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Water, Water Everywhere...? Examining Approaches to Rural Water Scarcity in Mindanao

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A thesis submitted in fulfilment of the requirements for the degree of
Doctor of Philosophy

Faculty of Science
University of Sydney

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Statement of Originality

This is to certify that this work has not been submitted for a higher degree or diploma at any other university or institution. To the best of my knowledge and belief, the thesis contains no material written or published by any other person, except where acknowledgement is made in the thesis. All of my sources of information have been acknowledged in the reference list.

The research presented in this thesis was approved by the University of Sydney's Human Research Ethics Committee (Protocol Number 15031).


TRINA ISORENA

11 April 2016

Use of Pseudonyms

To protect confidentiality and anonymity, the names of all research participants referred to in this thesis are pseudonyms.

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Abstract

This research addresses two themes: water scarcity and water resource management in the Philippines. Since 2004 the Philippines had been involved in the meeting the country's Millennium Development Goal's safe water target. Significant improvements have been achieved in access to drinking water in the rural areas, increasing coverage from 73 per cent to 91 per cent in 2012. Despite this achievement, there are still approximately 4.5 million rural residents in the country without access to safe water. I use the persistence of waterlessness in rural Philippines as a lens to examine the problems of the standardized approach to rural water provision in the Philippines. The core research question informing the research is: how do the conceptualisations of water scarcity by the households and the institutions that are tasked to manage it influence water access?

I use ethnographic methodologies combined with mapping techniques to examine the experiences of rural villagers in three different case study sites that were identified as water scarce/waterless in the Province of Agusan del Sur in Mindanao in the Southern Philippines. These three villages characterize three landscapes (uplands, lowlands and wetlands) that face distinctive types of water scarcity issues. The empirical exploration of people's experiences gives rise to questions how a basic service such as domestic water supply is provisioned by the state. In this regard, the communities' practices of accessing and using water, government practices of providing water in the villages and the biophysical conditions of the area are points of interest.

The case studies reveal that standardized approach to water scarcity, which assumes the communities' water problems relate to lack of investment and infrastructure and mostly focusing on engineering solutions to provide groundwater, fails to address the concerns of the local people who perceived water scarcity in different ways than the government agencies. In some cases it does not work because it is not technically possible due to the site's geology and hydrology, in others it does not address the problem of inadequacy of water for domestic needs of the community, or in some its salinity is unacceptable for the community.

The study demonstrates the importance of examining the specific context of situations where water access is an issue. It also shows the value of ethnographic methodology in such research.

Acronyms

BAWASA	Barangay Water Association
BHW	Barangay Health Workers
CAWST	Center for Affordable Water and Sanitation Technology
CBMS	Community Based Monitoring System
CHDF	Civilian Home Defense Force
DENR	Department of Environment and Natural Resources Office(r)
DILG	Department of Interior and Local Government
DOH	Department of Health
IWRM	Integrated Water Resource Management
KBA	Key Biodiversity Area
LGC	Local Government Code
LGU	Local Government Unit
LWUA	Local Water Utilities Administration
MDG	Millennium Development Goals
MENRO	Municipal Environment and Natural Resources Office(r)
MHO	Municipal Health Office
MWSS	Metropolitan Waterworks and Sewerage System
NIPAS	National Integrated Protected Areas System
NPA	New People's Army
NWRB	National Water Resource Board
PAMB	Protected Area Management Bureau
PASu	Protected Area Superintendent
PENRO	Provincial Environment and Natural Resources Office(r)
PHO	Provincial Health Office
PLGU	Provincial Local Government Unit
PPDO	Provincial Planning and Development Office
RBCO	River Basin Coordinating Office
RWDC	Rural Waterworks Development Corporation
UNICEF	United Nations Children's Fund
WATSAN	Water and Sanitation
WHO	World Health Organisation

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Chapter I

Introduction

INTRODUCTION

This thesis aims to examine how the conceptualisations of water scarcity by the households in the Philippines and the institutions that are tasked to manage water, influence water access in the rural areas where low water access persists till today. It also looks at modes of water delivery in the rural areas in the Philippines especially at reforms that seek to ensure clean water for areas considered to be ‘waterless’ or areas where the proportion of population with access to safe drinking water is half or less (NAPC, 2014). It also examines how these modes of delivery accommodate the different contexts of communities and the different ways communities view scarcity.

Water scarcity is generally considered to be a major global challenge. In 2000, the Millennium Development Goals (MDGs) were set up by the United Nations to push governments to attend to basic necessities such as safe water. Governments in different countries have been compelled to commit financing and focused programs to halve the number of people without access to safe water by the 2015 deadline (United Nations, nd). Based on the UN’s tracking of the water target 116 (out of 192) countries have met the target by 2012 (WHO and UNICEF, 2014). But according to the same data, around 783 million people are still without access to safe drinking water, of which, 90 per cent are in rural areas (WHO and UNICEF, 2014). According to UNICEF and WHO’s 2014 report, despite impressive achievements, it is possible that these have been overestimated and do not reflect water facilities that are in disrepair and provide ‘unsafe water’. The absence of baseline data on safe water from different countries in 1990 has led to the adoption of a proxy indicator for safe water under the MDG program. The program defines safe water as using an improved water source. ‘Improved’ means that certain types of technology have been used on a household’s

primary source of water that increases likelihood of safe water. These water technologies include boreholes, protected dug wells, protected springs, rainwater collection, public taps, or piped water into households. Thus funding has focused on the installation of these technologies in the areas where drinking water is a problem.

The Philippines is among the 116 countries that have met the MDG safe water target. From 2000 to 2012 funding for water supply projects reached a total of ₱15.5 billion¹ (10.4 by the Government of the Philippines and ₱5.1 billion by foreign funding). In order to achieve its target the Philippine Government identified cities and municipalities with 50 per cent or less of households having access to safe water as the areas that the program focused on. In 2012, the Philippines reported 92 per cent safe water coverage for the urban areas and 91 per cent for rural. Comparing the figures of rural areas, it can be concluded that that Philippines had benefited much from the MDG program. From the 73 per cent coverage in 1990 (NEDA, 2013), it has achieved more than its target of 86.5% of households with access to safe water in rural areas). This figure means that there are still 4.5 million rural residents that are without access to safe water. Why has this situation persisted in these rural areas? Have they simply not been reached by the government program? Or if they have, why have these programs failed?

Interventions to improve access to safe water have been developed based on what the government envisioned safe water to be. It is framed from the standpoint that the scarcity of drinking water is mostly explained by the lack of funding for infrastructure. Accordingly, programs by national government and overseas development assistance (ODA) focus interventions on the installation of water technologies. These programs are coursed through the national then the provincial government units. The Department of Interior and Local Government (DILG) and the Local Water Utility Authority (LWUA), the main institutions mandated to implement water supply provision in the rural Philippines, train the local government staff using water supply provision manuals (World Bank, 2012) to follow standardised ways of tapping water sources for communities' needs. The water supply manuals provide guidance in establishing rural water systems in various stages namely: design, construction supervision and operation and maintenance. According to Scott (1998), measures and standards are part of a government's instruments for bringing problems into

¹ Compiled from the infrastructure expenditure summary table of Department of Budget and Management's 'Budget of Expenditures and Sources of Funding' report for years 1999 to 2014.

sharp focus. By narrowing of the vision they (p.11) '[bring] into sharp focus certain limited aspects of an otherwise complex and unwieldy reality'. As this thesis shows, the nature of water in a specific context digresses from how standard interventions envisioned it to be.

In looking at water scarcity, this thesis focuses on clean drinking water supply, because of the serious problems of inadequate safe drinking water in communities and the health issues associated with it. However, viewing scarcity from the vantage point of programs alone risks portraying a problem in a way so different from what is experience by those affected by it. As Mehta (2013) points out, existing policies and institutional solutions often bias generalised viewpoints about scarcity, assuming scarcity affects everyone in the same ways. This thesis argues that simplified and generalised conceptualisations of water scarcity lead to the under appreciation of complexities of the dynamics of the social, environmental and technological dimensions of water systems, thereby providing standardize decisions leading to continued deprivation or, worse, the exacerbation of poor water access conditions.

In order to investigate how these standardised approaches work, the thesis looked at three case studies from one basin. Each of these three case studies has different characteristics and water scarcity issues that are quite different, but the standardised approaches are applied to address them. The case studies are in a rural area where water access is perceived to be a major problem, and yet the details are quite different in each case. I have selected these areas because the examples illustrate this point about the problem of standardising intervention. I have deliberately selected areas where it is generally considered that there is water scarcity, where I could explore the limitations of standardized approach. What I am actually doing is an ethnographic study of these to see how things work on the ground.

This is especially important in those rural settlements that continue to have low access to safe drinking water because the water technologies installed draw water in situ. In such settings, the physical landscape become a very important factor to look into. I underscore the importance of looking into social and material contexts of specific places especially at nature-people relationships.

I use the theoretical perspectives of governmentality and political ecology as a lens to view the problems of water access in the three case study sites. Governmentality analysis looks into the process of governing and the mentality of the government in ensuring the wellbeing

of the population (Foucault, 1991a) such as providing for water. Part of the means of governing include the 'technologies of government' (Foucault, 1991a) that are tools applied to steer behaviour of people. These technologies include first the 'technology of performance' Dean (1999), the technique of choosing which part of reality is made visible so that things such as access to water are characterised in ways that are amenable to calculation such as indicators which allow the measurement of reality through numbers. Second, there is also the 'technology of responsabilisation' (N. Rose, 1999) which means the making of active and responsible citizens who make decisions that are best for themselves and one that also follows the norms of society. But while the concepts of governmentality is instructive in seeing the government mentality in relation to programs of development, it fails in showing the people's perspective and how they actually access water.

I turn now to the perspective of political ecology to look into people's perspective as recipients of programs and how they improve their own water access. I argue that the decrease in disparity in water access is also mediated by the people and the environment. Here the political ecology approach is useful to explore how at the receiving end of the water interventions people respond to these interventions in relation to the material realities of water in their area.

An integrated analysis of the rural water supply delivery programs coupled with an ethnographic approach to enquire about the people's perceptions, knowledge and experiences of difficulties of access to water in rural areas brings forward a richer account of the problem. This provides the opportunity to reflect that there could be a plurality of approaches in providing water systems to marginal rural communities that can be sustained through time.

RESEARCH QUESTIONS

This main research question is: *how do the conceptualisations of water scarcity by the households and the institutions that are tasked to manage it influence water access.*

This is investigated in three rural landscapes (uplands, lowlands and wetlands) where low water access persists till today. In order to respond to the main inquiry, the research deals with three sets of questions that relate to measures of water scarcity, how these are experienced and how these are addressed by institutions.

- What are experiences and understandings of water scarcity in rural households and how does water scarcity influence the ability to secure livelihoods, health and food? What is the biophysical condition of water resources and how does this affect the availability of water and rural peoples' access to it?
- Does the data that is used by the agencies reflect the different perceptions? How is the dichotomy between water availability and water scarcity defined in terms of government data? What is the current status of water access in Agusan del Sur and how is the status measured?
- What are the state's approaches and mechanisms to address the constraints in water access in these areas? Who are the actors and what are the roles of different actors (including NGOs) in mediating water provision in rural areas? How adequate is the state response and how does this reflect the experienced needs of the rural households?

In the third set of questions although I focus on the state projects that provide water for the rural population, I also attempt to link this to the water resource management strategy (that is Integrated Water Resource Management) that the government has identified as its pathway towards coordinated equitable and environmentally sustainable management of water resources. I examine the various schemes to provide access to water resource by various actors – government and civil groups.

SIGNIFICANCE OF THE RESEARCH

In achieving the country's targets for improved access to safe water there is a need for a better understanding of rural water provision beyond the difference between rural and urban water. There has been lack of academic research that looks into experiences of rural households and their access to water. Much of the current literature on rural water provision consists of project monitoring and evaluation reports and focuses more on project milestones. While these reports are useful, there is limited critical engagement with the issues because of the literatures' narrow 'instrumental approach to knowledge and understanding' (Cleaver & Franks, 2008). Bakker (2013) recognizes that separate attention should be given

to rural water supply because the policies governing it are different and its analyses therefore point to ‘different technical and conceptual questions’.

An understanding of different experiences of water scarcity is important because it affects the view of users and policy makers on the most effective policies and interventions to address the water problems (Merrey et.al., 2005) . By providing empirical evidence that water scarcity is not a generalized and constant phenomenon and that local communities experience scarcity differently, this research helps to challenge the visions of scarcity by water resource management policies that tend to paint it as a generalised and homogeneous crisis.

THESIS OUTLINE

In Chapter 1, I lay out the research context and the research questions. I briefly present a theoretical and conceptual framework used to address the question of the influence of conceptualisations of water scarcity on water access. (The conceptual framework is discussed in more detail in Chapter 2.) I also establish the significance of the study in the country and in problems of water access in general. Chapter 2 discusses the water resource management approaches relevant to rural water supply and the different concepts about water that are used in the current rural water supply approach being critiqued in the study. The chapter also provides a background to water policy and governance approaches in the Philippines. In Chapter 3, I present the biophysical context of Agusan Basin as the wider context of the case study sites that I have chosen. I highlight here the heterogenous landscape within the basin that sufficiently influences the quality of water that is available for abstraction. I also discuss the socio-historical context of Agusan to illustrate the marginality of the area not only with regards to its physical distance from centres but also through the stereotypes and place-images that has been perpetrated by the dominant culture and used as an instrument in thePhilippine’s formation as a state and the state’s development agenda in Mindanao. The past socio-historical background contributes significantly to the current socio-economic status of Agusan and its people. In Chapter 4, I detail the use of mixed method research methodology with the ethnographic approach as the centrepiece supported by different methods (mapping, spatial analysis through GIS and water sampling) to gather various kinds of data to examine experiences of water scarcity in the three distinct rural sites. I also describe the challenges involved in researching in rural areas where water is inadequate.

Chapters 5 to 7 are the case study chapters. These chapters follow a similar structure. First it provides a biophysical description of the area, which is relevant to understand the kind of water resources that are available in each of the three landscapes. I also briefly discuss the population and socio-economic situation of the three villages to illustrate the setting of the socio-economic capacities of the people in the sites in dealing with difficult water access in their areas. The main discussion focuses on 1) how communities deal with the everyday experience of water constraints and 2) the water interventions that were implemented and the problems that villagers encounter with the water technologies installed. To close each chapter I analyse the reasons why low water access still persists in each area.

In Chapter 5, I present the first of the case studies from the uplands in the western side of the Agusan Valley in the village called Policarpo, where physical water scarcity is experienced. In Chapter 6, I examine the experiences of the lowlanders of Napo, Prosperidad, who have access to ample groundwater resource but its use limited by the quality of the water. In Chapter 7, I go to the lowest elevation of the Agusan Valley, the Agusan Marsh, where water surrounds the floating village of Panlabuhan, yet drinking water is a challenge.

In Chapter 8, the concluding chapter, I summarise the results by comparing and contrasting the different experiences of each site. I conclude the chapter by providing a summary of my analysis and findings and identify the key research contributions, the limitations of the research and grounds for future work.

Chapter 2

Water Resource Management: Concepts and Approaches

INTRODUCTION

This chapter is divided into three sections. The first section discusses the theoretical and conceptual framework of the study. The second section discusses the water management concepts of water scarcity, right to water and water governance which are pertinent in the examination of the experience of influence of conceptualisation of water scarcity in water provision in the case study sites in Agusan. The third section seeks to take into account the various viewpoints regarding the concepts and how it applies in the thesis. The section presents a brief overview of water resource management approaches that are relevant to the discussion of issues surrounding rural water supplies. It focuses on the forms of thinking informing these approaches when they were implemented. The following section localises the discussion to the Philippine context to see how worldwide trends in water management thinking are reflected in the country's management of its water resources. The discussion points out the issues and problems ailing the water bureaucracies.

THEORETICAL FRAMEWORK

In looking at the issues surrounding access to water by the population, I turn to two approaches - governmentality and political ecology as key concepts that help to answer the thesis questions.

Governing water flows and governmentality

The concept of governmentality was coined by Michel Foucault (1991a) in his works that look at the modern way of governing. He refers to governmentality to both the process of governing and the mentality of the government. Under this concept he defined government as the ‘conduct of conducts’ (Foucault, 1991a), or in Sokhi-Bulley’s (2014) words ‘regulation of behaviours’ by the government through deliberate means. Foucault argues that the modern way of governing is done not through sovereign power or through coercion, but by looking into the capacity of its citizens to act with the deliberate direction of the government. People ‘will do as they ought’ (J. C. Scott, 1995) because things have been arranged in certain ways so that people take it upon themselves to act for their self-interest. The expanded definition by Dean (1999, p. 18) captures the various elements of what government means under the concept of governmentality. He defines government as:

... any more or less [a] calculated and rational activity, undertaken by a multiplicity of authorities and agencies, employing a variety of techniques and forms of knowledge, that seeks to shape conduct by working through our desires, aspirations, interest and beliefs, for definite but shifting ends and with a diverse set of relatively unpredictable consequences.

With regards to the mentality of government, part of this mentality is to ensure the wellbeing of the population. Its purpose is the ‘welfare of the population, the improvement of its condition, the increase of its wealth, longevity, health, etc’ (Foucault, 1991a, p. 100). The concern for the welfare of the population extends to many aspects of its existence (Foucault, 1991a, p. 93). The concern for the welfare of the population extends to many aspects of its existence, including ‘men in their relations, their links, their imbrication with those other things which are wealth, resources, means of subsistence, the territory with all its specific qualities, climate, irrigation, fertility, etc.; men in their relation to other kinds of things, customs, habits, ways of acting and thinking, etc.; lastly, men in their relation to other kinds of things, accidents and misfortunes such as famine, epidemics, death, et cetera’ (Foucault, 1991a, p. 93). Given such a definition, the purpose of providing water in current times fit this aspect of peoples’ welfare.

Part of achieving this welfare for the population is the rationality that it is ‘the right manner of disposing things...the end which is “convenient” for each of the things that are to be governed’ (Foucault, 1991a, p. 95). Furthermore, the mentality of achieving the welfare according to Foucault is that is achieved in not anything more than is needed, which then requires certain methods of ‘simplification’ of things that are to be governed (J.C. Scott, 1998).

A government's means of regulating behaviours of the population is through what Foucault called 'technology of government'. Likening it to technology is done because this means of regulation takes on the characteristics of technology, which is made up of forms of knowledge and has various mechanical devices and various techniques to achieve practical outcomes (N. Rose, 1999). These technologies are said to be suffused with dreams and aspiration of the government in moulding the conduct in the hope of achieving desired effects and preventing undesired ones. The technology of government can be any among these 'modes of perception, practices of calculation, vocabularies, types of authority, forms of judgement, architectural forms, human capacities, non-human objects and devices, inscription techniques and so forth' (N. Rose, 1999, p. 52).

Among the technologies of government that relate to the study are 'technology of performance', use of manuals to direct desired outcomes and the 'technology of responsabilisation'. According to Dean (1999) the 'technologies of performance' are modes of evaluating through calculative means. This come out in the form of performance indicators - standards of safe water, proportion of households with improved water and by proportion of households receiving a certain level of service (fetching from a source or piped in). Scott (1998) alludes to these kinds of knowledge as the ones that require a 'narrowing of vision' to focus on certain aspects of reality. The narrowing vision involves a process of 'simplification' that standardises the conditions of people's lives in order to make them 'legible' or easy to make sense of. The second form of these technologies is the use of manuals. The rendering of elements of reality selectively is said to result in crude representation of the society's problem but at the same time produces the kind of knowledge that is receptive to 'careful measurement and calculations' which is desired in the modern statecraft.

Rural water design manuals are used by the Department on Internal and Local Government (DILG) among the staff of the government units and local government units and are accompanied with 'cascaded training' programs from the national, regional, provincial down to the municipal levels. These do more than guide 'the implementation of waters supply projects. This study shows that in fact the manual-based approach takes precedence over the observed environmental characteristics and community knowledge in determining the appropriate technology to enhance access to water in the rural areas of Agusan del Sur. Furthermore, with the recent trend of local government sponsored surveys in the form of

the Community-Based Monitoring System (CBMS), a massive array of household specific data (with georeferenced household locations) provides an opportunity for enriched and situated representation of the socio-economic status of individuals and households in the rural Philippines. However, despite the availability of detailed data, practices of simplification still persist.

The third aspect of these technologies is the ‘technology of responsabilisation’, a technique which reduces the scope of government’s work through making people become responsabilised by making them realize the social risks such as illness or poverty that can befall them if they do not act as they ought according to certain norms. In this way, the responsibility is transferred from the state to the domain of the individual.

Studying government programs is important because programs have effects (Li, 2007). Yet Li noted some scholars writing on governmentality look at questions about the effects of programs to be unnecessary. Rose (1999), for example, suggests governmentality studies to focus on the rationality of government in defining the problem that it sees as needing to be addressed and the strategies and techniques used to successfully accomplish the intended controls on the population. Foucault, (1991b) also looks at studies that enquire about what happened and why a government program failed as attempts to grasp the whole society and therefore being unnecessary. Li (2007) disagrees with both of these scholars and contends that including questions about the effects (what happened and why), things that are within the territory of ethnography, into the study of governmentality brings to light not only how programs change things but also how they digress from their intended results, its interactions with people and ‘sets of relations and processes’ that expose the limits of governmental interventions.

Rural water supply and political ecology

The success or failure of programs to decrease the disparity in access is also mediated by the social, political and ecological aspects of the area. Here the political ecology approach is useful to explore how at the receiving end of the water interventions people respond to these interventions in relation to the material realities of water in their area. A political ecology study ‘conforms to a specific mode of enquiry that identifies contextual sources of ecological change, questions of access, and political ramifications of environmental alteration’ (Bryant,

1992, p. 14). The aspects of the political referred to in this approach are the ‘practices and processes through which power, in its multiple forms, is wielded and negotiated’ (Paulson et al., 2004, p. 28).

I place rural water access at the centre of this political ecological analysis. With water access at the centre, its state can be linked with actions of, relations with, and decisions by a diverse set of actors such as the national government, the water bureaucracy, the local government and the citizens. I define access following Ribot and Peluso’s (2003) notion of it being ‘the ability to benefit from things’ which they differentiate from the rights perspective of the ‘right to benefit from things’. Ability, they argue, is similar to power in character. They define this ability/power in two ways: the ability of actors to influence the practices and ideas of others and power emanating from the person. Further Ribot and Peluso say that access can be brought about in various possible means for someone to benefit from things. These means or mechanisms include capital, social identity, technology, markets, knowledge, authority and social relations. These different mechanisms can be employed by themselves or in conjunction with the other types of mechanisms. It is a useful concept in analysing how people in particular rural environmental setting work out to improved water access when water interventions do not deliver as promised. As shown in the case study chapters the people use one or a combination of these mechanisms to improve their own means of accessing water and also to influence local government allocations in water interventions in ways that exercise their own power in a non-confrontational way.

Agnew (2011) acknowledges these practices of power and makes the case for the practical politics of water provision arguing that ‘politics is not about some idealized theory as often claimed in political philosophy but a practical activity’ (p. 7), or succinctly more of ‘who does what to whom for whose benefit?’ Kerkvliet (2013) provides a good characterisation of political practices along these practical lines that he calls ‘everyday politics’. Following Scott’s notion of ‘everyday resistance’ Kerkvliet argues that politics is part of daily life and ‘involves people embracing, complying with, adjusting to, and contesting norms and rules regarding authority over the production of, or allocation of resources and doing so in quiet, mundane, and subtle expressions and acts that are rarely organized or direct’(p. xix). In my research for example, the people’s contestation is evident in how the lowland villagers managed to force the local water bureaucracy to pour in more allocation to fix the questionable water technology installed by refusing to become members of the community water organisation that the local government had organised and likewise resorting to indirect criticisms of the failed water

system within the earshot of village councillors (see Chapter 6). It was also exhibited in how people of the uplands experiencing short periods of water scarcity, continue to practice open defecation against the advice of local health officials standards of 'clean communities', because they consider open defecation the best means to address daily need without using water.

A criticism of political ecology is one that points out that there is a bias in explaining environmental problems as political, focusing political control over natural resources and not how resources are affected by political controls (Vayda & Walters, 1999). The thesis is cognizant of this pitfall and therefore adapted the study to a geographical approach to political ecology which means analysis of the struggles over resource access and control give balanced attention to the 'nature or biophysical processes [that] play an active role in human environmental dynamics' (Zimmerer & Bassett, 2003, p. 3). This approach is important in the study to be able to provide empirical evidence for one of the main assertions, that water scarcity is socially constructed but also to show that true scarcity exists but is not a general condition and is time bound.

The study's attention to the materiality of nature allows it to show empirically demonstrate Swyngedouw's (2009) view that socio-environmental change is intrinsically a 'conflict-ridden process' because the improvements of the environmental qualities in one place lead to deterioration of social and physical conditions in another place. As shown in the wetlands case study, the wetland dwellers see flooding during the rainy season as a renewing mechanism for the wetlands and their fishing sites. This contrasts with the views of the lowland dwellers that see floods as destructive to homes and agriculture. In particular it presents the potential consequences to the wetlands and wetland community of plans to construct dams upstream of Agusan pushes through.

The use of 'empirical, research-based explorations to explain linkages in the condition and change of social environmental systems' (P. Robbins, 2004, p. 12) is a key methodological approach used in political ecology. This is because it has a high potential of uncovering the intricacies and nuances across different sites and scales that may otherwise be lost in the generalisations of discourses in development. This is also important because part of the drive of political ecology is to critique and explore the social and environmental changes in an area, with the understanding that there are very likely better, less coercive, less exploitative and more sustainable ways of doing things' (P. Robbins, 2004, p. 12).

WATER MANAGEMENT CONCEPTS

In this section I discuss specific water management concepts that are relevant in looking into rural water supply. These are concepts of water scarcity, rights-based water access and water governance.

Water Scarcity

Scholars, governments and media alike regard water scarcity as a worldwide challenge (Cosgrove & Rijsberman, 2014; Pereira, Cordery, & Iacovides, 2009; Postel, 2000; Rosegrant, 1997). Frequently, both academic and popular media have prognosticated of major crises, ‘impending doom’ and start of ‘water wars’ (Shiva, 2002). Their prognoses have urged the creation of numerous water scarcity indicators and global assessments that have classified countries at various levels of water security and insecurity. Criticism of these innovation has been the tendency to generalize conditions, that is to declare water shortage permanent, and dismiss various countries’ ability to respond to the challenges (Mehta, 2001). Perveen and James (2011) argue that different scales of analysis used in these assessments influenced the results of these scarcity models. Other criticisms of these world assessments focus on the naturalization of water scarcity, disregarding the possibility of ‘scarcity may be a social construct (a product of affluences, expectations and customary behaviour) or the consequence of altered supply patterns – stemming from climate change for example’ (UN-Water and FAO, 2006, p. 2).

Lautze and Hanjra (2014) note that using the water crises narrative as a means to rally support and highlight the urgency to respond may be justified. Mehta however argues that the scare tactics of a water crisis may be used by powerful groups to encourage support for ‘simplistic and inappropriate solutions that cause inaccessibility and perpetuate exclusions’. In such cases instead of improving access, it is further exacerbated. In many cases, the conventional visions of scarcity that focus on ‘aggregate numbers and physical quantities are privileged over local knowledges and experiences of scarcity that identify problems in different ways’ (Mehta, 2013, p. 2).

The International Water Management Institute (IWMI) has directed focus onto defining water scarcity from the viewpoint of the individual rather than on the hydrology of the area.

People are considered water insecure when they lack secure access to safe and affordable water that will consistently satisfy their needs for drinking and washing, food production and their livelihoods (Molden, 2007), further distinguishing scarcity as physical and/or economic. According to Molden, physical scarcity occurs when ‘available water resources are insufficient to meet all demands’ and economic scarcity occurs ‘when investments needed to keep up with growing demand are constrained by financial, human, or institutional capacity’ (Molden, 2007, p. 62). The distinction between different types of scarcity is important because it enables a thorough examination of the differences pertaining to scarcity. The economic scarcity definition cites inadequate investment in water in the developing areas of the world which limits water for human use (Rijsberman, 2006) Furthermore, it highlights a very important component of viewing scarcity; that is, the notions of access.

In the search for answers it is important to question how environmental problems such as scarcity are perceived by different actors and the extent to which their definitions are context-bound. There is a definite viewpoint advocating the need for empirical studies to examine the views of experiences and visions of scarcity in local settings.

Rights-based approach to water access

Since the 1990s, the rights-based approach to water was pursued to respond to concerns about development that might harm the ability of a person to enjoy water especially among the poorest households of the world. In July 2010 and subsequently in September of the same year the UN General Assembly and later the Human Rights Council recognized access to water as a human right (F. Sultana & Loftus, 2012). The water justice movement has celebrated the wins and subsequent declarations by some countries (i.e., Bolivia, South Africa, Ecuador, etc.) to recognize in their national laws, peoples’ right to water. However, there has been disappointment in the fulfillment of the declaration with some indicating that it has just become an ‘empty signifier’ (F. Sultana & Loftus, 2015). Bakker’s (2007) critique was focused on the rights-based approach’s shifting meaning which could mean any agreement between parties and as such could be an entry point for a corporation’s application for concessions in the global South. Others fear that while it may address issues of justice, it can be undermined by the concerns with efficiency and full cost recovery rationale in line with the Dublin Principle’s declaration of water as an economic good (UNDP, 2006) . The environmental justice literature provides another view about the right

to water as not necessarily 'uniform'. Schlosberg (2004) argues that the environmental justice movement defines justice, more expansively and recognizes the diversity of participants and their experiences. McLean (2007) extends this thinking in applying to rights of indigenous Australians to water, which does not demand the same kind of water provision as the urban dwellers but the kind of provision that acknowledges the different water culture of the Aboriginal people. In the wetlands chapter of the study, one can find the incongruous concept of water scarcity of the wetland dwellers and the mainstream vision of scarcity.

The launching of the Millennium Development Goals (MDGs) Programme in September 2000 set in motion the subsequent agreement of its 191 members states to combat poverty, hunger, disease, illiteracy, environmental degradation, and discrimination against women by 2015. The MDGs are said to offer straightforward solutions for example to decrease the number of people in the world lacking access to basic needs. A key rationale in the establishment of the MDGs was that the world today possesses the technology and knowledge to solve most of the problems faced by the poorer countries, but these solutions are not being used to address these issues at the needed scale (Millennium Project, 2014).

As a UN programme, the post 2010 implementation of the Millennium Project was said to be guided already by the standards of human rights in its programming. The human rights lens means a particular attention on the relationship of the state and the individual and how the state disposes of its duties to the individual (UNDP, n.d.). Achieving the MDG in water in the Philippines project focused on areas, both urban and rural, that have become marginalized by the current system of water supply provision. The Millennium Project provided the initial funds for these goals to jumpstart the process. This was done to encourage local counterpart funding to localize the efforts and funding to improve efficiency, access, affordability, and the quality of water services provided beyond 2015. World attention on these inequities has forced governments to act, and to act quickly.

To operationalise the goals in the Philippines, the national government identified municipalities and cities in the country that were considered 'waterless'. This mean that only less than fifty 50 percent of the households in a local government unit have access to safe water. In the Philippines, the upward trend in the achievement of its water targets is discernible through the percentage of the population with improved water access. The MDG UN team admits though that it still has to see the quality of the connections, which is about

whether improved access means safe water. Critics of the MDG efforts regarding water point out that by focusing on drinking water, agencies neglect other domestic water supply needs of the people.

Water Governance

The global endeavour to improve water access as a contribution to both poverty eradication and environmental sustainability has grown into a movement beyond the government's purview, involving the public and private sectors, civil society and citizen's groups and individual citizens. Given this plethora of actors' engagement in the management of resources, water governance becomes relevant when conceptualizing the processes that encompass the relations and activities established by the many actors in the water sector (Franks & Cleaver, 2007).

The concept of governance has been used in various ways -- sometimes carelessly -- within the natural resource management field. In some cases governance is perceived to equal government. But governance is more than government by the state; refers to various processes and arrangements through which decisions are made and carried out (Fisher, 2003). Water governance, on the other hand, is defined as 'the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society' (Rogers & Hall, 2003, p. 7). Three key aspects of water governance commonly found in the literature (Franks & Cleaver, 2007; Lautze, de Silva, Giordano, & Sanford, 2014; Tortajada, 2010) are: (1) processes engaged in decision-making; (2) processes that happen through institutions² and (3) the above two aspects engage different actors.

Lautze et. al. (2014) point out that the employment of water governance in various international development organisations' literature, especially when used in well known water sector paradigms such as water management and Integrated Water Resources Management (IWRM), has rendered it not only confusing, but has also undermined the crucial meaning of water governance. Water governance, rather than being a process to shape a goal, it is relegated to an instrument for preset goals.

² Here the term 'institutions' does not mean organizations (i.e. the government); rather it implies mechanisms, systems and traditions.

The application of the concept in this study focuses on looking at mechanisms. Mechanism here is described following Frank and Cleaver (2007) who provide an extended definition of the term to mean ‘particular specific arrangements for organising access to water’ (p.293). This, they say, is likewise shaped by the resources (material and people) and the outcomes (quantity, quality and timing of water availability).

APPROACHES TO WATER MANAGEMENT

Water resources development worldwide has changed in various ways since early civilizations’ efforts to control river flows, to reduce vulnerability, and to capture unpredictable rain. In many countries, the changing context of societies, such as population growth, changing standards of living, and the expansion of agriculture (Gleick, 2000), has paved the way for significant changes in the ways in which water resources are managed. This discussion focuses on the approaches employed in the twentieth century that become ‘mainstream’ and globalised paradigms in managing water resources. Today, water resource management is defined as ‘the study, planning, monitoring, and application of quantitative and qualitative control and development techniques for long term, multiple uses of diverse forms of water resources’ (WHO, 2009, n.p). A typology of these approaches is presented to situate rural water system in the broader framework of water resource management.

State hydraulic (a sectoral or techno-economic approach)

The twentieth century marked the growth of the modern society. In the modern world, populations were growing rapidly. As cities grew, agriculture become intensive and living standards changed, with water resource management becoming the dominant approach (Gleick, 2000) characterized by sectoral water development that placed emphasis on top-down, supply-focused approach. The water needs were defined by new standards of public health where reticulated water was hailed as the only way to secure hygienic water (K. Bakker, 2013).

The spread of this paradigm and the rise of a state hydraulic bureaucracy in the 20th century were driven by the visions of the ‘march of civilisation’ in the West, and the big countries in the East (China and USSR) through the damming of rivers for irrigation (Gleick, 2000). The state’s involvement was predicated upon ideals pertinent to the domination of nature,

enchantment with the ‘let the desert bloom’ ideal, and the creation of the lush gardens in water-deprived areas (Molle, Mollinga, & Wester, 2009). But, in addition to irrigation, there was also much greater demand for electricity. Not only were dams designed for agriculture expansion, and/or for reducing the damage inflicted by wild nature: they were also sources of power, changing the conditions of life in the cities. The spread to third world countries was ushered in during the postcolonial era. Newly independent governments were pushed into bringing development to their constituents. This was seen as crucial to the formation of the nation state, and to the legitimizing of its power (Molle et al., 2009).

Fuelled by this context, the ‘techno-economic approach’ (Both ENDS and Gomukh, 2005) or ‘sectoral approach’ became the dominant way of organising and securing supplies of water to society in general. Future demands were based on projected populations, industries and agricultural expansion (Gleick, 2000). Increasing demand was addressed through physical solutions such as building more capacity for storing water through dams and distributing it through long pipelines. This trend necessitated reliance on water engineering technologies and principles of economic efficiency. Planning and building were managed by a water bureaucracy dominated by technical and economics-oriented engineers, policy makers and state agencies (Molle et al., 2009). This approach, which went largely unquestioned for many years (Mollinga, 2008), was initially designed for North America and Europe. Its techno-economic design proved suitable for areas with high urbanization and industrialization, wherein demands for water and energy were centralized. But, the same approach was also widely applied in developing countries and countries in transition such Brazil, Chile, China, Guatemala, India, Malaysia, the Philippines, and Thailand.

This state-led approach was also described as a sectoral approach, due to the ways in which sectors of water resource development were managed separately. Sectors such as water supply, water quality, irrigation, hydropower, environmental water management, flood control, navigation, and recreation were managed by an assortment of departments and agencies, each one responsible for a specific water management objective. Each department or agency, which was established according to its own charter and activities, focused on its specific mandated tasks, and often hindering coordination between these institutions. Existing laws are often seen as inadequate to integrate the strategies for water resource development from each of the departments.

Ubiquitous monuments of this paradigm are the large dams, reservoirs, and aqueducts that capture, store, and move large volumes of freshwater runoff. Its benefits were evident: they ensured that big cities and urban areas off-site were the main recipients of these diversions of water and electricity. Most dams were built in the rural areas; the communities adjacent to the dam sites bore much of the costs of dam development. Massive populations were displaced from their villages and usual livelihoods, forced to resettle in new settlements and to learn new ways of earning a living. Ecological costs included the extinction of species (especially fish), contamination of water sources, disruption of ecological processes, and environmental degradation (WCD, 2000; Biswas, 2004)

Privatization of water

Water supply provision under this paradigm was centralized and state led. The requirement to increase its attention to the various costs to communities, ecology and environment placed the state in a position that tested its capability to address the country's increasing water needs, environmental costs and the increasing financial costs in operation and maintenance.

In 1990, a surge of privatisation of the water sector occurred in the water utilities in many parts of the world. This was the time when the state's capability to address the increasing water needs and environmental costs and its ability to fund the increasing costs of operation and maintenance were subject to question (Bakker, 2005). Two reasons were used to push the privatisation agenda: (1) the 'state failure' hypothesis depicting states as unproductive, inefficient, and ineffective (Bakker, 2005); and (2) the fiscal hypothesis that claimed that privatisation would ease the task of investment financing, especially in the world's developing countries that had monetary constraints (Araral, 2009). It was further argued that the private way of managing would improve the performance of water utilities. This mode of resource management was introduced -- captured in the term 'market environmentalism' -- as a mode of resource regulation that promised to meet both economic and environmental aims through market means (Anderson and Leal, 2001).

The entry of public good into the private interests for profit debate was also criticised as an 'accumulation by dispossession', the enclosure of public assets by private interests for profit, resulting in greater social inequity (Harvey 2003)

Supply driven to integrated thinking

The environmental movement in various countries in the late 1960s and early 1970s was instrumental in slowly changing perspective of the traditional approach to water management (Gleick, 2000). Growing opposition to construction of big dams saw major projects in developing countries either stopped or delayed due to the opposition from local groups (Cernea, 1988; World Bank, 1993). The legitimacy and effectiveness of water management, which was usually in the hands of top-down institutions, was increasingly being questioned. The increasing calls to incorporate ecological values into water policy sparked a shift from primary reliance on finding new sources of supply to addressing perceived new demands, and growing importance was given to meeting basic human needs for water services (Gleick, 2000). During the period 2000 to 2002, major international water fora brought these growing concerns to the world stage. One of the key reports for the 2nd World Water Forum convened in The Hague in 2000 featured the following important statement: ‘The world water crisis is a crisis of governance – not one of scarcity’ (Cosgrove & Rijsberman, 2014). Furthermore, the report stated that water resources had fallen into jeopardy due to ‘bad institutions, bad governance, bad incentives, and bad allocations of resources’. Much of the report cited governance as a key aspect of the shift. Governing water wisely would ‘...ensure good governance, so that the involvement of the public and the interests of all stakeholders are included in the management of water resources’. The concept of Integrated Water Resource Management (IWRM) appeared prominently in the outline of how challenges should be met.

Integrated Water Resource Management (IWRM) The Global Water Partnership has been the main institution to promote the IWRM approach. It has defined it as a ‘process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems’ (Global Water Partnership Technical Advisory Committee, 2000). Integrated management of IWRM means that all the different uses of water resources are considered together in contrast to the sectoral development of the traditional approach. Water allocations and management decisions take into account the effect of each usage on the others. Furthermore, IWRM takes into account the overall social and economic goals, including the achievement of sustainable development. Grigg (2008) identifies eight domains in which integration can happen namely:

policy sectors, water sectors, government units, organizational levels, functions of management, geographic units, phases of management, disciplines and professions. While Biswas (2004) conceded that the concept of IWRM is attractive, it can become bogged down by nebulous meaning, resulting in minimal agreement on fundamental issues. Furthermore, Biswas opined that the description of IWRM in itself shows the complexity of the approach, which struggles to discern how people understand its different facets which can mean different things to different people.

Integrated River Basin Management (IRBM) The World Wide Fund for Nature is the main organization promoting the IRBM approach. WWF provides a definition that is based on the definition of IWRM with slight changes. IRBM is defined as ‘the process of coordinating conservation, management and development of water, land and related resources across sectors within a given river basin, in order to maximise the economic and social benefits derived from water resources in an equitable manner while preserving and, where necessary, restoring freshwater ecosystems’ (Jones, Newborne, & Phillips, 2006, p. 5). This approach also resembles what is used in the Philippines. The key difference in these definitions is the spatial and ecosystem focus of IRBM, which highlights and espouses the hydrological unit (those of river basins or sub-basins) as the best scale to implement sustainable water resource management. It also integrates into its approach a further key element, which is the maintenance of functioning ecosystem services.

The water basin is espoused as the suitable water management unit primarily because its proponents cite its boundaries as clear and naturally delineated (White, 1957) and therefore as the logical unit under which the water management is to be arranged (Newson, 1997). However, many scholars question the naturalizing of the water basin/watershed as a management unit. Among the views that cast doubt on this perspective is one that discredits the natural logic because in fact it is not that easy to delineate the basin boundaries on the ground (Mostert et al., 1999) because some of them are linked to river basins especially in the lower and flat reaches of the river. Scholars such as Warner et. al. (2008) posit that choosing to manage water as a river basin places it in the realm of the political and is as much political as it is natural. If this is so, questions of ‘who makes decision and how’ in the homogenised water management unit are important. According to Venot et. al., the river basin is not a space of engagement yet for many actors to participate because it has not yet acquired social reality, The conflation of the basin approach with other governance tools (i.e. integration and

public participation) and with the Integrated Water Resources management (IWRM) is also what fuels the difficulties of implementation of the watershed approach (Cohen & Davidson, 2011).

Negotiated Approach The negotiated approach, which is an alternative to IWRM, highlights the creation of space for negotiation vis-à-vis defining river basin management options, including local stakeholders. This is a key approach within the water diplomacy initiative and the approach looks at existing local practices and knowledge of integrated land use and water use as the basis for expanding to a wider scale (Islam & Susskind, 2012). The role of local actors is to help develop strategies that are relevant to their specific context (Both ENDS and Gomukh, 2005). In such contexts, the approach recognizes the important links between people and the environment, but also heeds the functions served by the specific river basins it intends to manage and their relevance to a larger basin management framework. NGOs like Both ENDS and Gomukh working on water management in Asia support this approach, presenting it as an alternative to the conventional integrated water resource management or integrated river basin management (Both ENDS and Gomukh, 2005).

Nevertheless, there has been a paucity of evidence of these kinds of efforts at least in the Southeast Asian region. In documentation of local level efforts in water management that exhibited the qualities described by the negotiated approach in the Mekong Region, findings show that there were hardly any examples of what could be considered to be negotiation between communities and river basin authorities (P. Hirsch & Wyatt, 2004).

In the Philippines, the forest land use management efforts at the municipal level may be seen to be couched under this approach. Examples show how the forest land use planning and implementation efforts have been utilised to help communities within the municipalities negotiate for better financial support for their activities, from provincial and regional environment authorities that are in-charge of watersheds that have been designated as protected sites (Wao, 2004).

WaSH The water sanitation and hygiene sector previously have seen the different services treated as separate services. They eventually became grouped together because the effects of the inadequacies in each significantly overlap and therefore it was logical to address them

jointly to have stronger impact on public health (Harris et al., 2011). However, even within this WaSH framework it was the water sector that often receives more funding support. Only during the United Nations' International Year for Sanitation (2008) when more pressure was put on national governments and funding was increased from various international aid agencies did sanitation coverage catch up with the water access achievements (Harris et al., 2011). Currently at the global scale, various emerging initiatives focus on the appropriateness of technologies and addressing sustainability in different ways. Among these is the Rural Water Supply Network's approach which treats sustainability from an appropriate methodology point of view. The organization has processes and tools that help assess the applicability and ease of introduction of various technologies in various contexts. UNICEF on the other hand, has sustainability compacts with national governments to address sustainability issues. They have developed a checklist to gauge whether social, technical and financial aspects are taken care of by the national governments. The World Bank as a grant and loan institution has focused its efforts in ensuring collaboration of its efforts with the national governments and also with the lower levels of government. Coupled with this collaboration focus, is their advocacy for government units to view services as not only one time assistance but long-term process to ensure sustainability of interventions.

Mehta and Movik (2014) view these efforts to be salient and relevant in the work towards increasing coverage and keeping them, however they believe that consideration of the social dynamics should also be improved. By this they mean that implementers of interventions should also be attentive to the power relations that exist in areas where interventions are installed. This also means different groups in the community have different views of the value of the services installed and this may impact on the sustainability of the technology. Taking it further, Mehta and Movik argue that approaches that take into account 'social, technological and ecological dimensions of complex, dynamic water systems' (p.374) needs to be developed. They view that this not only addresses sustainability but also better ensures that the poor are able to access water. This view was in the direction of what the Overseas Development Institute (ODI), an international development and human development organization based in the UK, developed a guidebook for the political-economic analysis of sanitation service for donor project staff. This kind of endeavour has arisen from the understanding that present problems in access to water supply and sanitation are influenced by poverty, power and inequality (Harris et al., 2011). Using the guide could potentially help donor staff to identify knowledge gaps and correct unjustified project assumptions that are

held by the project staff. This helps in the reflexive process of a project and helps in identifying projects entry points that are more situated to the place.

The study by Sultana (2013) shows the effect of the social in the adaptation of the technology or the social constructiveness of water technology in the context of water tubewells in Bengal Delta. While in the past, tubewells had successfully provided people with clean water in the Delta, they are now the chief means of bringing up unsafe levels of arsenic from the ground. Yet despite its damaged image as a savior technology in the villages, people still continue to utilize arsenic contaminated water from the tubewells, showing the power of the view of people on a particular technology.

The WaSH statistics for the Southeast Asian region based on 2012 data show 89 per cent coverage in water access and 71 per cent in sanitation(United Nations, 2012) . There has been significant progress of the program in improving access to water and sanitation in the low and middle income countries, but considerable work still has to be done to the uncovered sections of the population. Cronin et. al. (2015) outline the agenda and strategy at the global, regional and national levels. At the global level, the strategy is to have the remaining work taken up by the Sustainable Development Goals (SDG) Program of UN which aims at to make water and sanitation available but also to ensure its sustainability. One of the key objectives in the SDG is to also gather high quality data that will provide evidence of safe water not only of access. In the next section, I discuss the context of the Philippines in the light of these concepts and water management approaches.

PHILIPPINE WATER MANAGEMENT

The first water system in the Philippines was established in Manila by the Spanish colonial government in 1878 (Blair & Robertson, 1903b). It later came under US management when the Spanish government ceded the Philippines to the Americans in 1898 (World Bank, 2003). In line with the colonial relations of the Philippines with the United States of America, water supply development followed the American model, which mirrored the dominant world approaches. The Philippines's supply-focused management followed the world dam building frenzy of the 1960s. Large dams constructed for various purposes, such as domestic water supply, irrigation, hydroelectric or a mixture of these, were constructed between the late 1960s and 1970s, and in the early 1980s. But, in the wake of state dam projects, thousands of

Filipino families were physically, economically and emotionally displaced. Homes and properties were destroyed and householders left uncompensated. Similar to other dam construction projects the state building process was accompanied by harassment and human rights violations. The government instructed the military to force communities into accepting the state's dam projects.

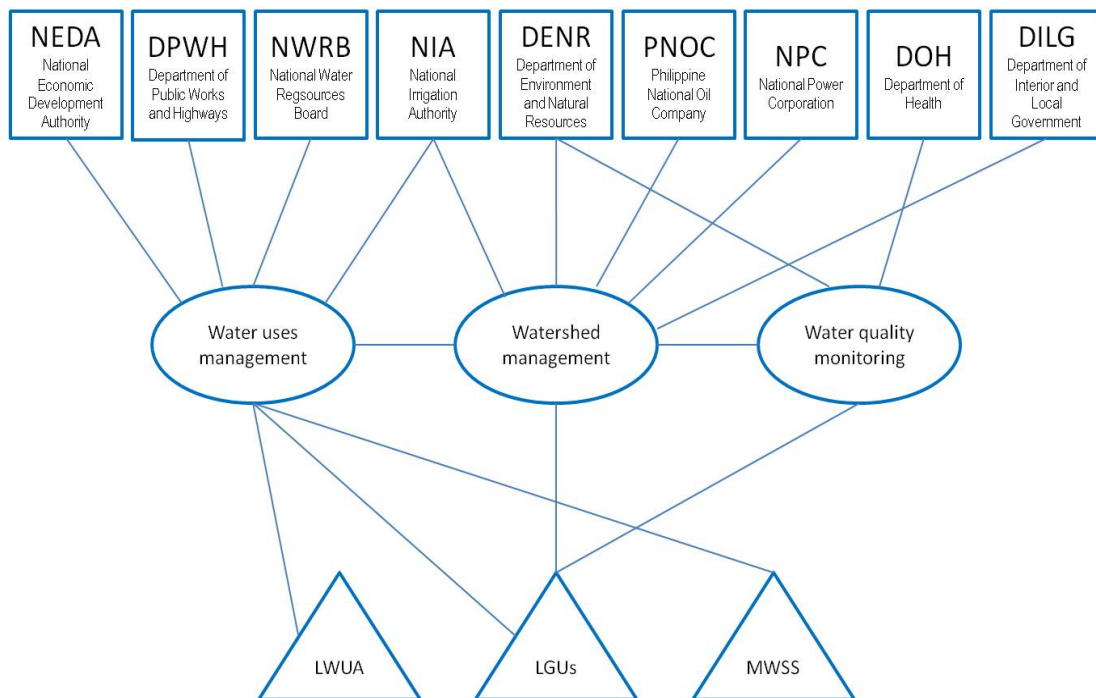
One noted example of local resistance was the case Macliing Dulag, a leader of the Kalinga tribe of the Cordillera Region in the Philippines. Dulag was instrumental in forming a peace pact between the warring tribes in Cordillera to unite against the World Bank-funded dam project, a pet project of former President Marcos (Doyo, 2015). The project would submerge three towns in Mountain Province and five in Kalinga. Parts of the Kalinga peoples' ancestral lands, rice fields, farms, forests, hunting grounds, water sources, natural orchards and burial grounds were earmarked for submersion. Dulag died in 1980 at the hands of government soldiers who open fired on his house. The death of this indigenous people's leader became a worldwide controversy which forced the Marcos government to abandon the Chico Dam project and succeeding dam initiatives (Remollino, 2009).

Fragmented water sectors

Philippine water resource management is highly fragmented with 30 agencies of the government managing various water-related mandates (NEDA,2010) . The different sectors of water management include the following: coordination/regulatory, water quality and sanitation, watershed management, integrated area development, data collection, research, cloud seeding, water supply, irrigation, hydropower, flood management and ports and navigation. The government units involved in water management can be divide into water supply agencies and the water resources-related agencies whose responsibilities influence water supply provision (NEDA, 2010) . Figure 2.1 maps out the different agencies and their involvement in particular water management responsibilities.

Most of these agencies prepare their own plans and seldom coordinate their activities. While laws support the establishment of these offices, in most cases the institutional structures are weak. As a consequence, these agencies tend to underperform their tasks. For example the National Water Resource Board (NWRB) plays a crucial role in coordinating policies, programs and standards relating to the Philippine Water Sector as well as managing and regulating all water-related activities and managing the regulating and monitoring of water utilities . However, the one NWRB office is inadequately staffed, and the existing staff are mostly inexperienced in utility operations. As the water regulatory arm of the government, the NWRB is responsible for water resources management planning (United Nations Economic Social Commission for Asia the Pacific, 2005). In 1998, the agency, with the assistance of the Japan International Cooperation Agency (JICA) drafted the National Water Resources Management Master Plan (JICA-NWRB, 1998). This saw the country divided into twelve water resources regions. Despite its national level status, the agency had very little influence on the management of the water resources regions.

Figure 2.1: Water Related Agencies in the Philippines



Source: Adapted from Elazegui, 2004

The primary agency that has direct jurisdiction and mandate over areas reserved for ensuring water yields is the Department of Environment and Natural Resources (DENR). After the American period of colonisation, water sources have been protected by declaration of

portions of the public land as watershed reservation. Most of these areas are located in the upper reaches of catchments. The DENR is also in charge of the public lands, which account for approximately 55 per cent of the total area of the Philippines. The Presidential Decree (PD) No. 705 or the Revised Forestry Code (PD 705, 1975) legislated that parts of the public domain may be declared for specific uses, such as watershed reservation as deemed necessary through presidential proclamation. As of 2013, there are 114 declared water forest reserves covering approximately 1.3 M hectares (Bureau, 2013). In contrast to the NWRB, the DENR has offices at different levels that is regional, provincial and field offices. However, its watershed management activities lack focus and often observe token implementation of its responsibility only. From among the watershed forest reserves, PD No. 705 provided the definition for a critical watershed viewed in relation to downstream infrastructure facilities present in a particular watershed. Protected status is given to critical watersheds by prohibiting commercial logging and grazing operations therein.

The passing of the Local Government Code in 1991 (Congress of the Philippines) introduced a new actor into water management. Under this law, the responsibility for delivering the basic services including personnel, assets, equipment, programs and projects was transferred from the national government to local political units. Among these responsibilities was the transfer of the primary responsibility for water supply, sanitation, and environmental management to local governments. The law also allowed Provincial Local Government Units (LGUs)³ to elect through a resolution to establish water districts that can serve one or more cities or municipalities. Water districts and LGU operated water systems often serve the urban areas or the more densely populated areas of the local government units. Generally speaking, in the rural areas it is the local government unit that operates village water systems. In the less densely-populated areas, that are characteristic of many of the rural areas of the LGU, most of the water supply consists of well springs and communal faucet systems. These water systems, which are operated by the village or Barangay Waterworks and Sanitation Association (BAWASA), are established with the help of municipal and provincial local government units. The Department of Public Works and Highways (DPWH) provides the engineering and construction activities for these systems. The water quality monitoring function is at the discretion of both the water districts and the LGUs.

³ The term LGU refers to administrative units at the provincial, municipal/city and barangay (administrative village) levels. Within the barangay the terms purok or sitio refer to hamlets.

Privatization of Manila's water supply

Manila's water supply is one of the largest water privatization projects in the world. This eventuated because studies indicated that the growth of national demand for water would grow by an estimated 75 per cent (Buena, 2008). The Metropolitan Waterworks and Sewerage System (MWSS) was in bad shape at that time, with only a third of the metropolis population able to access water 16 hours per day. The remainder had to buy vended water, which cost considerably more than reticulated water (David and Inocencio, 1996). In 1995, President Ramos was given emergency powers to deal with the crisis. The National Water Crisis Act of 1995 gave the president one year of emergency power. The deteriorating MWSS infrastructure and services was put further to test with the intense El Nino the country experienced in 1997. This was the final ingredient that precipitated the privatization of MWSS that year. However, as Cheng and others point out, these events were simply benchmarks signalling the tide of neoliberal reforms (Buena, 2008; Cheng, 2013) that was sweeping the world at that time. These reforms, which started with allowing entry of the private companies into the public infrastructure, were sealed with the signing of the Build, Operate and Transfer (BOT) law during the previous administration of Corazon Aquino.

The privatization of Manila's water supply was one example of the use of crisis narratives that pervaded discussion of water provision in the Philippines. The term 'impending water crisis' has repeatedly been the core rationale for the numerous water-specific policies implemented in the Philippines since 1972, including the 1995 National Water Crisis Act which paved the way for the privatization of the Manila waterworks. The most recent reference to the water crisis narrative was through the ADB report titled 'Asian Water Outlook' (2013) which cited the Philippines as one among Asia's most water insecure countries. The Philippines mass media (broadcast, print and online) carried the water crisis message showing images of people lining up for water and dam water at critical levels. The widespread media coverage it garnered influenced the public into thinking that the water crisis occurs uniformly across all of the Philippines, ignoring that differences of experience may exist between urban and rural contexts. Forsyth (2003) notes that media help to entrench hegemonic narratives. This can be applied to issues such as the inevitability of water scarcity due to increasing population numbers. In looking at water scarcity, Mehta (2001) advises to critically examine these narratives. There can be 'manufactured' scarcity raised in public and development discourse, that naturalizes, universalizes and paints it as permanent

phenomenon ignoring its cyclical nature. Conflating water issues in the urban and rural areas obscures the real scarcity happening in a particular locality. This view does not help to mitigate the symptoms and causes appropriately.

Urban and rural supply management

Historically, the management of the water supply in the Philippines has transferred hands from local to national and back to local arrangements since the end of the Second World War (1945) (Robinson, 2004). At the time, water supply systems were government-owned and managed by local authorities. Owing to the tropical weather in the Philippines and resulting dependable rain, groundwater availability was high in many areas. But, investment in water supply was significantly low relative to overall public infrastructure spending. The bias directed towards Metro Manila and other urban areas may be attributed to the particular orientation of the public infrastructure priorities of the national government, and the lack of a rational financing framework for the water supply sector (Ibon, 2011).

The National Waterworks and Sewerage Authority (NAWASA) was established in 1955, subsuming its precursor the Manila Water District⁴. The aim was to centralize the country's waterworks, sewerage and drainage systems. But, one of the results of this move was that development focused mostly in Metro Manila to the disadvantage of the outlying municipalities (World Bank, 2003).

In 1971, NAWASA was dismantled. Subsequently, the MWSS was established through the mandate to take charge of Metro Manila and nearby urban areas. Under this setup the provincial and municipal water supply systems once more became local government responsibility. At the time, existing water supply systems were in a state of disrepair due to the lack of local capacity and funds required to maintain them.

The extent of the problem was recognized by the central government. A solution was brought forward through the passing of the PD 198 or the Provincial Water Utilities Act of 1973 which created water districts and the Local Water Utilities Administration (LWUA). Water districts were conceived of as semi-public corporations operating outside of local

⁴ The Metropolitan Water District was established by the Philippine Legislature in 1919 to operate the Manila Water Works (MWSS, 1978).

government units, ostensibly to take care of a province's urban water supply. LWUA was created to provide technical assistance, financing and promotion of water districts. LGU had a choice to establish a water district that will manage its own water supply. In 1980 this system was subdivided to have not only an urban, but also a rural focused arm, the Rural Waterworks Development Corporation (RWDC). The RWDC had a similar mandate to the LWUA. But, it created rural waterworks association, a scaled-down version of the water district to serve rural centres and small towns(World Bank, 2003). In 1987, this system was abolished and the waterworks under its assistance were passed on to the LWUA.

Decentralization of water management

Decentralization was considered a major breakthrough in the administration of local governments in the Philippines (Brillantes & Moscare, 2002). The Local Government Code (Congress of the Philippines) paved the way for the decentralizing of functions of the state that used to be mainly decided and implemented by the central government. The local government code mandated the sharing of responsibility in government administration among the different levels of government units (national, provincial, municipal/city and barangay). This extended to the provision of the basic services such as water supplies, sanitation, and flood control, responsibility for infrastructure facilities such as waterworks, drainage, sewerage and irrigation systems, and in the enforcement of sanitation and potable water-related laws.

The Code assigned specific roles to different levels of local government units relating to water. The barangay's task was to maintain roads and bridges and water supply systems. At the level of the municipality and the city, responsibility centred on the building of infrastructure facilities that would be financed through city/municipal funds. These facilities includes small water impounding projects, artesian wells, spring development, rainwater collectors and water supply systems, seawalls, dikes, drainage and sewerage, flood control, inter-barangay irrigation systems, and water resources utilization and conservation projects. The provincial LGU mandate was accountable for infrastructure facilities designed to serve the needs of the residents, and financed by provincial funds, such as inter-municipal waterworks, drainage and sewerage, flood control, and irrigation systems. The 1991 Local Government Code also mandated LGUs to undertake watershed-related activities that once were confined to community-based management, social forestry and watershed projects.

In natural resources management (which is under DENR), there was only partial decentralization (A. Brillantes, 1996). Although the law stipulated that the LGU be held responsible for environmental management, the authority still remained with the DENR. A very insignificant percentage of its personnel and budget was devolved to the local government (Manasan, 2002). Elazegui et.al. (2001) point out that this stemmed from central government's doubts regarding the capability of the LGU. It was fearful that the management decisions would become hostage to politics. The unclear, limited, and overlapping mandates of DENR and the LGUs have caused tension leading to a stalemate in terms of on the ground natural resource management (Elazegui et al., 2001). In short, the law decreed that the local government units would assume watershed management roles, but remain subject to DENR supervision and control.

IWRM in the Philippines

As the history of water supply management in the Philippines reflects, there have been numerous reforms that sought to improve its management. These reforms were cognizant of the need for integrated management of the country's water resources in the context of population increase, environmental degradation and changing climate that threaten the quantity and quality of water resources. With the problems in the efficiency and effectiveness of managing of the water in the Philippines it is logical that IWRM presents an attractive approach. In 2009, through an Executive Order of the President of the Philippines, the River Basin Coordinating Office (RBCO) was created as the oversight agency for the government's projects and initiative vis-à-vis the country's river basins. It took over the coordinating role of the NWRB. To date, the ADB has assisted to draft plans for five of the major river basins (Paragas, 2012). Various water councils and water quality management boards have been established. Legislating IWRM as a primary means to managing water has troubled scholars in water governance, cautioning about IWRM becoming an end in itself (Giordano & Shah, 2014), as a 'nirvana' principle (Molle, 2008), and accompanied by particular prescriptive principles and accompanying bureaucracy mostly supported by donor funding and international organisations (Tortajada, 2010). Their apprehension lies in the implementation of IWRM, such as the institutionalisation of new representation in the form of catchment agencies which in some cases have undermined functioning water management systems (Butterworth et al., 2010). Often these new catchment agencies struggle to established legitimacy. In some instances, IWRM is feared for becoming a tool to mask other agendas

(Giordano & Shah, 2014) that are not readily acceptable to the general public, dam building for example. The snail's pace application of the concept has been attributed to its lofty and unwieldy aims (Butterworth et al., 2010) which may be reduced to a little more than a buzzword (Jønch-Clausen & Fugl, 2001) in the countries that are subscribing to this approach.

Despite this foreboding view of IWRM, some scholars see some promise in the concept as a way of integrating the fragmented ways in which water has been managed. Butterworth et al, (2010) allude to lighter versions of the approach which, they claim are actually present. This lighter approach 'that focuses on the quality of the connections between the system's constituting/constitutive elements', refers to actions that the local groups take when responding to water scarcity, for example and how they draw upon their own accessible networks in order to address the problem. One example of a nationwide effort along these lines was the forest land use planning implemented by local governments in the Philippines. These activities utilised minor sub-catchments within the municipalities or cities in tandem with the usual village boundaries, as planning units, cognizant of various integrated resource management concepts. This was also undertaken by the DENR staff, who participated in the process. The crucial outcome of this assistance was a legal agreement between the LGU and the local DENR to implement the plan. This, in a way, resembled the negotiated approach to integrated management discussed earlier in the chapter.

CONCLUSION

In this chapter I have discussed key concepts relevant to examining issues in water resource management. I describe major water management approaches. In the second section of the chapter I present the Philippine context in with particular focus on the policies that have paved way for some of management approaches to be applied in the Philippines. The brief third section deals with the concept of governance and theory of access.

The next chapter describes the context of the research sites.

Chapter 3

Context: The Agusan Waterscape

INTRODUCTION

This chapter aims to situate the three case study sites in three different contexts: the Agusan River Basin and its water resources; the history of the area and contemporary Agusan; and the existing water governance structure of Agusan del Sur.

The first section presents the context of the Agusan River Basin, where I discuss the rationale for differentiating between three landscapes to examine the different meanings and experiences of water scarcity. The biogeophysical discussion of the Agusan Basin that follows is intended to demonstrate the complexities of water resources of the area brought about by the seasonal variations in the rainfall and river flows as well as distribution of groundwater that is tainted with less than ideal quality of water for drinking.

The second section presents a history of Agusan that traces why despite its early prominence in pre-colonial economy and trading, it finds itself in the fringes of contemporary Philippine economy and human development. It points out how both colonial and then Philippine state power has looked at Agusan as a mere entry point to penetrate and gain control of the Mindanao region. Programs promoting migration to Mindanao enabled the state to claim that Mindanao had a heterogeneous population and therefore was less likely to demand secession. However, this process also displaced the indigenous population of Agusan valley. Resource extractive industries such as logging were pushed in Agusan with very little local processing industry existing and therefore made very little impact on the development of basic services in the area (i.e. drinking water and sanitation, roads, etc). The issues of land tenure for the indigenous population and the marginality of the case study sites can be partly

blamed on these programs. The resulting political landscape of Agusan is characterised by the control of a family which benefitted from the logging industry.

The last section presents the structure of the local water bureaucracy of Agusan del Sur. Here the structure established through national government assistance is described to provide the context of the programs that have been implemented. The water supply projects are mostly managed by the local water districts and the provincial government with the municipal government in supporting roles.

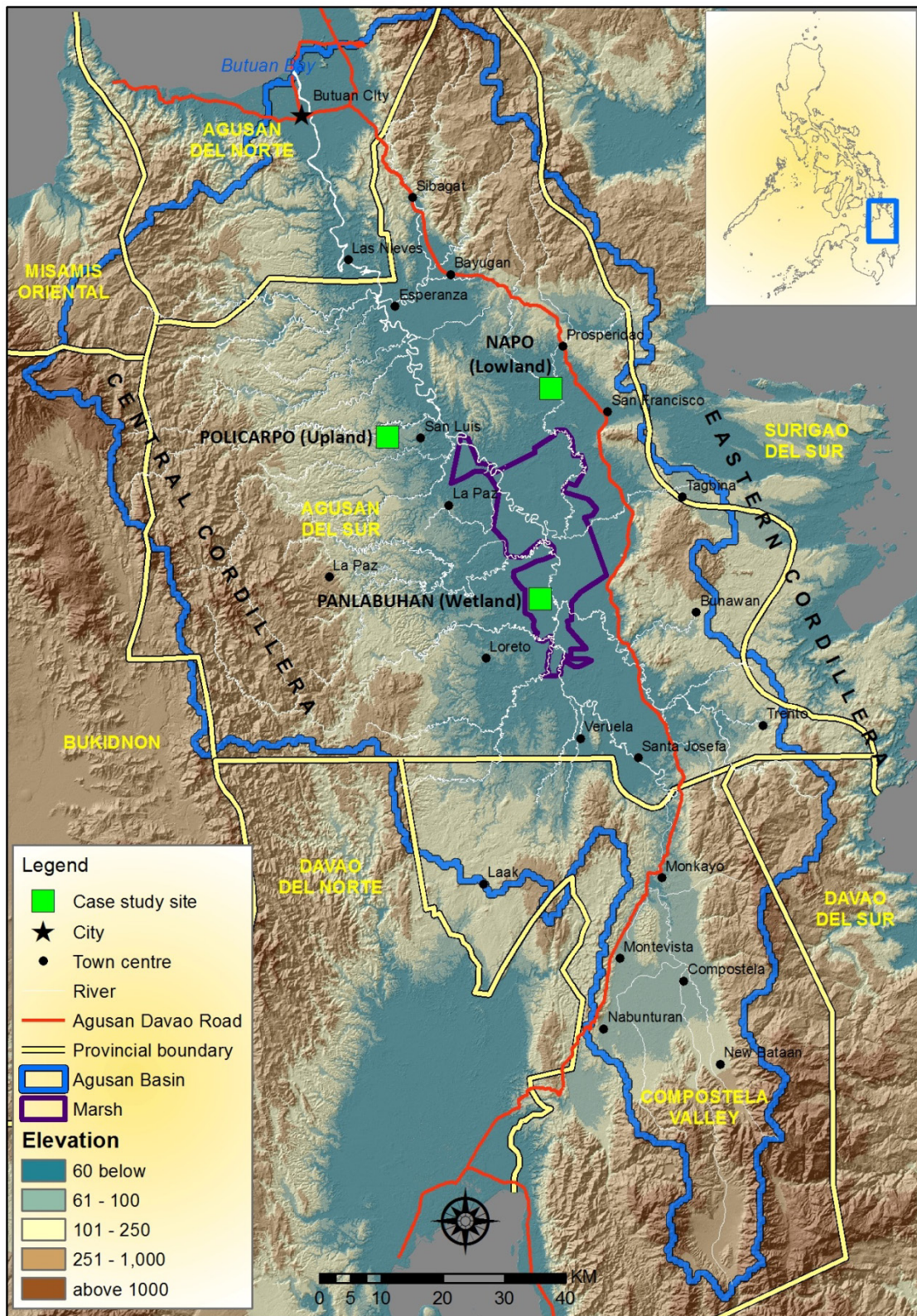
Presenting water in various contextual environments such the biophysical and historical, helps in being able to think about the current water regime in Agusan as a product of the interaction of the water and social relations, power and structures in the area. In analysing water-society relations Linton and Budds (2014) propose the hydrosocial cycle, as a concept that thinks of water as not only a product of the hydrologic cycle, but as having a social and political nature. It contends that the hydrosocial cycle is ‘a socio-natural process by which water and society make and remake each other over space and time’ (Linton & Budds, 2014, p. 1). Further it is argued that by ‘unravelling this historical and geographical process of making and remaking offers analytical insights into the social construction and production of water’ (p.1). Linton and Budds attribute the lack of access to drinking water in developing countries being not necessarily just due to immediate scarcity or too much population or low technological inputs but more due to the way it is organised or managed. This concept is couched in the understanding within anthropology and associated fields, that water and people are not only connected in a material way but also through experience and culture.

PHYSICAL SETTING OF THE AGUSAN BASIN

General Description

The Agusan River is a dominant physical feature of the northeastern section of Mindanao Island in the Philippines. Three hundred kilometres in length, it meanders through the provinces of Compostela Valley, Agusan del Sur and Agusan del Norte, flowing northward and exiting in Butuan Bay (Map 3-1). The Agusan Basin, which is characterised by wide

Map 3.1: Location of Agusan Basin



Source: DEM from NASA-JPL; municipal boundaries and Agusan Marsh shapefiles from the Agusan del Sur-ENRO.
Cartography: Author

alluvial plains, is flanked in the east and south by the Pacific Cordillera and in the west by the Central Cordillera. The Agusan plain is low lying with very little differentiation in elevation across the valley except for some low hills interrupting the central section with elevation ranging from 60 to 100m (ADB, 2011). In southern section of the Basin, elevation reaches to 2,500 metres above mean sea level (amsl) and around 1,700 metres in the west (CTI-Halcrow, 2008).

The city of Butuan in Agusan del Norte, which I will refer to as the gateway, hosts the only airport in the river Basin. Maharlika Highway connects Butuan to the adjacent provinces of Misamis Oriental in the northwest, Surigao del Norte in the northeast, Compostela Valley in the south, and Surigao del Sur in the east. Agusan del Sur province, which is the focus of this research, is an inland province that occupies 65 per cent of the entire basin. Located in the middle stretch of the basin, it is the largest province in the region in terms of area, covering approximately 900,000 hectares. Agusan del Sur is part of the administrative region of Caraga, which is comprised of 5 provinces namely: Agusan del Norte, Agusan del Sur, Surigao del Norte, Surigao del Sur, and the Dinagat Islands.

There is a great abundance of water in Agusan. The term *agusan*, which is cognate of the local tern *agasan* meaning ‘where water flows’ (Primavera, 2008), may signify the massive floods that are an annual occurrence in the area varying only in degree of severity. Spanish historical documents dating back more than a century employ the term *continuas inundaciones* (continuous flooding) to describe the weather conditions in Agusan (Schreurs, 1981). The flooding that occurred during periods of torrential rain in the period from December to February resulted in shifts of whole towns, for example Butuan in 1861 to its current site, and Bunawan’s relocation in 1877 (Schreurs, 1981). Today, the wetlands located in the middle section of the Agusan River Basin, commonly known as Agusan Marsh, add to this watery image, accounting for approximately 15 per cent of the country’s freshwater resources (CARBDP-PMO, 2003). This wide natural depression, which accommodates the excess water that spreads laterally from the main Agusan channel, serves as a flood retention basin, minimising peak discharge to downstream areas during flash flood events (CTI-Halcrow, 2008). Agusan Marsh was legislated as a protected area in 1992. In recognition of its unique ecosystem that supports diverse wildlife including endemic species of birds and flora, it has been included in the list of Ramsar wetlands of international importance. However, images

of excessive water dominate the imaginary of Agusan, masking the periods of drought and water scarcity revealed in the experiences in the different rural sites under scrutiny.

In earlier times, natural resource extraction was a key driver of the economy in the Agusan Basin. Known as the ‘timber corridor’, large scale logging fuelled its economy from the early 1950s to the 1980s (Severino, 1996). Archaeological finds approximately from 10th century where found in Butuan have identified Agusan as an area where gold was actively mined. The 1980s were witness to a gold rush in the upper reaches of the Agusan Basin, in the town of Monkayo. Gold mining in the area saw the emergence of a plethora of artisanal and small scale mining activities that have gained attention due to the number of lives lost in landslides, and the high amounts of mercury that were released into the river system during the processing of iron ore which resulted in cases of mercury poisoning in the area.

Situating the sites

From this description of the Basin, three types of the landscapes may be distinguished that are deemed to have differentiated the peoples’ ways of living: lowlands, wetlands and uplands.

The first space, the lowlands or low-lying areas which are the usual sites of settlements and of cultivation (particularly rice cultivation) is shown as blue areas in Map 3.2. The lowland village selected for study is Napo, which is situated along the Gibong River, one of the bigger tributaries of the Agusan River. Usually the lowlands coincide with areas classified as alienable and disposable lands; that is land in the public domain which has been deemed to be not needed for forest purposes (Malacanang, 1975). These areas are also subject to land title: Title holders are allowed to sell their land.

The second space, the wetlands, differs little from the lowlands in terms of location in the basin; the distinction lies in the fact that geologic processes have created a depression, allowing water to collect around the middle course of the Agusan Basin, creating lakes, ponds, bogs, marshlands and inundated forests. This is of particular interest to this study because it has given rise to clusters of floating settlements found in different parts of the Agusan wetlands. The wetlands site, the floating hamlet of Panlabuhan, is located in Poblacion village in the town of Loreto in the southwest section of the Agusan Marsh. Map

3.2 shows the legally proclaimed protected area of the wetlands; however, the wetlands extend beyond the stipulated boundaries.

The third space, the uplands, constitutes a physical space generally described as ‘an area of higher elevation than its surroundings’ (‘Uplands’, 2011). But, the identification of elevation considered uplands seems to be to have been arbitrary. In the case of Agusan elevation, areas as low as 100 metres are designated part of the uplands (see the slightly yellow and brown areas in Map 3.2). This may have been because these areas lie within a part of land classified as public forest, land that may or may not be reserved for forest purposes (Malacanang, 1975). The upland site, the village of Policarpo, is located in the San Luis municipality in the central west section of the Agusan River Basin.

Geology and Physical Geography

The geology and geomorphological processes of the area have formed the unique character and formation of the Agusan Basin. This is significant due to its implications for the groundwater development potential of the sites selected for the study. Agusan del Sur Province’s groundwater availability will be discussed in a later section (see page 38).

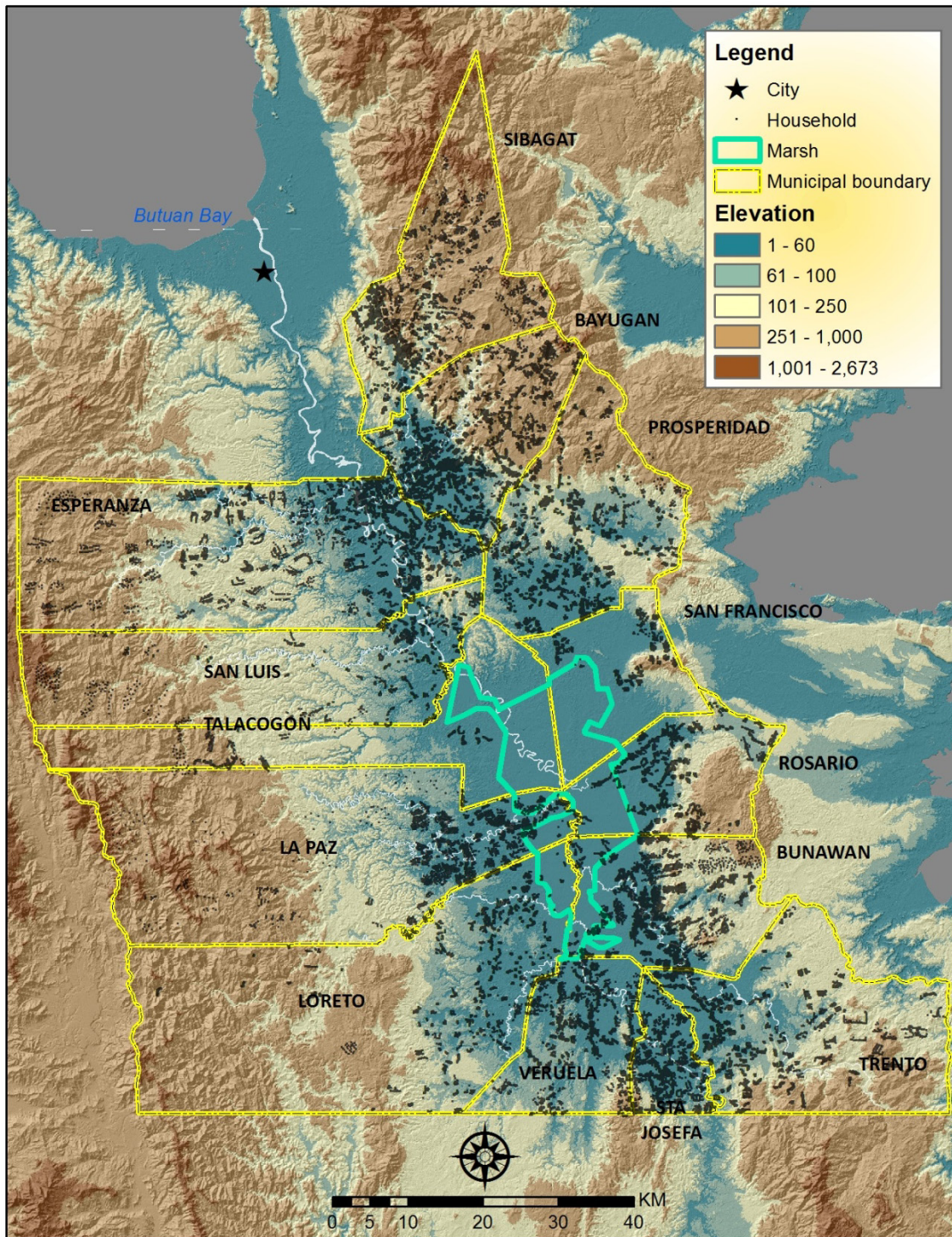
The geologic structures that are present in the area include: the Pacific Cordillera in the east; the Davao-Agusan Trough in the centre; and, the Central Cordillera west of the valley. The southern segments of the Philippine Fault Zone transect the central portion of the study area, trending in a north-south direction.

A study by the Japan International Cooperation Agency (JICA, 1998a) that provided considerable detail about the local geology of Agusan del Sur province reported that the Pacific Cordillera part of the Agusan Basin is made of sedimentary and volcanic rocks, including highly- weathered, and fractured limestone. It differs from the mountains system on the opposite side, the Central Cordillera, in composition. It slopes steeply into the flatlands due to the influence of the Philippine Fault Zone.

The Davao-Agusan Trough is the large structural lowland of the Agusan Valley. Segments of faults found in the area are of the overlapping strike-slip fault type (Pubellier, Deffontaines,

Quebral, & Rangin, 1994), a form of fault that has produced what is known as a pull-apart Basin creating a depression along the direction of the movement (Thomas & Goudie, 2009).

Map 3.2: Location of Households vis-à-vis the different landscapes



Source: DEM from NASA-JPL; Household locations from Agusan del Sur CBMS, municipal boundaries and Agusan Marsh shapefiles from the Agusan del Sur-ENRO.

Cartography: Author

This is the main process that has created the Agusan Marsh, the low lying portion of the floodplain. Most of these faults escape notice on the surface in Agusan because approximately 75 per cent of the surface is covered by Pleistocene and Holocene sediments and volcanic deposits (Pubellier et al., 1994). Fossil evidence from sediment samples collected from different parts of the Agusan Valley suggests that the area was previously occupied by the shallow Pleistocene sea (Dickerson, 1924). Successive and more extensive geological surveys of Eastern Mindanao support these findings (MGB, 1963).

The JICA (1998a) study observed that the Central Cordillera within the Agusan Basin was made up of two bands of formation. The area distinguished on the ground as a swath of low hills with elevation between 60m to 100m on the western side of the valley was composed of sediments from the Pleistocene and Pliocene Ages, consisting of unconsolidated conglomerate, sandstone, shale, and shallow limestone layers. The band adjacent to it, which was indicative of much older rock formation, featured volcanic, well-compacted sediment.

Climate

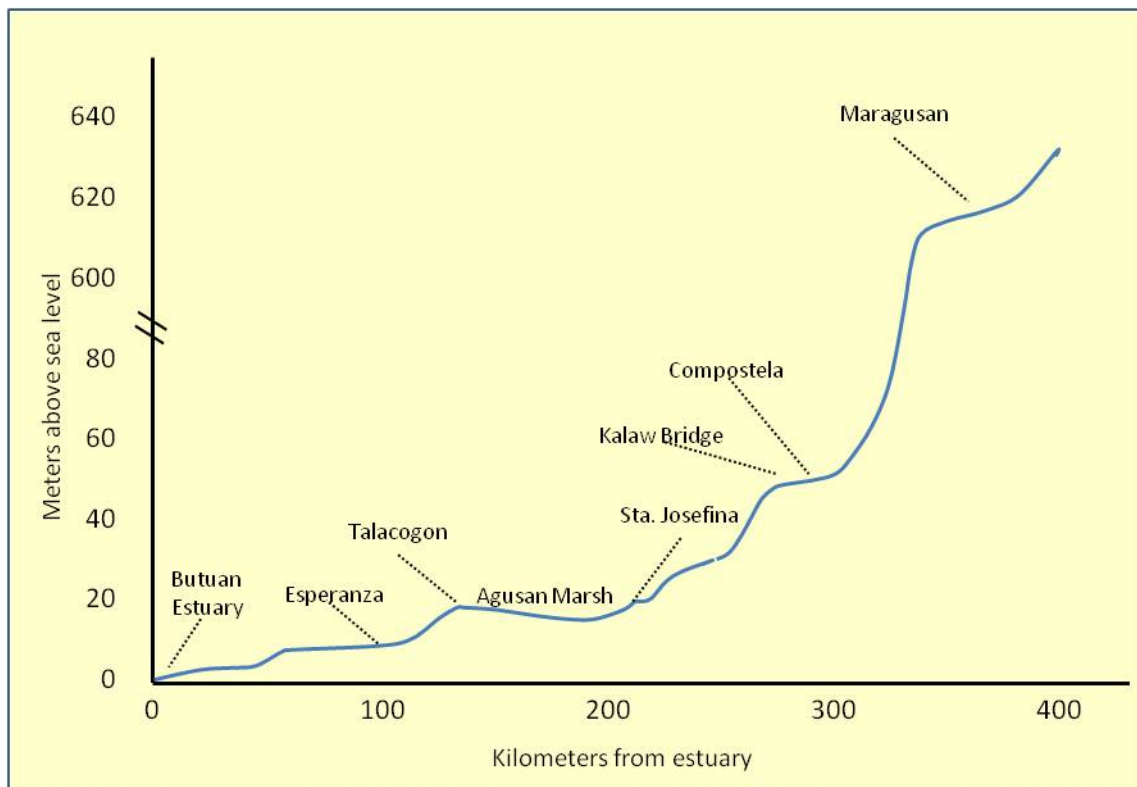
Climate plays a significant role in rendering Agusan a watery landscape. The Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) has classified the area of the Agusan River Basin into two Philippine climatic types. Most of the area is generally classified as Type 2, which is characterised by the absence of a dry season and a very pronounced maximum rainfall occurring from November to January. The southern portion of the Basin, which covers the area of the Compostela Valley, exhibits the characteristic of Type 4, meaning that rainfall is evenly distributed throughout the year (ADS-PPDO, 2008). During the wettest months of the year, December to February, the dominant *amihan* (or Northeast Monsoon winds) arrives in Mindanao bearing rain that affects the central and southern parts of the Basin (ADB, 2008). Based on the rainfall distribution map of the area (CTI-Halcrow, 2008), the plains can receive approximately 2000 mm of rain, while in the mountains in the southern section of the Basin, precipitation can reach as high as 4000 mm during this period. According to additional rainfall records maintained by the National Irrigation Authority in Prosperidad (located in the middle of the Basin), average monthly rainfall can drop to as low as 120mm in May and rise to 350mm in January.

With reference to the water systems in the upland area, with small intake boxes that depend on surface water, distribution of rainfall within the week is crucial. If there is no rain, surface water reduces to a trickle. This particular scenario is included among the problems that beset upland villages, problems I discuss in Chapter 5.

Agusan River and floodplains

The Agusan River is the third largest river system in the Philippines. Large river Basins such as the Agusan Basin often have geomorphological settings that result in floodplains that are massive in relation to the river systems (Welcomme, 1979). Local geomorphological processes in Agusan have created a river course that follows a series of descending steps as it flows to the estuary (CARBDP-PMO, 2003) (Figure 3.1). These steps are likened to shallow bowls in which water can collect (CTI-Halcrow, 2008). The widest of these shallow bowls, the Agusan Marsh is found in the middle part of the Basin. The Gibong, Simulao, Manat, Logum-Baobo, Ihaoan, Umayan, and Adgaoan rivers drain into Agusan Marsh. On a low flow, the total volume of water draining into the marsh is approximately 79 m³/s and its high flow is 283 m³/s(ADB, 2011) .

Figure 3.1: Profile of Agusan River



Source: Adapted from CARBDP, 2003

During high flow events, excess water from the Agusan main channel spreads laterally through its tributaries, inundating the surrounding plains. This results in two important mechanisms in the wetlands. First, according to Junk et al.'s (1986) 'flood pulse concept', periodic inundation of the floodplains is responsible for controlling the biota in the river plains. Junk et al. claim that this is because periodic inundation promotes nutrient recycling in the flood plains and 'the resulting physicochemical environment causes the biota to respond ... and produce characteristic community structures' (W. Junk et al., 1986, p. 112). Inundation can occur over a long duration (between December and February) similar to Panlabuhan (a village within the Agusan Marsh), one of this study's case sites (Chapter 7). Panlabuhan experiences the high precipitation during the period December to February. According to the locals, while the water level can rise as much as 4 metres, it does not stay constant. It fluctuates during this period but is always way above the November water level. It gradually decreases at the end of February. Further, creeks are submerged, rendering the site one large aquatic area. Junk et al. who identify this type of floodplain area as an 'aquatic/terrestrial transition zone' note that it alternates between aquatic and terrestrial environments. The gradual transition from the high to low water level creates a spectrum of habitats in this area that accommodate a wide range of aquatic and terrestrial species. These various habitats include open water (oxbow lakes, flood plain lakes and ponds), flowing water, herbaceous swamps, scrub swamps, swamp forest, river bank habitat and inundated forest (DENR-PAWB, 1999). Taken together, they support very diverse fauna including 65 species of butterflies, 17 species of fishes, 14 species of amphibians, 22 species of lizards, 2 species of crocodiles, 7 species of snakes, 102 species of birds, 11 species of mammals, and 64 species of various aquatic fauna (Primavera & Tumanda, 2008). Flora diversity consists of 28 flowering plants and 3 species of ferns.

The second function that the Agusan floodplain serves is its ability to replenish the groundwater resources of the area. According to Tabios (2008), the various ponds and lakes in the floodplain retain water for extended periods, allowing longer time for the water to percolate to the aquifer. Tabio's concern is that decreased flow into the Agusan Marsh due to planned dam construction of tributaries draining into the Agusan Marsh, could cause the lowering of the water table from its current 10 to 30 cm depth.

WATER RESOURCES IN AGUSAN

Surface Water

The Agusan River has thirteen major tributaries, the drainage areas of which range from 180 km³ to 1600 km³. The 1998 Provincial Water Supply, Sewage and Sanitation Sector Plan of Agusan del Sur, which was sponsored by the Japan International Cooperation Agency (JICA), examined four of these tributaries for their water quality. Simulao-Gibong and Wawa-Andanan were turbid, and the later showed very high amounts of iron and manganese which were attributed to the mineral rich rocks of the Pacific Cordillera.

The Agusan Basin's thirteen main tributaries include the Taguibo, Wawa-Andanan, Gibong, Simulao, Manat/Upper Agusan, Logum-Baobo, Ihaoan, Kayonan-Umayan, Adgaoan, Kasilayan, Maasam, Libang, Ojot, and Bugabus tributaries (Map 3.3). In basin management, big river systems are often subdivided into smaller catchment/tributaries areas for planning and management purposes. In the Cotabato-Agusan River Basin Development Project's Agusan River Watershed Study and Future Water Supply (2003), irrigation dam construction was one of measures proposed to address the projected future water-deficit catchments.

Table 3.1: Agusan River and Tributaries Flow and Proposed Dam data

No.	Main Channel / Major Tributaries	River Area (Km ²)	Length (km)	Potential Surface Water (MCM)	Proposed Dam Height (m)	Reservoir Storage Volume (MCM)	Power Potential (MW)	Target Year of Operation
Upper Agusan		1,570	171	454.12	100	1,080		2020
4	Manat	196	27	138.76	Plan			
5	Logum	151		851.47	Plan			2015
Middle Agusan		9,610	158					
1	Wawa	1,026	81		180	6,980		
2	Gibong	1,269	115	473.04	50	2,540		2016
3	Simulao	997	111	441.51	120	900		2017
6	Ihaoan	656	83	220.75	40	700		2012
7	Umayam	782	102	315.36	100	1,250	130	
8	Adgaoan	983	123	378.43	60	920	65	2020
9	Kasilayan	300		378.43				
10	Maasam	400		441.50				
11	Libang	280		283.82				
12	Ojot	805	68	756.86	90	2,700	30	
Lower Agusan		520	21					
13	Bugabus	184		145.06				

Source: CARDBP, 2003

Note: Entries in bold are water catchments projected to be water deficient.

recharge rates, all of which are crucial to drawing up development plans in the area. Tabios (2007) asserts that the strong seasonality and spatial variability of the hydrological (and subsequently the ecological) cycles and processes in the Agusan Basin and Agusan Marsh are important to keep in mind when examining the impacts of development, e.g., dam construction, that are considered in state proposals for integrated water resource management (IWRM) in the Agusan Basin. In chapter 7, the wetland dwellers describe in detail how the draining of small lakes in Panlabuhan has resulted in rapid changes in the area's bathymetry affecting also their fishing areas.

Groundwater

The discussion of groundwater resources here is especially relevant to provide context to the water problems encountered in the upland and lowland case study sites. Groundwater availability is usually determined by the type of rock formation present in an area. In 1998, a Groundwater Availability Map was prepared for the entire Philippines but, because the scale of the map was small, it was not reliable for planning water resources development. When mapping out Agusan del Sur's groundwater availability, the JICA project first examined the geology then supplemented it with a georesistivity⁵ survey to construct a clearer picture of the well development potential in the area. While georesistivity services are available in the Philippines, the cost is prohibitive. The results classified the groundwater availability into 3 categories (see Map 3.4).

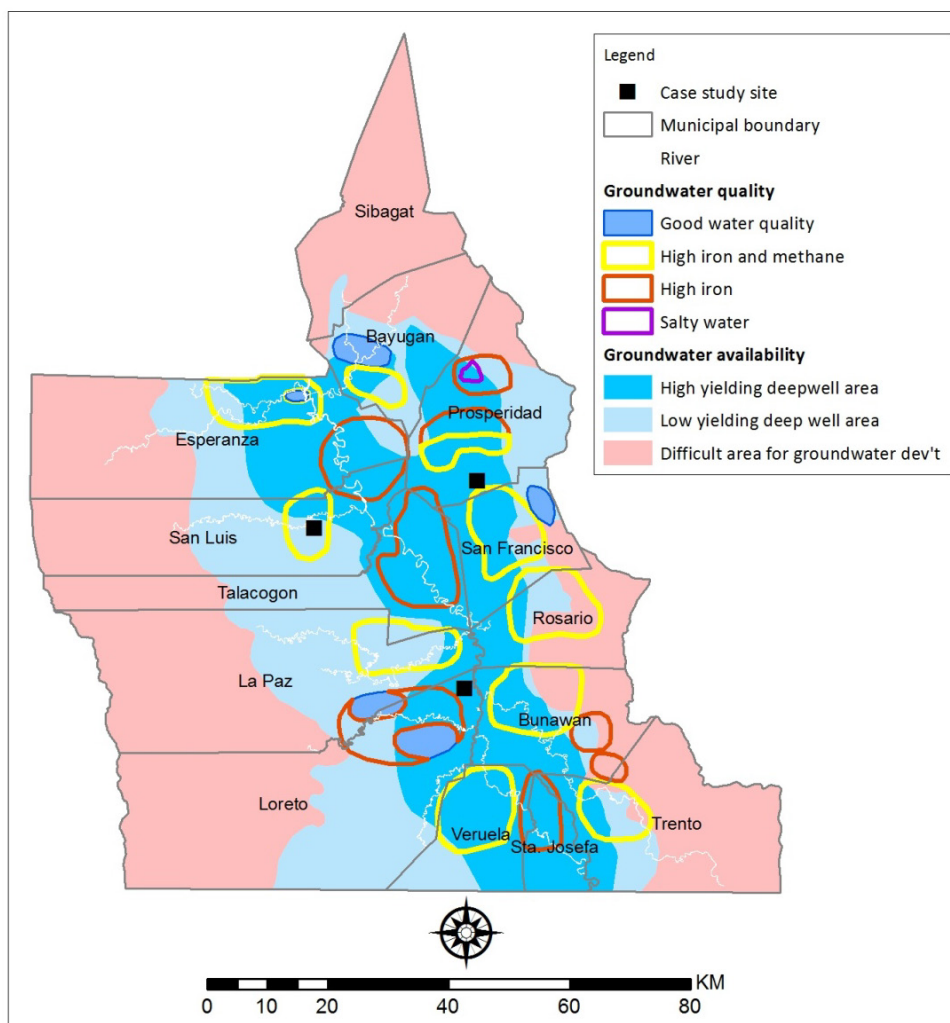
Shallow well areas According to the JICA report (1998a) shallow well areas are those that correspond to areas wherein alluvium or coastal deposits are up to approximately 20 m in depth. Although this was the case along the banks of the Agusan River, the majority of these areas have thicker alluvium deposits of more than 20m in depth. Therefore they have no existing shallow well area. However, it was also noted that this may be possible in the low yielding deep well areas described below. The average depth of a shallow well is 15m.

⁵ An abbreviated form of geoelectrical resistivity, a type of field survey that involves inserting a stake to the ground and running an electric current through it. Different kinds of materials (i.e. sand, clay, water, etc) show different resistance to electric current. Readings of the resistance data registered are automatically entered into an instrument. By examining the vertical and lateral resistance variations, it is possible to deduce the layering and lateral extent of subsurface deposits or materials (2009).

Deep well areas The JICA report identified deep well areas as occupying approximately 50 per cent of the province. Those located are along the western and eastern sides of the river featured sediment dating back to the Pliocene and Pleistocene ages. These areas were divided into two. The high yielding deep well corresponded to the area of alluvial plain, which was made of recent deposits of clay, silt and sand. Here the average depth of the deep well is 15.4mbgl (metres below ground level). The vicinity of Napo, the case study site discussed in chapter 6, is in this category. The low-yielding deep well was situated west of the river, in an area marked by low hills and its geology mainly composed of conglomerates, sandstone, limestone and shale. The average depth of this type of well was 36.8 mbgl.

Difficult areas These are areas that are underlain by older rock formations, and where

Map 3.4: Agusan del Sur's Groundwater availability and the groundwater quality issues



Source: Adapted from groundwater availability and quality maps, JICA study (1998a)
Cartography: Author

sediments were well-compacted, dense and impervious. Water from underneath rock layer of this type may be released through rock fractures.

An analysis of groundwater mining data in the Agusan Basin undertaken by the National Water Resource Council (NWRC, 1983) estimated the total groundwater storage of the area at 2,690 million cubic metres (mcm) with the recharge volume to the groundwater reservoir system at approximately 940 mcm/year. The safe yield level was set at 940 mcm/year. It was further estimated that at least 994 mcm/year would be available for a 50-year mining withdrawal.

The NWRB, with the assistance of the JICA, has endeavoured to consolidate water resources development and corresponding data throughout the Philippines. Well drillers and well owners are required to submit well-log data from their wells prior to their application for water permits. Agusan del Sur has 114 records in its database (NWRB, 2015), which was very small compared to the number of existing wells.

Springs

Springs, which are concentrated outflows of groundwater, occur when groundwater surface intersects with the ground surface. They are usually found in areas where there are gaps or cracks in the impervious rocks enclosing the groundwater (JICA, 1998a). A number of communities in Agusan, especially those located on the fringes of the municipalities, harness these springs for their drinking water, however in the case of Policarpo, the upland case study site this is not the case. As will be later explained in Chapter 5, the area's geology is made up of limestone, which can produce different kind of hydrologic patterns in the area.

In the World Bank Rural Water Supply Design Manual (2012), springs are classified as developed, undeveloped and untapped. Springs that are utilized and have sanitary protection (with spring box) are categorised as developed and those without as undeveloped. The latter are considered to be as an unsafe source. Perennially flowing untapped springs are unutilized.

In a report issued by JICA (1998b), data collected through a questionnaire, and distributed among the staff of the different municipalities of Agusan del Sur, showed that total of 266 developed springs and 65 untapped springs were existing in 1998.

Water quality problems

Despite having significant areas with high yielding groundwater, quality problems were identified by various studies. In the JICA report, identification of the water quality problems was done through the joint efforts of the research team from NWRB, with some general information from the Department of Public Works and Highways-District Engineering Office (DPWH-DEO) and the Provincial Planning and Development Office of Agusan del Sur. Map 4 shows different water quality problems, and indicative areas including sites where mercury contamination of water and sediment were detected. The water quality problems included the following:

High iron content Approximately 80 per cent of the existing wells were found to have high iron content; therefore they were considered the most serious problem by the JICA study. According to the Philippine Drinking Water Standards, testing the iron content of water is done to record the amount of iron that is tolerated by people's taste rather than negative health effects. Due to the prevalence of iron in the groundwater in Agusan, iron removal facilities were included in the new water installations. This issue relates to some of the initial water quality problems encountered by the water systems installed in the lowland areas such as the experience in Napo village (chapter 6).

Salty water The JICA report identified only Barangay Bahbah in the capital town of Prosperidad, the Poblacion of Trento and the Talacogon municipality as the areas where salty water was reported. However, during my fieldwork, I identified many more areas wherein people complained about salty water, particularly in lowland village of Napo. In contrast to JICA's report, the numbers of salty groundwater areas may have wider distribution than earlier surmised. In other words, they may actually pose a more serious problem than the iron content, because people's preference is more sensitive to salty taste and health issues are associated with increased salt intake, further limiting access to drinking water supply. The JICA report vaguely attributed the salt water content to geological

formation. The geohydrologists⁶ I interviewed hypothesized that it could be an occurrence of ‘connate’ water; that is, saltwater trapped in the sediment as it was deposited. The exposure of an area to previous ancient marine conditions set the stage for seawater to be trapped in sediment. The absence of flushing using freshwater in the geological system will result in sediment containing connate seawater (USGS, 2015). This notion is reinforced by studies mentioned in the geology section of this Chapter that the Agusan Valley was under marine conditions in its recent geologic past.

Methane gas High iron content in groundwater usually occurs due to high levels of methane gas. This was found to exist in both shallow and deep wells, there was only one aquifer in the municipality of Rosario where both iron and methane were observed. Groundwater availability is reportedly restricted by the occurrence of natural gas in the middle and lower reaches of the river system (DPWH, 2003).

Groundwater contamination There was also evidence of faecal pollution of groundwater, particularly near large settlements, albeit incidence was minimal (CTI-Halcrow, 2008).

Heavy metal contamination The proliferation of gold mining upstream of Agusan River—particularly in the Upper Agusan, in Manat and Naboc catchments (where the Diwalwal Mineral Reservation is located) and catchments east of the Agusan Marsh--has caused high levels of mercury, cyanide, and other pollutants. In addition, heavy siltation of rivers and streams in the vicinity, due to mine tailings from small and large scale mining/processing facilities being discharged directly into the streams without prior treatment, was noted (ADB, 2011). A study conducted by Appleton et al. (1999) found that mercury levels in the Diwalwal mining site and within the downstream distance of more than 14 km exceeded the WHO Drinking Water guidelines and the US-EPA Water Quality Criteria for the Protection of Aquatic Life. Mercury was also detected in channel sections utilised for fishing and potable water supply. The same study also further found that concentration of mercury in stream water and suspended particulate matter decreased as distance increased from the mining site. However, it also revealed an increase of mercury at the point in the Agusan River where the hydraulic energy was low, precisely where the Agusan Marsh is located. Mercury concentration in bottom sediment exhibited a different

⁶ I interviewed two geohydrologists who had done work in the Agusan Basin and Mindanao regarding the incidence of salty groundwater in the area.

trend. A comparison of samples taken at the intersection of Naboc and Agusan River (which is nearer the mining site) with samples taken along Agusan river channel 85 km downstream showed a 10 fold increase in the former. High sedimentary concentrations of mercury tend to constitute a long-term source of contamination, which will inevitably become more widely dispersed during periods of high flow.

Roa et al.'s (2008) study looked at the concentration of heavy metals, such as mercury, cadmium and lead in the mining sites in the headwaters of the Gibong River (one of the tributaries draining into the Agusan Marsh area) and in the Agusan River water in the Butuan City vicinity. Their work revealed a strong decreasing pattern in concentration from the upper reaches of the river towards the river mouth. The concentrations of cadmium and lead in sediments were highest at 44.46 mg/kg and 1256.16 mg/kg respectively.

Their study also explored the concentration of cadmium, lead and mercury in fish. The latter are said to be the most precise factor for estimating heavy metal pollution and risk potential to human health in the freshwater system because fish and fish products are the dominant sources of methyl mercury in a person's diet (Appleton et. al, 2006) The mercury concentration in the four fish species collected offsite in Butuan City was found to range from 2.14 to 6.82 µg/kg. These values are significantly lower than the 500 µg/kg maximum recommended limit for mercury (UNEP, 2002) allowed in fish for human consumption in many countries. Appleton et al's (2006) exploration of fish samples in the Naboc River showed that consumption equivalent to a kilogram of this fish per week could result in the accumulation of approximately 277 µg of mercury per week, a figure close to the value of the Provisional Tolerable Weekly Intake of 300 set by the FAO.

Given the mining activities upstream of Agusan Marsh, it seems likely that heavy metal contamination is present in the Agusan Marsh. With regard to a sampling site close to wetland site of Panlabuhan, an unpublished report by an NGO (VSO & Ecocaritas Egyesulet, 2006) based on a single sediment sample taken in Lake Dinagat (one of the lakes northwest of Panlabuhan area) the sample contained 0.37 ppm of mercury which exceeded the European Standard for sediment threshold level (0.15 ppm). In her paper titled 'Mercury Pollution: Threat to Agusan Marsh, Roa (2008) assesses the value of existing data on mercury pollution of Agusan Marsh. She stresses that the NGO's sample size was inadequate and that

more samples needed to be analysed to assess the current status of contamination in the marsh lakes.

Water-related diseases

According to public health standards, there are four types of diseases associated with poor access to consumption of water and poor sanitation: water-borne, water-washed⁷, water based⁸ and water-related vector borne diseases (USAID, 2011). Of particular relevance to this study are the water-borne and water-based diseases.

Water-borne diseases are transmitted via contaminated drinking water. Diseases include cholera, typhoid, dysentery hepatitis, and amoebiasis. Common symptoms are diarrhoea and vomiting. These conditions are often monitored by the local government units through their municipal sanitation officer and barangay auxiliary workers (barangay health workers or sanitary officers). Monitoring covers only those who approach these workers in the village or at the municipal health centre and does not extend to those who self medicate.

Self-medication of the symptoms of the common water-borne diseases in the three case study sites is a common practice. When faced with everyday choices of nearer but less safe water sources and distant safe water sources, people often rely on the accessible but doubtful sources. Although this exposes them to water-borne diseases, they are most likely to deal with symptoms through a mix of herbal and over-the-counter medicine than deal with the drudgery of bringing water from a farther water source (Persson, 2002)

⁷ These diseases are transmitted from person-to-person as a result of inadequate water supplies for personal hygiene and/or domestic cleaning. Examples include scabies, lice, typhus, trachoma and conjunctivitis.

⁸ These diseases are transmitted by insects that live and/or propagate in water, e.g., dengue fever, malaria and filariasis.

Water-based diseases are transmitted through an aquatic invertebrate organism such as schistosomiasis and leptospirosis. Agusan del Sur is among the areas in the Philippines where schistosomiasis is endemic.

Table 3.2: Leading Causes of Morbidity (all ages) 2010

	Causes	Number
1	Acute Respiratory infection	37,261
2	Hypertension/Cardiovascular disease	5,189
3	Wound all forms	3,217
4	Urinary Tract Infection	3101
5	Diarrhoea	2998
6	Pneumonia	2043
7	Skin Diseases	2004
8	Gastric Disturbance	1526
9	Influenza	1517
10	Malnutrition	1376

Source: Agusan del Sur Provincial Health Office, 2010 Annual Report

PEOPLE AND HISTORY

This section discusses aspects of the people who live in Agusan and traces the population's history in relation to its position within the development of the nation and its development agenda. Similar to Agusan, most of the earlier societies of Southeast Asia were riverine communities. The discussion focuses on the degree to which natural resources and migration played a part in the development trajectory of the area.

The Peoples of the Agusan Valley

Documented original settlers of the Agusan Valley include the Manobo, Mandaya, Banwaon, Higaonon, and Mamanwa tribes (Garvan, 1941; Montano, 1886). In his monograph titled *The Manobos of Mindanao*, Garvan (1941) observed that the Manobo people constituted the majority of the population of the Valley. His description of the spatial distribution of the different groups in the valley placed the Mandaya in the Upper reaches of the Agusan River. The Banwaon tribe occupied the area fed by the Laminga, Kandiisan, Hawilian and Ohut rivers and the whole of the Maasam River, a tributary of the Agusan in the western part of the Agusan Valley. The Higaonons inhabited the province of Bukidnon west of the valley. The Mamanwa occupied an area in the northeast of Agusan Valley. Regarding Butuan,

Bunawan, Talakogon, Veruela and Prosperidad, the Bisaya, who were long Christianized before coming to Agusan, were documented as also settled in these towns.

In Garvan's¹ rare detailed monograph about the Manobos of Agusan, he observed that most of them settled in middle and upper reaches of the Agusan River. They built their clusters of houses five, ten or fifteen miles from each other along the banks of the Agusan River. The clusters ranged from ten to thirty stilt houses, with some extending landward into the village's small streets. Garvan noted that not far from these settlements, perhaps a few metres away, the thick forests were interspersed with small patches of clearing, - gardens planted with a mixture of rice, yams and an assortment of vegetables to meet the households' needs. The Manobos' means of livelihood included farming, fishing, hunting and trapping.

Manoboland was divided into zones owned by clans. Each clan, which consisted of 20 to 200 persons, was led by a chief. Their leadership system is mostly male-led, and the chieftainship was usually bestowed upon someone who had earned the rank of *bagani* or warrior chief. In effect someone who had killed a certain number of people. More importantly, he should also be someone who was influential enough to attract a following. Garvan also observed that they customarily acknowledged the authority of the elders provided the latter were still physically and mentally able to attend public gatherings. The *bagani* also assumed the role of medicine man because he was said to have magic powers whether for good or evil purposes. Currently, Manobo leadership is passed on to the current leader's kin, who are chosen because they are considered to have healing powers.

Prehispanic Agusan

The northern reaches of the Agusan River, part of the current city of Butuan constitute an important area in Philippine prehistory. In 1976, pothunters searching for ancient Chinese ceramics abandoned a trench after hitting some planks of wood buried in the mud. The National Museum was informed about the find, which proved to be the remains of the traditional *balanghain* boat, which up until that time had existed only in a Spanish expedition scribe's documentation of life in the archipelago (J. T. Peralta, 1980). Archaeologists from the National Museum of the Philippines found nine old boats in the Barangay Libertad site,

¹ John Garvan was an anthropologist employed by the Department of Ethnology in the Bureau of Science in Manila during the American rule. He spent the years from 1907-1914 disguised as a trader. He travelled to Agusan Valley and to Davao in the south, and to Salug Valley west of the Central Cordillera in Mindanao (Garvan, 1927).

Butuan City, Agusan del Norte (Hontiveros, 2004). These boats, which were known as *balanghais*, were the most complex of the traditional boats that were used in the country. Carbon dating of three of the nine boats placed them around 320, 990 and 1250 AD (Custodio & Dalisay, 1998). These finds had very significant value in terms of looking at Southeast Asian maritime history (J. T. Peralta, 1980).

Archaeological finds have demonstrated that Butuan was a thriving international trading port a thousand years ago. According to historians, the area was the centre of the ancient Kingdom of Butuan. Historical records show that by the 10th century, the Kingdom of Butuan had established trading relations with the Kingdom of Champa, in what is now southern Vietnam, and with the Srivijaya Empire of Sumatra (Custodio & Dalisay, 1998). Experts say that the *balanghais* boats had varied uses. Some of them functioned as river boats, transporting people and goods from the interior to the coasts where trading took place. Others took the form of inter-island boats, that were used for trading and raiding not only in the Philippine islands, but also across maritime Southeast Asia (Junker, 1999). By the 11th century, Butuan had become a centre of trade and commerce in the Philippines.

Butuan's early dominance in the area was partly due to its gold deposits (W. H. Scott, 1982). In a letter from Andres Mirandaola (a representative of the King of Spain in the Philippine colony) to King Philip II, the writer spoke of the vast amounts of gold found in the district of Butuan (Blair & Robertson, 1903a). In another archaeological site in Butuan searchers unearthed clay crucibles and tools used for gold processing, a find that suggested specialization in the purification of gold and the manufacture of gold ornaments as far back as a thousand years ago (National Museum of the Philippines, 2006). Although the role of the interior riverine community is not clear in these finds, a recent archaeological exploratory field visit to the Province of Agusan del Sur identified some Mainland Asian tradeware ceramics in the area⁹. The visit report (Paz et al., 2014), which dates the ceramics at around the 13th to 14th century period, supports the interaction of interior riverine communities with the coastal community of Butuan.

⁹ The preliminary assessment is yet to be confirmed by systematic archaeological excavations since the pieces of tradeware left by the illegal pothunters were already taken out of the ground.

Spanish era

The Spanish conquest of the Philippines impacted on Agusan in two ways. First, it significantly diminished trading by the Kingdom of Butuan. Second, it rearranged the spatial organization of native communities (Abinales & Amoroso, 2005). Before the establishment of the Manila-Acapulco Galleon Trade in 1572, Butuan was one of the key trading centres in the islands. When Magellan arrived in Butuan in 1521, his chronicler noted several ships from Luzon, Borneo and China, anchored in Butuan Bay. Goods traded by Butuan included gold, wax, cinnamon and slaves (Wernstedt & Spencer, 1967). The subjugation of Manila in 1571 saw the emergence of the Manila-Acapulco maritime trade route, which connected the Spanish colonies in Mexico and in the Philippines with trade with the Asian countries, especially China which was the main supplier of commodities at that time (Giraldez, 2015). The Spanish government centred its trading in Manila, virtually shutting out the indigenous trade and reducing the role of the Butuan entrepôt (Abinales & Amoroso, 2005).

The Spanish strategy of conquest of communities influenced the changes in the *indios*' (natives) settlement organization and land ownership arrangements. The island of Mindanao was considered particularly difficult to penetrate by the Spanish missions and the military. Throughout the Spanish occupation, various Christian missionaries entered the Agusan Valley to convert the 'souls of the heathen tribes' (Garvan, 1941). They proceeded with great difficulty because of the 'warlike pagans of the interior'. In 1622, the Augustinian Recollects successfully established a mission in Linao (currently Bunawan), an area in the interior of the Agusan Valley. However, this was short-lived because in 1649 the natives rose in revolt, razing the mission to the ground (Philippines Census Office, 1920). It was only in 1881 that colonization of Agusan Valley became more successful, following the missions' implementation of a resettlement process known as *reducción* (Schreurs, 1986). *Reducción* involved moving people from their original settlements, which were usually along the rivers or near their kin, to the area in which the church was built. The objective of *reducción* was to concentrate the natives into an area where it was easy to count them and to collect tribute, goals of the state and church (Abinales & Amoroso, 2005). In Schreurs' (1986) archival research into reduction in the Agusan area, *reducción's* relative success was attributed to the new strategies employed by the missionaries. This included making the effort to get to know the people well, their way of life, social behaviour, their language, and the leaders and leadership circumstances. Instead of approaching the natives belligerently, the missionaries

showed friendliness, telling them that they had interceded and convinced the Governor-General not to send soldiers into the area. When they convince the leader to resettle, the site was selected, housing was arranged, and the local chieftain's people were forced into resettlement. The local chieftains were still given local authority in the *reducción*, The *datu* (traditional leaders) who now become part of the *principalia* (ruling class), were mainly in charge of collecting tribute from the *sakop* (clan member).

Towns that were reorganized during the Spanish rule normally had a town centre or *poblaciones* with a plaza complex or town square in which the church, the administrative buildings and the houses of prominent Spaniards and *indios* were located. The church which towered over all of the other buildings, created a clear representation of the Spanish power (Abinales & Amoroso, 2005). Around this centre, each family was assigned a lot, an area for a house and a parcel of land for cultivation on the outskirts of the town. This redefined the native population's spatial organization which usually sought a place where living was convenient, usually at the edge of a river (Schreurs, 1986).

Schreurs further notes that life in the new settlement was controlled by the friars. Although each settlement had a *datu* (chieftain), the villagers had to seek the friar's permission if they wished to leave the *reducción*. This controlled life in the *reducción* did not bode well for the Manobo. Not long after the 18 *reducciones* were established in the Agusan Valley in 1881, many left the resettlement areas, preferring their life in the wild. Those who left were aggressive towards those who stayed. In the words of the well known priest Fr. Urios, who headed the *reducción* in Agusan, and was well aware of reason for people's rebellion:

'We should not forget that the Manobos and Mandayas have their own idea of proprietary rights. Each family and each village considered as their absolute property not only the ground where their house stood, but also the mountains where they use to hunt and the rivers where they fish. No disalced friar had been able to talk them out of this idea. Although they are content with a hut that is open at all sides to wind and rain, they want land and trails for miles around' (Schreurs, 1986).

The new tenure system, imposed together with resettlement and the congregating of the people, impacted on the native people's right to their lands. Subsequently, the Americans encouraged settlement by migrants from other islands as part of their colonization strategies.

The American Period

In the early years of the American occupation of the Philippines, opening the Mindanao frontier was already on the US agenda. The 'Census of the Philippine Islands' (1905) reported that Mindanao had barely half a million people, roughly one tenth of the population of Luzon and Visayas and approximately one third of the country's land area. The colonisers saw Mindanao as a great untapped asset with large tracts of tillable land and vast timber resources (Magdalena, 1996).

In 1903, the Philippine Islands were still very much forested. At the time, estimates of the value of the forests of the entire country were estimated at US\$2 B (United States Bureau of the Census-US Philippine Commission, 1905). In Agusan, forests covered the mountains to the very top of the ridges and the diameter of the trees reached five feet (Magdalena, 1996). In 1918, it was reported that the timber harvesting in area along Butuan Bay had already commenced (Philippines Census Office, 1921)

Stauffer (1982) argues that in the early 1900s, the American colonial administration's stance vis-à-vis Mindanao was to open it up just as the West was opened up in the United States. The government strategy for opening the Mindanao frontier was development through trade, in effect to encourage settler-colonists while the military held back any opposition from the indigenous peoples who opposed it. In order to speed up the process, the American Congress passed the Public Land Act of 1903 (US Congress, 1903) which introduced the homestead concept and allowed the disposition of public land through grant, sale or lease (Philippines Census Office, 1921). The Act described a homestead as 'a land grant given by the government to an individual applicant as an incentive to occupy, improve and cultivate unused land in areas which are also largely unpopulated, provided that the individual is willing to remain in said land for a period of not less than five years'. An application fee of ₱20 would be collected from the applicant for a tract of land not exceeding 16 hectares before a land patent was awarded. The Act further stated that an application could be rejected 'if the Bureau of Forestry certifies the land as more valuable for forest purposes' (US Congress, 1903).

While provisions of the Public Land Act and subsequent legislation provided protection of some Filipino rights, there was also bias against certain groups of Filipinos. The Act stated

that only Filipinos could apply for a homestead, but a proclamation by the Civil Governor of the Philippine Islands in 1904 prescribing the rules and regulations of homesteads and the sale of public lands stated that in cases where native settlers occupied the public lands being applied for, the said natives would not be compensated. This was evidence of the bias vis-à-vis certain types of land usage, such as agriculture over natives' use of land for hunting. The Manobos in Agusan clearly used land other than for growing crops. In succeeding laws, for example the 1919 Public Land Act 2874 (Philippine Legislature, 1919), provisions for native settlers were already in place. But, whereas native settlers were allowed to acquire 10 hectares, the homesteaders' allocation was increased to 24 hectares. These unfair legal provisions clearly demonstrated the disadvantaged position of native settlers attempting to own land under the land laws of the time.

While the Public Land Act (US Congress, 1903) may have confirmed that the homestead was only for Filipinos, the sale or lease of land was a gray area. According to the Act, foreign nationals who grouped themselves under the Philippines incorporation laws could apply to purchase public lands. Based on applications filed by the corporations, there was a preference for provinces which had extensive lands for agricultural development, Agusan, for example. This was further encouraged by the American colonial government as it was in line with their objective of expansion in the frontier lands. Each hectare of land was priced at ₱10 per hectare, and should be disposed of through bidding (Philippines Census Office, 1921).

For several years following its implementation, the homestead program did not attract many applications from individuals. The Filipinos were not seen as a people imbued with the same 'pioneering spirit' displayed by the settlers in the central west of the United States (Philippines Census Office, 1921). In 1913, the colonial government launched a program of subsidized settlement in Mindanao. Officials recognised that people from the more crowded areas of Luzon and the Visayas would need significant funds to make the trip to Mindanao to construct their houses, develop the land, plant crops, and to meet their needs before the first crops were harvested (Wernstedt & Simkins, 1965). The new program provided free transportation, financial assistance, town sites and surveyed properties. But not long after, many people left the new settlement and returned to their original locales. The next iteration of the program provided only limited financial subsidies to those who were interested in and had the money to travel to Mindanao. Between 1903 and 1939, only 33,014 persons migrated

to Agusan a significant flatland area. This accounted for 4.7 per cent of total migration to Mindanao, an extremely low figure compared to provinces with also extensive lowlands such as Davao (20.7%) and Lanao (23.3%). Wernstedt and Spencer (1967) suggested that the watery middle course of the Agusan Valley deterred migrants from settling. In addition, there was no road access available in the area.

The Philippines Government

In 1934, the United States through the Tydings McDuffey Act, granted the Philippines provisional independence and established the Commonwealth Government of the Philippines. The act also stated that there would be a ten-year period of peaceful transition before the Philippines is granted full independence. In 1935, the Philippines elected the first Filipino president under the Commonwealth. In spite of this, the orientation of the programs pertinent to Mindanao followed the same mould as that of the US rule. In 1946, the year when the Philippines was to gain its full independence, the US imposed a new condition and that was for the Philippine Congress to pass the Philippine Trade Act. The Act, in essence gave preferential trading rights to the US. The US also offered US\$800 million post war rebuilding funding only if the said Act was ratified by the new Philippine Congress (Schirmer & Shalom, 1987). Among the Act's controversial clauses was the giving of US citizens and corporations equal access with Philippine citizens to the country's minerals, forests and other natural resources, a proviso contrary to the provisions of the 1935 Philippine Constitution which only allowed Filipino nationals the right to develop the country's natural resources. The Philippine Trade Act amended this proviso when it was ratified in 3 July 1946.

Starting in the 1950s, preferential trade opportunities were seized upon by American corporations; for example, the Philippine logging industry. In Agusan del Sur, a 99,000 hectare concession was awarded to an American company (Vitug, 1993). In 1958, the American firm sold its logging concession to the Santa Ines de Melale Forest Products Inc., not before it had earned a windfall from *Philippine mahogany*¹⁰, a hardwood species which was widely popular on the American market (Ross, 2001).

¹⁰ Philippine mahogany was a tradename incorporating seven different species of trees exported from the Philippines to America. This was the tradename given by American logging businesses in the Philippines to sell the wood in the American market (Myers, 1963).

The Agusan River and its tributaries were the main means (a) of accessing the interior, and (b) of transporting logs. Logging workers, merchants, and traders station themselves in major trading points along the main channel on floating log rafts anchored to trees (ADS-PPDO, 2008). This operation produced a lumber industry that was important to the valley's economy: it constituted a tenth of the Philippines' sawmill capacity (Wernstedt & Spencer, 1967). Most of the sawmills were located in the city of Butuan, the capital of Agusan province, and in the coastal towns of the province. They produced lumber, veneer and wallboard, most of which was exported to Japan and the US, although in some cases lumber was directly exported as logs (Myers, 1963). The boom in the logging industry, which lasted from the 1950s to mid-1970s, ushered Butuan into its cityhood in 1950.

Wernstedt and Simkins (1965), writing on the population growth in Mindanao, noted that the figures increased tremendously past World War II. The years 1948 to 1960 saw an 87 per cent increase in population in Mindanao, which represented more than twice the whole country's increase (41 per cent). Wernstedt and Simkins added that the various resettlement programs implemented during these years, were continued by the government after the war. In subsequent years, government changed the objectives of the program. By the 1950s, the resettlement programs saw about 92,971 more people in Agusan or 7.4 per cent of the total migration to Mindanao, a trend attributed to the active logging that occurred during the 1950s (Vandermeer & Agaloos, 1962).

It was in the decade from the 1960s to the 1970s that Agusan received most of its migrants: 1960 also marked the opening of the highway connecting Davao to Agusan Valley. Flieger's study (1977) noted that during this period, Agusan del Sur was among the three provinces in the country which were the most preferred destinations for migrants, especially from the Visayas - Cebu, Bohol, Iloilo, Samar and Leyte – who began to penetrate the interior. This study also showed that the average rate of in-migration to Agusan del Sur during the period 1960 to 1970s was very high at 370 (per 1000) compared to a very low 14 per thousand out-migration. Flieger hypothesized that it was driven by the lure of the agricultural frontier areas of Agusan (given that such areas were dwindling in migrants provinces of origin), Wernstedt and Simkins (1965) argued that it may have been driven by the establishment of road access in the area.

In sum, the public land laws, natural resource exploitation and migration policies have favoured the foreigners and migrants to Agusan. Taken together, these factors marginalised the non-Christian populations of Agusan and threatened their land tenure in their own land.

CONTEMPORARY AGUSAN PROVINCE

The present provincial administrative area of Agusan del Sur was created in 1967. During the Spanish colonization, it was part of the District of Surigao, but in 1914, the district was divided into the Province of Agusan and Surigao. In 1964, the Agusan province was further subdivided into Agusan del Sur and Agusan del Norte. Today, Agusan del Sur is composed of one city and thirteen municipalities. These city and municipalities are further comprised of *barangays* or villages (the smallest administrative unit of the local government system in the Philippines). There are 314 barangays in Agusan del Sur, 30 of these are classified as urban and 284 as rural. As of 2010, Agusan del Sur's total population was 656,418. Table 3.3 provides a summary of information of the area's people and its natural resources.

Table 3.3: Summary of information about the people and natural resources of Agusan del Sur

Municipality/ City	Land Area (sq km)	Pop'n 2010	No of Brgy		A&D* Land sq km	Timber- Land sq km
			Urban	Rural		
Bayugan City	446.6	99,361	3	40	170.9	368.5
Sibagat	567.8	30,985	1	23	37.2	464.2
Esperanza	1,001.2	51,897	1	46	252.2	749.0
Prosperidad	573.9	76,628	2	30	243.4	311.7
San Francisco	330.4	70,986	7	20	198.2	77.6
Rosario	296.0	38,280	2	9	121.7	236.6
Bunawan	433.1	37,482	2	8	132.6	310.6
Trento	750.7	47,193	1	15	169.5	591.2
Sta. Josefa	191.3	25,156	1	10	77.6	110.4
Veruela	332.6	40,457	1	19	147.7	184.3
Loreto	1,389.4	39,474	1	16	243.3	1,146.1
La Paz	1,053.0	28,562	2	13	143.0	956.7
Talacogon	819.8	37,224	3	13	122.9	241.9
San Luis	770.7	32,733	3	22	100.3	1,088.1
Agusan del Sur	8,965.5	656,418	30	284	2,160.4	6,805.0

Source: ADS-PPDO, 2008 (except for the Agusan del Sur's population figures from the Agusan del Sur CBMS)

Economic Activities

The province is positioned as an agri-forest and food processing zone of the region (NEDA-Caraga, 2013). The economic activities in Agusan del Sur revolve mostly around the agriculture and forestry sectors, which account for around 56% of the province's economy. Rice occupies the largest cultivated area, with 591 km² producing 237,000 MT of rice. The 243.85 sq km irrigated area yields 410 t/km², and the rainfed rice area of 165.73 km² yields 300 t/km². A 273 km² area producing around 77,400 MT of corn. The third product is palm oil which occupies places third with 161 km² of arable land (ADS-PPDO, 2008, p. 55).

From the 1950s to the 1970s, Agusan del Sur was one of the country's top lumber producers from natural stands. Today, much of its forest products come from planted trees (particularly soft wood such as *Albizzia falcataria*, *Gmelina arborea* and *Eucalyptus deglupta*). In 2007, production reached 342,000 m³ of logs; but, only 8 per cent was processed within the province (ADS-PPDO, 2008, p. 62). At the regional level, while Caraga was recognized for its considerable volume of log production, the region has not contributed significantly to value-added activities significantly (NEDA-Caraga (National Economic and Development Authority), 2013). Because the region had inadequate facilities to process logs into semi-finished products, the bulk of raw materials were processed in neighbouring provinces in (Regions X and XI).

The political clan of the Plasas has had stronghold on the leadership of Agusan del Sur province. The clan rose to the position mostly because of their lead role in the logging industry in the province. The family has dominated the politics in Agusan del Sur since the 1960s (Severino, 1996).

Although no data on mining production was available for the province in the provincial plan, the Caraga regional office website of the National Economic and Development Authority (NEDA) lists gold mining as the major industry in the province. Mining exports continue to rise as evidenced by the 28 per cent increase in the value of mineral exports from 2011 to 2012. China is still the major market of Caraga's mineral products followed by Australia, Japan, Hong Kong and Switzerland. In 2011-2012 the government coffers received a total of ₱2 billion in the form of excise and royalty taxes from mining activities.

Today, significant areas of the Agusan del Sur's swamplands have been transformed into agricultural land and settlement areas. Land use figures show that approximately 1,277 of the 8,960 km² (ADS-PPDO, 2008, p. 33) or 14 per cent of total land area of the province are used as settlement and agricultural lands. Extensive lands are devoted to oil palm and pulp wood (especially *Albizzia falcataria*) in the hilly parts of the province. In the eastern part of the province, there are two major and twenty small scale gold mining schemes operating in the eastern part of the province. Growing concern surrounds extractive land use activity due to its erosion and siltation-inducing processes. Furthermore, the use of mercury and cyanide to extract gold from the sediments has been known to pollute the tributaries of Agusan River.

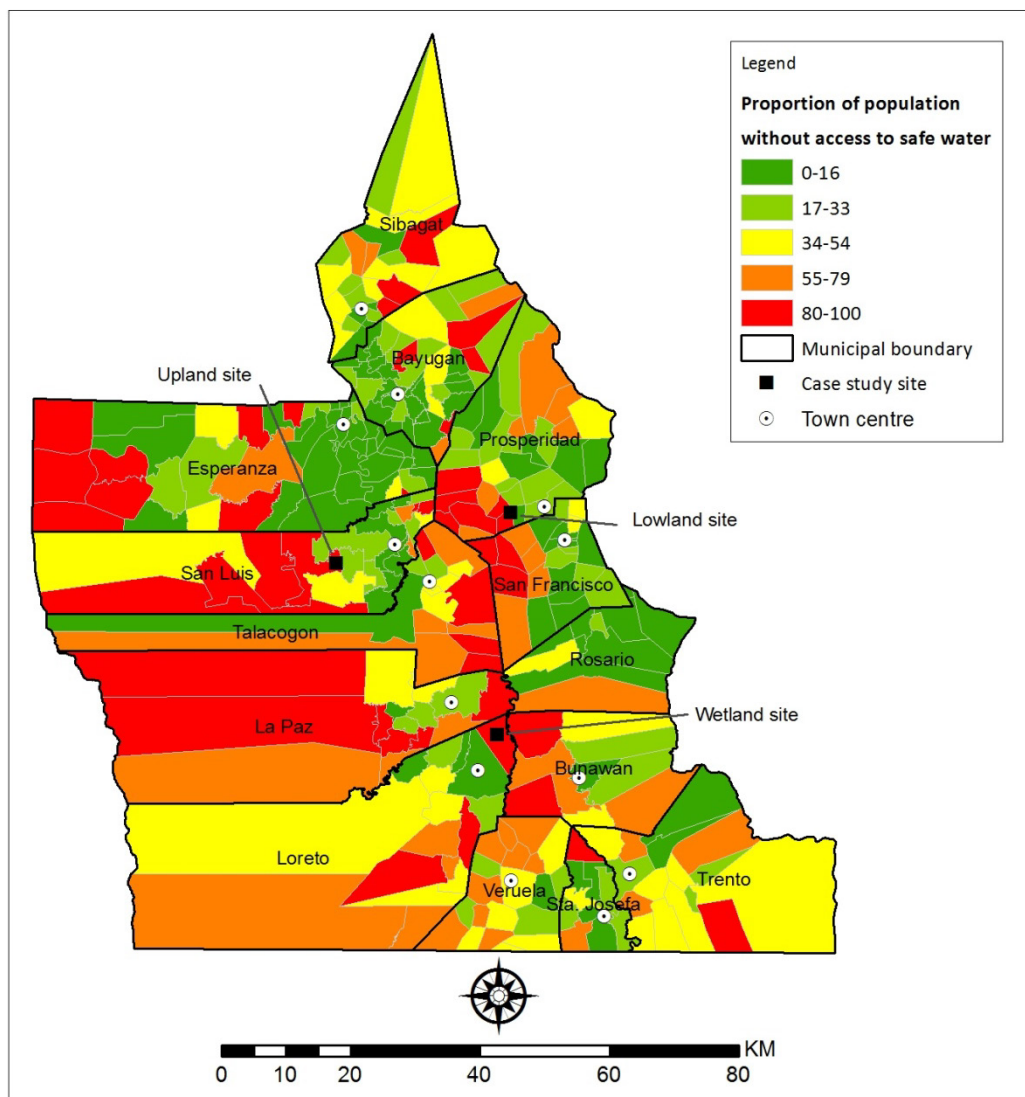
Agusan del Sur Human Development

While there has been increased agriculture production and increased economic activity in the mining sector, this has not translated into significant improvement in human development according to the 2009 HDI data. The region of Caraga's score of 0.468 implies low human development and, Agusan del Sur had the lowest score of 0.368 in the region. Although the province had the lowest HDI, it has the highest life expectancy among provinces in the region.

While poverty has declined in the province, it still remains high. There is still very low probability of achieving the Millennium Development Goals target of 18.80 per cent poverty among families by 2015.

Another crucial indicator of human development is access to water. Agusan del Sur's 2014 (Table 3.4) Environmental Sanitation data shows that the high percentage of families with access to safe water supplies was municipality and city dwellers who engage in urban associated activities. Those whose access fell below 60 per cent live in the upland and wetland municipalities (areas shaded in the Table below). Map 3.5 provides a visual presentation of the distribution of low water access.

Map 3.5: Percentage of Access to Safe Water per Barangay



Source: Water access data from 2012 CBMS
 Cartography: Author

Table 3.4: Households with Access to Safe Water in Agusan del Sur (2014)

MUNICIPALITY	TOTAL NO. HH	WITH ACCESS TO SAFE WATER SUPPLY	
		Number	Percentage
Bayugan City	17,012	17,012	100
Bunawan	9,541	7,062	74
Esperanza	9,791	9,079	92
La Paz	6,103	2,322	38
Loreto	8,015	4,695	58
Prosperidad	13,031	8,659	66
Rosario	8,866	7,999	90
San Francisco	15,456	14,026	90
San Luis	5,916	4,679	79
Sibagat	5,218	3,318	63
Sta. Josefa	5,853	5,098	87
Talacogon	7,000	5,672	81
Trento	8,256	7,878	94
Veruela	7,047	6,041	85
TOTAL	127,095	103,480	81

Source: PHO, 2014

Interventions to improve access to safe water have are classified into three levels. Level I are a stand-alone water points, such as hand pumps, shallow wells and rainwater collectors. Level II systems are piped water with communal water points, such as borewell and spring system. Level III systems are the piped water supply with a private water point, such as house connection (Robinson, 2004). In Agusan del Sur about 53 per cent of the households have Level I water system, 34 per cent for Level II and only 13 per cent have access to Level III (ADB, 2011). As shown in Map 3.5 most of the villages near the town centres (areas shade green) have better access to safe water in contrast to those further away.

DECENTRALIZED WATER AND SANITATION STRUCTURE IN AGUSAN DEL SUR

The Local Government Code of 1991 decentralized the system of local governance that impacted on the ways in which water and sanitation were provided in the different cities and municipalities in the country. In this section, I discuss the specific changes that occurred in the Province of Agusan del Sur.

Prior to the implementation of the Code, the functions assigned to the local government units (LGU) were limited to the collection of local taxes, enforcement of regulations related to business activities within their jurisdictions, and the administration of certain services and facilities like garbage collection, public markets, slaughterhouses and public cemeteries (Manasan, 2002). When the Code took effect, functions related to water resource management were transferred from the national government agencies to LGUs. The latter assume the main responsibility for delivery of basic services and the operation of facilities in the following areas: social forestry, environmental management and pollution control, water supply, communal irrigation, and land use planning. The national government agencies that shoulder these functions include the Department of Health (DOH), Department of Agriculture (DA), Department of Environment and Natural Resources (DENR) and Department of Public Works and Highways (DPWH).

The devolution process included not only the transfer of functions but also the personnel and budget. Manasan (2002), noted that among the agencies charged with the provision of water supply and water resources management in the Philippines, the Department of Health had most of its functions and budget devolved to the local government units, the DENR had the least number of positions transferred, while the DPWH had the lowest budget transferred to the LGUs (Manasan, 2002). What this suggests vis-à-vis the local governments is that they have failed to perform adequately due either to the lack of people and expertise or lack of funding.

In this section, I discuss the different offices involved in the management of water supply provision and development, and the management of water resources.

Provincial Government Involvement in Water supply

As a direct result of the Provincial Water Supply, Sewerage and Sanitation Sector Plan supported by JICA in 1998, Agusan del Sur created the Water and Sanitation (Watsan) Centre composed of staff from the Provincial Planning and Development Office (PPDO), Provincial Engineering Office (PEO) and Provincial Health Office (PHO). It was headed by the Provincial Planning and Development Coordinator who decided upon water project issues that arose.

LGUs were responsible for selecting sites, designing subprojects, and selecting suitable technologies with the full participation of beneficiary communities.

Provincial Health Office Currently, the Provincial Health Office of Agusan del Sur and its counterpart the Municipal Health Office (MHO) are the main offices that manage the LGUs' water and sanitation program. They perform three key roles: (1) they interact with the community and village leaders to identify projects; (2) they identify projects sites based on a set of criteria that the offices have set; (3) they are in charge of the soft part of government intervention. This means that they conduct information campaigns and training regarding water in the villages and municipalities. The training portion starts when the water systems are installed. Sanitation officers from the PHO and MHO team up to organize village water associations called BAWASA, to train officers and caretakers of the operation, and to repair and maintain the system. This usually includes Level I and Level II systems.

Provincial Engineering Office The staff from the engineering office are assigned the *hardware* part of the local government assistance. The staff, which include drillers, masons and engineers, survey water sources and provide assistance in the maintenance and repair. The municipal government engineering office staff coordinate with their provincial counterparts.

Department of Interior and Local Government (DILG)

The DILG, maintains an operations offices (at the province and/or municipality), to provide general administration and institutional building support to LGUs to strengthen the local

capacity for delivery of basic services. One officer is assigned per province. This officer is usually based in the regional office of the DILG in Butuan City.

Water districts and their role in rural water supply

Based on Presidential Decree 198, a water district is a local government corporation organized for the purpose of serving water supply requirements within a designated service/franchise area. Technical and financial assistance is provided in the form of loans the LWUA or other financial institutions. It is the role of the LWUA to regulate these water districts. The latter are expected to operate as businesses to generate revenue from water sales so that operating expenses and debt servicing and reserves for contingent funds will be covered.

Local water resources management

Agusan del Sur was among the first of the country's 81 provinces to established its own Environment and Natural Resources Officer (ENRO). Under the Local Government Code, the creation of an ENR management officer was considered optional. Not only did the provincial government designate or create an environment management officer; they created an entire office, the staff numbers of which have increased over the years. Today, the Provincial ENRO¹¹ has six functionary divisions within its office: mines and geo-science, forest management, biodiversity management, environmental management, research and development, and an administrative unit. The office, which performs tasks related to the enforcement of forestry laws, is limited to community-based forestry projects, pollution control law, small-scale mining law, and other laws pertinent to the protection of the environment, and mini-hydroelectric projects for local purposes. The office's work on the environment is still subject to supervision, control and review of the DENR.

SUPPORTING WATER SUPPLY PROJECTS

The call for support to improve the water supply in the rural areas commenced long ago. Ramon Magsaysay, who was President from 1953 to 1957, was determined to achieve the goals of his rural improvement programs that had water supply as their centrepiece.

¹¹ The name Provincial ENRO (pronounced as en-ro), is what is used to call the environment office that is under the LGU structure. This is to differentiate it from the PENRO that is under the DENR Structure.

However, critics disparaged Magsaysay's program, arguing that his economic policy was an 'artesian well economy' (Hart, 1954). The rural water supply improvement program continues today.

Local water supply projects

Table 3.5 lists the Philippine's more recent rural water supply projects that included Agusan del Sur as a recipient. Projects funded by ODA or Government of the Philippines (GoP) are reliant upon local provincial and municipal LGU staff for project implementation.

The above projects were funded either solely by ODA, by the Government of the Philippines or jointly. GoP funding is drawn from central government funds, usually from Presidential discretionary funds that are used to fund projects that are part of the current administration's priority program. Although most of these projects are listed as funded by the ODA or GoP, local government units also provide counterpart funds from their local budgets.

Table 3.5: Water Projects Implemented in Agusan del Sur from the 1980s to the Present

Water Projects	Year Implemented	Funding
Integrated Water Supply Program	1980	GoP
Rural Water Supply and Sanitation Project	1988	WB
Institution Building for Decentralized Implementation of Community Water Supply and Sanitation Project (WATSAN)	1996-1997	UNDP
Provincial Water Supply Sewage and Sanitation Sector Plan (PW4SP)	1998	JICA
Rural Water Supply and Sanitation Sector Project	2000	ABD
Presidential Priority Project on Water (3PW)	2004-2010	GoP
Kapit-Bisig Laban sa Kahirapan (linking hands in the fight against poverty) - Comprehensive Integrated Delivery of Social Services (KALAHI-CIDSS)	2007-present	GoP, UNDP
Payapa at Masaganang Pamayanan (PAMANA)	2009	NZAid
Tubig Ilimnun Ng Agusanon (TINA) – Biosand filter for households	2009-present	Congressional Representative
Salintubig Project	2011-present	GoP
Bottom's Up Budgeting	2013-present	GoP
Upland Support for Development (USAD)	2013-present	PLGU

Source: Compiled from Robinson, 2004; JICA, 1998; and various PHO reports

Funding provided by local governments for water supplies has to be taken from the LGU 20 per cent development fund. According to DILG policy, the funding must be used for human and ecological concerns. The development fund has increased over the years, with the increase in the LGU's internal revenue allotment ranging from ₱34 to 57 million. The share of water and sanitation in this allocation based on its historical data showed only 2 to 5 per cent which is very small (JICA, 1998a).

Funds allocated at the provincial level go to identified municipal units, while some cases, the municipal LGU decides where to locate the water supply projects, in others it is the provincial LGU (PLGU) that decides. There are also cases where the PLGU will require counterpart in the municipal government, either in the form of funds or in kind. When funds are required, the municipal LGUs draw from their own development funds.

In recent years, congressional representatives of the province have contributed financially to water supply development in their respective districts. The money comes from their priority development funds, which are released by the Department of Budget and Management to the congressional representative. Although in the past, the representatives may have allocated assistance to communities, starting in 2009, a program for water supply has been pursued, which is referred to in the list of projects as the TINA.

CONCLUSION

This chapter foregrounds the biophysical context of the Agusan Basin and how influences the kind of water resources available in the area. It also show the influence of the Agusan River in the environmental dynamics in the area. The discussion on the history of Agusan brings to the attention that despite the prominent role of Butuan prehispanic trading network, this was not carried on to its recent history. Its contribution to the country's economy through timber production had not translated into ample public services. Lastly, past land and migration policies have marginalised the native populations of Agusan in favor of migrants, leaving them in areas where land tenure is insecure and public services grossly inadequate.

The next chapter discusses the methods used to conduct the study.

Chapter 4

Methodology: Probing Rural Water Practices and Experiences

INTRODUCTION

This chapter outlines the overall approach and the specific methods that were used to investigate the problems of rural water access in three types of landscapes in rural Philippines. It also discusses the rationale for employing an ethnographic methodology to study the experiences of constrained rural access to water. The particular techniques used to collect, organize, and analyse the thesis data will be discussed.

My research addresses two themes: water scarcity and water resource management. The core research question focuses on water scarcity in the specific context of rural areas. This gives rise to questions vis-à-vis how people experience water scarcity and how a basic service such as domestic water supply is provisioned by the state. In this regard, the communities' practices of accessing and using water, government practices of providing water in the villages and the biophysical conditions of the area are points of interest.

The first part of the chapter discusses the general design of the study, the decisions made when selecting the study sites and the rationale for using the approach for studying water access. In the second part, I detail methods used, and what specific data they were used for. Focus in the third part is on my positionality in the field, and how my outward identity assisted and challenged the field research process.

RESEARCH DESIGN

For the purposes of this study, I employed a qualitative research approach. Ethnographic methods were used to examine how water scarcity is understood, experienced and addressed in three types of rural environment. A qualitative approach is suitable for exploring and interpreting the viewpoints of people in a specific context, and for eliciting the meanings, explanations and concepts sought (Ritchie, Lewis, Nicholls, & Ormston, 2013). It is useful for accessing 'tacit, taken-for-granted, intuitive understandings of culture' (Tracy, 2012). Key ethnographic methods such as participant observation and field interviewing uncover Hirsch and O'Hanlon's (1995) notion of a layered landscape. An initial exploration of Agusan del Sur's high average rainfall and of the Agusan wetlands resulted in an assumption of a sufficiency of water in the area. However, the water situation in the rural areas proved much more complex and diverse. My employment of an ethnographic methodology revealed diverse experiences of water scarcity in three different environments in Agusan del Sur. The Agusan waterscape is seen as the 'first landscape'. Through fieldwork, ethnographic description and interpretation (Stewart & Strathern, 2003), the 'second landscape' (E. Hirsch & O'Hanlon, 1995), which is produced through local practice, is made visible.

Geographic difference, a core theme in geography, means that different places have different biogeophysical and social characteristics that are linked to their respective environments (Zimmerer & Bassett, 2003). Heeding its influence on shaping environmental issues such as lack of water access, I conducted in-depth examinations of three different rural landscapes wherein access to water was constrained. In Agusan del Sur, I identified three distinct rural spaces, that is, the uplands, lowlands and wetlands. The first site was located in the uplands of the San Luis municipality in the central west section of the Agusan River Basin. The second, the lowland village of Napo, was situated along the Gibong River, one of the bigger tributaries of the Agusan River. The third, the floating hamlet of Panlabuhan, was situated in Poblacion village in the town of Loreto in the southwest section of the Agusan Marsh. Observing the problem in these specific rural contexts provides a nuanced understanding of the practices and rationalities involved in the use of water in a particular place. Rather than merely asking about what people say they do, researching in context provides an opportunity to see and hear what people actually do.

In human-environment research, immersion is not only in the social setting, but also in the environmental settings (P. F. Robbins, 2010). Understanding the specifics of how different water resources are being used in the community, how the water system works and a technical understanding of said water systems must be given special attention.

Water provision is among governments' interventions that set out to improve the lives of their people. My aim was to achieve a more adequate understanding of the problem, given the perception that it is part of a complex interaction of causes and effects. The wider context included the local and national government and concerned organizations, and the local policies and international agreements that influence how water access is addressed.

My overall approach was ethnographic. I utilised various methods such as field observation, field interviews, geographic information technologies to map research sites, document review and secondary data analysis. The use of these methods is discussed in more detail in succeeding sections.

SELECTING THE RESEARCH SITE

Exploring the nature of water scarcity in a rural area necessitates that the area studied should have experienced problems of insufficient access to clean water. Furthermore, since the study also investigates the links between water scarcity, and extends to a wider discussion of water resource management, the area must also be where integrated water resource management is being either planned or pursued. But, beyond the above criteria, other factors influenced my decision to choose Agusan del Sur as my research site. My familiarity with the area influenced my decision to conduct my research in Agusan del Sur province. I had earlier visited the environment agency offices in the Agusan region on several occasions to conduct workshops regarding the forest cover assessment that our The Philippine Environmental Governance Project, for which I was working at the time (2008) conducted for the entire Mindanao Island. I was further exposed to the area in 2009 when I co-coordinated a field school for the geography students of the University of the Philippines-Diliman which focused on the Agusan Marsh Wildlife Sanctuary. The field school allowed me to observe another dimension of water access practices of wetland dwellers, an experience that further cemented my interest in the topic. Lastly, my relatives in Agusan have always encouraged/requested me to undertake my research in the area because they felt that

Mindanao is often left out of research pursuits due to Mindanao being deemed an unsafe place due to political unrest. Given the criteria and other factors, I decided to undertake this study in the Agusan River Basin, Mindanao Island, in the southern Philippines.

Zooming into the village case study sites

My selection of the specific villages underwent various changes. I used the same criteria that the Department of Health (DOH) and Department of Interior and Local Government (DILG) used to identify areas that had problems with water access. In these areas, which are called 'waterless' villages or municipalities, only 50 per cent or less of households have access to safe drinking water. I incorporated the poverty incidence at 50 per cent or more as another criterion because poverty aggravates the uncertainty of access to water. During my preliminary fieldwork in January 2012, I consulted the Agusan del Sur - Provincial Health Office (PHO), the office that handled the province's Water and Sanitation program. The staff provided me with a list of all the villages of the province where information about the percentage of households with access to water and its poverty incidence were indicated. With their help I created a short list of each of the three types of sites. Following the advice of the PHO, I consulted the provincial government's Environment and Resources office regarding the security in some of the villages we identified.

FIELDWORK SCHEDULE: A SHIFTING TIMELINE OF ACTIVITIES

Fieldwork is an important part of geographical research. The 'field' is commonly associated with being 'outside', and gathering data. But as Seale et. al. (2008, p. 206) observe, the term fieldwork refers to 'the data collection phase when the investigators leave their desks and go out "into the field"'. The field may not be one single site: it may include a wider institutional landscape and context. My field variously included the Manila offices of government agencies that were involved in water provision and water management, the different offices of the local government of Agusan del Sur, and the villages in which I experienced community immersion.

The reality of doing field work means that many of one's pre-planned activities do not occur as scheduled. Intervening circumstances caused delays; thus adjustments to my research

timing were needed. In addition, inclement weather and personal circumstances caused delays in my field activities and the fact of my being pregnant necessitated adjustment to the research timing. After assessing the situation, I was convinced that I would be able to manage to continue with my fieldwork, albeit I would have to adjust the timing of my community immersions in specific areas.

My fieldwork was conducted in two phases: the first phase was my preliminary visit in January 2012 and the second extended from November 2012 to January 2014.

Preliminary visit

I had three main aims for doing my preliminary visit: (1) was to consult the relevant offices regarding my topic and to seek their advice regarding the specific field sites; (2) to introduce myself and detail my plans for doing research into water constraints in the province; and (3) to enquire about any required procedures for doing research in my target sites.

Visiting the relevant offices was a good opportunity to personally introduce myself. My past experiences working with local government units had taught me that face-to-face introductions and talking to people were the best ways to approach local government units when one plans to do activities in their area. It is far better than simply sending a letter detailing your research. I talked mostly with the Provincial Health Office staff because it is they who deal primarily with the monitoring of provincial government's water and sanitation program.

Provincial local government officials informed me that they required individuals or groups who planned to do research or to provide services to the communities in the province to formally inform officials at the provincial, municipal and village levels regarding their activities. This requirement was enforced due to untoward experiences of communities being taken advantage of by organisations supposedly doing research or providing services to these communities. Although my research did not target indigenous peoples per se, I had to coordinate with the provincial office of the Commission on Indigenous Peoples in Agusan del Sur because that area was an ancestral domain area. I was told to write a formal letter to their office outlining my planned research, and to inform the community in advance so that I could ask their consent. The Protected Area Superintendent (PASu) of the Agusan Wetlands

informed me that I needed to present to the Protected Area Management Bureau (PAMB) during its assembly, to request permission to conduct research in the protected area.

Main fieldwork

My main fieldwork was undertaken between November 2012 and January 2014. I took a break from my fieldwork from May to July 2013 as I gave birth in the first week of May. In addition to the main village immersions in the case study sites discussed below, repeated visits to the sites were done within the fieldwork period (except in April to August 2013). My home base was in Manila and my research base was in Prosperidad, Agusan del Sur's capital town. Prosperidad is an hour and forty-five minute plane ride from Manila to Butuan City followed by a two hour bus ride. I travelled to my different case study sites by bus, hired vehicle or boat (wetlands).

My initial community immersion in the wetland site was scheduled in the first week of December 2012, just as a typhoon was spotted moving towards Mindanao. On December 5, super typhoon Pablo (Bopha) hit southern Mindanao. It was the strongest typhoon to hit the area in two decades, it caused a lot of damage to lives and property including my wetland and upland sites. Naturally I had to postpone my community immersion. The week after the typhoon, I travelled to Agusan del Sur and decided to stay in the Provincial Capitol in Prosperidad. The local government was in the thick of disaster relief operations. I tried to visit some of the offices (water and sanitation, environment, health) in the province hoping to interview some of the staff. But most of the staff were out, having been mobilized to pack relief goods that were urgently needed. The municipal government of the affected towns requested relief assistance because they too were busy providing on site emergency assistance to their residents. I then decided to help with the packing of relief goods. This situation allowed me to gain an insight into how local governments function in disaster situations. Normal operations are disrupted and have a subsequent effect on the delivery of services to other areas.

In January 2013, I was finally able to start my community immersion in Napo, a lowland village. But once again I experienced delays, caused by inclement weather. January is the rainy season in Mindanao; so Napo was flooded. After a few days of waiting, I was able to go to the village and stayed there for two weeks. In February 2013, my planned community

immersion in the upland village was cancelled because of the rain. My provincial and municipal government contacts told me that the upland site was inaccessible to four wheel vehicles and that only motorbikes could pass. Since there was minimal rain in the lowlands, I decided to look at the operations of water districts that customarily provide services to the small urban areas in the Province. Although, not originally part of my plan, I realized that it would be useful to the research to see what kind of links the established water districts have when providing service to the rural villages surrounding their current service area. I conducted formal interviews with the staff, then joined a team that went to inspect their proposed new water source for their operations.

In September 2013, I managed to go to my upland site of Policarpo in the San Luis municipality. The sanitation officers of the Provincial government who were my contacts regarding the site insisted that I first meet with the municipal sanitation officers of San Luis before going to the community. I later found out the reason for their insistence. There were some reports of New People's Army (NPA) movement in the general area into which I was going. After talking to the municipal officers, they told me that based on their assessment it was okay to proceed with my fieldwork. So I did. I stayed in the community for one week.

My final village fieldwork in Panlabuhan in October 2013 proceeded without any hitches. Because Panlabuhan is some distance from Prosperidad, I first travelled by land and then by boat to the southern portion of the Agusan Wetlands. I stayed in the village for approximately two weeks. The succeeding months, up until January 2014, I spent travelling between Manila and Agusan tying up loose ends.

Figure 4.1 shows a timeline of field work/visits in relation to the dry and rainy seasons in Agusan. It illustrates that I was unable to be in the area during the driest time of the year, which is the particular interest of the research. Although, fieldwork in the context of the dry months would have added to the richness of the data, I believe the people's descriptions of their experiences during the period of low water supply was sufficient to provide an adequate overall picture. Interviewing them in their own place, where they could point out to me the physical locations they were telling me about, helped in vividly describing their experience during the period of low or scarce water. Clearly my personal observation, experience, and documentation (through photographs) was limited because of the timing, but the descriptions of people's experiences compensated to a large extent.

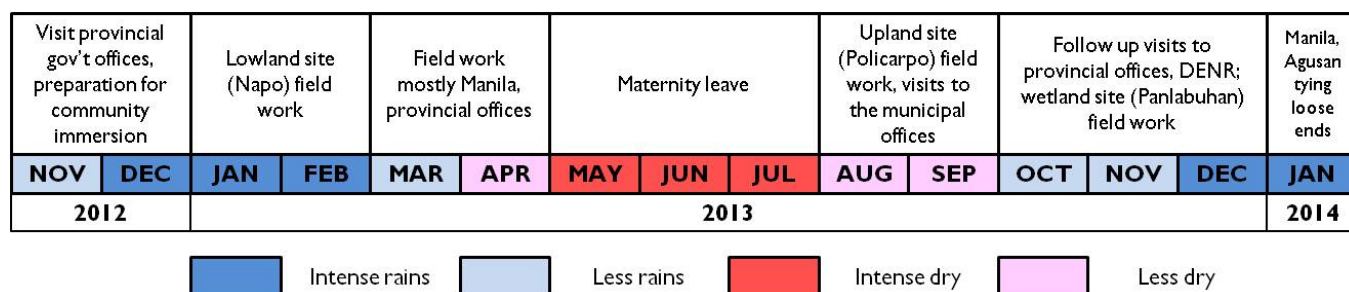
The next section discusses the various methods employed in data gathering and the challenges encountered in the research process.

FIELDWORK METHODS AND DATA

Formal interviews

Most of those interviewed using this method held official positions in the government. This included: different offices of the Department of Interior and Local Government; the Department of Health and National Anti-Poverty Commission in Manila; the Provincial Government and Provincial Environment and Natural Resource Office (PENRO) of Agusan del Sur; the municipal governments of the three case study sites; and, the local water districts. The interviews were held in their own offices. The questions followed the themes indicated in the letter that was previously sent to them. The interviews aimed to learn about the practices and experiences of performing tasks related to providing or managing water resources. The interviewees were asked about the problems and challenges they encountered when performing their tasks and for their opinions regarding the policies and actions of their institutions. Some of them were candid in their criticism of their own institutions. In some cases, I had to re-interview participants because my community immersion revealed some information that did not align. In these cases, the interviewees were willing to be interviewed again and to clarify their previous answers. I also used the opportunity to observe the set-up of their offices. The interviews were recorded and transcribed after the fieldwork and, observation was recorded as field notes.

Figure 4.1: Profile of Agusan River Nov 2012-Jan 2014



I also conducted interviews with the village chiefs of the different sites. Although I had to go through official channels to stay in the village, the success of the data gathering was dependent on how I interacted with the people in the community. Sikolohiyang Pilipino (Filipino Psychology) scholars stress that awareness of Filipino social interaction and communication protocols comes in handy when researching a community. Pe-Pua (1989) cites, for example *pagtatanong-tanong* which literally means asking questions but is different from interviewing. The latter have a formal atmosphere and there are clear interviewer and interviewee roles. Pe-Pua describes *pagtatanong-tanong* as having a casualness about it and it is participatory. This resonates with how my interviews unfolded. The people I interviewed often asked questions pertinent to myself and my personal circumstances before I posed questions related to my research. There are often side *estorya* (stories) about something that may have happened in the community, the relating of which causes the interviewee to stray from the topic. But s/he wants to talk about it. Within the process, there is blurring of interviewer-interviewee relations which helps to make the ‘interviewee’ more comfortable and forthcoming about sharing their opinions, knowledge and experiences.

There were instances when the interview turned into a group interview. Often the neighbours would come by and voice their own views. In many cases, the original interviewee remain unperturbed. But on one occasion, the village leader I was interviewing was frank and told the person to come back after the interview. I welcomed impromptu group interviews because they enriched the answers of the selected participants, especially when they helped her/him to recall certain interventions in the village.

Informal interviews

Informal interview could be described as ‘chatting with people in the field’, not necessarily about the research topic, but about ‘things’ in general, by extension providing a better sense of life in the research area. ‘*Estorya-estorya*¹’ would often be the response of the person to whom I was chatting when somebody came by and asked what my interviewee was doing. The topics ranged from local politics, history, the economy, significant events, personalities and/or programs that were implemented in the village. Controversies were also aired. People did not just state the facts, but also provided their opinions and interpretations of these

¹ In many instances in Visayan language (i.e., Cebuano, Hiligaynon, Waray), a linguistic trait of repeating an action word like *estorya* can weaken or diminish the action, as though it was ‘not performed in a serious or deliberate manner’ (Gamboa, 2009).

'things'. In most instances, people could not recall dates properly: they would often resort to names of typhoons occurring during that period. Sometimes they would refer to term of a president or a local politician as a time reference. This proved useful because I could search the Internet or office records if I needed other information relating to the topic.

My informal interviews were not necessarily planned. They often happened during 'research-off' times, such as when I was having a snack or a meal, preparing meals, hanging out with my host, getting an impromptu invitation to a *tapok-tapok* (informal gathering) at the small grocery store in the village, travelling or when having long waits for transportation.

I conducted a total of 153 interviews (41 from national, provincial and municipal offices and 112 from three different case study sites). In general the interviews lasted for a minimum of 30 minutes with the longest running to about 3 hours long. The interviews in the offices were recorded and some of the longer interviews of village chiefs in the case study sites were also recorded. However, many of the interviews were informal, casual conversations in the context of having meals or walking along in the fields and therefore notes were constructed after the activities. A list of interviewees/participants was recorded and an anonymised list is attached as an annex of the thesis (Annex 1).

To process the data from the interviews, I analysed and compared responses from each of the three categories of interviewees (community members, village and municipal leaders, and the staff of the water supply related offices) by theme and looked for consistencies and differences within and between the categories of informants.

Participant observation

Participant observation is a process of watching, participating in, and asking questions within a particular social setting. The researcher's aim is to reflect on it and to form an understanding of it (Atkinson, Coffey, Delamont, Lofland, & Lofland, 2007; Neuman, 2006). Central to this method is the observing of the particular social setting or situation as it is played out. This research method not only generates rich data, but provides an opportunity to gain important insights into hitherto poorly understood areas.

Since water is used everyday, there were many opportunities to observe the practices of getting water for drinking, bathing, washing, cooking, the use of water for sanitation, for their livelihood activities, the watering of home gardens, and where and by what means people obtained water for their daily activities. I personally experienced waiting in line, for water. I not only had to get in line but had to carry the water up a short but very steep incline to the path that led back to where I was staying. The everyday task of going to the toilet required substantial effort, particularly as one does these things repeatedly. Having to cope with this mundaneness made me realise why it was hard for people of Policarpo to stop their practice of open defecation when water was not available for their ready use. I noted in my field notes that just thinking about fetching water when I was there frustrated me. The thought of having to do it every day like the people of Policarpo was less than tolerable. It also made me question why storing water was not common practice in the village. Overall, this experience provided me with a nuanced understanding of households that includes the beliefs, knowledge and rationalities that form the basis of people's water usage.

Living in the community, *pakikisalamuha* (participating) in everyday events like meal preparation, eating, hanging out in the nearby *sari-sari* store (mini grocery) or watching TV with the villagers, helped to *pakikipalagayang-loob* (build rapport) with my research participants (Enriquez, 1990). When not actively interviewing, I engaged with the everyday stuff that the people negotiated.

Transect Walk and Field Mapping

At the start of my community immersion, I did a transect walk in the village. A transect walk is a 'systematic walk along a defined path (transect) across the community' accompanied by some village members (SSWM, nd). My intention was to explore the conditions in the village by observing, asking questions and noting points of interest. In actual fact I did a modified version of the transect walk by incorporating field mapping using a Global Positioning System (GPS). In the first village in which I did my community immersion, the people in the village centre said that there were only 5 *atabay* (wells) in use. However, when I did my mapping, I discovered that almost two in every three households had water wells in their backyards. The villager who accompanied me, took me to houses where she knew there was a well or water source. I introduced myself and told them about my research. Most of them acknowledged that their village leaders had mentioned my work to them. They told me that

they guessed that I was the *bisita* (visitor) when they saw me approaching their houses. I then interviewed them to elicit specific information about their respective *atabay*, when and why it was constructed, what they used the water for, what they thought about its quality, when did they not use its water, how they maintained it, and what were the arrangements regarding who could use the wells. I usually marked the location in the GPS after completing my interview. Some interviewees offered to tell me who among their immediate neighbours had a well. Although, my research focus was on domestic water supply, I asked about their sanitation arrangements as the positioning of their toilets in relation to their wells was important. In some cases, I marked the location in the GPS, and on others I sketched it in my field notebook.

As I passed by the houses, I stopped to chat with the villagers. Some asked what I was doing. In most cases, they knew already of my purpose in their village, but they still wanted to ask me personally. I realized later that this may have been because they wanted to be sure that I was not from the Department of Social Welfare and Development (DSWD)². They did not want to miss out being part of the survey that would assess who would be part of the government's conditional cash transfer program.

My fieldwork in the wetlands required an enhanced field mapping method to appreciate the micro dynamics of the wetlands environment in Panlabuhan, and the activities of the settlers in the floating village. This enhanced method entailed a combination of different equipment; for example the GPS, a camera and a voice recorder. I used the method when I accompanied one of the villagers to check the fish traps set the previous day. In my earlier conversations with villagers, they spoke of the challenges they faced living and working in the wetlands; the dynamics of the places, river and lake they referred to escaped my full understanding. During the fishing excursion, Bebot and his son talked about them again. It was during this activity that I clearly saw the value of doing research in context. Throughout this specific fishing activity Bebot and his son talked animatedly about many aspects of the fishing and environment dynamics they had not mentioned previously. Bebot pointed to specific places where accelerated shifting of the bathymetry of the wetlands was happening, resulting in deep incisions of some stream channels, and rapid *abono* (deposition) in some areas. He also talked about where certain fishing gear was set, and how fish were fooled into entering the

² The DSWD is currently implementing the Pantawid Pamilyang Pilipino Program, commonly known as 4Ps. A human development program, its focus is on health and education for poor households, through conditional cash transfer setup.

traps. While this was happening, my GPS was tracking our way or route. I took photos, took an audio recording of Bebot's narration¹². Before setting out on the fishing trip, I synchronised the clock with the three devices. The tracking feature of the GPS gathered point locations (including time and elevation) in short intervals, of the route of the fishing trip for example. It was like dropping bread crumbs to mark our path. This was very helpful because it allowed me to refer the specific location of the sites he pointed out in his narration (by matching time stamps of both records). In a sense I was georeferencing his narration. The mixing of ethnography and mapping, a positive synergy of methods provided a good opportunity to document human-environment interaction in a particular place, which often are generalised or glossed over.

The GPS recordings of locations were downloaded into a Geographic Information System (GIS). The notes that I took describing locations of interest (water sources, houses, toilets, water interventions, and tracks) were recorded in database format in Excel, and later linked to locations of interest in ArcGIS software. By transforming the data into a GIS format, they could be easily overlaid with other existing thematic maps that I considered useful for the study, such as topographic data, water availability, and drainage.

Having broad experience of GIS in my earlier professional work, I was familiar with the spatial datasets available, and knew which data sources would provide me with better spatial resolution. My research sites were remote villages: often they lacked good maps. My key aim was to integrate the different data that would help shape a richer description of the site.

Water sampling and quality testing

One of the additional datasets which I did not include in my original data gathering plan was the collection of water samples and having them tested for different indicators of water quality. In the early stages of my main fieldwork, I heard about a laboratory within the province that could be reached within the maximum holding time after collection of the water samples. During my first community immersion, the villagers mentioned certain sources from which they could draw water, but for which they were unsure of its quality. Given the information about the availability of the laboratory and the articulated need for

¹² I thought about video recording it, but the battery power constraints in a place where there was no electricity made me think otherwise. I also thought that the video recording Boyet might also make him self conscious and therefore get in the way of his activity and his casual narration.

water testing I decided to have the water samples collected and tested in all of my three case study sites. A water quality report would be good data to include, as it would assess the ‘improvements’ done to the water sources in the community.

Document Review

Researching water provision involved a significant amount of time looking at documents ‘that may be searched for clues to understanding the culture of organizations, the values underlying policies, and the beliefs and attitudes of the writer’ (Simons, 2009, p. 63). The documents that I searched included the Philippine government’s international commitments, national and local policies, national and local (provincial and municipal) plans, state program documents, and documents from non-government organisations (NGOs). Funding agency reports were also collected, reviewed and important sections noted. The main information noted from these documents was applicable to Agusan del Sur, and specific to water provision and water resource management.

Secondary Data

Secondary data are data that have been created by others but are used in the research in a different way (Schutt, 2014). Commonly, such data are generated by government agencies, published scientific studies or archives. They often come in the form of databases that individual researchers may not be able to singlehandedly collect by themselves (St Martin & Pavlovskaya, 2010). Examples of these datasets are census, resource inventories, satellite imageries, and digital spatial datasets. My study used data from the provincial socio-economic database of Agusan del Sur and the digital spatial data from the provincial government’s environment and natural resources office.

Community-Based Monitoring System Database (CBMS) This research accessed data from the Community-Based Monitoring System, produced by the Provincial government of Agusan del Sur. This CBMS was designed by a network of organizations (local and international) that developed tools to organize and analyse information. The aim was to provide policymakers and program implementers with a basis for monitoring the impacts of state policies and economic reform, by extension improving the lives of the people (Angelo King Institute, 2008). The collection of information for the CBMS of Agusan del Sur

followed the design proposed by the CBMS Network. Information was gathered by enumerators from the villages, who were paid by the Provincial government. Questionnaires were distributed for the purpose of gathering data, both at the household and individual levels, providing data not only on populations, but also key indicators pertinent to health, food and nutrition, shelter, peace and order, incomes, employment and education. Part of the aim of the CBMS was to improve the capacity of local governments, and to develop a transparent system of resource allocation and governance. The Provincial government has conducted the survey since 2005 and has been conducted every 3 to 4 years since.

This study used the CBMS (2012) data to provide a picture of the following aspects: (1) population count and structure; (2) economic activity; (3) food adequacy of the case study sites, and (4) water and sanitation. The CBMS data on households' main sources of drinking water and availability of toilet facilities was compared to the data gathered in the field. However, because the CBMS data reported only one source of water per household, it provided only a part of the water access story of the case study sites. The CBMS was also evaluated based on how it is analysed and how this analysis influences the kind of water interventions that occur in a particular community.

One important distinction of the CBMS when compared to the national census, is that the locations of households are georeferenced, meaning that each household has its location identified together with its census results. Therefore, when spatial analysis of households and their resource usage vis-à-vis the environmental context are needed in the analysis, researchers no longer have to settle for spatial data summarized by area (such as average or total number of villagers engaged in artisanal mining within the village area). Spatial identity matches the level at which the census is collected (which is at the household level). Using this spatially disaggregated household data would mean that lack of access to water could now be presented not only as percentages per village, but could specifically show the locations of households that lack access to safe water. Currently, the provincial government does not use the CBMS data in this way: it only follows the usual presentation as percentage of access per village.

Digital spatial data - Digital spatial datasets of various themes or layers were accessed from different sources: from the provincial government, digital topographic maps from the National Mapping and Resources Information Authority (NAMRIA), Philippine Task Force

for Water (PTFW), and imagery available from the Google Earth and digital elevation model available online. The mapped field data of water sources and water access descriptions compiled during my community immersion, were integrated with various spatial layers such as elevation, drainage, groundwater availability, roads, land cover using GIS. The intention of this method was to lay out the spatial context of the water features in the case study site because features in a location are determined by other factors present in the same location. Constructing a map allows one to gain insight into the kinds of processes at work on the landscape by linking one knowledge to other possible factors with the sites' spatial context (Goodchild, 2010).

The caveat in using these database is that these information sources utilise particular criteria that determine the phenomena or their features and, by doing so, exclude information about other phenomena (St Martin & Pavlovskaya, 2010). This results in the muting of certain phenomena because only certain 'formal' or 'standard' information is regularly collected by state agencies (Gibson-Graham, 2006) Informal social practices are not recorded and remain unseen by the state datasets that are often used for planning development agenda and intervention. A case in point in my study was that whereas the CBMS recorded one water source, in practice people draw water from multiple sources.

Given the limitation of these datasets, it must also be acknowledged that, but for the advancement in database technologies (quicker retrieval and cross-referencing of data variables) and the decreasing cost of maintaining such voluminous data that brought about the dramatic increase in collected datasets (St Martin & Pavlovskaya, 2010), data such as that of the CBMS of Agusan del Sur Province would have remained a pipe dream for local governments. However, to make these databases worth their cost it was essential to use non-standard approaches of presenting data to explore and visualize problems in water access (as will be shown in the case study chapters).

REFLECTIONS ON POSITIONALITY

The concept of positionality means that aspects of a researcher's identity such as gender, ethnicity, and age determine one's relational position and influence how one is positioned by her/his research participants. Unarguably, positionality can affect the research scene and the data collected. Aspects of bias should be embraced. Haraway (1988) argues that bias is

attributable to one's individual lifestyle, values and disposition; thus, it is often difficult to be 'objective' and devoid of bias. She further said that having such a view is like having a 'God's eye view', which emphasizes the impossibility of having no biases. Rose (1997) notes that the way around bias is through self-reflexivity which entails careful consideration of the researcher's personal biography, social situation, political values, past experiences, points of view, and roles. Hopkins (2007) stresses that this may require one not only to be mindful of the differences, but also of the similarities when thinking through channels wherein identity may influence research process and outcomes.

I describe my positionality as a 'forty something' woman, who lives in Manila, was born and raised in the Visayas islands, and speaks fluent Cebuano. Professionally speaking¹³, work has frequently exposed me to the rural setting, as someone who does mapping and teaching for a living. Being a native speaker of Cebuano was a point of similarity for most of the research participants. While several languages are spoken in the Agusan area, the *lingua franca* is Cebuano. Most Filipinos speak and understand Filipino (widely based on Tagalog), but it is not used in everyday interaction. Because most speak it haltingly, this often impedes their ability to expressing themselves to outsiders. I have noted on several occasions in my case study sites -- even in offices -- that people heave a sigh of relief when they realize that I speak Cebuano. They say that they 'will not get distressed worrying about speaking in 'Tagalog' when they talk to me, and this instantly earns me their favour. So, the ability to speak and understand the language invariably makes participants comfortable when interacting.

Often research participants looked for ways of relating to me. When chatting with or interviewing them, they would start with questions such as 'where are you from?' and I would answer 'from Manila'. And then they would ask why I speak Cebuano fluently and I would reply that I was from the island of Bohol, to which some would say there were a lot of Boholano in their community. Or, some of them would say that their relatives or someone close to them lived in Manila.

The fact of being pregnant during the period of my fieldwork, had its share of discomfort, but it also assisted me with my encounters in the community. I was on my fifth month and

¹³ I worked as a field researcher for an NGO involved in environmental research and indigenous peoples advocacy in the Philippines. I worked as a GIS specialist for an environmental governance project, providing assistance in mapping and spatial analysis to mostly rural local government units. I also taught part time at the Department of Geography at the University of the Philippines prior to commencing my PhD studies.

had to struggle a lot with the toilet situation as most of the toilets in the rural areas were not very comfortable. And, as I was researching in an area that had problems with access to safe drinking water, I had to bring my own drinking water supply. I was fearful of catching infection while pregnant, which would make me uncomfortable. On the other hand, being pregnant paved the way for connecting with the community. Coffey (1999) commenting on issues of fieldwork, states that the body itself is a key feature in one's relationship in the field. Schrijvers (1985) describes how her pregnancy and status as a mother was a significant point of her encounters with people. My relationship with women participants was based on sharing their experiences of being pregnant. People were very helpful and keen to make sure that I was comfortable. In some cases I was admonished by grandmothers about *laruy-laroy* (gallivanting) and seriously cautioned by the townsfolk to be careful and always have somebody with me when I was asleep because there are *ik-ik* (a creature of Filipino mythology) that target sleeping pregnant women.

Outsiders taking an interest in studying a particular place are often accorded the status of respect by the community being researched. Community members often told me that they were appreciative of the fact that I had chosen to study their villages. They considered me a *bisita* (guest) and would often go out of their way to make me comfortable. I have always been comfortable doing fieldwork in rural areas having done a lot during my career. To me it was a wonderful opportunity to travel and get to know my own country intimately. Yet sometimes, I felt that I had to exaggerate my comfort so that my host family would be at ease. I felt I had to resort to 'performing' an identity to make them more relaxed. This echoes what Goffman (1959) referred to as 'impression management' whereby people define a situation through the manner of interacting.

One's social network, or the people one comes to know, helps one gain access into an area, but, it can also get in the way of a researcher's interaction with her/his participants. In my wetlands case study site, a female staff member from the protected area office accompanied me to the site. She had both professional and personal ties with the area as the hamlet was part of the area that she monitored as part of her job. In addition, her ancestors from her mother's side came from there. What I was unaware of was that there seemed to be some dynamics with the hamlet chief, a problem I only became aware of after the staff left. I felt that the hamlet chief seemed to avoid me. I twice asked if I could interview him, but on both occasions he declined: he said he was busy with something. The second time I asked, I

already sensed his hesitation and speculated that, if he consented to an interview, it might be tokenistic. I decided that I would not ask again. A few days later, his mother, with whom I had chatted on several occasions, 'confessed' that her son was hesitant to talk to me because of my association with the protected area staff. But, she said, she had convinced her son that it was 'okay' to talk to me. That night, he came to the floating tourist cottage where I was staying and chatted with me. It was a very fruitful exchange because even though I opted not to interview him regarding water, I was able to get data about the issues and challenges surrounding the 'assistance' that had been offered to their village. Mataragnon (1987) identifies *pakikiramdam* as an important skill to have when researching in the community. He describes it as a 'covert individual process by which a person tries to feel and understand the feelings and intentions of another' by paying attention to subtle cues and non-verbal behaviour (Butalid-Echaves, 1999). I found this especially significant because Filipinos have a propensity for indirect or non-verbal communication (Pe-Pua & Protacio-Marcelino, 2000). Thus, had I 'pushed' for an interview prior to our chat, it may well have been superficial.

Managing Bias and Expectations

Concern for bias is always at the back of a researcher's mind. There were instances when I was acutely aware that I may have been operating from my personal bias, making assumptions which may have led me to misunderstand my informants' responses. An example was in relation to the reason why the villagers in Policarpo continue to practice open defecation. I initially felt that they were just 'lazy' about maintaining a toilet, but in the course of my fieldwork, through conversations with the villagers and my own experience of having to get water to use for the toilet, I was able to see the perspective as to why villagers were dragging their feet in adapting the use of the toilet 'for their own good'.

In a different situation, I believe that my experience in many rural communities in my past work were also a source of bias. In one instance, while I was with a villager from the wetland site collecting fish caught in his fish cage, I saw him throwing the fish back into the water. As I observed this, I readily jumped to the conclusion that he was selecting fish by size and did not ask about why he was doing it. After an hour or so, I was questioning myself why I was assuming his reasons for this practice. Belatedly, I eventually asked why he was doing it and got his answer. Although, his answer agreed with what I assumed, it was still an assumption of mine and not his answer.

In sum, the key aspects in dealing with my biases were, first to be aware and acknowledge the specific biases that I have. The second was realisation that self-reflexivity matters. I think allotting a time of the day when writing field notes was a great time to think about how I negotiated the day and what were the things that perhaps I had ignored or that had irritated me, or in the case above times when I assumed things to be in a certain way. A third aspect, is that the data that I collected through ethnography, asking questions and experiencing things for myself, allowed me not to depend on my own preconceptions and assumptions.

Researching water is a topic often assumed as something relating to government service or as part of NGO assistance. I found myself often positioned as a bringer of development. To some degree, I managed to negotiate this association by explaining that my research was part of my education as a lecturer at the University of the Philippines. People invariably responded ‘Ah, you teach’, which is readily accepted because teaching as a profession is highly regarded among rural families in the Philippines.

But, some of the people with whom I interacted most (that is village leaders, hosts), followed through with questions asking how this research would help them. *Makaayo ba na sa amo?* (Is that beneficial to us?). Within the confines of my own reflection, researching often provides privileges for the researcher – getting a degree or publishing a journal article. But, for the people researched, it may not be as tangible as they would want it.

The key response that I offered was that when researching, documenting and analysing issues of water access, a better way of doing things may be constructed. With regards to the more tangible aspects, many villagers said that they would like a copy of the map I had shown them (the topographic map showing the extent of their village). One leader asked if I could provide him with a copy of the transcript of my interviews because he could not record them himself; it would be useful for him to refer back to or to pass on to the next leader. I also provided each community and the sanitation officers with copies of the water quality testing results. Photo documentation was one of the things I believe they appreciated having. I promised them that when I finished my research I would return and present them a copy.

CONCLUSION

In this chapter I have detailed the kinds of method employed to collect particular types of data. I have addressed the challenges of collecting and drawing upon various types of data to construct the conditions and experiences of water scarcity in three distinct rural sites, both physically and socially and the interrelations of government interventions that are designed to address them.

I have also discussed the different ways in which my identity as a woman, teacher, and as pregnant shaped my encounters with the different offices in Agusan del Sur and in the rural areas that are deemed not usual places for outsiders to have interest on.

The next chapter explores the water scarcity experience of the villagers of the upland community of Napo.

Chapter 5

Policarpo: Physical Scarcity in the Upland Village

INTRODUCTION

In this first case study, I examine the continued physical water scarcity experienced by the people in the upland village of Policarpo despite numerous attempts by the local government to improve their water source. I seek to explain the outcomes and deficiencies of program interventions that aim to improve water access through an approach that had dominant focus on the application of certain types of water technology (springbox and drilled well), overlooking the physical context of the village. Alternative water technologies applied using biosand filters for households had minimal uptake among villagers because of inadequate consideration of sharing arrangements.

I present and analyse the context and experience of Policarpo in four sections. In the first section, I provide a background of Policarpo, its geography, a brief history of its current settlement, and a discussion of conceptions of upland areas in the Philippines that impact on the lives of the upland dwellers. In the second section, I focus on the specifics of water access. I show the status of safe access to drinking water in the municipality of San Luis and the village of Policarpo along with that of other upland villages. My research shows that the upland areas still have overwhelmingly low access to safe water, despite the different interventions. I identify the various water sources used and the various interventions that have been introduced to improve the village water sources. I analyse why these interventions have not been successful and the factors that brought about the failure. Due to the

inappropriate interventions, community members are forced to adapt to the situation and employ various strategies to deal with days when water is hard to come by. In the last section, I explicate the practices involved in the management of water and sanitation by the local government units at the provincial, municipal and village levels. These practices point to the fact that despite the distinct way water scarcity is experienced in Policarpo, standard interventions prevail, resulting to the failure in addressing upland village's water access issues.

BACKGROUND OF POLICARPO

Policarpo village, one of five upland villages of the Municipality of San Luis, is located east of the Agusan River and along the Maasam River, a tributary of the Agusan. The town of Esperanza is located north of the municipality of San Luis, Talacogon lies to the south, and to the east is the government town of Prosperidad. Based on past studies of the native people of Agusan (Garvan, 1941), the banks of the Maasam River from downstream to the upstream reaches have always been the territory of the Banwa'on tribe.

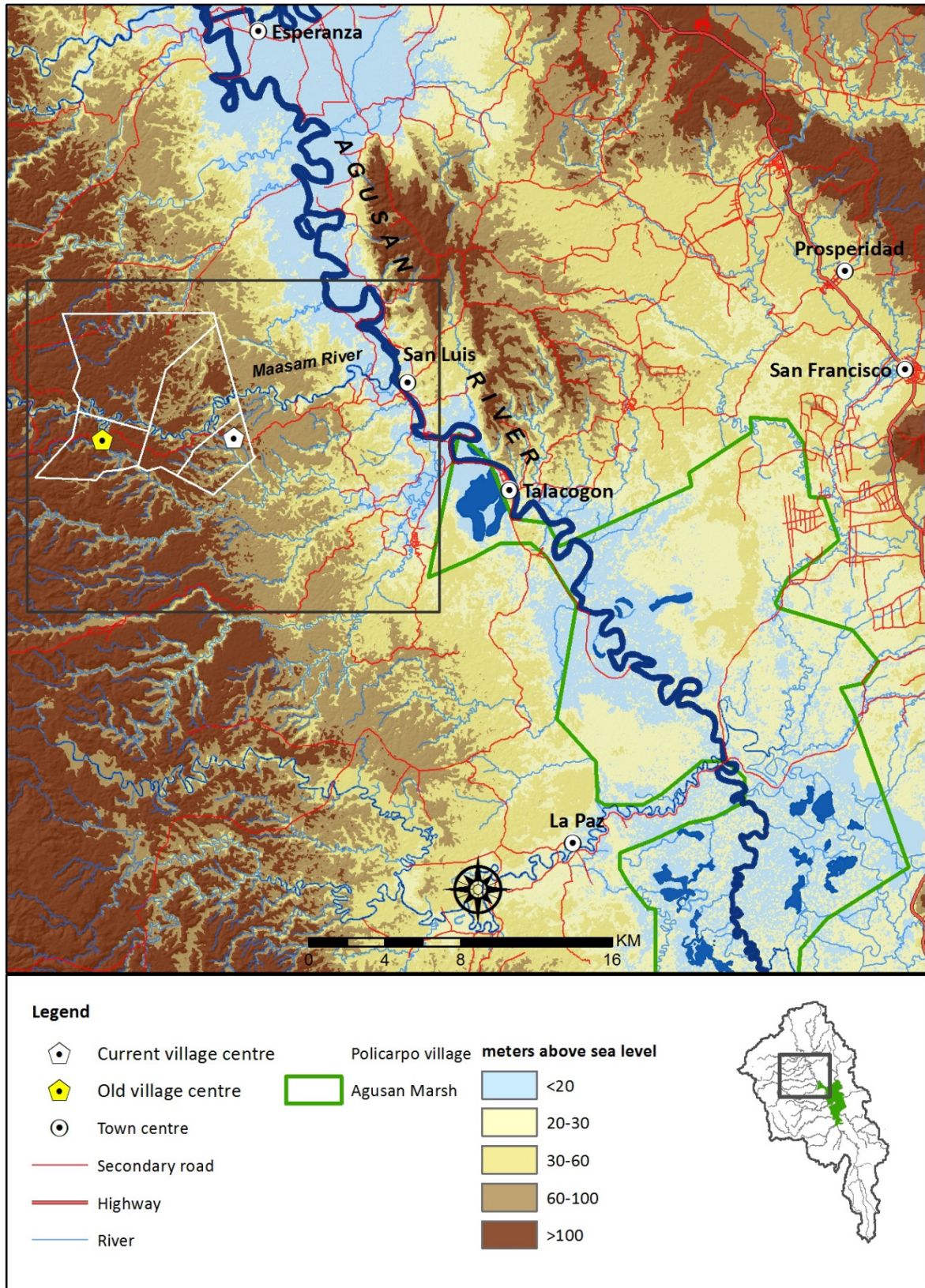
Typical of upland villages, Policarpo is remote and transportation is limited. Policarpo is not far from the town centre of San Luis municipality of which the village is part, approximately 11 kilometres. Its remoteness can be described as being 'out of the way' (Tsing, 1993) rather than remote in terms of the number of kilometres. Many of rural upland villages like Policarpo are not serviced by any regular public transportation. Buses ply from the main highway to the town centre but not to the villages. The villagers make do by transforming regular motorbikes into a passenger vehicles called *habal-habal* or *skylab*. They are serviced by a few enterprising villagers, who are able to take out loans to buy motorcycles for their own use and for the paid ride.

Like the majority of roads in the uplands of the Philippines, the road was established by a logging company operating in the area in the 1980s. It reaches four more upland barangays (Mahayahay, Santa Rita, Mahagsay and Binicalan). Before the road was established, communities living along Maasam River travel to the San Luis town centre by *gakit* (bamboo raft). Today, the road has become the main access to the upland barangays of San Luis. During the dry season, or when it is not raining, the road is serviceable. But, on rainy days, particularly in the rainy season, the road conditions deteriorate. The huge potholes become very muddy and slippery for the *habal-habal* which carries up to eight passengers per trip.

Chapter 3 talked about the history of logging in the province and the San Luis municipality was for several decades dominated by logging concessions (people recall names such as Liberty, Oromica and Philpac, logging companies that operated in the area). Today, placenames that people know are associated with the daily operations of the logging companies. The logging company marked the road that goes to Policarpo by the kilometre distance from the company's main office in the municipal centre (e.g., kilometre 11, 17, 29).

In many upland villages, the area is often classified as 'forestlands' and is thus part of the public domain. Members of the Banwa'on community derive their food and income from farming upland plots, hunting, fishing, small-scale logging and, more recently, artisanal gold mining. Some of them were former employees of the logging companies.

Map 5.1: Location Map of the Upland Village of Policarpo



Source: DEM from NASA-JPL, Shapefiles from Agusan del Sur-ENRO
 Cartography: Author

Geographic profile of upland barangays in Agusan

Uplands, as physical spaces, are generally described as areas of higher elevation than their surroundings ("Upland," n.d.). As described in Chapter 3, the uplands of western Agusan del Sur is divided into two: a swath of low hills and the steeper mountains adjacent to it. The elevation of the hills is quite low, from 60 to 100m, and the flat area on top can accommodate small villages. Geologically, this area is underlain by unconsolidated conglomerate, sandstone, shale, and shallow limestone layers (MGB, 1963). Based on its geomorphology, the area of Policarpo exhibits a kind of landform indicative of a karst landscape. The key feature of karst areas that has captured the interest of hydrogeologists is that these areas have water resources that may be difficult to acquire in certain settings, resulting in problems of water availability in a given area (Drew & Hotzl, 1999).

Unlike most of other barangays in the Philippines that are classified as uplands, Policarpo and many of the upland barangays in Agusan del Sur, have their centres in upland areas. Other upland barangays in the country are classified as upland because the majority of the barangay's area is within forestland or public lands, while the settlement centres are located in the lowland areas. Policarpo's current location and its spatial configuration impact on the accessibility of basic services to the residents of Policarpo.

Conceptions of upland areas in the Philippines

The different conceptions of the uplands are rooted in history; in particular, the country's colonial experience has resulted in an upland-lowland dichotomy. Towards the end of the Spanish rule in 1898, it was decreed that all lands that were occupied and tilled must be titled (Blair and Robertson). In applying the decree, areas in the lowlands were surveyed and measured and given a document of ownership. But, in the process, many areas in the interior of the uplands remained undocumented. Succeeding laws such as the 1936 Public Land Act stipulated that only those lands that were previously delimited and classified were declared for disposition and therefore classified as alienable and disposable land. The remainder would be determined further, whether it would be categorized as timber land or mineral land. Despite the uninterrupted settlement of the Banwa'on people along the Maasam River throughout Agusan's history, the law still classified Banwa'on lands as timber land as

evidenced by the presence of logging concessions since 1950s. This meant that no titles were given to the Banwa'on.

In an archipelagic country like the Philippines, most of the upland areas are in the interior of these islands. Many upland areas of the municipalities in the Philippines intersect with the public lands of the country. This is because the general policy in terms of the Philippines's land classification system is that lands with 18 per cent or 10.2 degrees slope that are within mountain zones (including plateaus in high elevations, and lands with hilly and mountainous terrains) are considered public lands (PD 705, 1975). These areas are placed under the management of the DENR and as such, have conservation as a general policy for the area. Public lands are among the heavily regulated spaces of the country. Timber cutting is banned and only non-timber forest products are allowed for harvesting (with the exception of rattan harvesting block leases which are auctioned).

In Philippine forest environmental discourse, the uplands are often considered in a bad light. In this narrative, uplands are seen as a site of degradation brought about by dwellers considered to be illegal settlers. These settlers are said to have illegally converted the forest into croplands using the 'slash-and-burn' technique, which causes rapid degradation of the public land (PD 705, 1975). Uplands are also regarded as headwaters and therefore must be sites for protection. But, this view puts around 17.8 million people in the uplands, most of whom are poor (Cruz et.al., 1988) in a precarious position.

Policarpo, a transplanted community

The current village centre of Policarpo, was only established in 1984. The people associate the same year with the term 'no man's land' applied to their old village centre where numerous killings occurred including members of their community. From 1970s to 1980s Mindanao was a fertile ground for recruitment into the New People's Army (NPA)¹⁴, the armed group of the Communist Party of the Philippines. Maasam River's thickly forested banks provided a perfect refuge for the NPA (Human Rights Watch Asia, 1992). But, for the Banwa'on living along the Maasam River this became a problem because the military suspected the community of supporting the rebels. The suspicion became stronger when the

¹⁴ The NPA was formed in 1969 in Luzon in northern Philippines, due to disillusionment among the people about how the government was being run.

villagers of Policarpo declined to join the Civilian Home Defense Force or CHDF armed civilian force organized by the government to augment the military force to fight the insurgency.

Unlike the villagers of Policarpo, the Higaonon, who lived in the town of Esperanza north of Policarpo, signed up in CHDF in large numbers (Human Rights Watch Asia, 1992). In Human Rights Watch Asia's documentation of the 1984 attack on Policarpo, a Higaonon leader from Esperanza, sent a group of Higaonon CHDF to avenge the killing of his people by the NPA, who they believed to be hiding in Policarpo. Twenty-seven people died in the attack including some who were innocent of the allegations.

Fearing additional loss of life, the Banwa'on were forced to evacuate their old settlement in an area called Kilometre 19, which was near the Maasam River, up the hill towards the current Policarpo barangay centre. Talking to the current village chief of Policarpo and his sister, I noted their longing for their old centre. Compared to the current village site, life was easier there. To them, it was a desirable place for the village because there was more land for farming and their harvests of sweet potatoes and rice had a more fragrant smell. They said they can endure the everyday problems that a village will endure, but when they had to fear for their lives and safety on an everyday basis then the decision to transfer was made easier. In the aftermath of the attack, the village split apart. Some families went to live with relatives in neighbouring villages, others elected to find another place to start their village again. During the split, new leaders took over and decided to establish a new village centre. The current village chief, who was then a forest guard of the logging company, suggested the current site to the Policarpo leaders. When they started constructing the new village centre, it numbered only seven houses. Slowly over the years, more and more people built their homes there, even those who had earlier evacuated to other villages. On the one hand, they said that it was good that they transferred because the current area is nearer to the municipal centre. They felt that this would make government services easier to reach. On the other hand, however, it positioned them away from their *umaban* (farmlands) their main source of livelihood.

This experience of the Banwa'on highlights different aspects of the issue of marginality. There is an intersection between suspicions of insurgency, the view that upland dwellers are destroyers of the environment and the effect of such view on the way they are able to access

different resources in their own community. Moreover, it also went against the common rationality of communities to locate their settlement sites near water sources such as the Maasam River, which the people from Policarpo did so previously.

PRESENT DAY POLICARPO

Today in Policarpo, the initial seven households have grown to approximately 105, with a population of 554 individuals. Approximately, 62 of these households are in Purok 2, the centre of the village (CBMS, 2012). The rest are scattered along the Maasam River near their farm plots. Ninety per cent of the population are Banwa'on: the remainder are Manobo, Bisaya and Higaonon. The community has a primary school, health centre, and day care centre. High school students have to travel to the neighbouring village of Balit for their schooling.

Livelihoods in the uplands

There are four sources of livelihood for the people in Policarpo and these are small scale logging, rattan harvesting, upland farming and mining. On my first day in Policarpo, it was evident that the village was located on the forestlands of municipality because three *skylab* motorbikes were each carrying two-40 centimeter round logs of *lauan* (*Shorea spp.*), carried one on each side. Not long after, I saw another *skylab* laden with poles of rattan of various sizes. These were among the usual forest products that the village folk are able to sell in the town.

One of the things that I noticed as I chatted with the villagers about their livelihoods in the area was that they were very candid when discussing their small scale logging activities, which, by law are prohibited. Most of those engaged in small scale logging owned a *carabao* (water buffalo), which hauled the logs from areas in the forests. The water buffalo was not only small enough to navigate the forest trails: it was sturdy enough to haul the heavy logs. They villagers earn ₱1,100 for round logs with a 30cm diameter, and ₱1,500 for 40cm logs. If they logged four times in a month they could earn ₱20,000. But, it was not the case every month. Although it is their biggest earner, they cannot engage in logging continuously. One reason being that the *carabao* has to rest and second, villagers are arrested if they transport

Figure 5.1: Livelihoods in Upland Village of Napo



Top left photo: The usual upland farm plots of the Banwa'on in Napo; Top right: Round logs are loaded onto the *skylab* to transport to Philpac and sold to timber middlemen. Bottom left: Bundle of rattan poles awaiting transport to the town centre. Bottom right: Farm plots along the Maasam River. Source: Photographed by the author, Policarpo, 2013.

logs illegally. Between September and December there is no apprehension¹⁵, but from January to March, the DENR becomes stricter. Logging is not an easy job; it is heavy work, and sometimes dangerous. The villagers say that they engage in it because it is their *depensa sa kawad-on* (defense from deprivation of basic needs). If they cannot transport the logs, they go to harvest rattan, but because they do not have a licensed rattan harvesting block, they earn very little for a day's harvest, approximately just ₱100 to ₱150.

¹⁵ In Northern Luzon, in my former research site, there is this assumed understanding when during the 'ber months' (September to December) is the period of the year nearing Christmas (*maggapasko na*), there is often a sense of being lenient in implementing rules especially when it relates to livelihood of simple folks. This may have the same context as to why there are no *dakop* (arrests) from September to December in Napo.

Panguma (engaging in farming) is considered a side livelihood because it is restricted to small scale farming, maybe to a quarter or half a hectare. The people opt to do it when other livelihood activities prove unsuccessful. The villagers do not engage in large scale farming because it requires financing. In their *uma* or farm plots, they plant out small areas in cassava, corn, and sweet potato. Some also plant agroforestry trees, such as gmelina, acacia mangium, rubber and various types of fruit trees. Plots along the Maasam River are planted out in upland rice which is mostly rainfed and does not require considerable water to grow. But, the harvest is often small due to attack by pests or birds.

Lately some of the men (and even the women) in the village have engaged in artisanal mining in Mahagsay, a village further upstream of the Maasam River. Access to the mining area incurs a fee of one milligram for every gram of gold that they get payable to the owner of the land. If the mining is not successful, they do not have to pay. The villagers stay in Mahagsay for several days to haul sediments, wash and sieve it to isolate any gold. If they are lucky, one gram sells for ₱1200 in the town market.

One of the women I interviewed described the seasonality of their means of living in the village as 'rolling, rolling'. One rolls to where opportunity provides one with the best return for effort at a certain time. There are, however, times of *kerisis* (crisis), when people can barely afford to eat three times a day. During the rainy season, when there is no respite from the rain, their cassava and sweet potato crops often rot from too much soil moisture. According to the CBMS data of San Luis, their insecure livelihoods render 77 per cent of the households in the village below the poverty threshold (based on household expenditures data). When the community is in this *kerisis* period, Banwa'on culture's enduring practice of food sharing with their neighbours is done. Households that have better livelihood options and therefore have ample food on their table would share to the neighbours that have none to eat.

UPLAND WATER RESOURCES AND INTERVENTIONS

Status of the water access in Policarpo and the upland villages in San Luis municipality

Information on the status of water access in San Luis municipality is drawn from two sources, the annual water and sanitation report by the Municipal Health Office and the CBMS data that is collected every 2 to 3 years and jointly implemented by the Agusan del Sur provincial government and San Luis LGU. The 2012 CBMS data reported that 62.8 per cent of households in the municipality of San Luis have access to safe drinking water. Table 5.1 presents a closer look at the data, segregating them into data on the lowlands and uplands. Combining the figures of the upland barangays of Binicalan, Mahagsay, Mahayahay, Policarpo San Pedro and Santa Rita shows that there is a disproportionate number of household without access to safe water in the uplands compared to the lowlands

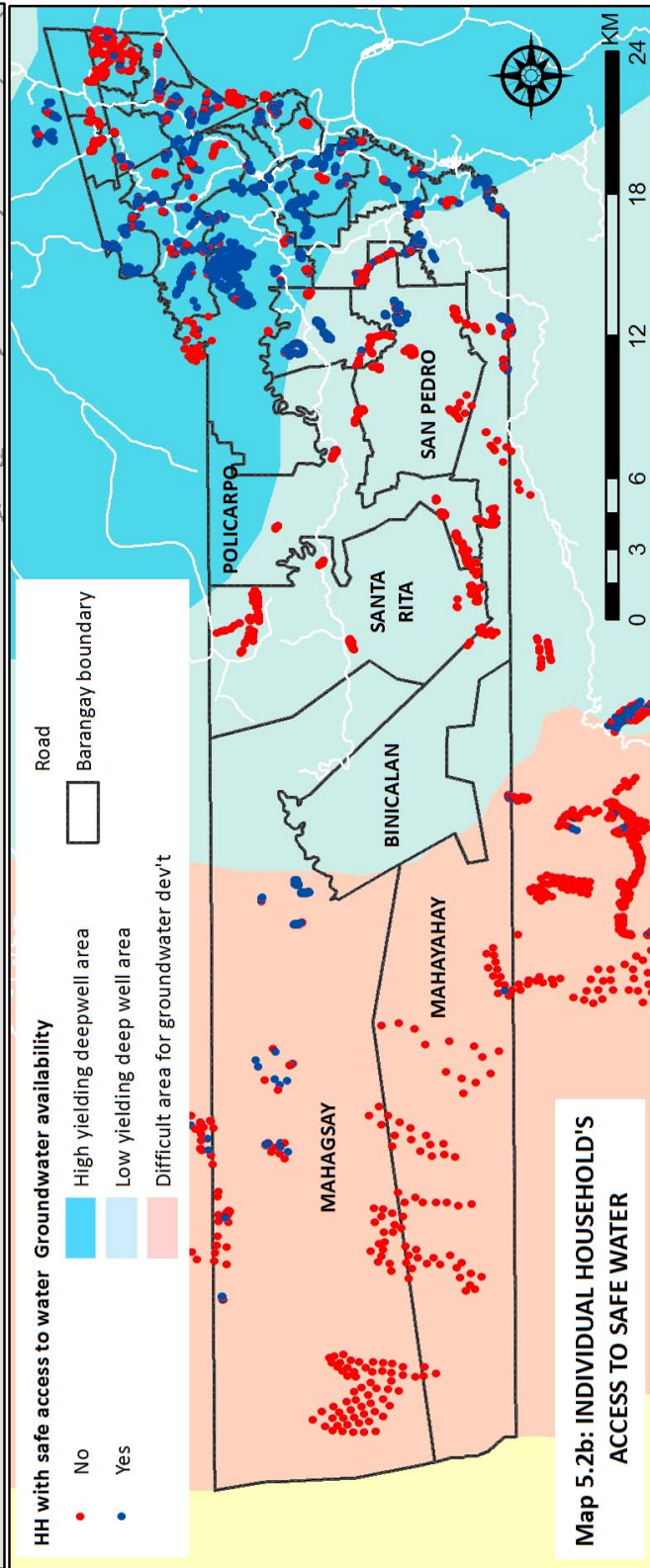
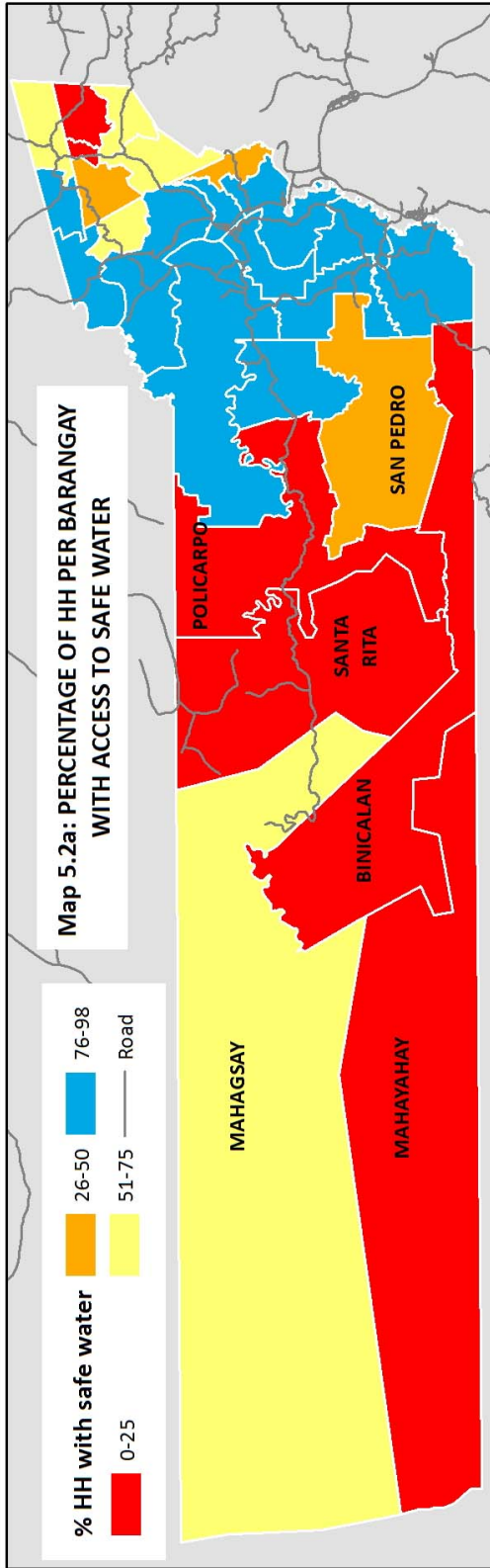
Table 5.1: Number of HH with and without Access to Safe Water in San Luis Municipality

No. Of Households	Total No. Of Households	No Access	%	With Access	%
Uplands	1,483	1,186	80	297	20
Lowlands	3,831	920	24	2,911	76

Data is from the 2012 CBMS data of Agusan del Sur

Additional information can also be derived by mapping the water access information. Given that CBMS data also include the georeferenced locations of households, I used this to map the CBMS data per barangay and per household. Both maps show that most of the areas with low access to safe water are concentrated in the upland areas (areas starting from 100m and above). But Map5.2b further shows that the distribution of households leads to a question about the sufficiency of a single improved water system for the entire barangay, when clusters of households are located a few kilometres from each other. In Map5.2b, I overlay the household data on the map of groundwater availability presented in Chapter 3. It can be clearly seen that these households in the uplands are those that fall in the areas where groundwater lays much deeper underground or where it is a difficult area for accessing groundwater.

Despite the availability of data with the geographic locations of households with individual information (from CBMS), the official presentation of achievements in the provision of access to safe water still follows the usual proportional reporting that the health offices have been used to doing. In its most recent report (2014), San Luis municipal health office revealed that current safe water coverage is 79 per cent, closing in towards the target of 86.5 per cent for the MDG deadline for the country in 2015. While the data shows great improvement, presenting disaggregated data by mapping helps uncover specific insights into the nature of improvements needed in the remaining unserved households. It also triggers questions as to why the unserved households are located in the uplands and the use of simple map overlay analysis helps point to an indication of why water may be difficult in these areas. In the succeeding section I detail the sources of the water for community and show how the said characterisation of groundwater availability affects the community of Policarpo.



Source: Barangay boundary shapefiles are from the Agusan del Sur -ENRO and household locations and water access data are from CBMS, 2012.
Cartography: Author

Community water sources

Having reported on the status of water access in the village, in this section I will describe the different water sources that Policarpo utilises, and specify the particular domestic uses they serve. There are four main water sources in Policarpo: the tub, the *atabay* (rock cistern), rainwater and river water.

The tub: the main water source The water facility that the villagers refer to as the *tub* is the main water source of Policarpo. It has an enclosed reservoir that was constructed in 2008. From the road along which the houses are located, it is an approximately 100 metres downhill walk to a gully wherein the reservoir is located. A concrete path descends steeply (at approximately 45°) to the gully. The village government cemented the pathway as it can get slippery when wet. A cemented box called a ‘spring’ box was constructed underground to catch the water and minimize contamination. From the spring box, a PVC pipe transfers water to the reservoir or water collection box (see Figure 5.1), which is where periodic water treatment (chlorination) is performed. On the front side are two water outlets from which people can draw water and underneath is a receptacle to catch spillage. This water source is classified as an ‘improved’ source due to the installation of a spring box and reservoir, components designed to secure safe water. Before this water source was improved, the villagers said it was similar to the water source they call *atabay* which is discussed in the next section.

Figure 5.2: The tub, Policarpo's main water source



Source: Photographed by the author, Policarpo, 2013.

The provision of drinking water is the priority of this water source, but using it for bathing and washing is not prohibited. The current main water source for Policarpo was just among the secondary water sources for the villagers when they moved in this site in 1984. The water source located at the back of the school (source 6, Map 5.2) was the main source because the water flow was stronger there. They later opted for another source of drinking water because the community felt it became contaminated when more houses were built in the area, and because during the rains the water drains towards that side. There is conflicting information as to whether the water is from a spring or surface water, both from community members' information and the municipal engineer of San Luis. Based on consultation with a Filipino geologist, it is most likely a spring albeit a very small one.

The small catchment area of the water source features somewhat sparse vegetation for a gully in which one would normally find dense vegetation due to the moisture that collects in that area. There was the usual undergrowth of grasses, lianas, bamboo and planted rubber trees. And it seemed that the undergrowth had recently been trimmed¹⁶.

¹⁶ Ideally, a catchment area should have as much vegetation coverage as possible, whether trees or the undergrowth because it is said to lessen the impact of rainfall on the soil. Instead of dropping directly on to the soil, rain is caught by

The Atabay (well) The villagers use eight water sources that they call *atabay* (translates as water well see Map 5.3). But, it is not actually a water well in the usual sense of the word (a hole dug to access water below the ground). In this case, it is more of a receptacle, a hole which the villagers have hollowed out from the rock. The karst topography of the village is comprised of a shallow soil layer and underlain by limestone. Since the limestone rock has low porosity (Ford & Williams, 1992), at the soil and limestone interface the water seepage trickles off to the lower surfaces such as the rock receptacles or rock cisterns¹⁷. Considered as unimproved by water development standards, and as an unsafe source, the villagers use this water to augment their domestic and drinking water needs. In order to improve on these types of water sources, the villagers engaged in *kabkab* (gouging), which is making hole in the rocks so that there is an area in which water can pool. This makes water fetching quicker as the people only have to scoop it instead of having to wait to fill their containers from the trickling water. Because the *atabay* also relies on water seepage from precipitation, the flow decreases to a small trickle when there is no rain.

leaf coverage. It then flow through stems, branches and trunks before reaching the soil surface, lessening its erosive power that compacts the soil.

¹⁷ Similar community water sources were observed in the Province of Bohol in Central Philippines, an island province mostly made up of limestone. The rock cisterns that Urich (1990) found were very similar to Policarpo's and has been used by the communities there for a long time. The only difference is that the water the seeps to their rock cisterns are from the hills where there are no settlements and therefore water contamination is minimal.

Figure 5.3: The *atabay*: an alternate water source



The numbers in each photo correspond to the numbers on the map of water sources (Map 5.2)
Source: Photographed by the author, Policarpo, 2013

Most of those who use water from the *atabay*, use it for washing, bathing and cleaning and sanitary needs only. The drinking needs are sourced from the tub. There are seven households use it for drinking and cooking, but they filter it first using the biosand filters that were distributed by the provincial government in 2009.

Rain water Villagers use rainwater as an alternative source for drinking or for other domestic uses. But, as some of them observed, rainwater collection is limited because most of the houses still use nipa palm leaves for their roofing material. This makes it difficult for rain gutters to be attached that could help with directing water to a container. Some householders living near the school said that they collected rain water from the school roof. I noted only a few households had big storage units for water, which suggested that storage units were not a common practice in the area. Some villagers said that they could not afford to buy big storage containers¹⁸, so they relied on either the 20 or 5-litre containers for storage.

There were also very divergent views about the use of rainwater for drinking. Some villagers said that they drank rainwater they collect directly. There was a view that it was *bugaw* (dirty) because it is contaminated by chickens defecating on the roofs (villages in rural Philippines often have free roaming chickens). Therefore, each household should sterilize it before drinking. Another householder who believed it was dirty, cited the hydrological cycle. His theory was that rain gathers as puddles of water on the road, the heat converts it into vapour, which becomes rain clouds and then becomes rain.

But a very common answer was that they opted not to drink it or drink it directly because it causes colds or slight fevers (*subawan*), especially in children. According to one villager, in her household they boil the rainwater before drinking it. According to noted Filipino medical anthropologist Michael Tan, the belief that rain causes respiratory ailments is pervasive in different Filipino regional cultures (Tan, 2008). Jocano (1973) in his book on folk medicine, framed this belief as a 'hot and cold syndrome'. He wrote that in Filipino folk medicine,

¹⁸ In the San Luis municipal market, the containers cost ₱900 (repurposed chlorine containers).

most illnesses are explained in terms of ‘hot’ or ‘cold’. Rain is considered ‘cold’ and therefore, ingesting it can cause colds¹⁹ (or other respiratory illnesses).

While these viewpoints may be scientifically questionable, they are important points to consider when planning water options for villages and when framing information campaigns regarding rainwater use.

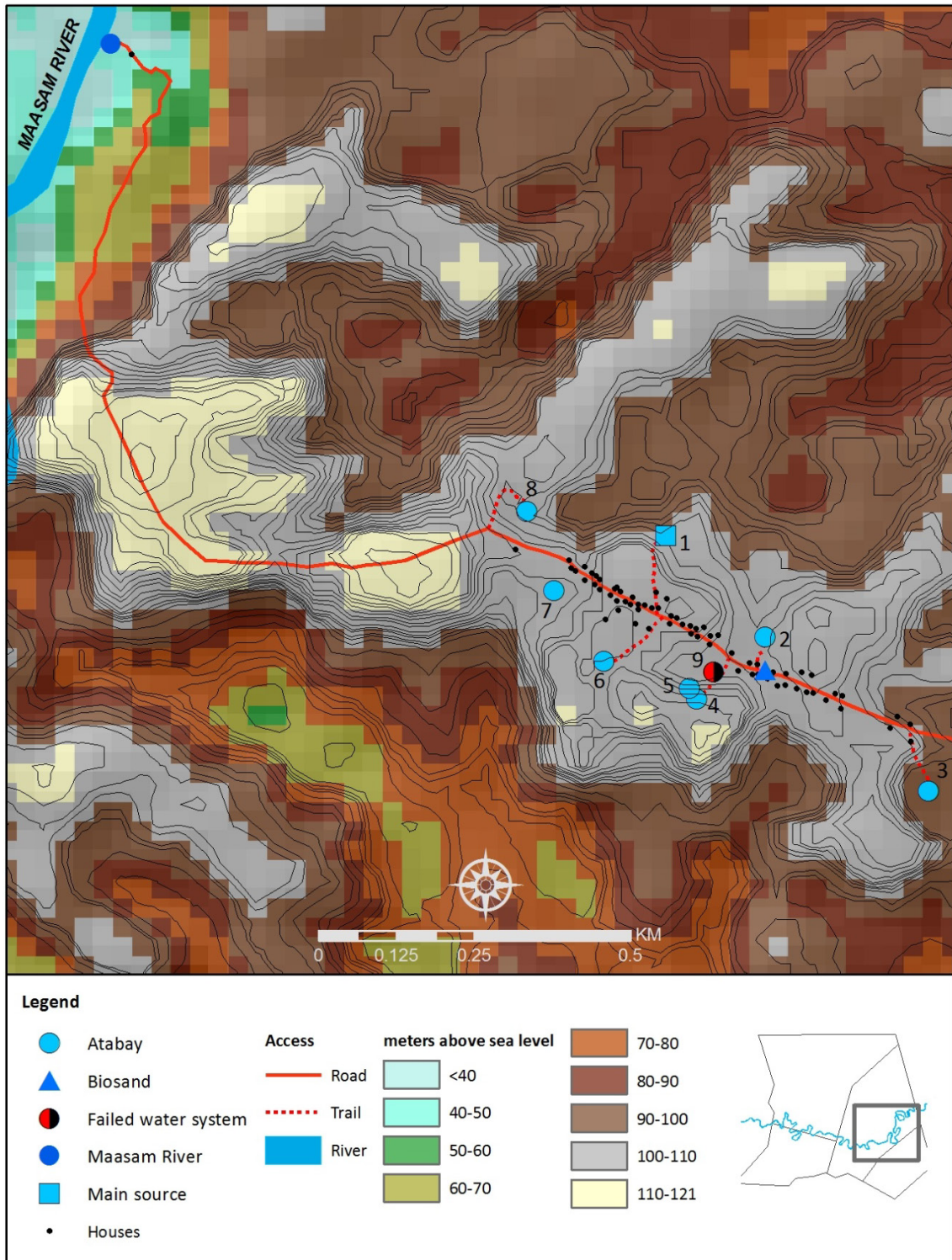
River water The Maasam River is approximately 2km from the Policarpo village centre. The river water is not part of the water source for daily needs, mainly due to its distance from the community. The villagers use it as a last resort when there is not enough water available in the usual sources mentioned, i.e., during dry spells or times of drought. River water is used only for bathing and washing clothes not for drinking and cooking purposes, because the people recognise that it is not safe to drink.

Map 5.3 shows the layout of water sources used by the villagers of Policarpo. Most of these sources are accessed by climbing down approximately 10 metres of steep slope into the gully. The map also shows the topography. Its form is suggestive of a karst landscape²⁰, a type of landscape that develops when an area is underlain by limestone rocks. Karst landscapes are said to be areas where freshwater may be difficult to exploit (Drew & Hotzl, 1999).

¹⁹ ‘Catching a cold’ was a common response of the villagers in the three different case study sites, when asked why they did not drink rainwater. Another variation of this belief is if one is rained on, rain being cold can cause respiratory ailments such as colds and cough.

²⁰ I showed the topographic map of the area to a geologist and she identified it as a karst landscape based on the topography. As indicated in Chapter 3, the area is also underlain with limestone.

Map 5.3: Water sources in Policarpo



Cartography: Author

Water issues in Policarpo

The residents of Policarpo describe the state of their water as *lisud kaayo* (very difficult), a state not only specific to their drinking water, but also to other domestic water needs including cooking, bathing, washing clothes, and sanitary purposes. Table 5.2 shows a number of interventions, both from the government and non-government organizations; have sought to improve the state of water access in the village. Building upon this I now discuss the key interventions and analyse how they have failed to improve the water situation in the area.

Table 5.2: History of Water improvements and interventions

Year	Water Source	Improvements/Interventions	Organization
1984	6	Hollowed out the rock surface to pool water from ground seepage in old water source	Community
undetermined	1	Transferred to current main water source; hollowed out the rock to also allow water to pool	Community
1997	9	Test drilling for water resources	Agusan del Sur WATSAN Centre and UNDP
2007	1	Spring box and reservoir constructed	Act for Peace
2007*		Rain water collector	PLGU
2008		Biosand filters were distributed to selected households	Congressional representative
2009	4	Construction of the Level II water System	PAMANA Kalahi-Kalayaan Program

Note: The water source numbers indicated refers to the specific water source in Map 3.2

*The municipal engineering office staff was not certain that it was 2007.

Compromised water quality due to physical water scarcity The current main source was improved to its current state in 2008²¹. As indicated on the reservoir markings, it was improved through the ‘Action for Conflict Transformation (ACT) for Peace’ programme²². One of the aims of the programme was the development and improvement of the potable water supply. According to one of the villagers who was a village official during that time,

²¹ Prior to the improvement of the *tub*, there was test drilling for groundwater in late 1997. Funded by the UNDP, the provincial government provided the drilling equipment, and the municipal government provided a team of engineers. The PLGU sent drilling equipment that could only drill up to 220 feet (manually operated pulley system). At 200 feet they were still getting red soil from the ground. It was recommended at the time that drilling for groundwater in the area was not advisable. The water level was far below the surface because it was in the uplands. This led to a search for an alternative source, which led to a water source that was at that time used by the community.

²² The program is funded by the Government of the Philippines and the United Nations Multi-Donor Programme (GoP-UNMDP) and targets areas that have been affected by the drawn-out war between the ideology groups and government forces. It has evolved from a humanitarian intervention focusing only in the Autonomous Region in Muslim Mindanao (ARMM) to other areas in Mindanao. The current design of the program attends to peace building including development interventions in the communities exposed to conflict, because it understands that the war has also affected their access to basic services (Tandag, 2011)

they attended a consultation meeting where they were asked to identify the key needs that the community felt should be assisted by the project. At the time, the village leaders identified water as a priority. The installation of the springbox was spearheaded by ACT for Peace in coordination with the provincial planning office and the municipal staff.

During my stay in the village, I noted that the main water source seemed to be in disarray. The cement lid of the reservoir opening had been removed, and the PVC pipe that directed the water to the reservoir had been taken out of the reservoir inflow tube and made to flow directly to the user. I asked the village head why it was in that questionable state and he said that the people had become impatient waiting for the water to fill the reservoir. He had told the users not to take out the pipe. He constantly put it back but it was always taken out again. Among the people I talked to, the common reason behind their insistence upon bypassing the reservoir was because the water flow hardly kept up with the people's needs. There was just not enough water for residents using this source.

As indicated in the previous section, the water from the tub comes from ground seepage. Therefore, it was very dependent on precipitation. Four or five consecutive days without rain see the flow reduced to a trickle; and, the situation becomes particularly acute during the dry season (March to May), when the flow is likened by the villagers to 'a child urinating'. During school days, the line to the tub is long. Fights erupt because some people say that others are inconsiderate. Some households with many containers fill all of them, resulting in a longer wait for the other households. Some villagers schedule their collection by waking up very early and lining up to fill their containers. Or, they seek to fill them in the evening when there was no longer a line, but the lull in the collection overnight is still not enough for the reservoir to be filled to its capacity.

Although the water source has been improved (fitted with a spring box and it now has a reservoir) it is still not a safe source because the water is surface water. This means that it has more exposure to likely contaminants. According to the village sanitation officer, they should chlorinate the water in the evening. However, due to the current practice of directly using it, and to the physical scarcity of water, the safety of drinking water for the village is compromised.

In all likelihood, the geology of the area contributes to the insufficient supply for different uses. Karst landscapes are areas in which water is difficult to exploit. The inability of the local government technical team to recognise that the community experiences short periods of physical scarcity has affected its program focusing on drinking water. Instead they focus on drilling deep wells which will not provide water due to the area's geology.

Low usage of household treatment due to insufficient number of filter units Due to the continuing problem of adequate water, in 2008 the PHO distributed several biosand filters. The technology was adopted by the province after a demonstration given by the Palawan Conservation Corps²³. At the time, provincial government was trying to find alternative solutions for providing safe drinking water. Recognizing its potential for use in remote villages, the government adopted the filter technology.

The *salaan* (biosand filter) was designed for household use by the Centre for Affordable Water and Sanitation Technology (CAWST). It came in a 1m tall concrete box with a 0.3m² body. According to CAWST it had been designed so that households could use it on demand, unlike the slow sand filter it was adapted from, which required continuous flow of water. Each filter contained several layers of filter (diffuser, biolayer, filtration sand, separation gravel and a drainage gravel).

The village of Policarpo received 13 *salaan* and each village councillor was assigned one filter. While I was interviewing the villagers about water, I noted that the biosand filter units were in various states of disuse. One was being used as a nesting spot for a hen, one as a rubbish bin, and another was cracked and had tumbled down the slope in the backyard of one of the households. It was only in Junie's (a former village councillor) household that the biosand filter was still being used. The design of the biosand filter that was distributed was meant for a household. The provincial health office told the recipients to share their biosand filters with their neighbours. The main reason that the people gave for stopping the use of the filter was that it took too much time to filter the water, approximately an hour for a 20 litre container. With 64 households in the Purok 1, (barangay centre), approximately 5 households shared each unit. One villager said that '*hulat ka pa sa tub, hulat pa pud ka sa salaan*' (you wait at the tub, you wait again for the filter). Another villager, commenting on the

²³ The Palawan Conservation Corps uses the technology in partner communities in Palawan. They were trained by a Philippine organization called 'A Single Drop of Water', which adopted CAWST design.

sharing arrangement said: *'mataba man mi'* (we feel timid) having to go inside someone else's home to wait for our water to filter. She added that sometimes when one needed to use the filter, the house was either closed or the occupants were sleeping. 'You get an irritated look when you knock to use the filter'. She said that she would definitely use it if she had one of her own. She hoped that the government would provide each household with one.

Junie's family no longer get their drinking water from the tub: they get it from the *atabay* at the back of their house (Source 2, Map 5.3). He and his wife said that once they started using the biosand filter, the water no longer made them sick. They have used it for five years now and make sure that it is well maintained because it is their first defence against water-borne sickness. Junie is especially cautious because he considers his family to be easily affected by amoeba. He said that sterilizing by boiling the water took longer than using the biosand filter, which is why he preferred to use the latter.

In addition to Junie's family, six other families depended on the *salaan*. All of these neighbours sharing the filter are Banwaon (with two families having spouses who are Bisaya). Junie had placed the filter in his front yard so that his neighbours could access it easily. Alice, Junie's neighbour and user of the filter was quite irritated by how some of the villagers had neglected the filter that was given to them. Even though these people did not use them, they were not willing to part with them, to let others like Alice's family make use of them. Alice could not comprehend some people's reasons for not enduring with their use of the filter, citing the long waiting time. She said they were easy to be managed. The seven families had agreed on a system whereby they would use the *salaan* one after the other. No one was allowed to filter water into two containers successively. One had to let another person in the line so that each had a quicker turn. They also do *pabina* (shared labour) when doing the monthly maintenance on the filter. When a significant amount of algae formed in top filter layer (biolayer), it could hinder the flow. They removed some of the algae (not all, because the algae support the filtering process). They mixed the biolayer and then poured water as a final wash either letting the water spill or stored for other uses.

When the villagers used the biosand filter, I observed that they did not use separate water storage for the filtered water. They used the same container that had held the unfiltered water. The CAWST (2012) guide to households showing them how to use the filter stressed having a separate storage unit for water to avoid recontamination. Despite not heeding this

recommendation, the users cited noticeable improvements in the water they got from the *atabay* after using the filter. Primarily the improvement was in its colour, from brown to clear. The taste was also better than the water from their main source, which to them was *lang-og* (had an unpleasant smell and taste). But, most of all, they were satisfied because their children no longer became sick after drinking the filtered water.

The municipal engineer saw the biosand filter as a very practical and useful water intervention in a place like Policarpo. For him, the technology worked, and the maintenance was both easy and doable. However, he said that the Banwa'on were 'just too lazy to do it'.

Figure 5.4: Biosand filter in Policarpo



The only biosand filter unit in use, the owner demonstrates how he uses the filter
Source: Photographed by the author, Policarpo, 2013

Although some willingly endured the current set-up of sharing the biosand filter with five to seven families, I found the non-users' reason valid. As respondents observed, in some cases, the social dynamics among neighbours hindered the sharing of the filter units. The social dynamics I refer here stem more from past neighbour misunderstandings and not necessarily from difference in socioeconomic status between neighbours. There is however clear distinctions in the way Banwa'ons view the Bisaya compared to the way they view Higaonon or Manobo in the village. Banwa'ons consider the Bisaya to be outsiders, who are often regarded with deference because they have higher educational achievements than the

Banwa'on or have better socioeconomic status and therefore the community people are timid about approaching them for help. To some extent this may also stem from the fact that the Bisaya have a low regard of the Banwa'on or more generally the indigenous peoples. Banwa'ons distance themselves socially because they do not want to be made to feel that they are less than the Bisaya.

Given that the area had a problem with physical supply, and that the available supply quality was suspect, the LGU should consider looking closely at and reassess the impact of their program. In addition it should review its distribution policy, given the partial success of its household treatment system using the biosand filter.

Failed level II water system Towards the end of 2009, a deepwell level 2 water system started to be constructed in the village, to augment the 'ACT for Peace' water system. Much to the dismay of the villagers, up to the time I was in the village in (September 2013), the system lay unused. The 'Kalahi' project was designed to pump water to an elevated water reservoir that could accommodate approximately 2,000 litres of water. It was equipped with a series of water stands laid out along the main road from which households could access water from their faucets. Construction was completed in early 2010, through the Kalahi-Kalayaan project which was implemented by the Engineering Battalion of the Philippine Army. The particular program targeted areas considered problematic in terms of peace due to the fighting between the NPA and the military.

To operate the water system it needed its own electricity meter to monitor its usage. The Agusan del Sur Electric Company installed the electric meter in the latter part of 2010; but when Ed, the current village chief tested the pump, it failed to yield any water. He then consulted the previous village chief about it because he had signed the turnover of the project when it was completed. The former chief said: 'Well when the contractor turned it over, there was water flowing. It may not have functioned because it took a while for the electricity to be installed.'

Ed felt that he was being blamed by his predecessor for the faulty water system. His next step was to report to the engineering battalion of the military the state of the water system they had installed, but, they were not very helpful. They told him that if the project had already been turned over, they would not 'meddle' with it anymore. So Ed's next option was

to go to the San Luis municipal government. This proved to be fruitful because the engineering department of the LGU responded and promised to send a team to examine the water system.

Because the system had lain idle for many months, the engineering office's initial analysis was that the water well screen needed to be replaced, and for surging²⁴ to be performed to remove any fine particles that may have accumulated along the screen causing very minimal infiltration of water into the well. The municipal engineering office pledged to do the work, but he asked the barangay council to provide a budget to cover the materials and other expenses needed for the rehabilitation measures.

When the team of engineers started the rehabilitation work, they first tried to run the pump. But, after two minutes, the water stopped running. The engineers assumed that the water was not coming out because the well lacked the depth to reach the level where it could sustain water yield. They surmised that the submersible pump was hovering at the top end of the aquifer, and therefore did not have the depth for ample water to seep into the well. The current level is at 200 feet so the engineer advised to drill an additional 20 feet.

Given the new information, the barangay had to budget for the additional pipes. The municipal engineering staff told them they would continue to provide them with the necessary technical assistance without cost to the barangay. The next step was to pull the pump out so that surging could commence. However, when the team attempted to pull the wire connecting the submersible pump underground, it gave way and the pump was left below. When they inspected the wire, they found that it badly rusted. The municipal engineering staff said that it would be difficult for them to repair because it was quite deep and they lacked the expertise to do such retrieval work. The village chief was told to seek the services of a private company that had the experience in dealing with such situations.

The attempt to salvage the water system was halted in the meantime. Ed said that he had to seek financial assistance because he thought that the barangay funds would be insufficient to cover it. He sought the help of a Provincial Councillor who he hoped, would help to provide additional funds to rehabilitate their water system. But, due to the absence of a system for

²⁴ Surging involves the alternating inflow and outflow of water through the well screen to flush the fine materials around the vicinity of the screen that may impede the flow of water from the surrounding water bearing layer.

dealing with this kind of breach in the construction project, the village chief had to resort to asking elected officials for help.

The barangay chief and her sister also hinted that they wanted me to be their emissary in bringing the information about their problematic water system to the Provincial government or other organisations that may have the expertise and capacity to rehabilitate their system. When I talked to the engineers from the municipal government, they did not sound particularly hopeful about the rehabilitation work. In the first place, they were quite surprised to hear that the engineering battalion had drilled such a deep well when, in fact, the ground water resources of the area in Policarpo were known to be really quite deep. They recalled that they have informed the coordinator of the project from the provincial planning office about the difficulty of groundwater resources in Policarpo because of the depth of possible aquifer and that, therefore, it was not feasible for water development. The municipal engineers, after hearing about the engineering battalion's haste to lay out the pipes, opined that this should not been done yet without ensuring first that the source was sufficient. They further said that they could do not anything because it was 'their' (the engineering battalion's) work, they had been chosen to work on the project, so they should and decide how to proceed with the work.

During my interview with the municipal engineering staff, I sensed that they seemed to have a 'hands-off' attitude towards the activities implemented by the provincial office. Somewhat ironically, the municipal engineering staff were assigned to monitor these projects. I enquired if there may have been some lapses in the checking of the work done by the engineering battalion; and they agreed.

Although, the village chief was already cognizant of the project and his role in the implementation, the chief made a mistake of receiving the water system during the turnover without informing the municipal engineering staff. They could have performed the necessary checking before the engineering battalion's work was cleared.

Policarpo's experience highlighted the key issues in the government's water intervention. First, there was little interaction between provincial staff and the municipal counterparts in planning or deciding in the improvements to be made. As the municipal engineer said they were surprised at the insistence on drilling for water in a difficult area. Second, it exposed the

weakness of the provincial and municipal systems when it came to monitoring the infrastructure implementation, especially the water infrastructure that required technical protocols to be checked.

Water quality and the incidence of waterborne diseases

Water quality test results The ‘Philippine Standards for Drinking Water’ (DOH (Department of Health), 2007) provides the main policy that guides institutions that provide drinking water to the public. The policy requires three sets of water quality tests: bacteriological, chemical and physical. It sets the standard values for each water quality parameter against which the results are checked. The foremost objective of the bacteriological test is to ensure the drinking water is free of pathogens that are responsible for waterborne diseases. In order to reduce the risk of contamination, water quality testing is required and regular treatment is conducted. The bacteriological testing focuses on the detection of *E.coli* (a thermotolerant coliform), and total coliform, and Heterotrophic Plate Count (HPC). *E.coli* is tested for because it is often an indicator of fecal contamination. Most coliforms principally originate from the intestines of warm-blooded animals (Edberg et. al.,2000) . The HPC is a recent addition to the list of required bacteriological parameters by Philippines standards. This count may be used as an indicator of the general biological condition following an insufficient treatment protocol. An elevated count may signal the regrowth of treated pathogens (DOH (Department of Health), 2007). Table 5.3 shows that all of the water resources tested in Policarpo failed the coliform indicators, although the main water source passed the HPC parameter. The overall conclusion is that there was faecal contamination of the water in Policarpo.

In cases of failed tests, the policy requires that daily samples are collected from the same sampling point until two consecutive sample reach acceptable quality. It is also imperative that action be taken immediately to locate and eliminate the source of pollution. During the time that I was in the village, a health worker admitted that have not done the chlorine treatment because the users of the *tub* no longer let water fill the reservoir (as mentioned in the main water source discussion), where the treatment is done. Moreover, regular water treatment done by the Barangay Sanitary Inspector was interrupted because the former inspector had resigned from her post.

Table 5.3: Results of Bacteriological Test

	STANDARD PARAMETERS			
DESCRIPTION OF WATER SOURCE		Ground seepage with springbox	Ground seepage	Ground seepage
LOCATION OF SOURCE		Source 1 Main source	Source 2	Source 6
PHYSICAL CHARACTERISTIC	Clear	Clear	Clear	with undissolved object
TOTAL COLIFORMS	<1.1 (MPN*/100 ml)	>8.0	>8.0	>8.0
FECAL COLIFORMS	<1.1/100 ml	>8.0	>8.0	>8.0
HPC	<500 cfu/ml	8	>6,500	910
REMARKS		Failed	Failed	Failed

Note: Text in red is above allowable amount

Based on the Philippine standards, the monitoring of the chemical and physical quality of Policarpo's drinking water is done once a year. This is so because it is acknowledged that certain chemicals are naturally present in the environment. However, 'certain chemicals' included carcinogens such as arsenic, lead, chromium, and cadmium among others. Therefore screening of their concentrations was required. In addition, the water's physical quality and chemical parameters are monitored not because of its health implications but because their presence affected the users' acceptability of the water being consumed. The policy listed a number of chemical and physical parameters, but only 13 are required to be annually monitored: arsenic, cadmium, lead, nitrate, benzene, color, turbidity, iron, pH, manganese, chloride, sulfate and total dissolved solids (TDS). Additional parameters,

depending on the context of the locality, could be added. In practice, however, the sanitary inspector of the municipality said that they had not done any chemical and physical tests of the water systems in the municipality, citing lack of funds as the reason for omitting them.

The ACT for Peace water system in Policarpo, despite having received outside funding, did not conduct any chemical and physical tests. The problem was not only lack of funding, but the accessibility of laboratories capable of performing the above tests that proved an added hindrance to the testing. In Agusan del Sur province, there was only the San Francisco Water District, located approximately around 50 km southeast of San Luis. And, from the list of required parameters, only eight could be tested by this laboratory. Bacteriological testing had become accessible and therefore better monitored because the municipal rural health centre had invested on testing facilities, however it was not done regularly. Table 5.3 shows that there is not much difference between the main source with the spring box (Source 1) and the unimproved rock cisterns (Source 2 and 6).

Table 5.4: Physical and Chemical Test Results

	MAXIMUM LEVELS (mg/L)			
DESCRIPTION OF WATER SOURCE		Ground seepage with springbox	Ground seepage	Ground seepage
LOCATION OF SOURCE		Source 1 Main source (tub)	Source 2 Back of the houses	Source 6 Old source – back of school
APPEARANCE	Clear	Clear	with undissolved fine particles	with undissolved fine particles
ODOUR	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
TEMPERATURE	Celsius	25.6	25	25.2
pH	6.5-8.5	6.12	6.51	6.41
SPECIFIC CONDUCTANCE	_uS/cm	20	26	32
SALINITY	200	0	0	0
TOTAL DISSOLVED SOLIDS	<10mg/L	10	13	15
COLOUR APPARENT	10 units	7	2	9
TURBIDITY	5 NTU	0.18	0.38	1.83
SULPHATE	250mg/L	1	1	1
IRON	1.0mg/L	0.02	0.01	0.03
MANGANESE	0.4mg/L	0.1	0	0
CHLORIDE	250mg/L	1.5	4.5	4
CHROMIUM HEXVALENT	0.4mg/L	0.006	0.005	0.01
COPPER	0.4mg/L	0.02	0.01	0.01
CYANIDE	0.4mg/L	0.003	0.003	0.003
TOTAL HARDNESS	0.4mg/L	9	6	8

Note: Text in red is above allowable amount

Getting ill from the water During my stay in the village, three people fell sick with *kalibanga* or Diarrhoea and *amiba* (amoebiasis): old a 5-year child, his father, and the child's grandmother. Based on the consolidated morbidity records of Policarpo in the years 2014 and 2013 (Table 5.4), waterborne diseases such as diarrhoea and amoebiasis are always in the top 5 diseases afflicting the village. I noted, however, in the 2013 morbidity data a recorded incidence of diarrhoea or amoebiasis in children (11 under the 0-15 years age group) but none for 16 years and above (the group within which the father and the grandmother should be included). As was pointed out by USAID assessment (2011), the DOH's Field Health Service Information System, which compiles the morbidity data, is problematic because it only records what is reported to the barangay health station or municipal health centre. It does not report the numbers of people who self medicate; therefore, they do not appear in the appraisal of the health status of the village.

Table 5.5: Morbidity data for 2014 and 2013

Policarpo 2014				
Rank	Type of Disease	0-15	16-above	Total
1	Upper Respiratory Tract Infection	21	4	25
2	Diarrhoea and Amoebiasis	8	5	13
3	Urinary Tract Infection	3	6	9
4	All wounds	4	1	5
5	Pneumonia	1	4	5
Policarpo 2013				
1	Upper Respiratory Tract Infection	58	46	104
2	Wounds (all types of wounds)	3	10	13
3	Diarrhoea and Amoebiasis	11	0	11
4	Gastritis	1	5	6
5	Urinary Tract Infection	2	1	3

Source: Barangay Policarpo Notifiable Disease Report, Rural Health Unit (RHU) of San Luis

In Policarpo, there is frequently higher incidence of diarrhoea or amoebiasis during the dry months of March, April and May and sometimes until June. There are some who fall victim during the rainy season. People said that they usually opted not to draw water from the tub twenty-four hours after heavy rain because they were sure they would develop diarrhoea. Sometimes they counted ten or more cases during these months.

The villagers considered water quality to be something that they got used to (*maanaad*). If one stayed in Policarpo for a long period of time, one would also get used to it. But most of the people there, at one time or another, fall prey to the village water conditions.

Among the villagers of Policarpo some may distinguish between the illnesses they experience, illness they attribute to the drinking water. Diarrhoea is considered a mild sickness that involves loose and watery bowel movements. It usually lasts for two to three days. Those afflicted experience stomach cramps but not as severe as when they have amoebiasis. The villagers describe amoebiasis as more pronounced stomach ache than diarrhoea. They make frequent toilet visits but are unable to defecate. When they do, their stools are watery and accompanied by a mucous-like substance. Their rectal area becomes irritated and they generally feel weary and lacking in energy. One person said that blood in the stool was a sign of amoebiasis. This corresponds to the symptoms of amoebiasis, but more often than not, the villagers only self diagnose. They seldom have their stools tested.

Some of the villagers said that if they drank some herbal medicine in the early stages of the diarrhoea (after one or two days had passed), then they could arrest further development of the complaint. Many boil the leaves of the avocado, guava and guyabano (soursop) and some also boiled the bark of the *macopa* (*Syzygium malaccensis*) tree. Others ate ripe papaya. Some used loperamide tablets to cure their diarrhoea; they either sometimes get them for free from the health centre, or bought them from the mini grocery store in the village.

If the diarrhoea lasts more than a week, the patient is taken to the Rural Health Unit in the municipality. Some of the worst cases are taken to the provincial hospital in Prosperidad. For those who have been diagnosed with amoebiasis, the RHU usually commences liquid hydration treatment using Oreosol. They are not given amoebicides.

Although, the people said that they were able to cope with the illness, due to traditional remedies and medicine provided by the health centre, it did impact on their everyday lives. In a household wherein the father developed amoebiasis, his eldest daughter had already taken the responsibility of providing for the family. His wife could not do much work because she recently had a miscarriage. His eldest daughter was fourteen years of age had joined other villagers who went to Mahagsay, a village further up the Maasam River, for gold panning. She

had stopped attending school for a while because her father was unable to provide for the family.

The sanitation officer of San Luis blamed the continuing incidence of diarrhoea and amoebiasis on the open defaecation still practiced by the Banwa'on people. This also affects the achievement of the target to increase access to sanitary toilet facilities. She said that the municipal government has handed out free toilet bowls but are still unused. The villagers responded that they had not installed them because the politicians of the municipality, had promised to provide cement for use in installation of their toilets, but it never came. Other villagers said they did not like to use it because it is smelled so bad. Others found it impractical to have to use water in the toilet every time they used it. They added that in their area where water was limited, finding a spot in the woods was the best option. The barangay health worker said she felt bad and ashamed because their village was often referred to as a *'bugay kaayo na barangay'* (very dirty village). But, she said, 'what can I do?' It is a challenge to

Figure 5.5: Unused toilet bowls



This is one among the many toilet bowls distributed by the San Luis Municipal Health Office to encourage the Policarpo villagers to use the toilet and stop open defaecation. This toilet bowl is not the usual ceramic bowls because it was just produced by the WATSAN unit of the San Luis municipality to save on costs.

convince people to install their toilets, when they were already worrying about enough water and food.

The situation above echoes what Rose (N. S. Rose, 1996) refer to as ‘technology of responsabilisation’ one of the many strategies of governments to lessen that coverage of ‘things’ that the government has to oversee. This is part of what Foucault (1991a) refer to as strategies that configure habits, in this case standards of hygiene to which people take upon themselves to act and keep up with the said standard. However, in this case the people have been dragging their feet in installing the distributed toilets primarily because they don’t see the usefulness of the toilet, when there is so much lack of water in their village.

SUPPORT MECHANISMS

The municipality’s water and sanitation program

Barangay auxiliary workers are an important link in the community health care system. In Policarpo, there is a Barangay Health Worker (BHW) and a Barangay Sanitary Worker (BSW). The BHW is in charge of updating the population count and resident information in the village, and of recording incidences of sickness. Villagers go to the BHW when they are sick and need a referral to the Rural Health Centre.

The current BHW felt that the amoeba incidence in the village had decreased three or four years back. She said that it had been a while since any cases had been reported. Between 2005 and 2009, it was reported more often. Now outbreaks occurred only occasionally, during rainy weather and during the dry months in May. These were often times when more people contracted amoebiasis.

The BSW monitors the tub and treats the water source with chlorine. The reservoir is cleaned every month with the help of the *tanod* (village police). The BSW is worried about the state of their water reservoir, because the metal inflow tube was rusting. She suspected it was affecting the water’s taste.

Municipal sanitation officers On the day of our agreed meeting, Amianan and Jose, two sanitation officers from San Luis municipality, arrived very late. They had just come from the

field. They had been monitoring the flooding in San Luis, which was allegedly the biggest flood that the residents of San Luis could recall. As sanitation officers, they were key people in the municipal disaster response team who ensured that the villagers were safe and had access to water and food. On a regular work day, their roles as sanitation officers focused on the dissemination of information about maintaining the quality of the water and sanitation in the different villages of San Luis, monitoring compliance in prescribed practices and the food and sanitation safety compliance of food establishments. Their work took them mostly out of their office as it involved visiting the villages.

According to Amianan, part of the water problem in Policarpo was the villagers' reluctance to use a toilet. She said the villagers of Policarpo had to learn to change their mindsets towards open defaecation and learn to use a toilet. She opined that often indigenous people have difficulty changing their ways. This type of thinking about the Banwa'on as "the other" at the expense of recognising that the problem of open-defaecation is not so much cultural as a consequence of the drudgery involved in collecting the water necessary to maintain toilets.

Since part of Amianan's work involved changes in behaviour, she felt that this could best be done via community organising. For her, it was not enough to simply make one or two visits: it was important to stay in the community and reinforce health education in the village. But, her current struggle with an inadequate budget for the water and sanitation program discouraged her. Although her visits to the different barangays were covered by general funds from the municipal health office, the other support activities were not covered. Most of the time her transport costs were not reimbursed.

The municipal health offices budget was defended during a meeting that included the mayor, the municipal councillors, and the heads of offices of the LGU. Jose said that whoever was at the helm had the deciding power regarding which of their department's activities were funded. If the sanitation program was not considered a priority, then her budget would be whittled down. In her 2013 budget, only the honorarium for the auxiliary health workers was approved. In effect, she was unable to continue any of the programs that she had introduced the previous year. In the previous administration, her budget for the fabrication of toilet bowls, and the honorarium for the village sanitation and health workers were approved at the quarterly meeting of the municipal workers.

Amianan had to be creative regarding the funding sources for her programme's activities. In 2013, she managed to justify her activities so that they were funded by the gender and development fund. By law, LGUs are mandated to set aside 5 per cent of the LGU's Internal Revenue Allotment (IRA) for gender and development activities aimed at mainstreaming gender concerns in development (Congress of the Philippines, 2008).

She said that it was 'a good thing that I don't have to worry about consumables such as chlorine' because they fell within the office's yearly budget for medicine and drug funding. The sanitation officers are allotted with two 5-gallon containers of chlorine annually, sufficient for the chlorination of the water systems in all of the villages in the municipality.

Water resource management

The DENR and DILG Joint Memorandum Circular 'Manual of Procedures for DENR-DILG-LGU Partnership on Devolved and other Forest Management Functions' (DENR-DILG (Department of Environment and Natural Resources-Department of Interior and Local Government), 1998) defined the process by which the provincial or municipal LGU should proceed with improving their management of the forestlands under their jurisdiction. But, despite that fact that these lands were within the LGU's jurisdiction, few of them actively participated in its management. The circular basically reminded LGUs to formulate their forest land use plans (FLUP) to improve effective management over their public lands by the DENR. The main attraction of this policy was that LGUs would have a say in how the public land was managed, which for many LGUs constituted a majority of their lands.

The Provincial Government of Agusan del Sur had formulated their FLUP in 2005. This mandated in turn their municipalities in the province to have a municipal environment and natural resources officer (MENRO) who would manage programs and activities associated with forest land use management. San Luis was among the two municipalities in the province that had yet to create a MENRO. However, they designated a staff member from the planning office to be the MENRO. This meant that their work partially involves environment and natural resources management matters.

The Province's Environment Code (SP-ADS (Sangguniang Panlalawigan-Agusan del Sur), 2007), proposed that the key strategy for ensuring water resources for the villages was for

municipalities and/or villages to localize the management of the catchments that were important to ensure the village's water source. Looking at the case of Policarpo, however, these strategies were not evident. However, one officer of the village council did stop cutting of the trees around one of their *atabay* (source 4).

Judging by the actions of the designated MENRO of San Luis when he accompanied me to the village for my fieldwork, he was not very well acquainted with what was happening in the village compared to the sanitary inspectors. He said that they do not have any program for water source protection initiatives in Policarpo. They did however have agroforestry farm in the village. But the village chief had scant knowledge of the purpose of the municipal government agroforestry farm. It was mostly planted in fruit trees: the municipality was said to share a percentage of the sale of the fruit, but, it had yet to receive its share.

Table 5.6: Summary of water intervention issues and its issues

Year	Improvements/ Interventions	Issues related to water intervention
2007	Spring box and reservoir was constructed	- water cannot be properly treated because water is intercepted before filling reservoir because water flows too slowly to keep up with people's needs
2007	Rain water collector	Installed a metal rain collector which rusted and became unuseable
2008	Biosand filters were distributed to selected households	- Only gave 13 filters for 64 households (5 households sharing it) - people consider it
2009	Construction of the Level II water System	No water coming out, pump is not working

Need to reassess strategy for water provision and water resource management

As the experience of the upland village of Policarpo showed, the narrow framing of improving water access by only addressing the drinking water compromised the availability of safe water for the village. As well, it failed to recognise that the village was actually experiencing physical scarcity of water, a failure that by extension led to a very reactive and patchy way of addressing the problem. The insistence to install a Level II system in an area where well data from past drilling had identified groundwater as difficult exposed the thinking that obtaining water was simply a matter of committing financial resources. It not

only wasted the financial resources poured into the failed infrastructure, but failed to address its objective of providing safe water or to improve water availability.

This case of Policarpo resonates with what Mehta (2001) cautions about ‘popular perceptions of scarcity’ (in this case, looking at scarcity as a matter of lack of infrastructure) that obscure the real scarcity that is actually happening. Policarpo’s experiences of physical scarcity, is influenced by factors such as its geology and rainfall. Due to these factors, the physical scarcity experienced in the area is not only seasonal, but happens in a much finer temporal scale, a matter of four to five days without rainfall.

There is strong evidence that the volume of water that can be utilized from the area (springs or seepage) is actually influenced by the biophysical context of the area (karst landscape. Given that karst landscapes are said to be areas in which water is not easy to exploit, then it may be that the LGU will have to involve the development of multi water sources such as the tapping of the rain water to improve water availability for various forms of domestic use in these areas. Although a rain collector was installed before, it was short-lived.

As regards the providing of household treatment units in the form of biosand filters, the impact was likewise limited due to the token quantity of filters the local government distributed.

As far as successive ineffective solutions to the problem in Policarpo are concerned, there is a need to reassess the conditions of the area and the local government strategy addressing the problem. And, because other upland barangays experiencing problems with water access are also located in the same karst landscape, there is strong possibility that they may also be experiencing the same conditions of physical scarcity.

The municipal engineering team was mostly composed of civil, electronic, engineering degree holders. Their current knowledge of water resource exploitation was mostly based on their on the ground experience. So, they constituted a very important knowledge base for reassigning the strategy. However, given the prevailing situation, there may be a need for a hydrogeologist, who will understand the complexity of water resources in karst landscapes.

CONCLUSION

In this chapter I have showcased a village that has experienced physical scarcity of water that is not often expected in the popular imaginary of rural villages in the Philippines. Policarpo's experience is an empirical manifestation of what Mehta saw as a case where real physical scarcity exists, but it is timebounded, not generalised and is experienced by a locality in a particular way. The poorly appreciated physical context of the scarcity has led to reactive approaches that have failed to address two issues: access to safe water and availability of water. Repeatedly, the water technology applied in Policarpo was the standard drilling of groundwater which has failed miserably in a karst landform. Other options that are more appropriate such as the rain water storage to secure water have not been considered seriously.

The chapter also shows how strategies of simplification in government programs persists as in the case of reporting achievements of safe water coverage in the traditional form as a proportion of households, even when more detailed data through the CBMS is available. Opportunities for reflection on how to modify the program and strategies are lost due to the enduring practices of simplification. This perpetuates the power of the local water bureaucracy to decide on the succeeding modes of water supply interventions.

On the other hand, the municipal government's target to increase access to sanitary toilet facilities through responsabilisation of Policarpo villagers to follow standards of hygiene, sometimes resorting to calling Policarpo village 'hugaw' (unclean) and through the distribution of toilet bowls has failed. This is because people have resisted the use of toilets because it also entails the use of water. As long as the community continue to experience periods of acute water supply shortage, the adoption of sanitary toilet facilities will remain low.

I conclude with quotes from two of my participants. When asked what they expected of their water system, Alice said: 'For us, as long as we have water that is proper, the kind which allows us to store water that is enough for our use. If not, you already are asleep you haven't washed your feet yet'. Marife added: 'If there is dependable water in the village, we can live properly as opposed to having to wait for water always. It is such a hassle. With dependable water, one can strategise on how we can elevate our livelihood.'

The next chapter presents the water access issues in the lowland village of Napo, Prosperidad.

Chapter 6

The Napo Lowlands: The Inadequacy of Standard Solutions

INTRODUCTION

In this chapter I discuss the water scarcity experience of the village of Napo, the lowland case study site, an unlikely site for water scarcity to be experienced because it is located in an area where groundwater is abundant. This case study highlights the inadequacies of the local water bureaucracy's standard water supply improvement practices to support the community's water system. I argue that one of the consequences of technical manuals exhorting standard procedures is that the technological – the standard aspect itself becomes a defining factor in deciding the final form of the water improvement installed, setting aside the contextual (ecological) and community (social) dimensions that are involved in the process. In exploring this process, I pay particular attention to what government staff does when the processes they implement do not achieve what they were intended to do. I also document how the affected villagers of the failed community water system respond and negotiate with authorities so that the failed system will be attended to.

The chapter is divided into four parts. The first section introduces the village of Napo and the lowlands where it is located. The second section details the water quality difficulties that people encounter in securing their everyday water, although these are less severe compared to the other two case study sites. The discussion reveals the active ways in which people sought to support their multiple water needs in addition to drinking water. When the government installed water system is non-operable, they go back to the community identified water sources that they have historically depended on. The section also describes the different interventions that local government has provided and it particularly focuses on the issues encountered by the water association that the provincial WATSAN office has established to

manage the community water system and the problems in establishment of a second community water system which most villagers rejected because of the salty water it provided. The third section, analyses the inadequacies of facilitating water access. The concluding section summarises the discussion of this chapter.

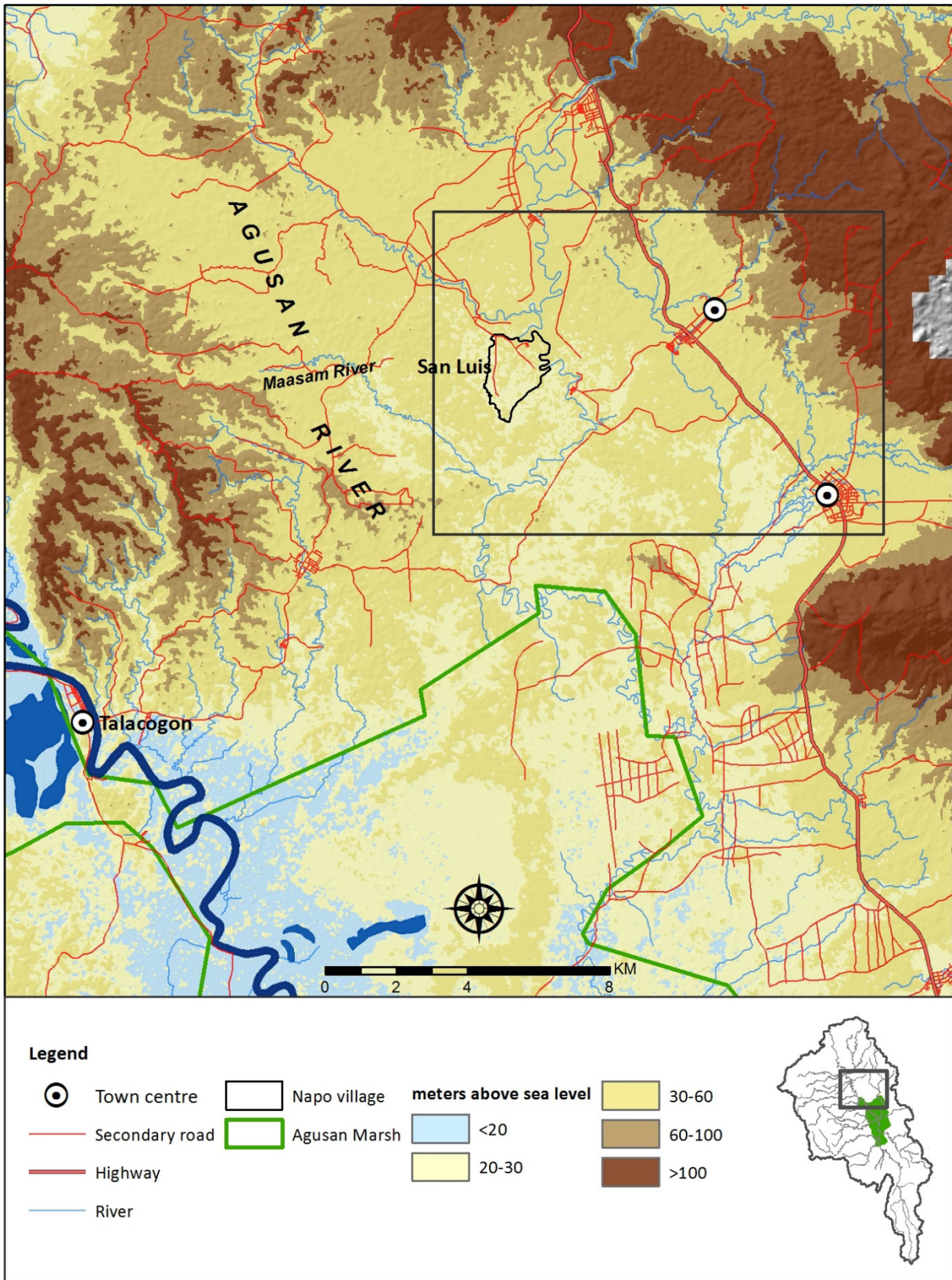
LOWLAND LANDSCAPE OF NAPO

Agricultural floodplains

The lowland village of Napo, which is part of the municipality of Prosperidad, is located adjacent to the Gibong River, one of the main tributaries of the Agusan River. While the village is part of the floodplains of the Agusan valley, it is located further away from Agusan's main channel, and its elevation is slightly higher (between 25 to 30 m) than the wetlands area of Agusan Marsh (Chapter 7). The general area of this part of the floodplain is dissected by a number of creeks and rivers, which together hinder the connectivity of the villages as only the main roads have bridges. The communities on opposite sides of the Gibong River have constructed hanging bridges to facilitate movement of people, and in some cases, of motorcycles. Napo is approximately eleven kilometres from Prosperidad town centre, and twenty kilometres from the Provincial Government Centre located in Patin-ay village. The villages of Lucena and Bahbah are significant for Napo in terms of drinking water, because Napo villagers draw from these villages' water systems when their own drinking water supply runs low.

The influence of river flow dynamics is inscribed in the village's name. According to the villagers the name Napo derives from *na pulo*, in the local language, *na* means becoming, and *pulo* means island. The village was completely surrounded by water and was cut-off from the Gibong River, in river flow dynamics, the creation of water deviation is a common occurrence among the highly sinuous rivers passing through low-lying areas. It creates meanders, which at times (when the river velocity increases) are cut-off from the main channel and form oxbow lakes or billabongs.

Map 6.1: Location Map of Napo Village



Source: DEM from NASA-JPL, Shapefiles from Agusan del Sur-ENRO
 Cartography: Author

For a low lying community like Napo, water in its various forms influences the everyday life and timing of seasonal activities in the community. It influences various aspects of the villagers' lives, such as access and physical mobility, drinking water supplies, timing of rice planting and enrichment of fish stocks. In addition to the Gibong, other significant water bodies traversing the village are the irrigation canal of the National Irrigation Authority (NIA), the Katohogan Creek, and numerous ponds in the village.

During the rainy season, from December to February, among the first water bodies to overflow is the irrigation canal²⁵ which often impedes the access of vehicles into and out of the village. The irrigation canal in Napo, as with many of the villages in Agusan del Sur, is constructed beside the village roads. During heavy downpours in Napo, water from the canal spills over to the road. Breaks appear in the canal wall, and the water volume flowing out to the road is high and easily erodes the unpaved road. The water also drags gravel and rocks to the rice fields on the opposite side of the road, hampering the physical mobility of people coming to and leaving the village. As well, these precarious road conditions limit the form of transportation that can enter the village. Only the modified motorcycle (*habal-habal* or *skylab*) is able to ferry people in and out of the village.

Barangay Napo

The village of Napo became a separate barangay in the 1960s. According to one of the original settlers of the village, there were only three households and sixteen people in residence when they settled there. Official declaration of Napo as a barangay was sought because then the state would be obligated to establish basic services in the village. Gundo, the oldest resident of Napo, came to live in the village in 1954. His family were originally from the Province of Leyte from the central islands of the Philippines. He described Napo as still mostly *lasang* (forest) with swampy conditions. Slowly the residents cleared patches of the forests so that they could establish areas for cultivation of rice, corn and some vegetables. Dry rice (*bumay na mala*) farming was practiced by the Manobo in the area, which the migrant families, like Gundo's adopted. Gundo also spoke of how without fertilizer and pesticides applied in farmlots, villagers would often have surplus grains compared to the farmers in current times. The surplus grain is sold to a middleman who takes it to Butuan. The grain is

²⁵ Villagers complained that the road was constructed much lower than the irrigation canal. When the irrigation water overflows from the canal during the rainy season, it erodes portions of their village road.

bartered by the middleman for basic supplies like salt, salted fish or clothes. These products are transported using *gakit* (bamboo raft) through the Gibong River up to the Agusan River where a *lantsa* (motorboat) transports it all the way to Butuan.

The village of Napo grew rapidly after the highway was completed in 1960. Map 6.2, the 1960 map²⁶, shows patches of the village indicating rice paddies surrounded by green (forests). In November²⁷ 2008 a satellite image of Napo was taken showing that practically all of Napo's land area was planted in rice with the exception of the settlement areas.

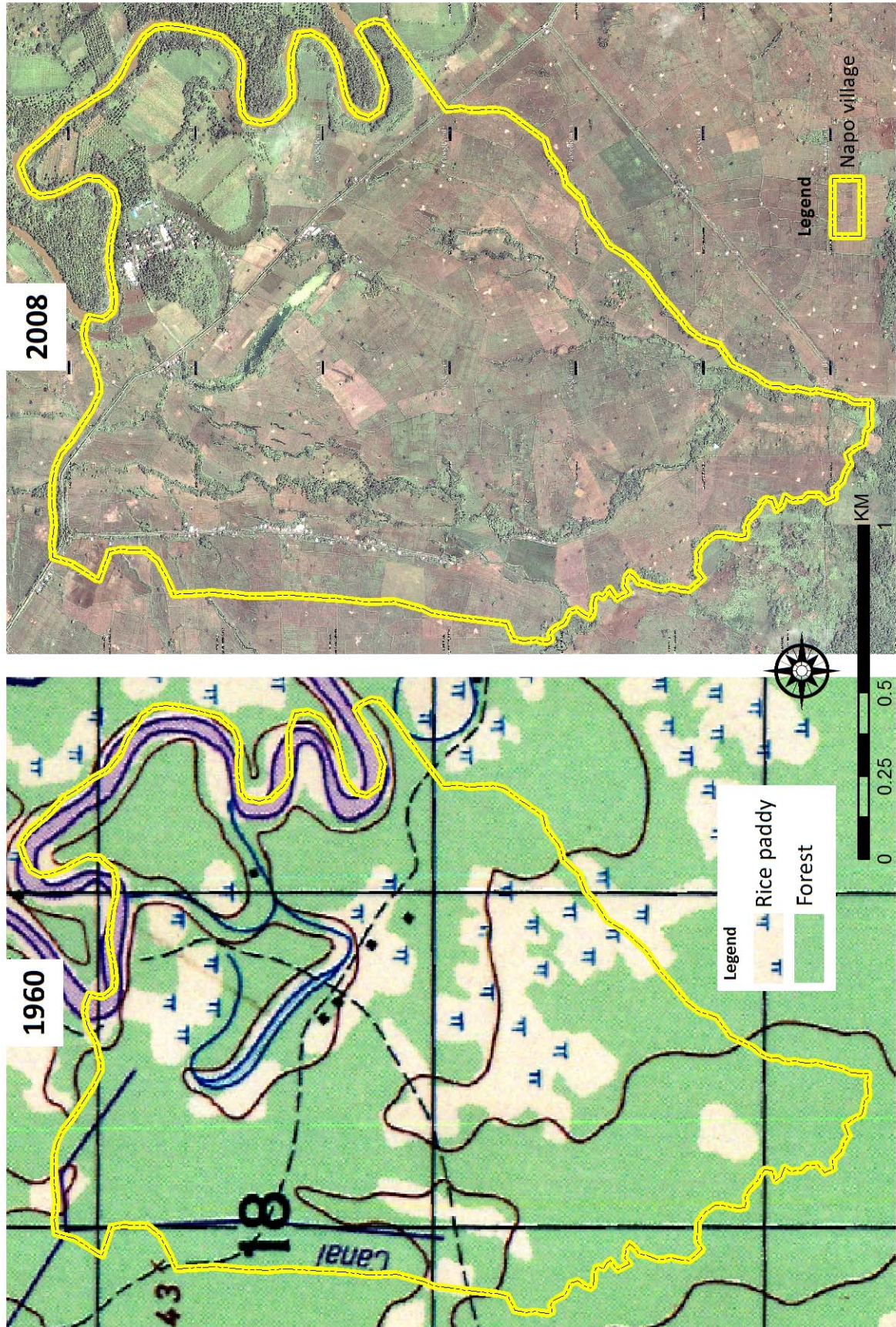
The village is divided into 4 *Puroks* (hamlets). Purok 1 is the village centre, and it is here that the barangay office, the school, a public grain storage facility and the community water system are located. As of 2012, Napo has 201 households, and a population of 895. Approximately, 56 per cent of the population are part of the indigenous peoples group (Manobo, Kamayo and Higaonon). The remainder are a mix of migrants from the provinces of Cebu, Iloilo, Bohol, Leyte and Surigao.

While rice farming is the main livelihood, the villagers also engaged in growing vegetables and rootcrops (some for their own use and some for sale), breeding livestock, poultry farming, establishing small grocery stores, occasional construction work in nearby town centre, and driving the *habal-habal* for local transportation.

²⁶ The topographic map was interpreted from ortho photographs of the area taken between December and January 1960 (Defense Mapping Agency, 1992)

²⁷ The area appears brown because the later part of October is the harvesting season.

Map 6.2: Comparison of land Use 1960 and 2008



Source: Left: DMA, 1992; Right: Google Earth, 2008
Cartography: Author

Just as the rainy season starts in December, the buzz of rice threshers can be heard in the village. People are busily harvesting their rice before it get drenched by the incoming rains. According to the villagers, the period from December to mid-February is the season when the torrential rains trigger seven flood events, seven being the usual number of floods experienced during this season. The *ikapitong baba* (seventh flood) cues the people to start their planting activities. In 2013 the people complained that the number of floods exceeded the customary seven flood events experienced during the rainy season. They said '*naka-nuebe na, na baba*' (it's on the ninth flood already), but, the rains kept coming. The villagers said that the rainy season had started quite early (at the end of November) and that the season was even wetter than usual. Because the rain persisted, the planting season started late. People became anxious: they were unable to start planting, and the problem was expressed in their daily conversations. Those people who harvested quite late in November the previous year, suffered the effects of the early rains. While I stayed there in January 2013, people were drying the rice which was soaked by the November rain, hoping to at least salvage some for their domestic use. Very wet conditions can diminish the people's opportunity to supplement their daily food needs by planting vegetables such as string beans, eggplant, various kinds of gourds, and sweet potato in their backyards. Either the plants do not flower, or if they do, the flowers just drop off.

Lorna, a resident of Purok 1, who was born and raised in Napo, said it was 'natural' to be regularly flooded. In December, 'the rainy season comes and there is always flooding in Napo'. The village experienced one of its highest levels of flooding during my stay there in January 2013. They had also experienced a big flood during Typhoon Sendong in 2011. This flood inundated the Provincial Government Centre. Lorna said the rainy season usually lasts until March, sometimes until April when the people have already planted their rice, but, she said, 'the floods are different these days than in previous years. These days only a day's rain will already flood the village'. Flooding usually occurs first in Puroks 1 and 2, which are adjacent to Gibong River. Twenty –four hours later, Puroks 3 and 4 will flood the water coming from the creeks south of Napo village. Years ago, it took a week's rain to flood Puroks 1 and 2. Lorna surmised that this happened due to the changes in the Gibong River. Before, she said while the river was narrow, it was deep, Nowadays, it has widened and is shallower. She attributed the changes in the river's channel to the construction of the National Irrigation Authority's dam upstream of Napo.

The combination of frequent flooding and the area being endemic to schistosomiasis²⁸ requires the villagers to wear rain boots. Rain boots were religiously worn by locals ranging from school age children to adults. It was common to see rain boots lying in the entrances to the people's houses. People were very aware of schistosomiasis, an infection transmitted by parasites commonly found in stagnant water. People can be infected by contact with the contaminated water. During the interviews that I conducted, I noted that the locals were well informed about how *sisto* was transmitted, and the symptoms. They had annual dosage of praziquantel, a drug used to treat the infection dispensed by the Department of Health's Malaria and Schistosomiasis Centre in Agusan del Sur. The villagers told me that they conscientiously availed themselves of the treatment every year. In some cases, people took the drug even though the municipal doctors advised against it. The prophylactic could not be taken by pregnant women, and not by those who were hypertensive. People were well aware that many among them had parasites in their bodies. Taking the drug makes the parasite unable to replicate.

LOWLAND WATER USE AND WATER RESOURCES

In this section, focus is upon the question of how the lowland villagers experienced water scarcity and how they dealt with the inadequate supplies. I also discuss the mechanisms of the local government's intervention when dealing with the community's water needs.

Status of Water access in Napo: Lisod ang Tubig – Water is Difficult

When I explained to the villagers that I was there to research on their *tubig ilimmon* (drinking water), they alluded to the irony of their water problem, given the flooding they experience due to excess water. The People of Napo claimed that in their area, *lisod ang tubig* (water is difficult). Certain households in their barangay (from Puroks 2, 3 and 4) had to walk a maximum of 2.5 km to the drinking water reservoir in Purok 1. Because of the long walk, some families would hire a *habal-habal* to transport the water. They paid P20 (15 for the transport and 5 for the water) per 20-litre jerry can. On average, the 20 litres required for their drinking and cooking needs lasted a family of five two days. One household in the

²⁸ Schistosomiasis is caused by the *Schistosoma* type of parasites. It is spread through contact with the water contaminated with the parasites. The hosts of the parasites are the freshwater snail which releases the parasites in the water (Department of Health, nd). Since Agusan del Sur is an endemic area for schistosomiasis, mass treatment is conducted by the DOH.

Prosperidad town centre, which had piped-in water paid P18.25 per cubic metre of water consumption²⁹. Clearly, households living in rural settings pay more than their urban counterparts for their water supplies.

Unlike the upland village case study site, Napo households' sources of water for their other household needs were not limited. Their location in the lowland allowed them to access the groundwater in the area. Due to the high rates of precipitation, the water table is quite shallow in the area, and the use of dug wells pervasive. Villagers drew from the various sources that were convenient to their households, and did not rely solely on the community water system for their needs (see section on self supply page 130).

Access to Safe drinking water data The data from the CBMS for Barangay Napo showed an interesting result for the village. One particular item in the CBMS survey asked the householders to name their main source of drinking water. The survey data presented in Table 6.1 shows that none of the households in Purok 1, which is where the community water system was located, had access to it. But based on my fieldwork, I can conclude that this was erroneous. The CBMS result thus indicates lack of reliability of the survey, despite the fact that according to the sanitary officer of the municipality of Prosperidad, CBMS enumerators were trained prior to their field work. This shows that data of this kind may prove unreliable.

Table 6.1: Percentage of Households with Access to Safe Water in Napo

PUROK	NUMBER OF HOUSEHOLD	COMMUNITY WATER SYSTEM	DEEP WELL	DUG WELL - OWN	DUG WELL - SHARED	OTHERS
Purok 1	60	0		49	10	1
Purok 2	48	1	3	23	13	7
Purok 3	42	1		19	22	22
Purok 4	51	0		33	10	10
Total	201	2	3	80	75	40

Source: CBMS, 2012

²⁹ This rate applies to households that consume 11 to 20 cubic metres of water.

Napo reservoir: An LGU managed rural water provision

The drinking water arrangements in place in Napo were perhaps the closest to the envisioned context of rural water supply conditions in the local government water delivery mechanism. They followed the ideal mechanism whereby a community water system is installed, and a community water association is made responsible for its operation and maintenance.

The main village water source was what the villagers refer to as a *reserboyr* (reservoir). The current status of the reservoir reflects the numerous adjustments it has experienced, from the time of its establishment in 1979 by the Department of Public Works and Highways (DPWH). At that time, the drilled deep well was fitted with a hand pump. According to the villagers, the water volume was reliable and met the residents' needs, but most opted not use it for their drinking needs because, they said the water had an overwhelming smell of *tayaon* (rust). Those who elected to use it allowed some time for the red coloured particles to settle (*palugdang*) before they used it. As indicated earlier in this chapter, the area of Napo was originally a swampy area: its drainage was poor. Characteristically, soils in swampy areas have high iron content, a characteristic that explains the red particles and the water's rusty smell.

Table 6.2: History of Napo's Drinking Water Source Improvements

YEAR	WATER PROBLEMS	INTERVENTIONS
1979	Unpredictable water – sourced from rain and spring; increasing population therefore need for additional water source	Jetmatic pump installed by DPWH
1991	Hand pump destroyed	New hand pump was installed
1998	Low usage of water from the pump because of high iron content of ground water	Construction of reservoir with electric pump Installation of the iron-manganese removal facility by provincial WATSAN Centre
2009	Households from Puroks 2, 3 and 4 have to hike a maximum of 2.5 km to the reservoir	Distribution of household biosand filters to some Purok 2, 3, 4 households
2011	Non-use of the biosand filter	Community water system with Improved Biosand filter

In 1996, the WATSAN Centre of Agusan del Sur was established with the assistance of the UNDP. Among the first services implemented by the centre was the construction of iron-manganese removal facilities for community water systems. In 1998, an iron-manganese removal facility was installed in Napo's water system. It consisted of two filters: one charcoal and one sediment (see Figure 7.1). Water passes through two basins, each half-filled with

charcoal. The latter is used to remove, the smell of iron from the water. The water is collected below the basins and flows to the next stage of filter, which is made up of layers of different-sized sediments. The sediments are contained in concrete tubs. After draining through, the water is collected below in another chamber. From this, a pipe channels the water outside of the shed into a faucet from which the people can fill their containers.

Subsequent to Napo's electrification in 1997, the WATSAN centre constructed the cement tank (reservoir), at the same time as an iron-manganese removal facility was installed. The centre decided to change from using a manual hand pump to motorized pumping of the water from the deep well. The reservoir, which only holds approximately two cubic metres of water, was filled to its capacity after 8 hours of operation (using a one-horsepower water pump). As is expected, electricity consumption is high during the summer months and decreases during the rainy period.

The upgrading of the village's water system, such as the installation of the electric pump and reservoir by the provincial government, came with the requirement that the villagers organize themselves into a water association known as the BAWASA (Barangay Water and Sanitation Association). Those who planned to draw water from the reservoir were required to be a members of their BAWASA. As members they agree to pay ₱25 per month. The amount was agreed upon by the general membership during a community organizing process led by the WATSAN staff. This amount allowed them to access unlimited water from the reservoir. Those who were not members would be charged by the volume of water they drew at a rate of ₱5 pesos per 20-litre container. The electricity consumed in the operation of the water pump would be paid from the monthly contributions of the BAWASA members, and from the fees collected from residents who drew water from the reservoir.

Figure 6.1: The Main Water Source



Photo 1: The *reserboyr* water source, consisting of the tank and the water filter shed; Photo 2: Charcoal basins for iron smell removal; Photo 3: the sediment filter; Photo 4: Water outlet

Source: Photographed by the author, Napo, 2013

A downside to the improvements in their water source was that when there was no electricity, water availability was interrupted. If the power interruption lasted only for a day, the stored water would suffice. In Napo, each household usually had two or three 20-litre containers and they frequently stored stock in their houses. However, power interruptions could last for months, as happened following the December 2012 Typhoon Pablo (Bopha). In such cases the people revert to using the spring, or travel to Bahbah or Lucena to obtain water. I personally found this part of the improvements counterproductive. For a place like Agusan del Sur, where blackouts occur frequently and can last for a month or more due to disruptions caused by typhoons or by roving blackouts during the summer months, this

seemed impractical. For the villagers that I have spoken to, the blackouts affecting their water supply is just something that they have to deal with since they consider the power interruptions as unavoidable. Although, they complain about having to seek out other ways of supplying their drinking water, they have not brought up any direct complaints regarding their main water source.

Operating and maintaining the community water system Similar to the other two case sites, Napo also had a Barangay Health Worker (BHW), who was tasked with spearheading the care and maintenance of the reservoir. This was done every month, but the actual date when it would be done had to be set. The BHW usually would set it when people were available to help with the cleaning. While cleaning of the filter system was a simple process, required more than one person to do it so that the cleaning would be finished quickly and the water system could operate again. The village had a system known as *pahina*, the voluntary contribution of individuals' efforts to tasks that would require more than one pair of hands. Usually when someone noted that cleaning had started, people came to help out. Regular cleaning entailed removing the charcoal and sediments from their containers, and repeatedly washing the latter with chlorinated water until the water was clear.

Another maintenance activity was disinfecting the water tank: it was treated with chlorine twice a week. The Barangay Sanitary Worker, who is responsible for disinfecting the water, mixed one tablespoon of chlorine with 2 litres of water, and then it poured into the tank. This was usually done at 6 p.m. and could be done again at 6 a.m. the following morning. Normally people received information about the chlorination by word of mouth.

While the maintenance activities described above were easily met by the BHW and the users, the repairs (even the small ones) were not readily done. While I was in Napo, water was wasted because the mechanism that automatically turned off the pump when the reservoir was full had not been fixed and a replacement faucet had not been installed. Robinson (2004) observed these kinds of problems in areas in different parts of the Philippines in which community water system were not maintained well due to the absence of a community organisation to assume the responsibility for the maintenance. In the case of Napo, while it had an organisation, it was unreliable (as I discuss in the next section).

Napo's community water association problems As discussed in Chapter 3, one of the key approaches that the centre embraced was the establishment of a community water association (BAWASA) that would manage the village water system. According to a WATSAN office staff member, the officers of the association are elected but their service to the organization is on a volunteer basis. The rationale behind this approach was 1) to ensure the sustainability of the water system through the participation of the people in the management of the water system and 2) to prevent the local politicians from using the water system for *pamulitika* (politicking) purposes. While some studies clearly show how community leaders capture water projects to bias their interests (Van Koppen, Rojas, & Skielboe, 2012), this seems not to have been the case in Napo. My host, who was the village councillor in charge of village budget appropriations, complained that often the barangay staff were stressed by the responsibilities of the BAWASA. For example, the Barangay secretary was requested with the task of collecting the monthly contributions of the households. However, when it was time to pay their electricity bill and collection was short, the responsibility of looking for additional money to cover the shortfall fell in the barangay officials' responsibility again. Often the barangay had to subsidize the water system. My host, who personally had to find money to meet the shortfall considered the policy of excluding the barangay council from the affairs of the community water system nonsensical, especially when the work ended up in the hands of the barangay officials anyway.

The WATSAN staff were aware of the common occurrence of contributions being inadequate to fulfil the operating costs of the community water system. They said that when they organised the BAWASA, they assessed the computed contribution based on the projected operation costs (electricity, contingency amount for repairs and spare parts) per month. However, the BAWASA members voted to reduce the contribution from the computed amount to lighten the burden on the residents. This somehow set up the BAWASA to fail even from the start.

Practice of self supply

As I learned from the interviews and the mapping of the water resources in Napo, the villagers obtained their water needs from an assortment of water sources which varied from season to season. But, these sources were placed in a hierarchy based on quality from rainwater, wells, springs, and water stations in Lucena and Bahbah. The ways in which they

were used corresponded to what Butterworth et. al. (2013) referred to as ‘self-supply’, whereby households developed their own water supplies, which were commonly nearby their houses. The authors considered self supply to have good potential as an alternative service delivery model that was seen to complement the community water system. Below is a description of these alternative sources and Map 6.3 shows the distribution of the water sources in relation to the houses.

Rainwater harvesting Many of the households relied upon rain for all of their water needs. Most of the households collected rainwater for drinking, especially those households in Puroks 2, 3 and 4. Many collected rainwater for use as an alternative source of water: it was used in combination with water from the wells. Many households stored rainwater in barrels. The more affluent households had massive water collectors for catching water from their tin roofs. In the absence of rainwater, people accessed their dug wells in their yards as an alternative.

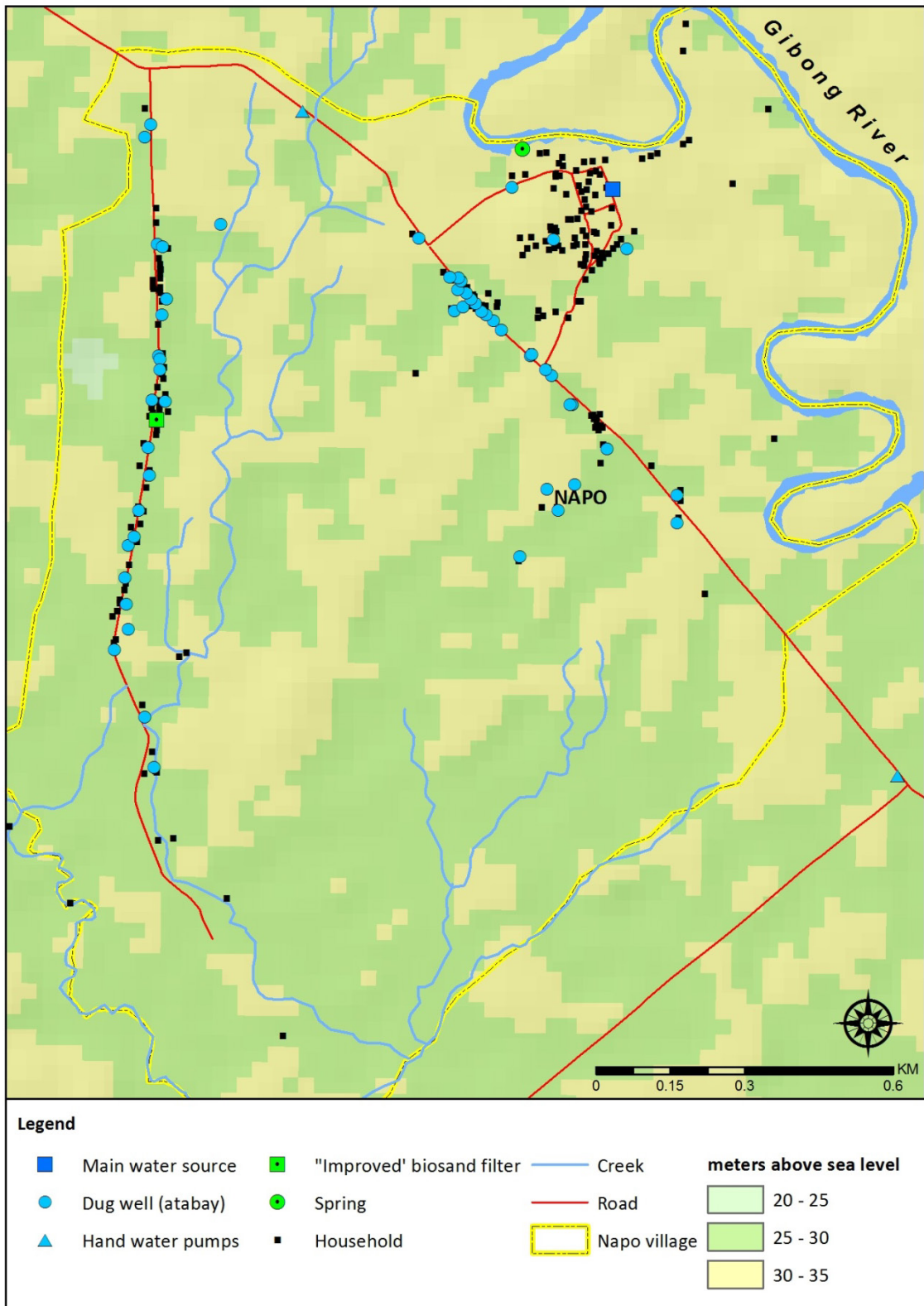
Dug wells My mapping of the water sources in Napo showed that a total of sixty dug wells *atabay* was in use. Many households in Puroks 2 to 4 were some distance from the water reservoir. These households relied on their dug wells for other domestic water needs such as bathing, the washing of dishes and clothes, cleaning, watering their home gardens, and for the use of the farm animals they raised in their backyards. Three households used their wells for drinking water: their dug wells were considered to be deep by community standards as they were 20 feet deep.

Wells were either dug by individual households or with the help of neighbours and, while not all households had their own wells, they were free to use their neighbour’s wells. They were not required to ask permission before accessing water from the wells, but they usually informed the owner out of courtesy.

Most of the wells were unprotected: the holes had no covers or protection from water on the ground that could seep into wells. Some villagers attached a cut barrel on the hole head to keep the water out. In some cases, users cemented the surrounding of the hole to keep seepage from the surface from entering the well. Flood events, especially during the rainy season, saw unprotected wells inundated, rendered unusable until they were cleaned. When the floods subside, users of the wells were expected to help with the *limas* (cleaning) of the

wells. *Pahina* (voluntary labour) often meant a voluntary contribution of something in kind. On occasions when a user was unable to help with the cleaning, he/she would contribute *pamainit* (snacks) for those who actively participated in the cleaning. The latter usually involved removing water from the well to rid it of flood water. This was done until the water became clear again. Joint efforts to improve the wells were also observed in some cases. People contributed to buying the materials for a well's improvement such as a barrel, cement, gravel, or any other materials that were needed. This somehow elicits a different view from the common narrative that tends to paint the community or users as lazy and uncaring vis-a-vis the community water system.

Map 6.3: Various water sources in Napo



Source: DEM from NASA-JPL, Shapefiles from Agusan del Sur-ENRO, Water sources from author's fieldwork

Figure 6.2: Household Self supply options



Photo 1: Privately owned water hand pump used for drinking; Photo 2: Dug well with a cemented apron around the well and a barrel covering the hole head; Photo 3: Hole head with barrel. Photo 4: Dug well; Photo 5-6: Improved home water system with filter - a barrel containing sediment and charcoal to filter the water placed beside the well so collected water is poured into the barrel and a pipe channels water straight to the house's kitchen. Photo 6: Another household filtering device

Source: Photographed by the author, Napo, 2013.

Figure 6.3: The Biosand filter interventions



Top photos: Show the abandoned state of the household biosand filters distributed to the Napo households; Bottom: The 'improved' Biosand filter that was designed by WATSAN Centre
Source: Photographed by author, Napo, 2013.

Spring along the Gibong River During the dry season, a common water source option for the households from the different Puroks was a spring along the Gibong River, which is exposed when the river water level goes down by approximately a metre and a half (Figure 6.4). The spring was not large but, according to the villagers, it never ran dry. People usually stuck a piece of bamboo into the spring to funnel the flow of water, making it easier for them to collect it.

Linao (oxbow lakes) The oxbow lakes or billabongs in the area were also sources of water for some. At least three of the people I interviewed said that at certain time of the year they used the water from the billabong for drinking and cooking purposes. They always boiled the water before drinking.

Figure 6.4: Spring and *Linao* (oxbow lake)



Top left: Shows the location of the spring in relation to the river surface; Top right: Almost indiscernible spring that the community depends on when the community water system is not functioning; Bottom: *Linao* or the oxbow lake that is an alternative source of water for households in Purok 1 and 2.

Source: Photographed by Author, Napo, 2013

The failed upgraded biosand filter system

In this section, I aim to demonstrate the WATSAN team's tendency to rely on standard responses to water interventions and their failure to properly assess and address issues of water beyond the standard criteria of sufficient volume and biologically safe water. The team's lack of technical knowledge to deal with complications such as salty water resulted in

a water system that is only partially useful for the community's use. In the narrative below, I detail the strong personality-based dynamics of small village administration, which impact on the ideal administration of village affairs. People rely on *estorya* (gossip) to get their complaints heard.

When I first visited Napo, I stopped by a group of people in the village centre to ask for directions to the barangay office. I was immediately told that their village chief and the other village leaders were unavailable as they were attending a workshop at the provincial government centre. Without hesitation they asked me about my purpose for coming to their village so they could pass the message onto their barangay chief. I told them that I would be carrying out my research in their village, and that I was interested in their experiences of access to drinking water. They said that water was 'hard to come by' in their village. One villager said that people from Purok 4 come to Purok 1 to get water even though a water system had been installed in Purok 4. He added that it was because their water there was *lad-ang* (a bit salty). The same person said that when I commenced my research, I should talk to the ordinary folks, not just to the village council members as the latter would not admit that water intervention had been unsuccessful. A few days into my fieldwork, I found out that the person I had been chatting to was actually the Purok 4 leader.

In 2009, prior to the installation of the water system in Purok 4, household-based biosand filter units were distributed, the same units that were distributed in the other case study sites. The same sharing arrangements were implemented, but in Purok 4 none of the units was still being used. Due to the unsuccessful adoption of the household biosand filter intervention, the WATSAN office decided to modify the CAWST's biosand filter design by scaling up its size so that it could serve several households at the same time. The village council was asked to suggest a source that may have sufficient volume to serve the community. The WATSAN team would conduct test drilling on the suggested source.

Prior to the test drilling, the barangay council and the purok leaders convened a meeting to discuss the possible source for the water system for Purok 4. The Purok 4 leader was not able to attend the meeting, but he later heard that the council had chosen an existing source with a water pump, which he knew had salty water. A further meeting was convened for the Purok 4 residents. It was conducted by the sanitary inspector from the Provincial Health Office, who oriented the community about their responsibility vis-à-vis the community water

system operation and maintenance. Some of the Purok 4 residents spoke out about the salty taste of the water from the chosen water source. They were assured that the biosand filter would remove the salty taste. The sanitary inspector also said that after fifteen days of use, the salty taste would disappear.

On the scheduled day for the test drilling, the Purok 4 leader informed the WATSAN team that the water was salty. He pointed out that it was an old barangay water project, and that it was not used for drinking because of its salty taste. However, the team still continued the test drilling. The leader was told by one of the WATSAN staff that the saltiness can disappear after days of pumping out water. He stopped arguing with the staff member when the staff said sarcastically, *'ikaw na lang mag-engineer'* (you might want to be the engineer). The result of drilling showed that it had sufficient water yield for the projected number of households that would be using it. The team also did a biological test on the water, which showed that the water was safe for drinking. However, they did not undertake the physical and chemical tests. All of these tests are required by the Philippine Standard for Drinking Water when new water system are being established. Had the chemical tests been done the salinity and chloride parameters would most likely have indicated saline water (DOH (Department of Health), 2007). This should have dissuaded the WATSAN team from continuing with the construction.

Despite the people's opposition to the water source, the construction proceeded and the water system was inaugurated in 2011. BAWASA was opened for membership, but only 15 people became members because many households did not want to pay for water that they could not use for drinking. One of the councillors who had suggested the current source defended the quality of the water, saying that it was just 'slightly salty'. She also emphasised that while some of the households were complaining about the water system, they were using the water for other purposes. She was also angered by the alleged misinformation that the Purok 4 leader was spreading. He was said to have told people that those who will be new members of the BAWASA will have to contribute in paying the past expenses for the electricity used in the operation of the water system even prior to their membership.

Another villager said that had the village council and the WATSAN people listened to what their Purok leader said about the water being salty, they would have had a water system for which households would not have been forced to pay ₱30 for monthly dues. They would

have volunteered right away. But, with reference to the salty water provided, one villager said: *'gusto nila musugal mi ug inum ana. Mura mi ug naghinayhinay ug pakamatay'* (they want us to gamble on drinking the water. It would be like slowly killing ourselves).

Given the low membership of the water system, a council session was convened in 2012 specifically to discuss it. The Purok 4 leader attended; but, he was rebuked by the village chief for not attending the session when the decision regarding the source was made. He was also rebuked for his resorting to *yaw-yaw* (gossiping) about the failed water system to many people, given that he had not done so officially at their village council session. The Purok leader said that even if he wanted to act, he would still be reprimanded and shouted at by the very dominant village chief. He did not want to subject himself to that and he would not rather engage in a debate because he knew the chief had hypertension and he did not want to cause him to have a heart attack. After the session it was decided that the barangay would have to set aside some money so that the Purok 4 water system could be fixed. The barangay council had to execute a village resolution requesting the WATSAN Centre's assistance in test drilling another water source which the Purok 4 leader had identified.

Negotiating for additional assistance for the failed water system In the course of my stay in the village, the village officers were often away on official business in the provincial capital. My host arrived home one afternoon and she said that their request for counterpart funding from the governor to fix their water system had been successful. She added³⁰ that they had their fellow councillor, Inday, to thank for convincing the governor that additional funds were needed for the water system in Purok 4: *'mapuslan pud diay ang iyang pagkabaga sa nawong ug pagkatabian'* (her being thick-skinned and chatty has its uses). She said that although she did not approve of how her fellow councillor had managed it (which was an allusion to the solid support their barangay gave the governor during the election), she still managed to do the job³¹.

³⁰ My host earlier intimated that she was often irked by the performance of Inday's duties as councillor. She said she may have been partly blamed for the failed water system in Purok 4 (where Inday also resided) because she did not conduct proper consultation with the residents there.

³¹ This type of negotiation for funds from local politicians by village leaders is quite a common practice in local politics in Agusan. Philippine politics is characterized as one that is highly clientelist. The described situation above thus hints of patronage politics that is described by Schaffer(2007) as 'providing material support, at any time (during electoral cycle), to individuals, families, or communities within the context of enduring asymmetric, but reciprocal, relationships.' The current governor's family has continuously held the highest position in the province since the late 1960s, only briefly interrupted in 1986 to 1988.

In this example, I see Ribot and Peluso's (2003) assertion that access to resources can be enhanced by using different mechanisms not only through having a right to water (mentioned in Chapter 2). In this case the barangay officials have used their social relations as a supporter of the governor of Agusan del Sur to request for additional funding to ensure the rectification of the said failed water system.

Test of water quality In my conversation with some community members, they asked if I could include in my research the testing of their water sources. They particularly asked if I could test the alternate water source they were proposing. Tables 6.3 and 6.4 show the results of the bacteriological test for the four selected water sources, based on the villagers' suggestions. Despite the installation of the Improved Biosand filter in source 2, the results show that the water failed the bacteriological test and thus was no different from the other

Table 6.3: Results of Bacteriological Test

DESCRIPTION OF WATER SOURCE	STANDARD PARAMETERS	Source 1 Dug well	Source 2 Improved Biosand filter	Source3 Proposed source	Source 4 Spring
LOCATION OF SOURCE		Purok 1	Purok 4	Purok 4	Purok 1
PHYSICAL CHARACTERISTIC	Clear	Clear	Clear	Clear	Clear
TOTAL COLIFORMS	<1.1 (MPN*/100 ml)	>6.0	>6.0	>6.0	>6.0
FAECAL COLIFORMS	<1.1/100 ml	>6.0	>6.0	>6.0	>6.0
REMARKS		Failed	Failed	Failed	Failed

Note: Text in red is above allowable amount

*MPN – Most Probable Number

sources which did not have any filtering units.

Table 6.4 shows that the water source with the improved biosand filter (Source 2) had not improved in quality in terms of colour, the amount of total dissolved solids, or the levels of manganese and chloride (high chloride content is a characteristic of saline water). A comparison of the quality of the filtered water (Source 2) with that of the proposed source (Source 3) in the parameters shown in the results revealed that the latter had better quality.

Table 6.4: Physical and Chemical Test Results

DESCRIPTION OF WATER SOURCE		Source 1 Deep well with pump	Source 2 Improved Biosand filter	Source 3 Proposed source	Source 4 Spring
LOCATION OF SOURCE	MAXIMUM LEVELS	Purok 2	Purok 4	Purok 3	Purok 1
APPEARANCE	Clear	with undissolved fine particles	Slightly yellowish	Yellowish with undissolved fine particles	Yellowish with undissolved fine particles
ODOUR	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
TEMPERATURE	Celsius	24.7	24.7	25.1	25.1
pH	6.5-8.5	7.58	7.37	7.66	6.93
SPECIFIC CONDUCTANCE	_uS/cm	378	3448	347	486
SALINITY	_ppt	0.2	1.8	0.2	0.3
TOTAL DISSOLVED SOLIDS	500mg/L	189	1580	172	242
COLOR APPARENT	10 units	0	17	14	12
TURBIDITY	5 NTU	0.09	0.31	1.06	3.26
SULPHATE	250mg/L	26	1	24	34
IRON	1.0mg/L	0.00	0.00	0.01	0.08
MANGANESE	0.4mg/L	0.0	0.5	0.0	0.0
CHLORIDE	250mg/L	3.5	850	8	11
CHROMIUM HEXAVALENT	0.5mg/L	0.004	0.004	0.004	0.006
COPPER	1mg/L	0.03	0.05	0.02	0.1
CYANIDE	0.07mg/L	0.005	0.009	0.006	0.007
TOTAL HARDNESS	300mg/L	186	740	125	240

Note: Text in red is above allowable amount

INADEQUACIES IN FACILITATING WATER ACCESS

This section discusses the main problems encountered by the villages of Napo with regards to the Provincial WATSAN Centre's interventions to improve their drinking water access.

Limited technical knowledge for dealing with the complexities of groundwater resources

Ill-advised innovation of the biosand filter As shown in the water quality test results of the community water system fitted with the improved biosand filter, the innovation of scaling up the household biosand filter design to a community scale proved ineffective. CAWST (nd) did not advise the scaling up of the size of the biosand filter, primarily because the specific measurements of the volume of each of the sediment layers were computed specifically for the size of the household size biosand filter. Scaling up the design required a high level of expertise to be able to calculate the right combination thickness of the sediment layers, and to achieve the right rate of flow of water through the sediments that would not compromise its effectiveness to remove pathogens. CAWST further advised that if a community scale filter was desired, then the slow sand filter design used in municipal water treatment process should be adopted.

The WATSAN team's sanitation inspector, when confronted with salty groundwater in Purok 4 provided false hope regarding the ability of the biosand filter to filter the salt from the water. This proved erroneous as desalination processes require a totally different type of technology.

Lack of knowledge of the complexities of groundwater resources This was not the first time that the WATSAN staff encountered saline water. In a group interview with the water drilling team (drillers, masons, plumbers and one engineer), they revealed that they had been in their jobs for ten to fifteen years, and that they were mainly tasked with conducting water well test drilling and water system repairs. They observed that salt in water tended to occur at depths of 80 to 100 feet. This was their experience when they did drilled deeper to be able to secure additional supplies for the Patin-ay Waterworks Project, which provided water to the provincial capital and to the households of Barangay Patin-ay. They also cited

other areas which had similar problems, but, they had virtually no knowledge of the nature of the salty water.

The presence of salty groundwater in an inland province like Agusan del Sur signaled the occurrence of what is known as *connate water*. As described in Chapter 3, geologic surveys have found that the Agusan Valley was exposed to marine conditions in its geologic past. Although, the area has transitioned to a terrestrial setting, this particular condition results in seawater becoming trapped in the spaces between the sediments deposited in an area. This water is referred to as *connate water* (USGS, 2015).

According to Peralta (nd), similar saline groundwater occurrences in Marikina Valley in Metro Manila also pointed to the occurrence of connate water. Peralta argues that examination of the occurrence of connate water requires specialized methodology known as the isotope technique. Furthermore, her study notes that application of this technique provides the opportunity to know the age and direction of flow, and to have a better sense of recharge mechanism of the saline groundwater in the affected area. Her study stressed that by doing so, the areas in which water pumping should be controlled or encouraged would be identified. The results of the isotope tests would provide a basis for estimating how much an aquifer should be pumped to exhaust the saline water, which later could be slowly replaced by recharge from rain.

The sanitation officer's claim that the salty taste would disappear after several days may actually have had an element of truth to it. However, as Peralta (nd) argues, there are certain sites where pumping needs to be controlled or totally stopped, and others which should be encouraged to manage their saline groundwater.

Clearly from Napo's experience, there is no available technical expertise within the WATSAN team to deal with these groundwater conditions.

Manual based thinking

The situation in Napo also revealed the tendency of the WATSAN team and the sanitation inspector to apply fixed strategies when addressing the water access needs of the community.

This manual based thinking may be attributable to the fact that the LGU and its staff are often guided by manuals such as the rural water design manual series published by the World Bank (2012) that advocated positive outcomes by following standard practices. Although, manuals are helpful, this becomes problematic when the situation is different but the same strategies are applied. In similar vein, studies by Sultana (2013) and Birkenholtz (2015) account for the negative consequences of applying the same groundwater technology as a blanket approach in improving community water supply.

The WATSAN office keeps files of records of well data which the team records for each of the test drilling activities they conduct. These well records document data on depth, soil type, depth of water table, depth of borehole, results of drilling and other pertinent information. The Napo case study has shown the degree to which manual based thinking coupled with an inadequacy of technical knowledge hindered the ability of the WATSAN team to take advantage of depth of their experience and the rich data available to them to become more adaptive in applying strategies to the particular water context being addressed.

Sustainability of community water systems

Participation for sustainability of community water systems Following the dominant approaches in rural development, the establishment of a community association (BAWASA) to manage each water system is heavily promoted by Agusan del Sur's water bureaucracy as a means for ensuring the community's sense of ownership over the water system and therefore ensuring its sustainability. Key arguments against these assumptions about participatory management is that they are just mostly myths (RWSN, 2010) and mostly held as an act of faith in development (Cleaver, 1999). Marks, Onda & Davis (2013) back these critiques through their study's survey about how community members ascribe a sense of ownership over their water system. Their study concludes that the people ascribe a strong sense of ownership only if they were able to pay a certain amount upfront and also when they are able to get water from the system regularly.

The case in Napo has shown that despite the establishment of BAWASA, there was an incidence of low monthly dues collection that impacted on the ability of the organisation to address water system repairs. It was actually some of the elected officials of the village that had to step in and provide funds or help in chasing up monthly collections to pay for

electricity bills and repair costs. To think that BAWASA was partly established so that the management of the water system would not be under the elected village leaders' control and thus would not be subjected to their possible politicking. The implication of the case in Napo is that these assumptions about participation and community water management need to be revisited by local water bureaucracy and may have to be revised in ways that addresses what is occurring in the community water systems.

Reliability of water supply As mentioned earlier, there are times of the year when the Napo water system is not operational for months because of disruptions in the power supply. In such cases the burden of finding alternative sources of drinking water is placed on the households. As power supply interruptions are not uncommon in Agusan del Sur this situation should trigger the WATSAN office to rethink the power supply options of community water system. Beyond ticking off Barangay Napo as having improved water source, it has think about its reliability – whether people can get water from the system most of the time.

CONCLUSION

This case study has shown the despite the application of standard elements in improving community water systems in the Philippines, enhancement of Napo's water access, improving the quality of drinking water or ensuring sustainability of existing community water system did not happen. The improvement of an existing drilled well and the installation of the biosand filter to improved water quality in Purok 4 led to a water system that is barely used by the community for drinking because of the salty water it produces. This came about with the insistence of the local government water and sanitation team to develop the particular water source despite protests by residents of Purok 4, reasoning that the water filter installed will fix the salty quality of the water. This reveals the poor quality of technical knowledge within the WATSAN team and how manual-based thinking and technical training are applied when water attributes described in their programs do not resemble what they find in actual sites. The experience also shows how villagers' inputs are undervalued in the consultation process.

The organizing of community association to manage the water system in Purok 1 to promote the villagers' ownership of system and consequently ensure sustainability of its operations did not happen as predicted. This chapter exposes the inadequacy of the manual-centred thinking of the Provincial WATSAN office. Not only is this thinking resulting in interventions that do not address their objectives but also people within the implementing offices are unable to recognise and appreciate the type of contexts when standard procedures are not to be followed.

The problems of access to drinking water in Napo may not be very severe when compared to the upland village of Policarpo but this chapter has shown the active engagement of the villagers in securing sources of water for their other needs. They apply the principles of filtering when they use the water from the dug wells that a household or a group of households have established. The community's response to the failed water intervention was not a direct confrontation of the village council, which followed WATSAN's advice to develop the salty water source. Instead it was done by their refusal to be members of the community association, through *parinig* or by complaining within the earshot of the village councilors while acting as though one is addressing it to no one, or spreading rumours about unfair charging of monthly dues among members of the water association. These examples resonate with what Kerkvliet (2013) called 'everyday politics'. While it took some time for Purok 4 villagers to nudge the village council to respond to their complaints, they were still able to move the council to allocate money to correct the failed system.

The next chapter will tackle a different vision of scarcity in wetlands village of Panlabuhan.

Chapter 7

The Panlabuhan Wetlands: Water Scarcity in the Midst of Plenty

INTRODUCTION

In this last case study chapter, I look at the concept of water scarcity from the viewpoint of the villagers of the floating house community located in the wetlands of Panlabuhan, an area in which water is plentiful. Indeed, it is all around them. I examine their conceptions and understandings of water scarcity through the community's everyday experiences of consuming water, and as the site of their livelihoods. These conceptions and understandings challenge the government program's notion of water scarcity as being a function of the lack of finances for the establishment or improvement of water sources.

In the first section of this chapter, I describe in detail the geographical landscape of a wetlands village, the daily or seasonal fluctuations of water that prevail in the area, and, by extension, their effect on the land and water forms and the flora and fauna of the wetlands. In the second section, I describe the human space that the Manobo occupy in the marshland and their everyday living in water. I establish here how people conceptualize water scarcity through their experiences and understanding of it in a place like Panlabuhan that is completely surrounded by water. Public health determinations regarding 'clean and safe water' consider the use of lake water for drinking 'unsafe'. Thus, amidst physical abundance, there is actually a shortage of drinking water. But Panlabuhan villagers' conception of scarcity extends to a much wider context and includes the condition of the water they live in. They define it generally in terms of unpredictability, decreased flow of water, and increased deposition in the lake and marsh environment, all of which combine to shrink the richness of the fishing area. It extends to the effects on fishing, the community's main source of

livelihood. The focus on fishing intends to demonstrate how water conditions are inextricably linked to the quality of life of the people's in the wetlands. While flooding, for example, tends to be considered disastrous by provincial government officials, the community members' view is diametrically opposed to this. They consider flooding as an opportunity to regenerate the lake waters and to better ensure fish catch and sustain lives of the floating community. The second section also assesses the different interventions that have been implemented to address the issue of lack of safe water access, and it shows how woefully inadequate the biosand filter units that were given to Panlabuhan. Future plans by the municipal government to augment its water and sanitation program in Panlabuhan points to the construction of floating toilets, an intervention that may be important but still leaves floating communities vulnerable to problems that unsafe water can create.

In the third section, I document the observed changes in the villagers' immediate environment and examine if these changes are affecting the people's livelihoods. I then relate it in a wider discussion of water resource management in the Agusan River Basin, which in recent years centred on the implementation of IWRM or integrated water resource management. My analysis focus on how the construction of dams (integrated within the IWRM project plans of Agusan River Basin), which could diminish flows of water in the wetlands; affect the environment and livelihoods in Panlabuhan.

The last section provides a concluding summary of findings of the case study.

GEOGRAPHICAL LANDSCAPE OF PANLABUHAN

The Agusan wetland area is not only a place wherein natural elements dictate the life rhythms of the flora and fauna. People too have managed to create their own space in this watery landscape. In this section, I provide a detailed description of Panlabuhan's biophysical environment as part of the Agusan wetlands in an attempt to understand the particular context of the lives of the villagers, their use of water, the changes they experience in their waterscape, and the impact that these changes have on the people's daily lived reality in the wetlands. I describe the physical features of the wetlands space, and the flows of water that dictate the lives of those who live here. I will briefly discuss the history and circumstances of the establishment of the village, and detail succeeding governments' agendas regarding this wetland space.

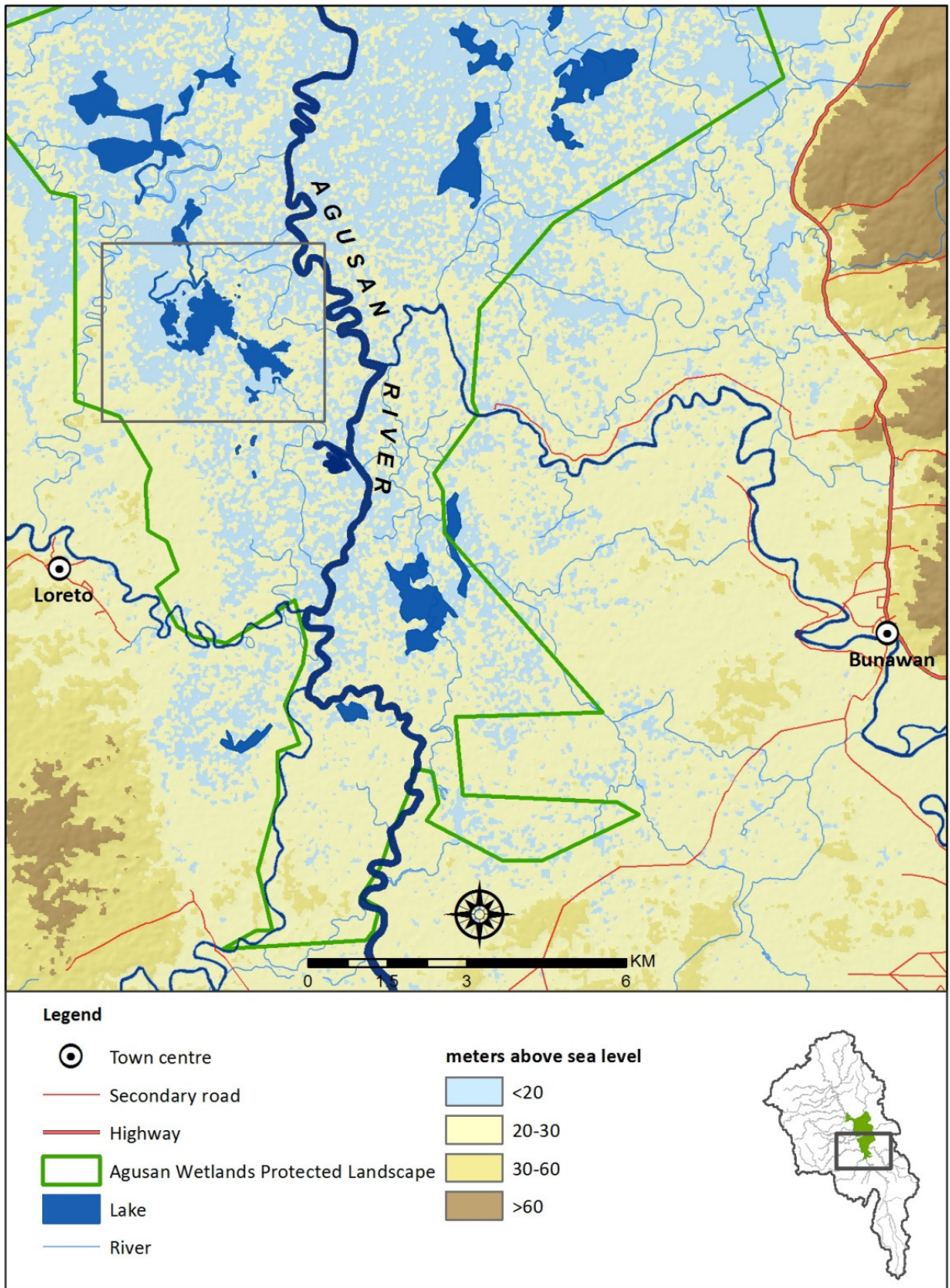
Panlabuhan floodplain

Panlabuhan, along with other floating villages in the wetlands shares the same elements, such as a stream connecting to the Agusan River and a mosaic of water bodies including lakes, ponds, streams, and swamps. As explained in Chapter 3, the Agusan floodplain where Panlabuhan is located is illustrative of Junk et al.'s (1986, p. 112) 'pulsing' river-floodplain system and the habitats that are characteristic of it. Junk et al. state that floodplains are zones wherein periodic transition between aquatic and terrestrial forms occurs. In the period of low water in Panlabuhan from March to November, different water bodies are discernible from each other. The mainstream Agusan River and its tributaries are part of the permanent water bodies in this zone. Some creeks (*sapa*), for example the Panlabuhan Creek, are visible only in extremely low water. In the littoral zone, natural levees frequently form along the waterways, bounding the stream's flow. Wetland settlers use these levees for seasonal rice farming or home gardens. These water courses also function as the main transport routes for Panlabuhan providing access to the town centre of Bunawan, the main trading point for fish caught from the lakes. Distance wise, Panlabuhan is nearer to Loreto (6km) than Bunawan (15km) but access, which is mainly by boat is frequently impeded by shallow swamps or old levees. Due to its proximity to the Davao-Agusan Highway, the wharf in Bunawan has become the main transfer point for crops and fish, and a staging point for the few tourists who travel to the Agusan Marsh. Map 7.1, which shows the general surroundings of Panlabuhan, highlights the permanent lakes. The elevations are also shown to illustrate the very subtle gradient of the area, which has created a collage of raised and low-lying areas shaped by the action of water.

The prominent lakes in Panlabuhan include the Kanimbaylan, Bukogon, Gawa-Gawa and the Little Bukogon. There are also smaller lakes or ponds that are approximately 20 m across. According to the villagers, some are quite deep, descending almost 5 metres. There are also oxbow lakes that the people refer to as *linao*, elongated and curved water bodies that used to be parts of river and creeks but were cut off when the river changed course. There was evidence of herbaceous plants, grasses and sedges in the littoral zone. Sedges such as tikog (*Fimbristylis utilis*), bagombong (*Phragmites australis*), and grass species such as bugang (*Saccharum spontaneum*) and balili (*Panicum stagninum*) are commonly found in the area. As well, there are specific tree species that are able to endure long periods with their roots submerged below the water line. Those most commonly observed in the area included the kabak

(*Nauclea orientalis*), banaba (*Lagerstoemia speciosa*), mambog (*Nauclea speciosa*), sako (*Barringtonia acutangula*), catmon (*Dillenia indica Blanco*) and adgaw (*Premna odorata Blanco*). *Catmon* fruits and *adgaw* leaves are commonly used when cooking a sour soup dish, while *kabak*, *banaba*, *mambog* and *sako*'s leaves, fruits or flowers are used for medicinal purposes.

Map 7.1: Location Map of Panlabuhan



Source: DEM from NASA-JPL, Shapefiles from Agusan del Sur-ENRO
 Cartography: Author

Hydrophytes or aquatic plants that grow in or near the water are important breeding areas for certain types of freshwater fish and insects. But, they are also detrimental to the lake ecosystems. In the permanent lake areas, the most conspicuous were the free-floating hydrophytes, such as the water hyacinth (*Eichhornia crassipes*) which the villagers refer to as water lily, and the *dagaylu* or water cabbage (*Pistia stratiotes*). The most dominant of these is the water hyacinth, which is considered such a nuisance by the wetland dwellers that they refer to it as *sagbot* (weed). The locals observed that as soon the water hyacinths are in open waters, they float freely, rapidly crowding out all other species. They form into massive clumps that clog the waterways, impede navigation, and become tangled in fishing nets. In the shallower waters, a mix of water lily (*Nymphaea sp.*), lotus (*Nelumbo sp.*) and dugman (*Hydrilla verticillata*) grow from the lake bed. These blooms are only visible during the low water period. The villagers sometimes harvest the lotus roots, but they are not a preferred food item due to their bitter taste.

Map 7.2 shows a satellite image³² of the area taken in October 2010, during the low water period. The different land and water bodies that the villagers identified by names, made much more sense to me when I had the satellite image to refer to.

I enhanced the image so that the lakes, creeks, and all other landscape details were easier to distinguish. I was able to differentiate the boundaries of the areas that they referred to as 'lakes' because they actually appeared in black compared to the rest of the area. Panlabuhan Creek's traversing of the Kanimbaylan and Bukogon lakes was visible on the image, but it had to be pointed out to me when we were canoeing on the lake. These linear features were actually river scars, or imprints showing where the rivers/creeks used to flow. Areas with recent sediment deposition could also be seen in the image.

The clumps of inundated forest trees at the lake edge are visible only as small crowns because the trees had very few leaves. Since these are small patches the existing land use/land cover map of the area generalizes them as part of the lake. This inundated forest is

³² This image was not available prior to my fieldwork. The best map that I could find for the area was a 1:50,000 topographic map. For an area that is almost flat, a 1:50,000 topographic map with a 5-meter elevation interval available for lowland areas could not provide reliable information about Panlabuhan. Data pertaining to lakes on the topographic map were very generalized and the place and creek names erroneous. Google Earth's high resolution image, which became available in 2014, was used as background spatial data where I overlaid my GPS readings and mapping field notes.

usually a mix of *kabak*, *mambog* and sometimes *katmon*. Due to its longer inundation, only the *kabak* trees remain.

Masses of water lilies are very distinct on the image: they appear as large white masses. They are, however, very mobile and can move with the wind and water current. Water lily masses merge and separate, making them an impediment for navigation and for the fishing nets. Shallower areas which may be areas of recent deposition, are also distinguishable on the satellite map.

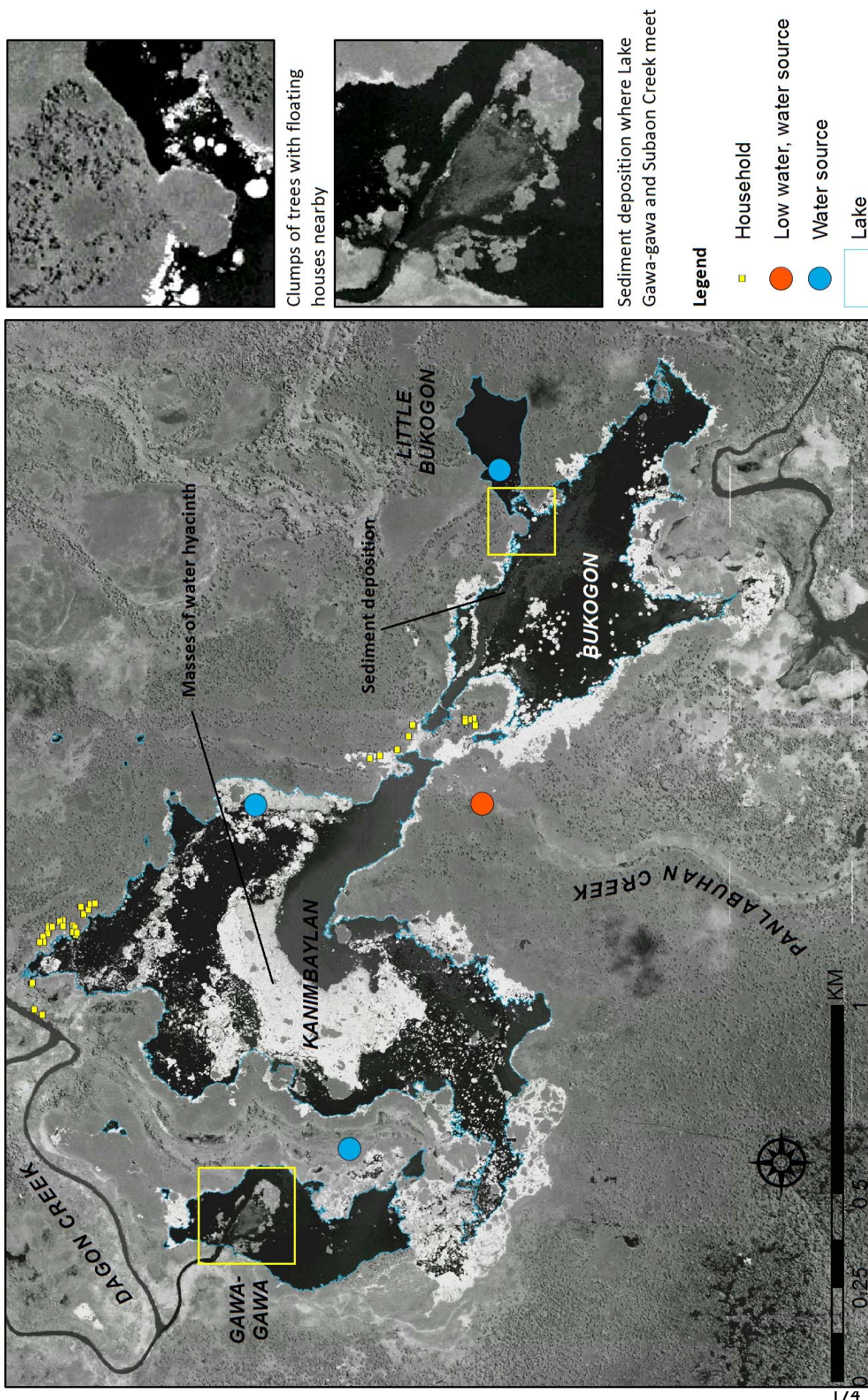
Water flows

The hydrological regime (or rates of flows of streams and levels and volumes of water in Panlabuhan) is heavily affected by precipitation and, by extension, affects the biota especially for the kind of floodplain of which Panlabuhan is part.

Annual flood pulse Junk et al's flood pulse concept proposes that the bulk of animal biomass in a floodplain is produced in situ, and aided by the lateral relationship between the main stream channel and the floodplain, which is shaped by predictable, seasonal and time-dependent flood pulses. Bayley (1995) sees these as circumstances that provide a site where biota can develop production strategies within their various life cycles that allows them to adjust to the elevated water of the 'moving littoral'. Instead of thinking of flooding as disturbing the floodplain, these periodic changes actually provide opportunities for the various species to recycle their composition (W. J. Junk & Wantzen, 2004).

different land and water forms in Panlabuhan

Map 7.2: Satellite image showing different land and water forms in Panlabuhan



Source: Satellite image from Google Earth, 2010 and toponyms and other information from author's fieldwork
Cartography: Author

The lands around Panlabuhan start to transform during the period spanning the end of November and February when the rains become very pronounced. Around this time the littoral zone in Panlabuhan is completely flooded by surface water that increases by three to four metres, leaving only the tree tops visible above the water. The increase in the volume of aquatic habitats, and the submerging of the vegetation and fauna start the process of decomposition of plants and animals leaving them to eventually rot in the water (see Figure 7.1). Furthermore, when the low water sets in, this decomposition process continues aided by the action of microorganisms. The product of decomposition, the organic detritus, serves as material for feeding the fishes in the wetlands. Talde et al.'s study (2004) explored the diet composition of six economically important fish species in the Agusan Marsh in an attempt to discern if the periodic fluctuations of water had an effect on their diet. The authors examined the stomachs of different fish species caught in different water periods in the Agusan Marsh. Their study found that the volume of food intake was greater during the rainy period, peaking when the water level fluctuated downward around February. It also showed that the volumes of food in the different fishes' stomachs were lowest from October towards the end of the dry season. This supports Junk et al.'s claim that flooding benefits the aquatic biota in a floodplain environment.

Figure 7.1: Floating houses in Panlabuhan (noting the water level)



This photo was taken in October during the low water season. The blue line approximates the level during the high water season (highest normally in December.)

Source: Photographed by author, Panlabuhan, 2013.

Flow direction The expanse of water surrounding Panlabuhan seems to show a flat surface but, on closer inspection -- and aided by the movement of masses of water hyacinth -- one can detect that the water is flowing northwest. At the local level, the flow of water may be influenced by prevailing wind from the southeastern section of the Agusan valley. The surrounding vista is mostly flat stretches of water, with the gaze interrupted by the trees and tall grasses.

HUMAN SPACE

In the previous section, I delineated the physical context of the wetlands that is characterized by a 'pulsing environment'. In this section, discussion will centre upon the establishment of Panlabuhan in an unlikely environment, and on everyday life in a floating village that defines the villagers' relations with the water.

The floating village

In an environment susceptible to transformation by varying degrees of rainfall, the Manobo not only adapted to the area, but created their own particular cultural space, in the form of a floating village. The activities and practices they have developed over time have become part of their cultural mosaic. Contrary to what is widely believed in Agusan, floating villages are not the traditional dwellings of the Manobo, nor is living in the middle of the marshlands. Early accounts of the Manobo people (Garvan, 1927; Montano, 1886), cite them as the predominant group living in Agusan Valley. They lived either in stilt houses or in houses perched on tree stumps, mostly along the Agusan River. Today, floating villages are literally houses floating on wetland waters. The houses are usually made of *lauan* (*Shorea* spp.), a tree species that is a less dense hardwood and is popularly used for boatmaking. The villagers also use round *lauan* logs as a base, and position a bundle of bamboo (usually consisting of approximately 20 poles) under the base as ballast. The floating houses are tied to trees to prevent them from being swept away by strong currents, especially during periods of high water. According to a descendant of one of the first families to settle in the area, the floating houses were adopted after the traditional houses on tree stumps were inundated by floodwaters when they first transferred there from one of the villages near Loreto town centre. Their decision may have been adopted from the logging operations' floating buying station/store which used to be sited at the junction of the Simulao and Agusan rivers. The

Agusan River was the main means of transporting logs from the interior of Agusan to Butuan. Logs were usually exchanged for goods such as salt, sugar, clothes and rice or were paid in cash³³.

The settlement was established in 1961 by the Reyeses, a Manobo family from Loreto municipality. Today, the current inhabitants of Panlabuhan are mostly descendants of Wenceslao and Alfredo Reyes, brothers who migrated into the area and cleared part of the swamp forest. During that time, the family built their houses along the Panlabuhan Creek. These days, the houses are clustered in two locations, one near Subaon Creek and the other at the edges of Lake Bukogon. Floating houses are mobile dwellings and can be relocated at will. The main requirement is that the houses should be built well away from areas where the current is strongest, and that they must be close to trees. Lashing the houses to trees prevents them from floating away.

The current sitio leader of Panlabuhan chose to have his siblings and parents cluster near Subaon Creek. His decision was one of convenience. It enabled his family to assist visitors to navigate their entry into the community. The leader feels responsible for visitors who may have a hard time gaining access to the village. Not to offer aid would reflect poorly on them as hosts. Familiarity ensuring safe passage for boats is important because not only can a boat sustain damage if it hits the bottom of the lake, but at the same time it can destroy the fishnets that the villagers have set. Staff from the Protected Area Superintendent's (PASu) office visits the area to coordinate park management activities with the community in Panlabuhan. Occasionally tourists stay in Panlabuhan, especially since the tourist floating cottage was constructed.

Land use and property regimes in the Agusan Wetlands

The area of Panlabuhan is currently under two land use and property regimes. When the Manobo first settled in the area, it was considered the backwaters of the province, unproductive and inaccessible. During the rapid increase of migrants to Agusan valley in the 1960s (as discussed in Chapter 3), the marshy conditions and regular flooding did not attract the migrants to convert the area into agricultural lands as part of their homestead. Thus, the area remained as part of the state land. Even in the 1970s, the view of it being as

³³ Interview with the wife of the former Agusan del Sur congressman.

unproductive continued. The former Governor Plaza was said to have planned to drain the water from Agusan Marsh to transform them into rice fields, to increase the rice production in the province. For unknown reasons, the plan did not push through.

Agusan Wildlife Sanctuary In 1996, the central government in Manila proclaimed Agusan Marsh a protected area (PP No. 913). This was in accordance with the Republic Act 7586, or the National Protected Area System or NIPAS Act that aimed to protect sites with characteristics deemed of national importance, whether for their biodiversity, heritage or outstanding views. Under this proclamation, the prime purposes for setting aside an area for a wildlife sanctuary were as follows: to protect and conserve its biological diversity; to protect nationally significant species; and to protect the biotic communities and physical features of the Agusan Marsh environment.

In 1995, the Conservation of Priority Protected Areas Project funded by the World Bank through the Global Environment Facility, identified the Agusan Wildlife Sanctuary as one of the priority sites for the implementation of the NIPAS Act provisions. Project implementation included the establishment of baseline data, and the setting up of the management council through the Protected Area Management Board (PAMB). Part of the management strategy was the common objective of having protected areas managed by the communities in partnership with the government. Although, the project was abruptly stopped³⁴, the establishment of the management board and the designation of the protected area superintendent were important in moving towards on-site management in the area (ESSC, 2007).

In 1999, Agusan Marsh was included in the Ramsar list of important wetlands of the world. It was identified as one of the Key Biodiversity Areas (KBAs) in the country by Conservation International-Philippines (CI-Philippines, 2006), and internationally recognized as an Important Bird Area (IBA) by Birdlife International.

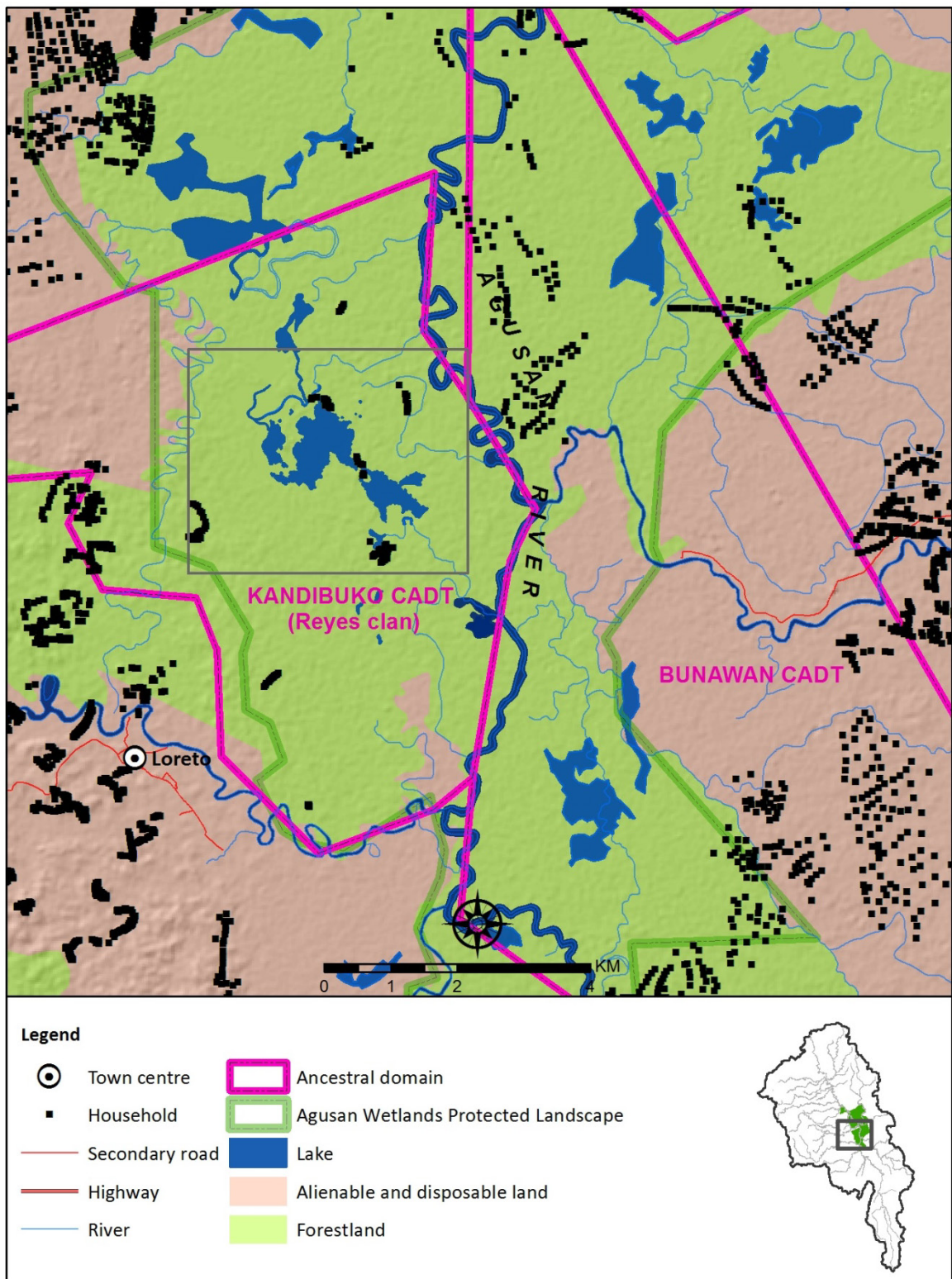
³⁴ The funding was stopped because of anomalies in the fund disbursement which was managed by a consortium of NGOs (ESSC, 2007).

Ancestral domain

The 1997 Indigenous Rights Act of the Philippines paved the way for indigenous groups including the Manobo to have their claims to land formally recognized by the State. Recognition was achieved through the granting of a Certificate of Ancestral Domain Title (CADT), a communal title. Panlabuhan was officially awarded a CADT by the National Commission on Indigenous Peoples (NCIP) in 2008. CADT 090 was awarded to the Reyes clan of the Kanimbaylan, Dinagat, Bukogon and Kobasayon (KANDIBUKO) areas, which total approximately 5,021 hectares. But, according to the Act, despite the fact that the title has already been awarded, it does not become a full-pledge title as it first has to go through the Land Registration Authority, which cross-checks the title with other claims by and issuances to mostly migrants, by the DENR and the Department of Agrarian Reform . There is a possibility that it could be reduced after registration. Up to the time of writing, it has not yet been cleared. It seems ironic that the land tenure claims of first settlers of the Agusan Valley remain unsure compared to the migrants' land claims and issuances that mark their stay in the Agusan wetlands. These kinds of dynamics of resource use conflicts are not uncommon in different parts of the Philippines in the encounters of indigenous peoples and migrants populations in the public lands. Often the migrants come out favoured in these struggles because of better education, awareness of legal intricacies and greater socio-political network (Dressler, 2009; Hayama, 2003). Despite this, the NCIP and different assisting organizations have organised the subdivision of the ancestral domain in sectors, a proposal agreed to by the Reyes clan in Panlabuhan.

Map 7.3 shows the overlay of extents of alienable and disposable lands in Panlabuhan in relation to the boundary of the Agusan Wildlife Sanctuary and the ancestral domain of the Panlabuhan Manobo.

Map 7.3: Map of the Property Regimes in Panlabuhan



Source: DEM from NASA-JPL, Shapefiles from Agusan del Sur-ENRO
 Cartography: Author

The people

The community members identify their place as Sitio Panlabuhan, under Barangay Poblacion in the municipality of Loreto. In the municipality books, Panlabuhan is referred to as Purok 17. Sitio is a term of Spanish etymology, means 'place' or 'site' ("sitio", 2014). The term, however, has taken on a more specific meaning in the Philippine context referring to a subsection of a barangay where a cluster of settlements is found and is typically rural. Similar in meaning to *purok* (cognate of the Tagalog word *pook* meaning place), it is often used more in an urban context. Sitio Panlabuhan is secluded from the rest of the village and access to its services is very limited. Notwithstanding, the community has thrived since its establishment.

Village population profile From the Reyes brothers' two original households in 1961, Sitio Panlabuhan has now expanded into 44 households. According to a CBMS survey taken in 2012 (Provincial Government of Agusan del Sur, 2012)³⁵, Panlabuhan or Purok 17 had a total of 240 inhabitants. The community is still predominantly comprised of Manobo with the exception of 10 individuals who married into Manobo families. There is an almost equal number of males and females, mostly young (41 % aged 15 years and below, with approximately half between the ages of 0-6 years). Only 6 individuals were recorded as aged 60 and above. In terms of educational attainment, a majority (60 %) of the residents had received at least primary schooling, 14 per cent had reached secondary school, and 2 per cent had reached college level. Almost a quarter reported not having received any schooling. Because the community has only had a primary school since 2010 (previously it was only a daycare centre), most of the parents in Panlabuhan earlier sent their children either to the nearest school which is in Barangay San Marcos, to one of the villages along the Agusan River or to Loreto. Some of the children were still sent to stay with relatives in the town centre of Loreto or to Bunawan to study. They spend their weekends at home. An integrated primary school was established for the community but, since the students were few, the Department of Education did not assign a licensed teacher. Therefore the school is only active two days a week.

³⁵ The socio-economic data used in the thesis were generated from the Community-Based Monitoring System (CBMS) dataset of Agusan del Sur Province. The survey was undertaken in 2012. I was provided with access to the database and therefore I used existing database summaries available and/or constructed my own to suit the information I needed. I refer to this dataset CBMS from hereon.

Due to Panlabuhan's distance from the mainstream villages, many of the usual services such as electricity are absent. A donation of solar power units by the Tuklas Katutubo organization has enabled some families to access electricity. Some households use TV sets and DVD players for entertainment. Some watch movies or sing karaoke.

Migration into the ancestral domain of the Manobo continues: there were two new households when I was there. The sitio leader said that they could settle as 'they are also people who would like to earn a living'. However, newcomers must abide by the community's rules, especially those pertaining to electrocution fishing. Both new families had relatives who were living in the community. Both said they migrated because the livelihoods in Panlabuhan were better than in their former area. One family was from an upland village in the municipality of La Paz and the other was from Lake Dinagat, which is another floating village in Agusan Marsh.

Community leadership The people of Panlabuhan are represented in their barangay by their sitio leader. In recent times, the sitio (or *purok*) has taken on a more official status in matters of dispensing official village functions. The barangay council, through an ordinance, may assign an administrative mandate to this subsection and authorize a representative to be chosen. A sitio leader performs government functions in coordination with and under the supervision of the barangay officials.

The choosing of a sitio leader is in part influenced by the Manobo tradition of choosing a leader. It is important to note that today, Manobo people in Panlabuhan cannot readily be distinguished from the dominant Visayan people. This is because they no longer wear their traditional garb. But, they still speak the Manobo language and continue to practice some of their traditions. Dodong, the current sitio leader of Panlabuhan, only became community leader recently. He is now the *datu* (term for traditional leader) after his father expressed his wish to pass the role on to his sons. Although Dodong had older brothers, his father, his siblings and other clan members were convinced that he had the ability/power to perform *taghap*, a ritual that invokes the spirit of their ancestors. The ritual is for different purposes, that is to bless people's activities, to heal the sick, to ensure good passage when they are out of their area, or for a safe stay for a visitor³⁶. This ability is held in high regard among the

³⁶ Before I started my research, Dodong performed the ritual to their ancestors for my benefit. The ritual involved the use of a candle, an offering of a beer, an egg, candies and biscuits. A traditional ritual would be more elaborate,

Panlabuhan Manobo. I believe that the villagers' belief in Dodong's power to perform *taghap* has a positive impact on his ability to make people follow the established rules in Panlabuhan. One of the important rules in fishing in Panlabuhan is that the villagers do not engage in *panguryente* or electrocution fishing. So far this rule has been implemented well in the village and Panlabuhan is known among the other floating settlements as a place where *panguguryente* is not acceptable.

Tubig Danao: a multi-use water resource

The ubiquitous presence of Panlabuhan's brown-coloured lake waters dominates many aspects of the Manobo's lives in their floating community. It facilitates quicker movement of their *baroto* (canoes), and provides the necessary supply for their household needs, such as cooking, water to wash dishes and clothes, water for bathing, recreation, livelihood, and most importantly their main source of water for drinking.

Based in the 2009 provincial CBMS survey, and the subsequent 2012 version, all 44 households of Panlabuhan secure their water from the lake, which is classified as an unsafe water source. Table 7.1 shows that in Barangay Poblacion, where the Loreto town centre is located, has a high percentage of its households with access to safe water (85 %). Mapping the distribution of these households (Map 7.3) reveals that households in Poblacion village without access to safe are those located either in the wetlands area or adjacent to it. Similar to what was presented in Chapter 5, mapping the data on water access contributes a new perspective of the water access information. This new perspective is very beneficial in preparing the LGU's strategy to cover the remaining unserved households in ways that will be appropriate to their context. Adapting to the situation of the area of the wetlands may require tweaking of the usual strategy and may also require more budget than usual.

requiring a pig or chicken as offering. But Dodong opined that it no longer needs to be grandiose. To him, what is more important is for the ritual to be performed in earnest. The lighting of a candle is the important part of the ritual, as it symbolises the calling of their ancestors to see that there is a visitor in their area. To the villagers it is important that the spirits are aware that an outsider is in their area so that no untoward incident will befall her/him.

Table 7.1: Proportion of households with and without access to safe water

PUROK	HH with safe water	%	HH without safe water	%
Purok 1	89	99	1	1
Purok 2	46	98	1	2
Purok 3	95	98	2	2
Purok 4	101	98	2	2
Purok 5	131	98	3	2
Purok 6	77	82	17	18
Purok 7	79	96	3	4
Purok 8	95	93	7	7
Purok 9	87	95	5	5
Purok 10	64	97	2	3
Purok 11	34	83	7	17
Purok 12	41	91	4	9
Purok 13	102	97	3	3
Purok 14	91	98	2	2
Purok 15	43	46	50	54
Purok 16	57	49	59	51
Purok 17	1	2	47	98
TOTAL	1,233	85	215	15

Source: CBMS, 2012

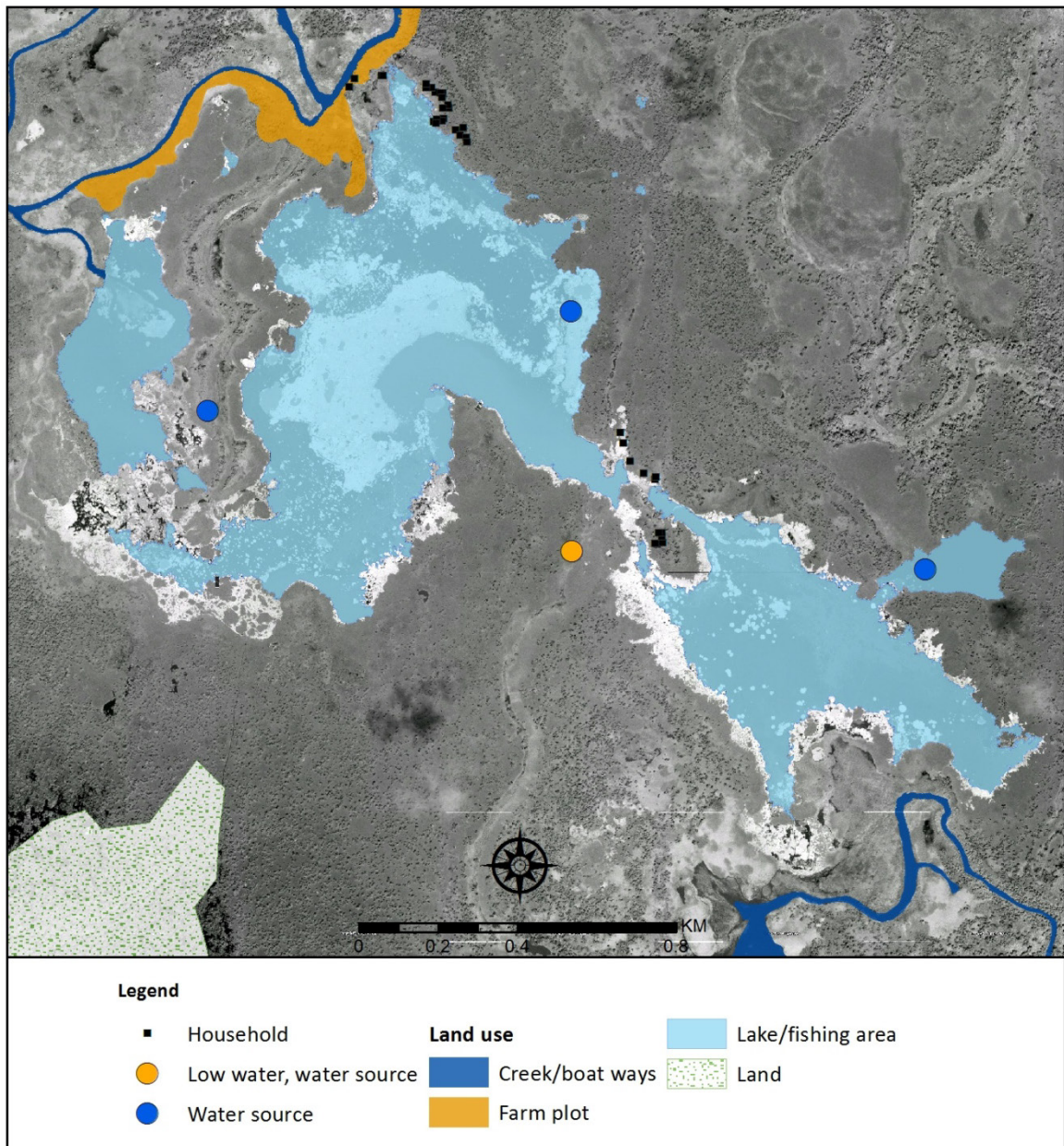
In the next section, I describe the practices of the villagers with regard to securing drinking water, their perceptions of the lake's water quality, their experiences of water-borne diseases and the treatments they use.

Water sources Convenience dominates the people's decision to collect water from this questionable source, but is also dominated by the water flows. When I first visited Agusan Marsh in 2009, I was very surprised to see that the villagers drew their drinking water directly from the brown-coloured lake. They adopted a generally nonchalant tone when I ask them about their drinking water. With little fuss, the Panlabuhan villagers said that they get their water from the lake – *tubig danao* (lake water). But during my fieldwork, I noted that they had appropriated certain places where the water quality was deemed better than in the rest of the lake area. Water for drinking and cooking was drawn from four trusted drinking water sites. As regards the inhabitants of the settlement cluster adjacent to Subaon Creek, the first choice was the side of Kanimbaylan Lake, and their second was Gawa-Gawa Lake, which lie 600 and 800 metres respectively from the settlement. Their third site was Lake Little Bukogon,

which is just 250m from the settlement cluster in Lake Bukogon. When the water is low, Panlabuhan Creek's spring can be accessed³⁷ (See Map 7.4).

These areas are considered safe because: (1) they are far enough from the contaminants that flow the village houses -- because households do not have toilets, the villagers relieve themselves right outside of their homes, straight into the lake water; and (2) based on their

Map 7.4: Panlabuhan land use and water sources



Source: Satellite image from Google Earth, 2013; Village data and household locations from author's fieldwork, 2013

Cartography: Author

³⁷ When the water is low, Panlabuhan Creek's spring emerges: the villagers say cold water gushes out, but when this happens, accessing the spring is not easy. Dug-out canoes can barely be used because there is no water to facilitate the movement. Walking is laborious in the soft muddy soil, because the foot tends to sink deep into the bottom.

knowledge of the water flows in their lakes system, the water flow travelling upstream, cannot bring suspended matter with it. The water on the edges of lake has low energy, so, the suspended particles settle in it quite quickly.

Although most of the people collect their water from the aforementioned sites, there are instances when they collect water just a few metres from the settlement cluster. This usually happens when children are asked to fetch water. They only go a few metres outside of the settlement cluster.

Although rainwater was their first choice for drinking water, I did not observe people storing enough to last until the next rain. Only 2 households owned blue water drums that could store up to 200 litres of water. Similar to the other two case study sites, jerry cans are commonly used to store water. One of the villagers said that they cannot store much in their houses because it would affect the balance of their floating house. There is also hesitation in using rainwater because it is commonly believed that it brings cough and colds, which the people claimed were more common ailments in the village than diarrhoea.

One householder said that they sometimes bought filtered water from the water refill stores in the town centre: it costs ₱40 per 20-litre container. But this was very occasional, only when they had a chance to go to town in their motor boats.

Household water treatment practices Generally the lake water is used straight away after collection. However, there are certain lake conditions that determine if some treatment of the water is needed before its intake. Turbid lake water collected after a flood would require boiling of the water, particularly the water given to young children. During the hottest period of the year, a green mass the locals call *bunlog* (algae) floats in the water column. This always prompts households to boil their water because they associate it with children becoming sick with amoeba. In one household I interviewed, the mother said that she added straining to the water treatment after boiling because small particles of algae were still evident. Her improvised filter was made of a layer of mosquito net, rocks and sand and placed in an old jerry can. She had copied how the people from Bunawan town filtered the water from a dug well. The households in general apply remedies to purify their water. Boiling for example, may be practiced, but it is considered *hasul* (bothersome) so is only done for the children and older people, who are considered unable to tolerate the poor water quality

Water purification tablets are sometimes distributed by the nurse from the municipal health centre, who visits the sitio once a month. Other times they are given *Hyposol* (sodium hypochlorite), but, these remedies are not distributed regularly.

Experiences of waterborne diseases and their local remedies Generally speaking, the villagers were relatively relaxed when talking about waterborne diseases. Most of them had learned to manage the symptoms using old and new treatments. When asked about the quality of the drinking water taken from the lake their common response was: '*Ok ra man. Bubi pa*' (It is okay. We are still alive). Despite their blasé attitude toward drinking the lake water, it was evident in the practices they employed when obtaining and handling water that they were concerned about its purity. When asked if they have experienced any illnesses after drinking the water, they respond '*panagsa*' or '*usabay*' (occasionally). When I asked them to describe what they had experienced, they said: '*maglain ang among tiyan*' (our stomach gets upset) and '*magkalibanga*' (diarrhea), but, they said it does not last long because they had some *tablet*s (loperamide tablets) to remedy the diarrhea. Some of those I interviewed specifically said that they had experienced amoebiasis – '*gi-ameba m?*'. They said that when they had amoeba, they become very weak as it caused them to defecate countless times. In addition, they felt nauseous and their eyes became sunken due to excessive fluid loss.

One of my interviewees, Lolong, experienced the most serious case of what seemed to be acute gastro-enteritis. During the onset, he experienced aching in his waist area, frequently felt the urge to urinate or defecate, but was unable to pass urine or defecate. He had stomach cramps which were sometimes really painful and he observed some blood in his stool. Lolong said that he drank loperamide when it was available. But, he also uses traditional methods to cure his diarrhoea. His grandparents taught him to use *alibo* or soot from the roof in their kitchen. The soot is scraped from surfaces that are often exposed to smoke issuing from the firewood used for cooking. When it is boiled with water it produces a yellowish-coloured concoction. After straining it to remove the suspended particles, it is ready to drink.

Virgie, another resident, attributed these water-borne diseases to '*tiempo nga tingbaho ang tubig, mao nang maabtan sa sakit*' (the time when the water is smelly is when one gets sick). Virgie observed that the water became smelly after the floods because the grass that had been

carried by the floodwaters rots. She saw this as the cause of the diarrhoea that the people experienced.

Lake water quality '*Komportable man mi sa among tubig*' (We are comfortable with our water), was how a villager described their current consumption of the lake water. He added, however, that although the villagers felt that they had adjusted to drinking water from the lake, and that they only occasionally became sick, they were not certain that it would not have adverse effects on their health over time. They were eager to know the status of the quality of their water, especially in the light of the changes that their *danao* had experienced in the past year.

These changes in the *danao* became the topic of debate when I met the villagers at a community meeting at which I was asked to speak about the topic of my research. The residents living in the Lake Bukogon settlement cluster commented on the heavy inflow they had been experiencing since early 2012. They saw it as the underlying cause of the marked deterioration of the lake water quality. They claimed that in earlier times, the lake water was clean. But now that the Dagon creek brings heavy flows from Agusan River into Lake Bukogon, different kinds of debris and waste material were entering their lakes in Panlabuhan. Waste materials in particular made the lakes very turbid. Once it took a long while for the floodwaters to flow into the lakes in Panlabuhan because the main Agusan channel was deep and could accommodate the volume of water. But these days, this has changed. Sometimes sacks of garbage are carried by the floodwaters, and although they keep moving, that is they are carried further into the lower areas, the rotting waste ultimately affects water quality.

Water samples from Lake Kanimbaylan and Bukogon water sources were collected in November 2013. Table 7.2 show results of the bacteriological test. As expected, the total and faecal coliform measurement was way beyond the maximum level.

Table 7.2: Bacteriological Test Results for Water samples from Lakes Bukogon and Kanimbaylan

LOCATION OF SOURCE		Bukogon	Kanimbaylan
DESCRIPTION OF WATER SOURCE	STANDARD PARAMETERS	1 Lake	2 Lake
PHYSICAL CHARACTERISTIC	Clear	Clear	Clear
TOTAL COLIFORMS	<1.1 (MPN*/100 ml)	>8.0	>8.0
FECAL COLIFORMS	<1.1/100 ml	>8.0	>8.0
HPC	<500 cfu/ml	575	535
REMARKS		Failed	Failed

*Most Probable Number

Note: Text in red is above allowable amount

Due to the mining activity in the tributaries upstream, a physical and chemical plus test for mercury content was requested for the water samples. Table 7.3 shows that the total dissolved solids were beyond the maximum levels, a result which was expected due to the turbidity of the water, evidenced by its colour. The test for mercury returned less than 0.001 mg/L, the tolerable level for drinking water. This was consistent with Appleton et al.'s (2006) findings that mercury content dramatically decreases in water samples taken further away from the source of contamination.

Table 7.3: Physical and Chemical Test Results for Water from Lakes Bukogon and Kanimbaylan

	MAXIMUM LEVELS (mg/L)		
LOCATION OF SOURCE		Bukogon	Kanimbaylan
DESCRIPTION OF WATER SOURCE		Lake	Lake
APPEARANCE	Clear	Slightly yellowish with undissolved fine particles	Slightly yellowish with undissolved fine particles
ODOUR	Unobjectionable	Unobjectionable	Unobjectionable
TEMPERATURE	Celsius	27.2	27.2
pH	6.5-8.5	7.46	7.27
SPECIFIC CONDUCTANCE	_uS/cm	281	240
SALINITY	200	0.1	0.1
TOTAL DISSOLVED SOLIDS	<10mg/L	133	114
COLOUR APPARENT	10 units	23	36
TURBIDITY	5 NTU	2.05	3.71
SULPHATE	250mg/L	20	15
IRON	1.0mg/L	0.12	0.20
MANGANESE	0.4mg/L	0.0	0.0
CHLORIDE	250mg/L	8	5.5
CHROMIUM HEXVALENT	0.4mg/L	0.01	0.00
COPPER	0.4mg/L	0.0	0.01
CYANIDE	0.05mg/L	0.001	0.001
MERCURY	0.001mg/L	<0.001	

Note: Text in red is above allowable amount

Living off the water

A factor that clearly emerged during my fieldwork in Panlabuhan was the importance that the community placed on fishing in relation to their lives in water. While their quality of drinking water was important to them, the disruptions to their livelihoods attributable to increasingly unpredictable water flows concerned them the most.

Fishing Fishing is not only the main means of living in Panlabuhan; it connects the villages to the mainstream economy. According to Agusan del Sur Provincial Planning Office data, fish production from the wetlands fishermen contributes 73 per cent of the province's total fish production volume (ADS-PPDO, 2008). They earn ₱40 per kilo for fresh fish, ₱50 per *tubog* (fish strung together) for ten pieces of fish that are small, in size and ₱60 per *tubog* for dried fish (12 pieces on a string). The income they derive from fishing is mostly used to purchase rice, which they have to buy from Bunawan or Loreto. Sometimes they are only able to catch get three to four kilos of fish in a day. So to manage on a ₱150 budget per day, most of villagers only buy items in *tingi-tingi* (small retail quantities). This enables them to spread the cash for expenses such as coffee, soap, *vetsin* (monosodium glutamate) and salt or if they have any extra money, they buy bread for their children. Sometimes they buy milk. On the average they use 3 kilos of rice per day for 5 people in the household. Sometimes they get to each meat once a week.

All of the households in Panlabuhan are engaged in fishing: the activity dominates the daily lives of the villagers. At approximately 5 a.m., the men set out early to check and collect (*manibaw*) the *pukot* (fish nets) and *taan* (hooks) that they set the previous day. They have to collect the fish as early as possible when it is fresh. Although the fish caught in the nets are still submerged in the lake water and can still survive, some fish species die easily after hours of being trapped. Setting out early will prevent the fish from being exposed to the sunlight, which causes them to bloat and make them unfit for sale, even as dried fish. Before the sun sets, usually around 4 p.m., the men return to their favoured sites to cast or set up their nets, hooks or traps again.

The most common fish species that are caught in the local lakes and rivers are *tilapia* (*Oreochromis niloticus*), *baluan* (*Channa striata*), *karpa* (*Cyprinus carpio*), *taywan* (*Clarias gariepinus*), *bito* (*Clarias batrachus*), *giant gurami* (*Osphronemus goramy*), and *gurami*

(*Trichogaster trichopterus*). In recent years, *kasili* (*Anguilla mamorata*) has been increasingly caught to meet the demand. Occasionally villagers catch *banak* (*Valamugil cunnesius*) *pyyo* (*Anabas testudineus*), and *lambu-o* (*Macrobrachium rosenbergii*) in their lines and traps. The frequent appearance of *janitor fish* (*Pteryoplichthys disjunctivus*) in their nets has worried the villagers in many of the communities in the marsh because the people believe that it eats the fingerlings of other fish species that are preferred by villagers. It is also blamed for destroying the fishermen's nets. A type of catfish native to South America, it is popular among aquarium enthusiasts as an algae eater, hence the name 'janitor fish' used in the Philippines (Chavez, De La Paz, Manohar, Pagulayan, & Carandang, 2006). It is hypothesized that these fish have been unknowingly released by aquarium owners in the towns surrounding Agusan Marsh (Kis, Hubilla-Travis, & Primavera, 2008). They have multiplied rapidly in the marsh because they are not considered edible. The janitor fish is known to burrow into the mud bottom, thus contributing to the turbidity of the lake water (Hubilla-Travis, Kis, & Primavera, 2007).

Flooding in Panlabuhan is welcomed by the villagers because the fish catches are better during these events. The locals' interpretation of the process is that the fish hiding in the numerous ponds and lakes in the area surrounding Panlabuhan are offloaded from these areas during the significant increase of water level during floods. The fish are then swept away towards the lake waters and into their fishing nets. A few days before I arrived in the area in October 2013, it flooded. This resulted in plentiful catches with one fisherman's catch reaching almost 100 kilos (not including the portion of the catch processed as dried fish). A flood of this kind only happens once a month, usually between August and November which, the people say, is a difficult time for them. This is because it is *habagat* (southwest monsoon) time, a season marked by heavy rain, and by water flowing in and out of the area. However there is little change in the water level. According to the villagers, during such periods the fish just stay in the ponds or wherever else they are hiding. But March is when the fishermen in Panlabuhan are *high grade* (a term they often use to denote someone having a great deal of money). They refer to this time of the year as *agas amihan* (flow of *amihan*³⁸) when there is successive flooding that tops the previous water level.

³⁸ Amihan: the prevailing northeast wind system that starts in October and disappears around April.

But, flooding also poses risks to their nets. The flooding current carries with it masses of water hyacinth which sweep away the fishing nets. One fishnet clump costs approximately ₱1200. Often the fishermen have to borrow money to finance the purchase of new nets.

Fishing gears Most families use *pukot* (fish nets) and *taan* (hooks) for fishing: they set them out in their particular areas of choice, normally near the edges of the lake. If another villager chooses to lay down his net or line of hooks alongside another net, it is allowed. The only rule that they insist upon is that motorized boats must follow paths. They are not allowed in certain parts of the lake.

Figure 7.2: Old and Fishing gear



Photo 1: Different kinds of traditional *bubo* (fish traps) used in Panlabuhan

Photo 2: Fisherman setting his *pukot*

Photo 3: The *ini*-screen or wire mesh fish trap

Photo 4: Lower right: New style of fish traps.

Source: Photographed by author, Panlabuhan, 2013

Adapting to the altered waters

The new fishing gears available nowadays have features that have improved the ways of catching fish. Most importantly they accommodate adaption to the alteration in Panlabuhan's wetlands. First, the way in which the screen fish trap works makes it suitable in the now shallow waters of Panlabuhan where a mix of tree saplings and hydrophytes is growing. This has proven problematic space for the gill nets because they risk becoming entangled in the vegetation. Second, because the screen fish trap is only halfway submerged, the trapped fish or animals are still alive when the trap is checked. This is a good outcome because live fish fetch a better price than dried fish. Moreover, it allows the fisherman to be selective regarding their catch. Small fish can be thrown back³⁹. Third, the big *bubo* design is better at withstanding stronger currents during floods, compared to the gill nets and it is able to catch bigger fish and the profitable freshwater eels.

But, one drawback was that these new cage designs require more capital to buy the materials for their construction. As Tuong (2013) argues, while adaptation strategies are constantly formed as the environment changes, they require capital. Poor households may be hard pressed to find the means to invest in these new strategies.

The inadequacy and incongruity of government interventions

Different interventions by government and non government agencies to address community needs have either proved to be inadequate or been questioned by the community. In 2010, the PLGU provided the community with two units of biosand filter. One was placed in the floating school in the Subaon Creek settlement cluster, and the other in the floating chapel in Lake Bukogon. The municipal sanitation officer of Loreto said that the households of Panlabuhan would share the biosand filters, but, according to the sitio leader, the sharing arrangement was not realistic (given that 20 plus households in each cluster were expected to share the filter). He said that because it took some time for the water to pass through the filter, the people reverted to their usual habit of directly drinking water from the lake. The two filter units are no longer serviceable because the filters (made of various sediment layers) spilled out after the floating structures (upon which they were placed) were destroyed during

³⁹ I actually saw one villager do this. When I asked him why he did it, he said: '*Padak-on sa nako. Dili man sya mahalina gamay*' (I will let it grow bigger first. It cannot get sold if it is small).

Typhoon Bopha in December 2012. The ineffectiveness of the intervention vis-à-vis Panlabuhan's needs is reflected in the result of the CBMS 2012 survey (see Table 7.1). Purok 17 or Panlabuhan maintained its poor water access record, but this was not because the people did not trust the biosand filter itself, it was because there were simply not enough filters.

I interviewed the female sanitation officer of the town of Loreto, in a bid to learn more about the municipality's general program and in particular to learn how they planned to address improving the water situation in Panlabuhan. She explained that in past years, the municipality's water and sanitation program had been very inadequate. She added that their health program was very dependent upon the mayor, and that the previous mayor had been very inattentive to the municipality's health program. She said their previous mayor allocated her an annual budget for the municipality's water and sanitation program of ₱50,000. However this changed when the new mayor was elected. Her budget has been increased to ₱500,000. The current mayor has shown more interest in improving the water and sanitation status of the municipality.

In light of these developments, I then mentioned to her the case of Panlabuhan's water and sanitation situation. She said that she was aware of it, adding that there was another barangay – Katipunan – in the same situation. I expected her to respond that she planned to supply more biosand filters for distribution, but instead she said that she had set aside a budget for the construction of floating toilets for the two communities. While the floating toilets were needed, I felt that the priority for floating community would be to assist them to secure safe drinking water, especially considering their great tendency to use lake water for their drinking needs.

CHANGING WATERSCAPE AND INTERVENTION

In the previous sections, I have discussed the environment and the villagers' lived reality in a floating village, with particular focus on how water quality in the area influenced their choice of water for their household needs, their livelihoods, and the general wellbeing of the villagers. In this section, I explore the perceived changes that the villagers have observed in their lake environment, initially caused by alterations to water flow in a section of

Panlabuhan in the early part of 2012 and exacerbated by Typhoon Bopha in December of the same year.

Altered flow and rapid increase in sediment deposition

The very rapid *abono* (deposition) of sediments in their local lakes has been subject of great concern for the community. They accept that deposition of sediments is part of the natural processes in the area, and that there is a *baylo-baylo* (swapping) process in the area; that is, the lake area becomes deep, then shallow due to deposition. What they find problematic is their recent experience of rapid increase of volume of deposits in a short span of time. They blame this phenomenon on the deepening of the Dagon creek that has resulted in a greater volume of water flow that has increased the creek's capacity to carry sediment and sometimes sacks of garbage from the Agusan River.

However, the deepening of Dagon Creek was not brought about by natural processes. The villagers claimed that it occurred when the *taga-gawas* (people from outside of the village) encroached upon the margins of the Panlabuhan lakes to fish. Dagon, a minor creek is connected to the main Agusan channel, similar to Subaon Creek. As the elevation gradient surrounding the Agusan River is very subtle, many creeks and tributaries in the Agusan floodplain flow both ways. This means that sometimes the creek brings water to the Agusan River during low water but it is also the same channel that flows into Panlabuhan when there is excess water from the Agusan River during flood events. While the *taga-gawas* often use electric fishing in the area, on one occasion they resorted to draining a portion of the Dagon Creek south of Lake Bukogon (a) to make catching fish easier and (b) to ensure a bigger volume of catch. They created a canal to drain the water into lower-lying areas. When the water was drained, it became easier for the men to spot and electrocute the fish left behind on creek bed. This artificial creation of space for the water to flow in, increased the stream of water from the Agusan River. In river science, increased flow means an increase in stream energy. And this was this that caused the deepening of the Dagon channel. This interference proved very crucial to the environs of Panlabuhan because deepening the channel transformed Dagon into a conduit of a greater volume of water entering the Panlabuhan area, by extension bringing in a greater sediment load. The villagers said, however, that but for the actions of these people, '*mapatay lang unta na ang Dagon, nidaku man binuon*' (the stream

would just have died⁴⁰ where instead it became bigger). This in effect caused accelerated sediment deposition in Lake Bukogon. Dagon is smaller than Subaon Creek, but, during my visit to the area, it showed a very deep channel that I would associate more with a bigger tributary of the Agusan River (See Figure 7.4 A comparison of sections of Subaon and Dagon Creeks).

During the low water period in the area, Lake Bukogon aggravated the decreased catch numbers. Nowadays, there are few fish in the lake. They prefer deeper waters such as in the forests where the deepest areas are found.

A further implication of this change has been the possible loss of the *kabak* forest. Whereas in earlier times that area of the forest dried up, its constant drowning these days has caused the *kabak* to lose their leaves. Atoy, a resident of Lake Bukogon, likened it to someone who is drowning. The roots are starting to rot already. He further added that this submerged forest's canopy used to be so thick that one could walk under it shaded from the sun.

ASPECTS OF CHANGE

Recognition of differences in water practice

As documented by Strang (2004) different people create multiple meanings of water as these part of the daily practice of water use and thus create their own water culture. The people of Panlabuhan, which clearly occupies a different kind of habitat, practice a different water culture from the rest of the population in rural Agusan del Sur. The practices and rationalities they adopt when dealing with the water they use in their households show the degree to which they differ from customary practice in the mainstream culture. As Mclean observes, recognition of these different water cultures is important if agencies are to deliver better services to these remote communities (2007). By providing biosand filters, a recognized viable household treatment scheme (Lantagne, Quick, & Mintz, 2006), the local government has acknowledged the floating villagers' practices. However, due to the low number of units provided to the community, it has failed to address the problem at the scale that is needed. This simply means that people must continue to go to the school or chapel to filter their water, an extra *basul* (bother) because it is something they need to do once or

⁴⁰ In river geomorphology, when a stream is cut off from its source of water, it is often said that it dies.

twice daily. As indicated by some of the households I interviewed and by households using their own ways of filtering or treating water, having a biosand filter of their own is appreciated. Providing each household with a biosand filter (or one to share between two) would improve the quality of a household's water supply and lessen the occupants' risks of water-borne diseases.

Floating communities and their links to water resource management

Part of the conception of scarcity in the wetland is connected to the Panlabuhan villagers' fishing livelihood which is, in turn, influenced by the volume and timing of water flow into the area. As the villagers' experience shows, alterations, even at a small scale, may impact on their village. Documenting the water flow dynamics in a floodplain area of Panlabuhan is significant when looking at the local implications of river control for the tributaries of the Agusan River that contribute to the water flow in the Agusan Wetlands. At the current scale of change, the ability to adapt appears to be still within the people's means, whether through their change in fishing strategies or their capacity to pay for change. However, as observed in Chapter three, there are plans to dam the tributaries of the Agusan River and the Agusan Wetlands for irrigation purposes (mentioned for consideration in the IWRM plan of the Agusan), and this would drastically decrease the flow of water to the floodplains. In particular it would diminish the ecological effect of the periodic sustained flooding during the months of December to February. This would not only have a profound effect on the viability and survival of the community in the Agusan Marsh, but also threatens to affect their fishing (their livelihoods) and the basic mobility of the people within the area.

The case of Panlabuhan highlights the meeting point of various valuations and conceptions of water use. First, there is the view of local government that focuses on safe drinking water for the population and their role to assure its safety for drinking. Second, there is view of the protected area office that looks at the water (the wetland) for protection of its wildlife and unique habitat. Third, there is water bureaucracy that tends towards focusing attention to supporting the productive industry of agriculture through irrigation. And fourth, are the people who live in the wetlands wherein water weaves through almost every part of their everyday living. The kind of arrangements that these institutions and actors have made to achieve their roles in the water-related work in the area highlights the strong 'silo effect' of their efforts. It is clear that the local government solution to drinking water issues was not a

bad idea, but the scale at which it was addressed was grossly inadequate. The protected area activities on ecotourism on the other hand, have largely been tangential to the concerns of the floating village dwellers. However, the presence of a protected area system within the wetlands, although focused on the wildlife and habitats, does contribute to bringing attention to water flows that are important to maintain the wetlands. These are the same water flows that the community values and is dependent on. It is, however the plans for dam building to address the projected deficit in irrigation that may cause significant impact on the water flows in the Panlabuhan area. In the context of Agusan, agricultural production is very much more visible in the government and public image of livelihoods than the fisheries of the wetland dwellers. In such a situation, where competing viewpoints of scarcity exist, it is often the more dominant image of agriculture's water deficits that is given priority. The problem with these perceptions is that the focus of attention on drinking water and irrigation, but they totally miss the point that the majority of the people in the area are fishermen. Empirical evidence of the visions of water scarcity of the fishermen of Panlabuhan helps to steer attention to the fact that there is another group of people who will be negatively affected when dams are built to address scarcity elsewhere. By drawing attention to this fact, the possibility of negotiating flows by wetland dwellers can become a reality.

CONCLUSION

The examination of the daily lived reality of the floating houses community in the Agusan wetlands and their means of living reveal a conception of water scarcity that is different from the LGU's program view. Despite the fact that the water they drink is considered seriously unsafe by public health standards, the people do not view their drinking water as particularly problematic. Rather than concern about drinking water, the wetland villagers' water scarcity is experienced more as the loss of the 'flood pulse' effect manifested by disruption of the wetlands' periodic inundation, decreased water flows, and abrupt increase in deposition in the lake and marsh environment impacting their fishing areas.

In order to address the villagers' view of water scarcity in Panlabuhan, the government needs to look into two considerations. First, in a wetlands environment settlement such as Panlabuhan, the convenience of getting water from the lake is a strong factor to consider when designing interventions to improve the quality of the drinking water of the floating village dwellers. The provision of biosand filters by the Provincial Government, an

affordable point-of-use treatment facility, is a step in the right direction, but, providing two units for forty-four households to share was superficial and inadequate effort by the local government. Panlabuhan is not the only village experiencing these conditions; there several wetlands villagers in the other municipalities and therefore, there is a need for local governments, both at the provincial and municipal level, to plan and execute more adequately their response to the prevailing water problem.

Second, water, even in its excessive form as part of the natural processes in a floodplain environment, is valued highly as it not only preserves the wildlife in the area, but also the lives of people living in the wetlands. This case study, which examines management of water on site and its links to areas outside of the village, shows how changes of water manipulation can have serious consequences for an area. Although the damming of the tributaries upstream is still in the plans of Agusan River Basin – IWRM, the , documentation of the effects on the environment and the people provides valuable knowledge that must be considered when decisions regarding the dam intervention are made. Such documentation can also serve the purpose of calling attention to the narratives of people who do not have the power to negotiate their concerns when decisions pertinent to water resource management are being negotiated. Documenting their perspectives and experiences will help their interests to be heard. According to Forsyth (2003), this kind of examination of potential problems is important in the political ecological analysis because it forewarns actors in natural resource management of the negative impacts of management options that may affect a section of the population.

The performance indicators through the reporting of proportion of household water access continue to limit the government's view in addressing the needs of the community. Despite the availability of the information to allow not only a synoptic view of the extent of water service coverage but also its distribution, the standard reporting practice still persists. This leads to the lack of appreciation of the 'situational locality' (Mosse, 2001) of the communities experiencing water access problems. Moreover, delineation of programs into different agency and offices in the Agusan wetlands results in a strong 'silo effect' of efforts that can potentially be contradicting each other. The case study has shown empirically how these contradictions may happen.

In the meantime while the government is yet to provide for a viable solution for a community with floating dwellings, the Panlabuhan villagers, in a form of resistance, persists with their use of the lake waters for all their water needs including drinking water regardless of the health warnings by the health authorities. Carrying on with these practices despite the possibility of being sick, continues to identify their community as without access to water. This status may actually be the impetus that pushes the local water bureaucracy to rethink their solutions and recognise Panlabuhan's unique situation, especially now that the period after the MDG deadline, campaigns for complete coverage for access to safe water is already underway.

Chapter 8

Discussion and Conclusion

INTRODUCTION

This concluding chapter is comprised of four sections, the first three sections correspond to the three sets of questions that tackle the main research question. These three questions are: 1) What are the experiences and understanding of water scarcity and how does water scarcity influence the ability to secure livelihoods, health and food? 2) Does the data that is used by the agencies reflect the different perceptions about water scarcity? and 3) What are the state's approaches and mechanisms to address the constraints in water access in these areas? The last section summarizes the key findings of the study, key contributions, implications and limitations of the study.

This study stems from exploration of the reasons why supply of safe drinking water continues to be elusive in three rural sites of Agusan del Sur, despite the continuing effort to address the insufficiency of safe water access. The three case studies have shown that the notion of water shortage really mean quite different things in each case. What is common though in these case studies is the responses are the same and the solutions ignore the differences of these cases. The case studies also demonstrate the mismatch between strategies for and standards of rural water service delivery and the experiences of the people. The problem lies in the standardised application of water technology usually focusing on groundwater, based on national policies and national manuals that provide guidelines on procedures for implementing safe water projects. In some cases the approach fails to work because it is not technically possible or because of the geology and hydrology; in other cases it does not address the water problem as perceived and experienced by the community.

The first case study, the upland village of Policarpo, is a classic case of water shortage. The attempts to address the water shortage focused on groundwater solutions (based on national standards this is the preferred source) in an area where groundwater is difficult to extract. This did not achieve what the intervention was set out to do, which was to provide safe water. It also did not address the community's need to manage a safe supply of surface water.

The second case study site is the lowland village of Napo where groundwater supply is abundant but where there are problems with water quality such as iron content and salinity. Application of a standard technology of water filter system to remove iron from an existing community water system was successful. However, the local government technical team's application of similar filter technology on saline water failed because sediment filter technology just does not filter salt from water. Again this situation highlights the reliance on standard solutions and more importantly the lack of technical knowledge to discern the applicability of certain solutions to certain water quality issues.

The third case study site is the wetland floating village of Panlabuhan where water is all around. Drinking water is scarce because public health standards consider the available water 'unsafe'. While the water technology that was provided (biosand filters) fits the drinking water context of the wetland villagers, the intervention failed to provide adequate filters to address the scale of the problem experienced. Moreover, Panlabuhan villagers' vision of scarcity relates more to how water affects their fisheries-based livelihoods, that is when water flow to the wetlands is unpredictable or when it is greatly diminished. Future plans of damming tributaries to the Agusan River will impact on the community's concept of scarcity. As explained in Chapter 7, holding up water behind dams cancels the seasonal 'flood-pulse' effect that periodic and sustained flooding has on the floodplain ecosystem renewing the biota of the floodplain. This in turn affects the fish population which the floating communities depend on for livelihood.

These cases represent rural areas that continue to have limited access to safe water because the standard water interventions did not adjust to the local context.

EXPERIENCE OF WATER SCARCITY

Experience of scarcity is context dependent and time bound

One of key questions related to the experience of scarcity that this thesis aimed to address, is how the biophysical context influences the water availability in the case study sites and consequently influences people's experience of water access. Detailed discussion of the biophysical context derived from secondary material and enriched by the fieldwork in each of the case study chapter has shown the villagers' experiences of water scarcity are not only affected by the biophysical context but the constraints differ from case to case. However, interventions to address the different water issues in these different contexts are based on engineering solutions that had been envisioned at a general scale and therefore there is a tendency to use manual based approach focusing mainly on groundwater.

In the upland case study site, the constraint in the availability of groundwater is significantly determined by the geology of the area especially in karst areas. There is a great deal of variability in the way aquifers are formed in karst areas, and drilling for water supply can be highly unsuccessful (Drew & Hotzl, 1999; Ford & Williams, 1992). The insistence on drilling of water supply wells in the uplands of Policarpo resulted in a failed Level II water system⁴¹. Villagers continue to be reliant on their reservoir and rock cisterns, water sources that depend on water seepage generated by precipitation. Most of their domestic water needs are sourced from these sources. Therefore when no precipitation occurs within four or more days, water supply becomes insufficient for the Policarpo villagers. The official groundwater intervention did not address the real water problem in Policarpo.

In the case of the lowlands, the volume of groundwater resources is not a problem. The high precipitation in the valley has resulted in a shallow water table and therefore there are abundant aquifers. However, groundwater quality is problematic. Since the Napo area was originally swampy, iron content of groundwater is high, affecting the people's preference. Water-technologies installed through the local government water supply interventions had addressed this quality problem. To improve accessibility of water system to those living more than a kilometer away from the main water system another water system was installed.

⁴¹ As described in Chapter 3, Level II water systems are systems where a water pipe is installed bringing the water from the source making water available to users as communal water stands.

However, this was not utilised fully because the water was salty. This salty water is not a consequence of the infiltration of seawater to the water table because Agusan del Sur is a landlocked province. It is a result of the Agusan Valley's exposure to shallow seas in its geologic past. When the area reverted back to a terrestrial area, some of the seawater was deposited unevenly along with the sediments. It is mobilised when groundwater is extracted, although its distribution, based on anecdotal information, is apparently not uniform. The standard application of a filtering system to address problems in water quality, proved to be ineffective in such a saline water context.

In the floating houses community of Panlabuhan in the wetlands, water is practically everywhere. Households do not perceive themselves as experiencing drinking water scarcity because their water source which is the lake water around them is accessible. Public health standards would identify this to be a 'waterless' area, because the water is deemed unfit for drinking. However, for the community, water scarcity relates to how their livelihoods are affected by unpredictability and decreased flow of water, and increased deposition in the lake and marsh environment. For them the problem is not about dirty water at all (or not mainly), but the intervention is about 'dirty' water. The provision of biosand filters by the municipal health office to address the water quality issue was appropriate but due to the scale at which it was addressed even the usual water problem as envisioned by the local government was not solved.

Standardised view of water scarcity and water resources

The current approach to rural water supply in the Philippines has been heavily influenced by the MDG goals of providing safe water for the population. This has created a standardised view of looking at water scarcity and water resources. The premise of the MDG goals is that the continuing lack of access to water is due to economic water scarcity. This means insufficiency of drinking water stems from inadequate investment in water. Looking at water scarcity mostly as a function of lack of investment can become problematic because it precludes the reality that certain areas experience physical scarcity.

This view of scarcity has effects on local government interventions. Most of the interventions were designed to respond to the task of extracting water for a community's use. These interventions involved the use of water technologies that are assumed to deliver the

needed water. Mechanisms to provide the interventions follow rural water supply manuals and templates that are provided by the DILG and more recently manuals published by the World Bank (2012). These manuals offer design templates, and step-by-step procedures for the WATSAN teams in different local governments in the country to follow. Although these are important resources for the local governments to have, they have created a very standardized view of the way to address the community water needs in the case study sites. Groundwater is placed on top of the trusted sources for drinking water needs. In the process it has promoted the view that, by focusing on tapping groundwater or applying certain water technologies, safe community water system can be provided. For example in Policarpo the upland case study site, the history of local government water interventions shows the focus was on groundwater extraction, such as construction of a spring box and drilling a well, even when the local governments field visits and data pointed to the difficulty of groundwater resources in the area. The consideration of rainwater as an alternative water source was pursued but was half-hearted and eventually failed. As a consequence of this the community in Policarpo continues to experience not only insecure water supply but also a doubtful drinking water source.

The case of Napo the lowland village was a slightly different experience. In this case that investment on a filtering device (improved biosand filter) was incorrectly assumed to be applicable to all types of water impurities, including salt in water, resulted in a failed system.

When examining these mismatches, two important aspects surface (1) water discourses have material effects, and (2) the kind of water service is mediated not only by the water technology but sometimes more strongly the nature of the water resource.

The dominant rural water supply discourse in the Philippines regarding the problem of water scarcity is largely influenced by the view that lack of investment has material effects. As has been mentioned above we can see that it matters how a phenomenon (i.e. water scarcity) is characterised because this affects how the problems are addressed and this is exhibited in the failed water interventions. Because of this dominant way of characterising water, it has missed the point that people's access to water is mediated not only by technology but also by the kind of water that is available in an area.

These mismatches of technology applied on the kind of water may sometimes stem from the lack of technical knowledge of the nature of water. For example it is surprising that the technicians did not know that filtering can remove suspended matter, but cannot remove dissolved salt from saline water.

Associating level of service to levels of development

In chapter 3, I mention that accounting for improvements in water supply provision by the local government estimates the percentage of the population served by various levels (types) of water systems. Level I systems are stand-alone water points such as handpumps, shallow wells and rainwater collectors. Level II systems consist of piped water from a water source to communal water points. Level III systems are those that serve water piped into individual household connections. Instead of highlighting the importance of shaping water interventions to fit the context of the area, the levels of services have become associated with level of development or improvement. I often hear from those that refer to level I systems as ‘Level I *lang na*’ (*its just level I*), signifying a lesser view of a well or a rainwater collector. In the case of Policarpo people experience the insistence of implementing a level II water system over improving water storage (rainwater collectors) even when the context does not allow it. This view is also held by the villagers as they aspire to have a better water system than what they currently have and also it shows that their barangay has ‘developed’⁴².

Recognition of difference

According to Strang (2004), people attach multiple meanings to water as these operate in the daily practice of water use. For the Panlabuhan wetland dwellers, water is simultaneously an essential requirement for life, livelihood and is part of their identity. The way by which water is used shows a different kind of water culture from the conventional rural water culture, which draws water from wells, community water system or is piped-in to homes. Panlabuhan villagers have different water habits as they literally consume the water they live in. Utilizing lake water for drinking has become the main means of supporting their needs since the time the villagers set up their houses in the wetlands. Beyond water for drinking the wetlands

⁴² In the case of Thailand the widespread implementation of water jars to collect rainwater helped secure rural household water availability before community water system were secured (Wirojanagud & Vanvarothorn, 1990). Households were said to be hesitant in the use of the water jars in the beginning, but today it has significantly helped the household’s domestic water needs.

villagers have inscribed meaning in their waterscape as their home and as part of their identity. More emphatically they value their waterscape because the flow of water in the area is what sustains their life and livelihoods.

Not many of people in Agusan del Sur are aware of the existence of the floating villages in the wetlands. To some local government officials they see them as nuisance and a few are convinced that they the people need to be resettled away from the wetlands because of the area's protected area status (Geography 192-2009 Agusan Class, 2009). Local governments have for a long time ignored the water problem in the area until 2009 when they distributed the biosand filters. Recognising that part of the rationality of people in areas where drinking water is not readily available is to lessen the drudgery when getting it, improving household's protection against water and sanitation borne disease is a way of recognising the difference in water culture practices. The point of use treatment which the provincial government distributed was in the right direction, but it must it must be implemented on a sufficient scale. The two units given for 44 households in Panlabuhan to share were just grossly inadequate.

CONSTRAINTS AND IMPACTS OF INDICATORS OF WATER SCARCITY

Indicators of performance for the coverage of water access are part of what I discussed in Chapter 2 as technologies of performance. These tools of governing are part of the technologies of government that seek to provide a synoptic view of the things that are to be governed through a process of making visible certain aspects of reality and processes of simplification. The study has shown how these simplifications have encouraged the view of water scarcity problems simply and with a single solution.

Modifiable areal unit problem or MAUP This refers to the effect that political boundaries have on spatial data and its analysis (St Martin & Pavlovskaya, 2010). In particular the scale MAUP which means that the scale at which data is presented and analysed can affect results (Wong, 2004). This is especially true in the identification of 'waterless' local government units. A more important aspect of the indicators is the way it can influence who gets the water improvements. The practice in the Philippines and in Agusan de Sur has been to identify the local government unit (cities, municipalities, barangays) that are 'waterless'.

Waterless means that only 50 per cent of the households in the particular local government unit have access to safe water. Those that fit this description are then given priority for water interventions. Although this provides a way of focusing resources and attention to where it is needed, it could also mean that it could take away that attention from the remaining waterless households in a barangay that has a high percentage of safe water access. This is true of Barangay Poblacion in Loreto, which Panlabuhan is part of. Eighty-five per cent of its households have safe water access, the remaining fifteen per cent is where Panlabuhan fits with almost all of its households without access to safe water. The province of Agusan del Sur should not have this kind of scale MAUP problem, because they have a Community Based Monitoring System or CBMS database, which does a complete census of households, including the locations of these households in the province, every three years. However, despite the presence of this dataset, the provincial government still reports or analyses the data per barangay. The available household location data are set aside without exploring how analysis can be enriched by linking them with other spatial datasets (e.g. geology or landuse) which the provincial government maintains. This is a crucial analysis that could be used as input to their plans in achieving a hundred per cent drinking water coverage of Agusan del Sur's population. Scale is very important in the analysis.

Typology of water facility The current typology of water sources recorded in the CBMS offers a very limited view of the water sources that are used by the communities. It focuses only on drinking water. Water sources such as rain water or pipe-in water source are not included in the typology. Although this may be a minor omission, this type of information

Table 8.1: Typology of Water Facilities Recorded in CBMS

Type of Water Facility	Safe Water Facility
Community water system-own	Yes
Community water system-shared	Yes
Deep well-own	Yes
Deep well-shared	Yes
Artesian well-own	Yes
Artesian well-shared	Yes
Dug/shallow well-own	No
Dug/shallow well-shared	No
River stream lake spring bodies of water	No
Bottled water	Yes
Others	

Source: CBMS, 2012

cannot be found in the typology, when in fact it does provide crucial data to be able to see the progress but also to have an understanding of what kinds of intervention are there. For instance being able to see the distribution of piped-in water may help the Provincial government in pushing water districts to serve areas that are within their area of service. Or they can also request water districts to set up communal water systems in areas where there is a better way of serving these communities. Given the expenditure of money on these surveys, the existing data being gathered for water is rather over simplified.

The potential of the data for analysis to input for planning purposes is curtailed by the limited dataset on drinking water and other water needs.

Upward accountability of water access indicators As shown in the example above, water typologies used in the CBMS are focused more on adopting the national government's typologies of water sources. For data related to water and the use of this data by the provincial government, there is the tendency to focus on using it to show the province's achievements that are consistent with the way the national government tracks the achievements in access to safe water. By showing the national government and funding organizations its achievements the province has succeeded in bringing in more money to support water supply interventions as indicated in Chapter 2 by the number of additional water projects that were specifically implemented only in Agusan del Sur. Recently the provincial government has also received additional funding from the national government as part of its incentive for their achievements in improving water access.

No mapped data of water facilities Although the water supply efforts of the Provincial government have been on going since 1998, there is still no mapped data of the community water sources installed. The provincial and municipal government own GPS units in their offices and recording locations of these community water sources would not be complicated. This would be a valuable data to have in strategising for better water coverage for the population.

LOCAL GOVERNMENT ARRANGEMENTS FOR WATER SUPPLY

Lack of overall water supply management

The state of the current water supply provision in the province stood out when I presented my research to the Water Resources Management Committee of the Agusan del Sur Environmental and Social Development Committee. The members said that it was their first meeting in three years. This somehow showed the manner by which the provincial local government dispenses of their lead role in providing local water supply in the province. The participants who represented the municipal LGU, water districts, irrigation authority, and the provincial LGU environment and WATSAN agreed that the committee should meet more often to discuss broader issues about water in the Province. They agreed that they have been operating on their own but sometimes they need the provincial government's intervention in resolving issues they experience.

Inability to strategise water management

Demand-response strategy Local government work in water supply work is characterized by mostly responding on request basis and shows little strategy in planning how the needs may be achieved. As mentioned earlier the rich data available has not been used to aid in the planning and review of implementation.

Lack of technical knowledge by the WATSAN team Key decision points in the installation of the water interventions in the case study sites reveal that the quality of the technical knowledge of the WATSAN team leaves much to be desired. The lack of

knowledge by the local government team creates inability to view problems in a much wider context than the need to provide ‘improved water sources’.

Although the staff from WATSAN team have long experience in setting up water supply there is little capacity to strategise to the ways by which existing can help to expand coverage. The Provincial Planning Development Office which is also involved in the WATSAN implementation in effect should step into this role, but that has not been the case. In the case of Policarpo they were the ones who influenced the decision to pursue the well drilling in Policarpo.

The role of the municipal engineers to monitor the implementation does not come out strongly in the experience of Policarpo. The municipal engineer of San Luis municipality seemed to be relegated as an observer only in the construction activities of the engineering brigade which the Provincial Planning Office arranged. As I indicated in Chapter 5, the municipal engineer’s hands-off attitude towards the provincial LGU initiated projects suggests a sort of power dynamics between the two levels.

The community members in Napo and Policarpo case study sites were actively participated in various work involved in the development of the water sources in their areas. They identify possible water sources and also offer information about their experience of the quality and the seasonal changes of the flow. In some cases some of the community members help in the construction work itself to provide their village’s counterpart in water improvement projects. The community knowledge is not viewed as being ‘technical’ and therefore is not seen as being able to improve the WATSAN team’s information of the water sources. In the case of Napo it was clear that there was outright dismissal of the community information, which in effect led to the failed water system.

Resistance to reflexiveness

Although the technical knowledge of the team leaves much to be desired, there have been some instances when they recognised that the current set of water technology they used or installed in the communities did not fit the needs of the communities. The provincial government’s initiative to use other water technology such as the filter was in fact a good move. However, the problem was that they did not think carefully about the strategy for

distribution of the household biosand filters. There was a mass distribution to the different municipalities, in a sharing arrangement. As was witnessed in the case study sites many filters have not been used because of the inadequate sharing arrangement. In an interview with one of the staff from the Palawan Conservation Corps, who trained the WATSAN staff, he did not agree that the provincial office just distributed it. He thought not all households would be keen in using filters especially those households that may have an easier option of buying their water from a nearby place such as what has happened in Napo.

The sharing arrangement imposed by the Provincial government was also ill-advised. According to one of the officers in the provincial government, the congress woman who provided the funds to the provincial government for the construction of the biosand filters was influenced to widen the distribution of the biosand filters to all municipalities instead of being selective and concentrating the distribution only to the critical areas such as Policarpo. This was because some of the municipal mayors were said to feel left out of interventions when this is done selectively. In the kind of political set-up of Agusan del Sur where there are strong clientelist politics, being on the best side of the mayors help during elections.

Local water concerns and basin wide IWRM plans

As mentioned in Chapters 3 and 7, there is a push by the central government's environment agency for the approval of Agusan River Basin Integrated Water Resource Management Project funded by the ADB. The project's consultants have already drafted the management plan that intends to operationalise the concepts of IWRM in the context of the Agusan River Basin. Its implementation was put on hold when many of the LGUs within the basin were not enthusiastic about its implementation. Since 2013, the DENR has revived discussions among concerned institutions, on whether this project will be implemented or not. The local government units have in the past seen the value in the various activities it plans to do but are quite apprehensive about the institutional arrangements and their role and say in the process of big and mostly project management office controlled implementation.

In the context of water supply improvement, the Agusan Basin IWRM plan has allocated significant funds to its development of water districts of each municipality in Agusan del Sur. Locating the experience of case studies within the a watershed level project scale may be quite a stretch. As has been shown in each case study their problems are essentially problems

that must be solved locally and may not need it to be addressed within the IWRM scale. The case studies are about how to deal with the natural realities of what is happening with water in a particular site and as it affect livelihoods. Locally does not mean without outside input. However, for this to be addressed within the scale the IWRM implementation may mean further delays in securing water for the communities similar to the experience in my case study sites.

There are current practices in villages that take care of local water conditions (such as Panlabuhan's ban of electrocution fishing) that are not visible to the provincial or municipal management levels but are creating positive impacts on the ground. A strong centralised implementing body with its 'technically' determined implementation activities can supplant these actual, local and working actions.

In theory integrated water resources management offers a set of ideas that are supposed to help to manage water more holistically, but in practice the overlying ideology of whole basin management often offers nothing because often it is applied mechanistically. It needs to consider the specifics of each site and address how activities in one sites affects other usually downstream sites. The watershed practices at the moment do not address local specifics and do not seem to address downstream impacts.

I return to my point in the wetlands chapter where I raise the concern of how infrastructure like dams would impact the lives and livelihood in the floating houses. The people there stressed decreased flows and unpredictability of water flows in the area would significantly affect them. At the basin wide scale of IWRM planned for Agusan, it is important that when interventions that seek to improve conditions in one place, but potentially create negative impacts in another place will be negotiated. It is crucial that these processes are not rushed to satisfy project implementation targets. It must genuinely allow people from villages like Panlabuhan to come and negotiate their concerns.

Giordano and Shah (2014) point out that IWRM may be set up to mask other agendas, usually to secure some funding especially for infrastructure that sometimes creates more problems. Some people from the water/environment sectors expressed their vote for the implementation of the project in Agusan Basin because it will fund a lot of the activities that are part of the mandate of their offices. The DENR and the water districts are the offices

that will benefit in the implementation. However, big complicated projects like the proposed Agusan Basin IWRM are too complicated to be placed in time-bound projects. The IWRM Basin plan will be dealing with various institutions and its bureaucracy who have programs of their own to achieve. Forging partnership takes time, but project timelines do not usually provide much leeway for this. As this IWRM implementation will be implemented through a loan-grant scheme, with achievement and timing targets which affects the loan utilization. Slow loan burn rates will mean bigger loan repayment for the Philippine public.

CONCLUSION

Summary of key findings

How people experience water shortage and what water shortage means to them is often different from what standardised projects do to meet water shortage. Standardised water projects have assumptions that do not fit with people's experiences.

The experiences of water scarcity in three different waterscapes examined are different from each other. These experiences are also divergent from the standardised view of water scarcity as being a product of the lack of investments in water supply. Beyond essentialising the local experiences, the study has explored negative impacts of the standardised ways of addressing the water scarcity experiences of the communities. Problems arise when there is mismatch between the standardised water technology applied to villages' varying contexts.

The problem with standardised applications based on national policies is that they are essentially based on generalised assumptions and standardised technology and too often based on groundwater. In some cases they do not work for technical reasons and in others they simply fail to address the problem of the community.

According to Bakker (2003) documenting people's experience of inadequate access to water may be an opportunity to see innovation in remedying the inadequacy. She calls these as 'archipelagos of supply', which may not be in the form as the standard forms as specified by the water supply providers but which needs to be adequate and address people's needs.

Contribution of this study

The first key contribution of the study has been to provide empirical evidence of the social construction of scarcity – that there different ways water scarcity is experienced and viewed by a local community and the ways that existing interventions do not always fit such needs.

An understanding of different ways water scarcity is important because it problematises the standard ways of providing water interventions, which may otherwise be accepted uncritically. By providing empirical proof that water scarcity is not a generalized and constant phenomenon and that local communities' experience scarcity differently, the study helps to challenge the visions of scarcity that underpin water resource management policies and tend to paint scarcity as widespread and impending. On the other side the study also presents empirical evidence against a Philippine rural imaginary where water flows abundantly and without problems of quality. And that the solution is just a matter having the investments to extract water and direct it to the rural communities.

In documenting how the importance of periodic inundation of floodplains have on the ecosystem of wetlands and also to people living there, it demonstrates a different side of flooding which is viewed as renewing rather than destructing. The pervasive view that flooding only brings destruction legitimizes interventions that aims not only control it but also is rationalize as a way to provide additional water supply to deficits in agricultural use such as irrigation.

This study thus attends to Swyngedouw's (2009, p. 57) call to 'empirically substantiate the processes through which particular socio-hydrological configurations become produced that generate inequitable socio-hydrological conditions'. Diminishing water to the wetlands will certainly threaten wetland villagers' livelihoods and further marginalize them.

Secondly, the contribution of the thesis is the use of both governmentality and political ecology approach in examining rural water governance in Agusan del Sur, which not only viewed the role of government programs shaping the forms of water provision but also highlighted the role of communities in organising access to water. This not done through the standard ways that community participation is envisioned in community water supply systems but more so in the 'everyday politics' (Kerkvliet, 2013). Examples are the everyday

action of 'foot dragging' in the use of sanitary toilet or the resistance of individuals in being members of water association that managed that failed water system that have forced the water bureaucracy to give in to what the people are pushing for.

Implications of the study

This research provides empirical evidence which contributes to a broader understanding of local experiences of water scarcity. This is important because there is prevalent use of the water scarcity crises in development work, academe and public discussions. In the Philippines there is also quite a strong sentiment by the general public on issues about scarcity of water and its impact on the poor, but often in the discussion in the local media there are no distinctions between what is happening in the urban and rural context. Messages such as 'Water crisis to hit Philippines in 10 years if no new sources are tapped, expert says' (Anonuevo & Cuevas-Miel, 2013) are carried in the headlines. This leaves a message generalizing a condition for all areas in the Philippines needing dams to be built.

I have focused my case studies on the Philippines. The study is particularly relevant to the Philippines because the generalization that water scarcity is as mainly a problem of lack of investments in water supply dismisses the existence of experiences of physical water shortage in certain areas in the country. I believe similar research is relevant elsewhere. As in the Philippines, there is often the same sort of tendency for not only local governments but also other organizations to provide standard solutions without looking keenly at specific experiences of water shortage.

Beyond the responsibility of bringing water supply to communities, local governments may have to review the mechanisms by which they have implemented rural water supply provisions in the province. The Provincial Government of Agusan del Sur has within its disposal water information development from past and ongoing programs (CBMS data, water well data), and the knowledge and experience of their WATSAN staff. What perhaps is needed is to create avenues for reflecting on their way of doing things, especially considering that it has produced several instances where it had not fit people's needs.

People have perceived water needs which do not coincide with the official attempts to propose a solution. Much more attention should be placed on how people perceive their

water needs. Local government should allow for active collaboration with the communities that pay more attention to its context, communities' experience of water to foster each other's development effort to improve the situation of community in particular and the province as a provider of service.

There is a space for academic research in looking at practical issues in the governance of rural water supply. Academic research offers methodologies such an ethnographic approach that can capture 'tacit, taken-for-granted, intuitive understandings of culture' (Tracy, 2012, p. 5) in this case, how inadequate water needs are experienced differently. Insights such as this are not captured by the usual ways of inquiring such as surveys which the water sector or local governments are more familiar and more inclined to do. For example, it is often said that one size does not fit all, but time and again as experienced in the communities of case study sites, it has shown that this is ignored. This type of research can describe and specify in what ways the size does not fit all. As a consequence better ways of doing things can be identified.

Limitations of the study and future research

This study focused on specific experience of three different landscapes in Agusan and because of this the study may only present a partial view of experiences of water scarcity and water supply in the rural areas. But the study's use of ethnographic methodology has provided an avenue to enrich what we know of local water experiences and visions of water scarcity. In the Philippines for example, the 'looming water crisis' narrative has largely centred on the experience of the urban areas. Studies that examined issues in water supply are mostly centred on urban water supply issues, if they do these are mostly project reports that have narrow focus on project targets.

I intended to present a broader view of the water access problem of the entire province spatially showing the distribution of individual households' water access in all of Agusan del Sur. I encountered some problems with patchy data from some of the municipalities, but this would be a good follow-up exercise with the WATSAN team. It would be a good way to show them how they can use existing data to strategise their efforts in improving water access in the province. This also fits well with future plans in relation to follow-up action research work outlined below.

Choosing the topic for my research I have chosen something that would contribute to 'practical wisdom' applying on current issues in the rural areas that I have worked in. I believe that the results of my study could contribute to improving the ways rural water supply provision is implemented in Agusan del Sur. After my thesis I intend to follow on the results by striving to be able to present them to Provincial Government. I hope to do this through the project⁴³ that I am required to implement, as a scholar of the Australia Awards in the Philippines. The plans are designed to encourage the scholars to contribute practical programs using the educational experience they got from the Australian university. The scholars are expected to be implementing their plans within two years of their return.

⁴³ The project is officially called my REAP or Re-entry Action Plan which I design after I finish my studies.

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Annex I Informant List

INFORMANT /PSEUDONYM	OCCUPATION
Staff from Government Offices in Agusan del Sur	
Informant 1	Watershed Focal Person, PENRO, Agusan del Sur
Informant 2	Former Head, Provincial Environment and Natural Resource Office
Informant 3	Plumber, WATSAN, Provincial Engineering Office
Informant 4	Plumber, WATSAN, Provincial Engineering Office
Informant 5	Plumber, WATSAN, Provincial Engineering Office
Informant 6	Supervising Sanitary Inspector, Provincial Health Office
Informant 7	Senior Sanitary inspector, Provincial Health Office
Informant 8	Sanitary Inspector, PHO
Informant 9	Sanitary Inspector, Provincial Health Office
Informant 10	Provincial Environment Office staff
Informant 11	Bayugan Water District Staff
Informant 12	Mediatrix Foundation
Informant 13	Engineer, National Irrigation Authority
Informant 14	General Manager, Bayugan Water District
Informant 15	Provincial Environment Office staff
Informant 16	Staff, HEED Foundation
Informant 17	Staff, HEED Foundation
Informant 18	Staff, Agusan Marsh Protected Area office
Informant 19	Staff, Provincial Environment Office
Informant 20- Amianan	Sanitary Inspector , San Luis Municipality
Informant 21 - Jose	Sanitary Inspector , San Luis Municipality
Informant 22	San Luis, Designated MENRO
Informant 23	Prosperidad Sanitary Inspector
Informant 24	Staff, Mun. Planning and Dev't Office, Prosperidad
Informant 25	Staff, Mun. Planning and Dev't Office, Prosperidad
Informant 26	Division Manager, San Francisco Water District
Informant 27	Water district staff
Informant 28	Water district staff
Informant 29	General Manager, Prosperidad Water District
Informant 30	Municipal Envi and Natural Resources Officer, Loreto
Informant 31	MPDC Loreto
Informant 32	Sanitary Inspector , Loreto
Informant 33	Loreto Nurse
Informant 34	Loreto Tourism staff
Informant 35	Municipal Engineer San Luis

Informants based in Manila

Informant 36	Salintubig Project Manager
Informant 37	Salintubig Program Manager , NAPC
Informant 38	Salintubig Program Manager , DOH
Informant 39	Geohydrologist involved in several water provision projects of an

	international development organisation
Informant 40	Geohydrologist
Informant 41	Geologist

Lowland Site – Barangay Napo

Informant 42	Barangay Health Worker
Informant 43	Barangay Health Worker
Informant 44	Councilor, Brgy. Napo
Informant 45	Councilor, Brgy. Napo
Informant 46	Resident, Purok 1
Informant 47	Resident, Purok 1
Informant 48	Resident, Purok 1
Informant 49	Resident, Purok 1
Informant 50	Resident, Purok 1
Informant 51	Barangay Sanitation Worker
Informant 52	Resident, Purok 1
Informant 53	Resident, Purok 1
Informant 54	Resident, Purok 2
Informant 55	Resident, Purok 2
Informant 56	Resident, Purok 2
Informant 57	Resident, Purok 2
Informant 58	Resident, Purok 2
Informant 59	Brgy Kagawad - Health
Informant 60	Purok 4 President
Informant 61	Resident, Purok 3
Informant 62	Resident, Purok 3
Informant 63	Resident, Purok 3
Informant 64	Resident, Purok 3
Informant 65	Resident, Purok 3
Informant 66	Resident, Purok 3
Informant 67	Resident, Purok 3
Informant 68	Resident, Purok 3
Informant 69	Resident, Purok 3
Informant 70	Resident, Purok 3
Informant 71-Gundo	Resident, Purok 3
Informant 72	Resident, Purok 3
Informant 73	Resident, Purok 3
Informant 74	Resident, Purok 4
Informant 75	Resident, Purok 4
Informant 76 - Inday	Resident, Purok 4
Informant 77	Resident, Purok 4
Informant 78	Resident, Purok 4
Informant 79	Resident, Purok 4
Informant 80	Resident, Purok 4
Informant 81	Resident, Purok 4
Informant 82	Resident, Purok 4
Informant 83	Resident, Purok 4
Informant 84	Resident, Purok 4
Informant 85	Resident, Purok 4
Informant 86	Resident, Purok 4

Informant 87	Resident, Purok 4
Informant 88	Resident, Purok 4
Informant 89	Resident, Purok 4
Informant 90	Resident, Purok 4

Upland Site – Barangay Policarpo

Informant 91-Ed	Barangay Captain
Informant 92	Resident, Purok 2
Informant 93	Purok 2 President, Brgy Policarpo
Informant 94	Resident, Purok 2
Informant 95	Councilor, Brgy. Policarpo
Informant 96 - Junie	Resident, Purok 2, Brgy Policarpo and former village councillor
Informant 97	Barangay health worker
Informant 98	Resident, Purok 2
Informant 99	Resident, Purok 2
Informant 100	Resident, Purok 2
Informant 101	Resident, Purok 2
Informant 102	Resident, Purok 2
Informant 103	Resident, Purok 2
Informant 104	Resident, Purok 2
Informant 105	Resident, Purok 2
Rhoda Pedrosa)	Resident, Purok 2
Informant 107 - Alice	Resident, Purok 2
Informant 108 - Marife	Resident, Purok 2
Informant 109	Resident, Purok 2
Informant 110	Resident, Purok 2
Informant 111	Resident, Purok 2
Informant 112	Barangay Nutrition Scholar
Informant 113	Resident, Purok 2
Informant 114	Resident, Purok 2
Informant 115	Resident, Purok 2
Informant 116	Resident, Purok 2
Informant 117	Former Brgy Captain, Brgy Policarpo
Informant 118	Resident, Purok 2

Wetland Site – Panlabuhan, Barangay Poblacion

Informant 119 - Dodong	Purok President, Panlabuhan
Informant 120	Resident, Panlabuhan
Informant 121	Resident, Panlabuhan
Informant 122	Resident, Panlabuhan
Informant 123	Resident, Panlabuhan
Informant 124	Resident, Panlabuhan
Informant 125	Resident, Panlabuhan
Informant 126	Resident, Panlabuhan
Informant 127-Virgie	Resident, Panlabuhan
Informant 128	Resident, Panlabuhan
Informant 129	Resident, Panlabuhan
Informant 130	Resident, Panlabuhan
Informant 131	Resident, Panlabuhan
Informant 132	Resident, Panlabuhan
Informant 133	Resident, Panlabuhan

Informant 134	Resident, Panlabuhan
Informant 135	Resident, Panlabuhan
Informant 136	Resident, Panlabuhan
Informant 137	Resident, Panlabuhan
Informant 138	Resident, Panlabuhan
Informant 139	Resident, Panlabuhan
Informant 140	Resident, Lake Bukogon
Informant 141 - Lolong	Resident, Lake Bukogon
Informant 142	Resident, Lake Bukogon
Informant 143	Resident, Lake Bukogon
Informant 144 - Bebot	Resident, Lake Bukogon
Informant 145	Resident, Lake Bukogon
Informant 146	Resident, Lake Bukogon
Informant 147	Resident, Lake Bukogon
Informant 148	Resident, Lake Bukogon
Informant 149	Resident, Lake Bukogon
Informant 150	Resident, Lake Bukogon
Informant 151	Resident, Lake Bukogon
Informant 152	Residents of Talacogon
Informant 153	Residents of Talacogon