garden area in the next ten years | | | | | Total |
|---|-----------|-----------|-----------|-----------|------------|
| Don't know | Reduced | Constant | Increased | | |
| Kwerba | 8 | 1 | 2 | 19 | 30 |
| Burmeso | 30 | 4 | 9 | 1 | 44 |
| Metaweja | 6 | 4 | 3 | 17 | 30 |
| Papasena 1 and 2 | 7 | 0 | 5 | 18 | 30 |
| Yoke | 16 | 5 | 1 | 8 | 30 |
| Total | 67 | 14 | 20 | 63 | 164 |

with 164 respondents describing human activities which may harm the forest, where a respondent is allowed to give more than one answer.

Table 13 shows that 5 of the activities, i.e., logging by companies, excessive logging by the local community, fishing with poisons, contractors for public works, and land conversion were considered by the majority of the respondents to be the most harmful. Through statistical analysis it was proven that there is strong causality that supports the results.

Although harmful, the local communities think that all these activities – apart from littering and witchcraft – benefits can still be derived from them. All respondents – particularly in Burmeso – said that logging companies are beneficial, as they are the main economic driver in the village. The local communities benefit directly from cash handouts and development of the local infrastructure. Logging by the local community (especially by Kwerba and Yoke villagers) is considered important for building materials and for the villagers in Metaweja, it is a livelihood.

Occupations of the local communities

Table 8 gives the main occupations in the six surveyed villages. Farming is the most common occupation in Kwerba, Burmeso, and Metaweja.

Table 13. Human activities that harm forests

| No | Activity | Frequency | % |
|----|--|-----------|-------|
| 1 | Logging companies | 106 | 64.63 |
| 2 | Excessive logging by the local community | 61 | 37.20 |
| 3 | The use of poison for fishing | 56 | 34.15 |
| 4 | Contractors for public works (i.e., roads and buildings) | 51 | 31.10 |
| 5 | Land conversion | 43 | 26.22 |
| 6 | Dam project | 12 | 7.32 |
| 7 | Littering | 10 | 6.10 |
| 8 | Expansion of regency administration | 8 | 4.88 |
| 9 | Crocodile business | 3 | 1.83 |
| 10 | Witchcraft (<i>koahnoro</i>) | 2 | 1.22 |
| 11 | Quarrying sand and stone | 2 | 1.22 |

While in Papasena 1 and 2 and Yoke, the local community is more dependent on natural resources from the river and sea.

To make a garden, the majority of the respondents (102/164) in the six villages selected locations in the

vicinity of the village or on the banks of rivers close to the village (35/164). A few respondents (16/164) cultivate gardens on the banks of rivers far from the village. These gardens are used as a source of food when the local community hunts and collects other forest products deeper into the forest. Nearly half of the respondents (81/164) frequently hunt in areas close to the village and another (43/164) venture further, and (35/164) of the respondents said that natural resources are also abundant on the river banks close to the village.

According to the respondents in the six surveyed villages, some people keep domesticated animals for protein reserves or to assist in hunting (dogs). These animals (dogs, chickens, and pigs) are caged around the house. The villagers often catch fish and crocodiles (102/164 of the respondents) in the Mamberamo River or its tributaries close to the village, in swamps or lakes close to the village (52/164) or far from the village (11/164). The measure of distance used throughout this report is defined as the time required to reach the area and back to the village. Areas considered to be far are those that take more than one day to get there, hunt and return.

Occupational challenges

In general, the problems encountered by the local community that could be defined as being occupational challenges are crop and animal diseases, capital limitations, and damage caused by wild animals. Most (129/164) of the respondents, all villages combined, reported problems of having disease attack their crops or animals. More than half of the respondents (84/164) have capital limitations, and an overwhelming majority (149/164) said that wild animals (e.g., wild pig) frequently damage their gardens.

Their coping strategies for diseases affecting crops and animals, for some (37/164) they prune the affected parts of the plants; while (56/164) confessed that they do not have any coping strategy and would just leave the infected plants or animals.

Capital limitations affect the ability to buy gardening tools or gasoline for their boats. These challenges may be overcome by proposing that the government provide assistance from the regency government. Some (25/164) of the respondents have succeeded in securing government assistance, while for 17.1% such

assistance has yet to materialize. Some respondents (25/164) use of their own money. To respond to wild animal 'pests', most respondents (117/164) trap them while others light fires to deter (48/164) or hunt them (32/164).

Important forest products and the dynamics of scarcity

From various forest resources, 164 respondents in the six villages reported six forest products they most frequently harvest, which appear in Figure 6. In general, these important forest products can be harvested by everyone in the six villages, however, there are several tendencies noted. Wild pig (*Sus scrofa*) and cassowary (*Casuarius unappendiculatus*) for instance, are important products in all six villages, but more so in Kwerba, Metaweja, and Papasena 1 and 2.

Fish are important for villagers in Yoke, Papasena 1 and 2, while *genemo* (*Gnetum gnemon*) leaves (a local vegetable) are more important for people in Metaweja and Yoke. Ground kangaroo (*Dorcopsis hageni*) is hunted in Kwerba and Burmeso, and collared scrub

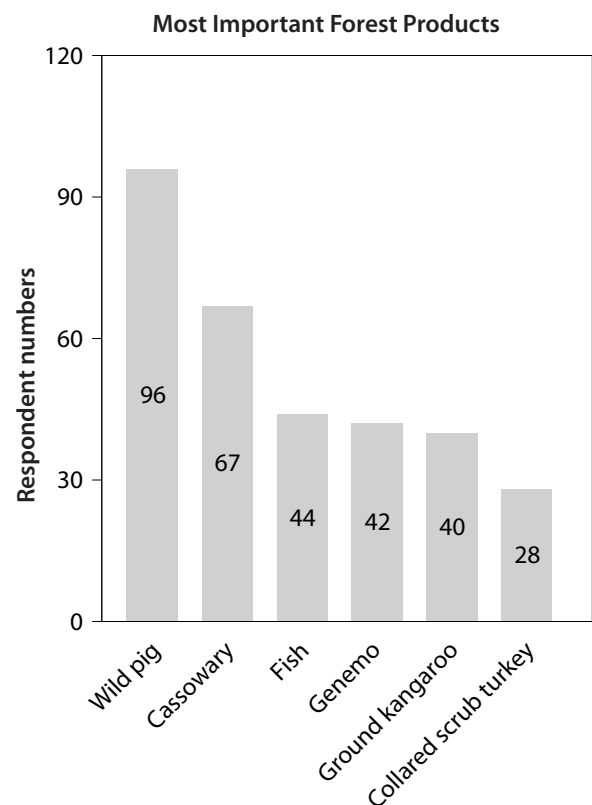


Figure 6. Most Important Forest Products in the 6 villages

turkey (*Talegalla jonbiensis*) is commonly hunted in Burmeso and Metaweja.

Having obtained information on important natural resources which are commonly harvested from the forests by the local community, we further inquired whether the numbers had decreased or increased compared to 10 years ago. The number of forest products we used in this interview were not supported by direct measurement but only based on our respondents' perceptions. The numbers were considered to have decreased if people thought the

forest product was less available or more difficult to find while increased would mean the opposite. Stable meant that there was no difference in the number of forest products people could harvest now and 10 years ago. Others meant forest products either plants or animals other than the particular species in the table being discussed. Statistical analysis shows that there is no significant difference in the number of forest products now and 10 years ago

Table 14a illustrates the change in the number of collared scrub turkeys in the forest now compared to

Table 14a. Change in the number of collared scrub turkey

| | | Collared scrub turkey | | | | Total |
|------------------|---------------|-----------------------|--------------|-------------|-------------|---------------|
| | | Others | Decreasing | Stable | Increasing | |
| Kwerba | Number | 26 | 1 | 3 | 0 | 30 |
| | % | 86.7% | 3.3% | 10.0% | 0% | 100.0% |
| Burmeso | Number | 32 | 12 | 0 | 0 | 44 |
| | % | 72.7% | 27.3% | 0% | 0% | 100.0% |
| Metaweja | Number | 20 | 1 | 4 | 5 | 30 |
| | % | 66.7% | 3.3% | 13.3% | 16.7% | 100.0% |
| Papasena 1 and 2 | Number | 27 | 3 | 0 | 0 | 30 |
| | % | 90.0% | 10.0% | 0% | 0% | 100.0% |
| Yoke | Number | 30 | 0 | 0 | 0 | 30 |
| | % | 100.0% | 0% | 0% | 0% | 100.0% |
| Total | Number | 135 | 17 | 7 | 5 | 164 |
| | % | 82.3% | 10.4% | 4.3% | 3.0% | 100.0% |

Table 14b. Change in the number of wild pig

| | | Wild pig | | | | Total |
|------------------|---------------|--------------|--------------|--------------|--------------|---------------|
| | | Others | Decreasing | Stable | Increasing | |
| Kwerba | Number | 4 | 5 | 14 | 7 | 30 |
| | % | 13.3% | 16.7% | 46.7% | 23.3% | 100.0% |
| Burmeso | Number | 29 | 15 | 0 | 0 | 44 |
| | % | 65.9% | 34.1% | 0% | 0% | 100.0% |
| Metaweja | Number | 6 | 2 | 15 | 7 | 30 |
| | % | 20.0% | 6.7% | 50.0% | 23.3% | 100.0% |
| Papasena 1 and 2 | Number | 9 | 5 | 10 | 6 | 30 |
| | % | 30.0% | 16.7% | 33.3% | 20.0% | 100.0% |
| Yoke | Number | 21 | 0 | 6 | 3 | 30 |
| | % | 70.0% | 0% | 20.0% | 10.0% | 100.0% |
| Total | Number | 69 | 27 | 45 | 23 | 164 |
| | % | 42.1% | 16.5% | 27.4% | 14.0% | 100.0% |

ten years ago, according to the local community. The number of collared scrub turkeys is decreasing in all surveyed villages except in Yoke, where collared scrub turkey is not viewed as an important forest product. The people argued that the number of collared scrub turkeys is decreasing because of poaching (in Kwerba, Metaweja, Papasena 1 and 2), expanding village areas (Papasena 1 and 2, and Burmeso), overharvesting and logging (Burmeso).

Other respondents believe the number of collared scrub turkeys is stable or even increasing and argue that it is due to habitat protection (Kwerba), rarely poached and successful breeding (Metaweja).

Table 14b describes the number of wild pig (*Sus scrofa*) hunted currently compared to ten years ago. Some respondents in all villages, except in Yoke, consider that the number of wild pig in the forest has declined. They attribute this decline to poaching (Kwerba, Burmeso, Metaweja and Papasena 1 and 2), villages being expanded and becoming more populated (Papasena 1 and 2 and Burmeso), and logging (Burmeso).

The respondents in all villages, except Burmeso, think that the number of wild pig remains stable or has increased. They believe this is because people protect the pig's habitat (Kwerba and Papasena 1 and 2), hunted only for subsistence (Metaweja and Yoke), and successful breeding (Kwerba, Metaweja, Papasena 1 and 2).

Table 14c illustrates the change in the number of *genemo* (*Gnetum gnemon*) now compared to ten years ago according to the local people. Only respondents in Burmeso and Papasena 1 and 2 said that the number of *genemo* has declined due to logging (Burmeso) and the lack of cultivation (Papasena 1 and 2).

Respondents in the six villages said that the number of *genemo* remains stable or is increasing. This is because it is rarely harvested (all villages), protection of habitat (Kwerba, Metaweja, and Yoke), grows easily in the wild (Metaweja and Yoke) and is sometimes cultivated (Yoke).

Table 14d shows the change in the number of cassowary people can hunt in the wild today compared to ten years ago. The decline in wild cassowary is reported by respondents in Kwerba, Burmeso, and Papasena 1 and 2. They explained that the decline is caused by the expansion of the village (Kwerba and Burmeso), the use of rifles (Burmeso and Papasena 1 and 2), and logging (Burmeso).

The respondents in the six villages, except Burmeso, said that the number of cassowary is currently stable or increasing. According to these respondents, this is because it is not poached (Metaweja and Yoke), protection of its habitat (Kwerba and Papasena 1 and 2) and the cassowary's successful breeding (Kwerba, Metaweja, and Papasena 1 and 2).

Table 14c. Change in the number of *genemo*

| | | <i>Genemo</i> | | | | Total |
|------------------|---------------|---------------|-------------|--------------|--------------|---------------|
| | | Others | Decreasing | Stable | Increasing | |
| Kwerba | Number | 28 | 0 | 1 | 1 | 30 |
| | % | 93.3% | 0% | 3.3% | 3.3% | 100.0% |
| Burmeso | Number | 38 | 5 | 1 | 0 | 44 |
| | % | 86.4% | 11.4% | 2.3% | 0% | 100.0% |
| Metaweja | Number | 19 | 0 | 9 | 2 | 30 |
| | % | 63.3% | 0% | 30.0% | 6.7% | 100.0% |
| Papasena 1 and 2 | Number | 21 | 1 | 4 | 4 | 30 |
| | % | 70.0% | 3.3% | 13.3% | 13.3% | 100.0% |
| Yoke | Number | 14 | 0 | 6 | 10 | 30 |
| | % | 46.7% | 0% | 20.0% | 33.3% | 100.0% |
| Total | Number | 120 | 6 | 21 | 17 | 164 |
| | % | 73.2% | 3.7% | 12.8% | 10.4% | 100.0% |

Table 14d. Change in the number of cassowary

| | | Cassowary | | | | Total |
|------------------|---------------|--------------|--------------|--------------|-------------|---------------|
| | | Others | Decreasing | Stable | Increasing | |
| Kwerba | Number | 9 | 5 | 11 | 5 | 30 |
| | % | 30.0% | 16.7% | 36.7% | 16.7% | 100.0% |
| Burmeso | Number | 33 | 11 | 0 | 0 | 44 |
| | % | 75.0% | 25.0% | 0% | 0% | 100.0% |
| Metaweja | Number | 11 | 0 | 16 | 3 | 30 |
| | % | 36.7% | 0% | 53.3% | 10.0% | 100.0% |
| Papasena 1 and 2 | Number | 20 | 4 | 5 | 1 | 30 |
| | % | 66.7% | 13.3% | 16.7% | 3.3% | 100.0% |
| Yoke | Number | 27 | 0 | 3 | 0 | 30 |
| | % | 90.0% | 0% | 10.0% | 0% | 100.0% |
| Total | Number | 100 | 20 | 35 | 9 | 164 |
| | % | 61.0% | 12.2% | 21.3% | 5.5% | 100.0% |

Table 14e. Change in the number of ground kangaroo

| | | Ground kangaroo | | | | Total |
|------------------|---------------|-----------------|--------------|--------------|-------------|---------------|
| | | Others | Decreasing | Stable | Increasing | |
| Kwerba | Number | 13 | 6 | 8 | 3 | 30 |
| | % | 43.3% | 20.0% | 26.7% | 10.0% | 100.0% |
| Burmeso | Number | 31 | 13 | 0 | 0 | 44 |
| | % | 70.5% | 29.5% | 0% | 0% | 100.0% |
| Metaweja | Number | 28 | 0 | 2 | 0 | 30 |
| | % | 93.3% | 0% | 6.7% | 0% | 100.0% |
| Papasena 1 and 2 | Number | 22 | 0 | 7 | 1 | 30 |
| | % | 73.3% | 0% | 23.3% | 3.3% | 100.0% |
| Yoke | Number | 30 | 0 | 0 | 0 | 30 |
| | % | 100.0% | 0% | 0% | 0% | 100.0% |
| Total | Number | 124 | 19 | 17 | 4 | 164 |
| | % | 75.6% | 11.6% | 10.4% | 2.4% | 100.0% |

Table 14e shows the number of ground kangaroo people can hunt currently compared to the ten years ago according to local people in the six villages. A decline in the number of ground kangaroo is reported by the respondents in Kwerba and Burmeso. They argue that this is due to the expansion of the village (Kwerba and Burmeso), the use of rifles and logging (Burmeso).

Other respondents in Kwerba, Metaweja and Papasena 1 and 2 said that the number of ground kangaroo remains the same or is increasing. This is due to protection of its habitat (Kwerba), subsistence

hunting (Metaweja and Papasena 1 and 2) and the ground kangaroo's successful breeding.

Table 14f illustrates the change in the number of fish people can currently catch in the wild compared to ten years ago, according to respondents in the six villages. A respondent in Metaweja and several in Yoke said that the numbers of fish are now decreasing due to overfishing. Other respondents in Metaweja, Papasena 1 and 2, and Yoke said that the number of fish is stable or has increased. This is due to the protection of its habitat (Metaweja and Yoke), introduced fish species from outside Mamberamo

Table 14f. The change in fish

| | | Fish | | | | Total |
|------------------|---------------|--------------|-------------|--------------|--------------|---------------|
| | | Others | Decreasing | Stable | Increasing | |
| Kwerba | Number | 30 | 0 | 0 | 0 | 30 |
| | % | 100.0% | 0% | 0% | 0% | 100.0% |
| Burmeso | Number | 44 | 0 | 0 | 0 | 44 |
| | % | 100.0% | 0% | 0% | 0% | 100.0% |
| Metaweja | Number | 25 | 1 | 2 | 2 | 30 |
| | % | 83.3% | 3.3% | 6.7% | 6.7% | 100.0% |
| Papasena 1 and 2 | Number | 16 | 0 | 8 | 6 | 30 |
| | % | 53.3% | 0% | 26.7% | 20.0% | 100.0% |
| Yoke | Number | 5 | 4 | 9 | 12 | 30 |
| | % | 16.7% | 13.3% | 30.0% | 40.0% | 100.0% |
| Total | Number | 120 | 5 | 19 | 20 | 164 |
| | % | 73.2% | 3.0% | 11.6% | 12.2% | 100.0% |

(Papasena 1 and 2) and the fishes' successfully spawning (Papasena 1 and 2 and Yoke).

It appears from the six tables above that the number of collared scrub turkey and ground kangaroo that people can hunt from the wild is decreasing. The number of wild pig and cassowary has remained stable and fish and *genemo* have increased. At the village level, most of the respondents in Burmeso considered that collared scrub turkey, wild pig, *genemo*, cassowary, and ground kangaroo are declining. The popular reasons for this trend are unsustainable harvesting practices (i.e., cutting trees to harvest fruit, the use of poison and rifles), village expansion and an increase in the population (due to the development of the regency capital), and logging. In the five other villages, the number of forest products are perceived to be stable or increased.

The dynamics of change in harvest area

In addition to information regarding the change in the number of natural resources, we also asked whether the current harvest – compared to ten years ago – is found in areas located closer or further away from the village. Statistical analysis has shown that changing in harvest area is significant for the six important natural resources in all research villages. From the six tables above, the responses from the 164 respondents in the six villages vary, particularly between Burmeso and the other villages. According to respondents in Burmeso, areas to hunt are

currently far from the village, often requiring people to spend nights in the forest. Ten years ago they could still hunt in the forest near the village.

In Kwerba, Metaweja, Papasena 1 and 2, and Yoke, the place where the local community goes to hunt the six important natural resources have not changed compared to ten years ago. They can still be found in the forests or river close to the village. However, some people go regularly far into the forest for certain purposes such as patrolling and monitoring their territory and resources, including the six research species.

3.8 Local perceptions of climate change: comparing responses between gender and age

All information presented in this section is based on focus group discussions (FGD) in all research villages with four different groups: women, young and older, men, young and older. We identify the major trends in each village and across villages.

Climate change: identification

The term used during the FGD was 'seasonal change' rather than 'climate change,' as the first was better understood by local communities and they had experienced and suffered from events related to seasonal changes.

There were three events that most frequently occurred according to the people in the six villages, which were related to seasonal changes. They are temperature increase, flood, and windstorm. Human casualties were due to diseases and the impact on crops during or after a bad event.

In Burmeso, the most extraordinary event, according to all groups, is prolonged dry season. This may lead to a dramatic increase in temperature with unpredictable rain and decreasing river water. In 2009, the seasons seemed to reverse (the wet season became dry and vice versa). In the 1990s, there was a prolonged and rainless dry season for seven months. The impact was an increase in the prevalence of disease (influenza and malaria), loss of crops, and the death of fish due to an increase in river water temperature.

In Kwerba, three events were pointed out by the local community: heat wave and prolonged drought in 2007, windstorm in 2011, and a big flood in 2005. These events caused crops such as sago and betel to die, declining yields from crocodile hunting and the tributaries dried up. Impact from big floods and windstorms included damage to some houses (houses washed away or roof tiles were blown off by the winds).

In Metaweja, according to the local community, the seasons became more irregular with rains more frequent in 2009 and the dry season was prolonged (4-6 months in the same year). During the prolonged dry season, disease spread among the villagers (diarrhea, influenza, and malaria), several livestock died (chickens), many fish died because the water temperature increased. Windstorms became more frequent causing damage to houses and felling and damaging trees. In 1976 and 1990, big floods took place in Metaweja and damaged the gardens and houses.

In Papasena 1 and 2, people were also experiencing the same types of natural disasters as those that occurred in other villages. A big flood happened in 1998, 2009, and 2010 which resulted in the loss of many animals (mainly wild pig and cassowary) as well as crops. Many people in the village suffered from malaria, influenza, and headaches. In 2009, a prolonged dry season also happened and the fish in several lakes died. Windstorm followed by a prolonged drought took place in 2006 but there were no serious damage to the village.

Since Yoke is situated in a mangrove area, flood was not considered as an event which could threaten the village. Instead, three important natural events were prolonged wet season (1997, 2011), the prolonged dry season (1994, 2003, and 2010), and windstorm (2000, 2010). The impacts of a prolonged wet season were disease epidemics including malaria, as well as the loss of crops and wild animals in the forest. A prolonged dry season led to difficulties in obtaining clean drinking water and many plants died. During the long dry season in 1994-1995, a large amount of sugarcane, planted on the banks of the Mamberamo River caught fire. Trees fell or were damaged during a windstorm.

Table 15 below shows seasonal changes that have occurred more frequently and have the worst impact on humans. Both animal and plant species have various ways of responding to change and we only list the name of the species which are prominently affected by seasonal change.

Adaptations to Seasonal Changes

Information on how the local community reacts to seasonal changes is important to understand their adaptive capacity in coping with such changes. In Burmeso, there is no change in the way people plant their gardens during a prolonged dry season. They would frequently go to the forest to find a cooler place to stay. If they had a flood, the people would temporarily relocate to higher ground. When the gardens were flooded, then the local community would cultivate short-term plants (string beans, ground nuts, other green vegetables) on available dry land.

In Kwerba, when the rainy season is prolonged, the local community relocates to higher ground until the season changes. The gardens are also moved, or old gardens are used after fixing and replanting damaged plants. However, the species planted does not change. If there is a prolonged drought, the young men replace the roof with leaves (allowing cooler air inside the house) and perform rain call ceremony. The positive thing about a long dry season is that it is easier to fish as the water becomes clearer.

In Metaweja, people move to huts in the forest far from the main river during a flood. The gardens are also moved to higher ground. During prolonged rains, the direction of the streams changes and so

Table 15. Seasonal changes: frequency and impact in the 6 research villages

| Name of village | Most frequent change | Most damaging change | Most sensitive animals/plant |
|------------------|--|---|--|
| Burmeso | Heat | Heat, rain (flood, disease) | Sago, fine plants and those with short roots, turtles, crocodiles, fish, and wild pig |
| Kwerba | Longer rains, longer dry season | Rain (flood), Heat | During floods: Sago, betel, taro, banana, crocodiles, fish During drought: crocodiles move to Mamberamo when the tributaries dry up. Ground kangaroo, cassowary, and wild pig go to the rivers. Fish and prawns die. |
| Metaweja | Longer rains, windstorm, and longer dry season | Windstorm, rains (Disease) | Winds: destroy coconuts, gomo, betel, cocoa Heat: affects fish and prawns |
| Papasena 1 and 2 | Longer rains, windstorm, and longer dry season | Floods, heat wave | Sweet potato, cassava, sago, chilly wilt in prolonged hot weather and dry soils and they rot following floods. Cassowary and wild pig have difficulty finding dry land in the swampy areas during the rainy season. |
| Yoke | windstorm, and longer dry season | Dry season (crop failure, dry and saline wells), Longer rains (diseases, tides) | Betel and bananas dry out during long droughts. Genemo, spinach, and gedi vegetables become scarce. Sago yields on river banks decrease. Freshwater fish die as the water becomes more saline. Coconut palms, betel palm, and pine trees fall during windstorms. |

Note: This table is based on the combined summary of the four FGDs in each of the surveyed villages

does the location of ponds. Therefore, people have to move to the new ponds for fishing. According to the younger women, there are taboos during the prolonged rains and floods: no gardens shall be planted in Nuari Mountain as it is a sacred area, otherwise, disaster such as lightning and thunderstorms will occur. According to the elders, there was a taboo about planting on the riverbanks to avoid crops being swept away by floods, but now this taboo is no longer believed or followed. Metaweja is the only village where rules and taboos, directly linked to seasonal change, are believed and followed.

The local community in Papasena 1 and 2 shift their gardens and go hunting on higher ground when they have a flood. Their houses are built on stilts to secure important goods. During periods of drought, the people plant cassava as it is drought resistant and other fast growing plants which can be quickly harvested such as sweet potato and banana.

In Yoke, the people do not move their gardens to other locations during long dry seasons. They go to places further away to find drinking water. If there is damage (to a house, etc.) then they will communally fix it.

Seasonal change: comparison between men and women

In general, in all six villages, the knowledge of the women is equal to the men as the women often work in the gardens and process sago. The men often go to the forest for hunting, but also assist in land preparation for sago and other plants to be planted. Both men and women go fishing so when extreme seasonal changes occur, everyone knows the impact, and thus the answer from all groups is quite similar. Differences only occur when the groups were asked the year the extreme seasonal changes took place.

The analysis of each village is as follows:

In Burmeso, when being asked about the worst seasonal change, all men answered the prolonged dry season; whereas the women replied that prolonged rains were worse as they led to more disease and flood.

In Kwerba, different opinions were found not in gender-based groups but rather age-specific. The elders thought that prolonged rains were worse as they caused floods while the young argued the effects of a prolonged drought were worse.

In Metaweja, the women considered that windstorms were most frequent and caused disastrous effects. However, when asked about how people respond to seasonal change, almost all talked about adaptation to flood.

In Papasena 1 and 2, according to the women, a prolonged wet season happened most; whereas the men suggested dry season and windstorm. How people respond to flood was similar in all groups of young or old, men or women.

In Yoke, we received detailed response from the older women on their coping strategies in the event of seasonal change. According to this group, during the prolonged rainy season, women chose short-term crops (cassava, spinach, eggplant, papaya, sweet potato etc.) to be planted in recently cleared land. The planting method was to plow and make a temporary hut to grow certain seedlings such as eggplant and chilly. When they were big enough they were planted out. While other plants such as spinach, corn, sweet potato, papaya and banana were planted directly in the beds. The seeds were bought in Jayapura. These plants were easily planted, harvested, and sold. During the prolonged dry season, the women chose longer term plants that were drought resistant.

3.9 Local perception of natural disasters: comparison based on age and gender

The link between seasonal change and natural disasters was separately explored using different questionnaires given to the same groups of local community. Before conducting the interviews, it was necessary to differentiate between the two terms. In explaining the concept of natural disaster and differentiating it from the concept of seasonal change, we explained to the local community that natural disasters had a more destructive effect and was not always related to seasons (example: earthquake), and usually there was a response such as emergency assistance from the government.

Types of natural disasters

There were not many types of natural disasters identified by the people in the six villages. Table 16 summarizes the types of natural disasters and the level of damage caused. In Yoke, the group discussion was

a combination of two villages (Yoke in the swamp and Mantabori on the coast).

In Burmeso and Kwerba, the natural disasters did not cause widespread damage so that emergency aid from the government was not necessary. The level of damage was medium.

In Metaweja, natural disaster was devastating and caused damage to many houses. Earthquake never occurred.

In Papasena 1 and 2, flood was the most frequently mentioned disaster with medium impact.

In Yoke, apart from earthquake, which is common in all villages, people identified two types of natural disaster which are not related to seasonal change: coastal erosion/landslide and tsunami. The first tsunami was in 2011, several months before our survey took place. Villagers received post-disaster aid from the local government at that time. Coastal erosion/landslides occur once in every decade when the sands of the eastern seashore in Mantabori are swept away by ocean waves and deposited on the western seashore (Ingondi beach). In ten to twenty year periods, a reverse pattern follows where the eroded sands from Ingondi beach are deposited on the shores of Mantabori.

Ways to predict natural disasters

According to the villagers in Burmeso and Metaweja, if there is continuous rain for a long period (about one week) in the area of the springs, then there may be a flood. There is no way to predict earthquake. In Metaweja, the sound of wind rumbling for fifteen minutes is a sign that a windstorm will follow.

In Kwerba, extraordinary rain is predicted by the sounds of dove and small frogs underground. There is no way to predict earthquake. Prolonged droughts can be predicted by the presence of *Cunta* (a particular star) glowing in the skies.

In Papasena 1 and 2, flood is predicted when there is continuous rain for several days, especially in the area of the Mamberamo springs; Monitor lizards emerge from their nests; soft shelled turtles also show up; there is a strong wind upstream and *ketapang* (tropical almond, *Terminalia catappa*) fruits start to fall.

Table 16. Types of natural disasters and level of damage to the six villages

| Village name | Type of disaster | Year | Level of damage |
|------------------|----------------------------|---|---|
| Burmeso | Earthquake | 2010 | No damage |
| | Extreme drought | 1992 | Damaged the gardens |
| | Extreme flood | 1996 | Lost furniture and domesticate animals |
| Kwerba | Big rain | 2009 and 2010 | Landslides causing sago, coconut and betel palm and trees to be swept away. |
| | Earthquake | 2005 and 2010 | No damage |
| Metaweja | Flood | 1976 or 1979, 1990, 1994 | Houses and plants damaged, pets died, even on occasion the burial grounds were damaged |
| | Drought | 2009, 2010 | Crops failed |
| | Earthquake | Annually | No damage |
| | Windstorm | 2009, 2011 | Houses damaged, trees fell |
| | Flood | 1990, 1998, 2000, 2004, 2009, 2010, the biggest once every 15 years | Houses swept away, crops damaged, livestock died |
| Papasena 1 and 2 | Earthquake | 1960's, 1980's, 1996 | No damage |
| | Tsunami | 1996, 2011 | Wells, roads, houses, church, school, and a soccer field damaged in Mantabori |
| Yoke | Coastal erosion/ landslide | 1994, 1998, 2010, 2011 | Three houses collapsed |
| | Earthquake | 1996 | Houses on the coastline damaged |
| | Drought | 1995, 2010 | Salt water seeped into the swamp killing freshwater fish, polluting drinking water, dried crops |

Note: This table is based on the combined summary of the four groups in each of the surveyed villages

In Yoke, tsunami is preceded by an earthquake, which can be distant (such as in Japan in 2011) or close (as in Biak in 1996). A tsunami early warning was also issued on TV or Single Side Band (SSB). For coastal erosion/landslide, the signs are strong ocean waves that suck in sand and eventually cause coastal landslides.

Local community prevention and response to natural disasters

In Burmeso, the people plant trees (long term crops) along the riverbanks to prevent flood. It is not permitted to cut trees near the river. Customary rights are also respected to prevent natural disasters. If short term crops are planted, they should be harvested before the floods. Houses may not be built near the river or on top of easily eroded soil.

In Kwerba, to overcome all the identified types of natural disasters, people used to recite traditional mantras and shoot an arrow into the sky, or special tree barks were chewed and spat on the ground by

specific people. These traditional methods are not applied anymore and instead the people pray. All groups interviewed did not know how to prevent natural disasters. The young women suggested that they should revert to the old customs.

In Metaweja, to overcome natural disasters such as flood, winds, or extreme drought, the method is similar to those related to seasonal change (refer to the previous chapter). Damage from a windstorm can be reduced by tying the roof down tightly and putting heavy logs on top as weights. To handle flood and prolonged drought, people revert to customary practices (such as planting specific trees on the riverbanks)

In Papasena 1 and 2, people build their houses on stilts to cope with extreme flood; they also use hardwoods, stronger construction, and deeper foundations. Speed boats are also used to move during a big flood to find food in Kasonaweja. To

avoid flooding, the people are aware that they need to be careful about harvesting timber in the forest.

In Yoke, to cope with tsunami, people build their houses further from the coast and on higher ground. Strong housing construction and planting various trees is also needed, and some have even returned to the old Yoke village. To prepare for the dry season and saltwater invading their fresh water rivers, several wells on the edge of the swamp close to Yansukuba Stream, far from the village, have been built. According to the villagers, to reduce the impact of a tsunami and coastal erosion in the future, the government has suggested that they move to the old Yoke village, but the majority have chosen to stay close to the harbors of Teba or Sarmi to sell their fish and garden produce. In Mantabori, the garden is only 30 minutes to an hour away from the village. A church has been built and people do not want to leave the existing church. They want development to be undertaken behind Mantabori village to reduce the impact of natural disasters.

Future Trends

According to the local community in Burmeso, flood will be more frequent and will cause greater impact in the future, not because of seasonal change but due to the logging company activities operating in the Burmeso territory. The old men, however, argued that natural disasters will not be more frequent in the future.

In Kwerba, the local community found it difficult to predict whether natural disasters will be more frequent or not in the future.

In Metaweja, the old men thought that the occurrence of flood would remain stable, but drought, windstorm, and earthquake would be more frequent within a year. For other groups, all types of natural disasters will be more frequent in the future.

In Papasena 1 and 2, big floods will be more frequent in the future; from once in every fifteen years to every decade. However, the young women suggested that flood will not become more frequent but will last longer. Earthquake will remain the same. In Yoke, the villagers said that tsunami could not be predicted and might happen anytime. Coastal erosion/landslides might occur anytime, but were predictable in certain periods. Coastal erosion will

become more frequent, the young men said, as it occurred twice already in one year and that global warming might cause the sea levels to rise and create bigger waves.

3.10 Traditional monitoring of natural resources, important places and territories

Monitoring or surveillance is an important part of the management of natural resources, including the monitoring of those who enter a village and for what purpose. Local communities in Mamberamo highly respect their customary land rights and they control outsiders who might have a negative influence on their natural resources. Therefore, we asked them about monitoring methods (how people update their knowledge of the amount of natural resources) and how they guard their vast and inaccessible territories. Through discussion with community groups of different gender and age, we explored the knowledge and perceptions of the various people in the village, including those who rarely have the chance to express their views (the women and the youth).

3.10.1 Natural resource monitoring

Methods to measure the amount of natural resources

Burmeso

It is not surprising that both old and young women have less knowledge of the amount of natural resources as they almost never go far inside the forest. However, they can estimate the number of resources based on those brought back to the village by the men. They usually obtain information from the men who go into the forest. The women, in Burmeso, only go into the forest during the fruiting season when groups (men and women), go together to collect forest products. At the same time, a group of men conduct clan territorial patrols.

Both young and old men possess a similar knowledge to measure the amount of natural resources. The number of animals can be estimated through direct observation or by listening to their sounds in the forest. They can also be estimated indirectly from animal tracks, claw marks on tree trunks, bite marks etc. According to the men, the amount of plants can only be predicted through direct observations in the forest.

Kwerba

As in Burmeso, the young and old men have knowledge of the amount of natural resources as they often go to the forest to hunt or collect forest products. According to these two groups, animals such as birds can be recognized from their sounds in the forest. Silent means that there are fewer animals. But at the moment they are still abundant as their sounds are often heard. Wild pigs can be identified from their tracks or by the presence of their favourite food plants. If such plants are not found, it is difficult to find any wild pigs in the area and vice versa. The people used to be able to hunt animals around the village, but now they have to walk quite far outside the village area. This would suggest that there are fewer animals at present than in the past. For plants, the young men suggested that there is no large scale land clearance yet in Kwerba so they can still find trees and other valuable plants around the village.

Young women sometimes follow a group of men when going to the forest. According to them, the presence of animals can be recognized from their sounds, dung, or tracks. In particular they know birds are present, when they see their nests in the trees. The old women spend most of their time processing sago, but they argued that the number of wild plants and animals are still abundant as there are no companies working in Kwerba yet. In addition, people still manage their forest and natural resources in accordance with customary practices.

Metaweja

Both old and young women sometimes go together with a group of men to stay for several nights in the forest, particularly during the fruiting season. The men will build huts for them to stay in and the women process sago close to the huts. During the fruiting season there are many wild animals as they come to eat the fruits so they are easy to observe. According to the women, animals can also be recognized from their dung or tracks on the ground. They believe that plants are still abundant as people only take what they need and they see many seedlings growing in the forest.

The old men argued that wild animals are still abundant as they frequently find animal tracks when hunting. They also suggest if many leeches are found in an area, this means that there is a population of

wild pig, cassowary, ground kangaroo and others. The young men use indirect signs such as tracks, dung, and bite marks, chewed bark to find out how many animals are in the forest. They also believe that plants are also plentiful because people harvest only a small amount for subsistence.

Papasena 1 and 2

In Papasena 1 and 2, various animal species can be easily found in the forest which is still close to the village. People can hear the animals from the village. The women who work more in processing sago, not far from the village, also know that animals are abundant. The men who usually hunt in the forest suggest that the animals are easily found directly or indirectly through their tracks, sounds, dung or nests. The old men said that people in Papasena 1 and 2 regularly guard their natural resources from outsider exploitation. They conduct these activities while monitoring the animals and plants. To estimate riverine resources, people usually catch fish with nets and then count the catch. While for crocodiles, during the dry season, they can estimate the numbers from the tracks in the sand on the riverbank and using flashlights at night to count the number and size from the reflection of the crocodiles' eyes.

Plants can be found anytime particularly during the fruiting season. In Papasena 1 and 2 the villagers take only what they need so that the plants remain abundant.

Yoke

The women of Yoke often travel far into the mangrove and in the swamp to look for fish, crabs, and bivalves. According to the old women, the wild products are always plentiful and people can easily harvest a large number of fish, crabs, and others almost everywhere in Yoke. Both young and old men said that wild pigs, cassowary and other animals are easily found and hunted as people harvest them only for subsistence. Various plant species are also easily obtained in the forest.

Patrol activities

Patrol is an activity that can be done while people go hunting and collecting natural resources. There are several ways to patrol: in groups, on foot, by boat, for a short or long period. Here we elaborate on the patrol activities in each village.

Burmeso

Burmeso villagers, particularly groups of men, often patrol their clan's territory to monitor and guard natural resources from outsider's interference. This can be for several days up to more than one month living inside the forest. They can take a ride on a company vehicle or walk to a specific location on foot. The number involved is not limited but usually ranges between two to ten people. While monitoring the forest, they also conduct other activities such as hunting and collecting natural resources, building huts and small gardens to meet their daily needs while living in the forest. The women usually join for a few days (less than a week) during the fruiting season to harvest fruits such as *matoa* (Fijian longan, *Pometia pinnata*). Sometimes during school holidays, children may go too.

Kwerba

In Kwerba, each clan is responsible for monitoring its own territory. The clan leader or *Ondoafi* will decide the people who should join the patrol and where they should go. Two or three patrols are usually conducted in one month involving small groups of five people who stay in the forest for 1-2 weeks. They usually go by boat or on foot. They also monitor while hunting and collecting natural resources. Women rarely join this activity.

Metaweja

In Metaweja, the villagers monitor the natural resources one to three times a year. They go on foot to the forest and stay in a hut for one week to two months. Those doing the monitoring are usually men from one family or more. They also monitor while hunting and collecting other forest products. These activities can also be combined with patrolling the territorial borders between Metaweja and neighboring villages. Both old and young women sometimes join the men and process sago or prepare food in the hut.

Papasena 1 and 2

Both young and old men alternately go hunting and collecting forest products while monitoring natural resources and their territory. There are no specific arrangements, but there is always a group of people going to the forest once a week. According to these two groups, they usually stay for a day up to one week in the forest. Women almost never take part in this activity. The *Ondoafi* and all villagers strictly

prohibit activities considered to damage the forest and natural resources. There is no report – until this survey was carried out in July 2011 – from the villagers about outsiders entering Papasena 1 and 2 territories to look for forest products.

Yoke

The position of both villages, Yoke in the swamp and Mantabori on the coast help people to monitor the mangrove forest and swamp area directly from the village as those two settlements are the only access to the forest. In addition, there is one family that has lived on the shores of Lake Tabaresia for years and guards the access to the lake from outsiders coming from the Apauer River. Monitoring of forest products is also assigned to one family from the people of Paito and Basumbaso, who will stay in a hut in the forest for one week up to one month. They monitor anytime including while collecting forest resources. They usually take a paddle boat for up to three nights to go far inside the forest.

3.10.2 Monitoring of important places

The results from our discussions with the four groups (men, old and young; women, old and young) show similarities among the six villages. Monitoring of important places is not a single activity conducted at certain times, but is usually integrated with other activities such as hunting, collecting forest products, and monitoring of natural resources. Type of places people considered important and so need to be monitored and guarded are usually historic or sacred areas.

The types of sacred areas vary in all villages and customary practices are specific to each community.

Table 17. Sacred areas in the six villages

| Village | Category of sacred area |
|------------|--|
| Papasena 1 | Spring outlet and mountain |
| Papasena 2 | Spring outlet and mountain |
| Kwerba | Spring outlet and mountain |
| Burmeso | Special places with occupants (by the river, cave), and mountain |
| Metaweja | Mountain summits around the village |
| Yoke | Certain rivers, and waterway junctions in the mangrove |

Considering the importance of these places for the local communities, particularly those related to historic and sacred values, we do not mention their names in this report. From the results of the discussions in each village, some respondents described these places in connection with taboos that prohibit people (both villagers and outsiders) from doing certain things such as entering these places, hunting, or cutting trees. Anybody who breaks these taboos is believed to soon fall ill and even die. It may also lead to disaster (e.g., thunderstorm or windstorm), which could threaten the villagers so that they need to perform certain ceremonies.

3.10.3 Monitoring of village territory

The results from the discussions, with the four groups in each of the six villages, on monitoring of the village territory suggest that the two types of monitoring are similar, i.e., natural resources and important places. The people suggest that the village territory – including the borders with neighboring villages – are monitored anytime involving a group of several people and carried out while hunting or collecting forest products. The border between one village and another is usually based on natural landmarks such as rivers or ridges on hills.

Burmeso

Monitoring the village territory is conducted alternately among the villagers, once a month on average. Each clan is responsible for its territory. The village borders are distant from the village and monitoring, therefore, rarely involves women.

In addition to monitoring activities conducted by a group of villagers, there is one person who permanently stays in the old village and takes care of the natural resources and village territory. This person has never been back to Burmeso and it is only his family or other villagers who sometimes visit and stay with him for several days or weeks.

Kwerba

Monitoring the village territory in Kwerba is under the authority of the *Ondoafi* and clan leaders. They determine who does the monitoring. All clans are involved. If the place is far, the monitoring group is exclusively men. The women sometimes go to places close to the village.

Metaweja

Territory monitoring is carried out by each clan while they hunt and look for natural resources. There is no specific rule for the clans to guard and protect their own territory, but they have to let the *Ondoafi* or clan leaders know when they monitor. People usually monitor the village territory for one week up to one month.

Papasena 1 and 2

No specific arrangements are made for monitoring the village territory as the people have protected the forest for a long time. They frequently go and stay for several days up to one month in the forest for hunting or collecting other resources while guarding the forest. However, the western part of the village is now guarded by 5-7 households of the Khu clan who moved from Papasena 2 and built a new settlement on the border with Sikari Village.

Yoke

All members of the community are involved in monitoring the village territory in Yoke. There is no specific monitoring activity as it is integrated with collecting natural resources. It can be done alone or within groups for several days up to one month, but there is no permanent guardian who stays in the forest.

3.11 Traditional land use (present and future)

Land use by the local communities: present and future

Figure 7 is a portion of the participatory maps (as an example, further examples can be seen in Appendix 3) of land use developed by CI, CIRAD, and CIFOR together with the local communities of Burmeso, Kwerba, Metaweja, Papasena 1 and 2, and Yoke. There are 2 maps for each village that illustrate how people currently use their land and their perceptions of future land use. In general, the people in the six villages have the same perceptions that the current land use can be divided into areas for gardening, hunting and collecting other natural resources, fishing and hunting crocodiles, as well as sacred areas. However, perceptions of future land use vary among villages. The people's views in Burmeso, Metaweja, and Yoke are related to changes to land

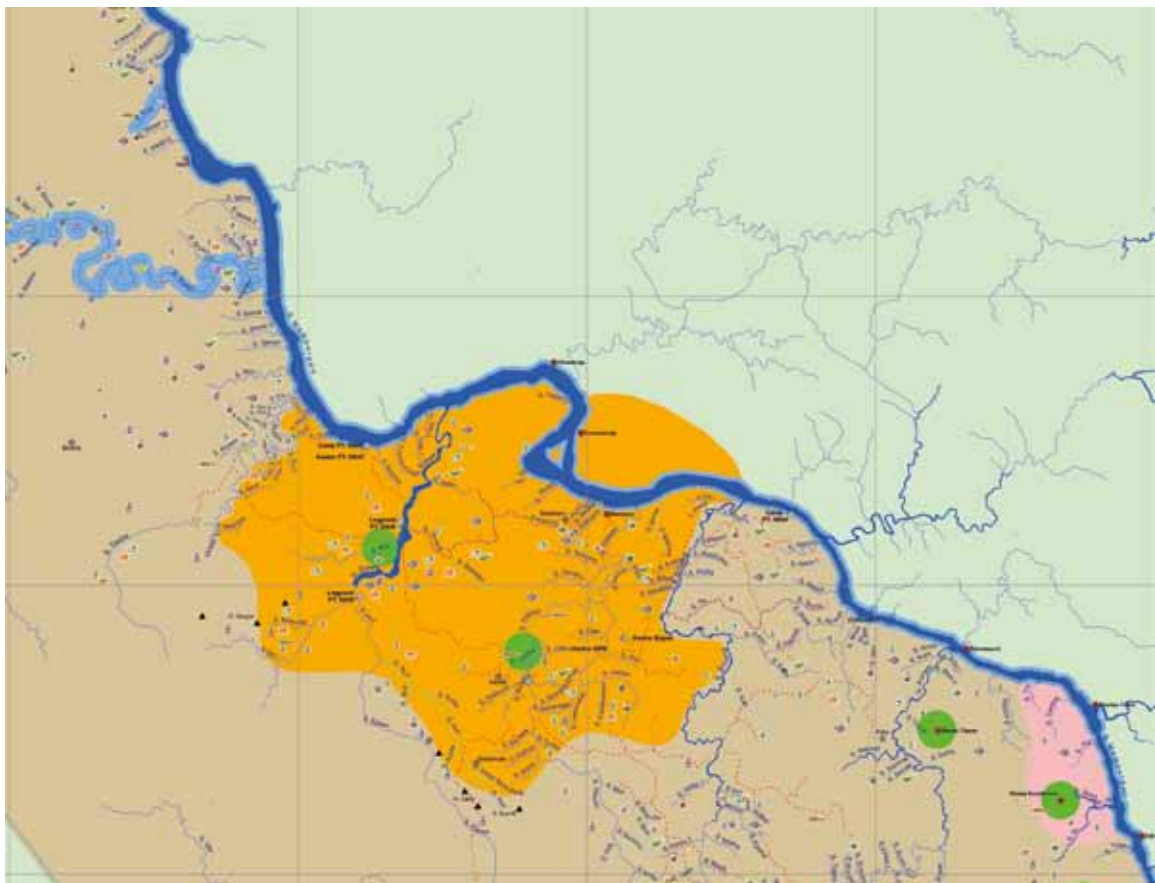


Figure 7. Portion of the participatory maps of current and future land use in Burmeso

use in the future due to development programs particularly access connecting the villages to the regency capital. According to the people in Metaweja and Yoke, population increase in the future will lead to land clearance for gardens. In Burmeso, current gardens and part of the hunting areas will be used for the development of the new regency capital city. Consequently, gardens will be moved to several places in each clan territory, and a portion of the local community will change their livelihoods to become regency officials or company workers.

In Kwerba, Papasena 1 and 2, the people also need infrastructure to be developed in their villages. However, they do not want extreme changes in land use and so development programs must be conducted carefully and only in areas currently allocated for gardening. According to the people in these villages, there is still space available in their garden areas to accommodate local needs for the next ten or even twenty years as well as development plans. People in Kwerba and both Papasena 1 and 2 are aware that their villages are located inside the conservation area and would therefore like to keep their forests and lands protected.

The only place considered strictly prohibited for any future land use changes are sacred areas. The people in the six villages stated strongly that these places are extremely important for the present and future as they define local identities linked to the community's ancestral heritage.

Customary regulations on land use

The local communities in the six villages have arguably similar customary regulations related to land use and the extraction of natural resources. These undocumented regulations have been developed by the elders or *Ondoafi* in each village, and have been applied for many generations. These regulations are used as a guideline for all villagers in using their land and extracting natural resources to ensure sustainable use for future generations. Land clearance for new gardens, hunting, logging and collecting other forest resources, fishing, whether for subsistence or for commercial use are some of the activities included in the regulations. In principle, these activities are allowed anytime and do not require permission from the *Ondoafi* or clan leaders as long as they are conducted in the individuals' clan territory and only to fulfill their daily needs. Permission is required from the clan leader or *Ondoafi* if the activities

are conducted outside of their clan area and or for commercial purposes.

For outsiders, permission from the clan leader or *Ondoafi* is needed either for subsistence or for commercial purposes. In addition, the natural resources harvested must be shared with members of the clan who own the territory. If natural resource extraction is for commercial purposes, e.g., companies or contractors working in Burmeso, they need permission and must obey the customary rites such as burying a wild pig's head.

Several regulations regarding the extraction of natural resources are more specific in certain villages on certain occasions. For instance, no one is allowed to take natural resources in the Nuari Mountain (Metaweja) and the Foja Mountains (Papasena 1 and 2) because these two areas have historical value and the local community considers them sacred. If someone breaks this prohibition, then a disaster will strike not only that particular person but also everyone in the village. In Yoke, the local community members of Paito and Bosumbaso ethnic groups collectively manage one garden location together without requiring permission. Lake Mowam is one of the crocodile hunting places in Kwerba, but at the time of our field research, the *Ondoafi* temporarily closed the lake to let the crocodiles breed. The *Ondoafi* has the authority to open hunting in the lake. He will do this when there are sufficient numbers and the crocodiles are big enough.

Harvesting several species of plant and animal in the forest is forbidden. Cutting resin wood (*Agathis* sp.) and *masohi* (*Criptocarya massoy*) are tightly controlled in Metaweja. In Papasena 1 and 2, hunting birds of paradise (*Paradisaea* spp.) is forbidden because these birds cannot easily reproduce and often live in sacred areas such as the Foja Mountains. Trees with a diameter of more than 1 meter and large animals are not allowed to be harvested as they are believed to be a good source of gene pool. In addition, people consider them to possess totem spirits that live and guard the forest.

Changes in customary regulations regarding the use of natural resources

Are there any changes between current practices in customary regulations regarding the use of natural resources and those in the past? Responses from village heads, *Ondoafi* and clan leaders in the six

villages varied but can be classified into: more strictly, constant, or more relaxed.

- **Guarding of village territories will need to be more strict**

The human population will increase in time and so customary territories need to be more strictly guarded.

In the past, people might have opened a garden and extracted the natural resources in another clan’s territory and they would share the harvest. Now the clans have their own territorial rights so that someone who wants to harvest resources in another clan’s territory must ask for permission and must be escorted by a member of the clan who has territorial rights.

In the past, people used to be free to collect resources including crocodiles, birds of paradise and iron wood and there was no requirement to share the harvest. Recently, the resources have been decreasing and so permission from the *Ondoafi* or clan leaders is needed. Occasionally, the harvest must be shared with the clan who owns the land. In Metaweja and Yoke, cutting trees of specific species such as iron wood, resin

and *masohi* requires permission, even when it is for subsistence. Hunting crocodiles in all villages except Metaweja and birds of paradise in Burmeso, Kwerba and Metaweja are strictly regulated and need permission from the *Ondoafi* or clan leaders. In Papasena 1 and 2, hunting birds of paradise is prohibited.

- **Guarding of village territories will be constant or more relaxed**

Some respondents suggest that current customary regulations remain the same as those in the past because the forest and natural resources have always been looked after and guarded by the local communities. The *Ondoafi* and clan leaders are responsible for protecting the forest and natural resources in the village. Respondents who believe that the regulations will be more relaxed explained that in the past, outsiders could not take the natural resources easily. A little violation of the regulation might have triggered a war, but now it is easier as people from outside the village are only required to seek permission and share the harvest.

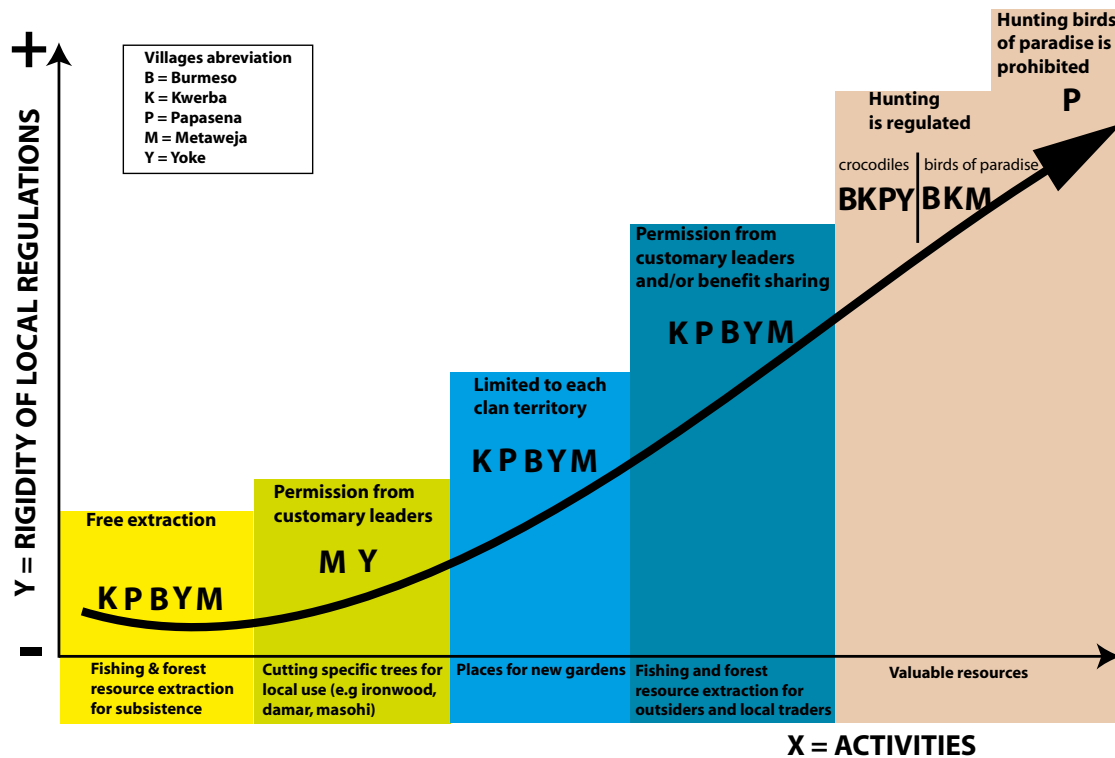


Figure 8. Changes in customary regulations on natural resource extraction in the six villages

4. Discussion and recommendations

This part is based on all results from the surveys we conducted in the six villages in the Mamberamo Raya Regency in 2010 and 2011. These results could benefit all stakeholders who have an interest in the development of this regency. We hope that this report can be a source of consideration for the local government, local communities, civil society organizations, and the private sector when discussing land use in the regency.

As presented in the introductory section of this report, the results of this research and the recommendations suggested are not based on official Mamberamo Raya Regency's nor the Province of Papua's data. They are the results of interviews and discussions with regency officials and local communities in the six villages. The villages chosen do not represent the other villages in the regency. We chose them as samples to represent the specific conditions in the field such as spatial zoning (production forest, conservation areas), bio-specific (topographic and ecosystems), access, and demography. Most of villages in the regency are inside the Mamberamo Foja Wildlife Reserve and so we selected five out of six sample villages located inside this conservation area.

In this discussion part we discuss three issues:

- **First:** similarities and differences on the development and utilization of the land. We compare zoning and spatial planning prepared by the local government for the entire regency and local perceptions at the village-level.
- **Second:** we give recommendations on the concept of integrating local perceptions when decisions concerning spatial planning are made at the regency and provincial levels.
- **Third:** other important issues such as the borders of customary territories and new districts: their size and source of livelihoods and income, infrastructure development (health and education) and the location of the new regency capital.

4.1 Land use and the RTRW: comparison between regency and village

Every regency in Indonesia, including those in Papua, is required to prepare an RTRW following a top-down approach - based on the RTRW developed at the provincial level. Data collection should be conducted by the BAPPEDA team through field surveys in the villages. Indeed, linking the communities' perceptions at the local level and a more detailed scale to the needs of spatial planning at the regency level remains a big challenge.

Scale is an important issue and can become an obstacle to reconciliation between the government's vision and that of the local communities. In our research, we have designed a map at the same scale as required for the RTRW at the regency level which is 1:50,000. However, these maps are only for 6 out of 59 villages. If the regency government wants to produce similar maps with the requirements for the RTRW, then data collection to develop the maps needs to be completed in the remaining 53 villages.

According to the forest classification map developed by the Forest Area Mapping Agency (*Badan Pemantapan Kawasan Hutan* – BPKH) in the Papua Province, Mamberamo Raya Regency has been divided into several zones with different types of forest utilization (protected forest, conservation area, conversion forest, production forest, limited production forest), as well as an area reserved for other uses such as village, district and regency development. The maps available at BAPPEDA and the Public Works Service of the Mamberamo Raya Regency show locations of where public facilities, infrastructure and communication channels will be set up in the future (airstrips, roads, etc.). In addition, the maps describe how the regency government predicts and is planning future developments in the region, particularly areas being prepared for settlement and district as well as regency government centers. For the time being, the plan still

lacks information and consideration as to how people at the village level use their land. Local communities actually want to take part in the discussions on the land use plan so that development programs can be undertaken in their villages while keeping important areas such as sacred places and those with fragile ecosystems (e.g., shortcut channels from Mamberamo River to the mangrove areas in Yoke, agathis forest in Burmeso) are protected.

The participatory land use maps we developed together with the local communities are not intended as official maps for the future RTRW. However, they could be taken into consideration when discussion or negotiation concerning land use is being held between the local communities and relevant parties of the regency government.

4.2 Potential for integrating local perceptions into the decision making in Mamberamo Raya Regency

By understanding the local perceptions, the regency government could create a development plan which could be more easily accepted and applicable at the village level. In this report, we highlight two important aspects: the first is that forest is vital for local livelihoods, e.g., hunting and collecting other forest resources as well as a source of income for present and future generation. People are quite consistent in their thoughts about what threatens the forest and livelihoods in the villages, either based on their own experiences or from what they have heard from other villages.

Each village has different opinions regarding forest products that are most frequently utilized including the dynamics of these particular forest products. The six research villages have distinct topography and ecosystems, diverse socio-cultural characteristics, which all comprise various perceptions from one village to another. The most obvious difference is between Burmeso and the other five villages concerning their perceptions of the dynamics of forest products. The local community in Burmeso, where changes have occurred, suggests that the number of forest products is declining and they now require more effort to find them than ten years ago. These changes affect their perceptions of future land use. As an example, due to the development of the new regency capital, the people of Burmeso are going

to move to their original clan villages. Their source of livelihoods and income are predicted to shift from agricultural to clerical positions in companies or local government. The local communities in the other five villages consider that the forest in their territories, although having a declining role, still provides sufficient natural resources for the coming generations. In addition, they are learning from what is taking place in Burmeso as consideration for future land use in their own villages. There is also a perception in the six villages that forest is important for local livelihoods.

The local communities want development programs to be conducted in their villages. They need infrastructure and facilities which will open new opportunities to market local products. These aspirations stem from the desire for better living for future generations through better access to education, health, job opportunities, etc.

What remains unclear is the trade-offs between protecting and conserving the forest and the customary rights and all possible impacts from development (uncontrolled migration, environmental damage due to excessive harvests both by the local community and private sector, etc). When being asked how people monitor and protect important natural resources, all respondents in the six villages replied that they would guard their natural resources and customary land by patrolling and monitoring outsiders who intrude into their territories. The monitoring aspect is thus important to be understood to define the relationship between local communities and their environment.

Based on the results of this research, we would conclude that discussions between local government with all of the community in each village (not only with the village administrators) may reduce any negative impacts from development and inform local communities as to what could happen if a road is constructed or a village becomes a district center, or the conservation forest status is changed.

4.3 Important issues

Important issues discussed in this section are selected from a range of issues we compiled during our field work and are adjusted to what was identified by the communities as problems which need to be addressed. Table 18 is a summary of the main

Table 18. Problems faced by the local communities in the past five years, according to key informants (head of village, *Ondoafi*, and clan leaders) in the surveyed villages

| Type of Issue | Kwerba | Burmeso | Metaweja | Papasena 1 and 2 | Yoke |
|--|--------|---------|----------|------------------|------|
| Insufficient compensation from the companies | | X | | | |
| Handover of customary land rights for development | | X | | | |
| Civil servants from the local indigenous community are still rare | | X | | | |
| Inequitable distribution of government assistance | | | | x | |
| The expansion of villages and districts needs to be followed-up | | | x | x | X |
| The change in village administrators is not managed well | | | x | | X |
| The harvest of natural resources by outsiders still occurs frequently | x | | | x | |
| Lack of access to markets for forest products | x | | | x | |
| Lack of public buildings (housing, school, medical center) | x | | x | x | x |
| Lack of accessibility (roads, airstrip) | | | x | x | x |
| Education: lack of teachers and scholarships | x | | x | x | |
| Paramedics are insufficient to meet local needs | x | | | x | |
| Insufficient clean water facilities | x | | | x | |
| No electricity | x | | | x | |
| Exodus of the local community to other villages or to form new settlements | | | x | x | |

problems and concerns in the past five years identified by the communities in the six villages.

Customary territorial boundaries within the villages

Together with the local communities we developed three types of map: first we drew a map of the selected research villages showing the village boundaries according to the villagers, locations of natural resources and other important places (i.e., sacred areas, old villages, sago, etc.). Having finished this map, we then drew two more maps: the present and future land use maps, so that the people could present their ideas on what they think will change and where, based on the current conditions in the village. The use of these two maps has already been discussed above. Another map on the customary boundaries showing clan territories of each village was also created. This map is not available for all villages as it was only created on request from

the local communities. For instance in Yoke and Metaweja, the people did not want a clan territory map as it might potentially lead to an inter-clan conflict within the village. However, in other villages, the clan territorial boundaries map was requested by the villagers to clarify the customary territorial rights of each clan. According to the villagers, this map will be used as a tool to negotiate with the private sector, such as those in Burmeso. In addition, the aim of the map is to document the clan territories which have already been established (such as in Kwerba, Papasena 1 and 2) and thus, will not create conflict.

What is still lacking from all of these maps is verification. They were drawn by individual villages (our research villages) and not in conjunction with neighboring villagers. As this is a pilot activity involving a limited number of villages representing different typologies (see Selection of research location in the Methods section), we did not have a chance to

survey neighboring villages, except between Burmeso and Kwerba and between Kwerba and both Papasena 1 and 2. Kwerba and Burmeso have the same heritage and thus, the boundaries between these two villages become irrelevant. Kwerba, Papasena 1 and 2 have large territories, and the villages (or settlements) are located far from the boundaries, so the possibility of conflict concerning territorial claims is negligible. In order to obtain confirmation from all parties (including the neighboring villages), inter-communal discussions between bordering villages need to be initiated. This idea has already been proposed to the local communities during our field work and again when we returned to give them the draft maps. Due to this lack of verification all maps are clearly labeled “Draft”. Negotiations among villages need to be carefully facilitated to avoid conflict or misunderstanding which may occur in the future.

District expansion

People in several of the research villages expressed their wish for their village to become a new district. However, it is still debatable for the local community in Yoke as some of them worry if development does happen, upgrading the village territory (administrative status) to a district, the environment will be damaged, particularly areas reserved for future generations. In contrast, the villagers in Metaweja, Papasena 1 and 2 are looking forward to the development of public infrastructure in their villages. What needs to be discussed is the objective of upgrading a village to a district and the size of the district area compared to its source of income. This should not impact the environment and biodiversity, particularly that protected by law and forest resources important for the daily needs of the local communities. Developing a district inside a conservation area also needs to be discussed. At the time of this research, the status was wildlife reserve in which development (e.g., roads, office buildings etc.) is not permitted. Changing the status into a national park would not necessarily omit potential conflict of interest between development and conservation.

Based on our results, we proposed to start a discussion between the government (particularly the Public Works Service and BAPPEDA) and local communities to take all possible impacts into consideration before making any decisions on land use change. Developing a village where infrastructure is properly planned can be more beneficial both for the villagers and local government than developing

a new district without adequate official resources and the local community unprepared and unable to anticipate the coming changes.

Infrastructure and facilities at the village level

At least two villages are expecting a road and airstrip construction, i.e., Burmeso and Metaweja. Papasena 1 and 2 have no objection if a road passes their territories as long as it does not go into sacred areas and the width does not exceed that needed. The people also want their customary rights respected. In Burmeso, the people would not give permission for the road to Sikari to pass through the Agathis Mountains as it is a sacred area. Consequently, the contractor stopped road construction. In the future, a three-party negotiation between the regency government, local community, and the company is needed. Two villages expressed their objection to a road or river channel passing through their territory. Yoke wants the river channel excavated from Yoke directly to Lake Rombelai (not to the Mamberamo River). Kwerba wants the road from Kasonaweja/ Burmeso to Sikari to only pass on the other side of the Mamberamo River (next to Burmeso), where its land status is conversion production forest. All these concerns and aspirations need to be discussed and negotiated with the local government to address sustainable development to benefit all parties in the regency.

The most required facilities are those to support community health and education. In Kwerba and Metaweja, there is no community health center. It is even worse in Metaweja as it takes three days walk to gain basic medical attention in Kasonaweja. Education is getting better, but teachers are still limited – sometimes absent – in Kwerba, Papasena 1 and 2, and Metaweja.

The people in Metaweja are constructing an airstrip with the hope that they will receive compensation or assistance from the regency government. Kwerba and Papasena 1 already have an airstrip but it is not well maintained. In Burmeso, people can go to Kasonaweja, about 15 minutes by boat, but they think they should have their own airstrip as Burmeso will become a regency capital. Yoke is located in swampy area, making it difficult to build an airstrip.

The location of the regency capital

The regency capital is in the process of being moved from Kasonaweja to Burmeso, due to

accessibility and zoning issues (Kasonaweja is inside the conservation area). People in Burmeso have high expectations for development in the regency. They hope to find employment as regency officials or company employees, especially as the forest in Burmeso is decreasing due to logging activities. The development of the regency capital can be a pilot project for sustainable development, by conserving natural resources and biodiversity. The villagers understand that development would lead to many changes especially on land use, for instance the area for gardens will become a city and the number of fish and crocodiles will decline. However, as their customary land has been developed, the people hope that they will have more opportunities to gain access to jobs and education and live prosperously. People in Burmeso welcome migrants to Burmeso and permit them to trade and open stalls as long as customary rights are respected.

Communities from other villages think that development in the regency will continue to take place especially in Burmeso. They believe that there will be many changes in the wake of the development programs and logging activities. They also wonder

how development will affect other villages in the future.

Logging companies

The villagers in Burmeso are divided into two distinct groups related to the logging company operations in their area. Some believe that it benefits in terms of the compensation they receive per cubic meter of logged wood, in addition to working opportunities with the company. They are also happy to accept the buildings jointly constructed by the regency government and the company. The second group sees that the company logging activities have reduced natural resources important for local livelihoods. This group urges the government to review the logging company's permit in anticipation of severe impacts in the future. The people in other villages, do not seem to have a clear idea as to whether they should accept (but this may not be interpreted as a rejection) logging companies operating in their territories. When reviewing logging company permits, the villagers may need to be involved in the entire processes not only the *Ondoafi*, traditional council, and village administrators.

5. Conclusions

5.1 How to utilize the project results: report and maps

In this pilot research, we looked for the most accurate and relevant methodology to collect data and information from the government and local community regarding their perceptions of development, their role in decision-making, and their customary land rights as a starting point to develop the RTRW. We tested several methods to find the most suitable to meet the interests of the regency government and the needs of the local communities. From these methods, we kept those useful for the regency officials and explain in more detail how to use them and their benefits in a guideline.

The maps are important for the regency government, as they use the same scale as those used for the RTRW. Using these maps, therefore, would be an easy way to describe how people use their land at present and what they expect for the future. However, these maps are not perfect yet; they are not ready to be used as an official outcome. They ought to be used as a tool to discuss and negotiate between all parties (local government, local communities, NGOs, and private sector) on the future of the Mamberamo Raya Regency.

The maps will be more useful when accompanied by additional information on the history of the village, ethnic groups inhabiting the village, valuable natural resources and important places, how people safeguard their customary land rights, and their perceptions for the future.

We would like to submit all these methods to the local government and to offer a training activity for the regency officials. The training will build the capacity of regency officials in conducting this kind of survey in the remaining 53 villages in Mamberamo Raya Regency. The training will be implemented in 2012 involving a number of regency officials and divided into two parts: in class training for two weeks where we will give training on all instruments, methods, data collection, data entry, data analysis, and report preparation and mapping process. In

addition, we will hold an *insitu* field training in 1 or 2 villages, to practice the methods for one month. This activity was discussed during the final workshop in March 2012 in Kasonaweja and thus preparation will be initiated in the middle of 2012.

The objective of this project was to develop a method for collaborative land use planning. The methods were applied in 6 pilot villages. We believe our results have potential and could be used as a basis for further investment, particularly for donors interested in sustainable community development in Mamberamo and infrastructure development. Some options were explored during the final workshop, according to the perspectives of local people and government staff. Proposals are summarized in the following section on the results from the final workshop.

This could involve other stakeholders and donors interested in funding activities in Mamberamo, such as USAID or the Norway government. Based on the report and workshop results, we suggest that a feasibility study should be conducted for each proposal, before any action is taken. A feasibility study would concern the ecological impact of infrastructure development (e.g. road construction, channel construction) and the opportunity cost of such a project.

5.2 The workshop

We organized a final workshop in Kasonaweja, to initiate discussions between all relevant parties and to submit the research results to the regency government and to each local community with whom we had worked.

Implementation (who, when and where)

The BAPPEDA of Mamberamo Raya Regency in collaboration with CI, CIRAD, and CIFOR invited the local communities from the six villages, provincial (BBKSDA and BPSDALH) and central government institutions (BAPPENAS), NGOs, and private sector (PT. Mamberamo Alas Mandiri), on 20-21 March 2012 to discuss all research results. Table 19 is the agenda of the above mentioned workshop.

Objectives

This workshop, apart from disseminating our research results, was a good opportunity to initiate discussions with all stakeholders that have an interest in land use in Mamberamo Raya Regency. We wanted to present information about our activities, the report and maps we developed, and recommendations for the next phase (i.e., Collaborative Land Use Planning (CLUP) training). In addition, we wanted to facilitate discussions between all parties (note that our role was solely to facilitate) about the roles the local communities could potentially play in decision making related to land use planning and development.

Results of the workshop

The workshop was attended by more than 100 people including representatives of the surveyed villages, of other surrounding villages (Dabra, Danau Bira, and

Namunaweja), regency officials, local parliament, head of the Mamberamo Raya Customary Council, the logging company, and NGOs (e.g. *Yayasan Lingkungan Hidup – YALI*) Papua, Indonesian Forest and Climate Support – IFACS). It was opened by the Bupati and closed by the Vice Bupati.

The first half day consisted of a presentation by Ketut S. Putra (Executive Director of CI-Indonesia) introducing and updating the progress of the project. It was followed by a speech from the Bupati indicating his support for this project as well as next steps that should be taken after this project is finished.

In the next session, a description of the current status of the RTRW both at the provincial and regency levels was presented by Tobias Pahlevi (BAPPEDA of Papua Province) and Obed Barendz (Head,

Table 19. CLUP Workshop Agenda, Kasonaweja, 20-21 March 2012

| Date | Time | Agenda |
|------------------------|--------------------------|--|
| Tuesday, 20 March 2012 | 9.00 -9.30 | Welcome remarks on conservation and development in the Mamberamo Raya regency and the opening session by the Regent Prayers led by the priest |
| | 09.30-10.00 | CI presentation (Ketut S. Putra) |
| | 10.00-10.30 | Presentation: Mamberamo Raya regency RTRW |
| | 10.30-11.00 | Coffee break |
| | 11.00-11.30 | Presentation: Papua province RTRW |
| | 11.30-12.00 | Discussion |
| | 12.00-13.00 | Lunch |
| | 13.00-14.00 | Presentation on CLUP research results |
| | 14.00-15.00 | Presentation by representatives of the six villages on local perceptions of the RTRW |
| | 15.00-15.30 | Coffee break |
| | 15.30-16.15 | Presentation by representatives of the six villages on local perceptions of the RTRW |
| | 16.15-17.00 | Discussion |
| | 17.00 | Day 1 closing |
| | Wednesday, 21 March 2012 | 9.00-10.00 |
| 10.00-10.30 | | Coffee break |
| 10.30-11.15 | | Group Presentation |
| 11.15-12.00 | | Panel discussion, future plan, discussion and inputs from the SC: evaluation and suggestions |
| 12.00 -12.30 | | Handover of map and report, closing ceremony by the regent |

BAPPEDA of Mamberamo Raya Regency). They showed the integration of the development plans in the region between those two levels. However, land use plans at the regency need to refer to the provincial plans, but are in general described at a more detailed scale.

During the afternoon session, CI-CIFOR-CIRAD team presented the results of the project, based on the findings in the six villages. Some comparisons between villages were made, as well as opportunities to integrate local perceptions into regency land use planning.

The rest of the first day was devoted to presentations by each village representative, to give them a chance to explain their own participatory land use maps. It was also an opportunity for them to describe their views on how they use their customary lands and how they plan to cope with future changes in land use. One main issue from the 5 villages located to the east of Mamberamo River, i.e., Papasena 1 and 2, Kwerba, Metaweja, and Yoke is that they are aware that their villages are located inside the conservation area where any development programs are strictly limited, unlike villages outside the conservation area (e.g., Burmeso). Therefore, the issue of equity - in terms of development programs - was explicitly raised by these communities. They urged the regency government to pay attention to this situation.

Day 2 of the workshop was intended to facilitate group discussions among stakeholders. We divided participants into 5 groups according to each village – but Papasena 1 and 2 were merged into one group.

The regency officials, logging company workers, and NGO staff were involved in a different group of discussions. During the discussions, participants were encouraged to highlight the main issues, based on what had been described on the maps, which should be addressed to find win-win solutions for sustainable development in the regency.

Results of the discussions per village group are as follows.

All issues raised by the local communities from the six villages during the discussions became valuable inputs for the regency government. According to the Head of BAPPEDA, all the suggestions from the villagers can be discussed and, after a feasibility study,

could be included when revising the RTRW of the Mamberamo Raya Regency. The mechanism would be through a Development Planning Discussion (*Musyawarah Rencana Pembangunan* or *Musrembang*) and Regional Workshop (*Rapat Kerja Daerah* or *Rakerda*), each being conducted once a year in Kasonaweja.

At the end of the workshop, all the results, i.e., report in Indonesian and the maps, were handed over to the local communities of the six villages and to the regency government. In addition to the report and maps, we gave a Collaborative Land Use Planning guideline (in Bahasa Indonesia) to the local government as a reference for conducting similar activities related to land use in the future.

The workshop was a success. Both local communities and local government were enthusiastic in their participation and in particular when they received the maps. It was not surprising as the maps, developed at a scale of 1:50,000, can help to visualize the information about the landscape, natural resources, customary land rights of certain clans, and land use according to the local community. They were designed and printed on a tough material to ensure long-term use.

The Bupati expressed his appreciation to the project during 2 informal evening meetings in the Bupati Residence, and his interest for the next activities. In terms of budget, the regency government also contributed in covering the local transportation for the representatives of the six villages, and half of the meals during the workshop, which represents about 15% of the total budget for the workshop.

Intellectual property rights

We consider the results, i.e., report and maps, of our activity as belonging to the local communities in Papasena 1 and 2, Kwerba, Burmeso, Metaweja, and Yoke and should be given back to the local communities. We also asked for approval from the local communities in the six villages before planning this workshop for sharing the project results with other parties. An official letter signed by the village administrators, *Ondoafi*, clan leaders, and the elders of each village, on behalf of the local community was a prerequisite to this workshop.

Information contained in this report includes input from the local communities during the workshop.

Tabel 20. Main issues raised during the focus group discussions

| Issues | Kwerba | Metaweja | Burmeso | Papasena 1 and 2 | Yoke |
|-------------------|---|--|---|--|---|
| Infrastructure | <p>Permanent path connecting village to Mamberamo River</p> <p>Airstrip improvement</p> | <p>Access connecting Metaweja to other villages and to regency capital is a must. Airstrip and road construction are needed. But airstrip is the priority</p> <p>Construct buildings to support new district development</p> | <p>Buildings and road construction to be implemented in line with the development of the new regency capital</p> <p>airport construction</p> | <p>Road is needed but should be constructed around the village territory only, to avoid disturbing sacred areas (e.g., Foja Mountains)</p> | <p>Dredging is needed in Wandumari River to allow access from Yoke to Lake Rombebai and Mamberamo River, but not in Ipinem River as that would bring mud into the swamp and mangrove</p> <p>Construct buildings for Community Health Center, school, and church</p> |
| Local livelihoods | <p>Cash crop plantations: areca nut and cacao</p> | | <p>Short and long term plantations: lack of seedlings, need to adopt methods for permanent agriculture</p> <p>Home garden plantation (2013): <i>durian, duku and rambutan</i></p> | <p>Crocodile and pig farming suggested by Forestry and Agriculture Service staff</p> | <p>People are preparing land across the village territory for sago plantation</p> <p>People need tools and equipment to support fishing: fish nets, cool box, freezer, generator, and boat engine</p> |
| Land use | <p>People do not want logging companies operating in Kwerba as it will disturb the Foja Mountains which is protected by customary regulations</p> | | <p>More than 90,000 ha of customary land (currently utilized by PT. MAM for logging) will be given for developing the regency capital</p> | | <p>3 lakes: Rombebai, Warmaresia, and Tabaresia could be developed for ecotourism</p> |
| RTRW | <p>Boundaries between villages need to be clearly defined and mutually agreed</p> | | <p>People will move back to their old villages when the current village has been developed as a regency capital</p> | <p>The new district in Papasena is strongly urged by people to ensure increasing local health, education, economic and trade, etc.</p> <p>Idea to change the current status of wildlife reserve to a national park was suggested by Forestry Service staff</p> | <p>Need to include 3 villages: Subu, Kosata and Bina (on the Apauer River) in the Mamberamo Raya Regency as they are historically close to the community in Yoke</p> <p>Yoke will be developed into 3 villages (2013)</p> |

Appendix 1. History of the villages

We need to emphasize that our research deals with local perceptions of forests, livelihoods, and traditional land use. This is often challenging, for example when discussing the history of the village, the information obtained from our informants depended very much on the informant's memory and how they perceived the questions asked. In addition, information on village history is sometimes not easily linked to the results from interviews or discussions. However, we believe that this kind of information is important to understand how local people may be influenced by their past experiences. From an anthropological point of view, it might be developed into a more comprehensive study on the local cultures as well as how people have been utilizing the forest and their customary lands for numerous generations. This would also benefit the local people in terms of documenting their knowledge on natural resources including customary regulations for their future generations. Some of our respondents were concerned that their younger generation knew so little about their sacred grounds, they knew only the location. This suggests that local knowledge of local cultures is fast transforming and needs to be captured before it is gone forever. History of each of the six surveyed villages is described as follow.

BURMESO

Clans and ethnic Groups

The ethnic group in Burmeso village is called Burmeso; they are all descendants of common ancestors and have four clans: Tasti, Meop, Enghuarasit, and Abiasit. Their ancestors include: Dergfi (Tasti Clan), Sumakauw (Meop Clan), Sobak (Enghuarasit Clan), and Binaro (Abiasit Clan).

Village history as told by the villagers

In the 1940s the old village moved to Timon and Sarie Rivers across from Murumerei village. Then the villagers moved to Wetitai, and then in 1955 they moved to Siwak village near Batiwa River. They lived in this village until 1971. But due to an increasing population (the village was between two rivers, Siwak and Batiwa, on the slope of Bone Mountain) it was difficult to expand the village. They then moved

again to open a new village named Gaya Barudan, which then became Burmeso village. The name Burmeso comes from 'Bur', which is a small bamboo commonly used for making bamboo flutes. The villagers have divided the village based on clans.

Important historical events as told by the villagers

- In the 1950's the Christian Church of Indonesian (*Gereja Kristen Indonesia* – GKI) and in the 1960's, the Adventist Church, came to Burmeso along the Siwak River
- In the 1960's a Greek missionary, Kostan Kostan Makris, brought the Evangelical Church of Indonesia (*Gereja Injili Di Indonesia* – GIDI) to the village. At the time, he was staying in Taive in the Upper Mamberamo, and started to spread Christianity to all Mamberamo. In 1970, Reverend Makris moved to Burmeso village and stayed for many years
- An air strip was opened in 1970 by Mathias Meop (current village head)
- In 1972-73 the air strip in Burmeso was damaged by a landslide and was temporarily moved to Kasonoweja
- In the mid 1970's Mathias Meop was appointed the first village head
- Mathias Meop, as the first village head, made reforms that improved the village livelihoods
- In 1997 there was a prolonged drought (El Nino), everything was dry and no crops could be grown. Fortunately there were no bush fires and the sago groves in the swamp were not affected by the drought
- In 2004 CODECO corporation (now PT. MAM) entered the Burmeso area
- In 2007, when the new regency was created, Burmeso village was expanded for the construction of new settlements. The formation of the new regency was important for the local communities as they actually took part in ushering in the endorsement of a new regency. In 2011 the new Mamberamo Raya Regency was inaugurated and the regency head was elected and sworn-into office.

KWERBA

Clans and ethnic Groups

The Kwerba, Papasena and Kasonaweja people have common ancestors. The Kwerba ancestors originated from Sanem settlement near Edivalen, and then migrated to other places. There are 5 original clans in Kwerba: Maner, Tawane, Hacıwa, Karawata, and Meop.

Village history as told by the villagers

The exodus from one place to another was, among others, often caused by war. Their enemies were the Burmeso, Sikari and Kures of Jayapura regency. In addition to war, the migration was also caused by death because of diseases, which was perceived as the angry spirits of ghosts dwelling in sacred areas. Migration was also due to scarcity or depletion of natural resources.

From Sanem, the Kwerba people moved sequentially to different places: first to Ahomo settlement (near Hanem River), the banks of the Mayau River, a new village near Tabiri River, the shores of lake Mowam, the banks of Hanem River, and finally back to the Mayau River, which by then had become part of the Republic of Indonesia (circa 1963).

At the Mayau River, the Kwerba people split into three locations: Mayau River was settled by the Tawane and Meop clans; Tabiri River by the Hacıwa clan and Lake Mowam by the Maner and Karawata clans. These five clans are the original Kwerba community. The Indonesian government persuaded the Kwerba people to merge into one village at a single location, on the banks of Tabiri River.

Shortly after they had settled in Tabiri, there was news that Reverend Konstan Makris was preaching Christianity in the upper reaches of Mamberamo. Eli Maner, Isak and Paulus Tawane took Agus Tawane, the settlement leader (*Korano*), to see Reverend Makris in Taive, in upper Mamberamo, to ask the reverend to preach in Kwerba. The priest along with the Kwerba people returned in an aircraft to survey the village. They could not land the aircraft as there was no flat clearing in the mountainous area. The reverend saw a relatively flat clearing near the Wiri River. Reverend Kostan encouraged the local community to move to the current Kwerba village where the land is flat and wide enough to build an airstrip. Then he asked preacher Pontikus Ondi from Sentani and Kendarat Wonda from Wamena

to preach to the Kwerba villagers. The preachers also persuaded the Kwerba people to stop their nomadic lifestyle.

After the local community started to settle at the current location of Kwerba, the clans from other ethnic groups arrived, such as from Papasena, Kasonaweja, Burmeso, and Marina Valen, through marriages or as prisoners of war, which was for instance, what the Meop clan was at the beginning. They were awarded living quarters and land in Kwerba. The Koh clan from Marina Valen came and married people from Kwerba and then settled. The first of the Koh clan who came to Kwerba married someone from the Maner clan and was given land.

Important historical events as told by the villagers

Besides the introduction of Christianity in Kwerba, several important events occurred:

- In the 1970's, school teachers, Daniel Jikwa and Amos Kogoya, arrived
- In 1975 religious preachers started providing the village with literacy classes and other formal education
- The first Kwerba village head, Agus Tawane, was appointed (no recollection of year)
- In 1980, modern medicine was introduced; a community health clinic was opened in the village, and
- In 2008, Kwerba became an officially recognized village.

PAPASENA

Clans and ethnic Groups

The ethnic group in Papasena is called the Batero, which has 5 clans: Daurije, Khu, Kawena, Dude, and Ewey.

For a long time the inhabitants of Papasena, from the Ewey clan, settled in an area that became Papasena 1 village, currently on the Daude River near the Mamberamo River. Other groups were isolated at the time. The Kawena clan's ancestors originate from the Foja Mountains (Kujawawa) between the sources of the Siri and Sanye Rivers. The Kho clan came from the source of Beri River in the Aridijari Mountains. Kho and Kaitaku came from common ancestors and share the same territory. The Dude 1 clan used to live at the source of Kware River and the Dude 2 clan

settled at the source of Orijo River. The Daurije used to live at the source of Suake (Tuaki) River.

Village history as told by the villagers

Even though the villagers no longer live a nomadic life, they still roam their respective clan territories. The main reason is war and disease. Before the introduction to Christianity the Papasena enemies were the Sikari, Kay, Douw, Taive, Dabra, Fuao, Baso and Taria, while they were allied to the Kwerba, Kaso, Burmeso, Marina Valen, and Murumerei people. In the old days, they believed in Putauwi (a local God). When they were about to engage in war they sought the assistance of Putauwi. The wars ceased after the arrival of Dutch colonists, but still sporadically erupted. In order to secure peace, the Dutch colonial administration persuaded the villagers to settle in the current village location, which is Papasena 1, part of the Ewey lands.

Important historical events as seen by the villagers

- In the late 1960's, Reverend Kostan Makris, came to preach in the village and the villagers became Christians. Reverend Makris also built an airstrip in Papasena 1. Reverend Makris, was succeeded by, Inwar (from Serui) and then Reverend Philip May (also from Serui). The entry of Christianity also acted as a uniting factor for the villagers and encouraged them to congregate. Teachers and the construction of schools and churches quickly followed. Many outsider groups also joined, such as the Baso from the Dikibak and Baidobak clans.
- In the early 1970s, Enos Khu (a local public figure) and Isaskar Khu (a missionary) followers of GKI (the Christian Church of Indonesia) persuaded villagers of the same church to move from Papasena 1 and build a new village, Papasena 2. Religious differences between GKI and GIDI followers prompted the move. Now, the followers of GKI live in Papasena 2, while those who follow GIDI live in Papasena-1. The villagers of Papasena-1 are predominately from the Dude and Ewey clans, while those living in Papasena 2 are mostly from the Kawena, Khu, Kaitaku, and Daurije clans.

The introduction of Christianity, the arrival of schoolteachers, and the establishment of a new village and settlements are several events that the local community in Papasena 1 and 2 consider to

be important. In addition, other important events include the relocation of the Upper Mamberamo District office from Papasena to Dabra, which occurred about 1972, when a landslide hit Papasena 1. The District office is still located in Dabra.

METAWEJA

The first Metaweja community settled at the source of the Met River in a place called Cibijem. The former name of Metaweja was Ewaja (or Suweja or Suwaja). They believed that God (or Maraj in Metaweja language), created humans. The descendants of the first human are called the Nunubukauw.

From Cibijem, they moved to Kabariya. In the mid-1970's, for various reasons (such as conflict with other villages and disease), the Metaweja migrated from one location to another, but remained within the vicinity of the Met River. At that time, the Sawai and Samas lived near Omeri River in Kwamereti village. By 1972 people from Hilare joined the Samas people. During that time the Tamats (clan) still existed, but they died out because of war.

In 1992 there was a Cholera outbreak, and many people died. Those who survived the outbreak moved to Kamerinya. In 1994, following a large flood, they moved to their present location where they built an airstrip 400 meters in length. Because the old airstrip was considered too short they recently built a longer airstrip.

Ethnic groups and clans

When the evangelist mission arrived in Metaweja, the elders divided the community into 5 clans, because the male Bilasi clan was able to marry their own clan. The parents of the Nunubukauw women choose which grandchildren must follow their father's clan (it is still the case today), aside from the Nunubukauw clan, there are five additional clans:

- Nunubukauw clan, the original clan, from Cibijem,
- Bilasi clan from Hoitaman (Kwanima Mountain)
- Samas clan from Kamerinya (old village)
- Koh clan from Buntomana
- Sawai clan from Sangkuweja
- Poye clan from Tamaja

The current Sawai clan comes from a marriage between a Nunubukauw woman and a Sawai. The woman's brother told her to join her husband and gave the newlyweds a plot of land at Wire River. Now this land belongs to the Sawai clan.

A man from the Bilasi clan (from Kwanima) married a woman from Nunubukauw. The woman from Nunubukauw gave land to her child at Hoitaman, Kwanima Mountain.

A Poye from Tamaja married Herlina a woman from Nunubukauw. They were unable to go back to Tamaja because the Poye did not have any women siblings to counter-offer for marriage to the Nunubukauw. Herlina's parents gave her land at Wire River.

The origin of the Kho clan is from a cave on Aca River, the men of Nunubukauw brought all inhabitants of Mimitaarits to live in Iwa, at the Old Village. The reason for the move was because they lived inside caves. The men of Nunubukauw gave them the sago grove settlement of Wawaram, in the mid-section of the Met River.

Until the present, when marriages occur with an outer tribe, there must be a woman from the groom's clan to exchange. If the groom's clan cannot comply, then the groom and his Nunubukauw wife are not allowed to go back to the groom's village. This is to ensure that the population does not decrease. The Nunubukauw would even give land so that men from outside the tribe would settle in Nunubukauw territory and strengthen their numbers in anticipation of war. The elders try to continuously inform the younger generation about the origins of their clans.

Important events as told by the villagers

The first missionary in Metaweja was Reverend Philip May (evangelist) from Serui who came from Ameninya. Reverend May introduced Christianity and built an elementary school for the community. He served for two years and was replaced by Reverend Matias from Wakde Island – Sarmi. Reverend Matias spent more time hunting in the forest than teaching during his first year in the village. He was replaced by Reverend Awes from Sarmi who served the community for two years. Reverend Awes was then replaced by Reverend Twenti, also from Sarmi who stayed for 6 months.

Then Reverend Tinus Iriori from Warembori replaced Reverend Twenti, and remained in the village for 3 years. Reverend Iriori was replaced by an evangelist from Sentani who served for 1 year until he was replaced by his son-in-law, Reverend Ansaka, from Sentani. Reverend Ansaka was replaced after 2 years by Reverend Isak Bilasi, who has been serving in Metaweja until recently.

In 1970 the government came to the village. Then in 1977 a missionary, Klaus Leuter, from Bira Lake came to Kamerinya by airplane.

War

In the past, the elders often fought the people of Babija, Surumaja Gunung, Tamaja, and Murumerei. However, they remained allies with the people of Marina Valen. Fighting between the people of Nunubukauw and Babija was once started because a woman from Metaweja eloped with a Babijan man. Another time, a Metaweja died because of an unknown cause, it was believed that he or she was murdered through witchcraft (*Suanggi*) by people from another village. This kind of problem may also lead to war.

During the war, the local communities did not move out of the village, but lived around Metaweja. There has been no war since the missionaries arrived and started preaching Christianity to the Metaweja.

YOKE

In their local language, Yoke or Yokhui means "here" so Yoke village means "the village right here". In addition, some people argue that Yoke consists of two syllables i.e., "Yo" (yes) and "Ke" (work), and thus Yoke can also mean "ready to work". The ancestors of the Paito people came from the Ani River near Kwerba where there was once a big settlement called Pase. Then their people descended to Trimuris near the river that ran down to the direction of Yoke. From Trimuris they moved to Tri River. The River is split into two: the lower reaches near Lake Rombebai are in the Paito territory and the upper reaches are in the Bagusa (or Ikuasara) territory, they live near Kosori River.

The original male ancestor came from the Paito ethnic group near Lake Rombebai, and the female ancestor from the Bosumbaso ethnic group at Lake Tabaresia. When they married they lived at

Disireba, which became the location of the present Yoke village. Since the marriage, both ethnic groups often visit one another, intermarry and live together in Yoke, also known as the Old Village. The area includes the land from Lake Rombebai, owned by the Paito, up until Tabaresia. The latter belongs to the Bosumbaso. Today, there are no boundaries between the Paito and the Bosumbaso, all resources being the collective wealth of the two ethnic groups to hunt, fish, and collect Sago.

From Yoke, the community moved to Lake Rombebai to Mabekutama or Bandendi village. After which they returned to Yoke. In 1965, the community moved from Yoke to the western side of Mantabori (on the northern coast). Several years later, erosion took its toll and several houses collapsed. A part of the local community returned to Podosubuai or to Yoke village. In 1991 the government requested the local community to move to Mantabori. The government promised to build houses, but in the end, the local community built their own.

Around the year 2000, erosion damaged several houses and the school and church buildings collapsed. Members of the community returned to Yoke village for fear of constant landslides. The *Ondoafi* (ethnic group leader) and their families also returned to Yoke village.

When the tsunami hit the coast of Japan in 2011, Mantabori village was hit by a tidal wave and several houses were damaged, but there was no widespread damage of the village. The local community sought refuge across the river behind the village and returned once the tidal waves dissipated. The regency authorities asked villagers to settle in Yoke so that the development of public facilities could be concentrated in one place. But the local people want to stay in Mantabori because there is already a school, church, and community clinic outlet. Another contributing factor is the proximity to Sarmi and its harbour, so it is easier to sell their catch and harvest of fresh fish, smoked fish and other products. Their gardens are also closer to Mantabori.

Ethnic groups and clans

At the beginning there were three ethnic groups: Paito, Bosumbaso, and Warumuaso but the latter perished. The clans of the remaining two groups are as follows:

Bosumbaso Clans:

1. Dondi
2. Inggimamba
3. Dumberi
4. Binemba
5. Sirembori

Paito Clans:

6. Serawa = Sineri and Serumi
7. Rumansara = Rumansarawai

There was another clan, Kabarimbo, which was the elder of Sineri and part of the Paito ethnic group but this clan's name is currently no longer in use. According to local lore, the Dumberi came from Lake Rombebai but some said that it was adopted from the name of a clan that came from Yapen, i.e., the Numberi. This ploy was often used as a survival tactic in war and sometimes the clan's name from a female caught during war was adopted. The female was then taken as a wife by her captor and to remember her origins, her clan's name was used for some of their children.

Another example is how the Rumansara clan name is found in both Paito and Bosumbaso. It began during the war with groups from Biak. A strategy used by the Paito of Yoke was to learn the Biak language and name their children using the Rumansara clan's names so that they would not be attacked by the Biak, as if they were related to the Rumansara.

The switching of clans sometimes becomes quite complicated as the following examples demonstrate. Sineri came from Lake Rombebai and were also asked to change their clan name to Serawa to expand their territories. The Serumi originated from Tanah Kuri in the Lake Rombembai area. However, some other Serumi belonging to the Paito came from Warembori. There are some people which were expected to change their clans into their original ones, for example Sineri to change into Serawa.

At present, there are three clans from outside that reside in Mantabori; they are the Imbiri, Lamalu, and Konisirei who married into the Mantabori.

Important historical events as told by the villagers

War was very common before the introduction of Christianity and the people were nomadic. The

people of Yoke fought against the Waropen Atas, Biak, Bonggo, and Sarmi. During times of war the people would hide in Ingondi and returned to Yoke when it was safe. The Yoke never fought people of Warembori, Bagusa, Burmeso, nor groups of the upstream Mamberamo River.

During the Second World War, the villagers of Yoke lived in Kapeso, more specifically at Doinpadiai, an old village near Ari River (also known as Mebakutama or Warmaresia). They returned to

Yoke several years later. There was no more war after the Second World War as the Dutch forbade it and imposed a jail sentence on those who transgressed.

The first missionary arrived in Yoke on July 5, 1953. Adrianus Walesman, an evangelist who had come from Takar in Sarmi, lived in Yoke for three years. People believed that it was the first time Christianity was introduced in Mamberamo, which then spread to the upper regions of Mamberamo.

Appendix 2. The changes in harvest area of the six important natural resources

Table a. Change in areas to hunt collared scrub turkey

| | | Collared scrub turkey | | | | Total |
|------------------|---------------|-----------------------|--|---------------------------------|--|---------------|
| | | Others | close (no difference between past and present) | it was close, but now it is far | far (no difference between past and present) | |
| Kwerba | Number | 26 | 4 | 0 | 0 | 30 |
| | % | 86.7% | 13.3% | 0% | 0% | 100.0% |
| Burmeso | Number | 32 | 0 | 12 | 0 | 44 |
| | % | 72.7% | 0% | 27.3% | 0% | 100.0% |
| Metaweja | Number | 20 | 5 | 2 | 3 | 30 |
| | % | 66.7% | 16.7% | 6.7% | 10.0% | 100.0% |
| Papasena 1 and 2 | Number | 27 | 3 | 0 | 0 | 30 |
| | % | 90.0% | 10.0% | 0% | 0% | 100.0% |
| Yoke | Number | 30 | 0 | 0 | 0 | 30 |
| | % | 100.0% | 0% | 0% | 0% | 100.0% |
| Total | Number | 135 | 12 | 14 | 3 | 164 |
| | % | 82.3% | 7.3% | 8.5% | 1.8% | 100.0% |

Table b. Change in areas to hunt wild pig

| | | Wild pig | | | | Total |
|------------------|---------------|--------------|--|---------------------------------|--|---------------|
| | | Others | close (no difference between past and present) | it was close, but now it is far | far (no difference between past and present) | |
| Kwerba | Number | 6 | 13 | 9 | 2 | 30 |
| | % | 20.0% | 43.3% | 30.0% | 6.7% | 100.0% |
| Burmeso | Number | 29 | 0 | 15 | 0 | 44 |
| | % | 65.9% | 0% | 34.1% | 0% | 100.0% |
| Metaweja | Number | 6 | 13 | 2 | 9 | 30 |
| | % | 20.0% | 43.3% | 6.7% | 30.0% | 100.0% |
| Papasena 1 and 2 | Number | 9 | 15 | 6 | 0 | 30 |
| | % | 30.0% | 50.0% | 20.0% | 0% | 100.0% |
| Yoke | Number | 21 | 8 | 1 | 0 | 30 |
| | % | 70.0% | 26.7% | 3.3% | 0% | 100.0% |
| Total | Number | 71 | 49 | 33 | 11 | 164 |
| | % | 43.3% | 29.9% | 20.1% | 6.7% | 100.0% |

Table c. Change in areas in which to collect *genemo*

| | | <i>Genemo</i> | | | | Total |
|------------------|--------|---------------|--|---------------------------------|--|--------|
| | | Others | close (no difference between past and present) | it was close, but now it is far | far (no difference between past and present) | |
| Kwerba | Number | 28 | 1 | 1 | 0 | 30 |
| | % | 93.3% | 3.3% | 3.3% | 0% | 100.0% |
| Burmeso | Number | 38 | 0 | 6 | 0 | 44 |
| | % | 86.4% | 0% | 13.6% | 0% | 100.0% |
| Metaweja | Number | 19 | 2 | 0 | 9 | 30 |
| | % | 63.3% | 6.7% | 0% | 30.0% | 100.0% |
| Papasena 1 and 2 | Number | 24 | 5 | 1 | 0 | 30 |
| | % | 80.0% | 16.7% | 3.3% | 0% | 100.0% |
| Yoke | Number | 16 | 14 | 0 | 0 | 30 |
| | % | 53.3% | 46.7% | 0% | 0% | 100.0% |
| Total | Number | 125 | 22 | 8 | 9 | 164 |
| | % | 76.2% | 13.4% | 4.9% | 5.5% | 100.0% |

Table d. Change in areas to hunt cassowary

| | | Cassowary | | | | Total |
|------------------|--------|-----------|--|---------------------------------|--|--------|
| | | Others | close (no difference between past and present) | it was close, but now it is far | far (no difference between past and present) | |
| Kwerba | Number | 9 | 11 | 8 | 2 | 30 |
| | % | 30.0% | 36.7% | 26.7% | 6.7% | 100.0% |
| Burmeso | Number | 33 | 0 | 11 | 0 | 44 |
| | % | 75.0% | 0% | 25.0% | 0% | 100.0% |
| Metaweja | Number | 11 | 6 | 3 | 10 | 30 |
| | % | 36.7% | 20.0% | 10.0% | 33.3% | 100.0% |
| Papasena 1 and 2 | Number | 17 | 9 | 4 | 0 | 30 |
| | % | 56.7% | 30.0% | 13.3% | 0% | 100.0% |
| Yoke | Number | 27 | 3 | 0 | 0 | 30 |
| | % | 90.0% | 10.0% | 0% | 0% | 100.0% |
| Total | Number | 97 | 29 | 26 | 12 | 164 |
| | % | 59.1% | 17.7% | 15.9% | 7.3% | 100.0% |

Table e. Change in areas to hunt ground kangaroo

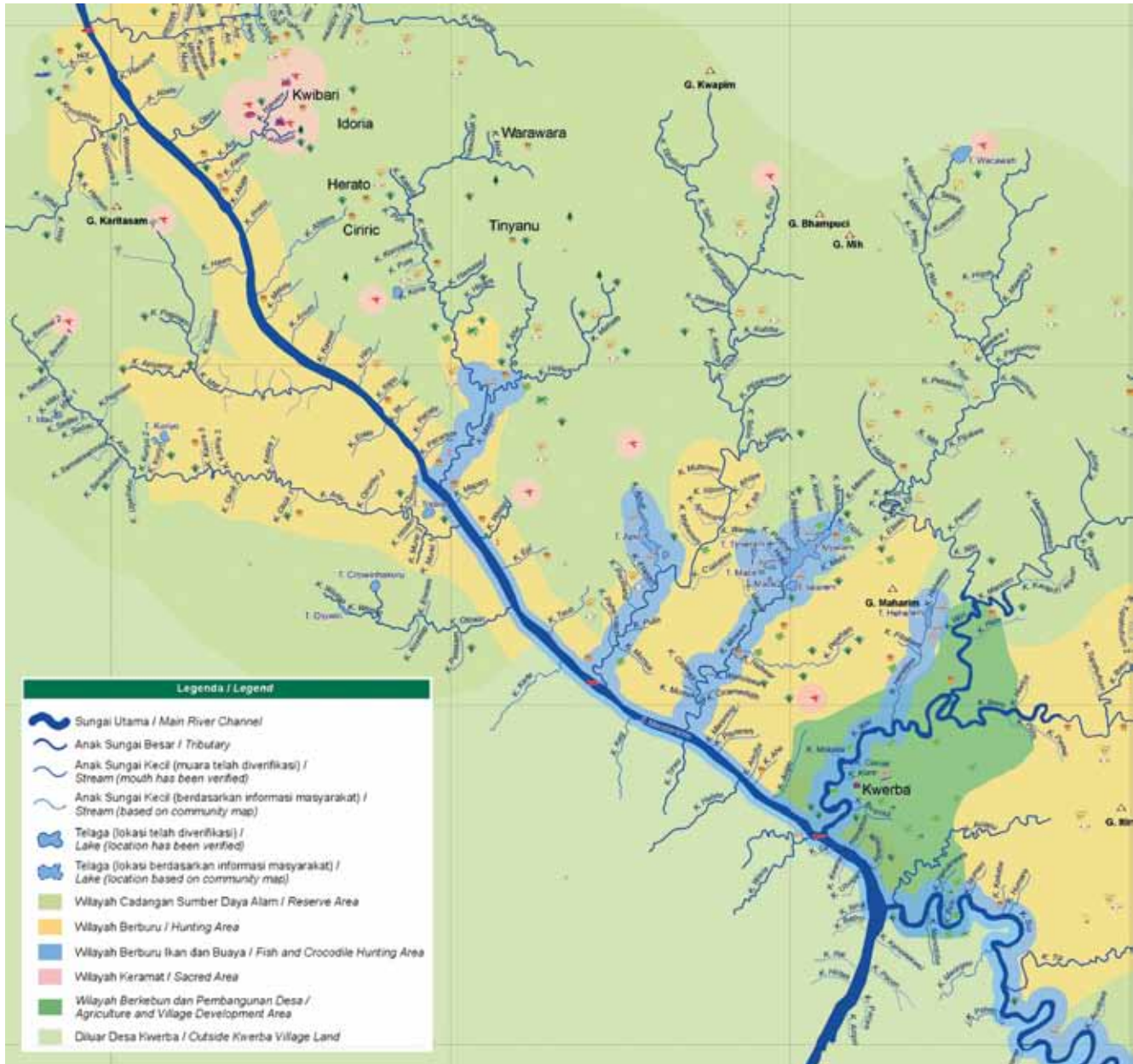
| | | Ground kangaroo | | | | Total |
|------------------|---------------|-----------------|--|---------------------------------|--|---------------|
| | | Others | close (no difference between past and present) | it was close, but now it is far | far (no difference between past and present) | |
| Kwerba | Number | 15 | 9 | 6 | 0 | 30 |
| | % | 50.0% | 30.0% | 20.0% | 0% | 100.0% |
| Burmeso | Number | 31 | 0 | 13 | 0 | 44 |
| | % | 70.5% | 0% | 29.5% | 0% | 100.0% |
| Metaweja | Number | 27 | 0 | 1 | 2 | 30 |
| | % | 90.0% | 0% | 3.3% | 6.7% | 100.0% |
| Papasena 1 and 2 | Number | 25 | 2 | 3 | 0 | 30 |
| | % | 83.3% | 6.7% | 10.0% | 0% | 100.0% |
| Yoke | Number | 30 | 0 | 0 | 0 | 30 |
| | % | 100.0% | 0% | 0% | 0% | 100.0% |
| Total | Number | 128 | 11 | 23 | 2 | 164 |
| | % | 78.0% | 6.7% | 14.0% | 1.2% | 100.0% |

Table f. Change in area to fish

| | | Fish | | | Total |
|------------------|---------------|--------------|--|--|---------------|
| | | Others | close (no difference between past and present) | far (no difference between past and present) | |
| Kwerba | Number | 30 | 0 | 0 | 30 |
| | % | 100.0% | 0% | 0% | 100.0% |
| Burmeso | Number | 44 | 0 | 0 | 44 |
| | % | 100.0% | 0% | 0% | 100.0% |
| Metaweja | Number | 25 | 5 | 0 | 30 |
| | % | 83.3% | 16.7% | 0% | 100.0% |
| Papasena 1 and 2 | Number | 17 | 13 | 0 | 30 |
| | % | 56.7% | 43.3% | 0% | 100.0% |
| Yoke | Number | 8 | 18 | 4 | 30 |
| | % | 26.7% | 60.0% | 13.3% | 100.0% |
| Total | Number | 124 | 36 | 4 | 164 |
| | % | 75.6% | 22.0% | 2.4% | 100.0% |

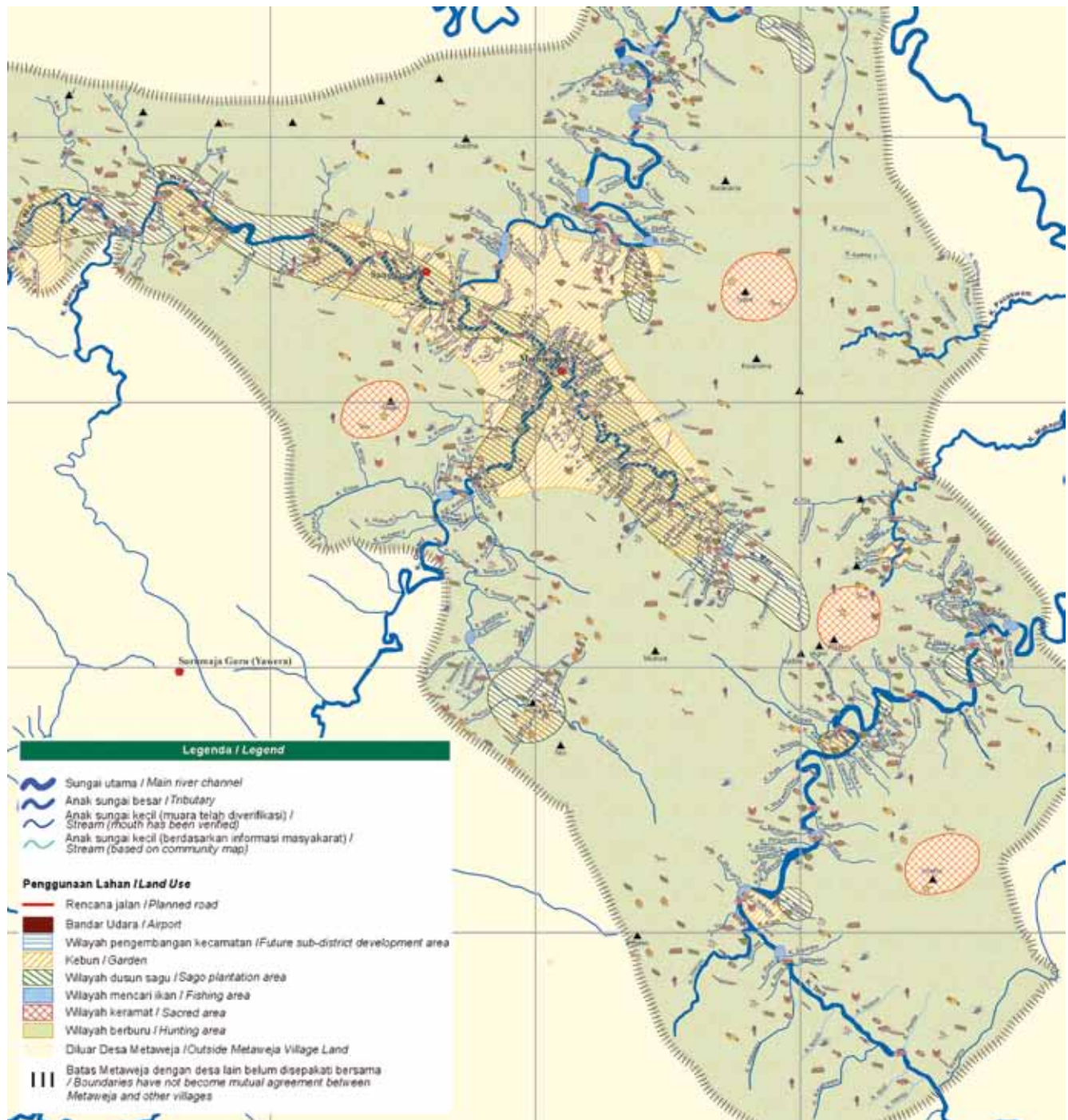
Appendix 3. Portion of the participatory maps of current (up) and future (below) land use in the surveyed villages

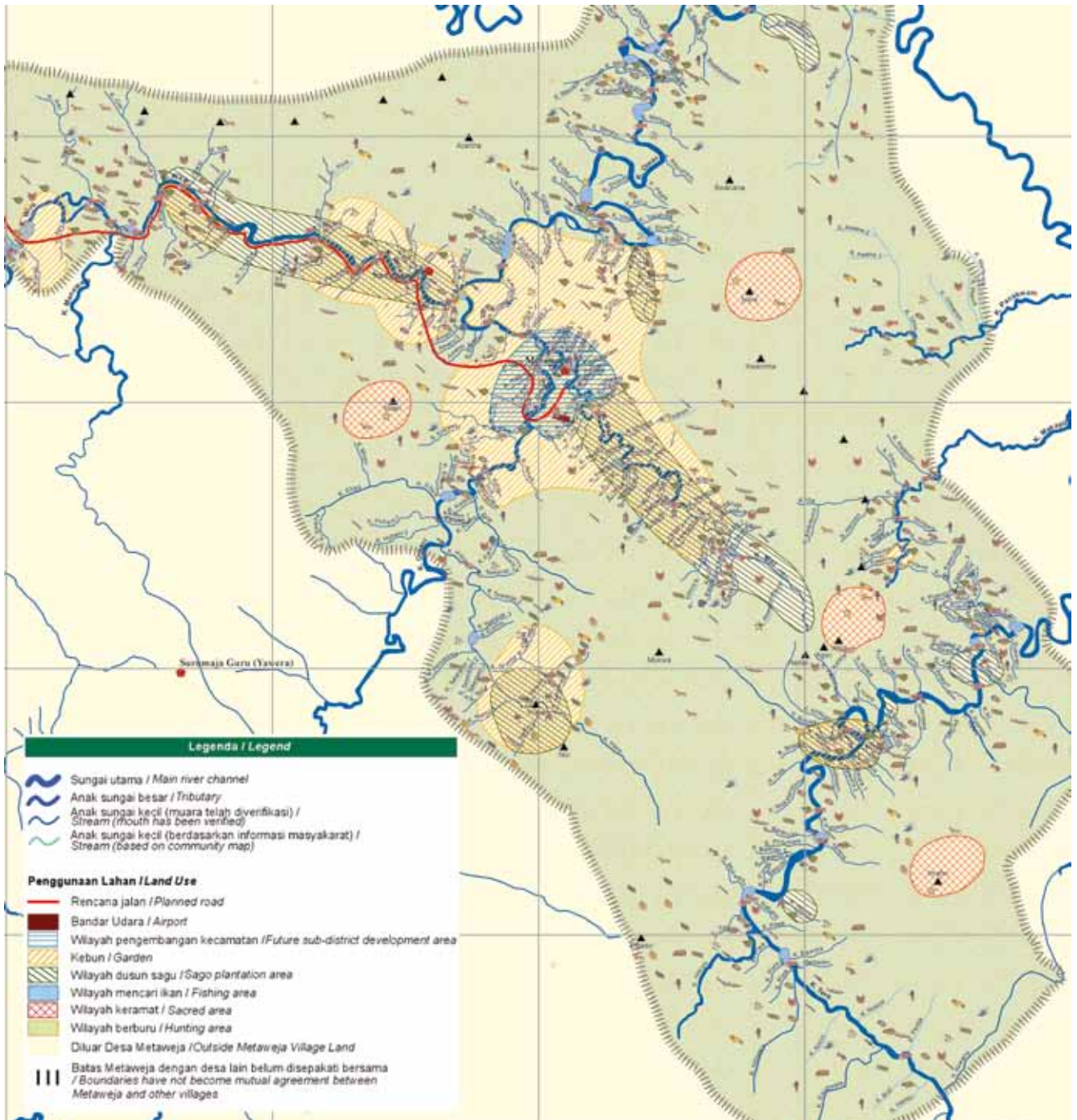
a. Kwerba



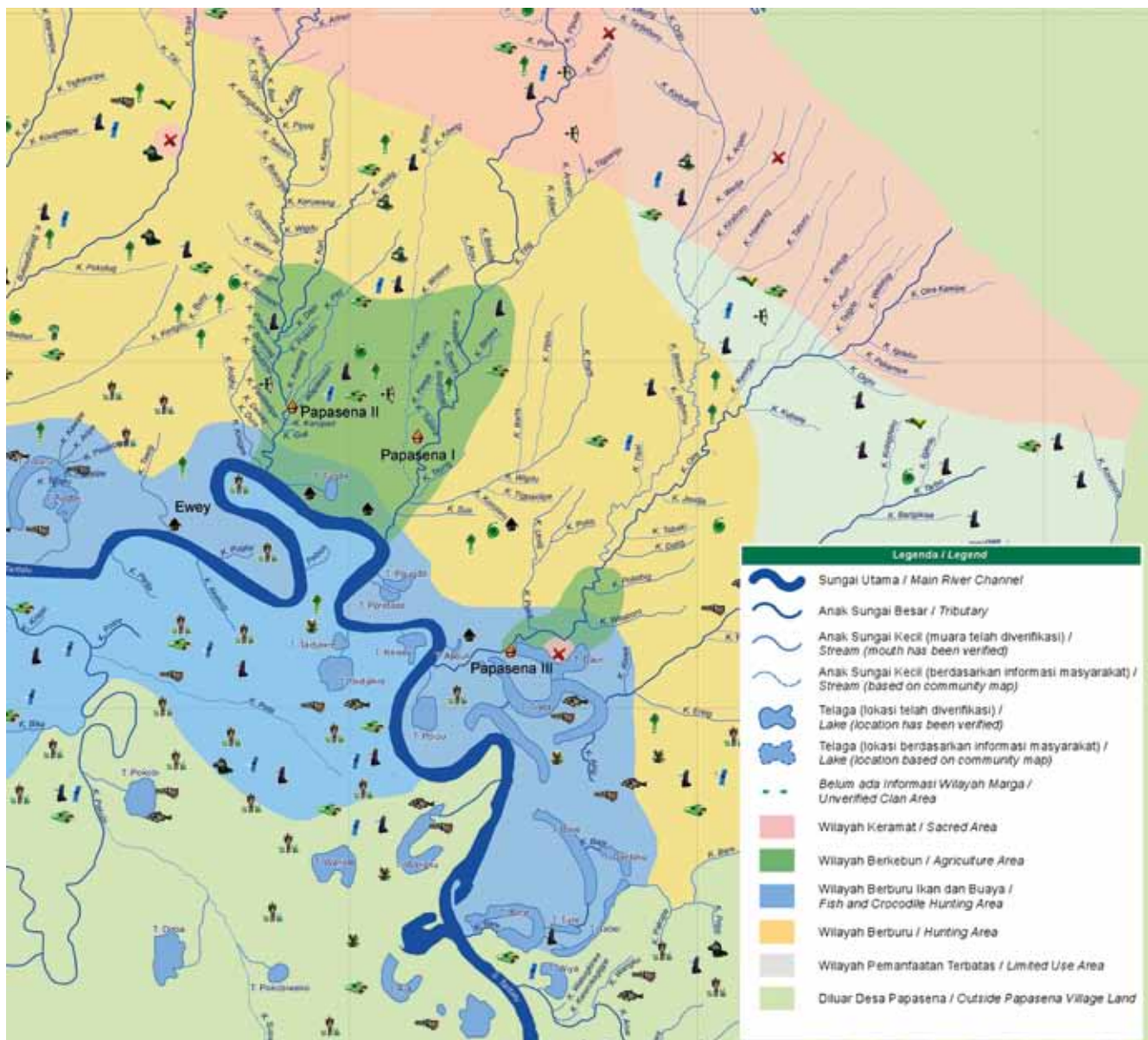


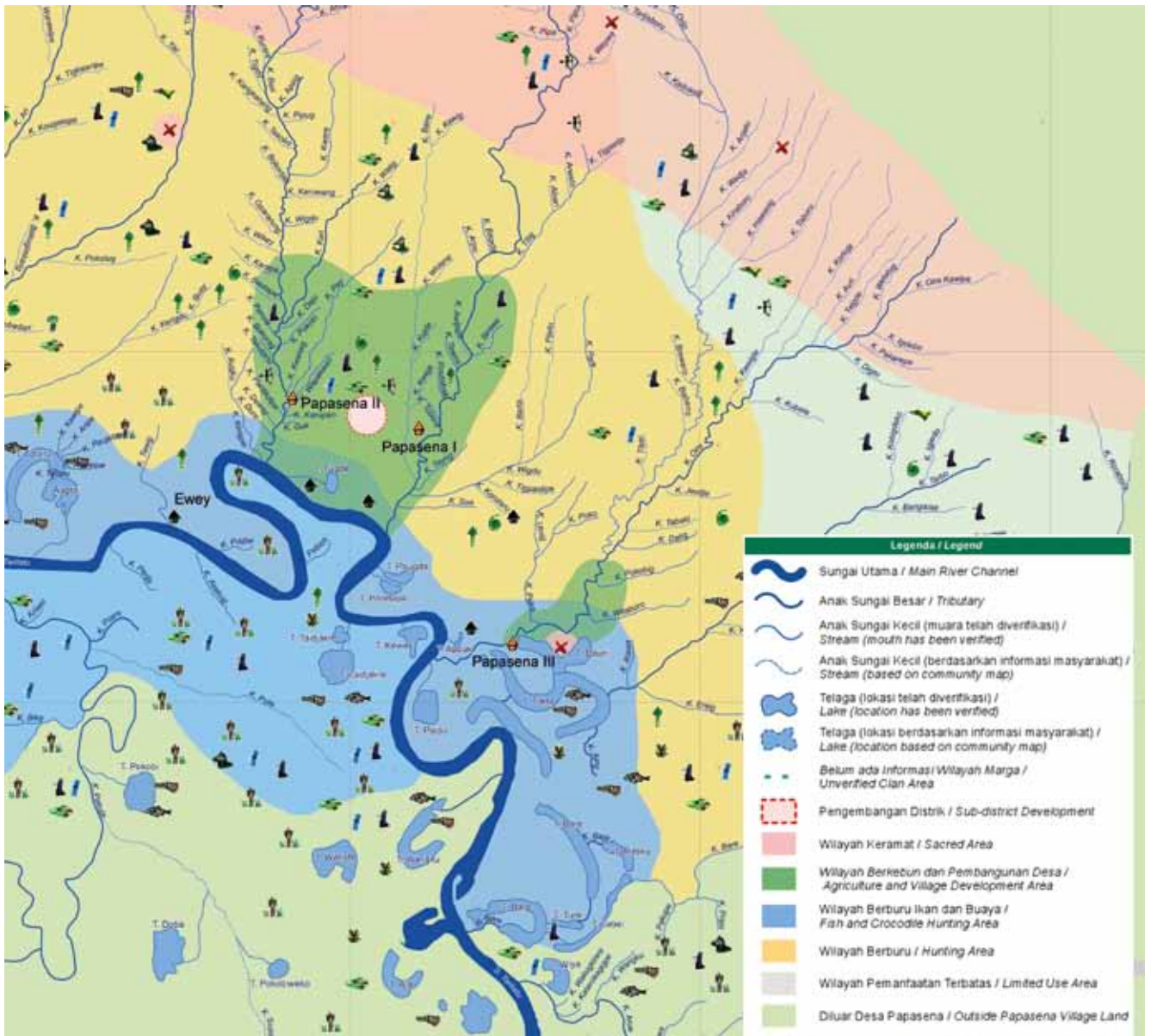
b. Metaweja





c. Papesena





d. Yoke

