International course on water and water management in the Philippines

3 January – 3 February 2013

Merlijn van Weerd, Jouel Taggueg, Renske Kok, Mercedes Masipiqueña, Marites Gatan-Balbas and Gerard Persoon (editors)

Hoogheemraadschap van Rijnland

Universities of Leiden and Oxford
LOUWES FUND
research on water and food

MABUWAYA FOUNDATION, INC. 2003

ISABELA STATE UNIVERSITY 1978

Universiteit Leiden

International course on water and water management in the Philippines

Merlijn van Weerd, Jouel Taggueg, Renske Kok, Mercedes Masipiqueña, Marites Gatan-Balbas and Gerard Persoon (editors)

Cover: participants of the water course 2013

Please cite as follows: Van Weerd, M., J. Taggueg, R. Kok, M. Masipiqueña, M. Gatan-Balbas and G. Persoon (Eds). 2013. International course on water and water management in the Philippines 2013. Report. Isabela State University, Cabagan, the Philippines and Leiden University, Leiden, the Netherlands.

International course on water and water management in the Philippines

Editors

Merlijn van Weerd

Jouel Taggueg

Renske Kok

Mercedes Masipiqueña

Marites Gatan-Balbas

Gerard Persoon

With contributions by:

Channa Van Leijsen, Koen Geul, Melanie D. Aquino,Tessa van Duijvenbode, Bondee L. Peñaflor, Rocel S. Galicia, Lilian van Herpen, Jilmar A. Juan, Manon Vrolijk, Marinet M. Sagadraca, Jemalyn C. Vinarao, Jowieke Larooij, Eduardo C. Narag, Melanie Schippers, Davie Ann C. Queddeng, Tertia Uljee, Lisette de Heiden, Zyrene Zapanta Cabaldo, Hannah van Meurs, Roxsan M. Antonio, Daniel Kan, Mart Lubben, Cristina P. Mediana, Jasmin P. Talub, Luuk Gremmen, Kathlyn An P. Eugenio, Ivan aan den Toorn and Zyra Cabaldo.

Isabela State University and Leiden University

Cabagan, the Philippines and Leiden, the Netherlands

2013

Hoogheemraadschap van
Rijnland

Message

Winter Course 2013

In January 2013, fourteen Dutch students went to the Philippines to meet their fourteen Filipino counterpart students, with whom they would participate in the Winter Course of 2013. Although the name Winter Course might confuse one in the Philippine context, something serious is going on with climate change.

The goals of the Winter Course might be described as: Getting to know your counterpart student from a different country and a different discipline; Getting to understand what 'integrated water management' and 'river basin management' looks like in practice.

The Rijnland District Water Control Board feels an obligation in sharing knowledge on the subject of integrated water management. With the millennium goals in mind, we understand that sharing knowledge does not limit itself to the boundaries of your country. Our cooperation with Leiden University led us to the Philippines and in this case specifically to the Isabela State University and the Centre for Cagayan Valley Programme on Environment and Development (CCVPED).

In this booklet you find the experiences of the group of students participating in the Winter Course 2013. We are proud of the results and the fact that we could contribute to this activity.

It might be a little too soon to speak of a tradition, but I am confident that this third Winter Course in a row will not be the last one.

I sincerely hope that many more Winter Courses may follow!

Timo van Tilburg
Head of the Policy Department
The Rijnland District Water Control Board

Leiden, The Netherlands

Acknowledgements

In 2006 and 2007 two summer courses of six weeks each were organized in the Philippines for 30 participants: 15 international and 15 Filipino students. The courses were organized under the umbrella of CVPED, the Cagayan Programme for Environment and Development. This collaborative program between Leiden University and Isabela State University started in 1987 and lasted for more than 20 years until December 2009 when it unfortunately came to an end. This also implied the end of a range of joint educational activities, including the summer courses.

By a stroke of good fortune however, renewed contact at a personal level between staff members of the Water Board (Hoogheemraadschap) Rijnland and Leiden University resulted in the interest of Rijnland to partly fund a course in the Philippines on water use and water management. The first international winter/water course was organized by the Faculty of Social Sciences of Leiden University, Isabela State University and the Mabuwaya Foundation in January 2011 with 24 students: 12 from the Philippines and 12 from the Netherlands. The course was a huge success, the interest of students in a full time interdisciplinary and intercultural course was as high as during the earlier summer courses. Based on the positive results of the first water course, Rijnland, Isabela State University, the Mabuwaya Foundation and Leiden University decided to continue this collaboration. In January 2012, another international water course was organized, this time with 30 students in total: 15 from the Philippines and 15 from the Netherlands. And in January 2013, the third international water course took place, with 14 Dutch and 14 Philippine students.

The present booklet is the outcome of the work done by the students during their training and fieldwork in the Philippines from 3 January – 3 February 2012.

The 2013 Course would not have been possible without the funding by Hoogheemraadschap Rijnland, the Louwes Fund for research on Water and Food and the Faculty of Social Sciences of Leiden University.

The course was organized and coordinated by the Faculty of Social Sciences of Leiden University (Gerard Persoon, Renske Kok and Merlijn van Weerd), Isabela State University (Mercy Masipiqueña, Jouel Taggueg and Lito Guzman) and the Mabuwaya Foundation (Marites Balbas and Merlijn van Weerd).

During the preparation in the Netherlands, the Dutch students received information from Maurits Ertsen of the University of Delft on the technical and social dimensions of irrigation systems in developing countries, Gwen van Boven of the Netherlands Commission for Environmental Impact Assessment on Environmental Impact Assessments, Mayo Buenafe on Philippine culture and Josine van Velzen on her experiences during the water course 2012. These persons are well thanked for generously sharing their time and expertise during the evening meetings.

Participants from Isabela State University were screened from the different colleges and we thank Lito Guzman Jr. and Tomas Reyes of CFEM, Janet Quilang of PTIA, Ma. Theresa Aggabao, Jane Cabauatan and Josie Balmaceda of CDCAS, Joel Alcaraz of the College of Engineering at Echague and Precy De Lima from ISU Cauayan Campus for their assistance in this.

The Centre for Cagayan Valley Program on Environment and Development (CCVPED) of Isabela State University (ISU), headed by Mercy Masipiqueña and with staff members Eso Tarun, Onia Gunayon and Lenlen Morillo provided support while the students stayed in Cabagan. Accommodation and meals were provided by ISU with the meal service coordinated by Rose Araño and Jun Zipagan while Snooky Macapallag coordinated accommodation.

Randy Macapallag made sure the audio-visual equipment was working during lectures and presentations in Cabagan. Myrna Cureg and Ric Paddayuman of ISU Cabagan amd Engr. Bonifacio T. Ausa of ISU Echague kindly provided advice to students working on their reports. We thank Campus Executive Officer Edwin Macaballug of ISU Cabagan for all his support during the coordination and the implementation of the course.

We thank Dr. Bacani for the Echague bus used during this course, driven by Bong Atuan and Jun Macaballug.

Essential support during the preparation and implementation of the course was provided by the Mabuwaya Foundation team: Arnold Macadangdang, Dominic Rodriguez, Edmund Jose, Ronald Addatu, Gina Gammad, Amante Yogyog and Dorina Soler.

A large number of representatives of government, non-government and international organizations warmly welcomed the students at their offices or field sites and provided a unique insight in their work: Rodel Lasco of the World Agroforestry Centre (ICRAF), JC Gonzalez of the Museum of Natural History of UP Los Baños, Beatrisa Martinez of the International Rice Research Institute (IRRI), Thelma Perez and colleagues of the Protected Areas and Wildlife Bureau (PAWB), Ian Makin, Cherry Rivera, Chris Morris, Rita Festin and Mark Bezuijen of the Asian Development Bank (ADB), Dave de Vera of the Philippine Association For Intercultural Development (PAFID), Marlon Pielago of the municipal government of Teresa, Rizal and Pastor Delbert Rice of the Kalahan Educational Foundation (KEF).

Lectures were given at the Environmental Information Centre (EIC) building in Cabagan. The following persons kindly shared their knowledge and expertise on a wide variety of subjects with the students: Orly Balderama, Robert Araño, Marino Romero, Dante Aquino and Engr. Gualfredo Martinez.

Isabela State University President Aleth Mamauag and Cabagan Campus Director Edwin Macaballug provided inspiring speeches during the opening program.

During fieldtrips, the group was very kindly received and informed by For. Melchor Abiqui and For. Luz Soriano of DENR CENRO Cabagan and Engr. Wilfredo Salvador of NIA.

Last but not least, the students experienced the famous Philippine hospitality while staying with host families in the field sites. The Mayor and Local Government Unit officials and employees of Tumauini, Barangay Captains and Council members, interview respondents, guides and host families in the field sites in Tumauini are warmly thanked for their generosity, hospitality and support.

The Editors

Table of Contents

	Page
Message by Timo van Tilburg/Hoogheemraadschap Rijnland	4
Acknowledgements	5
Table of Contents	7
Introduction	8
Participants, Coordinators and Supporting staff	10
Course Program	13
Student teams and field work topics	15
Student Reports	19
Channa Van Leijsen. *Introduction*	20
Koen Geul & Melanie D. Aquino. *Physical characteristics of the dam and the hydrological characteristics of the Pinacanauan River at Tumauini, Isabela*	25
Tessa van Duijvenbode & Bondee L. Peñaflor. *Dam construction, Antagan, Tumauini: waste and sanitation management*	35
Rocel S. Galicia, Lilian van Herpen & Jilmar A. Juan. *Impacts of building a dam on the diversity of existing flora and fauna at Antagan I, Tumauini, Isabela*	51
Manon Vrolijk, Marinet M. Sagadraca, Jemalyn C. Vinarao & Jowieke Larooij. *The possible impacts of the Tumauini dam on upland communities in Magoli*	67
Eduardo C. Narag, Melanie Schippers, Davie Ann C. Queddeng & Tertia Uljee. *The Tumauini irrigation system and rice cultivation: current situation and expectations for a future with dam*	78
Lisette de Heiden & Zyrene Zapanta Cabaldo. *Tumauini River Multipurpose Project: analysis of the actor field, policy and legal environment and appropriateness of procedures conducted*	92
Hannah van Meurs, Roxsan M. Antonio & Daniel Kan. *Awareness, perceptions and attitudes regarding the multipurpose dam in Tumauini, Isabela*	103
Mart Lubben & Cristina P. Mediana. *Use of environmental services delivered by the Tumauini watershed to the people who live downstream of this watershed, including their awareness, values and willingness to pay for sustaining these services*	114
Jasmin P. Talub, Luuk Gremmen & Kathlyn An P. Eugenio. *Vulnerability and disaster assessment of the proposed dam in the protected area of Tumauini watershed forest reserve*	127
Ivan aan den Toorn & Zyra Cabaldo. *The economic impacts of the proposed Tumauini dam*	140
Channa van Lijsen *Conclusion: Rapid Assessment Tool*	147

Introduction

Water is one of the most critical resources currently under threat world-wide. Developing countries in particular face complex challenges as the demand for clean drinking water, irrigation water and water for the generation of hydroelectricity grows rapidly. Water becomes increasingly scarce while its quality declines. Climate change leads to greater risks associated with floods and droughts.

Water supports a great variety of resources, functions and services, and in order to safeguard these for the future, sustainable management is essential yet not adequately practiced. The formulation of policies for sustainable water resource management is a complex process. Water resource management is typically associated with multiple stakeholders and a wide range of social, environmental and economic needs. Moreover, effective management of water resources is achieved through the linkage of sustainable land and water uses across the whole of a river basin, crossing boundaries of different administrative units. Global institutions highly promote the participation of local communities, claiming that water resource management and development are central to sustainable growth and poverty reduction. Nevertheless, communities face numerous barriers in their efforts to establish sustainable water and land resources management systems, water sources and watersheds and adapt to weather-related disasters

The Faculty of Social Sciences (FSW) of Leiden University, in cooperation with Isabela State University and the Mabuwaya Foundation in the Philippines organized an international, interdisciplinary course on water issues and water management in the Cagayan River basin in Northeast Luzon in the Philippines from 3 January – 3 February 2013. Twenty eight students participated in this course, 14 through Leiden University and 14 through Isabela State University. The students were enrolled in different studies: Cultural Anthropology, Biology, Forestry, Public Administration, Religion, Political Science, Chinese Languages and Culture, Architecture, Archeology, Civil Engineering, Education, Sociology, Agriculture, Agricultural Engineering, Environmental Science, Development Communication and Business Administration.

The general focus of the course was on the utilization and importance of fresh water, water scarcity and super abundance, climate change and water, watershed and biodiversity conservation, conflicts over water and the role of communities and government in water management. The objective of the course was to gain experience with working in an international, interdisciplinary team on a problem-oriented research assignment. Apart from gaining knowledge on water issues and water management in a developing country, students learned practical fieldwork skills, the application of research methods and techniques and the complexities and opportunities of working in multi-disciplinary multi-cultural teams.

At the start of the course, to get to know each other and learn something about the Philippines, the students visited the old city of Intramuros in Manila and the National Museum of the Filipino People.

In Los Baños, the group visited the International Rice Research Institute (IRRI) to learn more about rice cultivation and the importance of water management for rice farmers. The World Agroforestry Centre (ICRAF) provided a background on climate change, reforestation, forest protection and Payments for Environmental Services (PES). Students and staff also visited the Botanical gardens and the Museum of Natural History in Los Baños.

On the way back to Manila, an exemplary waste management facility was visited in the municipality of Teresa. In this facility, run by the municipal government, waste that is collected throughout the municipality is segregated and re-used and recycled.

In Manila, the Asian Development Bank (ADB) presented their work in general, their Philippine programs and their system of environmental safeguards to assess the impact of large projects. The Protected Areas and Wildlife Bureau (PAWB) of the Department of Environment and Natural Resources (DENR) provided a background on biodiversity and conservation in the Philippines, with special attention for wetlands. The Philippine Association for Intercultural Development (PAFID) lectured on the Indigenous Peoples (IP) of the Philippines and their work with IP communities for land rights and conservation.

On the way to northern Luzon, the Kalahan Educational Foundation (KEF) and the Ikalahan Ancestral Domain in Nueva Vizcaya were visited. Here the students learned about the role of Indigenous Peoples in watershed protection. After two cold nights high in the mountains, Magat Dam was visited, downstream of the forest that the Ikalahan are protecting.

In Cabagan at Isabela State University, a series of lectures was given by external and academic presenters on water related subjects. During a two day field trial in Puerta, students were introduced to field conditions and to research methods.

The students worked in couples (interdisciplinary, multi-cultural) on the development of a small field study proposal on a water-related issue. The 2013 course had a special topic: the Tumauini River Multipurpose Project (TRMP). This proposed project consists of the building of a dam in Tumauini River upstream of current settlements. The objective of the project is to provide a reliable water supply for irrigation to increase the productivity and incomes of farmers in about 8,200 hectares of rice and corn farms in the municipalities of Tumauini, Cabagan and Ilagan. The dam will also generate electricity and provide possibilities for fish farming and eco-tourism.

The students conducted a short study in relation to this proposed project. Together, the studies could form part of an environmental impact assessment of the project. To practice assessment tools further, the students used a framework developed by the Asian Development Bank to assess the project's impact and sustainability on environmental, social and economic factors.

Field work was conducted by the research teams during five days in various research sites in Tumauini. After field work, data were analyzed during three days and presented during a workshop on the Tumauini River Multipurpose Project with external participants.

The hard work done, the students visited the Philippine crocodile rearing station in the municipality of San Mariano to learn more about the conservation of the world's rarest crocodile. Then the group visited Calao Caves with their millions of bats. A visit to the rice terraces of Banaue, a world wonder of indigenous engineering and water management, concluded the course. In Batad, a UNESCO World Heritage Site, the students participated in the restoration of some of the 2000 year old rice terraces.

This booklet contains an introduction of the participating students, the course program and a short description of the field studies followed by the full student reports.

The Editors

Participating Students

Bondee L. Peñaflor
BS Envt'l. Science

Davie Ann C. Queddeng
BS Agricultute

Eduardo C. Narag
BS Agriculture

Jasmin P. Talub
BS Education

Jemalyn C. Vinarao
BS Envt'l. Science

Jilmar A. Juan
BS Biology

Kathlyn An P. Eugenio
BS Civil Engineering

Ma. Cristina P. Mediana
BS Forestry

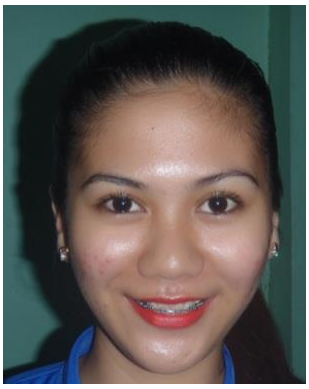
Marinet M. Sagadraca
AB Sociology

Melanie D. Aquino
BS Agrricultural Eng'g.

Zyra Cabaldo
BS Banking and Finance

Rocel S. Galicia
BS Forestry

Roxan M. Antonio
BS DevCom



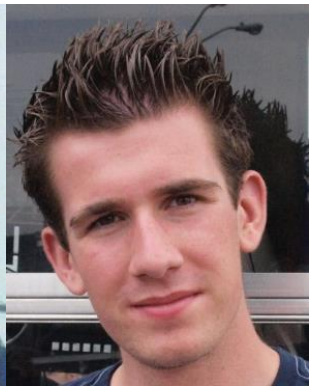
Zyrene Cabaldo
BS Public Administration

Channa Van Leijsen
Cultural Anthropology

Daniel Kan
Political Science

Jowieke Larooij
Cultural Anthropology

Hannah van Meurs
Cultural Anthropology



Koen Geul
Civil Engineering

Lilian van Herpen
Biology

Lisette de Heiden
Public Administration

Luuk Gremmen
Architecture

Manon Vrolijk
Chinese

Mart Lubben
Biology

Melanie Schippers
Civil Engineering

Ivan aan den Toorn
Archeology

Tertia Uljee
Religion

Tessa van Duijvenbode
Cultural Anthropology

COORDINATORS

Arnold Macadangdang
Mabuwaya

Gerard Persoon
Leiden University

Jouel Taggueg
ISU

Merlijn Van Weerd
Mabuwaya/Leiden

Marites Gatan-Balbas
Mabuwaya

Renske Kok
Leiden University

Lito Guzman
ISU

Mercedes Masipiqueña
ISU

Program 3 January – 3 February 2013

Day	*Date*	*Activity*	*Accommodation*
Thursday	3	Departure Amsterdam/Isabela	
Friday	4	Arrival Manila. Welcome Dinner	Manila: Natividad
Saturday	5	Visit Intramuros and Mall of Asia	Manila : Natividad
Sunday	6	Visit National Museum, travel to Los Baños	Los Banos: Searca
Monday	7	Los Baños: visit ICRAF and IRRI, Botanical gardens and Natural History Museum	Los Banos: Searca
Tuesday	8	Travel back to Manila via Laguna de Bay, visit the waste management project of the municipality of Teresa	Quezon City: University Hotel UP Diliman
Wednesday	9	Visit organizations Manila: Asian Development Bank (ADB), Protected Areas and Wildlife Bureau (PAWB) and the Philippine Association For Intercultural Development (PAFID)	Quezon City: University Hotel UP Diliman
Thursday	10	Travel to Santa Fe/Imogen. Visit Ikalahan Foundation and community-based watershed conservation project	Imogen: Kalahan Educational Foundation
Friday	11	Visit Ikalahan area/workshop about field topics	Imogen: Kalahan Educational Foundation
Saturday	12	Travel to Cabagan via Magat Dam	Cabagan: Environmental Information Centre (EIC)
Sunday	13	Free	Cabagan: EIC
Monday	14	am: welcome Isabela State University. pm: Intro Cagayan Valley and water management	Cabagan: EIC
Tuesday	15	am: lectures on research methods pm: workgroups and development research proposal	Cabagan: EIC
Wednesday	16	Field work trial day 1	Puerta
Thursday	17	Field work trial day 2	Cabagan: EIC

Day	***Date***	***Activity***	***Accommodation***
Friday	18	Development and presentation research proposal	Cabagan: EIC
Saturday	19	Field work, field day 1	Field
Sunday	20	Field work, field day 2	Field
Monday	21	Field work, field day 3	Field
Tuesday	22	Field work, field day 4	Field
Wednesday	23	Field work, field day 5/return from field	Cabagan: EIC
Thursday	24	Data analyses and report preparation	Cabagan: EIC
Friday	25	Cabagan Fiesta / Data analyses and report preparation	Cabagan: EIC
Saturday	26	San Mariano: Philippine crocodile rearing station Peñablanca: Calao Caves	Cabagan: EIC
Sunday	27	Free	
Monday	28	Preparation presentations	Cabagan: EIC
Tuesday	29	Multi-stakeholder workshop, external presentation results field work. Evening: farewell party	Cabagan: EIC
Wednesday	30	Am: Travel to Banaue, pm: visit rice terraces	Banaue: Banaue Hotel
Thursday	31	Banaue: Batad	Batad Hillside Inn
Friday	1	Travel to Manila and Isabela	Manila: Natividad
Saturday	2	Departure Manila to Amsterdam	
Sunday	3	Arrival Amsterdam	

Student teams and field work topics

Student: Channa Van Leijsen

Title: Introduction and Assessment

Students: Koen Geul & Melanie D. Aquino

Title: Physical characteristics of the dam and the hydrological characteristics of the Pinacanauan River at Tumauini, Isabela

Students: Tessa van Duijvenbode & Bondee L. Peñaflor

Title: Dam construction, Antagan, Tumauini: waste and sanitation management

	**Students**: Rocel S. Galicia, Lilian van Herpen & Jilmar A. Juan **Title:** Impacts of building a dam on the diversity of existing flora and fauna at Antagan I, Tumauini, Isabela
	**Students**: Manon Vrolijk, Marinet M. Sagadraca, Jemalyn C. Vinarao & Jowieke Larooij **Title:** The possible impacts of the Tumauini dam on upland communities in Magoli
	**Students:** Eduardo C. Narag, Melanie Schippers, Davie Ann C. Queddeng & Tertia Uljee (not on picture) **Title**: The Tumauini irrigation system and rice cultivation: current situation and expectations for a future with dam
	**Students:** Lisette de Heiden & Zyrene Zapanta Cabaldo **Title:** Tumauini River Multipurpose Project: analysis of the actor field, policy and legal environment and appropriateness of procedures conducted

Students: Hannah van Meurs, Roxsan M. Antonio & Daniel Kan

Title: Awareness, perceptions and attitudes the multipurpose dam in Tumauini, Isabela

Students: Mart Lubben & Cristina P. Mediana

Title: usage of environmental services delivered by the Tumauini watershed to the people who live downstream of this watershed, including their awareness, values and willingness to pay for sustaining these services

Students: Jasmin P. Talub, Luuk Gremmen & Kathlyn An P. Eugenio

Title: Vvulnerability and disaster assessment of the proposed dam in the protected area of Tumauini watershed forest reserve

Students: Ivan aan den Toorn & Zyra Cabaldo

Title: the economic impacts of the proposed Tumauini dam

The students, coordinators and support staff visiting the Philippine crocodile rearing station in San Mariano, Isabela (photo by M van Weerd)

On the way to the field trial site in Puerta, Masipi-East, Cabagan (photo by M van Weerd)

Student Reports

Field visit to the proposed dam site in Tumauini (photo by M van Weerd)

INTRODUCTION: IRRIGATION AND THE TUMAUINI RIVER MULTIPURPOSE PROJECT

Channa van Leijsen

RICE SHORTAGE

Although almost all the people in the Philippines eat rice 3 times a day, there has been a shortage in this staple since 1870 (Tumauini River Multipurpose Project, Summary Report 2012: 3). At the moment the Philippines produces 11.2 million Metric Tons of milled rice, which is only sufficient for 90% of the population. As a result between 1 and 2 million mega tons of rice are imported each year. This large amount even resulted in the country being the number one importer of rice in 2007 (Normalyn Yap TIBAO).

A couple of reasons for this lack in rice production could be appointed to (Tumauini River Multipurpose Project, Summary Report 2012: 3):

- limitation of land;
- low productivity;
- limited connectivity;
- weak resilience;
- population growth.

The limitation in land and population growth are factors that go hand in hand as it resulted in a loss of half of the irrigated land due to urbanization (Normalyn Yap TIBAO). By now the Philippines has 97 million inhabitants and the estimation is that the 100 million mark will be reached this year. The average population growth in the last couple of decades was 2.34%, compared to the rice fields which only increased by 1.6% (Tumauini River Multipurpose Project, Summary Report 2012: 3). This rapid population growth and rice production shortage could result in some major problems. Especially for the 68 million Filipinos that live on less than 2 dollars a day and for whom the rice purchases make up 12 to 20 percent of their total food expenditures and an important part of their daily nutrition (Normalyn Yap TIBAO).

The issues that arose from the population growth and the shortage in rice have received a lot of attention from the national government. This resulted for example in the goal to be completely rice self sufficient by 2013 and increase the total production of the product to 22.73 million metric tons by 2016 (Department of Agriculture 2012: 4). In the Food Staples Sufficiency Program, which deals with those plans, they imply a two-sided plan for these goals:"First, massive investments in terms of financial resources and policy attention are necessary to raise agricultural productivity. The agriculture sector must figure prominently on the national agenda.

Second, food insecurity and mass poverty in agriculture cannot be solved within the sector alone. A feasible solution hinges on a dynamic link between the agriculture and the industrial and services sectors" (Department of Agriculture 2012: 2).

The ways to achieve this self sufficiency are divided in three chapters: 1) Raise farm productivity and competitiveness, 2) Enhance economic incentives and enabling mechanisms and 3) Manage food staples consumption (Department of Agriculture 2012: 5-6**)**.

Because of this program, and the strategies shown above, there is a lot more attention for the importance of agriculture and the position of the farmers and the poor. As part of the second chapter for example, a policy to expand crop insurance coverage was put in place, which resulted in a more widespread use of suitable high-quality seeds and fertilizers. In addition other integrated crop management practices were encouraged (Department of Agriculture 2012: 4). Because of these policies and the other benefits gained from the Food Staples Sufficiency Program, this focus is publicly perceived as positive, although the chances of reaching this self sufficiency are very small. The Philippine Institute of Development Studies (PIDS) says that the efforts to improve rice production have so far been insufficient and further investments are needed in order to reach the goals (abs-cbnnews**).**

IRRIGATION

Another important factor impacting the rice productivity and the chances of reaching the government goals, which also has been addressed by the PIDS, is the lack of a decent water supply, a degradation of the watersheds and a low operational efficiency of the existing irrigation systems. Moreover, these existing irrigation systems are often outdated and not optimized enough because of inadequate designs, inadequate operation and a low maintenance budget (Tumauini River Multipurpose project, summary report: 4).

The above shows us the importance of irrigation, and the quality of this irrigation. A secure supply of water is a necessity if the government wants to achieve the goal of self sufficiency on time without harming the farmers. If you even add other risks and factors possibly influencing this supply and the rice production like droughts, typhoons and other natural disasters, the need for a secure source of water becomes even clearer. A part of the solution for these issues can be found in the development and introduction of more dams.

DAMS AND THE TUMAUINI RIVER MULTIPURPOSE PROJECT (TRMP)

A dam is a construction that "can refer to any barrier erected to obstruct or control the flow of water" (Morris and Fan, 1998). In most cases a dam is built to either generate hydro-energy, or to provide the area with irrigation or drinking water. In some cases this can even be combined with a function as a protection for floods. An example of the dam that combines the irrigation, generation of energy and flood protection is the proposed Tumauini River Multipurpose Project in Tumauini, Isabela.

The first research studying the possibilities for this dam was finished in 1998 by the National Irrigation Administration (NIA). By now, only some last clearances have to be given and then the construction will probably start in a year.

To provide some basic information in order to understand the rest of this booklet and the researches of the other students, the next part of this introduction will consist of some general information about the Tumauini River Multipurpose Project.

OVERVIEW OF GENERAL INFORMATION ABOUT TRMP

The project objective was formulated by the NIA as follows: "The objective of the project is to provide adequate and timely water supply for irrigation to increase productivity and incomes of farmers in about 8,200 hectares of rice and corn farms in the municipalities of Tumauini, Cabagan and Ilagan in the province of Isabela" (NIA 2012: v).

In the scope this is further explained and the several components of the project are mentioned:

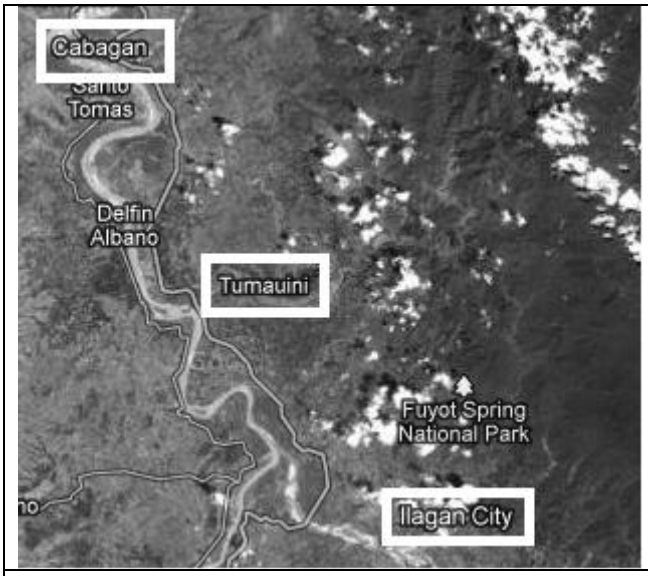
- Physical infrastructure. Which includes the 'construction of a central core zoned type of rack and earth fill high dam, and after bay dam, and construction of a new and improvement/upgrading of existing irrigation facilities'
- Institutional development program. This will be implemented to 'strengthen the capacity of irrigators associations to participate in the implementation of the project and subsequent operation and maintenance
- Watershed management. This focuses on the implementation of 'activities to properly compensate project-affected families and mitigate negative impact of communities' (ibid.).

Furthermore, in the older version of the feasibility study there is a short addition to the general objective about the generation of hydropower. There is less focus on this side of the project in the updated one, but in both reports they state that the total energy that will be generated will be around 7.000 KW (NIA 1998: x).

An overview of other important data will be supplied in the figure below (NIA 2012 and NIA 1998) and the map of the area.

Table 1: Overview of general information TRMP

Official location	So. Magoli, Brgy. Antagan 1, Tumauini, Isabela. N 17° 17'32'' E 121°55'52''
Towns influenced by TRMP	Cabagan (3 barangays) Ilagan (1 barangay) Tumauini (30 barangays)
Area irrigated by TRMP	8200 ha
Catchment boundary	16.320 ha
Project estimated costs	P4.0 billion
Annual costs after construction	P6.1 million



Map 1: Affected towns (google maps)

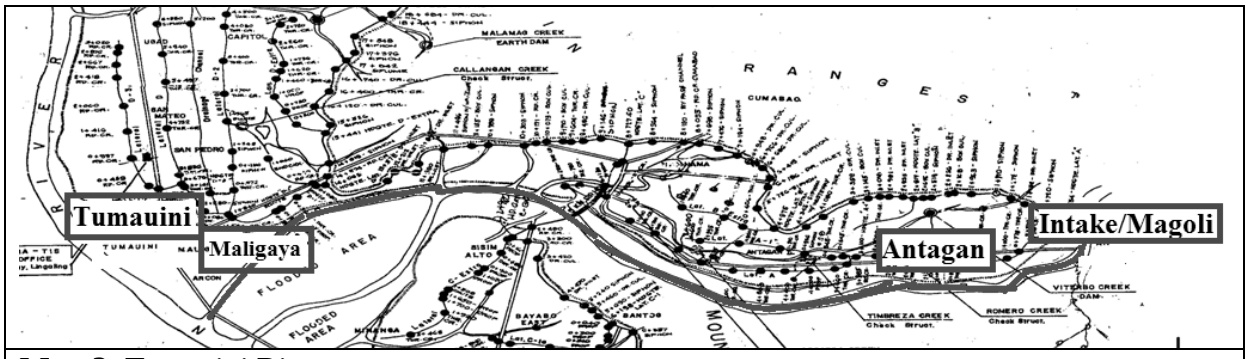
STUDENT RESEARCH TOPICS

The environmental impact assessment (EIA) for the TRMP has already been conducted and based on this report and our own interest, the different topics for the projects of the students were formulated. Case: the building of a dam for hydropower generation, irrigation and flood control in the Pinacanauan de Tumauini (Tumauini River) in the municipality of Tumauini, Isabela Province

Main question: what will be the impact of the construction of the dam on the environment and the people of Tumauini?

1. Physical characteristics of the dam and the hydrological aspects of the river
    - Koen Geul (Civil Engineering)
    - Melanie D. Aquino (Agricultural Engineering)
2. Dam construction, risks and pollution
    - Tessa van Duijvenbode (Cultural Anthropology and Development Sociology)
    - Bondee L. Peñaflor (Environmental science)
3. Impact on flora and fauna
    - Lilian van Herpen (Biology)
    - Jilmar A. Juan (Biology)
    - Rocel S. Galicia (Forestry)
4. Impact of the dam on the people upstream (indigenous peoples)
    - Jowieke Larooij (Cultural Anthropology and Development Sociology)
    - Manon Vrolijk (Chinese)
    - Jemalyn C. Vinarao (Environmental Science)
    - Marinet M. Sagadraca (Sociology)
5. Rice cultivation and irrigation
    - Tertia Uljee (Religion)
    - Melanie Schippers (Civil Engineering)
    - Eduardo C. Narag (Agriculture)
    - Davie Ann C. Queddeng (Agriculture)
6. Actor analysis and policy environment
    - Lisette de Heiden (Public Administration)
    - Zyrene Zapanta Cabaldo (Political sciences)
7. Knowledge, awareness and expectations about the proposed dam among inhabitants
    - Daniel Kan (Political Science)
    - Hannah van Meurs (Cultural Anthropology)
    - Roxan M. Antonio (Development Communication)
8. Environmental services and the willingness to pay
    - Mart Lubben (Biology)
    - Cristina P. Mediana (Forestry)
9. Vulnerability assessment of the dam: risks and hazards
    - Luuk Gremmen (Architecture)
    - Jasmin P. Talub (Education)
    - Kathlyn An P. Eugenio (Civil Engineering)
10. Economical impacts of the dam
    - Ivan aan den Toorn (Archeology)
    - Zyra Cabaldo (Business administration)

All the researches have been conducted in the surroundings of Tumauini. The places most visited during the fieldwork are indicated in the map below.



Map 2: Tumauini River

The reports of the various researches can be read in the next chapters of this booklet.

REFERENCES

Department of Agriculture (2012) *Food Staples Sufficiency Program*

http://maps.google.com. Seen on: 28-01-2013

http://www.abs-cbnnews.com/business/11/28/12/ph-unlikely-become-self-sufficient-rice-2013. Seen on: 27-01-2013

http://www.nodai.ac.jp/cip/iss/english/9th_iss/fullpaper/1-1-5nchu-tibao.pdf. Seen on: 27-01-2013

Morris, G.L. & J. Fan (1998) *Reservoir Sedimentation Handbook: Design and Management of Dams, Reservoirs, and Watersheds for Sustainable Use*

National Irrigation Administration (1998) *Feasibility Study Report*

National Irrigation Administration (2012) *Feasibility Study Report*

Tumauini River Multipurpose Project: summary report on public scoping (2012)

PHYSICAL CHARACTERISTICS OF THE DAM AND THE HYDROLOGICAL CHARACTERISTICS OF THE PINACANAUAN RIVER AT TUMAUINI, ISABELA

Koen Geul & Melanie D. Aquino

INTRODUCTION

The general objective of all water resource development is to improve the economic and environmental conditions for human living. A water resource project may serve one or more purposes such as irrigation, power development, flood control, industrial/domestic/ municipal water supply, recreation, fish and wild life preservation and promotion, and navigation. As such, before the design requirement of a single component, such as a dam, can be finalized, investigation of the entire project is needed as a unit (Asawa 2005).

Dams and reservoirs are key components in almost every water resource project. Dams impound water, divert water from a stream, or raise the level of water. The term dam can refer to any barrier erected to obstruct or control the flow of water (Morris and Fan 1998). In exceptional cases, construction of dams may be to impound water- borne sediments and water having a damaging chemical quality. Dams can also contribute in reducing poverty by supplying enough irrigation to the farmlands, which would help the farmers to produce more yield, thus it would increase their income. The dam also prevents floods and droughts in the downstream area. It enables more growth of biomass by delivering more water for irrigation, so more crops can grow.

In the Philippines, some of the major objectives of the National Irrigation Administration (NIA) are to provide adequate irrigation supply to farmlands and increase irrigated areas and cropping intensities. Tumauini River (also known as Pinacanauan de Tumauini) is one of the tributaries of Cagayan River. It is envisioned to supply more water to the farmers and to provide power supply through a construction of a multipurpose dam. The said dam construction is commonly known as Tumauini River Multipurpose Project (TRMP) (NIA 1998).

NIA as one of the proponents of the said project conducted several studies on the location and features of the dam to be constructed. One feasibility study was conducted in the year 1998 and it was updated last 2012 (NIA 1998, NIA 2012). All of these, along with the interviews with local people and the engineers involved in making the feasibility study, have been used to write this report.

Scope and limitation of the study

This study was limited to the physical characteristics of the dam to be constructed and the hydrological characteristics of the river. Fieldwork was done for five days to conduct estimations, visitations to the proposed dam site and interviews to local officials from NIA, Local Government Units (LGUs) in Tumauini and local residents from Barangay Antagan I. The research was conducted within the watershed of the proposed dam.

RESEARCH QUESTION

How is the proposed Tumauini dam going to influence the Tumauini River?

Sub questions

In order to answer the main question, we formulated three sub questions as follows:

- After the construction of the dam, what would be the changes in hydrological processes, such as discharge and siltation in Tumauini River?
- What are the physical characteristics, like the height and width of the dam's embankment?
- Does flooding pose an issue for the new dam?

METHODS

In this study, we gathered information on the following aspects:

a. Physical features of the future dam
b. Hydrological aspects of the river
c. Maps of the watershed area and the future reservoir
d. Occurrence of flooding

The details of the fieldwork are shown in Table 1.

Table 1: Time schedule during the fieldwork

Day	***Activity***	***Location***
19 January, 2013	We travelled to Tumauini and we met our host family.	Irrigation intake, Tumauini
20 January, 2013	We visited the proposed location of the dam and estimated the velocity and discharge of the river.	Proposed dam location
21 January, 2013	We conducted interview among local authorities and local residents.	NIA, LGU, Irrigation Intake
22 January, 2013	We gathered information in the regional office and conducted interview to the concerned engineers at NIA.	NIA in Tumauini, Cauayan and Cabagan
23 January, 2013	Got a copy of elevation map from NIA – Tumauini and we interviewed the CENRO director.	NIA - Tumauini, CENRO

Since studies about the possibility of the proposed Tumauini dam were already conducted, we decided to interview some of the engineers involved in the conduct of the Feasibility Study. Some of them were from the LGUs of Tumauini and from different offices of NIA.
During the second day of our fieldwork, we conducted rough estimations of the velocity and discharge of the river at the proposed location of the dam. We measured the width and the depth of the river and estimated the average flow rate using float method. To get the estimated discharge of the river, we calculated the cross- sectional area of the flowing water and multiplied it to the average flow rate ($Q = AV$).

We devoted our remaining days to visit and interview local officials and residents. From the regional office of NIA we were able to get a copy of the updated reports about the project and gather more information related to the planning of the dam. To be able to validate the information obtained in the interviews at NIA and LGU, we selected several local residents who are more familiar with the area and asked several questions about the occurrence of flooding and landslides in the area. After all the data were gathered and the interviews were conducted, the data were analyzed in order to write the report.

RESULTS

Location and Area

The TRMP is located at 17˚17'32.10" N and 121˚56'52.12" E. The dam will be constructed at about 2.5 km upstream from the existing intake in Sitio Magoli, Barangay Antagan I, Tumauini, Isabela, as shown in Figure 1. The water from the Tumauini River will flow to the Cagayan River where it will be conveyed to the sea. The TRMP is designed to irrigate 8,200 ha located in the 30 barangays of Tumauini, three barangays of Cabagan and one barangay of Ilagan.

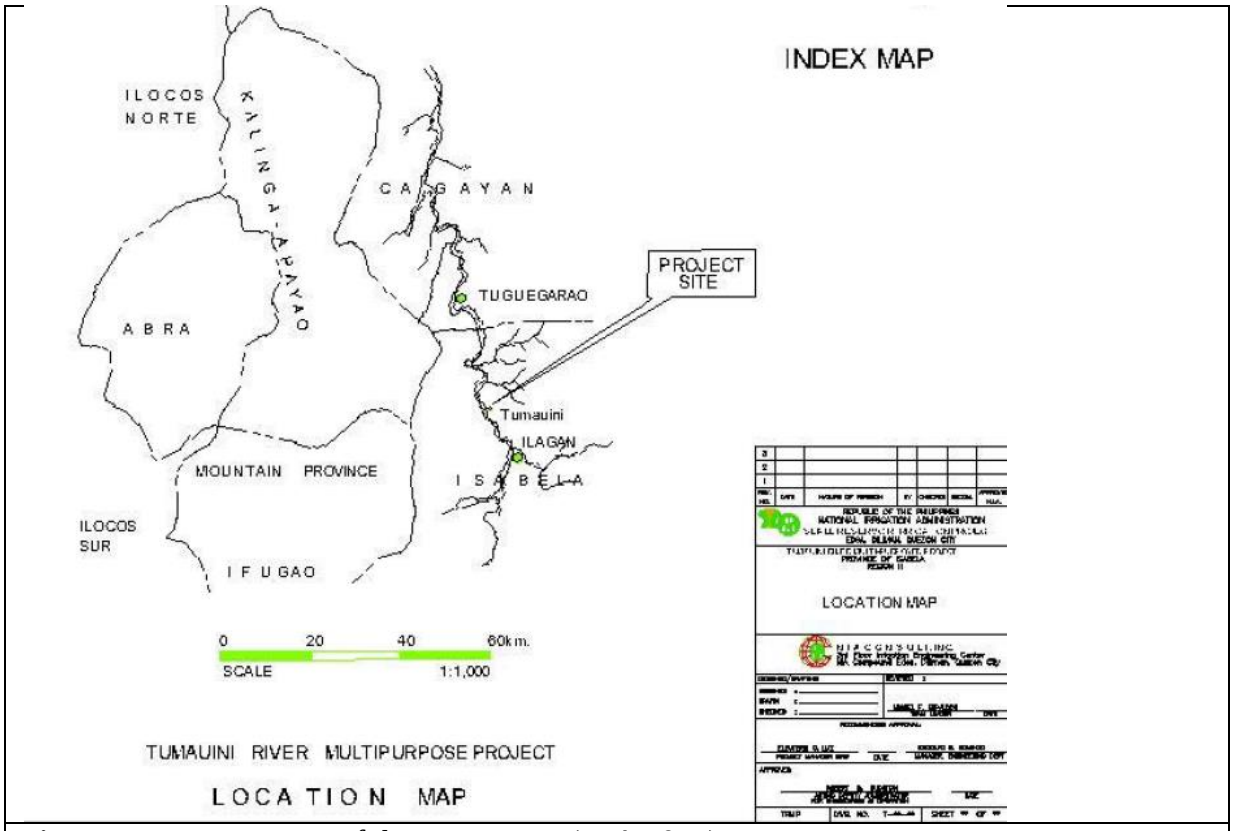


Figure 1: Location map of the project site (NIA 2012)

Watershed

The TRMP has a watershed area of about 163.2 km^2. The boundaries are shown with a blue line in Figure 2. The shape is irregular and the hill slopes in the watershed are classified as steep to very steep. Due to the irregular shape and the hill slopes in the watershed, it takes a long time for rainfall to travel to the river. It takes 26 hours after the rainfall for the discharge of the river to reach its peak.

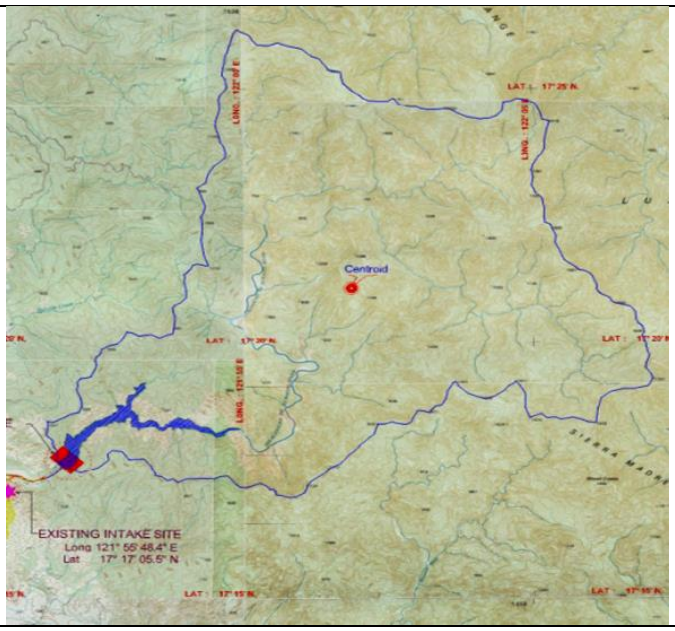


Figure 2: Watershed area upstream of the proposed dam (NIA 2012)

The estimated annual rainfall and runoff are 2,634 mm and 2,201 mm, respectively. The remaining water will evaporate and infiltrate into the ground. The average discharge during 1 year is 20.14 m^3/s. There is high monthly rainfall variability. The highest and lowest average discharges occur in the month of November and February, respectively (Table 2). The discharge hydrograph corresponds to the rainfall distribution. With that, February has the lowest amount of rainfall and November the highest (Table 3). Consequently, the month with the lowest rainfall happens to be the month with the lowest discharge and the month with the highest rainfall have the highest discharge. The relation of the discharge hydrograph and rainfall distribution is shown in Figure 3.

Table 2: Average discharge per month in m^3/s (NIA 2012)

Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
18.42	7.87	8.02	11.85	13.12	9.68	10.51	19.04	10.65	30.25	58.69	43.60

Table 3: Average rainfall per month in Ilagan in mm (NIA 2012)

Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
74.8	44.3	46.7	68.6	171.1	186.4	195.1	214.2	248.0	335.7	377.3	238.8

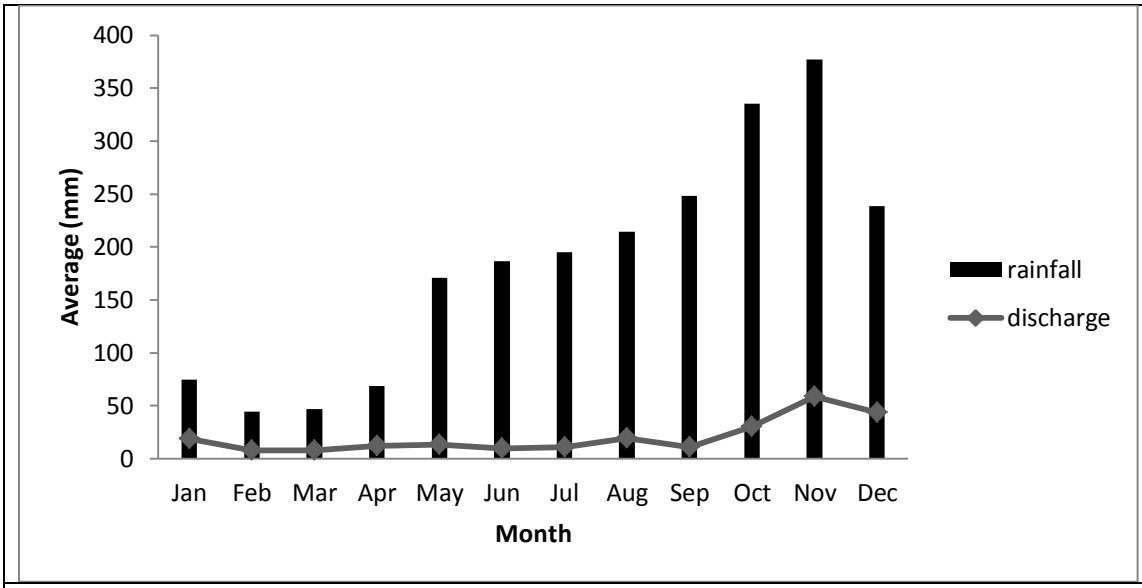


Figure 3: Hydrograph and rainfall distribution

The Tumauini dam

With a height of 81.60 meters, the dam is going to have a crest length of 340 meters and a base width of about 490 meters long. The height of the dam includes several safety factors. Some of these factors are the height of wave due to wind and earthquake. The safety factor is set to 6.6 m (freeboard), which was already included in the 81.6 m total height. It is a central core zoned rock and earth filled type of dam, and it will be protected on both sides by rocks sourced from excavations.

In order to get an idea of what the project will look like, Figure 4 shows the top view of the dam site. The right side of the dam is where the reservoir is located to impound water. The right side of the dam also looks longer than the left side of the dam. This is because they have different slopes. The downstream slope is 2.50:1, and the upstream slope is 2.75:1. Furthermore, the spillway is located on the south side of the dam.

One of the functions of the dam is to store water for irrigation supply. Aside from that, the dam is also used to generate hydropower. The powerhouse is located at the downstream north side of the dam. The water will be transported through pipes (with two turbines) to the powerhouse that will generate energy of about 7.0 MW. Since the dam is mainly built to store water for irrigation, the hydropower generation will be dependent on water demand downstream of the dam (Engineers at NIA, pers. comm.). With a constant discharge of 20.14 m^3/s, a water head of 60 meters is sufficient to generate the required 7.0 MW.

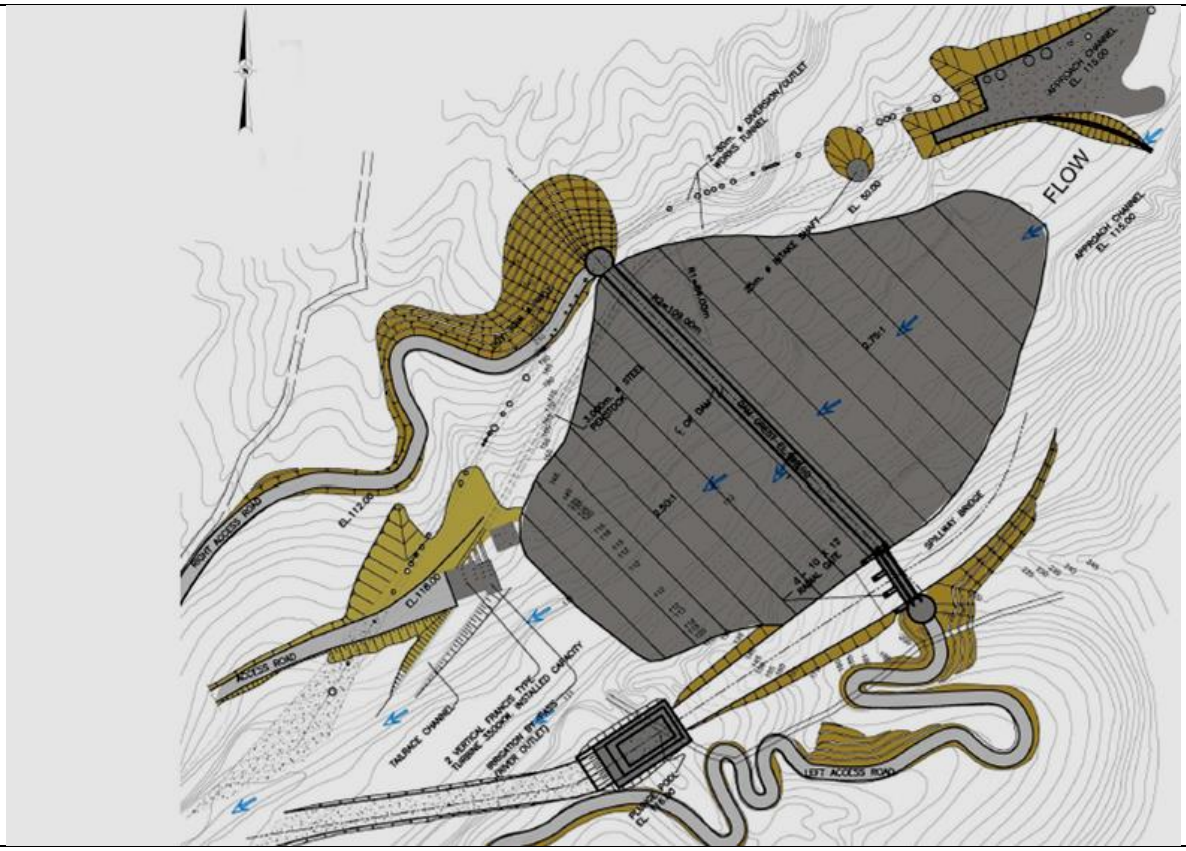


Figure 4: Top view of the proposed dam (NIA 2012)

Afterbay dam

A construction of an Afterbay dam is designed to divert a water discharge of 14.68 m^3/s to the existing intake of Tumauini Irrigation System (TIS) at So. Magoli, Antagan I, Tumauini, Isabela. The Afterbay dam will be located about 20 meters downstream of the intake. It will be composed of rubble masonry dam of 140 meters length and it is designed for flood discharge of 2,818.94 m^3/s with frequency of occurrence of one in every 200 years. It will be raised up to 20 m from the riverbed with 350 m of bank-to-bank distance (Figure 5).
The Afterbay dam will be constructed to elevate the level of water for irrigation supply and will serve as bridge from the existing local road to the proposed right access road.
In constructing the Afterbay dam, the required concrete aggregates may be coming from the quarry pit upstream of the dam or in the riverbed between the dam and the intake (NIA 2012).

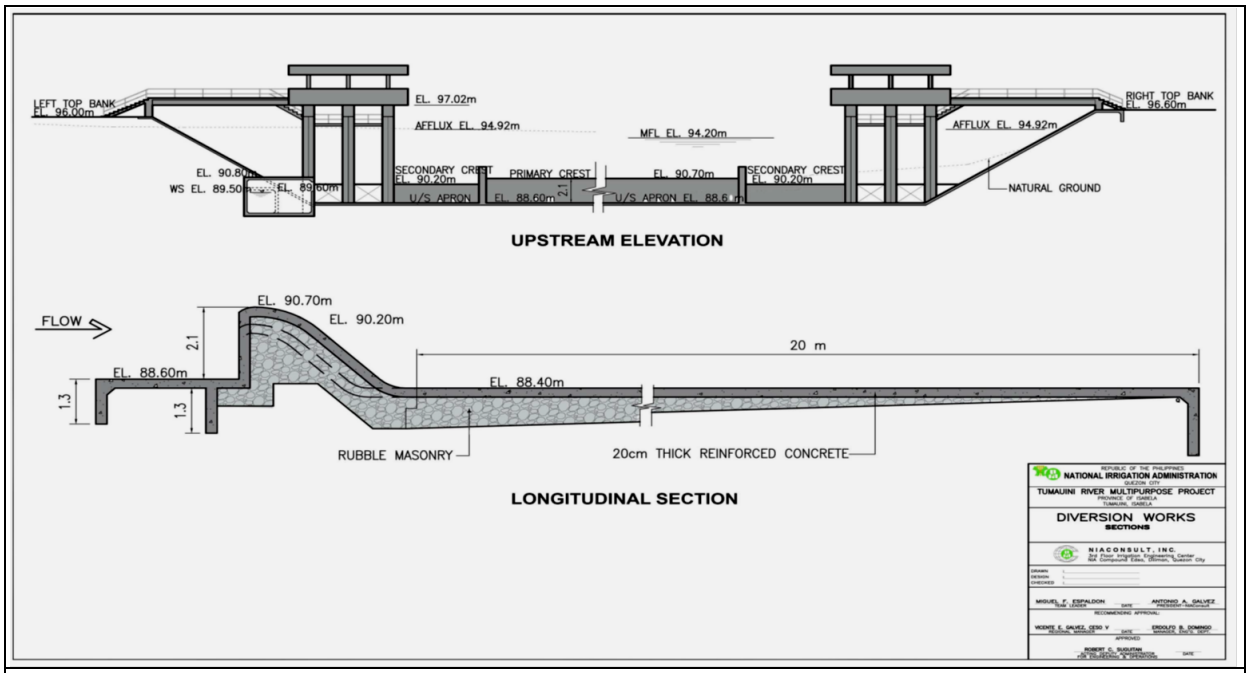


Figure 5: Rubble Masonry Dam elevation and section (NIA 2012)

Flooding

Due to some instances of excessive rainfall, especially during typhoon, the level of water to be impounded in the reservoir will rise quickly. The province of Isabela where the proposed dam will be constructed is one of the most typhoon prone areas in the Philippines. A spillway is built in the dam in order to protect it from overflowing. The spillway will be opened when the water level of the reservoir is too high. The spillway is designed for a discharge of 3,384.26 m^3/s. This is a flooding discharge with a frequency of once every 1000 years. The flooding discharge design for the Afterbay dam is 2,818.26 m^3/s, which is a flooding frequency of once every 200 years.

In our interviews, local farmers claimed they had experienced only one flooding in their lives. This flooding only occurred in the low situated areas in the Barangay (Antagan I). The higher situated parts of the Barangay had never experienced flooding. In addition, the interviewed farmers believe that the dam will protect them from future flooding.

Reservoir

For the proposed reservoir of the dam, 155.56 ha of land will be submerged (Figure 6). With this area the expected maximum volume of the reservoir to supply the needed demand for irrigation and power generation, which is 43.43 million m^3, will be reached. It gives a water height of 188.64 m above sea level (asl). The normal height of the reservoir is 186.00 m asl, which represents a volume of 39.53 million m^3. The reserve volume of 3.90 million m^3 can be used in case of excessive volume of water. The dead storage of the volume is estimated at 11.70 million m^3.

The annual rainfall in the watershed is about 10 times larger than the reservoir area. This means that the average rainfall in the watershed can fill the reservoir on average 10 times a year.

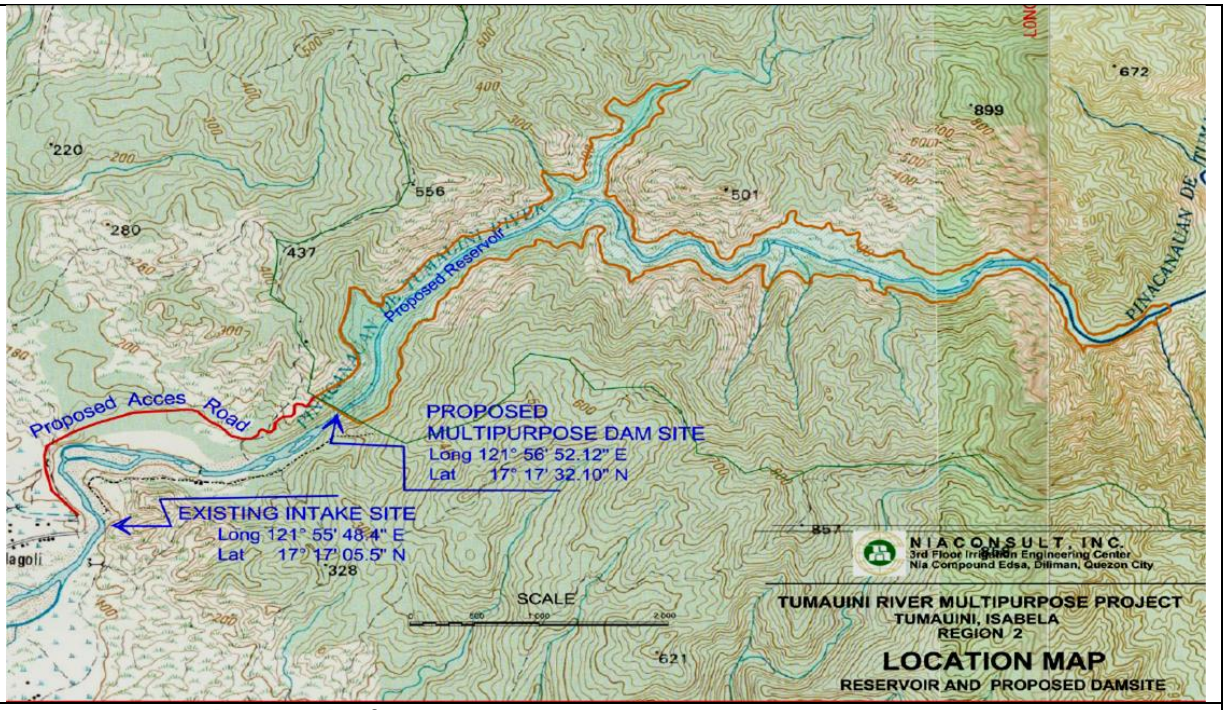


Figure 6: Map showing the future reservoir (NIA 2012)

The operational time of dam ends when the dead storage space is filled with sediment. The current rate of sedimentation in the Tumauini River is 1,388.03 $m^3/km^2/y$. In the watershed area of 163.2 km^2 this corresponds to 226 * 10^3 m^3 of sediment a year. With the known dead storage space, the expected lifetime of the dam is around 50 years. This is when all the sediment is trapped within the reservoir and none of the sediment is removed and no natural disasters, like a landslide, appear.

River discharge and velocity estimation

Estimations were made in the future location of the dam. We estimated the width and the depth of the river by using a measurement tape, and the average velocity was estimated by making several trials using a bottle that travelled a distance of 10 m and we noted the time of the bottle to travel the said measured distance. At different points in the river the measurement was done several times, in order to get a good idea of the average time it will take for the bottle to travel 10 meters (Table 4). In doing so, we gathered the needed information (Figure 7). The velocity in every trial was calculated by dividing the distance by the time of the bottle to travel the given distance. The discharge was calculated by multiplying the velocity with the area of the water. The result was 26.01 m^3/s. Unfortunately, we were not able to compare our estimated discharge to the actual measured discharge. There was no data on the current discharge, and the discharge varies too much during the measured years in the report (NIA 1998) to actually compare the results. We also tried to estimate the amount of sediment in the water, but the water was very clear and we could not see any sediment transport.

Table 4: Velocity at different points in the river

	Distance [m]	***Average Time [s]***	***Velocity [m/s]***
Point 1	10,00	77	0,13
point 2	10,00	49	0,20
Point 3	10,00	19	0,54

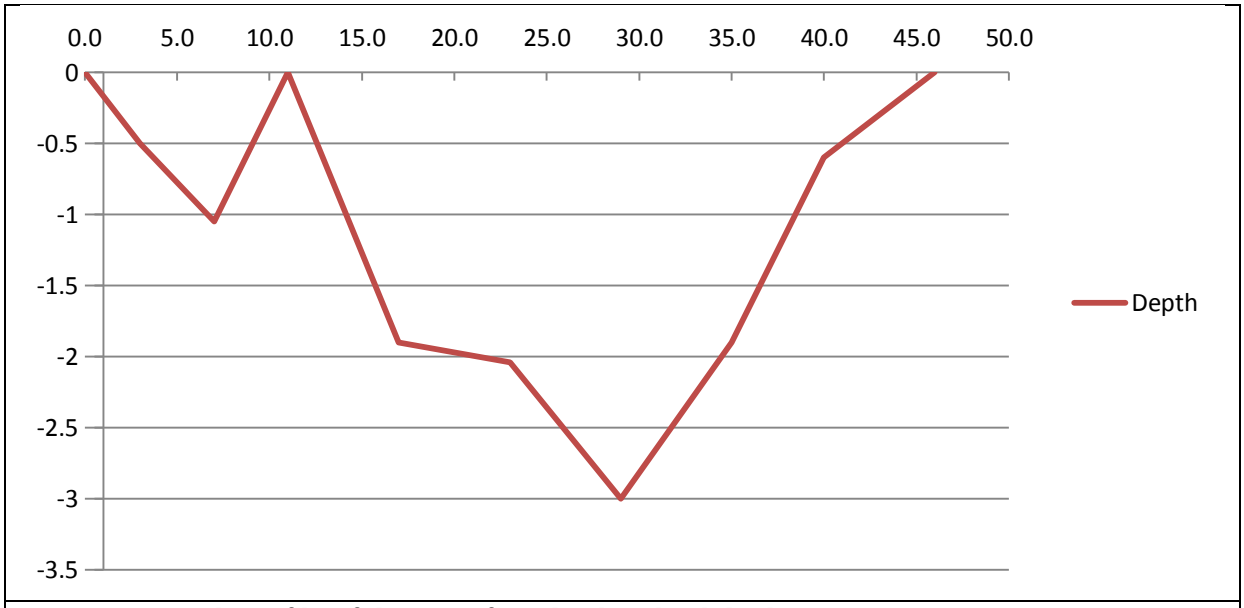


Figure 7: Depth profile of the river from bank to bank looking upstream

Summary
All the hydrological and physical characteristics of the proposed dam and the Tumauini River are shown in the table below:

Table 5: Summary of hydrological and physical characteristics (NIA 2012)

Component	***Dimensions***
Dam:	
• Type;	Central Core Earth; Rock fill
• Height (incl. 6.6m safety height);	81.60 m; 192.60 m asl
• Base width;	490.00 m
• Length;	340.00 m
• Hydropower generation;	7,000 KW
• Spillway;	3,384.26 m^3/s
• Lifetime;	50 years
Reservoir:	
• Area of the reservoir;	155.56 ha
• Riverbed elevation;	111.00 m asl
• Maximum water height;	188.64 m asl
Maximum volume of the water;	43.43 million m^3
• Normal water height;	186.00 m asl
Normal volume of the water;	39.53 million m^3
• Minimum water height;	157.03 m asl
Dead storage volume of the water;	11.70 million m^3
• Total storage capacity / average annual run off;	0.10
Afterbay dam:	
• Materials;	Rubble masonry
• Designed flood discharge;	2,818.94 m^3/s
• Water going to irrigation intake;	14.68 m^3/s
Watershed:	
• Area of the watershed;	163.2 km^2
• Average discharge during 1 year;	20.14 m^3/s
• Mean annual rainfall;	2,634 mm
• Mean annual runoff;	2,201 mm
• Siltation;	1,388.03 $m^3/km^2/y$ or 226 $*10^3$ m^3/y

DISCUSSION

With the results we gathered during the fieldwork, it is possible to answer the sub questions and subsequently the main question. A lot of information on the dam has been provided, including its hydrological and physical characteristics as summarized in Table 5.
Some hydrological processes will change after the dam is built. For instance, the discharge during the year. There will be a more constant discharge during the year, with the exception of when a flood occurs and the spillway has to be opened. Also, more water will be available for irrigation, because of the Afterbay dam. The Afterbay dam will make sure that more water will flow in the irrigation intake, and the Tumauini dam will make sure that there is enough discharge going to the Afterbay dam and the irrigation intake. Other hydrological processes, like rainfall, will not change because of the dam.

Flooding does not seem to be a problem in the watershed. We have talked to many local people and none of them could recall a serious flooding. Only two government officials recalled a flooding in 2008 or 2010. They were sure it was only one flooding, but they could not remember the year. Also, the dam is built to withstand a flooding that on average only occurs once every thousand years. The people we interviewed are not afraid the dam is going to cause a flooding. On the opposite, they believe it will protect them from flooding.

To answer the main question: does the dam influence the river? First of all, the discharge will be influenced. It will be more continuous throughout the year. The sedimentation will also change; it will be trapped by the dam. Under current conditions sediment is transported downstream. With the future dam, it will build up in front of the dam. The dam together with the Afterbay dam will provide water to irrigate more lands. According to local people, it will also provide more safety against flooding. Also technical data from the dam, like the buffer zone of 3.90 million m^3, tells us a flooding is less likely to happen.

ACKNOWLEDGEMENTS

We would like to extend our heartfelt gratitude to the following people and organizations who became part of the realization of this study: The Barangay Captain and Barangay Officials of Antagan I, Tumauini, Isabela for their unending support and hospitality; Sammy Divina and Federico Bello (farmers) for giving valuable information about the occurrence of flooding and landslides; Engrs. Martinez, Salvador, Fabros and Bacoling of NIA for giving us enough information about the proposed dam; and Engr. Dante M. Rapanut and Jennyvi B. Tumolva of the Local Government Unit (LGU) of Tumauini for the information on flooding. Lastly, we would like to thank our host family for the very nice and comfortable accommodation and for treating us as part of their family.

REFERENCES

Morris, G.L. and J. Fan. 1998. Reservoir Sedimentation Handbook

NIA. 1998. Tumauini River Multipurpose Project Feasibility Study. Springer: NIA, Quezon City.

NIA. 2012. Tumauini River Multipurpose Project Feasibility Study.

G. L. Asawa. 2005. Irrigation and Water Resources Engineering

DAM CONSTRUCTION, ANTAGAN, TUMAUINI: WASTE AND SANITATION MANAGEMENT

Bondee Peñaflor & Tessa van Duijvenbode

INTRODUCTION

Apart from researching the impacts the Tumauini, Isabela dam can have on the environment, it is also crucial to look at the impacts the actual construction of the dam can have on the environment and its population. Once construction on the proposed dam will begin, over 2,300 workers will enter the area of Antagan and will take up residence in the area for 5 years. Questions such as 'Where will they stay?' and 'How will they alter the current living conditions in the area?' arise and will need to be answered. In this chapter, a short research has been conducted regarding the waste and sanitation management of these employees and how these will alter the current situation in Tumauini Barangays Antagan I and Antagan II.

According to the feasibility assessment conducted by the National Irrigation Administration (NIA), 2,340 skilled construction workers will be employed for the duration of a 5-year construction plan (TRMP Feasibility Study Report, 2012). Even though a part of the workers will be employed from local communities, migrant workers will enter the living areas of Antagan I and II. Waste and sanitation management will have to be arranged for these temporary inhabitants. Seeing how the NIA will be in charge of most of the construction aspects, in what way will the barangays be involved in the waste and sanitation management of the construction workers? How will this management differ from their own management and in what way can they alter or influence each other?

The area where this research was conducted consists of two barangays closest to the proposed dam site, namely: Barangay Antagan I and Barangay Antagan II. Both these barangays lie downstream from the dam site and might benefit from the employment draft by the Tumauini River Multipurpose Project (TRMP), but might also be most affected by the management of the employees' living conditions.

RESEARCH QUESTIONS

General Question: How is the current waste and sanitation management in Antagan I and II, and in what way will the Tumauini dam construction influence this management in the Antagan area?

Sub questions:
How is waste and sanitation created by the Antagan barangays managed?

1. waste management
2. sanitation management
3. pesticides

How will waste and sanitation excess created by the Tumauini dam construction site be managed?

In what way can the waste and sanitation management of the construction site influence the downstream Antagan communities?

METHODS

Date	***Location***	***Activity***
Saturday, 19-01	Magoli	- Observation research area
Sunday, 20-01	Magoli, dam site, Antagan I, ARCON dumpsite	- Observation dam site - Interview inhabitants - Interview Brgy captain Antagan I - Observation dumpsite
Monday, 21-01	Antagan I, Antagan II, ARCON dumpsite	- ARCON dumpsite - Antagan II (shopkeeper/captain) - Interview inhabitants - Elementary school
Tuesday, 22-01	Tumauini Centro (barangay San Pedro)	- NIA visit - LGU, Interview MENRO - Interview hospital - Sampling index pesticides - Robin's Junkshop
Wednesday, 23-01	Tumauini Centro	- Sampling index pesticides - NIA visit

During the research's field work, qualitative data was collected from different key informants via interviews. Topic lists were used during these interviews which were often updated after new information was gathered from other informant groups. Since it was crucial for this research to find out as much as possible about the current waste and sanitation management, informants were not restricted to one specific group. Apart from inhabitants and government officials such as the Local Government Unit (LGU) and the appropriate barangay captains, the local hospital, elementary school, local shopkeeper and junkshop manager provided crucial information. Observation during and in between interviews, contributed to- and contradicted information gathered from the informants. Not only did this offer new insights, but it also taught us about the contradictory aspects of interviews. Furthermore, for background information on the inhabitants' pesticide use and how this affects the environment, we formulated an index of the available pesticides and how these are managed depending on the extent of environmental damage they cause.

Finally, aerial maps were shared with us by the Municipal Planning and Development Council (MPDC) for use in the study.

RESULTS

Question 1: How is waste and sanitation excess created by the Antagan barangays managed?

Waste management

Municipality

Since the war on waste started by the Philippine government in the 1990's, reducing the amount of residual waste has become a big priority in Tumauini municipality in Isabela. With the implementation of the Republic Act 9003, otherwise known as Ecological Solid Waste

Management Act of 2000, the municipality of Tumauini answered the government call by replying with a new and improved management plan. According to the Municipal Environment and Natural Resource Officer (MENRO), Dante Rapanot, segregation has become the key solution to improving Tumauini's waste management (Rapanot 2013, pers. comm.). To achieve the best results concerning segregation, inhabitants are required to segregate their waste at home, before the municipality collects the remaining wastes. Waste is sorted in the following three components: compost, recyclables and residual waste. In the Municipality of Tumauini, 12 [of the 46] barangays are actively involved in the LGU's waste collection program (Table 1). According to Rapanot, waste is collected daily by the LGU's garbage trucks and is taken to designated places to be further recycled (Table 2).

Table 1: Solid waste disposal of the municipality of Tumauini, Isabela (NIA 2013, in litt.)

Household (%)	***No. of households (Total: 13,767)***	***Practice***
4	551	Served by garbage truck
5	688	Practice composting/recycling
92	11299	Practice dumping + burning method
5	688	Practice dumping – burning method
4	511	Biodegradable as fodder

Table 2: Summary of waste disposed by source in kilograms per day Tumauini, Isabela

Biodegradable	***Recycle***	***Residual****	***Special* Hazardous (i.e. hospital)***	***Total***
9,136.13	5,973.60	2,284.04	175.70	17,569.47
52%	34%	13%	1%	100%

*Arcon dumpsite

Arcon dump

Residual waste and special hazardous wastes are collected and transferred to the nearby Arcon dumpsite in three daily truckloads. Arcon is one of the barangays of the Municipality of Tumauini. For the past 12 years, a plot of land located on the main road that leads from Centro to Antagan, a dumpsite has been created for the use of the entire municipality of Tumauini. According to Rapanot, since 2000, barangays have made the individual decision whether to use this facility or not. Since Centro inhabitants do not have the available space to do segregation themselves, Centro is the biggest supplier of waste to this dumpsite. According to LGU official workers, James Baquiran and Nestor Curugan, at the Arcon dumpsite, the dump receives an estimate of 4 truckloads on weekdays and double that amount on weekend days. After unloading at an LGU appointed area, collectors, also called 'scavengers', sift through the dump loads for recyclables (see "one man's trash…"). People (mainly women), including children, sort through the piles to salvage items for recycling. The course of action on what happens with the waste after further segregation becomes unclear after hearing different views. According to counselor Rapanot, the official procedure of the LGU is to bury the waste. Once in a while LGU loaders move the piles of waste into dug pits where the loaders will bury the waste under a layer of soil (Rapanot 2013, pers.comm.). According to LGU officials and collectors at the site though, most of the garbage is burnt. Who eventually sets fire to the waste is unclear. The collectors say it is the LGU officials, and the LGU, including Rapanot, blame the other side. What is known is that the current dumpsite is slowly filling up to its 2 ha capacity. Brgy Captain of Antagan II, Rodel Mariano, mentioned an LGU plan for a new dumpsite on the other side of the mountain, near San Vicente. According to the

captain the current site is not only causing flies infestations at a nearby resort, but is also costing the LGU rent money, since the dumpsite plot is actually privately owned by the Taccad family, Maligaya (Mariano 2013, pers.comm.). Rapanot denies both charges and claims the land as donated plus the resort has not had any complaints regarding flies. The proposed dumpsite, in Arcon, will be an improvement, says Rapanot, for the waste will be appropriately segregated and dealt with, in contrast with the recent Material Recovery Facility (MRF), which has not been functional since the 2003 typhoon Goring. In 2006, a team of Isabela State University students wrote an Initial Environmental Examination (IEE) to convert the Arcon dumpsite into a Sanitary Landfill that would comply with the RA 9003. According to Rapanot, the proposal could not be put through, because of budgetary reasons. The proposed plan for the new dumpsite has also not been approved yet and is not bound to start quickly because of financial deficiencies.

Compost

Biodegradable waste has been a rich source for the Tumauini municipality since the waste segregation started in 2000. According to Dante Rapanot, compost is collected by garbage trucks and brought to the municipality compost pit, where it is turned into a communal fertilizer. This fertilizer is bagged and sold to the municipality in Centro for a discount price, 200 pesos per 50 kg bag, compared to commercial fertilizer (Rapanot 2013, pers. comm.).

"One man's trash..."
"May pera sa basura"

The saying "one man's trash is another man's treasure" truly applies to the so called 'scavengers' of the Arcon dumpsite near Namnama, Tumauini. Mostly women and children come here during 2 dayshifts to freely collect anything recyclable from the dumploads. By collecting plastics, bottles, cans and metals which they turn over to their Junkshop of choice, these women often earn 300 to 400 pesos per week. Working even on weekends during the dump's rush hours (students join in on weekends), the women have been coming here since the dump's start 12 years ago. Sickness often occurs to these women, who during the interviews were standing kneedeep in garbage, in the form of fevers, headaches and open sores. Medicine bought at the local boutika often soothes the worst pains and for open sores the women use *Mimosa pudica*, also known as *makahiya* ('quite shy') (Roberts 2005). *Mimosa pudica* extract is known to be an effective immobilizer of the *strongyloides stercoralis* bacteria, which is often found in unsanitory and tropical, rural areas (Robinson et al. 1990). So fortunately the area that makes them sick, can also provide the cure!

Recyclables

Of all barangays of the Municipality of Tumauini, recyclables are fervently collected by both the LGU and the inhabitants. Junkshops scattered around the municipality collect and buy these recyclables and after little processing, resell them to specific buyers (Table 3). According to Robin Tamang, owner of Robin's Junkshop in Maligaya, Tumauini, junkshops are issued with Mayor's permit and are inspected once or twice a year by different government agencies for matters such as hygiene, taxes and fire safety. Robin's Junkshop is a main collector of recyclables in the Antagan area. Once or twice a month, Robin's employees collect recyclables in their area and bring it to the junkshop.

According to Dr. Melrose Lozada, though, recyclables can also contribute to serious health hazards in the Antagan community. Empty plastic bottles and cans, especially during rainy season, can hold stagnant water which attracts malaria- and dengue infecting mosquito (Dr. Lozada 2013, pers.comm.).

Table 3: Robin's Junkshop (Robin Tamang 2013, pers.comm.)

Recyclable	***Buy value (Tumauini)***	***Sell value (external)***	***Buyer***	***Buyer quantity per collection***
Plastic	16 pesos p/kg	18 pesos /kg	Recycle plant Santiago	100 kg
Glass bottles	1 pesos p/bottle	1.5 pesos /bottle	San Miguel Liquor plant	4000 bottles
Cans	4.5 pesos p/kg	5 pesos /kg	Cauayan plant	450 kg
Metal	14 pesos p/kg	unknown	unknown	unknown

Antagan

Both Antagan I and Antagan II have handled their own waste segregation program in accordance to RA 9003. All segregation management that is offered in Centro is done individually by the inhabitants of Antagan I and II (compost pit; residual waste burning; recycling for junkshops). The Arcon dumpsite is not used by both barangays; they do not even own a garbage truck.

According to Rapanot, 4 times a year meetings are held which are attended by all 46 Brgy Captains and other officials, concerning municipality matters. Whatever government issues are discussed here should be shared with the barangay inhabitants by the captain at mandatory barangay meetings. Former Antagan II counselor (1997-2003), Leonida Simeon, who is the current Antagan II Botika shopkeeper, says that even though yearly General Barangay Assemblies have been deteriorating slightly, barangays, through appointed Barangay Health Workers (BHW), still inform their inhabitants during dual meetings (June and December) about health-, policy- and waste matters. Even though officer Rapanot encourages inhabitants, in barangays who do not use the Arcon dumpsite, to only bury their waste in their backyard. Because of lack of soil space, Rapanot admits that most inhabitants do burn their waste (Table 1).

Despite the waste burning practices in both Antagan barangays, Antagan I was the winning barangay in the 2010 municipality environmental segregation competition organized by the LGU. A cash price of 50,000 pesos was awarded to the barangay and a certificate was presented to encourage both this and other barangays to maintain the segregation plan after the competition came to an end. According to Antagan I Brgy Captain, Reynaldo Rapadas, many people went back to burn their residual waste, but both composting and recycling were broadly supported and implemented. Rapadas encourages people to donate their compost to the local reforestation tree nursery as fertilizer. Both Antagan I and Antagan II are planning to hold a Purok segregation competition this coming year during the April 23rd general fiesta with cash prices ranging from 1000-5000 pesos for the winning Purok.

Sanitation management

Drinking water

According to a 2011 Barangay Survey conducted in Antagan, the full 100% of Antagan's 698 households get their drinking water from a shallow well (60 ft. and below (18 m. or less)). 600 of these households have their own water pumps and the other 98 make use of their neighboring wells (Barangay Survey 2011, in litt.). Brgy Captain Rapadas of Antagan 1 explains that a project was proposed by the National Waterworks & Sewerage Authority (NAWASA) to create a communal spring well further upstream the Tumauini River. Unfortunately budget was insufficient, so people remained reliant on their pump wells. Rapanot explains that rural areas can make due with a shallower well, especially Antagan, which is still relatively close to a clean water source (Tumauini River). In Centro most households need to dig deeper and get closer to 12-16 meters, where Antagan has pump wells with a reach of 6-8 meters. The fact that access to drinking water is a crucial aspect in the livelihoods of Tumauini inhabitants is something politicians have also noticed and often make use off. The first household in Sitio Magoli that was encountered had received their pump well from a politician. As officer Rapanot acknowledged: a lot of inhabitants will be enjoying clean water during the upcoming election months!

Diseases

Since most of the inhabitants have private or shared access to water, quantity is often not the problem. Considering that pesticide use and waste burning could contaminate the soil, pump wells are often at risk of becoming useless. According to Antagan inhabitants the wells often become corrupted by either rust or unidentifiable impurities. In these cases inhabitants often switch to buying their water in Centro from filling stations (Leila G. 2013, pers.comm.). Elementary school teacher Rapadas explains further how especially during the rainy season the groundwater level rises, which often brings impurities to the surface in the form of worms, thus the seasonal shift to bottled water. Barangay Health Workers (BHW), who are employed by the Brgy Captain, alongside the local midwife, monitor cases of diarrhea whenever these impurities come to the fore. The midwife reports weekly to the Municipal Hospital (barangay San Pedro, Centro), where the Rural Health Unit (RHU) can measure whether actions have to be taken. It is often practice that Sanitary Health inspectors, controlled by the Department of Health (DOH), are sent to a contaminated area or well to analyze the problem (Dr. Lozada 2013, pers.comm.). Contaminated wells are then usually treated with chlorine, which will purify the water for drinking for 6 months (Leonida Simeon 2013, pers.comm.). According to Dr. Melrose Lozada, the RHU is in charge of inspecting household water facilities and at least 96% of all the households' water sources have been inspected by water sampling and have been disinfected by chlorine treatment. Dr. Lozada explains that this is crucial for the prevention of massive outbreaks of diarrhea. Yearly the hospital deals with 1,151 cases of acute gastroenteritis (Dr. Lozada 2013, pers. comm.). Especially during rainy seasons, at least 50 to 60 people a day report to the hospital with diarrhea cases related to drinking water. It is therefore crucial, according to the doctor, that people either boil their drinking water during the rainy season or that they report to the local midwife or BHW who can arrange chlorine treatments with the RHU.

Waste water

Waste water management in the form of septic tanks is relatively new to the area of Antagan. Opposed to pump wells, politicians do not provide inhabitants with septic tanks. Most inhabitants in Antagan have not had septic tanks until the last 10 years or less. Before, it was the 'old tradition' of simply digging a hole (Reynaldo Rapadas 2013, pers.comm.). How long one septic tank will last one family was therefore often a difficult question. Many inhabitants had not experienced a full septic tank yet. One of the shopkeepers did have experience with a full septic tank, but she simply dug a new hole for a new tank and covered the old one. Where animal manure is often used as a fertilizer, human waste is not something the inhabitants see fit for compost.

Most of the inhabitants of Tumauini have access to a septic tank for their Comfort Rooms (CR) (Table 4). Because the septic tanks are closed off to the surrounding soil, soil contamination through personal waste water does not pose a hazard. Other sources of waste water though, could pose a problem. Inhabitants in Antagan do not always use their septic tanks; waste water derived from cooking, washing clothes and personal washing is often drained into the ground, either nearby or away from the household. Inhabitants often install drain pipes which lead 10-12 m. away from the household into the soil. Since clothes and personal washing often includes non-biodegradable soaps and shampoos, these materials eventually end up in the groundwater. Monitoring these drain canals is something the barangays don't always do, according to Leonida Simeon. Households close to the river with the drain canals leading towards the water are considered critical by the barangay, and there are plans to educate these households about appropriate water management (Simeon 2013, pers.comm.)

Table 4: Human Waste Disposal (Tumauini, Isabela) (NIA 2013)

Household (%)	***No. of household***	***Disposal Method***
82.66	11380	Water sealed toilets
7.16	986	Closed pits
7.90	1088	Open pits
2.28	314	Other kind of toilet

Pesticides

Use of Pesticides

To determine the current quality of the Tumauini river water, it is essential to look at all possible environmental impacts inflicted and/or caused by the inhabitants of Antagan. Besides negligent disposal of waste, pesticides can also negatively contribute to the quality of the irrigation system and thus to the river and soil quality in the Antagan area. Proper and environmental friendly use of these agricultural supplies is crucial to ensure water safety for current and future inhabitants.

Pesticides are of different kinds; Insecticides kill insect pests that feed on the crops (Tayo et al. 2004). It comes in powder, paste or liquid form (Odum 1971); Herbicides or weedicides are applied to kill or eliminate weeds (Tayo et al. 2004). It is also applied for forest management and in agriculture. Also, it is applied to clear railroads and highways from weeds (Odum 1971); Molluscicides are designed to kill mollusks (Agpoon and Pul 2011). It is especially used to fight the apple snail, a mature nuisance in rice paddies.

As to the farming practice of farmers, they often ensure that their crop production would tend to increase. During the sixties, the Green Revolution of the government was launched to increase crop production, particularly rice. It introduced complete rice technology which includes high yielding varieties, application of chemicals (pesticides, fertilizers) and constructions of dams to ensure irrigation and rural credit (Mabasa 2002).

As an emerging rice farming system, in order to increase crop production of farmers, there is considerable literature on farmers' dependence on pesticides (Agpoon 2012). The use of chemicals to control pests and even fertilizers for the soil has been a major factor in increasing productivity of modern agriculture.

Pesticides or biocides are chemical substances designed to kill or eliminate organisms (insects, weeds, rodents, etc.) and are considered undesirable (Agpoon 2012). Many inhabitants claim that the uses of pesticides, like POWER, are unwanted since they can cause serious damage to the soil. According to LGU engineer Daniel P. Ballacua, the massive increase of pesticides and fertilizers back in the 70s and 80s have also contributed heavily to soil erosions. Mainly herbicides kill and loosen the soil which in turn creates landslides and silts the rivers. When these rivers block up, floods can occur (Ballacua 2013, pers.comm.)

Chemical inputs are used to increase crop yield (Agpoon and Pul, 2011) and agricultural pesticides hold the largest percentage of it. Pesticides, if improperly applied or indiscriminately used, may pose threats to the environment and to human health (Agpoon, 2012). Chemical substances of pesticides could contaminate the surrounding soil, water and even the air and it can also bring harm to the applicator himself (Agpoon, 2012), especially on an untrained farmer because he may use the wrong pesticide, at unnecessary high concentrations.

The uncontrolled use of agricultural pesticides could even contaminate the whole watershed (Agpoon, 2012). Pesticides are designed to solve all pest problems forever (Odum, 1971), but some pests are now resilient to such pesticides, while people would suffer from health problems (Agpoon and Pul, 2011). The worst thing that could happen is when people or the farmers apply these pesticides near their houses. There would be a big possibility that people in these households inhale these chemicals and so it could provoke serious health problems. Moreover, these chemicals would percolate under the ground and so it can contaminate the water of deep wells or pump wells. Chemicals in pesticides could also cause severe damage to the biological environment, example in the mature killings of fish stocks (Agpoon and Pul, 2011) and even to the bird species and other organisms vulnerable to it.

Pesticides Used

Farmers of the Antagan Barangays grow rice and corn in a total area of 2000 hectares. An irrigation system that receives its water from the upland rivers supplies the farmland with water. The residual water flows on towards Tumauini and subsequently enters the Cagayan River (Agpoon and Pul, 2011).

People in the Antagan community often used insecticides and herbicides. Rice fields which are more prone to insects compared to cornfield are sprayed with insecticides. On the other way around herbicides are often use for cornfield because of the weeds and grasses dominating in it.

During the interview conducted in the Antagan community, it shows that the most frequently used pesticides are Spitfire, Karate, and Vindex (Table 5).

Table 5: Pesticides used by Antagan community and its classification

Respondents	***Pesticides Used***	***Classification***
Julie C.	Mower Spitfire	Herbicides Herbicide
Fred C.	Spitfire Power	Herbicides Herbicide
Eugenio A.	Karate Vindex Chix Magnum Mower Power Round up Spitfire	Insecticides Insecticides Insecticides Insecticides Herbicides Herbicides Herbicides Herbicides
Reynaldo R.	Karate Vindex Spitfire Clear Out 2,4,D	Insecticides Insecticides Herbicides Herbicides Herbicides
Leonida S.	Spitfire Karate Magnum Triple 8	Herbicides Insecticides Herbicides Insecticides
Rodel M.	Vindex Armure Triple 8 Spitfire	Insecticides Insecticides Herbicides Herbicides
Rosemarie B.	Spitfire Mower	Herbicides Herbicides
Leila G. & Ernesto G.	Vindex Experimental mixture: Hot peppers, detergent and water	Insecticide Insecticide

Applications of Pesticides

During the General Barangay Assemblies, the Barangays of Antagan I and II gather all farmers of the community to conduct meeting concerning pesticides applications (Rapadas, pers. comm., 2013). They inform the farmers about the good and bad pesticides which can bring harm to the environment. According to MENRO Rapanot the government is not actively involved in regulating the use of pesticides among its inhabitants. Republic Act No. 6969, or Toxic Substances and Hazardous and Nuclear Waste Control Act of 1990, "provides for the regulation of all chemical substances that may pose threats to public health and the environment through import, manufacture, sale, use, distribution, and disposal as well as the regulation of all hazardous wastes from generation, transport, storage, re-use/recycling, treatment and disposal" (WEPA, RA No. 6969 2013). Even though Agri-suppliers in Centro are certified with a mayor's approval concerning the selling of hazardous wastes, disposal or

use management concerning these wastes are not regulated. The only way the municipality is managing its pesticides hazardous nature is by informing the public about the environmental damage by means of colourlabelling its sold pesticides (Figure 1). Green labels (environmentally friendly), blue labels (environmentally safe), yellow labels (environmentally hazardous) and red labels (environmentally poisonous) inform buyers on the damage they can inflict on their natural surroundings (Maxima H. 2013, pers.comm.). By national order, red labels have been banned from commercial buying and selling and recently LGU officials are attempting to ban the yellow label as well (Rapanot 2013, pers.comm.).

Of course pesticides can be detrimental to the environment (Rapanot, pers. comm., 2013). Pesticides can pose severe danger to human health (Lozada, pers. comm.2013). However, there are still those who do not know the effects of pesticides on the environment and on human health. "I do not know if it is harmful to the nature" (Caingitan, pers. comm. 2013).
Most of the respondents who were interviewed said that applying pesticides should be in necessary amounts. They are following the prescribed directions for use which is stated at the label of the pesticides used. According to (Acenas, pers. comm. 2013), he strictly follows the indications on the pesticides. On the mixture; a solution having less amount of pesticides, can still be attacked by pests (Acenas, pers. comm. 2013), when it is too much of the amount of the pesticides in the mixture, the leaves of the crops can wither. There are those who don't follow the indications on the pesticides (Rapadas, pers. comm. 2013). They are making solutions which are often based on experience (Rapadas, pers. comm. 2013). Once again it is the farmers' choice on what to use and how to use it (Simeon, pers. comm.2013).

Brand	# quantity	Insecticide/herbicide	Price (p/l)	Label
Spitfire*	7	Herbicide	290	Green
Clear Out*	9	Herbicide	330	Green
Karate*	8	Insecticide	480	Yellow
Cymbush*	9	Insecticide	350	Green
Machete*	9	Herbicide	500	Green
Sonic	8	Herbicide	400	Green
Sofit	8	Herbicide	700	Green
Xpress	5	Insecticide	290	Green
Bida	8	Insecticide	580	Yellow
Gramoxone	7	Herbicide	470	Yellow
Vindex*	7	Insecticide	660	Yellow
Siga	4	Insecticide	430	Yellow
Magnum*	8	Insecticide	350	Green
Armure	7	Insecticide	2080	Blue
Pyanchor	7	Herbicide	1600	Green
Chix*	7	Insecticide	598	Blue
Triple 8*	3	Herbicide	270	Green
2,4,D*	6	Herbicide	280	Yellow
Mower*	4	Herbicide	270	Green

*Used and mentioned by Antagan inhabitants

Figure 1: Pesticides sold by Tumauini Agri-suppliers

Question 2: How will waste and sanitation excess created by the Tumauini dam construction site be managed?

Employment

When the proposed dam will be built, 2,340 employers will be working and/or living near a designated area for the construction of the Tumauini dam. According to the NIA, priority employment of the regular construction workers will be given to Antagan I and the surrounding barangays. In the National Irrigation Administration (NIA) Feasibility Assessment exact numbers though, are not supplied concerning the percentage of local employees. NIA does mention that "the composition and number of construction workers that will be employed by TRMP will vary as the work progresses" (TRMP Feasibility Study Report, 2012: 78). This incomplete information regarding the employment [numbers] worries the Brgy Captains of Antagan I and Antagan II. According to the NIA, meetings concerning these issues have already been conducted with the appropriate barangays. Brgy Captain Antagan II Rodel Mariano though informs that no consultations concerning labourers have been organized in their barangay. Mariano expresses worries on both the labour percentage and the access road which will pass directly through the Antagan barangays: "…we are dependent on compensation!"(Mariano 2013, pers.comm.). Brgy Captain Antagan I Reynaldo Rapadas is also hoping for a compensation agreement for employment, mostly for the barangays out of school youths and unemployed.

NIA management plan

Crucial for setting up management plans concerning waste management and sanitation regulations, is clear knowledge about the living conditions and site of the construction's employees. On the matter of the employees' living locations Captain Rapadas is very clear: concerned about the safety of his inhabitants, Rapadas expresses that he would like his employed inhabitants to live in their current houses and that only necessary technical workers will reside at the construction site itself. Not only will this cause less impact on the current waste management of Antagan, but this will also cause less environmental damage at the construction site area (Rapadas 2013, pers.comm.). Mariano on the other hand thinks all the employees will live near the construction site (Mariano 2013, pers.comm.).
According to both barangay captains, sufficient knowledge concerning these crucial matters should be provided to the surrounding areas. Not only have the barangays not been informed about any plans concerning the employees living conditions, but all the NIA mentions about the workers living conditions and location is the following: "The essential office headquarters, bunkhouses and sanitary facilities, source of potable water and waste management and disposal program will be strategically put in place and operationalized" (TRMP Feasibility Study Report, 2012: 78-79). Therefore mapping the dam construction's waste and sanitation management plans becomes unnecessarily and frustratingly difficult for the involved parties.

Waste and sanitation

In the EIS report provided by the NIA, estimates concerning waste and sanitation management of the constructions employees are generally provided. Waste generation and management are estimated to reach 210 tons of solid human waste per year (EIS Report (November 12 2012), 235). Air- and liquid waste are considered nonexistent for the proposed project. Furthermore, solid waste management is set to consist of water sealed toilets in the NIAs Pollution Control System (PCS) (EIS Report (November 12 2012), 225). Considering

that 82.66% of the Antagan communities use those same solid waste management tools (Table 4) in the form of septic tanks, more specific information is needed as to where and how these facilities will be created. Also, on drinking water further specific information is needed concerning the source. According to the EIS Report, ground water levels are measured at 3-10 meters in depth, which means that the same pump wells used in the Antagan communities can be used for the construction employees (Barangay Survey 2010, in lit.; EIS Report (November 12 2012), 226). It is unclear if these same facilities will be provided.
Finally, waste management of non-biodegradable waste is shortly mentioned in the EIS Report under the Impact Management Framework of TRMP (EIS Report, 81-89). Any mentions of these management plans refer to 'proper disposal programs' and 'segregation', to be arranged by the NIA and the contractor (EIS Report, 81). Specific details surrounding these programs and ways of segregation are not mentioned.

Question 3: In what way can the waste and sanitation of the construction site influence the downstream Antagan communities?

Dam construction site management
Since information concerning the employees' facilities is inconclusive and incomplete, multiple options concerning waste, drinking water and sanitation during the construction are feasible. These options can all affect the Antagan communities in different ways. It is therefore up to the NIA to decide upon the least damageable and most beneficial solution to these construction matters. In the following tables, multiple management options have been provided. Possibilities have been divided into either dam construction site localization or accommodations in the existing Antagan communities. In case the construction workers will reside at the construction site area, new facilities will need to be put in place to provide for 5 years of construction. Should NIA decide to accommodate the construction workers mainly in the Antagan area, existing waste management (Table 6) and sanitation management (Table 7) plans can be adopted for the employees.

Table 6: Proposed options for NIA dam construction: Waste management

Waste management			
Residual waste			
Construction site		*Antagan area*	
Garbage truck pick up by the LGU waste management program. Waste will be dumped at the Arcon dumpsite (D. Rapanot 2013, pers.comm.)		Adopt burning/burying method (Captain Rapadas 2013, pers.comm.)	
Pros: - Will not interfere with Antagans waste management - After construction finishes Antagan can enter the LGU waste management program	Cons: - Garbage trucks will have to enter the Antagan area to reach construction site - Temporary dump areas near construction site	Pros: - No waste traffic (garbage trucks) in Antagan - No additional waste on Arcon dumpsite	Cons: - Added air/soil pollution - Health risks - Prohibited by RA 9003 - Construction site waste needs to be either disposed in the dam site area or transported to Antagan

Compost			
Construction site		*Antagan area*	
Compost pick up by LGU trucks for municipal compost production; fertilizer (Rapanot 2013, pers.comm.)		Individual compost pits. Fertilizer production for personal- and communal use or barangay tree nursery (Rapadas 2013, pers.comm.)	
Pros: - Increase LGU fertilizer sales income - Increase quantity municipal fertilizers	Cons: - Compost pickup trucks will enter the Antagan area to reach construction site - Temporary compost dump site near construction area: attract insects	Pros: - Creates positive social cohesion within the community and the construction workers - Beneficial for tree nursery and reforestation	Cons: - Improper use of composting can attract insects. This can cause crop threats or human health risks. - Dam site compost waste needs to be disposed at the dam site area or transported to Antagan
Recyclables			
Construction site		*Antagan area*	
Recyclables pick up by LGU trucks for junkshop sell (Rapanot 2013, pers.comm.)		Individual pick up by junkshop personnel operating in the Antagan area (Tammang 2013, pers.comm.)	
Pros: - Increase LGU income on junkshop sellings - Good exemplary governmental waste segregation (in accordance with RA 9003)	Cons: - Recyclable pickup trucks will enter the Antagan area to reach construction site - Temporary MRF	Pros: - Individual employee income on recyclables - Increase income Antagan operating junkshops	Cons: - Increase mosquito by collections of stagnant water in recyclables (dengue, malaria) (Lozada 2013, pers.comm.)

Table 7: Proposed options for NIA dam construction: Sanitation management

Sanitation management			
Drinking water			
Construction site		*Antagan area*	
1. Natural spring well near the construction site. Sufficient budget can operationalize the well into a source of drinking water (Rapadas 2013, pers.comm.)		1. Individual or neighbouring pump wells. To be installed and regulated by NIA (Rapadas 2013, pers.comm.)	
Pros: Natural water, no filtering expenses - No water transportation to the construction site - After construction, spring well can benefit Antagan area	Cons: - Operationalizing costs for spring well - Regular water quality inspections - Extra workload RHU (inspections) - During rainy season, increase water impurities	Pros: - Natural water, no filtering expenses - Individual water dispensers - Personal water quality control inspections	Cons: - During rainy season, increase water impurities - Depletion groundwater - Regulation costs - Drinking water needs to be available at construction site

<table>
<tr><td colspan="2">2. Consumption drinking water from Centro, Tumauini (Rapanot 2013, pers.comm.)</td><td colspan="2">2. Consumption drinking water from Centro, Tumauini (Lozada 2013, pers.comm.)</td></tr>
<tr><td>Pros:
- Water safety; less waterborne diseases
- Quantity is always sufficient</td><td>Cons:
- Water transportation trucks will enter the Antagan area
- Additional expenses</td><td>Pros:
- Water safety: less waterborne diseases
- Quantity is always sufficient</td><td>Cons:
- Water transportation trucks will enter the Antagan area
- Additional expenses
- Drinking water needs to be available at the construction site</td></tr>
<tr><td colspan="4">Waste water</td></tr>
<tr><td colspan="2">Construction site</td><td colspan="2">Antagan area</td></tr>
<tr><td colspan="2">Modern sanitary facilities: toilets, pipelines to joint sceptic tank and waste water collection site (Mariano 2013, pers.comm.)</td><td colspan="2">Adapt to existing sanitary facilities: CRs, sceptic tanks and waste water drain canals (Rapadas 2013, pers.comm.)</td></tr>
<tr><td>Pros:
- Clean facilities; less disease prone
- Area is mostly empty
- Bigger surface for joint sceptic tank</td><td>Cons:
- Construction site is near the river. Waste water could easily access the river: problems downstream
- After construction useless pipe systems and sceptic tank
- Digging pipelines</td><td>Pros:
- Adopt to existing system
- Left over sceptic tanks can be used by Antagan communities</td><td>Cons:
- Waste water canals can contaminate ground water
- Left over sceptic tanks after construction finishes: in case of non-reusability
- Decrease of available space
- During construction extra sanitary facilities need to be provided at dam site; or else river pollution</td></tr>
</table>

RECOMMENDATIONS

Acknowledging the serious impacts of wastes and lack of sanitation have on health and environment, it is important that not just the policy-maker who has the responsibility and accountability for this endeavor, but also each individual and the whole community should get concerned about this, in order to protect the present generation. It is imperative also that necessary care should be exercised to lessen the effect of our actions onto man and the environment. For the NIA to fully comply with the wishes of the surrounding areas and its inhabitants and to follow the nation's regulatory laws, such as RA 9003, further management plans have to be conducted before the construction of the dam is to begin.

Therefore, we propose the following actions to be taken by the NIA:

- A decent accommodation plan concerning the employees needs to be in place, since construction will start shortly after the proposal is approved.
- The concerned parties, such as the Antagan barangay captains and the LGU, need to be properly informed about the full construction plans. This includes sewage, road construction, accommodation and waste management.

- Management plans for the employees' accommodation matters during the construction of the dam should involve long time benefits for the surrounding areas (spring wells, waste collection, improved infrastructure).
- Environmental safety precautions should be included in the management concerning the employees' accommodation. These safety precautions should be shared with surrounding areas and, if not already in place, implemented there.

ACKNOWLEDGEMENTS

We would sincerely like to thank Captain Alcaraz of the barangay of Maligaya for his warm hospitality during our field research. Even though they remained anonymous, also a heartfelt thank you to the guards that kept us safe at night and whom we could share our food with! Furthermore a thumbs up for our faithful tricycle driver, Bryan, who was patiently waiting for us every morning on our doorstep and who would sound and safely return us to our temporary homestead by dusk. Finally we thank all our informants, from inhabitants to officials to volunteers, for letting us into their homestead or office and providing us with lots of information!

REFERENCES

Agpoon, V.Y., 2012, Pesticide Usage and Perceptions Among Farmers on Rice Production in Cabagan, Isabela, ISU- Cabagan.

Agpoon, V.Y., Pul, N., "Determining Pesticide Usage and Consequences in the Tumauini Community", Weerd, M. van, Aquino, D., Masipiquena, M., Persoon, G., *International course on water and water management in the Philippines 3-30 January 2011*.

Barangay Survey 2010, Antagan communities

Botkin, D.B. Keller, E.R., 1995, Environmental Science: Earth as a Living Planet, 2nd edition, Canada.

Deauna, M.C, Durado, S.L., 2002, Environmental Science for Philippine Schools, Phoenix Publishing House, Inc.

Municipality of Tumauini, Isabela, LGU, *10-year ecological solid waste management plan*, Chapter 4: Waste Characteristics, pp. 45-46.

National Irrigation Administration (NIA), *Feasibility Study Report (revised)*, December 8th 2012.

National Irrigation Administration (NIA), *Environmental Impact Statement (EIS)*, November 12th 2012.

Odum, E.P., 1971, Fundamentals of Ecology, 3rd edition.

Roberts, L., Janovy, Jr., J. Foundations of Parasitology. 2005. 412-415.

Robinson RD, Williams LA, Lindo JF, Terry SI, Mansingh A (1990). "Inactivation of strongyloides stercoralis filariform larvae in vitro by six Jamaican plant extracts and three commercial anthelmintics". *West Indian Medical Journal* 39 (4): 213–217.

Tayo, G.T, et al., 2004, Fundamentals of Environmental Science, Trinitas Publishing

WEPA, 26-01-2013, RA No 6969
http://www.wepadb.net/policies/law/philippines/ra6969.htm

APPENDIX I

Key informants

MENRO, LGU	Dante Rapanot
LGU engineer	Daniel P. Ballacua
Antagan I Brgy Captain	Reynaldo Rapadas
Antagan II Brgy Captain	Rodel Mariano
Rural Health Hospital	Dr. Melrose Lozada
Botika owner Antagan II (former Antagan II Councilor 1997-2003)	Leonida Simeon
Elementary School Teacher/Wife Brgy Captain Antagan I	Mrs. Rapadas
Inhabitants	Julie C., Fred C., Rosemarie B., Eugenio A., Leila G. and Ernesto G.

IMPACTS OF BUILDING A DAM ON THE DIVERSITY OF EXISTING FLORA AND FAUNA AT ANTAGAN I, TUMAUINI, ISABELA

Rocel Galicia, Lilian van Herpen & Jilmar A. Juan

INTRODUCTION

Biodiversity is the variety of life, in terms of genetic diversity, species diversity and ecosystem diversity. It provides several benefits including food, medicine, industrial raw materials, etc. Due to its nearness to the Northern Sierra Madre Natural Park (NSMNP), Tumauini is an important area for biodiversity. Therefore, this study has looked at the biodiversity of flora and fauna at the possible construction site of a dam and its reservoir in the area of Tumauini, Isabela. The building of this dam may have an effect upon the local flora and fauna, particularly at aquatic fauna, birds and flora. Flora refers to plant life and fauna to animal life, with aquatic fauna in particular referring to those animals that spend their life in a freshwater environment.

Tumauini is also an agricultural area, as are the areas downstream of where the dam may be built. The presence of both birds and fish is a good indication of the current state of the area, including water quality and insect populations. Aquatic fauna is an important food source for the local population while the flora forms the habitat for all land animals, including birds.

Additionally, the study has looked at the variety of plant and animal species and their conservation status. In the case of aquatic fauna, the study has looked specifically at the local species of fish, molluscs and crustaceans. An inventory of the present species and their abundance has been made at the site of the proposed dam and its surrounding area. By looking at the habitats and habits of the species found, we have made a prediction of the effects of the dam and reservoir, 5 years after the build has been completed.

RESEARCH QUESTIONS

1) What is the current occurrence of fish, mollusk and crustacean species and how will they be impacted by the building of the dam?
1.1 What are the current species present and what is their International Union for the Conservation of Nature (IUCN) ranking? (ask fishermen)
1.2 Are any of the species migratory?
1.3 What is the likely impact of the change in habitat once the dam is built?

2) What is the current occurrence of bird species and how will they be impacted by the building of the dam?
2.1 What are the current species present and what is their IUCN ranking? (ask guide)
2.2 Are any of the species migratory? (maybe not possible)
2.3 What is the likely impact of the change in habitat and food sources once the dam is built?

3) What is the current occurrence of flora species and how will they be impacted by the building of the dam?
3.1 What are the current species present?
3.2 Will there be any reforestation projects to replace the lost trees?
3.3 Will the flora (or at least the larger trees) be removed from the site of the reservoir?
3.4 What are the possibilities for future growth of aquatic plants in the lake?

METHODS

- Random sampling survey for aquatic fauna → 6 respondents
- Random sampling: Given very little time, we interviewed every fisherman and hunter we could find.
- Survey: One of the easiest ways to get information about the local fish is to ask the fishermen and the people who sell fish. Since we could not go to a market, we asked the fishermen instead.
- Point count for birds → 5 surveys with McKinnon lists

By doing point counts for a set amount of time (20 min per point count), we could indentify most of the species in an area. Using The McKinnon lists work as follows:

Every time you see a bird, you write down which kind. Each new species gets a number until you hit 5 (in our case, using 10 is more common). At that point, you write down the number of new species you have seen since you started the survey. In the first list this is automatically 5, in subsequent lists this number will go down and down until, for several lists, you have no more new species. At this point you have likely seen all the species in the area. (Except perhaps the truly rare or shy ones.)

- Strip plots for flora → 5 plots of 5x20
- Strip plots provide a way to get information on (most of) the species present in an area. By choosing a small area and determining the species inside, and repeating this several times, we could find out most of the species present, except perhaps the truly rare ones.

Table 1: Time schedule

Day	***Activity***	***Result***
1	-Travel to Tumauini -Surveys	 2 respondents
2	-Travel to campsite -Point count -Survey	 2 point counts 1 respondent
3	-Point count -Strip plot -Survey	2 point counts 3 plots 1 respondent
4	-Point count -Strip plot -Survey	1 point count 2 plots 2 respondents
5	-Visit Municipal Environment and Natural Resources Office (MENRO) Tumanuini -Travel back to Cabagan	

RESULTS

For research questions 1.1, 1.2, 2.1, 2.2 and 3.1:
-38 bird species identified (See appendix 2)
-31 flora species identified (See appendix 2)
-18 aquatic fauna species identified (See appendix 2)

Figure 2: Flora and fauna found at the site. Pictures by Lilian van Herpen.

Question 1.3: What is the likely impact of the change in habitat once the dam is built? (Aquatic fauna)

Partial answer on Environmental Impact Statement (EIS) Report p. 72:
"About 10 percent or 14 hectares of the reservoir area will be allocated for fish production, particularly tilapia, using developed fish cages."

Table 2: Prediction of the effects of the proposed dam and reservoir on freshwater species

Local name	***Common English name***	***Scientific name***	***Habitat/Habits***	***Prediction***
Igat	Freshwater eel	*Anguilla marmorata*	Lives on the bottom of rivers, lakes and estuaries.	The reservoir will likely be a suitable habitat.
Bunnug	Large snout Goby	*Awaous melanocephalus*	-	-
Dalag	Mudfish	*Channa striata*	Living up to its name, this fish sometimes moves onto the land and lives mostly in shallow water.	The deep lake of the reservoir will not be a suitable habitat.
Paltat	Hong Kong Catfish	*Clarias fuscus*	"Adults occur in streams, ponds, ditches and reservoirs. They prefer deeper pools and tend to hide under thick mats of vegetation; are nocturnal feeders foraging on small fishes, worms, crustaceans and insects."	As this species occurs in reservoirs, the proposed reservoir will likely we a suitable habitat.
Palakang-bukid	Luzon wart frog	*Fejervarya vittigera*	Lives on the river banks and in wet fields.	As it does not live in the river or lake, it will likely be unaffected.
Ikan	Squaretail Murrel	*Liza vaigiensis*	Juveniles may be found in rice fields.	Considering the expanded rice fields after the project is completed, the habitat for juvenile Squaretail murrels will be greatly expanded.

Local name	***Common English name***	***Scientific name***	***Habitat/Habits***	***Prediction***
Agurung	Univalve	*Melanoides turricula*	This species lives in flowing water.	As the water of the lake will be standing, this species will need to move upstream or downstream of the proposed reservoir.
Kurilao	Catfish	*Netuma thalassina*	This species is mainly marine, but can be found in fresh water.	This species feeds mainly on shrimp and crabs, which will be negatively impacted by the lake. However, it also feeds on small fish so it may be unaffected.
Tilapia	Native (Mozambique) Tilapia	*Oreochromis mossambicus*	Freshwater and brackish, depth of 1-12m. Tropical areas. " Inhabit reservoirs, rivers, creeks, drains, swamps and tidal creeks; commonly over mud bottoms, often in well-vegetated areas. Also found in warm weedy pools of sluggish streams, canals, and ponds."	As this species occurs in reservoirs, the proposed reservoir will likely be a suitable habitat. Will be used in aquaculture.
Mori	Marble Goby	*Oxyeleotris marmorata*	Basins, rivers and other water bodies.	This species will likely be unaffected.
Basikul/Suso	Channeled applesnail	*Pomacea canaliculata*	Freshwater, continuous reproduction in tropical areas.	This species will likely be unaffected.
Agatol	Freshwater crabs	*Sundathelphusa sp.*	These crabs live in shallow water, on the edges of the river.	The deep water of the reservoir will not be a suitable habitat.
Susay	Feathered river-garfish	*Zenarchopterus dispar*	-	-
Borasei/Burasi	Unknown	Unknown		
Burarog	Unknown	Unknown		
Imelda	Asian carp	Unknown		
Lasik	Shrimp	Unknown	Both kinds of shrimp live in fast-flowing and standing shallow water.	As the banks of the proposed reservoir are quite steep and the water very deep, it will not be a suitable habitat for either species of shrimp.
Lasik ti bato	Shrimp	Unknown		

Question 2.3: What is the likely impact of the change in habitat and food sources once the dam is built? (birds)

Answer: New situation: Deep lake (proposed reservoir), 155.56 ha.
Rainforestation: 483.29 ha. Narra, Tindalo, Ipil, Kamagong, Balete, Tibig and Hauali
Agroforestry: 161.25 ha. Coconut, Mango, Nangka, Citrus and Kakawate/Ipil-ipil
Bamboo: 37.93 ha. Bayog, Kawayan Tinik and Buho

Table 3: Prediction of the effects of the proposed dam and reservoir on local birds

Common name	***Scientific name***	***Habit/Habitat***	***Prediction***
Common sandpiper	*Actitis hypoleucos*	Wetlands: mountain streams and rivers, edges of ricefields, ponds and marshes, coral flats.	The extended rice fields would provide a suitable habitat, however the loss of quite a large area of streambed would have a negative impact. It would need to move to the upstream and downstream areas of the proposed reservoir.
Sunbird sp.	*Aethopyga sp.*	-	-
Indigo banded kingfisher	*Alcedo cyanopectus*	Rocks/branches near clear freshwater streams up to 1500m.	This species is dependant upon streams for fishing. The lake would be unsuitable as habitat. It would be forced to move far upstream or downstream. Downstream is unlikely as this is a populated area and the kingfisher is a rather shy bird. Upstream however, it may find a suitable habitat.
White-breasted wood swallow	*Artamus leucorynchus*	Forest edge and in clearings, open and cultivated areas up to 1800m.	This bird will likely thrive in agroforestry areas.
Little heron	*Butorides striatus*	Exposed coral reefs or edge of tidal creeks, mangroves, lakes, rivers, streams and fish ponds.	The proposed reservoir will likely be a good habitat.
Philippine coucal	*Centropus viridis*	Grassland, mixed cultivation, second growth and forest, up to 2000m.	Both the agroforestry and reforested areas will be good habitats
Pygmy swiftlet	*Collocalia troglodytes*	Forest, clearings, logging roads, fish ponds and mangroves. Low to middle elevation. Nests in caves or under bridges near forest.	The reforested areas will be a good habitat. It is unsure if these areas will provide nesting sites, however.
Large-billed crow	*Corvus macrorhynchos*	Forest edge to open country, coconut plantations and edges of towns.	The large-billed crow will likely not be influenced by the dam or its reservoir.
Wandering whistling duck	*Dendrocygna arcuata*	Freshwater wetlands from marshes and swamps to rice fields. Sometimes in brackish ponds.	One of this duck's habitats is the rice fields. As these will be extended to 8,200 ha by the dam project, it will profit from the proposed project.
Red-keeled flowerpecker	*Diaceum australe*	Canopy in forest, forest edge, second growth and shrubs in open country. Fruiting and flowering trees.	The Red-keeled flowerpecker will probably profit from the reforestation and agroforestry projects.

Common name	***Scientific name***	***Habit/Habitat***	***Prediction***
Bicoloured flowerpecker	*Diaceum bicolor*	Canopy in forest and forest edge, second growth in fruiting and flowering trees. Usually below 1000m, but has been seen at 2250m.	This flowerpecker will also profit from the reforestation and agroforestry projects.
Little egret	*Egretta garzetta*	Wetlands from marshes and rice fields to tidal flats.	The amount of (irrigated) rice fields will be extended to 8,200 ha. As this is one of the Little egret's habitats, it will profit from the building of the dam.
White throated kingfisher	*Halcyon smyrnensis*	In clearings or along larger streams and rivers in open country or adjacent to forest. Usually in lowlands but can be found at higher altitudes.	This bird prefers streams and rivers, and as such would be negatively impacted if this habitat was changed to a deep lake.
Brahminy kite	*Haliastur indus*	Open country and forest edge, lakes, rivers estuaries and along the coast. Usually in lowlands.	As this bird lives both on forest edges and near lakes, the reforestation and agroforestry projects, as well as the reservoir will provide good habitats.
Pacific swallow	*Hirundo tahitica*	Coasts, towns and open areas, rarely over forest. Low elevations. Nests fastened to overhangs on cliffs, caves or the eaves of houses.	The Pacific swallow lives near the towns in the area and will likely not be affected by the project.
Philippine bulbul	*Hypsipetes philippinus*	Forest and forest edge up to 2000m. Nest placed in small tree or bush or in the understory.	This bird prefers the forest, so the reforestation and agroforestry projects will provide suitable habitats.
Brown shrike	*Lanius cristatus*	All habitats.	Lives everywhere, so likely no change.
Long tailed shrike	*Lanius schach*	Open country and scrub, particularly drier areas. All elevations.	This bird prefers open country, so the reforestation projects may have a negative impact.
White-bellied munia	*Lonchura leucogastra*	Forest, forest edge, rice fields and grasslands.	Both the reforestation projects and the additional rice fields will provide suitable habitats.
Chestnut munia	*Lonchura malacca*	Rice fields, grasslands and open country.	This bird will likely move downstream, to the rice fields as its upland habitat will be removed by the reforestation projects.
Striated grassbird	*Megalurus palustris*	Grasslands, ricefields, marshy areas, and open country. Any altitude but usually in lowlands.	This bird will likely move downstream, to the rice fields as its upland habitat will be removed by the reforestation projects.
Tawny grassbird	*Megalurus timoriensis*	Tall grass, shrubs in open areas and early second growth in the lowlands and mountains up to 2000m.	The reforestation projects may destroy this bird's habitat, though the young forest may provide a suitable habitat for a few years.
Blue rock thrush	*Monticola solitarius*	Exposed Rocky slopes, road cuts, open areas (incl. parks) and along rocky streams and rivers.	The current rocky slopes will be submerged, but there may be a suitable area further upstream, beyond the proposed reservoir.

Common name	***Scientific name***	***Habit/Habitat***	***Prediction***
Grey Wagtail	*Motacilla cinerea*	Stream beds and forest roads with water running alongside. All elevations, rarely in open areas.	This bird requires running water, and as the area downstream of the proposed dam site is open and populated, it would need to move upstream instead.
Yellow wagtail	*Motacilla flava*	Open country, particularly rice fields, marshy areas and parks. All elevations.	As the rice fields would be greatly extended, this bird would certainly profit from the project.
Black-naped oriole	*Oriolus chinensis*	Forest edge, second growth, scrub, and trees in cultivated areas or gardens. Rarely in true forest.	The edges of the areas for the reforestation projects, and the agroforestry projects would provide suitable habitats for this species.
Philippine tailorbird	*Orthotomus castaneiceps*	Forest, forest edge and second growth in the understory.	The reforestation projects would provide a very good habitat for this species.
Elegant tit	*Parus elegans*	All forest types, at all elevations.	The reforestation projects would provide a very good habitat for this species.
Ashy minivet/Pied Triller	*Pericrocotus divaricatus/Lalage nigra*	Sporadic migrant in crowns of forest edge and second growth./Gardens, open areas, mangroves and scrub. Not in true forest.	The lake itself would provide an open, but likely unsuitable area. It is more likely that this bird lives closer to the towns and thus would not really be affected by the project. (Pied triller)
Scale feathered malkoha	*Phaenicophaeus cumingi*	Up to 2000m. Forest, forest edge and second growth.	The reforestation projects would provide a very good habitat for this species.
White-eared brown-dove	*Phapitreron leucotis*	Lowlands up to 1600m. Early secondary to primary forest, nests near streams.	The reforestation projects would provide a very good habitat for this species. It's nesting would be restricted to the upstream areas, however.
Yellow-vented bulbul	*Pycnonotus goiavier*	Gardens, cultivated areas, scrub, early second growth, never in virgin forest.	This bird likely lives near the towns and would thus not really be affected.
Stripe headed rhabdornis	*Rhabdornis mystacalis*	Canopy and middle story of forest, forest edge, second growth. Below 1200m.	The reforestation projects would provide a very good habitat for this species.
Pied bushchat	*Saxicola caprata*	Scrub or grassland and cultivated areas at all elevations.	The agricultural and agroforestry areas would likely provide a suitable habitat for this species.
Crested serpent eagle	*Spilornis cheela*	High above forest and forest edge, hunts in forest canopy.	The reforestation projects would provide a very good habitat for this species.
Golden crowned babbler	*Stachyris dennistouni*	Middle and understory in forest and forest edge.	The reforestation projects would provide a very good habitat for this species.
Eurasian Tree Sparrow	*Passer montanus*	Cities, towns and cultivated areas.	This bird lives near the towns and would thus not really be affected.
Red Jungle Fowl	*Gallus gallus*	Virgin forest, secondary growth and forest edge.	The reforestation projects would provide a very good habitat for this species.

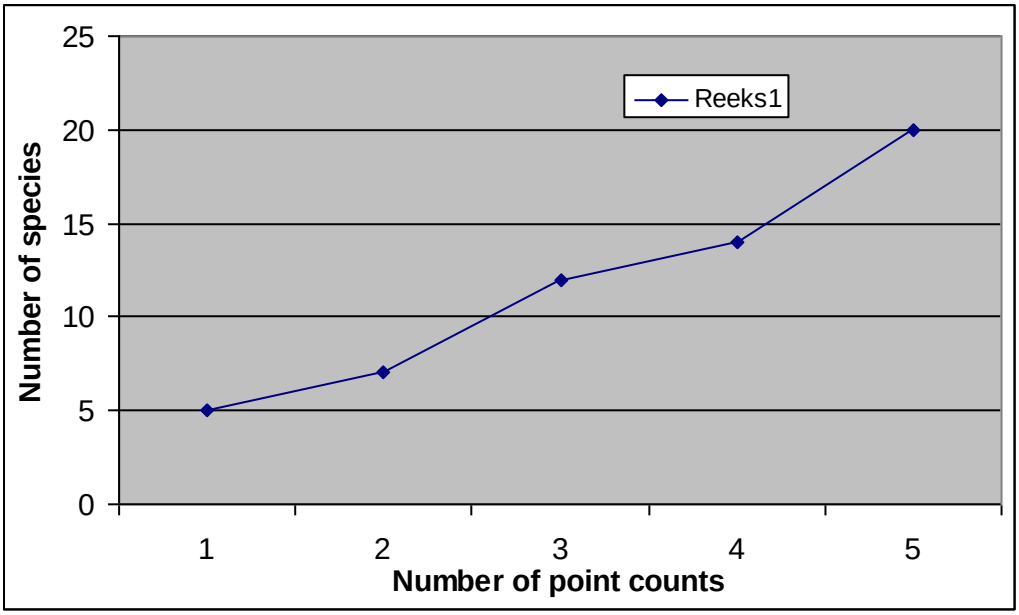


Figure 3: Graph of McKinnon lists

We did not manage to see all bird species in the area (Figure 3). All our lists had at least one new species. A longer survey would be necessary to provide full data on all species in the area. We did include the bird species we found outside of the surveys to account for a total of 38 species.

Question 3.2: Will there be any reforestation projects to replace the lost trees?

Answer: Paraphrased from EIS Report p. 73-75. Project 1: Rainforestation project, recognized and promoted by the Department of Environment and Natural Resources (DENR). It promotes the utilization of native species (e.g. Narra, Tindalo, Molave, Balete, Tibig, etc.) to restore degraded and marginalized landscapes of protected areas. "The project will build on the 10 ha rainforestation project initated by Plant TREES (Plant Towards Rainforestation and Eco-enterprise in Sierra Madre) Project at Tumauini Watershed Forest Reserve (TWFR) in 2011. Plant TREES is a joint project of: a) Philippine Tropical Forest Conservation Foundation, Inc.; b) Foundation for the Philippine Environment; c) Foundation for Sustainable Society, Inc; d) Peace and Equity Foundation; e) Mabuwaya Foundation, Inc.; and f) Maguli Marginal Farmers Producers Association- the local-based implementor."

The total area of denuded or marginalized landscape that will need to be restored in order to sustain the water function of the watershed is roughly 230 ha downstream and 250 ha upstream of the proposed dam. Of high concern is the downstream area due to kaingin and charcoal making being rampant there.

“Based on the remaining vegetation, the trees considered for the project are Narra, Tindalo, Ipil, Kamagong, Balete, Tibig and Hauali. Other native species may be considered when economical and social considerations are factored in.

The project will run for 7 years, 5 years for the nursery and outplanting operations and 2 years for maintenance and protection. Total expected cost is P10,297,569 assuming P21.00 per seedling/wildling.

Tumauini River Multipurpose Project (TRMP) will support the restoration of 258 ha at an estimated cost of P5,500.000 (at P21,307/ha). 250 ha located upstream of the dam, and the remaining 8 ha between the intake and the proposed dam site."

We see the use of Narra as a very positive feature, as it is critically endangered. It also provides very good wood, so if managed responsibly, it could become a source of income for the locals. "Practical implementor of this component is the Maguli Marginal Farmer Producers Cooperative and the Agtas. The former is currently implementing 50 ha with funding from the National Greening Program."

Project 2: Community Agroforestry Project. This project has 2 sub-components. Sub-component A in the 100-hahaha river valley. Sub-component B of 61.24 ha will be alongside the rainforestation component. Total of 161.24 ha. A is to transform the current rice and corn fields to an agroforestry based system in order to minimize erosion and sedimentation.
Species considered for hedgerows: Coconut, Mango, Nangka, Citrus and Kakawate/Ipil-ipil.
B is to transform upland agriculture (kaingin) to a more soil and water conservation farming system. It will adapt appropriate upland farming technology (e.g. SALT and LandCare). These technologies have demonstrated that by following contour planting and installation of hedgerows, among other means, soil erosion is minimized and the area becomes more fertile and productive. Fruit tree and forestry seedlings will be used.

Estimated total cost is P8,618,271. TRMP will support the establishment of about 56 ha at a cost of P3,000.000

Principal implementor of these 2 sub-components will be the non-tenured migrants/forest occupants themselves with technical advice from the National Irrigation Association (NIA)-TRMP and partners.

Project 3: Bamboo Plantation. Bayog (*Dendrocalamus merrillianus*) and Kawayan Tinik (*Bambusa blumeana*) are in high demand for the construction of huts/kubo. Buho (*Schizostachyum luampao*) stands are also found to be quite sparse, likely due to extensive harvesting. As bamboo is quite effective in stabilizing riverbanks, planting more would be quite useful. The total estimated area that requires bamboo planting is 37.93 ha, at a cost of P1,074,611. TRMP will support 17.65 ha at a cost of P500,000. TRMP will focus on the establishment of bamboo barriers along appropriate sections of the river banks of Pinacanauan de Tumauini River and in creeks and tributaries that require stream bank stabilization.
Principal implementor of this component is Maguli Marginal Farmers Producers Association. Currently, they are the implementing arm of the Plant TREES project.

Table 4: Estimated cost for rainforestation, agroforestry and bamboo plantation (EIS Report Table 6.1)

Project Component	***Area (ha)***	***Cost Sharing***		***TOTAL COST***
		NIA-TRMP	***NGP/LGU/IAs***	
Agroforestry	161.25	3,000,000	5,618,271	8,618,271
Rainforestation	483.29	5,500,000	4,797,569	10,279,569
Bamboo	37.93	500,000	574,611	1,074,611
Total	**682.47**	**9,000,000**	**10,990,452**	**19,990,452**

"As reflected in Table 6.1, NIA through TRMP will support the implementation of the 3 subcomponents of the Integrated Watershed Environmental Management & Monitoring Plan that will restore the degraded areas both downstream and upstream of the proposed dam site and provide positive impact to the livelihood concerns of the forest occupants. Total budget requirement to implement these sub-components is P19,990,452 which will be shared by the ongoing Plant TREES project, the National Greening Program of the government, the Local Government Unit (LGU) 75 of Tumauini, the IAs and the NIA through TRMP. The share of the TEIS Report p. 73-75. Project 1: P9 million, i.e., 45% of the total re-greening cost of TWFR"

Question 3.3: Will the flora (or at least the larger trees) be removed from the site of the reservoir?

Answer: EIS Report p. 72. "6.1.2.1 Harvesting and clearing of the Reservoir Area. On the short term, the Agtas and non-tenured forest occupants in the watershed as well as the lowland farmers of Antagan I and Antagan II will have employment opportunities in harvesting and clearing the plants/trees in the dam-reservoir. The premium timbers species that will be harvested are worth P33,920 and P50,880 per cubic meter for narra and molave, respectively. While for the common hardwood species, such as guijo and white lauan of the dipterocarpaceae family, current local market prices are worth P23,320 and P19,080, respectively. The equivalent forest charges will be good income for the Protected Area Management Board of TWFR. The premium species which most likely will be processed as furniture will generate additional opportunity for the workers."

Question 3.4: What are the possibilities for future growth of aquatic plants in the lake?

Answer: Sadly, no reliable information on this subject could be found.

DISCUSSION

In case of the aquatic fauna, there is a division in species which will be unaffected, negatively affected and positively affected by the proposed dam and reservoir. Several species present at the site would do quite well in a lake, however, there are others which require shallow or flowing water and thus would be negatively affected. One of the possible problems is that shrimps are one of the species that require shallow water. As shrimp is a food source for several larger fish species, this may pose a problem in the long term. On the other hand, species which feed on shrimp usually also feed on small fish, which may be more abundant in a lake. As shrimp (and freshwater crabs, which face the same problems) are also a food source for the local population, perhaps they may be cultivated downstream of the dam site.

One of the species present at the site and which would likely thrive in the lake is the Channeled applesnail (*Pomacea canaliculata)*. This species is alien and highly invasive, and it may be wise to eradicate it as soon as reasonably possible, as it could negatively affect native species.

In case of the birds, the results are more positive. There are several species which would be negatively affected, but for the majority the added rice fields and reforested areas would provide a suitable habitat to replace the loss of their current one.

In case of the Philippine duck (classified as vulnerable by the IUCN), which the EIS report mentions as being present in the area, they require shallow lakes or rice fields. The lake may be too deep for this species, but the added rice fields could stimulate their presence.

The large area that is reserved for the reforestation and agroforestry projects more than compensates for the loss of the forest in the reservoir area and should go quite a way to ensure the quality of the water and prevent erosion. A very positive point is the use of native species for reforestation and fruiting trees for agroforestry as this provides a good habitat and food source for many bird species.

AKNOWLEDGEMENTS

Our guide and host: Alberto Milanes. Edmund Jose, for his help in guiding us and determining the birds. Our respondents. LGU of Tumauini. Barangay Antagan officials. NIA. DENR of Cabagan. Jane G. Cabauatan, PhD. Thomas Reyes, PhD.

REFERENCES

Kennedy et al. 2000 (reprinted 2010). A Guide to the Birds of the Philippines

EIS Report 2012. Tumauini River Multipurpose Project

Madulid, D. A. A dictionary of Philippine Plant Names, Vol. II

Guingab, Ma. V. D., Preliminary Checklist of Woody Plants at the Isabela State University Wildlife Sanctuary & Vicinity, Cabagan Campus

http://fish.mongabay.com/data/Philippines.htm downloaded on January 25, 2013

http://www.fishbase.org/ downloaded on January 26, 2013

Appendix 1: Questions for Fishermen

respondent #:…
Name: Possible to be anonymous!
Age:
Civil status:
Profession:
Ethnicity:
Language or dialect:
How long do you fish/sell at market?
What kind of fish/shells/crabs do you catch?
How much of each kind?
Have you noticed an increase or decrease in fish stock in recent years?
Are the changes in fish stock seasonal?
Are you aware of the plans for the dam and reservoir?
What do you think will be the effects of the building of the dam? (positive and negative)
Will they be relocated if the dam is built?
Will they be able to continue fishing? (aquaculture?)

Appendix 2: Species inventory

Appendix 2.1: Flora Species Observed

Local name	***Common English name***	***Scientific name***	***Conservation status***	***Endemism***
Tindalo	-	*Afzelia rhomboidea*	Vulnerable	Resident
Langka	Jackfruit	*Artocarpus heterophyllus*		
-	Long-Branch Bamboo	*Bambusa dolichoclada*		
Gablos	Pigeon pea	*Cajanus cajan*		
Hagonoy	Siam Weed	*Chromolaena odorata*		Introduced
Balete	Strangling fig	*Ficus balete*		
Tibig	-	*Ficus nota*		
Hauili	Hauli Tree	*Ficus septica*		
Is-is	-	*Ficus ulmifolia*	Vulnerable	Endemic
	Part of willow family	*Flacourtia sp.*		
Gmelina	Paper tree	*Gmelina arborea*		
Labting	-	-		
Mali-mali	-	*Leea guineensis*		
Ipil-ipil	White leadtree	*Leucaena leucocephala*		
Sablot/Lawat	-	*Litsea glutinosa*		
Binunga	Blush Macaranga	*Macaranga tanarius*		
Hinlaumo	-	*Mallotus molissimus*		
Banato	Red Kamala	*Mallotus philippensis*		
Alim	-	*Melanolepis multiglandulosa*		
Kamoteng kahoy	Cassava	*Manihot esculenta*		
Makahiya	Giant sensitive plant	*Mimosa invisa/Mimosa diplotricha*		Introduced
Damo-hiya	Touch-me-not	*Mimosa pudica*		Introduced
Saging	Latundan banana	*Musa sapientum*		
Alagaw	Fragrant premna	*Premna odorata*		
Narra	New Guinea Rosewood	*Pterocarpus indicus*	Vulnerable	Resident
Katagpo	-	*Psycotria luzoniensis*		
Kape	Coffee family	*Rubiaceae sp.*		
Sabavil-atap	-	*Phaseolus adenanthus*		
Kamiring	-	*Semecarpus philippinensis*		
Pandakaki	Banana bush	*Tabernaemontana pandacaqui*		
Anabiong	Indian charcoal-tree	*Trema orientalis*		

Appendix 2.2: Bird species observed

Local name	***Common name***	***Scientific name***	***Conservation status***	***Endemism***
-	Common sandpiper	*Actitis hypoleucos*	Common	Migrant
-	Sunbird sp.	*Aethopyga sp.*	-	-
Tapsuk	Indigo banded kingfisher	*Alcedo cyanopectus*	Uncommon	Endemic
Pagatpat	White-breasted wood swallow	*Artamus leucorynchus*	Common	Resident
Bakaw itim	Little heron	*Butorides striatus*	Fairly common	Resident/Migrant
Tsabukot	Philippine coucal	*Centropus viridis*	Common	Endemic
-	Pygmy swiftlet	*Collocalia troglodytes*	Fairly common	Endemic
Uwak	Large-billed crow	*Corvus macrorhynchos*	Common	Resident
Baliuis	Wandering whistling duck	*Dendrocygna arcuata*	-	Resident
Pipit	Red-keeled flowerpecker	*Diaceum australe*	Common	Endemic
-	Bicoloured flowerpecker	*Diaceum bicolor*	Uncommon	Endemic
Tagak	Little egret	*Egretta garzetta*	Common	Migrant
Tig-mamanuk	White throated kingfisher	*Halcyon smyrnensis*	Fairly common	Resident
Lawin	Brahminy kite	*Haliastur indus*	Common	Resident
Layang laying	Pacific swallow	*Hirundo tahitica*	Common	Resident
Palang-gang gubat	Philippine bulbul	*Hypsipetes philippinus*	Common	Endemic
Tarat	Brown shrike	*Lanius cristatus*	Common	Migrant
Panal	Long tailed shrike	*Lanius schach*	Common	Resident
Maya	White-bellied munia	*Lonchura leucogastra*	Common	Resident
Maya	Chestnut munia	*Lonchura malacca*	Common	Resident
Titiryok	Striated grassbird	*Megalurus palustris*	Common	Resident
Tisuk	Tawny grassbird	*Megalurus timoriensis*	Common	Resident
Solitariyo	Blue rock thrush	*Monticola solitarius*	Common	Resident/Migrant
Iwad-iwad	Grey Wagtail	*Motacilla cinerea*	Common	Migrant
Payug-yug	Yellow wagtail	*Motacilla flava*	Common	Migrant
Kilyawan	Black-naped oriole	*Oriolus chinensis*	Common	Resident
Didit	Philippine tailorbird	*Orthotomus castaneiceps*	Common	Endemic
Pipit motas	Elegant tit	*Parus elegans*	Common	Endemic
-/Ibon-pare	Ashy minivet/Pied Triller	*Pericrocotus divaricatus/Lalage nigra*	Uncommon/Common	Migrant/Resident
Abaloryo	Scale feathered malkoha	*Phaenicophaeus cumingi*	Fairly common	Endemic
Bato-batong tulog	White-eared brown-dove	*Phapitreron leucotis*	Common	Endemic
Luklak	Yellow-vented bulbul	*Pycnonotus goiavier*	Common	Resident
-	Stipe headed rhabdornis	*Rhabdornis mystacalis*	Common	Endemic
Sipao	Pied bushchat	*Saxicola caprata*	Common	Resident
Bankas	Crested serpent eagle	*Spilornis cheela*	Common	Resident
-	Golden crowned babbler	*Stachyris dennistouni*	Common	Endemic
Mayang-bahay	Eurasian Tree Sparrow	*Passer montanus*	Common	Resident
Labuyo ♂/Upa ♀	Red Jungle Fowl	*Gallus gallus*	Common	Resident

Appendix 2.3: Aquatic fauna species observed

Local name	***Common English name***	***Scientific name***	***Conservation status***	***Endemism***
Igat	Freshwater eel	*Anguilla marmorata*	Least Concern	Native
Bunnug	Large snout Goby	*Awaous melanocephalus*		Native
Dalag	Mudfish	*Channa striata*		Native
Paltat	Hong Kong Catfish	*Clarias fuscus*		Native
Palakang-bukid	Luzon wart frog	*Fejervarya vittigera*	Least Concern	Endemic
Ikan	Squaretail Murrel	*Liza vaigiensis*		Native
Agurung	Univalve	*Melanoides turricula*		
Kurilao	Catfish	*Netuma thalassina*		
Tilapia	Native (Mozambigues) Tilapia	*Oreochromis mossambicus*	Near threatened	Introduced
Mori	Marble Goby	*Oxyeleotris marmorata*		Native
Basikul/Suso	Channeled applesnail	*Pomacea canaliculata*	Least Concern	Introduced
Agatol	Freshwater crabs	*Sundathelphusa sp.*		
Susay	Feathered river-garfish	*Zenarchopterus dispar*		Native
Borasei/Burasi	Unknown	Unknown		
Burarog	Unknown	Unknown		
Imelda	Unknown	Unknown		
Lasik	Shrimp	Unknown		
Lasik ti bato	Shrimp	Unknown		

Appendix 3.1: Tree composition and conservation status in the reservoir/Direct Impact Area (DIA) (EIS Report Table 4.12)

FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS
Anacardiaceae	*Dracontomelon dao*	Dao	Vu
	Mangifera altissima	Pahutan	Vu
Annonaceae	*Cananga odorata*	Ilang-ilang	
Apocynaceae	Alstonia scholaris	Dita	
	Wrightia pubescens	Lanite	
	Tabernaemontana pandacaqui	Pandakaki	
Araliaceae	Polyscias nodosa	Malapapaya	
Araucariaceae	Semecarpus philippinensis	Kamiring	Vu
Burseraceae	*Canarium asperum*	Pagsahingin	
	Canarium ovatum	Pili	OTS
Combretaceae	*Anthrocepalus chinensis*	Kaatoang bangkal	
	Terminalia camalansanai	Mala-kalumpit	
	Terminalia foetidissima	Taklisay gubat	
Datiscaceae	*Octomeles sumatrana*	Binuang	
Dilleniaceae	*Dillenia philippinensis*	Katmon	OTS
Dipterocarpaceae	*Dipterocarpus grandiflorus*	Apitong	Vu
	Parashorea malaanonan	Bagtikan	Vu
	Shorea guiso	Guijo	Vu
	Shorea hopefolia	Kalunti	Vu
	Shorea contorta	White Lauan	Vu
Ebenaceae	*Diospyrus pilosanthera*	Bolong-eta	En
Euphorbiaceae	*Mallotus philippinensis*	Banato	
	Antidesma pentandum	Bignay pugo	
	Endospermum peltatum	Gubas	
	Macaranga bicolour	Hamindang	
	Bischofia javanica	Tuai	
Fabaceae	Eriythrina variegate	Dapdap	
Lamiaceae	*Prema odorata*	Alagau	
Leguminosae	*Intsia bijuga*	Ipil	En
	Intsia acuminate	Mala-ipil	Vu
	Pterocarpus indicus echinatus	Narra	Cr
	Afzelia rhomboidea	Tindalo	En
Meliaceae	*Toona calantas*	Kalantas	Cr
	Terminalia edulis	Kalumpit	
	Sandoricum koetjape	Santol	
Moraceae	*Artocarpus blancoi*	Antipolo	
	Ficus sp.	Balete	
	Ficus septic	Hauili	
	Alleanthus luzonicus	Himbabao	
	Streblus asper	Kalios	
	Ficus variegate	Tangisang bayawak	
	Ficus nota	Tibig	
Myrtaceae	*Sysygium samaragense*	Makopang bukid	
Podocarpaceae	Podocarpus imbricatus	Igem	
Sapotaceae	*Palaquim philippinense*	Red Nato	Vu
Sonnerateaceae	*Duabanga molucanna*	Loktob	Vu
Ulmaceae	*Trema orientalis*	Anabiong	
	Celtis philippinensis	Malaikmo	
Verbenaceae	*Vitex parviflora*	Molave	En
	Tectona grandis	Teak	
	Gmelina arborea	Yemane	

Legend: *Vulnerable (Vu) Species*: a species that is not *critically endangered* or *endangered*, but is under threat from. adverse factors throughout its range and is likely to move to the endangered category in the future.
Other Threatened Species (OTS): refers to a species that is neither critically endangered nor vulnerable but is under threat from adverse factors, such as over collection, throughout its range and is likely to move to vulnerable category in the near future. *Other Wildlife Species (OWS)*: refers to 'non-threatened species that have the tendency to become threatened due to predation and destruction of habitat or other similar causes as may be listed by the Secretary of the Department of Environment and Natural Resources.

Appendix 3.2: Fauna species observed in the DIA of TRMP

Table 4.15 Fauna species observed in the DIA of TRMP

Common Name	Scientific Name	Conservation Status	Endemism
Little Heron	*Butorides striatus*		
Philippine Duck	*Anas Luzonica*	Vu	Philippines
Red Jungle Fowl	*Gallus gallus*		
Philippine Serpent Eagle	*Spilornis holospilus*		Philippines
Lesser Coacal	*Centropus bengalensis*		
Philippine Coacal	*Centropus viridis*		Philippines
Scale-feathered Malkoha	*Lepidogrammus cumingi*		Greater Luzon
Plaintive Cuckoo	*Cacomantis merulinus*		
Pygmy Swiflet	*Collocalia troglodytes*		Philippines
White-throated Kingfisher	*Halcyon smyrnesis*		
Bar-bellied Cuckooshrike	*Coracina striata*		
Yellow-vented Bulbul	*Pycnonotus goiaver*		
Philippine Bulbul	*Ixos philippinus*		Philippines
Large-billed Crow	*Corvus macrorynchus*		
Pied Bushat	*Saxicola caprata*		
Striated Grassbird	*Megalurus palustris*		
Tawny Grassbird	*Megalurus timoriensis*		
Philippine Tailor Bird	*Orthotomus castaneiceps*		Philippines
Mountain Shrike	*Lanius validirostris*	Near Threatened	Philippines
White-breasted Woodswallow	*Artamus leucorynchus*		
Coleto	*Sarcops calvus*		
Olive-backed Sunbird	*Cinnyris jugularis*		
Purple-throated Sunbird	*Leptocoma sperata*		
White-bellied Munia	*Lonchura leucogastra*		
Chestnut Munia	*Lonchura Malacca*		

Appendix 3.3: Aquatic life observed in the DIA of TRMP

Table 4.16 Aquatic life observed in the DIA of TRMP

Common Name	Scientific Name	Local Name
Fresh water Eel	*Anguilla marmorata*	Igat, Siging
Giant (Nile)Tilapia	*Oreochromis niloticus*	Tilapia
Native (Mozmbigues) Tilapia	*Oreochromis mossambicus*	Tilapia
Silver Fish/Java barb	*Barbonymus gonionotus*	Dungkug, itawis
Squaretail Murrel	*Liza vaigiensis*	Ikan, Sira, Itubi
Carp	*Cestreaus sp.*	Roho
Golden Carp	*Carassius carassius*	Golden, rasian
Mudfish	*Channa striata*	Dalag
Catfish/Paltat	*Clarias fuscus*	Paltat, patta
Catfish/Kurilao	*Netuma thalassina*	Kurilao
Marble Goby	*Oxyeleotris marmorata*	Mori
Large snout Goby	*Awaous melanocephalus*	Bunnug/Vunug
Feathered river-garfish	*Zenarchopterus dispar*	Susay, balambang
Shrimps	*Macrobrachium lar*	Lasik, lasi
Bivalve	*Pomacea canaliculata*	Giant, Basikul
Univalve	*Melanoides turricula*	Agurung
Freshwater crabs	*Sundathelphusa sp.*	Agatol, agama

THE POSSIBLE IMPACTS OF THE TUMAUINI DAM ON UPLAND COMMUNITIES IN MAGOLI

Jowieke Larooij, Marinet M. Sagadraca, Jemalyn Vinarao & Manon Vrolijk

INTRODUCTION

The local government of Tumauini is planning to build a dam at Sitio Magoli, Barangay Antagan I. This will have negative and positive impacts on the people who are living there and also on the environment. In this research we focus on the impact of the Tumauini Dam on the livelihoods of migrants and indigenous peoples. Our research groups consist of people living and farming upstream, including the Agta indigenous people; people living downstream but farming upstream and people formerly living upstream but currently living downstream.

Indigenous people in the Philippines have a special status, since 1997 a law was formulated which protects their ancestral domain, their own piece of land to ensure their economic, social and cultural well being (IPRA 1997). This law is called the Indigenous People Rights Act (IPRA) and we expected that this act would have an impact on the value of (indigenous) people's opinions. Also migrants can have rights and titles which can be relevant in the case of the building of a dam. Those different rights will be an important factor of consideration for the proposed dam.

RESEARCH QUESTIONS

Main research question: What are the impacts of the proposed dam on upland (up river) communities in Tumauini?

Sub Questions:

- How do the people of Magoli, Tumauini who have land upstream, live upstream or work upstream maintain their livelihood?
- What will change in the livelihoods of these people when the dam will be built?
- What are the rights of the people who have land upstream, live upstream or work upstream?
- Will the rights of those people change if the dam will be built?

METHODS

To answer the main questions and sub-questions, we conducted fieldwork for five days in Magoli, Tumauini. During those days we used different methods to gather information about the Tumauini Dam. We conducted open interviews, we used short questionnaires and we did observation. Moreover, during these days of fieldwork we stayed with a host family which gave us the possibility, besides the research activities, to integrate in the local life. We hoped that, because of this participant observation, we could learn a little bit more about the livelihood of the local community. "Participant observers can be insiders who observe and record some aspects or life around them; or they can be outsiders who participate in some aspects of life around them and record what they can." (Bernard 2002). The last type of researcher that Bernard described is the one that we reflected on ourselves. We realize that five days of fieldwork never can be enough to give a representative overview of the total livelihood but we tried to make the best out of it.

The expectations beforehand differed from the actual situation that we found in the field. We had to change the nature of the respondent population. We were expected to interview only the people that lived upstream but there are only a few people that are actually living there. Together with the information of the Barangay Captain and the observations that we did in the field, we decided to not only interview people that are actually living upstream but also to integrate the farmers who have their land upstream but living downstream. Besides, we interviewed some respondents that lived in the mountains in the past but moved to Magoli and are now living and working there. In finding these respondents we focused on the status of migrants and the Agta (the original habitants of the Philippines). On the first day of observation, we discovered that in the morning and afternoon many farmers are crossing the river at the intake to either go to their land or to their house. For those farmers we made a questionnaire in the field (Appendix A). By using this method we hoped that we could easily compare results as Russell Bernard mentioned in his book: "The idea in structured interviewing is always the same: to control the input that triggers people's responses so that their output can be reliably compared" (Bernard 2002). We made a similar questionnaire (Appendix A) for the fishermen and -women to discover which species they catch and how.

Besides these questionnaires we conducted semi-structured interviews. We used this method because we wanted to make the interviews more like a casual conversation in which respondents could come up with their own ideas and topics. In these interviews we only used a short list of topics about which we wanted to talk but the rest was up to the respondent. The questions were more just like a guideline. In the interviews we also used the free listing method in which respondents make their own list of words, for example fish species that they catch. This can give a reliable indication on what informants see as the most important things in their livelihood. Besides, we asked some respondents to draw a map of their land to indicate how people consider their own land.

We changed the sampling method after we got information from the *Barangay* secretary. Based on a document that included an overview of different ethnicities, we concluded that it was impossible to make an evenly divided sample of the different groups because they made no differentiations in upstream and downstream habitants and there was no list of habitants structured by their ethnicity. We decided to interview respondents with different ethnic background according to the random stratified sample method but within the different sub-groups we did not pick them randomly. We used the networks of one of our key informants. So we structured the sample according to the preferences of the researchers (respondents of different ethnic background) and within the sub groups according to the knowledge of one of our key informants. This is a form of haphazard sampling in which the researcher "grabs whoever will stand still long enough to answer your questions" (Bernard 2002). Due to the knowledge and networks of our key informant, we interviewed whoever had enough time for an interview.

The members of our research group are two female Filipino students and two female Dutch students. We are very aware that the presence of two white Dutch students asking for names and taking notes can be very intimidating and might have influenced the answers and results. This became especially visible when respondents were very shy and hesitant to answer our questions or did not want to tell us their opinions on the dam. The answers they eventually gave us were very short and in some cases we did not receive any answers at all. However, not all the respondents were like this as some of them openly told us about their negative opinions and rejections of the dam. The DENR knows about these mixed feelings among the

people and explained that every project has people who agree and people who disagree, and they see it as their task to deal with and satisfy both parties.

Day:	***Activities:***
Saturday January 19th	Visit to river intake Gathering information at Barangay Hall Interviewing host family First meeting with key informant
Sunday January 20th	Viewing Tumauini Damside Interviewing Agta Observation at Tumauini riverside
Monday January 21th	Interviewing Counselor Observation an conducting questionnaire at riverside Interviewing Agta children
Tuesday January 22th	Interviewing migrants Interviewing at Ibanag area Visiting high school
Wednesday January 23th	Interviewing Department of Environmental and Natural Resources (DENR) Interviewing Agta Back to Cabagan

Structure of the report

First, according to our research questions, we will talk about the livelihood of the specified groups of people, what they do for a living and how they see their near future. Afterwards, based on the answers the respondents gave us, we will describe the possible impacts of the construction of the dam. Next we will talk about the possible rights of the upland communities and how important they are. After that we will conclude which role they have in the general discussion. In the end, this report will be part of an environmental impact assessment (EIA) which we will formulate with our fellow students.

RESULTS

Livelihoods

On the first day, the Barangay Captain provided us the Barangay profile which contained a table (Table 1) about the household population of all ages by mother tongue and ethnicity. We made use of the haphazard method of sampling but noticed that the division of our respondents (Figure 1) roughly corresponded with the actual division in the whole Barangay. Moreover, we made an overview of the ways how our respondents maintain their livelihood (Figure 2).

Table 1: Household population all ages by mother tongue and ethnicity in Barangay Antagan 1 (Barangay Profile 2011)

Mother tongue and ethnicity	***Male***		***Female***		***Both sexes***	
	Total	%	Total	%	Total	%
Ibanag	100	6	180	11.46	280	8.67
Ilocano	1376	83	1270	81	2646	82
Tagalog	100	6	80	5	180	5.57
Bikol	20	1.21	15	0.96	35	1
Kalinga	10	0.60	2	0.12	12	0.37
Itawes / Itawis	2	0.12	3	0.19	5	0.15
Other dialects	50	3	20	1.21	70	2.16
Total	1658	99.93	1570	99.94	3228	99.92

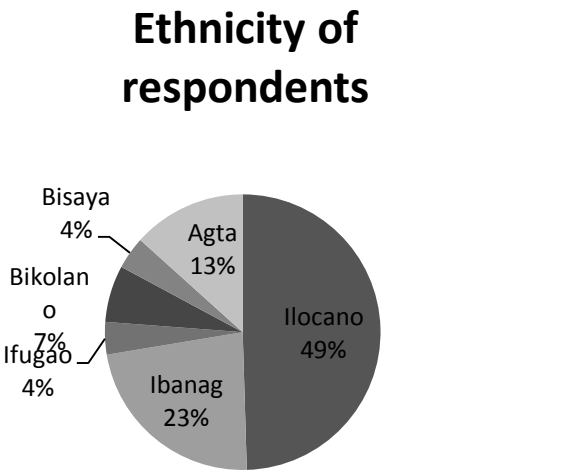


Figure 1: Division of ethnicity of respondents

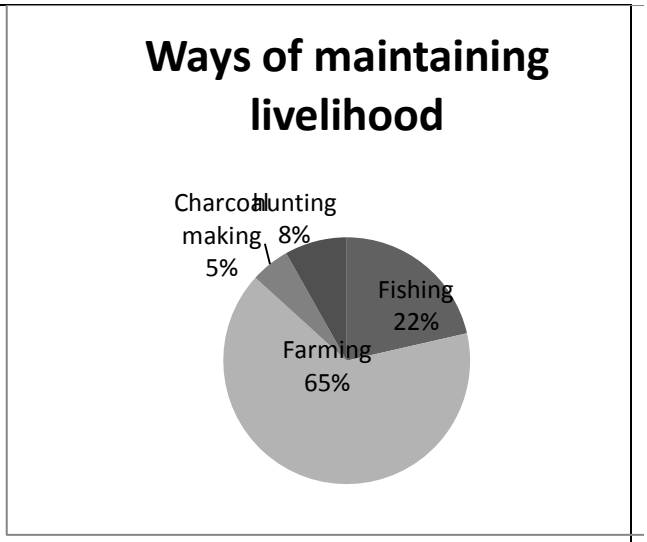


Figure 2: Overview of ways of maintaining livelihood of the 33 respondents

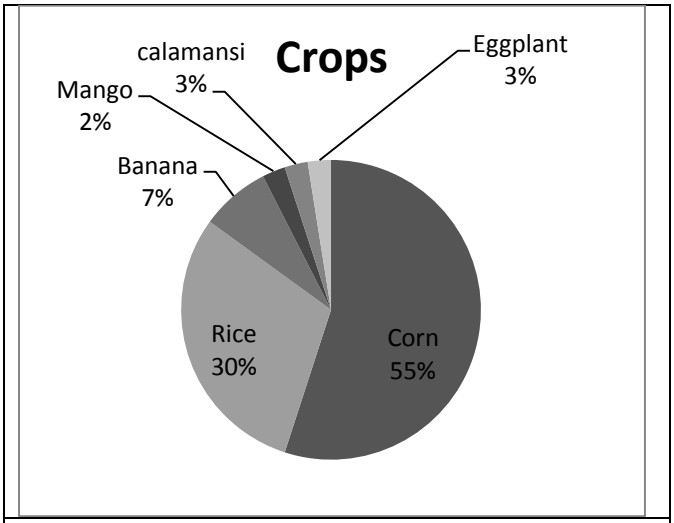


Figure 3: Overview of crops

After we analyzed the different livelihoods maintained in the uplands, we found out that 22 percent of the respondents earn money in fishing. We pursued to seek the reasons why they prefer fishing as their main source of livelihood. We found out that one of the main reasons is because their houses are nearby and the fishes are easy for them to catch. Furthermore, the livelihood of eight percent of the people is hunting, and obviously, there are only a few hunters because the distance between their houses and the forests where they hunt are very big. Only five percent of the people have charcoal production as their livelihood, and the most significant kind of livelihood is farming, practiced by 65 percent of the people.

One of the major reasons for the big percentage of farmers in this village is the possible versatility of crops cultivation in the mountain area (Figure 3).

The average age of the interviewed farmers was 38 (24-60). The average size of the farms was 2.08 ha. (0.25 ha-5 ha.). Different kinds of crops are grown for various purposes (Table 2).

We collected information to find out that most of the farmers choose to plant corn because their land is located upstream. Since it is in the upstream area, the irrigation and water supply promised by the construction of the dam cannot reach the farms. Therefore, they prefer to plant corn rather than rice. Most of them plant as many crops as they can.

Table 2: Overview of main livelihoods with specifications

Main Livelihood	***Types of Species/Crops***	***Multipurpose***
Fishing	Tilapia, Shrimp, Bunsilan, Burarong, Cat fish, Crab, Balambang, Bursi Susay, Agatul, Milyunpis and Eel	Commercial and personal purposes
Hunting	Monkey, wild pig, deer, python snake	Commercial
Charcoal making	Any types of species	Commercial
Farming	Corn, vegetables, fruit bearing trees and rice	Commercial and personal purposes

The level of knowledge and awareness about the project at community level is also a question integrated in this research. We measured the knowledge of all the 33 respondents in Barangay Magoli, and we found out that there is wide spread awareness. Most of the respondents declared that they came to hear about the project by conversations in the community.

Agriculture

According to the results of the interviews we conducted, a large part of the population earns a living by means of fishing or farming. In addition to these two, hunting, producing charcoal and bamboo cutting are examples of other sources of livelihood. Some of our respondents thus have several sources of income, and this could reduce the severe possible impacts of the construction of the dam. However, during our interviews with various farmers and fishermen who work upstream, we discovered that a lot of people actually can be affected by the dam and almost all the people are extremely scared of the possible impacts the proposed dam will bring.

Most of our respondents told us they are worrying about the floods that probably will occur. These floods will not only cause damage to their farmlands in the mountains, but will also affect the water level of the rivers downstream. It will get too high and eventually will cause the farmlands to be flooded. This, in turn, will result in small yields and less income, and cause negative consequences to the future daily lives of the farmers.

Fishing

Our research also showed us that the fishermen, too, will encounter impacts of the construction of the dam. We were able to conclude this after we conducted interviews with our fishermen respondents. Through observation we also discovered that, in addition to manual fishing, electro fishing is also widely practiced in the area. However, this method require a rather shallow water level, and according to one of our respondents the dam and the rising water level will definitely affect this way of fishing: they will likely lose a significant part of their income in the near future. Fishermen who use this method to catch their fish, are most likely to find an alternative way of fishing which will leave them with smaller fish catches than before.

In addition to this method, fishermen who use a so-called *pana* to catch their fish will also be affected by the construction of the dam. The *pana* is a special kind of gun made out of wood, with a string and a hook attached to it. We came to know about this method because several of our respondents showed us this tool and explained how it works. These respondents, however, suspected the construction of the dam will have positive impacts on this particular method, because the lake to be created will be very suitable to use the *pana*.

Dependent on the used method, the construction of the dam and the dam itself can have either negative and positive impacts on the fish catches. During our talk with the DENR we discovered that they know about these issues, and they told us that they will take the possible losses of income into consideration by providing fish cages inside the lake to practice aqua culture and, in addition to that, they will divide the fish catches evenly among the fishermen.

Perception

In general, awareness of both negative and positive consequences of the dam on the livelihoods of the people exists. Two respondents told us that the roads for construction of the dam, will also improve the roads to their farmlands in the mountains. Reaching their lands will be more convenient than it was before and they will save time which they can contribute to other important activities. However, one of our respondents mentioned the possibilities of this road being washed away by the water, which will cause only inconvenience because the farmers can not reach their lands anymore.

Another positive aspect of the construction of the dam will be the large amount of construction workers that will arrive to construct the dam. These people need food and recreation, which can be provided by the local farmers and people in the village of Magoli. The housing, on the other hand, can cause problems of pollution and overpopulation. Besides, several respondents are willing to take the jobs that will be generated by the construction of the dam, which will reduce the high unemployment rate of 80% in the community (Barangay Survey 2011).

We noticed that the majority of our respondents holds an either positive or neutral opinion on the dam, but a lot of them are very afraid of floods or natural disasters. Although, when we asked them what they would do if their lands will be washed away, they replied that they will look for a solution themselves. Even if they are forced to leave their land because of government interference, they expressed a willingness to leave their land and look for something else. We would qualify this as a very interesting thing, because of the certain rights

these farmers should have, but barely know about. We will further elaborate on this subject in the following chapter.

Rights of the community

In addition to the livelihood of the upland communities, we decided to gather information on the status and rights these people deserve as well. The questions and topics we addressed are, once again, to be found in Appendix A. As already mentioned in the introduction, the Philippine government adopted the Indigenous Peoples' Rights Act (IPRA) in 1997, and from then on the National Commission on Indigenous Peoples (NCIP) issued rules and regulations on implementing these rights.

One of the groups belonging to our definition of the upland communities are the Agta people, and they are the only official indigenous people of the Philippines. Logically, the IPRA act would be applicable for this particular ethnic group and we asked the different people if they knew about this law, and, if yes, if they had the rights or if they had any idea about the importance of these rights for them as a community. Among our respondents were only four Agta, two women and two male high school students. During our interviews with the Agta people we encountered some difficulties with the communication and they appeared to be shy and very hesitant to answer our questions about the dam and/or their rights. We did ask them however, and it turned out to be that none of the four Agta knew about the IPRA act and the rights that they should have derived from that. One female respondent answered that she heard about it, but she could not tell us what it would mean for them.

The other woman did not even get the chance to answer that question, because the interpreter, told us that she (and Agta in general) were not interested in these kind of official things and were happy enough to be able to eat three meals a day, every day. We went on asking him questions about the indigenous peoples rights' situation, and he told me that the Barangay officials know about the rights, but they do not apply them. In addition, because of the presence of one of the officials, the answers the Agta did give us are most likely to be influenced by the sensitivity of the topic.

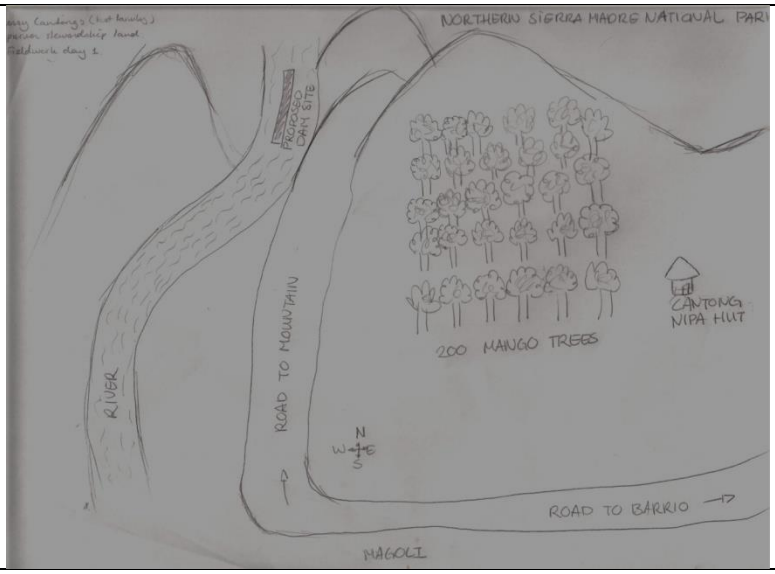


Figure 4: Map drawn by our Bisaya respondent of their land in the mountains.

However, we did not limit our research to only the Agta, we also asked other ethnic group about their farming lands and whether or not they had a title or rights on their land. We discovered that none of the people who farm upstream have a title or any rights on their land. They only use the land temporarily, and when the government claims it, they have no other choice than to leave the place.

Independently from the government, institutions like the Department of Environment and Natural Resources (DENR) provide certain programs to give people rights on pieces of land upstream. One of our Bisaya respondents told us about a piece of land upstream on which he had a stewardship title. It was part of the DENR's Upland Development Program (UDP) in mitigating climate change. One of the objectives of this program is to create additional incomes for upland households in support of the hunger mitigation program and supporting the development of sustainable livelihood. The farmers who were interested in taking part in this program have to apply, and after evaluation of their land and measures by the DENR, the decision on whether or not the applicant would be able to receive the stewardship title was made. To help the applicants and farmers make the right decisions on which crops to plant and other practical issues, the DENR provides the seedlings of several fruit bearing trees. The farmers then can plant them themselves, and can keep and/or sell the fruits that come from the trees. We asked our respondent to draw the land of which he has the stewardship title (see Figure 2), and it appears that his land is quite close to the proposed dam site. He then explained to us that this land belongs to the DENR, but still the government has rights to claim the land. According to our respondent they do need to pay for it, or provide some kind of alternative, but afterwards they can do whatever they want with it, and destroy the carefully protected piece of land. During our interview with the DENR later on, it became clear that the paying party is going to be the NIA, while the DENR will survey the various lands and decide on the kind of alternative they will receive.

To conclude and answer the sub question provided above, indigenous peoples rights do exist formally, but when it comes to implementation, there are still a lot of problems to be solved. As for the rights of migrants, this group of people does not have any formal rights, but the DENR provides opportunities for them to gain rights on quite a big piece of land and maintain their livelihood there. However, the government is still able to claim those areas, as long as they pay enough money, or provide a substitute.

Conflicts

On the improvement of the rights for individual people, we found some conflicting answers. As you can read above, the IPRA act has already existed since 1997, which should protect and preserve the rights to their ancestral domain (IPRA 1997). After that, we found out about the NIA Feasibility Study Report (NIA 2012), which informed us about the new regulations that will apply for specifically the Agta indigenous people. This report told us that during and after the construction of the dam, the four Agta families living upstream will be awarded with rights to their ancestral domain. The same rights that, according to the IPRA law, already should have been recognized and promoted for more than 15 years.

Assuming the statements of the NIA report are going to be realized, another set of conflicts will occur. During our interview with the DENR, it became clear that the DENR does not recognize the one Agta family we interviewed living in the affected area as Agta indigenous people. Which means that the IPRA rights of 1997 (if implemented at all) will not be applied on them. As well as the new regulations of the NIA report will not be of any impact on this one family. Based on these different sources of information, we can also conclude that the DENR and the NIA either calculated the affected area differently, or both use a different approach in identifying Agta.

At last, the research of sir van den Top informed us about the fact that the government owns all the forestlands in the Philippines.(van den Top 2003) Combine this with the fact that the

Agta livelihood traditionally exists in the forest, and if the NIA wants to maintain this livelihood by giving the Agta the rights to their ancestral domain in the forests, they most likely will be unable to do this because of the higher importance of the government.

DISCUSSION

During our research project we prioritized the main livelihood of the upland communities in Antagan 1. Aside from it we wanted to know about the indigenous people rights, perceptions and their awareness and knowledge about the proposed dam. On this case, we really pursued to seek the impacts of it into their livelihood.

To answer the first sub question we made some overviews of livelihoods. From our results we can conclude that the majority of our respondents (98%) are working upstream. In seeking the impacts of the dam to their current way of living, we predict that there will be more changes regarding to our respondents main livelihood. These changes are about the land or land title where they cultivate crops, and fish. According to them they used the land freely in farming but have no land title. They are also allowed to get forest products but before they do it they have to get some consultation from the Department of Environment and Natural Resources (DENR). We found out that the DENR provided the stewardship program to the community, and we have seen that this program is successful in poverty reduction and the sustainable development of a protected area. To discover the perceptions of the respondents about the dam we asked them, according to the second sub question, what they think, will change in their livelihood. We mentioned that it is difficult for them to contradict the dam project of the local government being implemented because some of them told us that they have the feeling that they are powerless or do not know where to go.

In the last two sub questions we wanted to include the particular rights of our respondents. We found out that the *Barangay* officials know about the indigenous peoples rights but the indigenous people do not know anything about it.

Throughout the entire analysis we reached our main target. Positive and negative reactions were revealed about the proposed dam. We discovered that they are not fully informed because we have found that our respondents do not have a lot of knowledge about the possible negative impacts of the dam to their livelihood. Through this, we can say that the dissemination of the information about the dam can and should be better during the *Barangay* assembly meetings. Respondents told us that they only hear about the alternative benefits of the project such as, more job offers, improvement of irrigation system, improvement of the road, fish cages and the alternatives of affected land will be paid by the National Irrigation Administration (NIA). By this unfair information, we knew that some answers concerning negative impacts just came from their own perceptions and imagination.

We concluded that there should be some recommended actions for use in the future. First, provide opportunities for the local people to express their opinions about the project, and take into consideration that the presence of *Barangay* officials can cause people to keep silent. Second, make an assessment on the possible protection of livelihoods, instead of immediately forcing (involuntary) resettlements. And finally, prioritize the social acceptability survey in order to inform the people about the project, the details of the project and the positive and negative effects that they will derive from it. And in particular, to speak about the rights of the indigenous people, the various sources of information all have a different way of coping with and handling the rights of indigenous people. Hence we would recommend establishing one

institution which will take care of the social acceptability among the local people. It would be good if they can be responsible for all the regulations, laws and implementations on indigenous peoples' rights. In the most desired situation, the rights the indigenous peoples deserve will be awarded to them and regardless the dam will or will not be constructed, and the traditional livelihood of the Agta will be protected and preserved.

REFERENCES

Antagan survey (2011) *Historical Background of Barangay Antagan 1st*.

Bernard, R. (2002) *Research Methods in Anthropology*, Oxford: Rowan Altamira.

Department of Environment and Natural Resources (DENR), Upland Development Program (UDP), http://forestry.denr.gov.ph/SUDP.htm accessed on January 28th 2013.
IPRA Act (Indigenous Peoples Rights Act), 1997.

National Irrigation Association (NIA). (2012) *TRMP Feasibility study report*, Cauayan City, Isabela.

Top, G. van den (2003) *The Social Dynamics of Deforestation in the Philippines: Actions, Options and Motivations*. Copenhagen: NIAS Press.

ACKNOWLEDGEMENTS

We would like to express our deepest gratitude to the people who helped us during our research. To the *Barangay* officials and people of Antagan, for their warmest welcome and open assistance. To Mr. Jovito W. Sutio, Barangay secretary, for giving us the *Barangay* profile. To uncle Jerry Cantong and his family for accommodating us during our five days in Antagan. To the respondents for sharing with us their information and most especially for their cooperation during the interview. To the officer of the DENR. And a special thanks to Uncle Orlando for joining us and helping us whenever we had a request.

Appendix A: Questionnaire

General questions
Name?
Age?
Profession?
Ethnicity?
Are you married?
How many children do you have?
Do they attend school?
What is your place of origin, where do you like it better?

Questions for farmers
Do you have your own land?
Do you have the rights of that land?
What kind of crops do you plant?

Questions for fishermen
What kind of fish/ species of fish do you usually catch?
How do you qualify the different species on importance?
Do you practice electrofishing?

Questions for Indigenous People
Do you know about the indigenous peoples rights
Do you have these rights?
What will you do when the government claims your land?
What will happen when your land gets affected by the (construction of the) dam?

Questions about the dam:
Do you know about the dam?
How do you know about it, was there any formal dissemination?
What will be the effects of the dam?
What is your opinion/reaction on the dam?
How did you come to your conclusions?
Do you have the feeling you can express your thoughts/complains about the dam?

Questions for the DENR*:*
What is the NGP and what are their objectives?
Is this project known among the people, what are their responses?
What is a stewardship?
To whom will it be given, are there any specific regulations or characteristics you need to fulfill?
What will happen to dam affected land which belongs to the stewardship program?
Will you keep checking on and evaluate the occupied areas?
Is the construction of a dam allowed in a protected area?
What are the plans concerning formal dissemination?
Do you deal with the Indigenous People rights?
Can you tell us something about the increase or decrease of fish diversity?
Do you allow electro fishing/logging/collecting of bamboo out of the forest?

THE TUMAUINI IRRIGATION SYSTEM AND RICE CULTIVATION: CURRENT SITUATION AND EXPECTATIONS FOR A FUTURE WITH DAM

Eduardo Narag, Davie-Ann Queddeng, Melanie Schippers &Tertia Uljée

INTRODUCTION

Tumauini is located in the basin of the Pinacanauan de Tumauini River. The Tumauini River originates in the Sierra Madre Mountains and it is a major subsidiary river of Cagayan River. It is a key source of water for irrigation purposes, serving an area of 2.691 hectares of agricultural land.

According to the latest census, Tumauini has a population of 60,000 and consists of 46 barangays. Most of the residents in this area are engaged in production of crops such as corn, sugarcane, tobacco and rice, which is considered the staple food of the populace. Tumauini has 6,350 hectares of land and a huge portion is cultivated by farmers in most barangays, among them is Barangay Antagan 1.

Antagan 1 has a total of 34.841 square kilometers and a total population of 2,697 persons. There are 690 farmers in the area representing at least four ethnic groups, namely: Itneg, Ibanag, Agta and Kalinga (Calingay and Wissingh 2011).

In this village the lowlands are intensively cultivated. There are a lot of farmers, who plant mostly rice. Upland farmers depend on the water upstream from the mountains and rain, while lowland farmers depend on the current irrigation system. Therefore, the problem of farmers is the insufficient supply of water to their fields during dry seasons. It is for this reason that the National Irrigation Administration (NIA) has proposed to implement a project which is the Tumauini River Multipurpose Project (TRMP). This project aims to provide dependable irrigation water supply to the Tumauini Irrigation System service area, generate 7,000 Kw of hydro-power, improve/rehabilitate the irrigation facilities of Tumauini Irrigation System, and create employment opportunities and increase farmer's income (NIA 2012).

In this research, we will try to find out what the current irrigation system looks like and what kind of rice cultivation practices farmers employ. The goal is to compare the current situation with the expectations for a future situation after implementation of the Tumauini Multipurpose Project and identify the changes. The results of this research can be used to evaluate the proposed project.

RESEARCH QUESTIONS

General questions

How does the current irrigation system work?
What are the current practices in rice cultivation?
What are the expectations for these topics in a future with the Tumauini Multipurpose Project?

Sub questions

How does the current irrigation system work and what are the plans for it in the Tumauini River Multipurpose Project (TRMP)?
What are the current practices in rice cultivation and their income yields in the Tumauini area?
What is the attitude of farmers towards the TRMP in comparison to the governmental organizations?
Is the capacity building and awareness raising program effective in the Tumauini area?

METHODS

Date	**Activity**	**Place**
19 January	-took a trip to Antagan 1, explore the site -observed the condition of the current irrigation system -interviewed three farmers	-Antagan 1, Tumauini, Isabela
20 January	-visited the proposed dam site -interviewed five farmers	-Antagan 1, Tumauini, Isabela
21 January	-travelled to Municipal office to get a permission letter -interviewed the Municipal Agriculturist -tried to interview Engineer Salvador (NIA) in Cabagan, no interview but appointment for next day -went back to Antagan 1 -interviewed five farmers	-Municipal Office, Tumauini, Isabela
22 January	-interviewed four farmers -went to NIA Cabagan, interview -went to NIA Cauayan, interviewed three engineers	-Antagan 1, Tumauini, Isabela -Garita, Cabagan, Isabela
23 January	-interviewed two farmers -went back to EIC	-Antagan 1, Tumauini, Isabela -Garita, Cabagan, Isabela

Our coordinators of this course sought approval from the officials of Barangay Antagan 1 to do our research and conduct interviews to gather information. By walking around the barangay, we had selected our respondents by asking if they are willing to be interviewed, and if they said "yes", the discussion started. When we arrived at the house of our chosen interviewee, we introduced ourselves and gave some information why we are conducting interviews. Two of us were taking notes while the others translated and interviewed the respondent. We used this technique, so we were able to help each other translating and to come up with other relevant questions. We did this for almost two days to conduct interviews as a group.

To gather ideas on how many hectares are covered by the irrigation system, we also interviewed the President of Tumauini Irrigation Plot Area (TIPA) but he was not around. Hence, we asked the secretary of TIPA to represent him instead. Fortunately, the secretary granted our request. In order to continue the above mentioned discussion, we visited the

Municipal Agriculture Office in Tumauini Centro to gain more information. They accommodated us very nicely and even advised us to go to NIA in Tumauini. Unfortunately, our time schedule was compressed for not getting the information we needed from NIA. Due to lack of time, three of us had to go back to Antagan 1 to continue interviewing, while the fourth counterpart had to go to NIA Central Office.

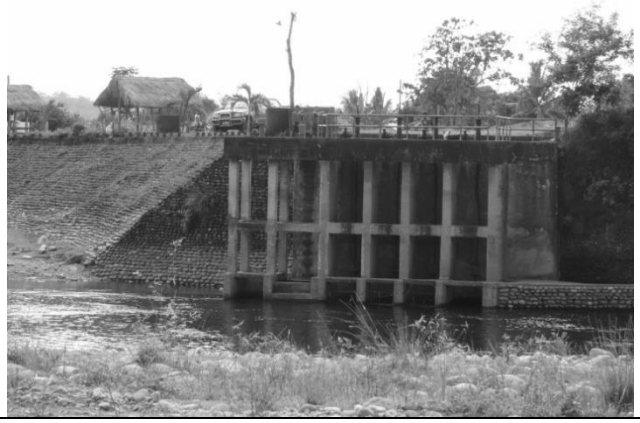
The central officer of NIA (Cauayan), Engineer Martinez, provided various documents containing information about the implementation of the Tumauini River Multipurpose Project (TRMP). We were very lucky that he handed these documents because they gave us good insight regarding the proposed project of NIA. One of our counterparts went to the Head of NIA, Engineer Salvador, in Tumauini. Salvador set a meeting with the presidents of Irrigation Associations. Our counterpart was allowed to ask questions during the meeting. Unfortunately, some of our questions regarding the Tumauini Irrigation System were not being answered due to some circumstances. Luckily, Salvador was willing to get a photocopy of the document he had that time.

RESULTS

How does the current irrigation system work and what are the plans for it in the Tumauini River Multipurpose Project (TRMP)?

The Tumauini Irrigation System (TIS) is a national irrigation system in the province of Isabela. The intake of the system is located at Sitio Magoli, Antagan 1 with the Tumauini River as its water source. The system became operational in the year 1976 and supplies water to fields in the towns of Tumauini, Cabagan and Ilagan. The designed area of the irrigation system is 6100 hectares, but the serviced area is only 3020 hectares (Tumauini, 2900 hec; Cabagan, 78 hec; and Ilagan, 42 hec). 65% of the area is irrigated during the first cropping season (June), whereas the irrigated area during the second cropping season (October) is only 54%. The reason for these low percentages is that there is not enough water to supply all the lands (National Irrigation Administration (NIA), (Feasibility Study (FS) NIA 2012).

The system exist out of 1 main canal of 23.5 kilometers and several lateral canals with a total length of 87.9 km. A map of the system is included in the appendices.



Intake of the TIS at Sitio Magoli (Photo by M.M.A. Schippers)

The NIA manages only part of the system. Local Irrigators Associations (IA) manage the system in their own area. The officers of these IAs are farmers themselves and report to a local NIA office. All the IA presidents of the region are gathered in the Council of IAs. The NIA supports the local IAs with technical and management knowledge by offering trainings and seminars to the board of the IA. One of the tasks of the IA is collecting the fees for the irrigation system, which they share with the NIA. 35% of the fee is for the IA, 65% for the NIA (Jovito W. Sutio Sr. 2013 pers. comm.).

The NIA maintains the intake and the main canal of the system and monitors the whole system. To manage these tasks, the NIA has three employees to take care of the system. The IAs manage the system from lateral canals to the outflow at the rice fields when they have a contract with NIA under Model 2. The other option is a contract under Model 1. The IAs with this contract do not manage the system in their area, but only take care of some operation and maintenance (O&M) tasks. Currently, 8 IAs have a contract under Model 2, 4 under model 1. One of the goals of NIA is to contract all IAs under Model 2; this project is called the Irrigation Management Transfer (I. Oliveros and P. Hutten 2011 and FS NIA 2012).

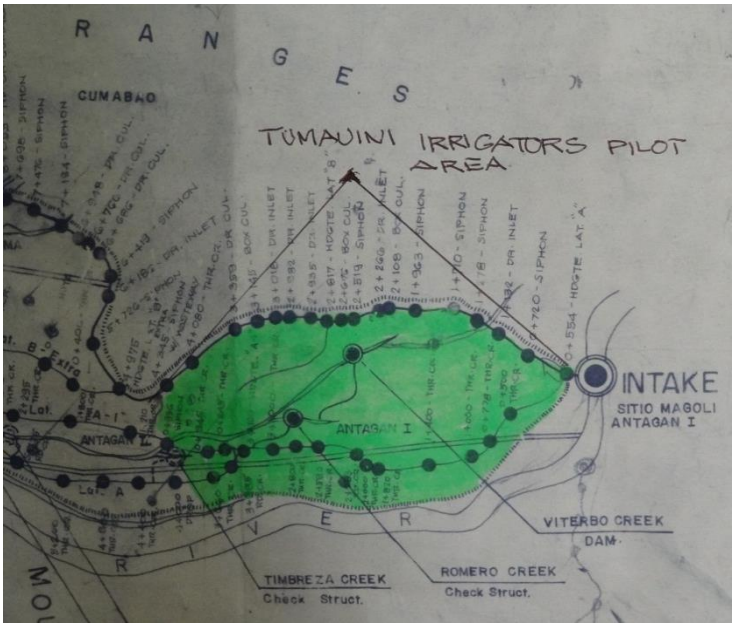


Figure 1: Area of IA-Tumauini Irrigators Pilot Area (IA-TIPA, 2013)

The plan for the physical changes of the irrigation system consists of 5 parts: improving the current intake at Sitio Magoli, creating a new intake to connect to the existing irrigation network of Caligayan, replacement of the current siphon, improvement of the main canal and various improvements on the existing system.

The irrigated area will increase from the current 3020 ha to 8200 ha. This increase consists of three parts: the existing system will get more water (3080 ha); the Caligayan system will be connected to the reservoir (284 ha); and some additional areas will be connected as well (1836 ha) (Appendix 4). This brings the total surface of the irrigated area to 8.200 hectares. The designed discharge of the system is 14.68 m3/sec.

Besides physical changes to the irrigation system, institutional development is part of the TRMP as well. This development includes the organizing of 22 new IAs (total of 34 IAs) in the new irrigated areas and the strengthening of the current IAs. Goal of this development is to support community-based management in the area. The NIA has developed procedures to organize the new IAs from scratch. The strengthening of the current associations will happen through several trainings concerning business operation, system management and their finances.

What are the current practices in rice cultivation and their income yields in the Tumauini area?

In order to answer this sub question, we interviewed 19 farmers (N=19) in Antagan 1, Tumauini. Because this number is not representative for the farmers who cultivate their fields in this area, we will back up our gathered data, where possible, with the information presented in the Feasibility Study (FS) (NIA 2012) and the Environmental Impact Statement (2012) of the proposed dam site. Moreover, we are aware of the fact that we only interviewed farmers living near the intake. This will change the outcomes because these farmers are already benefitted by the current irrigation system. Due to lack of time, we did not interview farmers from other barangays that are currently depending on rainfall, but will be benefited by the upgraded irrigation system.

Antagan 1st has a population of 2.697 people (EIS 2012). We interviewed 13 female and 6 male farmers. The records of EIS revealed that approximately 96% of the farmers in the Tumauini area are male, and 4% female. It is likely that most women are housewives and work in and around the house. By observation we can acknowledge the fact that women work in the field as well, especially during planting and harvest season. Furthermore, EIS showed that the average household size is 5 persons per household. In comparison, average number of family members of the respondents is 5.5. EIS further revealed that 48% of the sample populations are male and 52% are female (EIS 2012).

Our data showed that two farmers reached college level. The education level of the 14 other interviewees varies between elementary grade 1 and high school graduate. The literacy rate is high in the area of Tumauini, Cabagan and Ilagan at 88%. In the FS it is suggested that this may be attributed to the large number of educational institutions/facilities in the area (NIA 2012).

The main crops in the area of Tumauini are rice and corn. The farmers we interviewed planted either rice (7 farmers), rice and corn (11 farmers) or corn (1 farmer) (figure 2).

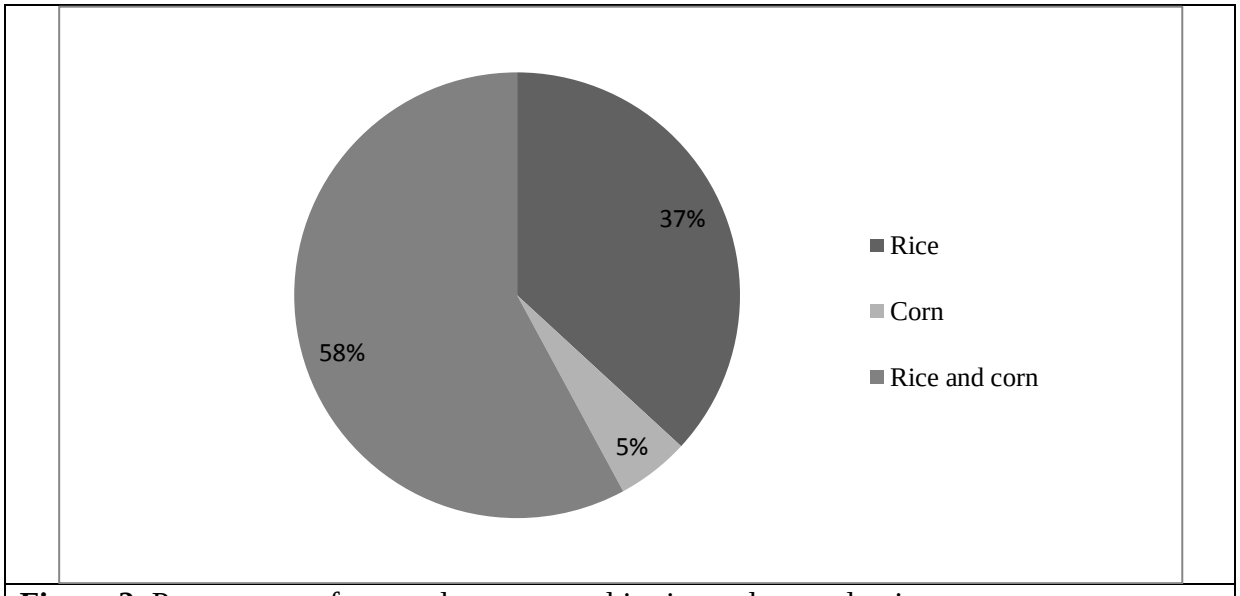


Figure 2: Percentages of respondents engaged in rice and corn planting

The average field size in Tumauini, Cabagan and Ilagan is 1.04 ha (FS NIA 2012). Our respondents' rice field sizes varied from ½ ha to 3 ha.

The varieties of rice our respondents plant are mostly changed per cropping, to prevent the yields from deteriorating and to determine whether the seeds are suitable for soil. The major varieties that are used are inbreed high yield varieties such as 9231, 1-5-2, 2-2, c18, G8, 1-2-4 and 2-2-4. Hybrid varieties, such as Bigante, are also mentioned.

Except for one respondent, all interviewees used fertilizers to augment their yields. Most of the other farmers use Urea. Other fertilizers used are Ammonium Sulphate, Philpos and Vikings (Figure 3).

Table 1: Characteristics of rice cultivation

Resp	**Variety**	**Fertilizer**	**Ag. Tech**	**Crop /yr**	**Yield/ cavan/ha**	**Irrigation**
1	Hybrid	Chemical, Urea	Hand Tractor	2	80	Connected
2	Hybrid	Organic, Chemical	DA Tech	2	100	Connected
3	Hybrid		Hand tractor	2	154	Waterpump
4	Inbreed	Ammonium sulfate	Man-animal	1	100	Waterpump
5	Hybrid	Urea	Man-animal	2	80	Connected
6	Inbreed	Chemic, Urea	Man-animal	2	80	Connected
7	Inbreed	Organic, Chemical: Ammonium Sulphate, Urea	Man-animal	2	90	Rainfed
8	Inbreed	Urea, Ammonium Sulphate	Man-animal	2	120	Connected
9	Hybrid	Organic/chemical	hand tractor, man-animal	2	100	Spring
10	Hybrid	Urea	Man-animal	2	60	Connected
11	Hybrid	Philphos, Vikings and Urea	hand tractor, man-animal	2	65	Connected
12	Red/ white rice	Urea, Ammonium Sulphate	Man-animal	1	(40)	Connected
13	Hybrid	Urea	Man-animal	2	90	Spring
14	Inbreed	Urea, Viking	Man-animal	2	100	Connected
15	Hybrid	Urea, Viking	Modern tech	2	40	Rain fed
16	Hybrid	Herbicide	Man-animal	2	110	Rain fed
17	-	Urea	Man-animal	0	(40 corn)	Rainfed
18	Inbreed	Urea, Viking	Man-animal	2	110	Connected
19	Inbreed	Oganic Fertilizer	Man-animal	2	80	Connected

The average annual yield of the Philippines is around 40 cavans of rice per cropping per ha. In comparison, the average crop yield of 17 rice farmers we interviewed is about 46 cavans per cropping (Figure 3). We excluded the data of the red rice farmer because red rice is a wild variety of rice which has a very low grain yield. As a result many rice farmers in its native Asia regard it as a weed. We excluded the data of the corn farmer as well, because it is not relevant to the sub question about rice cultivation.

There are a few factors that explain the high yield of rice in the Tumauini area. 11 Rice fields of the 18 respondents are connected to the irrigation system. The irrigation system supplies water continuously during all stages of the rice cultivation. This means that irrigated rice will

grow faster than rain fed rice. Spring rice fields produce high yields as well, because spring water is managed and flows even during drought (Mercedes Alyas 2013, pers. Comm.).

The secretary of TIPA explained that the rice cultivation in Antagan 1 is presented as an example for other rice cultivating areas (Jovito W. Sutio Sr. 2013, pers. comm.). In Antagan 1, NIA and PhilRice experiment with the newest hybrid rice varieties and with the best irrigation methods through "Farm Demo". 10 of the 18 interviewees experiment with high yield hybrid rice varieties (Figure 3). Rice farmers plant inbreed and hybrid varieties (Figure 3) but most of them prefer to plant hybrid seeds for their good quality and being pest resistant compared to inbreed varieties. The estimated price of hybrid rice is 1300 pesos compared to inbreed varieties of 800 pesos per bag. Thus, for a lot of farmers hybrid rice is too expensive.
Even though the rice cultivation of Antagan 1 is named as an example, only 30% of the respondents attend agricultural trainings and seminars given by agricultural extension workers of the Department of Agriculture (DA). Other farmers are either too busy or not willing to attend the seminars.

Many farmers use traditional agricultural technology (man-animal). The average size of rice fields is just about 1 ha. For that reason, big tractors are not preferred to cultivate the field. Tractors are too expensive for most farmers as well.
Furthermore, most farmers practice dual pattern cropping. According to them, the first cropping is done in the month of June and ends in November, and the second cropping starts in the month of October and ends in April. Engineer Salvador (NIA) explained that a lot of farmers still use the dual pattern cropping, even though their fields are connected to the irrigation system. The mission of NIA is for the farmers to generate 5 croppings in 2 years. This means that the farmers will have to change their traditional annual practices in order to produce more yields and increase income.

Additionally, some interviewed farmers gain extra income by running a variety store, sending a family member abroad (a.k.a. Overseas Filipino Worker), or cultivating fruits/vegetables. This information is confirmed by the EIS (2012). The study states that households in the area of Tumauini have other sources of income, to augment the income derived from cultivating rice/corn. Other sources of income mentioned in the FS are employment either in public or private offices, poultry, livestock and backyard gardening, hiring out of machineries, equipment and also farm animals (EIS 2012).

All our interviewees, both farmers and officials, expected an increase in income once the TRMP is implemented. In terms of crop yields and production, the main crop will be irrigated rice during both wet and dry seasons. Farmers who cultivate corn will change crops and will grow rice. Because of the continuous water supply all year long, rice cultivation will gain more income than corn cultivation. With the proper management of applying fertilizers and improved rice varieties, there is a tendency that the rice yield will be increased to 5.0 to 5.2 tons per ha during wet and dry seasons, respectively (NIA, 2012).

The interviewed farmers expect that the upcoming irrigation system will be well constructed and maintained, based on their experiences with the current system.
Based on the FS, some changes of the area in terms of land use, cropping pattern and farm mechanization are needed in order to attain the desired crop yield in the future. It is hoped that the present Tumauini land use of rain fed areas for rice and corn will change into irrigated rice fields. Increasing the rice cultivation is part of the strategy of the Philippine government to become a self-sufficient rice country.

What is the attitude of farmers towards the TRMP in comparison to the governmental organizations?

Based on interviews, we can say that the different governmental organizations in the region are all positive towards the TRMP.

The administrator of IA-TIPA, Jovito W. Sutio Sr., mentioned the increase of irrigation water. This extra supply of water will mean higher yields for the local farmers. Rice is a water loving crop and more water will lead to better circumstances for the rice plant to grow. A second effect is the change of crops; farmers, who grow corn at the moment because they are not connected to the irrigation system, can switch to grow rice when they have access to irrigation water. All this will mean an improvement of the economic situation in the countryside. The construction of the dam will bring a lot of employment to the municipality, because workers from the surrounding villages are preferred. This is also a big advantage for the area; there is a lot of unemployment at the moment. The risk of flooding is not mentioned as a problem by Mr. Sutio; NIA will construct the dam properly and will manage the amount of water in the lake well.

The chairman of the local NIA-office, Engineer Salvador, also supports the proposed project. The dam will lead to a lot more irrigation water, especially in the dry season. The yields will increase and more rice can be produced. Because of the continuous availability of water, it is possible to have 5 cropping seasons in 2 years instead of 4 cropping seasons at the moment.
Engineer Martinez, Central Officer of NIA Cauayan, was head of the local office of NIA during the decision making process. He mentioned the same arguments in favor of the dam as Engineer Salvador. He also mentioned the intention of the government to become a rice producing country by 2016. The TRMP is part of the plan to reach this goal; the lake will provide more irrigation water and make more intense large(r) scale rice cultivation in Isabela possible.

Engineer Amante M. Palce, agriculturist of the LGU of Cabagan, sees the TRMP as a good project. Farmers in the community will benefit from the irrigation water. Besides that, the project will lead to a higher employment rate. He also sees the dam as a possible tourist attraction, like Magat Dam.

All respondents in Antagan 1 heard about the proposed dam project including the upgrading of the irrigation system. They are all satisfied with the increase of irrigation water during the dry season and acknowledge the economic impact on the area in relation to the increase of yields and additional employment.

On the contrary, not all the farmers are positive towards the TRMP. Their concern about possible floodings is not shared with the officials and the information about safety measures is not spread among the population.

The proposed raise of the fees is not mentioned as a problem; all farmers are willing to pay more money if the irrigation system will be upgraded. Some farmers said that when their yields will raise, they have enough liquidity to pay more and justify that when the benefit will raise, the fee will increase as well. Other farmers said that they cannot influence the fee increase, so they will pay because they do not have other options.

Most of the farmers concluded that they have neutral attitude towards the proposed TRMP, because they confirm the positive effects of the upgraded irrigation system, but also fear flash floods in the lower areas (Figure 4).

Concluding, we can say that the attitude towards the proposed TRMP differs from the farmers' vision. We experienced a gap between all the positive information given to us by the different governmental employees and the rumors living among the local community.

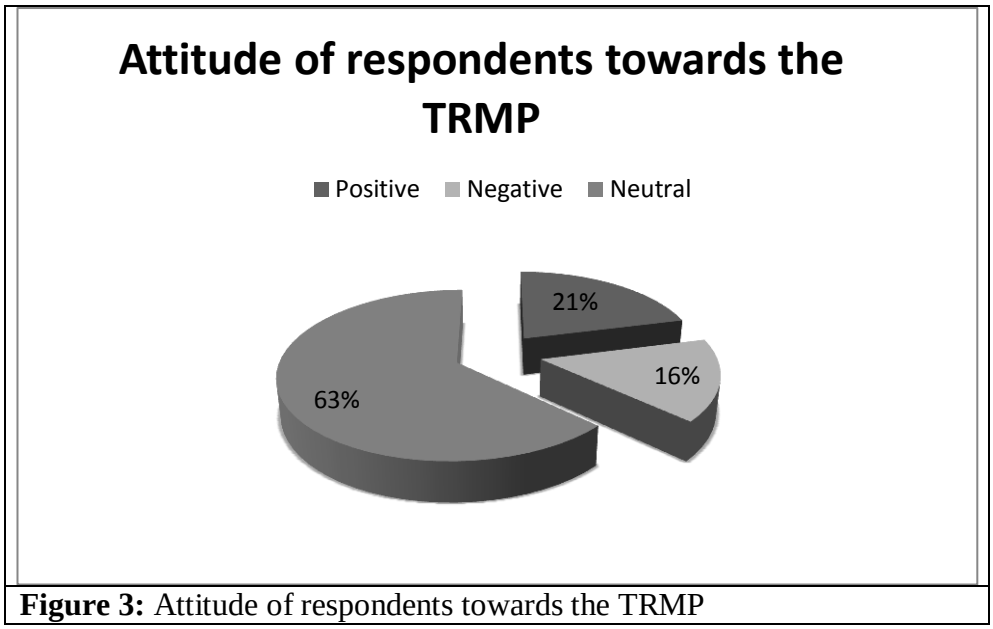


Figure 3: Attitude of respondents towards the TRMP

Is the capacity building and awareness raising program effective in the Tumauini area?

Capacity is the ability of the person or organization to do things with maximum competence. The organization needs to be effective in the delivery of the services and efficient in the use of resources. People are key players in establishing an effective operation in an institution. In case of irrigation services, provision means to acquire, allocate and distribute water equitably and reliably to all the legitimate users in a sustainable way. In this case, the IA-TIPA organize, in cooperation with PhilRice and sponsored by the Department of Agriculture, some seminars regarding the latest information on farm techniques, good varieties of rice and the latest agricultural technology. This will surely help the local farmers in the service area of the IA-TIPA, if the farmers will cooperate as well.

Trainings are provided to enhance the capability of the local farmers to improve the old practices in rice farming. It is more advantageous to know the facts regarding the proper management of rice cultivation and have good knowledge about the irrigation or distribution of water to the rice lands.

Increasing the knowledge of the rice farmers is part of the strategy of the Philippine government to become a self-sufficient rice country. The other 3 parts are Integrated Water Resources Management, investment in sustainable climate change-resilient agriculture infrastructure and enhancement of sustainable, multi-sectoral and community-based resource management mechanisms. The knowledge transferred to the farmers should contain information about techniques to cope in a good way with the climate and climate changes (NIA 2012).

According to Eng. Wilfredo Salvador, one of the objectives of the local NIA office is to have 5 croppings in 2 years. This explains why NIA managed a meeting with the IA presidents of the region to inform them of the benefits of having a dam in the river. The engineer told us that a lot of farmers stick to their traditional ways of farming (2 croppings a year) instead of the introduced 5-in-2 program which is possible with the availability of irrigation water.
Farmers need organizations to provide advice and support. It is provided in the form of extension services that link research with practical farming. At Barangay Antagan 1, the management set up a meeting to inform marginal farmers in the area to know the technical know-how of rice farming and irrigation. They also promote the area as being the hybrid rice producer nationally.

Sustainability is also a concept that requires careful thought, e.g. considering whether a training facility should be sustained beyond its usefulness or be closed. Capacity development is not a fixed issue and any strategy must be flexible enough to meet changes in capacity needs. This concept needs a lot of settlement to do so. In this regard, the joint effort of NIA with the help of IAs and cooperating farmers – the capacity of everyone will extend until the goal will be achieved.

Not all of our respondents are attending the meetings organized by the IA (Figure 5). Some said they were too busy working on the land, others said they were not informed about the seminars.

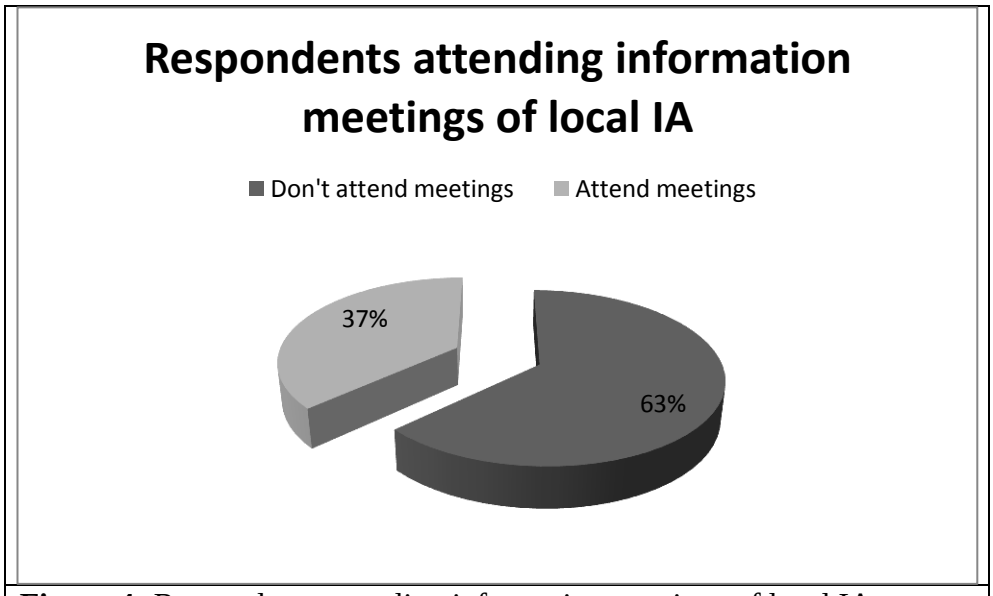


Figure 4: Respondents attending information meetings of local IA

Concluding, we can say that the NIA vision of capacity building in the area consists of organizing local meetings in cooperation with the IA-offices. These meetings are not attended by all farmers, because they do not know about the meetings or are busy working on the land. The effectiveness of the NIA-program can be made higher by improving the awareness of the farmers on the meetings, emphasizing the importance of the meetings and trying to plan the meetings outside the harvest season.

DISCUSSION

The strengths of the proposed TRMP for the irrigation system are without any doubt focused on the increase in irrigation water, especially during the dry season. Furthermore, the irrigated area will be more than doubled. The increased availability of water will have impact on the rice cultivation in the area. Farmers who grow corn at the moment will switch to rice if they will be connected to the system. Farmers who grow rice will probably switch varieties due to the changed circumstances and will have higher yields. This will have a positive influence on the local economy.

The weaknesses of the proposed TRMP are laid in the distribution of information. Farmers are afraid of flash floods because of the dam, mainly because they do not know the details about the plan. They talk among each other about the fear of losing their lands.

An opportunity for the TRMP is using the current organization structures. We think the devolving organization of the NIA, IAs and government is well structured Nevertheless, the final link, the connection between the community and the IA and LGU, is weak. Informing people about either the proposed project or the latest agricultural technologies is well planned on paper, but it is not thoroughly brought in practice. A significant number of farmers do not know about seminars of the IA and do not attend information meetings.

The current system is well maintained and the institutions are well developed. The proposed project will increase the scale of the system and new IAs have to be established. Such scaling could be a risk for the system and its beneficiaries. Despite the seminars organized by the IAs, a lot of farmers keep their old, traditional ways of rice cultivation. This could be a risk for the TRMP as well. When more water is available, traditions have to be broken in order to reach the goal of an increased rice production.

The basis of this research is formed by a five-day fieldtrip. We realize that five days is a too short period to get exact answers on our questions. We tried to get an impression of the irrigation system, rice cultivation and the possible changes and problems related to it. Our number of farmer-respondents, 19, is also not sufficient enough to get reliable statistical data. This report should therefore be read as an impression of the subject that can only give an indication of the percentages and numbers. Further research should be conducted to get more reliable statistics and to get a clear view of the situation and expectations of the Tumauini Irrigation System.

ACKNOWLEDGEMENTS

Foremost, we would like to express our sincere gratitude to Brgy. Captain Reynaldo Rapadas of Antagan 1, Tumauini, Isabela for giving us permission to conduct our research study and letting his barangay officials accompany us to our host family. To Municipal Agriculturist Amante M. Palce, Jr. for giving us enough information on what we need on our research, Engr. Wilfredo Salvador for permitting us to have an interview with him and letting his documents open to us. To Engr. Martinez of NIA for giving us a copy of the feasibility study. To all our respondents for answering our questions honestly. We would also like to thank from the bottom of our hearts our very kind host family Mr. and Mrs. Peduca and their children, for the great accommodation and for treating us nicely to make us comfortable. Lastly, we thank God for giving us strength and wisdom to make this research a successful one.

REFERENCES

Calingay, Jacinto O. and Wissingh, Thomas F., *Forest cover and land use in an upland area of Tumauini.* Booklet of International course on water and water management in the Philippines, 2011.

Environmental Impact Statement (EIS) Tumauini River Multipurpose Project, NIA 2012.

National Irrigation Administration (NIA), *Tumauini River Multipurpose Project: Updated Feasibility Study Report.* Version 8 december 2012.

Oliveros, I. and Hutten, P., *The Tumauini Irrigation system: Rules and regulations in theory and practice.* Booklet of International course on water and water management in the Philippines, 2011.

Salvador, Eng. Wilfredo, Head of the local NIA office of Tumauini, interviewed 22th of January in Cabagan.

Sutio Sr., Jovito W., Administrator of Irrigation Association – Tumauini Irrigators Project Area (IA-TIPA), interviewed 20th of January in Antagan 2nd.

Appendix 1: Questionnaire Farmers

First a short introduction about us and what we want to do.

1. What is your name?
2. What is your age?
3. What is your occupation?
4. With how many family-members do you live?
5. What is your education?
6. What kind of crops do you grow?
7. Which varieties do you grow?
8. Do you use natural or chemical fertilizers?
9. What kind of agricultural technology do you use?
10. Do you have any latest information about the current agricultural technology?
11. How many cropping seasons do you have in one year?
12. How many cavans do you harvest in one cropping season?
13. Are your fields connected to the irrigation system?
14. If yes, does the system give you enough water?
15. Are you in general satisfied with the irrigation system?
16. Did you hear rumors about the dam that will be built upstream?
    a. If yes, do you know irrigation system will be upgraded?
    b. If no, do you know irrigation system will be upgraded?
        i. If yes, continue.
        ii. If no, end interview.
17. What are your thoughts about the new irrigation system?
18. What do you think of the current and future fees for the irrigation system?
19. Are there any upcoming changes for you if the upgraded irrigation system works?

a. Variety
b. Practices
c. Yields

20. What do you expect of the maintenance of the irrigation system in 5 years?

Appendix 2: Questionnaire NIA

General start

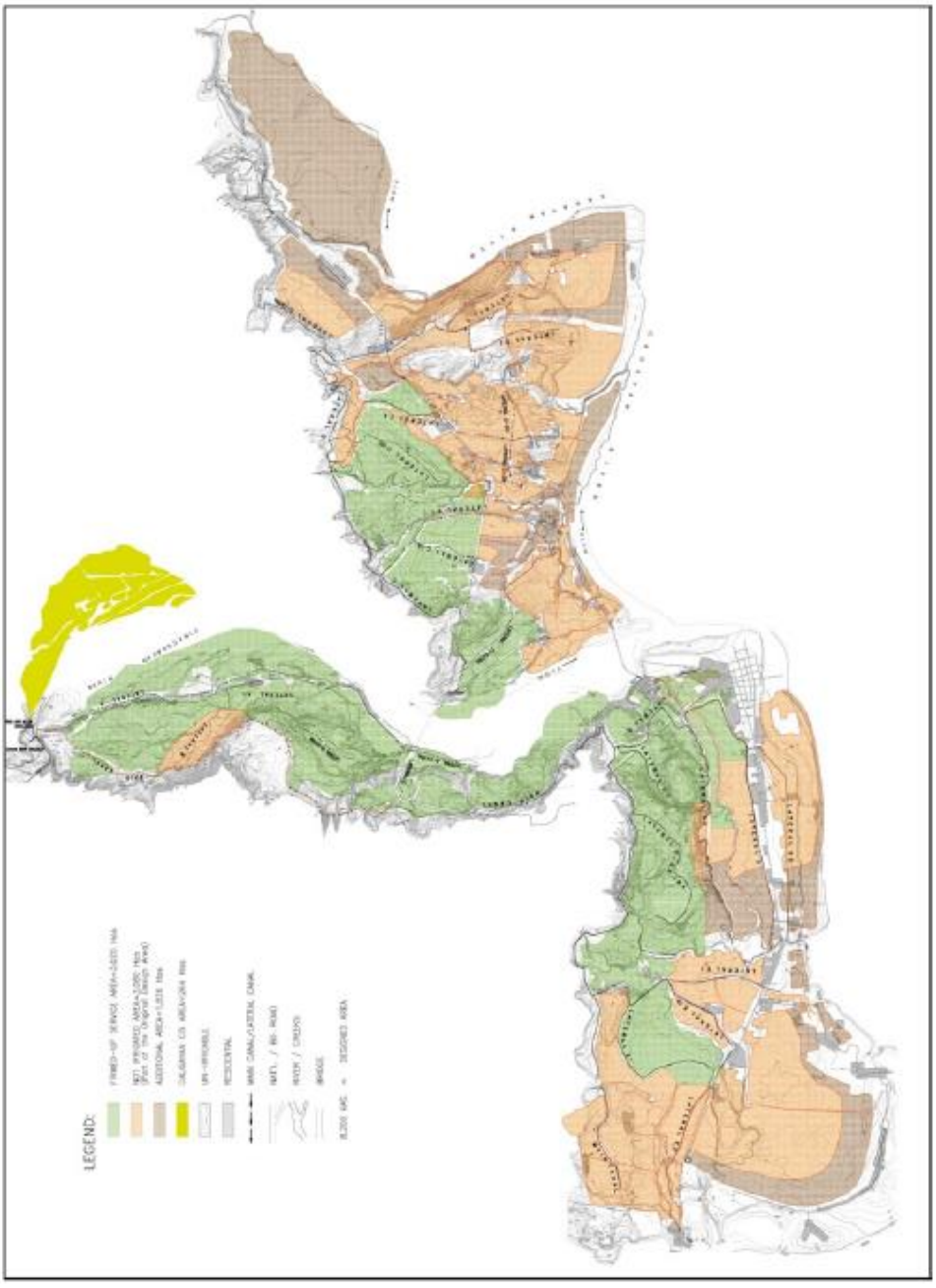
1. What is your name?
2. What is your occupation?
3. What is your connection to the dam being built?
4. What is the condition of the current irrigation system?
5. How many areas are beneficiaries by this irrigation?
6. What is the annual average volume of water discharge for irrigation?
7. What are the fees for the irrigation system?
8. How many croppings are there in one year?
9. What is the average production per cropping per farmer?
10. What are the other benefits in irrigation aside from rice production?
11. In terms of prediction, is there an increase of serviceable areas/beneficiaries, increase of annual average volume of water discharge for irrigation, increase of cost paid by the beneficiaries, increase of yields per cropping?
12. What do you think is going to change for the farmers?

Appendix 3: Questionnaire Other Governmental Organizations

General start

1. What is your name?
2. What is your occupation?
3. What is your connection to the dam being built?
4. What is the condition of the current irrigation system?
5. What are your expectations for the new irrigation system?
6. What do you think is going to change for the farmers?

Appendix 4: Map of irrigation area



(NIA, 2012)

TUMAUINI RIVER MULTIPURPOSE PROJECT: ANALYSIS OF THE ACTOR FIELD, POLICY AND LEGAL ENVIRONMENT AND APPROPRIATENESS OF PROCEDURES CONDUCTED

Zyrene Z. Cabaldo & Lisette de Heiden

INTRODUCTION

The decision making process regarding the Tumauini River Multipurpose Project (TRMP) started more than a decade ago. Because of the long duration of the decision making process, opinions as to how and when it started even seem to vary. On the one hand, this project was said to be running for approval the same time as the Magat dam, but had been rejected because President Marcos preferred Magat dam, which would be the biggest dam in Asia (Savella 2013, pers. comm.). On the other hand, the project did not start until 1995, when the head of the NIA in Tumauini was asked by the mayor to identify the biggest problem with their irrigation system. As a result, the mayor and the head of the NIA Tumauini sent a proposal to the NIA central office (Martinez 2013, pers. comm.).

Apart from the questions on how and when the proposal has been initiated, the steps that have to be undertaken to obtain an approval are very clear. Philippine environmental law and policies clearly dictate the procedures that have to be followed and the actors that have to be involved in the decision making process regarding this project. Since the TRMP is identified as an Environmentally Critical Area and an Environmentally Critical Project, additional measures have to be followed. Furthermore, all involved organizations follow clear guidelines and procedures in fulfilling their part in the process.

In order to fully understand the decision making process, a research was conducted to provide a comprehensive overview of the policy and legal environment, combined with the official procedures. In addition, an evaluation was done to assess the extent to which the reality of the decision making process of the Tumauini dam proposal matches the official procedures and relevant legal framework. To remain in the proximity of the matter at hand, the research was conducted in Tumauini and its surrounding municipalities. The evaluation of the policy and conducted procedures can be used to derive specific recommendations to help improve certain aspects that are related to the decision making process of projects such as the TRMP.

RESEARCH QUESTION

During this investigation, the following research question will be answered:

To what extent does the reality of the decision making process of the Tumauini Project proposal match the prescribed procedures and relevant legal framework?

In order to answer this question, additional questions have been drafted. They concern three different themes that will help answer the main research question. The first main theme is ‘formal procedures, legal and policy environment’. This theme includes sub questions such as:
What are the relevant laws to the construction and management of the dam?
What laws are relevant to the decision making process? What are the formal procedures?

The second theme concerns the 'actor field analysis'. Different questions will be used to construct the actor field:

What are the main interests/motives of the actors?
Who is responsible for the decisions?
Who pays and who benefits?
Who is accountable?
What is their involvement in the decision making process?

The third and last theme will be the 'reality check', in which the reality of the decision making process will be identified. In order to do this, the following questions will be asked:

What information was communicated during the public consultation?
How were the locals involved in the decision making process?
Which informal processes and decisions have contributed to the decision making process?

METHODS

Table 1: Time schedule for investigation

Day	***Activities***	***Place of Visit***
1 (Saturday January 19)	- Visited Magoli - Set an appointment with the Brgy. Captain of Antagan I	- Magoli, Antagan I, Tumauini - Bgry. Antagan I, Tumauini
2 (Sunday January 20)	- Visit Project Site - Interviewed the Brgy. Captain of Antagan I, Hon. Reynaldo Rapadas	- Magoli, Brgy. Antagan I - Brgy. Antagan I, Tumauini
3 (Monday January 21)	- Interviewed the Secretary to Sangguniang Bayan (SB) of Local Government Unit (LGU) of Tumauini, Mr. William Macapiya - Interviewed Head of Provincial Environment and Natural Resources Office (PENRO), Mr. William Savella - Interviewed Head of Provincial Environment and Management Office (PEMO), Mr. Proculo Castaňeda	- Municipal Hall of Tumauini - San Felipe, Ilagan City - San Felipe, Ilagan City
4 (Tuesday January 22)	- Interviewed Engr. Wilbert Galamay of NIA – Regional Office in behalf of the Regional Director - Interviewed Division Manager A of NIA – Cauayan City, Engr. Gualfredo Martinez - Interviewed Principal Engineer of NIA Isabela Chapter (Mallig, Tumauini, San Pablo – Cabagan), Engr. Wilfredo U. Salvador	- Minante I, Cauayan City - Minante I, Cauayan City - Garita, Cabagan
5 (Wednesday January 23)	- Interviewed Brgy. Captain of Antagan I, Hon. Reynaldo Rapadas for confirmation of surveys conducted by NIA - Visited other areas	- Antagan I, Tumauini - Brgy. Antagan II - Brgy. Namnama

The research question was answered by using a qualitative research method. In its most basic form, this method involves the analysis of any unstructured data, including literature research. Using this research method, the researchers used interviews as a method of gathering information. Practically, it is a conversation with purpose (formal or casual, structured or unstructured). Hence, it is useful in order to gain insight into the subjective understanding of the respondents. This method would guide the researchers to tap into the depths of reality of the situation and discover interviewees' meanings and understandings. The researchers developed empathy with interviewees to win their confidence and to be unobtrusive in order not to impose their influence on the interviewees.

Interviews were conducted with government officials from the National Irrigation Administration (NIA) in Cauayan City, Cabagan and Tumauini, the Local Government Unit (LGU) of Tumauini, Provincial Environment and Natural Resources Office (PENRO), Environmental Management Bureau (EMB) and Barangay Antagan I. Relevant actors as well as their accountability and motives for their action or lack of action were identified using information gathered in combination with a literature research.

An extensive literature research was conducted to be informed of the legal and policy environment. Together with the gathered information from the interviews, a comprehensive understanding of the legal framework regarding prescribed procedures in the decision making process was used to analyze and compare the results if the procedures conducted is appropriate to that of the prescribed procedures and decision making process base on the legal provisions. The researchers relied on procedures established in the law (primarily using Oposa's "A Legal Arsenal for the Philippine Environment") and information about the procedures as communicated during the interviews.

The methods used in this research are characterized by several advantages and disadvantages. First of all, by conducting face-to-face interviews, the researchers were able to witness how the interviewees react on certain questions. Observations about non-verbal communication could be far more important than verbal communication when it comes to understanding the complete intention of the interviewee when answering a question. The important point of the research is that it is essential that the nonverbal and verbal elements of a presentation be aligned. A facial expression can convey a great deal of information. Furthermore, this method of investigation shows great advantages over other research methods such as questionnaires. In an interview, respondents' answers can invoke follow-up questions to help the researchers create a comprehensive picture of the decision making process. Primary data were also properly gathered by direct inquiry from the respondents. Thus, changes (additional or modification) in the information provided were avoided as such plays an important role in analyzing and making conclusions and recommendations. The face-to-face interviews have also helped to receive referrals to other key actors.

Unfortunately, considering the scope and delimitation of the research, the study was confined within the vicinities of Tumauini, Cauayan City, Ilagan and Cabagan. Interviews usually cost more time per informant than other research methods. More interviews could have been conducted by using telephone and email conversations. There were also times wherein the respondents could not help deviating in answering the questions objectively. This research is descriptive by nature, and describes both the formal decision making process and procedures and the reality of the decision making process. Most key actors and informants have been identified prior to the investigation. Furthermore, in the course of the interviews, other key informants could be identified and added to the respondent list.

RESULTS

Throughout the course of the investigation, the interviews and literature research have provided a comprehensive understanding of the actor field and decision making process. First of all, the analysis of the actor field shows the involvement of a lot of actors supervising, endorsing and influencing each other, as well as delegating authority (Figure 1). This Actor Field Analysis, in combination with information from the interviews and relevant legal framework have further elucidated the prescribed procedures, as well as its chronological order (Figure 2) and the reality of the decision making process.

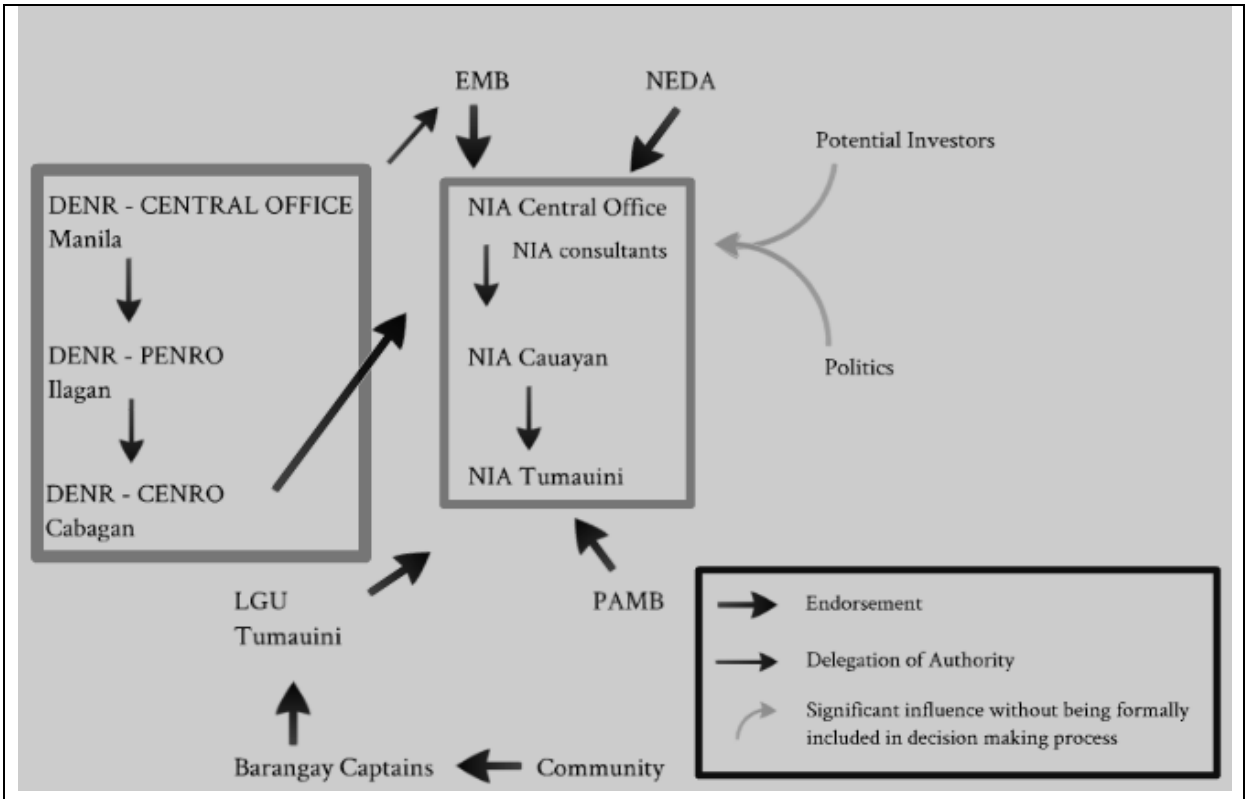


Figure 1: Actor Field Analysis of the TRMP Decision Making Process

Figure 2: Timeline of the TRMP Decision Making Process, Current Step (ECC Review Committee) Depicted in Bold Lines

In this project, the initial idea was conceived by the then mayor in collaboration with an official from the NIA Tumauini office in 1995. "He [the mayor, red.] asked me: 'engineer, what is our main problem with our irrigation?', to which I replied 'the water supply'." (Martinez 2013, pers. comm.). From this moment on, the process was set in motion. A resolution was drawn up and the proposal for the dam was sent to NIA's central office.

The first step in the TRMP and every project alike is always the endorsement of the community.

In order for the NIA to conduct preparatory investigations for the project, they need the endorsement of the Local Government Unit (LGU), expressed in a resolution drawn up by the council after the mayor's approval. However, without the consent of the community, the LGU cannot supply the resolution. Hence, the LGU will take the first step in consulting and/or convincing the community (Macapia 2013, pers. comm.).

After the proposal has been sent to the Central Office of NIA in Manila, a feasibility study will be conducted. Prior to the thorough investigation, NIA's Project Development Department will assess the feasibility of the project, after which an expert group will conduct a thorough investigation (Martinez 2013, pers. comm.). The first feasibility study dates back to 1998. However, since 15 years have already passed, the feasibility study was reformulated in 2012.

One of the most important components of the feasibility study is the public scoping. The team that conducts the study has to assess the social acceptability of the project. In the case of the TRMP, the team has interviewed key informants (LGU officials, Barangays captains, leaders of irrigator associations and chairmen of people's organizations) and undertook focus group discussions (Federation of Irrigators Association, People's Organization and the Protected Area Management Board (PAMB)) (NIA 2012). Furthermore, they undertook the first Public Scoping in August 2012 at the LGU Training Centre in Camp Samal in Tumauini. There were LGU officials present, as well as the Governor, Vice Governor, Barangays officials, PAMB members, heads of irrigators associations, NGO's and general public (Martinez 2012, pers. comm.). The attendance list shows a lot of LGU officials, NIA officials and officials from other organizations involved in the project. The attendance list shows about 20 people who do not belong to a specific organization and thus represent the 'general public'. When asked about the contents of the meeting, all respondents replied that they were informed of all the benefits of the proposal. Furthermore, the respondents testified that no one present opposed the project. Instead, they just raised questions concerning the assurance/guarantee of general welfare provided that the project was realized.

When the feasibility study is finished, it has to be sent to the National Economic and Development Authority (NEDA) to seek their approval (Martinez 2013, pers. comm.). Major projects must be properly coordinated with the NEDA at both the national and regional levels prior to their adoption, in order to ensure their consistency with established national priorities and coordination with other policies, plans, programs and projects of the government (Executive Order No. 230). This includes all projects of 0.5 billion pesos and up (Galamay 2013, pers. comm.).

After the approval of the feasibility study by the NEDA, an Environmental Impact Assessment (EIA) has to be conducted. This will be handled by a group selected by NIA itself comprising different experts that specialize in forestry, geology, irrigation engineering, soil technology, design engineering and so on as far as the environmental sustainability is concerned (Martinez 2013, pers. comm.). An EIA identifies alternatives and measures that can prevent, minimize or alleviate the adverse consequences in all stages and in the long run. All agencies and instrumentalities of the national government, including government-owned or controlled corporations, as well as private corporations firms and entities have to conduct this in every action, project, or undertaking which significantly affects the quality of the environment (Presidential Decree No. 1151). In the case of TRMP, the EIA was conducted by staff from NIAConsult, Inc. and consisted of five experts. According to the EIA report from NIA, the EIA was conducted from June to October 2012 (NIA 2012).

The TRMP has been identified as an Environmentally Critical Project and the area has been identified as an Environmentally Critical Area, as stipulated in Proclamation No. 2146 for Environmentally Critical Areas and Projects. This means that the proponent has to conduct an EIA, and is also obliged to secure an Environmental Compliance Certificate (ECC) (Presidential Decree No. 1586 Sec. 4). It certifies that the proponent has complied with all the requirements of the Environmental Impact Statement (EIS) system, which covers the EIA. The ECC will be supplied by the Environmental Management Bureau (EMB) after thorough investigation. A review committee will conduct an investigation to determine if the EIA reflects the real environmental and if the mitigating measures for the negative effects are sufficient. The committee will conduct its own investigation on the area, and for critical projects, the head himself will join the research group (Castaneda 2013, pers. comm.). The EMB can greatly influence the decision making process, since the issuance of an ECC is vital to the success of a proposal.

After the issuance of the ECC, the proposal is ready to be approved by the national government and the President. When all the requirements are met, the national government and the politicians can make an informed choice about the project. However, there might still be some obstacles. First of all, funding has to be provided for the project which has already proven to be of significant influence. As mentioned before, the first feasibility study was already conducted in 1998. However, because of a lack of funding, the project was not given priority which has led to the present situation wherein the proposal has to be reassessed after 15 years. Although the constraints are mostly financially, social problems might also arise. For example at the Apayao Abulug diversion dam, opposing parties burned the equipment of the construction workers to sabotage the project (Galamay 2013, pers. comm.).

Throughout the process, the Department of Environmental and Natural Resources (DENR) also closely watches and oversees the process. The DENR is tasked to formulate and implement policies, guidelines, rules and regulations relating to environmental management and pollution prevention and control. Furthermore, as the Tumauini Watershed Forest Reserve (TWFR) is a protected area, the National Integrated Protected Areas System Act (NIPAS) requires a Protected Area Management Board (PAMB). This is a multi-sectoral body which includes the Municipal Mayor, Barangay Captains and the DENR as chair. PAMB has to be consulted about construction in protected areas and relies on the information provided in the EIA for its assessments (Savella 2013, pers. comm.).

Most actors, including their authority, motives and involvement have been mentioned. However, other actors have been identified that are not formally involved in the decision making process and the management after construction, but can influence it nonetheless. First of all, investors are crucial for the proposal to succeed. The source of funding might influence the details concerning the dam and the time it takes for the project to be approved. The money might come from the Philippine government (also known as General Appropriations Act), the Japanese, Korean or Chinese government, local funds, bank loans, grants or probably a combination of several. In connection to these potential financers, mode of public-private partnership is to be considered such as build-transfer and build-operate-transfer (Martinez 2013, pers. comm). Furthermore, the objectives that politicians and the government have for the Philippines might have influenced the process. The objective is to be self-sufficient in rice by 2016 and even start exporting rice. Because of these objectives, projects such as the TRMP have become priority projects. NIA has been mandated to constantly look for opportunities for irrigation development (Galamay 2013, pers. comm.).

More efficient and increased irrigation can improve the current yield of rice, and farmers who currently produce corn may start producing rice instead.

DISCUSSION

From the analysis of the decision making process, it appears that the official procedures have been followed. However, there seem to be several discrepancies between information provided by the different informants. Furthermore, improvements can be made in the information dissemination and knowledge on procedures. A SWOT-analysis has been used to identify all the strengths, weaknesses, opportunities and threats of the system (Table 2).

Table 2: SWOT Analysis of TRMP Decision Making Process

Strengths:	**Weaknesses:**
- Hierarchy of government – every actor/agency is designed to do their own part to increase efficiency wherein each has significant roles upon coordination, which is to plan; to supervise; to verify and to implement. - Furthermore, the specializations and authorities of different government agencies on specific matters are integrated to guarantee the general welfare of the people, the sustainability of the project and the protection of the environment. - Public consultation is required to assess the social acceptability of the project.	- Sufficient knowledge on prescribed procedures and current status of the proposal is essential for an efficient and effective decision making process. Without, this cannot be guaranteed, but actors are highly dependent on other actors for information. - The inclusion of many actors can cause miscommunication and uncertainty about actors' accountability and responsibility. - The value of the public consultation depends highly on the attendants and the information provided by the agencies in charge of the consultation.
Opportunities:	**Threats:**
- The expertise of all the different agencies as well as the prescribed procedures can contribute to the assurance of the project's sustainability, the general welfare of the people and the protection of the environment. - The public consultation informs people about the impacts of the project, as well as provides a platform for people to express their opinions on the project, which can help to improve the project details.	- Lack of knowledge on procedures within actors and miscommunications and uncertainty between actors can cause delay and unwanted effects. - Participants in the consultation are dependent on the information provided by the proponent. If all the information disseminated is focused on the positive effects, the conclusion about the social acceptability might not reflect the actual situation.

First of all, a problem arises in the dissemination of information. Since NIA is the proponent of the project, responsible for the Public Scoping and the EIA, and accountable for anything that might go wrong, it beholds most of the information, though there appear to be a lot of discrepancies with the information in possession of other key actors. According to the EIA report from NIA, the EIA was conducted from June to October 2012. However, most respondents replied that an EIA has not yet been conducted. One respondent even claimed that an EIA should take longer than six months and could never have been finished (Castaneda 2013, pers. comm.). The Barangay Captain of Antagan I also claims never to have heard of an investigation of the like, although he 'has seen some people drilling near the dam site' (Rapadas 2013, pers. comm.). The LGU is not sure of the current step in the process, and refers to NIA for any information (Macapia 2013, pers. comm.). There is a very high reliance on their technical expertise, and they have a high credibility among all respondents.

Secondly, the information provided by NIA appears to be very one-sided and mainly focused on the benefits of the dam. Especially considering the public consultation during the Public Scoping, respondents claim to have been informed of all the benefits. To Mr. Reynaldo Rapadas, Barangay Captain of Antagan I, the scoping was more of an announcement of the project than it was a consultation of the public. He feels like he has not received all the information, and would like to have an actual public consultation in which the public will be more consulted than informed. For this reason, Mr. Rapadas is taking up the initiative to invite the NIA to their next general assembly in March 201. When asked about the guarantee of himself and his constituents vis-à-vis the accountability of the actors, Memorandum Of Agreement (MOA) has to be made (Rapadas 2013, pers. comm.). Furthermore, as mentioned before, all respondents testified that no one opposed the project during this Public Scoping. However, if this Public Scoping was of great influence on the assessment of the social acceptability, it might provide a potential threat to the conclusion of this assessment. If the meeting was focused on all the benefits of the project, could the attendants have made a well-advised decision based on all the pros and cons and potential impact on their lives? Furthermore, a representation of around twenty people from the 'general public' is a meager amount compared to the total population of the affected area.

The inclusion of many actors can help efficiency and effectiveness in guaranteeing people's general welfare, the sustainability and environmental protection. However, a potential threat is miscommunication (Table 2) which has already proven its danger in the process. PAMB had to be consulted about construction in Protected Areas, but the construction for the access road for the construction site of the dam had already commenced without consulting the PAMB on this matter. As a result, the head of NIA Tumauini received a fine from the DENR of 30,000 pesos (Salvador 2013, pers. comm.). While in this case the damage is limited to the fine, it could have also caused significant impacts on the environment by the lack of information from PAMB.

CONCLUSION

Although the official procedures have been followed, it appears from the interviews that there are a lot of discrepancies between the information of the respondents. Especially knowledge on the official procedures and current status of the project appear to be inconsistent and insufficient in several key actors, which points to a weakness and threat in the system (Table 2). Furthermore, the value of the Public Consultation is questionable considering the one-sided information provided and small representation of the community present, which also illustrates one of the weaknesses of the system (Table 2).

As is apparent from the analysis of the decision making process, there is an asymmetrical distribution of information, with the NIA beholding most information. NIA is dependent on the community for endorsement and consent in the public consultation, but the people who have to endorse and the actors who have to make decisions are dependent on the information as provided by NIA. This shows a different actor field analysis than initially assumed, with the NIA influencing the community and other actors by means of the information they choose to disseminate.

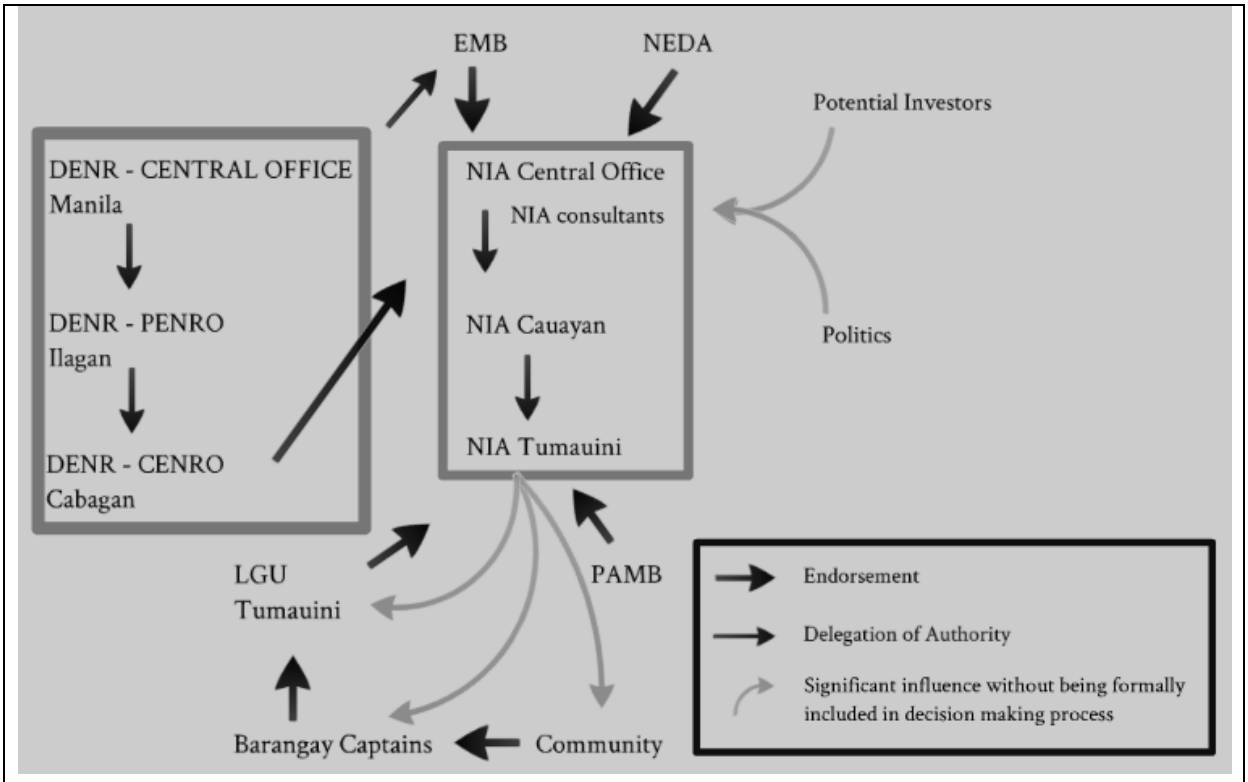


Figure 3: Modified Actor Field Analysis, Including Influence by NIA through Information Dissemination

From the SWOT analysis (Table 2), additional information and documentation and the modified Actor Field Analysis (Table 3), specific recommendations have been drafted:

- Increase knowledge on prescribed procedures among all actors involved to increase effectiveness in decision making
- In addition, actors should be better informed about the current status of the proposal so as to exercise thorough supervision
- Active dissemination of information on this matter by the proponent should be improved and the actors should take their responsibility in assuring they have all the information needed.
- Use the public consultation as an opportunity to gain insight into the opinions of the people in the community and other actors involved. Inform them of all the benefits and possible negative impacts, so they are able to form a well-advised opinion based on all the aspects. This will be extremely useful to make improvements in the project details and gain support from the community.

ACKNOWLEDGEMENTS

We would like to extend our profound gratitude and deep regards to those who had contributed to the success of our research. To our host family, for their warm welcome and for providing us a place to stay during the field work. To our key informants (interviewees), for imparting us the valuable information/data we need. Their indulgence to give their time so generously is highly appreciated. Hon. Reynaldo Rapadas of Antagan I for sharing us his perspective and experience as the head of his community and in behalf of his constituents, Mr. William Macapiya of LGU Tumauini for the referral of other key informants and providing facts on how LGU and National Government are involved in the decision-making process and procedure, For. William Savella of PENRO for the talk on how each agencies play their part as government authorities, Engr. Mr. Proculo Castaňeda of PEMO for sharing his ideas on the veracity of the procedures conducted and activities accomplished in so far as the entirety of the procedure and current status of the proposal is concerned, Engrs. Gualfredo Martinez and Wilbert Galamay of NIA – Regional Office for the discussions on the thoroughness of the process to be undertaken as well as the short description, origin and history of the proposal, and Engr. Wilfredo Salvador of NIA – Cabagan (Isabela Chapter) for some documentations. To Ms. Mauren N. Licudine and Mr. John Michael L. Babas, for their sincerest support and assistance with the scheduling of other appointments. To our Parents, for the constant encouragement and guidance given from time to time without which the study will not be that meaningful for the researchers. And to the Almighty God, for allowing us each day of our research days to do our activities in accordance with what we planned and for giving us the wisdom as a medium

REFERENCES

About EMB, http://www.emb.gov.ph/portal/AboutEMB.aspx, downloaded on January 28, 2013

Cariño, J. 2005. Indigenous Peoples' Right to Free, Prior, Informed, Consent: Reflections on Concepts and Practice, Arizona Journal of International & Comparative Law Vol 22, No. 1
DENR (2007), Revised Procedural Manual for EIA
DENR Cauayan, http://r2.denr.gov.ph/index.php/penro-isabela/cenro-cabagan, downloaded on January 28, 2013

DENR Mission and vision, http://www.denr.gov.ph/about-us/mission-vision.html#, downloaded on January 28, 2013

Jeff Anderson Consulting, Inc. Interviewing and Research Methods http://www.jeffandersonconsulting.com/marketing-research.php/survey-research/research-methods downloaded on January 22, 2013

Keeney, D. Fundamentals of media interview skills: facial expression http://www.evancarmichael.com/Public-Relations/213/Fundamentals-of-media-interview-skills-facial-expression.html. downloaded on January 23, 2013

NEDA legal mandate http://www.neda.gov.ph/about/legal_mandate.htm#AnnexA, downloaded on January 28, 2013

National Irrigation Authority (NIA). 2012. Tumauini River Multipurpose Project: Environmental Impact Statement

National Irrigation Authority (NIA). 2012. Tumauini River Multipurpose Project: Feasibility Study Report

O'Connor, T. 2011. "Qualitative Research Methodologies" MegaLinks in Criminal Justice http://www.drtomoconnor.com/3760/3760lect06.htm, downloaded on January 22, 2013

Oposa, A.A. 2002. 'A Legal Arsenal for the Philippine Environment', The Philippine Islands: Batas Kalikasan Foundation.

Presidential Decree No. 1067 (1976). The Water Code of the Philippines http://www.chanrobles.com/presidentialdecreeno1067.htm#.UQbvaR0yMSd, downloaded on January 28, 2013

Villaluz, M.G. 2003. 'Advancing the EIA system in the Philippines', in: UNEP EIA Training Resource Manual: Case studies from developing countries, pp. 257-260.

AWARENESS, PERCEPTIONS AND ATTITUDES REGARDING THE MULTIPURPOSE DAM IN TUMAUINI, ISABELA

Roxsan Antonio, Daniël Kan & Hannah van Meurs

INTRODUCTION

The National Irrigation Administration (NIA) is planning to build a dam in Tumauini, Isabela. The main objective of the Tumauini River Multipurpose Project (TRMP) is to improve the water supply for farmers. The agricultural sector plays a significant role in the economy of the Philippines, especially in rural areas like Tumauini. The NIA expects that the farmers will be able to increase their productivity and income in the irrigated area (NIA 2012).

The Philippine government requires that affected communities should be informed and consulted prior to execution of any large project such as dam construction. Without proper information, the community is not able to formulate its opinion on the project proposal. In case of environmentally critical projects, such as the TRMP, an environmental impact assessment (EIA) is required. As part of the EIA, a public scoping meeting has to be organized. The scoping procedure must be followed by a public hearing or a public consultation. In these meetings, the project proponent is required to hand out copies of the EIA Report, the Executive Summary and copies of Project Fact Sheets in the local language, so the people are able to make an informed decision (DENR 2003).

Despite these progressive laws, differences may occur between the letter of the law and the implementation. The law on free, prior and informed consent for instance is protecting indigenous people very well on paper. The law protects indigenous people, but in reality their opinion is often manipulated and ignored and the law is not executed properly (Cariño 2005).

This research is conducted to find out the present level of awareness, perception, attitude and information needs of the Tumauini people regarding the construction of the dam. Our aim is to investigate whether the people in Tumauini have a positive or negative attitude towards the said project. Additionally, we will look into the level of awareness and perceptions of the people with regards to the proposed project to be able to explain their attitudes cognizant of the fact that people cannot take an informed decision if they are not aware of the proposed plans and if their knowledge of the impact of the TRMP is not sufficient.

RESEARCH QUESTIONS

We want to know if the people in the affected areas of Tumauini are aware of the proposed project and what their perceptions and attitudes are on the construction of the TRMP.

Our general research question is:Which factors are important in explaining the level of awareness, the perceived impact and attitudes of the people in Tumauini on the Tumauini River Multipurpose Project?

Sub-questions:

- Are the people aware of the fact that there is a proposed dam?
- What is the perception of the people about the possible impacts of the dam?
- What is the attitude of the people towards the construction of the dam?
- How can the attitude of the people be explained?

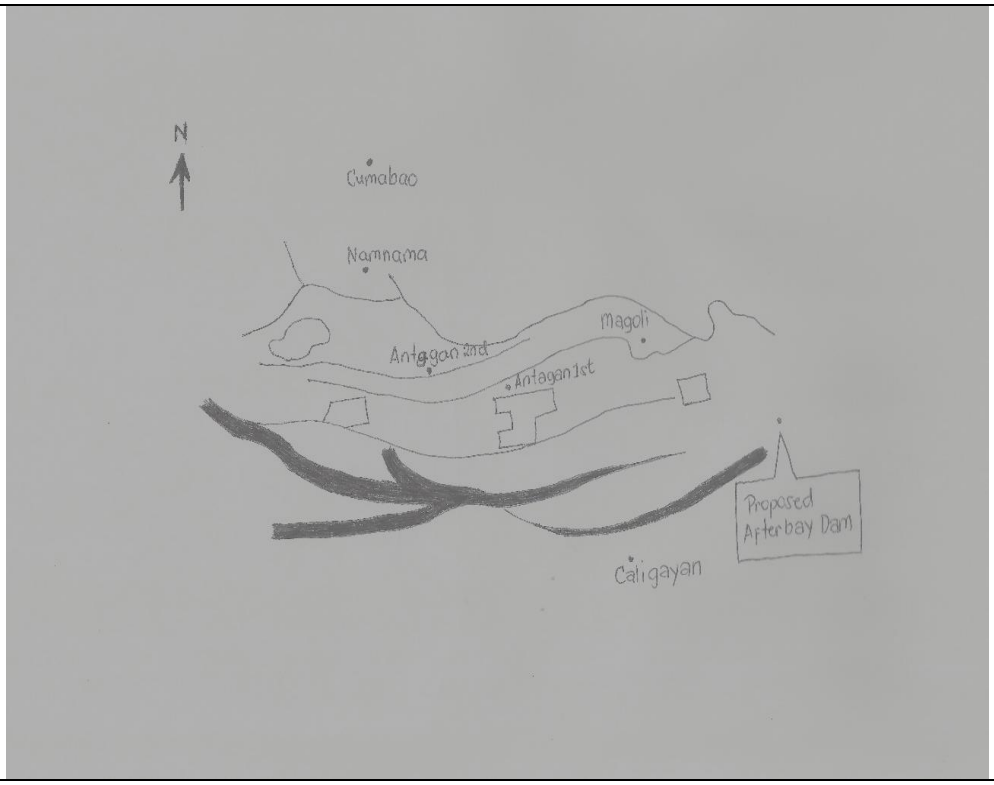
METHODS

We spent five days in Tumauini for our research on the awareness of the affected communities. Our accommodation was located in Antagan I. We spent our time in Tumauini visiting six barangays (Table 1).

Table 1: Time schedule

Date	***Activity***	***Location***
Saturday 19 January 2013	Travel from Cabagan to Antagan I Conducting interviews in Antagan I	Cabagan Antagan I
Sunday 20 January 2013	Visit the dam site Conducing interviews in Antagan I	Magoli Antagan I
Monday 21 January 2013	Conducting interviews in Cumabao Conducting interviews in Namnama	Cumabao Namnama
Tuesday 22 January 2013	Conducting interviews in Magoli Conducting interviews in Antagan II	Magoli Antagan II
Wednesday 23 January 2013	Conducting interviews in Caligayan Travel back to Cabagan	Caligayan Cabagan

In order to get to know the level of awareness, the perceptions and attitudes of the Tumauini population, we conducted 42 interviews. We divided the interviews among six different barangays, namely: Antagan I, Antagan II, Magoli, Namnama, Cumabao and Caligayan (Table 1). We chose these barangays because we wanted to look at the differences between the villages on levels of awareness, perceived impacts and attitudes. We chose these six barangays also because they are close to the dam site (Map 1).



Map 1: Drawing of the six barangays and the proposed dam site

We used stratified sampling since we conducted seven interviews per barangay. Within the barangays we used availability sampling and snowball sampling to get our respondents, while making sure the interviews were equally spread throughout the barangay. By doing the interviews, we were able to hear the opinions of the people living in the affected area. We focused on this group of respondents to get an overview of what they think about the proposed TRMP.

Besides the interviews we conducted, we also made observations as a way to gather information in our research. We drew a map of our research area to show which barangays we visited and their relative positions with respect to the proposed dam site (Map 1).

Thirty-three of our 42 respondents said they are aware about the proposed dam, but they are only informed about the positive impacts. Nine respondents did not know anything about the proposed dam so we used Magat Dam as an example to explain the characteristics of the proposed dam in Magoli. We asked them whether they knew the Magat Dam and they all replied positively.

RESULTS

Information dissemination about the project

In order to evaluate the information dissemination process, we asked our respondents where they heard about the TRMP. Most of our respondents replied that they heard about it at the assembly meeting where the NIA was invited in 2012. A lot of people heard about it in their neighborhood and most of the time the information came from people who attended the General Barangay Assembly in their village. So the main source of information was provided by NIA through the barangay assembly meetings. Some people got their information from government officials, NIA officials or in some instances from Dr. Robert Araño (Table 2).

Table 2: Information sources

Source of information	***Number of respondents***
Assembly meeting	8
Neighborhood	8
Government officials	7
Dr. Robert Araño	4
NIA officials	3
No answer	1
Not informed	11
Total	42

When we asked our respondents if they have other sources of information, most of them replied that they do not read newspapers. They do listen to radio and watch television, but they did not receive information about the dam through these media.

Awareness

Antagan I, Antagan II, Magoli, Cumabao, Namnama and Caligayan are the barangays in Tumauini that are the first to be affected by the dam, because they are closest to the dam site. With the proposed dam, people living in these barangays should be the first to be informed. In order to measure the awareness of the people in these six barangays, we simply asked them if they are aware of the proposed dam. Among our respondents, a large majority claimed that they are aware of the project, but more than 25% said that they had never heard of the proposed dam before (Figure 1).

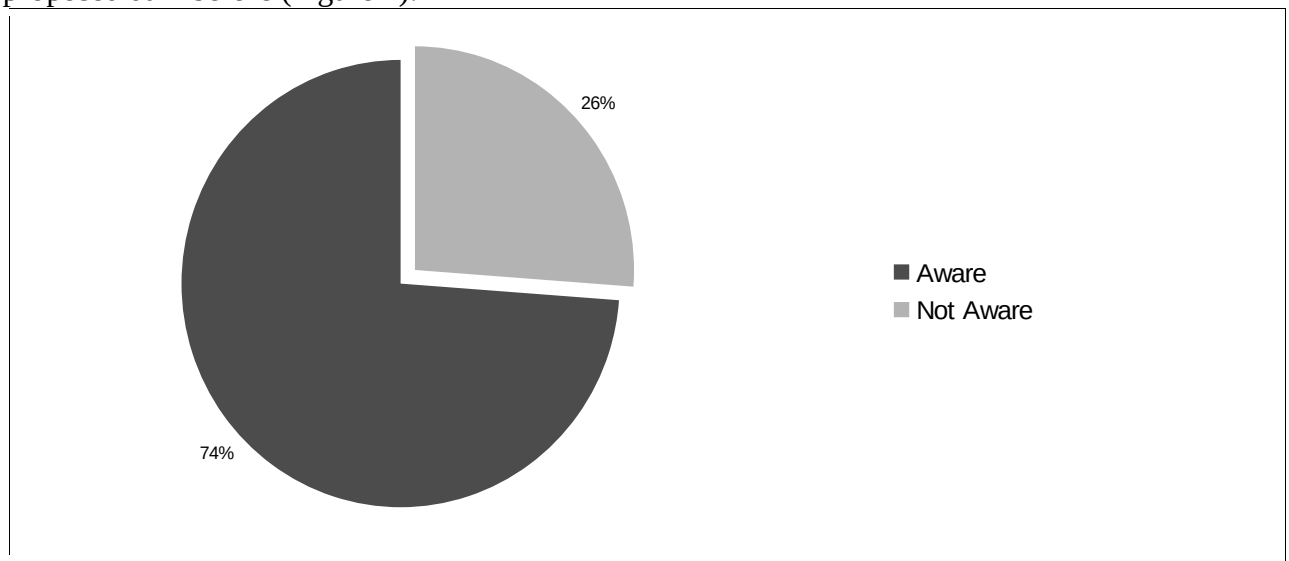


Figure 1: Proportion of the respondents who are aware of the proposed dam. (n = 42)

We asked the people from where they obtained their information. The main source is the general barangay assembly. Although most of the people who went to the assembly meeting had some knowledge of the project, the amount of information they got was very little. We noticed that the barangay officials were aware of the characteristics of the dam, but the rest of our respondents received very little information on the characteristics. When we asked the respondents about the benefits of the dam, most of them knew that it will be used for irrigation. None of them mentioned hydropower, not even the barangay officials.

All our respondents said that during the assembly meeting, NIA only informed the people about the positive impacts of the construction of the dam in their area. They were not informed about the potential risks of the construction. Some of the respondents asked questions about their fear of floods or the collapse of the dam. They said that NIA simply replied that they do not have to worry. We found out that only nine of our respondents were satisfied and 33 were not satisfied with the information they received (Figure 2). So, almost 80% of our respondents wanted more information about the dam. The remaining nine respondents (21%), who were contented with the information they received, did not care for additional information. Some of them told us that they do not have a choice, because if the government wants this project to be constructed, the decision to push through with the project is already taken and their opinion does not matter.

During our fieldwork we noticed that the people living in the more distant barangays knew less about the proposed project. Both in Cumabao and Namnama, only three (42%) of the seven respondents per barangay were aware of the proposed dam, the other four (58%) did not know that there are plans to construct a dam near their barangay.

Another interesting thing we observed in these two barangays is that the three people who are aware are either the wives of the barangay captains, or the neighbors next to or across the road from the barangay captain's house. When we conducted interviews with people who live farther away from the house of the barangay officials, they often know less about the project.

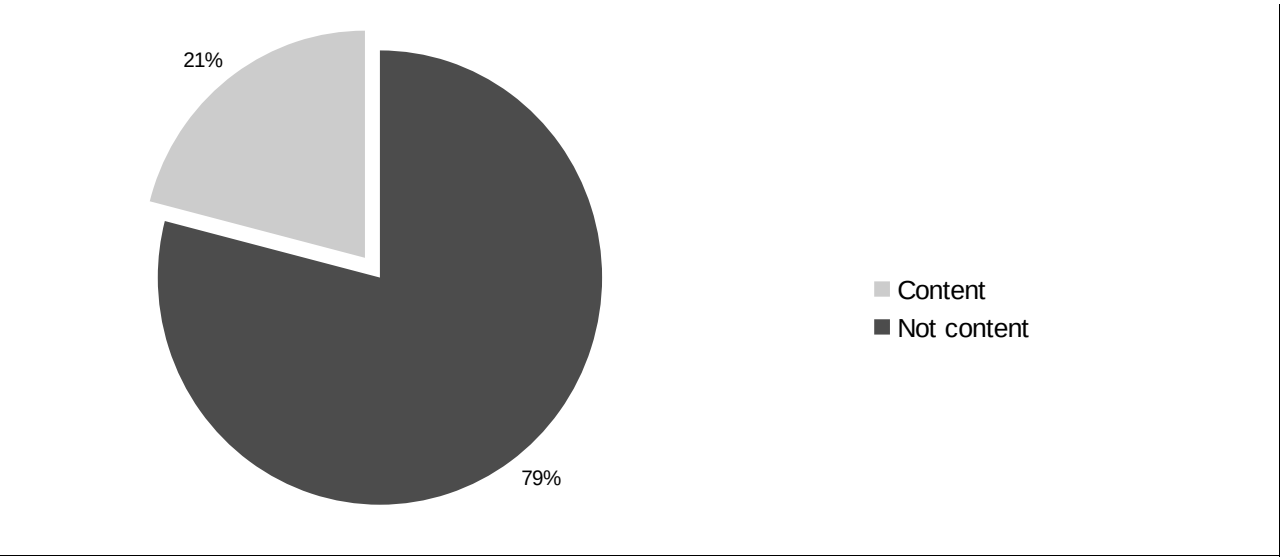


Figure 2: Proportion of respondents (n=42) who are contented with the amount of information they have received about the Tumauini River Multipurpose Project.

Although majority of the respondents claimed that they are aware of the TRMP, the remaining (26%) stated that they are not aware of the proposed dam. The general barangay meeting is a good way to disseminate information, but the project proponent (NIA) in this case did not provide the people with enough information to fully understand the project and its impacts.

Perceptions

What we noticed about the awareness of the people in the six barangays is that none of the respondents received negative information about the dam. Our first respondent, the barangay captain of Antagan I, told us that when he heard about the proposed dam he feared flash floods. He asked the representative from NIA about the potential negative effect that he feared but the response he got was: 'calm down'. The person was also quick to add that the dam would ensure that there would be no flash floods. The barangay captain and the other 41 respondents did not receive information about possible negative effects that could be caused during the construction of the dam or when it would be finished. We asked our respondents whether they think the dam will have an impact on their lives.

When we asked our 42 respondents what they think could be a possible effect of the construction of the dam, 33 of them (78%) responded that they are afraid of floods (Figure 3). Especially in Caligayan the fear of floods is high, because they are situated in the lower area. They fear that floods will occur when the spill ports of the dam will be opened, due to heavy rainfall. They say that when the typhoon season comes it is combined with heavy rainfall that causes the water level in the river to rise. According to them the dam can only secure a maximum amount of water and when that level increases the dam has to release water. In their opinion, this will create flash floods. They are afraid that they will lose their land and for them that means a decrease in income.

On the other hand, the people also had positive thoughts about the proposed dam. During the five years of constructing the dam, they expect that more jobs will be generated as more people will be required to work at the construction site. Twenty-eight of the 42 respondents (67%) wanted to work in the construction of the dam because they want additional income (Figure 3). Most of them rely on the income from their harvested crops. They said that they do not need to work every day on the farms so they have time for a second job. The other 14 respondents (33%) are not willing to work at the construction site, because they have no time and others do not agree with the proposed dam, so they do not want to help with the construction.

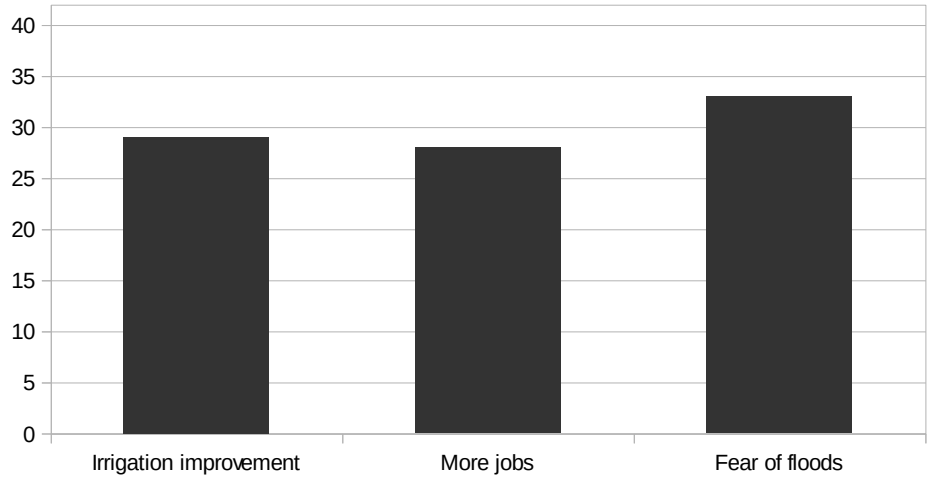


Figure 3: Most commonly perceived impacts of respondents (n=42) about the dam.

The other possible positive effect of the dam is the improvement of the irrigation system. Based on their own knowledge and information from NIA, the farmers can see a better future for their rice fields. Twenty-nine of the 42 respondents (69%) see that the dam can improve the irrigation system. Some farmers said that there is not enough water to sustain their rice field, especially during summer. They are positive towards the dam because it can improve the water supply. We also noticed that the people producing corn, want to convert to a rice field because it is more profitable. A woman told us that they now produce yellow corn that is only for the pigs and not for human consumption. She wants to convert to rice because, 'that is what we can eat' (according to respondent 36).

The respondents, who are currently growing corn, said they have to rely on the weather. They said that they cannot control the rainfall so it depends on the weather if their harvest is successful or not. With this proposed dam, they think that the irrigation system will improve. If the irrigation is improved, they want to convert their land to rice fields because they believe that the dam will provide the amount of water they need. The respondents see the possible positive effects that the dam can have on their lives and their income.

Attitude

In order to measure the attitude of the people, we asked our respondents whether they are in general positive, negative or neutral towards the construction of the TRMP. We refer to the neutral category as balanced, because the majority of the people we have interviewed said they see the positive sides of the dam, but they also fear floods.

Because of the difficulty in weighing these pros and cons, 21 of the 42 (50%) respondents we have encountered, said that they are neither positive nor negative, but balanced about their attitude towards the Tumauini dam. Overall, 16 (38%) of the respondents are positive, while 5 (12%) are negative (Figure 4).

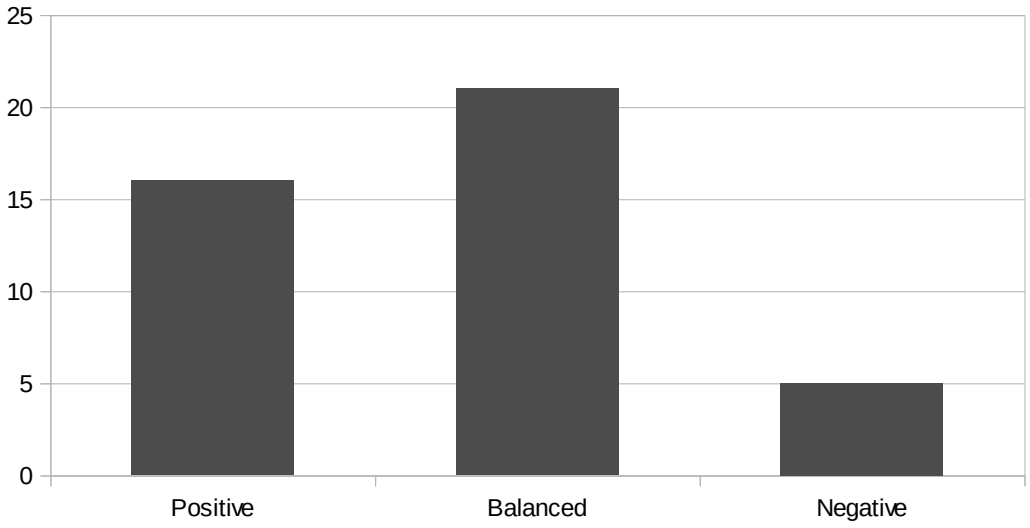


Figure 4: Attitude of respondents about the proposed dam. (n=42)

The main reason for their negative attitude is their fear of floods. There is little difference in attitude between people who are aware of the TRMP and those who were not aware (Table 3). The respondents, who are aware of the project, provided us with the same reasons as the people who were not aware. The reasons are, improvements in the irrigation system, employment opportunities, but they also fear that the dam will cause flash floods.

Table 3: Difference in attitude between our respondents who are aware of the project and those who are not aware. *(n=37)*

	Positive	***%***	***Balanced***	***%***	***Negative***	***%***	***Total***	***%***
Aware	8	31 %	14	54 %	4	13 %	26	100 %
Not aware	3	27 %	7	64 %	1	9 %	11	100 %
Total	11	30 %	21	57 %	5	14 %	37	100 %

(Note: If the respondents were not aware of the TRMP, we informed them by using the Magat Dam as an example. We used the Magat Dam because it is similar to the proposed dam and we did not want to influence our respondents with our view and knowledge about the TRMP.)

Even though there are concerns about the safety of the dam (flash floods) the approval rating for the project is high. Overall 79 % of our respondents approve the construction of the dam, while 21% do not approve. In this case, difference in awareness does not cause significant differences in the approval rating (Table 4). The approval rating of the people who were not aware is even slightly higher, while the people who were already aware, only received information about the positive impacts. So differences in awareness do not contribute to the explanation of the differences in attitude of the Tumauini people.

The difference in the attitude of the people in Tumauini can be explained by the perceived impact the proposed dam will have on their lives. There is little difference between the people who agree with the construction and those who disagree, concerning the perceived negative impacts. Both groups fear the dam will cause flash floods. There is a big difference in expected positive impacts. Only 25% of the people who disagree with the building of the dam think they will be positively affected by the improved irrigation and the employment opportunities. In the group of people who agree with the construction, 79% expect to benefit from better irrigation, and 83% expect to benefit from the employment opportunities (Figure 5).

Table 4: Difference in approval rating between our respondents who are aware of the project and those who are not aware (n=38)

	Approve	***%***	***Disapprove***	***%***	***Total***	***%***
Aware	23	77 %	7	23 %	30	100 %
Not Aware	7	88 %	1	13 %	8	100%
Total	30	79 %	8	21 %	38	100 %

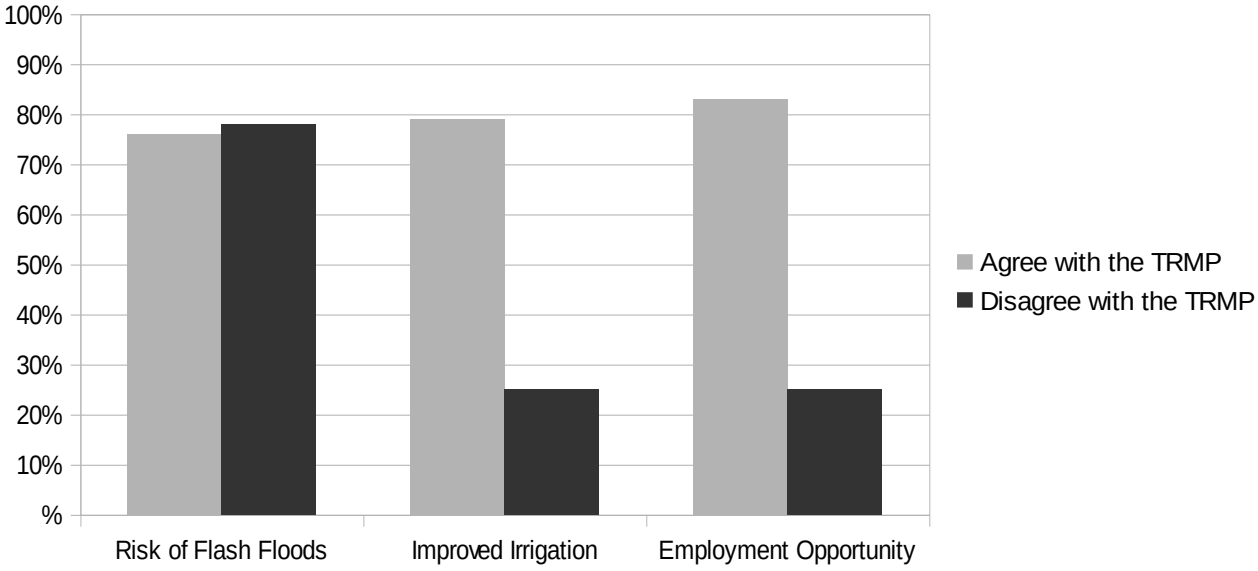


Figure 5: Difference in expected impacts between respondents (n=42) who agree, and respondents who disagree with the construction of the Tumauini River Multipurpose Project (TRMP).

DISCUSSION

The best way to explain the attitude of the public is by the perceived impact the dam will have on their situation. If they will benefit from the improved irrigation or the employment opportunities, it is likely that they will agree on the construction, even though the fear of flash flood is still high. If they think that they are not influenced by improved irrigation or the possible employment, the fear of floods is higher than the possible positive impacts. In that case, it is not likely that they will support the project.

The majority of our respondents agree with the TRMP, however the amount of information disseminated to the communities is very little. 79% of our 42 respondents are not contented with the amount of information they received. There are still a lot of questions about the safety of the dam. The fear of floods as a result of the construction of the dam is high. However, there is no widespread opposition against the TRMP. If the people in the Tumauini area are better informed about the possible risks, their fears about the safety of the dam might decline. If NIA will improve the information dissemination to the affected communities, the chances of widespread support for the TRMP will be high. If NIA fails to improve the amount and quality of the information provided to the communities, they risk negative public opinion on the TRMP. If flash floods occur after the dam is built, affected communities will blame the dam and its proponents, like the NIA. The biggest fear of the people in the six barangays we have covered is flash flooding. While dams can be useful to prevent floods, the perception of the people is the other way around. 26% of our respondents were not aware of the construction. The other 74% who are aware are ill informed. Many (78%) of our respondents believe that the dam will cause floods. Further research should be done on dissemination of information about the impacts of the dam and the water release management of the spill ports, in order to increase the public support for the dam.

Challenges

Our research was limited to Antagan I, Antagan II, Magoli, Namnama, Cumabao and Caligayan. This is only a small part of the affected area. We suggest further research to be done in all affected barangays; interviews should be conducted with an increased sample size. Because of the short amount of time spent in Tumauini, the number of interviews conducted is limited. With seven respondents per barangay, there is room for improvement concerning the validity of our results. We do think our results are more reliable than the results from the public consultation meeting in Caligayan, because the difference between them can be explained by the reluctance of the people to express their concerns and ask critical questions when they are in the presence of high ranking officials.

We wanted to interview all the captains of the six barangays but unfortunately the captains of Antagan II, Caligayan, Namnama and Cumabao were not available at the time of our visit. One of our questions to them would have been whether there were assembly meetings where the NIA was invited to explain its project. Now we do not have a good overview of the efforts NIA has undertaken so far to inform the people in the various barangays. Some of our respondents said that an assembly meeting was already held in their barangay, while others said that this meeting had not taken place yet. We encountered different stories, even within barangays. Although we did not get a complete picture, the conflicting stories show that not all people are equally informed.

Recommendations

It is positive that NIA is using the existing dissemination infrastructure like the general barangay assembly. This is a very useful way to provide information to the community, but not everyone will be reached in this way. That is why they must also use other communication strategies like distributing leaflets and posters broadcasting news through local radio stations, in order to inform the people who do not have time to attend the general barangay assembly.

ACKNOWLEDGEMENTS

First, we want to thank the Barangay Captain of Antagan 1 in Tumauini, Isabela who allowed us to sleep in their Barangay Hall and treated us with a nice videoke for two nights in Magoli. We enjoyed the videoke a lot and it was a nice experience. We would like also to thank all the Barangay Tanod for securing us overnight and especially to Mario Balong for helping us always in cooking using the charcoal and for his help in getting us to Caligayan. We also want to thank all the farmers, barangay officials, professionals and housewives who were willing to spend time for an interview and answer our questions.

REFERENCES

Cariño, J. 2005. Indigenous Peoples' Right to Free, Prior and Informed Consent: Reflections on Concepts and Practice. Arizona Journal of International & Comparative Law Vol. 22, No. 1 2005.

DENR 2003. Environmental Management Bureau Revised Procedural Manual for DAO 2003-30.

NIA 2012. Tumauini River Multipurpose Project Updated Feasibility Study Report.

Appendix A: Questionnaire

Socio – demographical profile

1. Name
2. Address
3. Age
4. Gender
5. Civil status
6. Highest educational attainment
7. Occupation/Profession
8. Ethnic group

Government dissemination/awareness

9. Are you aware of the proposed construction of the dam in this area?

(If YES go to question 9, if NO go to question …..)

10. Where/how did you learn about it?
11. What sort of information did the project proponents and the government provided you in relation to the dam?
12. Did you receive leaflets, posters or other information to take home?
13. Did you watch television, listen to radio or read a newspaper?
14. Did you receive information about the proposed dam through these media?
15. Did they tell you anything about the pre – construction phase/ construction phase?
16. Did they tell you anything about the potential benefits or positive impacts?
17. Are there any employment opportunities to be provided for you or for your family during the pre-construction and construction phase? If yes → 18, if no → 19
18. What type of employment is this? And for how long?
19. Did they inform you about the potential threats, risks, hazards or other negative impacts during pre-construction, construction and after the construction?
20. Do you think the information you received about the dam is complete and relevant? If yes → 21, if no → 22
21. What information was most important to you?
22. What information was missing?

Perception

23. How does it affect your situation?
24. Are you overall positive, neutral or negative towards the plan to build the dam?

Attitude & willingness to pay

25. Do you agree that this project will be constructed in your barangay? Yes or No and why?
26. Are you willing to pay for the additional cost of irrigation system, which will be provided by the dam in the near future? Yes or No and why?
27. If they grow corn: Do you want to convert to rice after the dam is built?

USE OF ENVIRONMENTAL SERVICES DELIVERED BY THE TUMAUINI WATERSHED TO THE PEOPLE WHO LIVE DOWNSTREAM OF THIS WATERSHED, INCLUDING THEIR AWARENESS, VALUES AND WILLINGNESS TO PAY FOR SUSTAINING THESE SERVICES

Ma. Cristina Mediana & Mart W. B. Lubben

INTRODUCTION

Watersheds existing in forest and mountains deliver a lot of provisioning and regulating services to people. The provision services are: the delivery of clean water, food, wood and clean air. Regulating services include carbon storage, pollination of crops and plague control. Furthermore, watersheds with natural habitats and biodiversity have an aesthetic and educational value. Nevertheless, human life and behavior changes the watershed and thereby the quality and quantity of its services. For example, cutting too much wood causes erosion, floods, droughts, habitat loss, temperature changes, air quality degradation, etc. **(**Miller 2011**)**. Moreover, people also try to influence environmental services of watersheds in a positive way, dam construction is an example.

In our research we examined the Tumauini watershed area in Tumauini, Isabela. The Tumauini watershed also delivers environmental services to people, especially the people who live in or downstream of the Tumauini watershed particularly Barangays Namnama, Antagan I and Antagan II. For purposes of this research, we analyzed the environmental services used by the people in the afore-cited barangays. These areas are very interesting because there has been a lot of forest loss (DENR, interview 2013 & Persoon, 2011) and a dam is been proposed (NIA, 2013). Those two major changes influence the environmental services delivered to the people living in or downstream of this watershed. What are the environmental services provided by the Tumauini watershed? Furthermore, we want to know what environmental services these people use and if these people are aware of these services. Moreover, if they are aware, who is responsible for maintaining these free environmental services? For example, are these people willing to pay to sustain or improve these services? Also, what will be the effect of the proposed dam on the environmental services?

RESEARCH QUESTIONS

Main question:

What do the people who live very closely downstream of the proposed Tumauini dam think about paying for the environmental services delivered by the Tumauini watershed?

Sub questions:

- What are the environmental services provided by the Tumauini watershed?
- What environmental services are most important and used by the people who live very closely downstream of the proposed Tumauini dam?
- Are the people who live very closely downstream of the proposed Tumauini dam aware of these environmental services delivered by the Tumauini watershed?
- What is the influence of the Tumauini dam on the environmental services provided by the Tumauini watershed?

METHODS

Four research questions need to be answered. For each research question different methods are used. For the awareness of ES services and the willingness to pay for these services a questionnaire is used. To find out what the environmental services of the Tumauini watershed are observations and literature were the main sources of information.

For gathering data we interviewed and observed people living very close downstream of the proposed Tumauini dam mostly living in Antagan I, Antagan II and also in Namnama. The people who live the closest to the watershed are more likely to benefit from or depend on these services. Also, those people are the most sensitive to changes of the Tumauini environment. The research area chosen minimizes the amount of transportation (tricycle, jeepney, etc.). This is done because of practical reasons. We were able to do our fieldwork mostly by feet; in this way, it was easier to make observations and photos for recording all different environmental services used by the people.

Because nearly all people in this area are farmer or farm loaner (Persoon, 2013), our fieldwork consists mostly of observations and interviews with these occupations. As a consequence, the results mainly include farming as a way to make a living. The fieldwork will not provide loads of information about the environmental services in connection with for example fishermen and non-farming professionals. On the other hand, farming is the most dominant occupation and researching this group will likely give the most realistic data.

Observations are continuously made during the whole stay in the field; most of the observations are captured on camera. In this way evidence of environmental services used by the people is gathered. Especially for cutting wood, which has been prohibited two years ago, is easier to catch by camera than committed in an interview.

Table 1: Time schedule January 19-23, 2013

Day	**Description**
1 (Saturday)	Travel to Antagan Introduce ourselves and ask permission to conduct a research to the baranggay officials. Meet host family, check the area
2 (Sunday)	Visit the construction site Interview locals
3(Monday)	Visit the NIA Gather information in the Municipal Office Interview locals
4(Tuesday)	Listen to the DENR meeting at the barangay (information about reforestation project) Interview locals
5(Wednesday)	Final interviews, doing last observations and picture making (+ final lunch cooked for host family) Data analysis Travel back to ISU Cabagan

RESULTS

What are the environmental services provided by the Tumauini watershed?

Regulating:
- Carbon storage (countering climate change)
- Temperature regulation
- Plague control
- Water flow
  - Anti-droughts
  - Anti- floods
- Anti-erosion

Provisioning:
- Water
  - Irrigation
  - Personal hygiene & Laundry
  - Drinking water (sometimes)
- Food
  - Fruits
  - Wild animals
  - Mushrooms
  - Vegetables
  - Fish
- Clean air
  - Removing particulates
  - Delivering oxigen
- Wood
  - Construction
  - Cooking or Charcoal making
- Pollination
  - Vegetables
  - Corn (most farmer use chemicals to 'pollinate' corn.

Education:
- Learn from watershed
  - School, universities, NGO's, etc.

Others:
- Biodiversity & habitats
  - Species conservation
- Health
  - Physical but also psychological
- Tourism
- Playground for children

What environmental services are most important and used by the people who live very closely downstream of the proposed Tumauini dam?

The most important environmental services provided by the Tumauini watershed are:

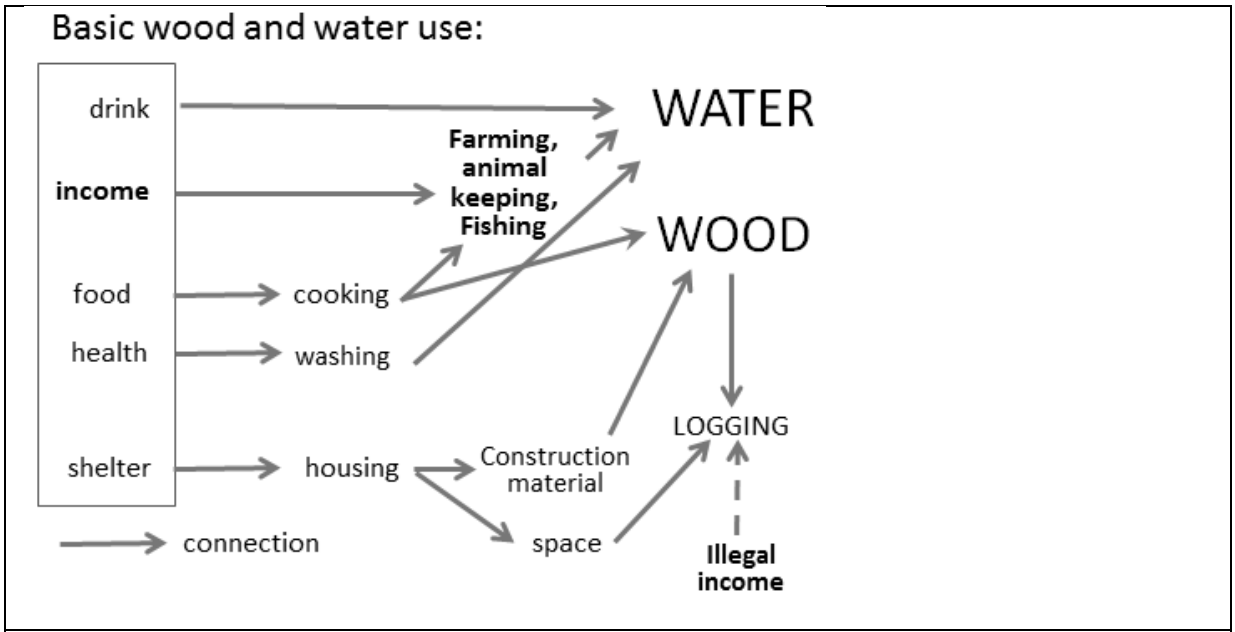


Figure 1: Some basic necessities for the people living in the research area which results in water and wood usage.

The majority of people in Antagan I, Antagan II and Namnama have a farming and animal keeping way of life. Farming is commonly rice and/or corn, also sometimes vegetables, fruits and/or seedlings. The animals kept are commonly: chickens, turkeys, goats, carabaos and dogs. A minority of inhabitants catch fish for private or commercial use or practice illegal logging for their income.

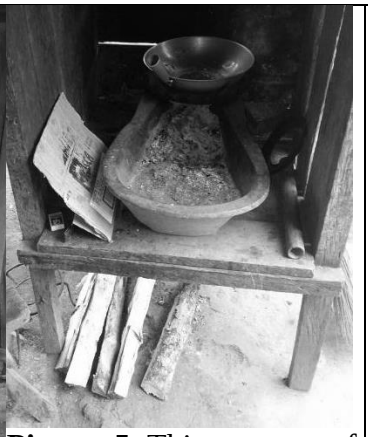
Remarkable is that the majority needs wood for cooking and construction, but legal logging does not exist. Legal ways to get fuel for cooking is buying gas, which is expensive, or buying the cheaper charcoal. This charcoal is also wood and charcoal making often affects the forest negatively. People depend on wood for cooking and this has a negative effect on forest and its delivery of ecosystem services. Also, there is not a good alternative for using illegal Philippine wood for construction and repair. There is no sufficient legal market for Philippine wood and alternative wood from Malaysia or Indonesia is expensive and from worse quality. Thereby this foreign wood is probably just as destructible for tropical forests as the Philippine wood. Conclusion, people cannot do without wood for cooking and constructing, but forests are threatened and also limited in the amount of wood. Nonetheless, cutting trees is not always bad for the forest and ecosystem services. Forests create wood and a share of this wood can be used on a sustainable way. On top, using wood is more sustainable than using for example steel. Wood is also a good carbon fixing material which will help to counter climate change. Essential to a successful wood use is a good managed system in which people will not use more wood than is created by the forest.

Water is of course also essential for people, used for drinking, washing, irrigating, etc. Remarkably, most people who live in the research area do not depend on the watershed for drinking water. The majority (in our case 95.4 % of the 22 interviewed people) use a water pump to get ground water for drinking. Washing and irrigation depends on the water from the watershed. The sewer system does not depend on the watershed water.

Provisioning of Tumauini watershed captured in field:		
Wood and Bamboo		
Construction		charcoal making or selling
		
Picture 1, This house could use some reparations.	**Picture 2,** Some bamboo for building an outdoor roof in the back of the house.	**Picture 3,** 'Uling 4 sale' is written on this house, it means *charcoal for sale*. People burn their own wood or forest wood for making charcoal.

Cooking

Picture 4, The front door view of a house full of constructing tools and a lot of wood.



Picture 5, This was part of our kitchen; wood or charcoal was the most common fuel in the area.

Picture 6, Bag of charcoal (120 pesos) for one sack of charcoal.

logging and selling

Picture 7, A man on a Carabao, with a load of wood. Gathered somewere in the area.

Picture 8, A large jeepnee full of Bamboo.

Water

Drinking (small amount, more dependent on ground water)

Picture 9, Every household has its own water pump for ground water.

Washing

Picture 10, Many people use the clean water of the watershed, to wash themselves and their clothes.

Food

Fish, fruit, mushrooms and wild animals

Picture 11, A young pineapple

Picture 12, Banana trees are found everywhere in the watershed area, providing of course bananas.

Seeds

Reforestation

Picture 13, Our stay was at a Rain forestation nursery, this one was non-profit. Other people in the area were also growing seedlings for themselves or for sale (7 pesos each). The seeds from the seedlings came from the watershed. Thus, seed provision is also an environmental service delivered by the watershed.

Are the people who live very closely downstream of the proposed Tumauini dam aware of these environmental services delivered by the Tumauini watershed?

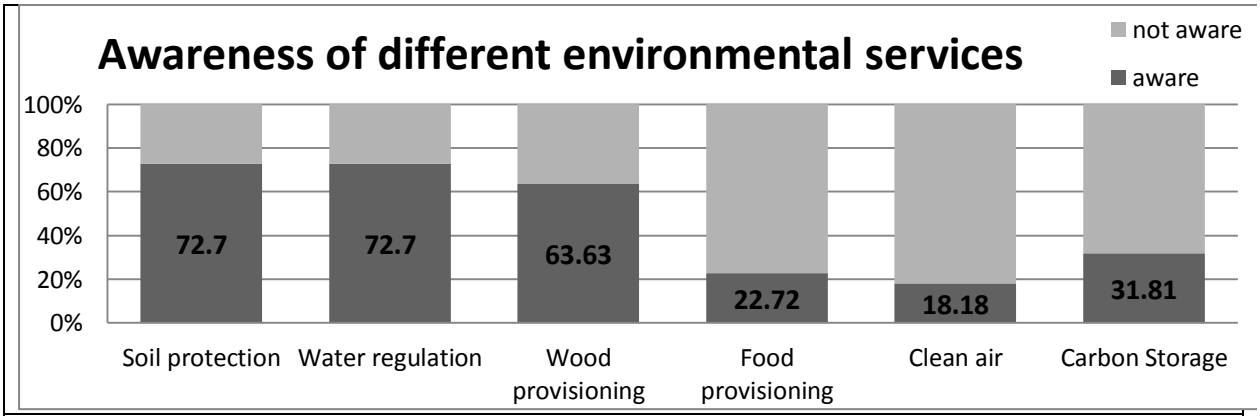


Figure 2: The awareness of people about some ES, following from 22 interviews.

The average age of locals we interviewed was 48.8 years old. Most of the locals are farmers who owned a field by themselves, three of them were tenants and one of them was a logger and hunter. The majority of the people that we interviewed were aware of the importance of the environmental services: *soil protection* and *water regulation,* delivered by the forest (Figure 2). They usually connected these services to flood and erosion, sometimes also to drought. Furthermore, the provision of wood was a well-known service of the watershed (Figure 2).

What do the people who live very closely downstream of the proposed Tumauini dam think about paying for the environmental services delivered by the Tumauini watershed?

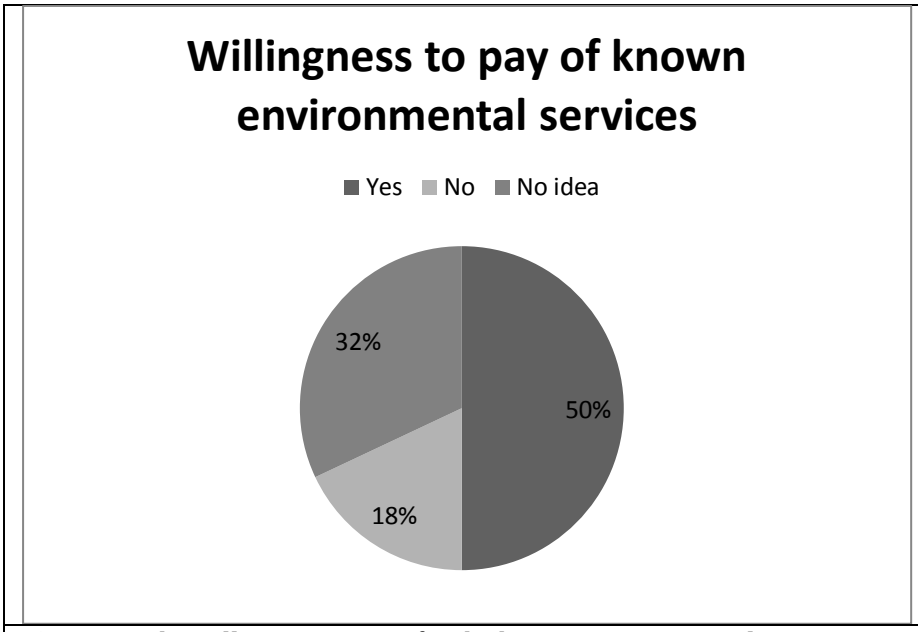


Figure 3: The willingness to pay for the known environmental services.

Half of the interviewed persons (11/22) are willing to pay for environmental services they were aware of. The willingness to pay could not be asked about environmental services which were not known by the interviewed person. Only 4 times there was given a straight 'no' to paying for environmental services. The argument given included every time: 'it is nature, so it is free'. Most of the people who gave 'no' as an answer were not used to pay for irrigation. Only 1/15 persons with an irrigated field was against paying for environmental services. He said that he was already paying taxes and that the government was responsible for conservation. The group that responded with 'no idea' would first like to know more details about the costs and what it will guarantee and/or deliver them.

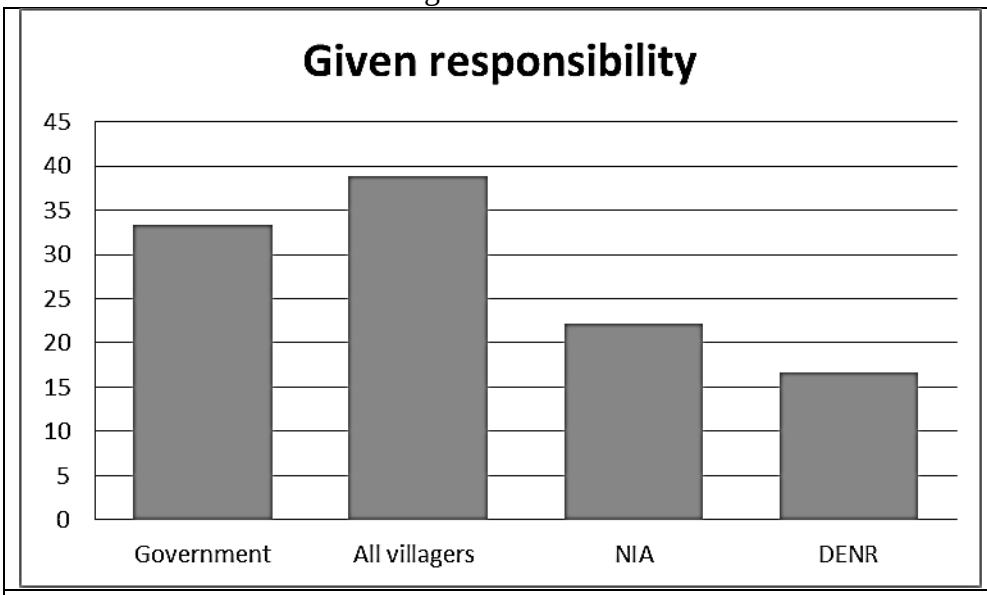


Figure 4: *Who should be responsible of conserving the environmental services of the watershed?* Because people could give more than one answer the total is more than 100% (total 18 answers).

What is the influence of the Tumauini dam on the environmental services provided by the Tumauini watershed?

It is very unclear and hardly predictable what the effects of the dam on the environmental services will be. To give an idea an expectation of the most optimistic and most pessimistic scenario is created:

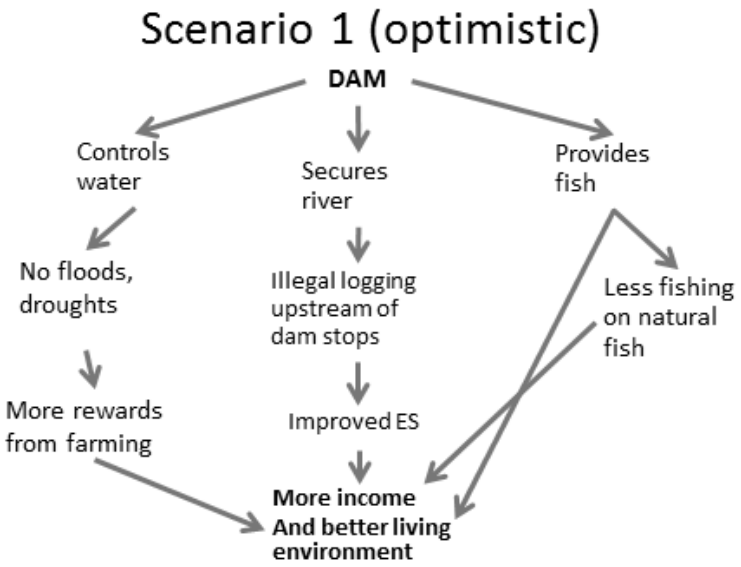


Figure 5 The dam has the possibilities to secure the river and form an anti-illegal logging barrier. This will improve anti-erosion, habitats, biodiversity and other ES. Also farmers will get more profit from their lands, due to better irrigation. If right, the dam will contribute to a lot of people and bring income, security and improve the Tum. watershed conservation.

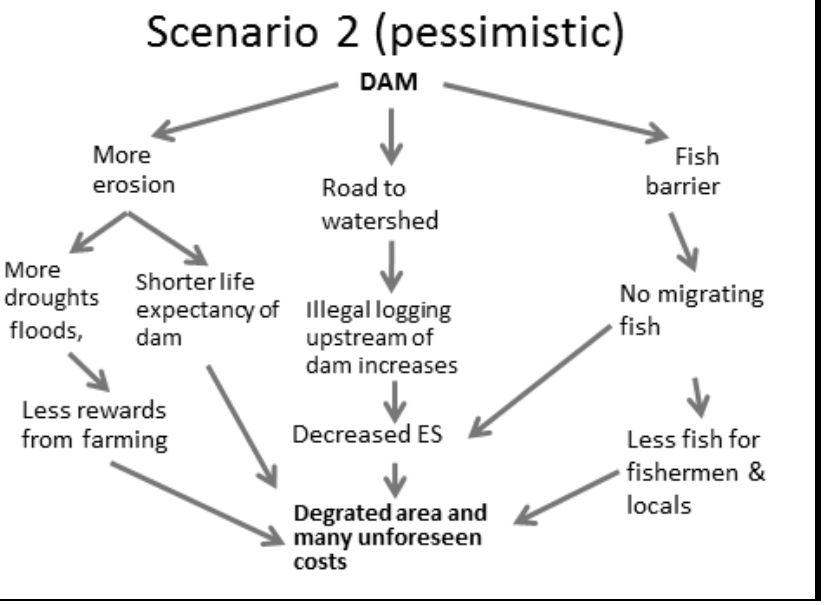


Figure 6 Every project has possible negative consequences if it's not properly managed. This figure shows a hypothetical future, if there is insufficient or no managing at all. The area of the proposed dam could be sensitive to severe erosion. The created lake could be filled with sediment quicker than expected, like Magat dam.

This will lower the life expectancy and the investment must be spread over fewer years than expected. Sufficient soil protection or a good hazard analysis is a necessity for a huge investment as a dam. We heard that there is a geo-hazard map which is made by the Mines and Geosciences Bureau (DENR). This geo-hazard map is not positive about the soil at the moment. We did not see this map nor are we geo-scientists; therefore we cannot predict that severe erosion is likely to occur. Furthermore, the road could cause problems if it is not

secured. According to the proposal and a consultant of the EIA the road will not cause trouble because the security will be sufficient (Dr. Araño 2013, pers. comm.). About migrating fish and impacts on ecosystems no information is found, the prediction is possible, but we have no evidence that it is likely to happen.

DISCUSSION

During our research we focused on the environmental services of the downstream living people. We first tried to visit the NIA office to gather some information about the Tumauini watershed irrigation and the dam but unfortunately the personnel were not around so we tried to go to the Tumauini Municipal Office and luckily they gave us maps and some information about the dam. After which, we interviewed as many people as possible, every interview took a lot of time. And while doing these interviews, we learned that most of the inhabitants of the area are farmers, which is not what we expected. We changed some of our questions and schedule on the next day. Almost all of them depend on groundwater for drinking purposes. And most of the farmers depend on the irrigation for their fields. All of the locals that we interviewed used either wood or charcoal in cooking; they said that they usually get the wood from their fields or backyard, while the charcoal were bought from the market. Most of the people we asked about the dam were afraid of flood and erosion but on the optimistic side they are looking forward for the job opportunities that will be offered during and after the construction of the dam. One woman also claimed that there is a possibility that a mining will be established in their area. We also met an Agta the night before the day we left.

ACKNOWLEDGEMENTS

We would like to express our gratitude to the following: To the Barangay Officials for their warmest welcome. To the inhabitants of Antagan. To the Divina, the family who adopted us for five days in their house. To Mr. Samuel Divina, Chairman. To Mr.William B. Macapia, Secretary of the Sanggunian. To the officers of DENR. To the Municipal Office. And to all the respondents for their cooperation in the interview.

REFERENCES

Department of Environmental Natural Resources (DENR), Management Plan

Miller, environmental science, 2011 (book)

National Irrigation Association (NIA), TMRP project proposal

Persoon, G. A., M.a. Masipiqueña, D. Aquino and M. van Weerd. 2011 International course on water and water management in the Philippines. In: Calingay & Wissingh. Forest cover and land use in an upland area of Tumauini.p 64-72. Mabuwaya: Cabagan.

Appendix 1: Questionnaire

Basic questions

What is your name?
Male/female:
How old are you?
What is your educational background?
What is the size of your household?
What is your main source of livelihood?
What is the main source of your water?
Do you have problems with droughts or flood?

Farmers

Are you an owner of the land or are you a tenure?
How large is your farm?
What is the source of water for your fields?
Do you have enough water all year?
Do you have another income besides farming?

Environmental services

Are you aware of environmental services around?
How do you manage water?
What do you used in cooking?

What are the effects of deforestation?
Do you know any project of reforestation in your area?
What are the benefits that you can get in planting trees?
Who is the responsible in protecting our environment?
Are you willing to give something in return for those who protect and secure our environment?
Are you willing to pay for environmental services?
Are you aware to the construction of the dam?
Do you want to be connected to the pipeline from the water spring?
Are you willing to pay for that service?

Imagine the Tumauini watershed is populated with a lot of people, does this affect your life?

Questions to ask in the DENR

Ask about the reforestation project. What is their aim?
National Greening Program

- Climate Change adaptation and mitigation
- Planting forest and fruit bearing trees
- Poverty reduction
- Biodiversity Conservation
- Food security

Where do they get their funds?

- National Government and donors

What do they think about paying for environmental services?
For the people --Indirect benefit (No monitory value)

- Vegetative Improvement
- Conserving water and soil
- etc

Do they have any written report in the previous years about giving funds of the combustion factories to the project of reforestation?

Yes, it was also publish in their DENR Isabela publication

Are there plans of carbon paying and reforestation? Also for Tumauini dam project? And are there funds available from the dam project or are they external?

Yes, the reports are in the Environmental Management Bureau (EMB).

DATA:
How much forest is lost in the Tumauini watershed?

TOTAL LAND AREA---- 6,050.0 hectares

Residual Forest----------3,325.0 hectares
Old Growth----------1,500.0 hectares
Denuded----------1,225.0 hectares

The government gave certain level of emission of carbon per factories, agencies, etc. those who violate the terms and conditions will pay. The government required the agencies who benefited from the environmental services to plant trees in return and these agencies also donate money in the reforestation.Info about erosions. Erosion, removal of rock and soil material by natural processes, principally running water, and wind. Erosion transports rocky material after the process of weathering has broken bcedrock down into smaller, moveable pieces.

Awareness of environmental services												
N	Age	Occupation	soil protection	water regulating	wood	food	Clean air	Carbon storage	Willingness to pay	responsible ES	drinking water	irrigated
A	63	Farming	*1*	*0*	0	0	0	1	yes	NIA, Gov.	ground water	Yes
B	51	Farming	1	0	0	0	0	0	Maybe	DENR	ground water	Yes
C	52	Farming	1	1	1	1	1	1	yes	NIA	ground water	Yes
D	43	Farming	1	1	1	0	1	1	yes	Villagers	ground water	Yes
E	53	Farm worker	0	1	1	0	0	0	yes	DENR	ground water	X
F	37	Farm worker	0	1	1	0	0	0	no	DENR	ground water	X
G	61	Farming	1	1	1	0	0	0	yes	Gov.	ground water	No
H	52	Farming	1	1	1	1	0	0	X	NIA	ground water	Yes
I	32	Farming	1	1	0	0	0	0	X	All	ground water	Yes
J	X	Farming	1	1	1	0	0	0	yes	X	ground water	No
K	45	Farming	1	1	0	0	0	0	X	All	ground water	Yes
L	32	Farming	1	1	1	O	0	O	X	All	ground water	Yes
M	60	Farming	1	0	0	0	0	1	X	All	ground water	Yes
N	55	Farming	1	1	1	O	O	O	yes	All	ground water	Yes
O	45	Farming/ Carinderia	1	0	1	0	1	1	yes	All	ground water	Yes
P	77	Farming	0	1	1	1	1	1	no	Gov.	Buy distilled water	Yes
Q	65	Farming	1	1	1	0	0	O	yes	Gov.	ground water	No
R	15	Farming/ logging /hunting	0	0	1	1	0	0	X	X	ground water	No
S	45	logging/ hunting	1	1	0	1	0	1	no	Gov.	ground water	X
T	50	Farming	0	0	0	0	0	0	yes	0	ground water	Yes
U	50	Farm worker	1	1	1	0	0	0	no	0	ground water	X
V	42	Farming/ Kagawad	0	1	0	0	0	0	yes	Villagers, NIA, Gov.	ground water	Yes
			72%	72%	64%	23%	18%	32%				

VULNERABILITY AND DISASTER ASSESSMENT OF THE PROPOSED DAM IN THE PROTECTED AREA OF TUMAUINI WATERSHED FOREST RESERVE

Jasmin P. Talub, Luuk Gremmen & Kathlyn An P. Eugenio

INTRODUCTION

Water, as one of the essential needs of people, is said to play a vital role in the realization of dam construction and contribute a lot in terms of vulnerability. Disasters such as floods, landslides and earthquakes significantly cause a major loss to livelihoods and even human lives.

The proposed dam that is located in the northern part of Barangay Antagan 1 and part of Tumauini Watershed Forest reserve (TWFR) is expected to bring changes in the vulnerabilities affecting this area. However, the adaptive capacity of human systems is low while vulnerability is high, because of this it could also introduce new vulnerabilities to an area. Especially in this time of changing conditions and climate change, this should not be forgotten. "Indeed across the archipelago, Filipinos have noted evidence of the impact of climate change – Higher than normal temperatures, severe droughts, unusually large volumes of rain triggering devastating floods and landslides, increasingly severe storms and rising seas."(Albano 2012)

Tumauini watershed forest reserve is a protected area with steep slopes and abundant trees but has been heavily damaged by illegal loggers, which makes it vulnerable for dam construction. This research is conducted to assess the changes in vulnerability the Tumauini River Multipurpose Project (TRMP) would induce to several areas including the construction site and the affected barangays of Tumauini. Because of the magnitude of the TRMP a lot of areas are affected in a different way. Some areas might become more vulnerable while others will be benefitted. This assessment focuses on the impacts that the dam might bring on the people and environment whether it is positive or negative.

RESEARCH QUESTION

General question: What will be the changes on the effects of flood and landslide vulnerabilities after and during the construction of the proposed dam in Tumauini?

Sub questions:

- What is the current situation with regard to floods and landslides?
- What is the perceived impact (positive and negative) of the dam on the effects of floods and landslides during and after the dam construction?
- What mitigating measures will the local people, the local government and the proponent of the dam take in case of disasters?

METHODS

This research was conducted to determine the vulnerability of the affected barangays to disasters after the construction of the proposed dam in the Tumauini Watershed Forest Reserve (TWFR). Specifically, a total of 30 respondents were selected to make up the sample. The data gathered from this research study were then computed for analysis and interpretation.

The researchers used the descriptive method of research design, did an observation in the affected areas, gathered data from different offices and undertook measurements at the construction site so as to identify the vulnerability and disaster assessment of the proposed dam in TWFR. Descriptive research describes data and characteristics about the population being studied.

Description is used for frequencies, averages and other statistical calculations. Of the best approach, prior to writing descriptive research, is to conduct a survey investigation. In short, descriptive research deals with everything that can be counted and studied and has an intrinsic worth on the part of the researchers. For their aim is to determine the vulnerability and disaster assessment of the proposed dam in TWFR through interviews, calculations and observations.

Descriptive research is mainly preferred to gain a deeper understanding of a topic. This method is easy to use because the data can be easily gained and interpreted. On the other hand, this method does not always provide accurate data; hence, the researchers mediated this by using a larger number of interviewees. The results of descriptive research provided the platform to enable us to generate important decisions as well as research ideas.

Time schedule

Activities	**Date**	**Place**
- Ask permission from barangay captain. - Exploration of the area - Interview within Antagan 1	Saturday, January 19	- Brgy. Antagan, Tumauini, Isabela
- Interview within Antagan 1 - Measurements at construction site	Sunday, January 20	- Brgy. Antagan, Tumauini, Isabela
- Request data from MDRRMO - Visit MDRRMO - Interview outside the barangay	Monday, January 21	- Centro Tumauini, Isabela - Brgy. Namnama, Tumauini, Isabela - Brgy. Antagan 2nd, Tumauini, Isabela
- Interview within the barangay - Interview outside the barangay	Tuesday, January 22	- Brgy. Antagan, Tumauini, Isabela - Brgy. Cumabao, Tumauini, Isabela
- Interview DENR	Wednesday, January 23	- Brgy. Antagan, Tumauini, Isabela

RESULTS

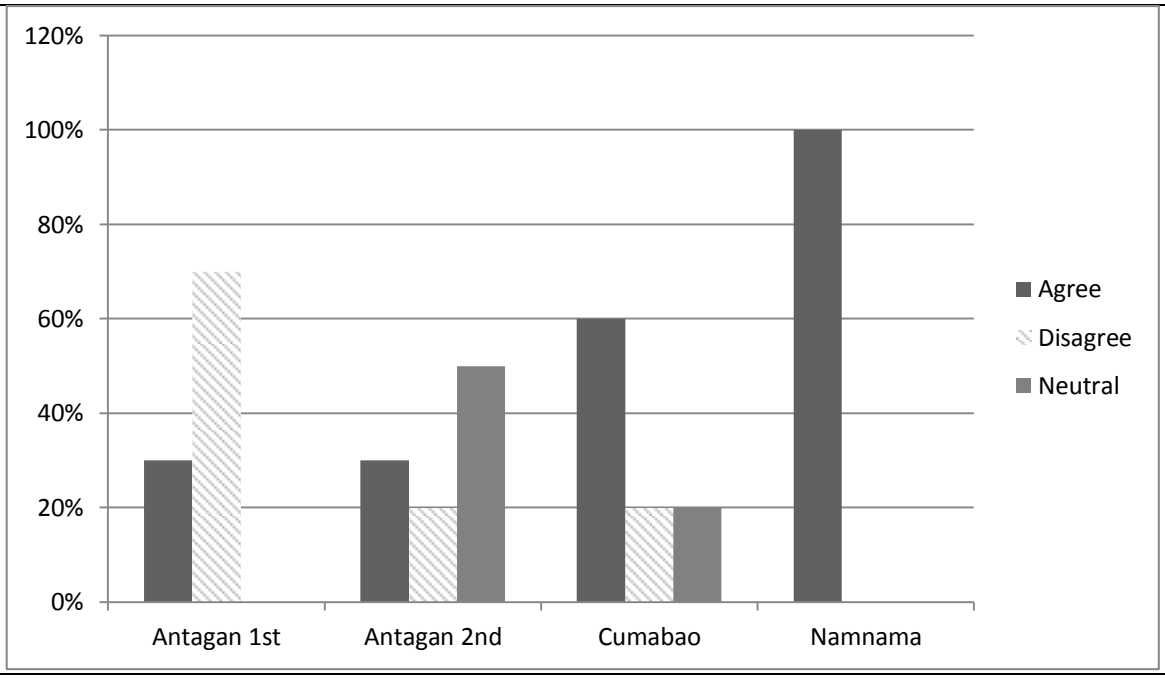


Figure 1: Percentages of respondents that agree with the TRMP

Table 1: Number of interviewed respondents who are agreed with the TRMP

Location	***No. of respondents***	***Agree***	***Disagree***	***Neutral***
Antagan 1	10	3	7	0
Antagan 2	10	3	2	5
Cumabao	5	3	1	1
Namnama	5	5	0	0

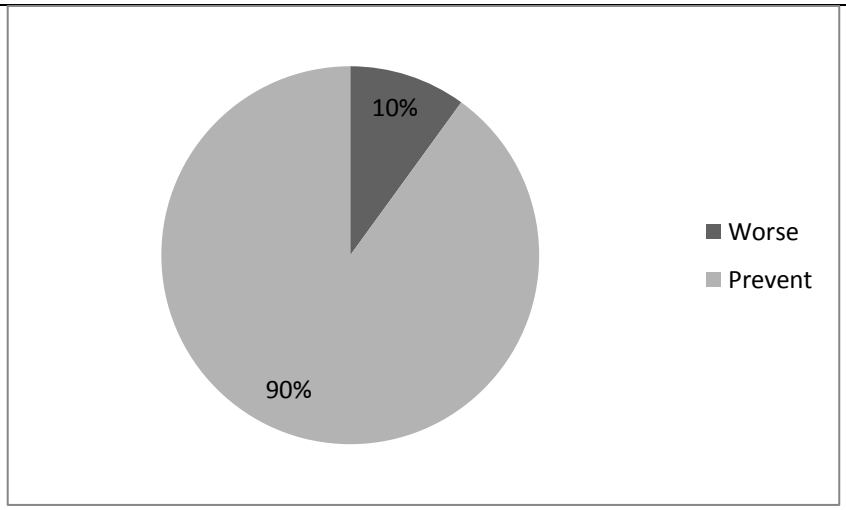


Figure 2: ***Landslide assessment***

90% of the respondents believe that the TRMP will prevent landslides; the other 10% believe that landslides will get worse.

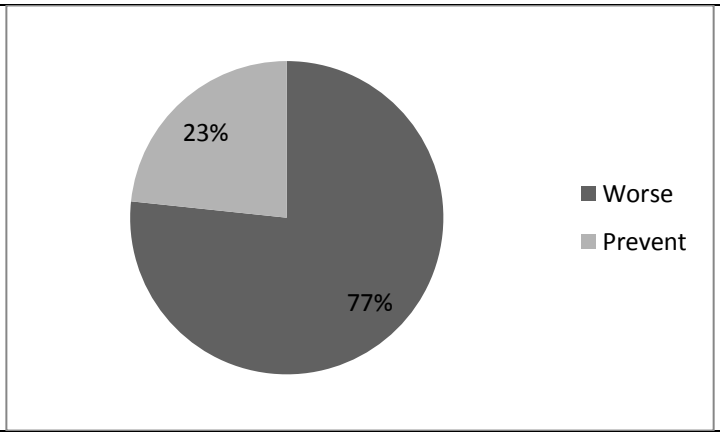
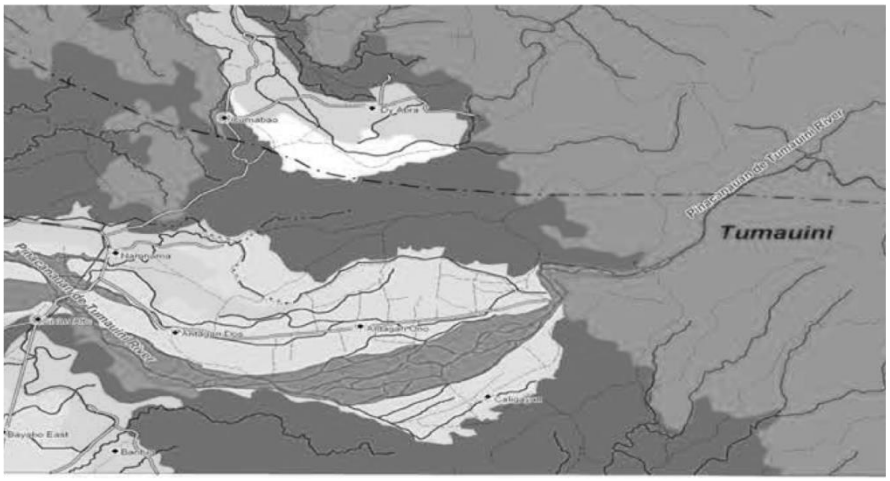


Figure 3: Flood assessment

77% of the respondents believe that the TRMP will worsen the floods and 23% believe it will prevent floods.

Table 2: Top 5 landslide prone areas (MDRRMO)

BARANGAY	***SUSCEPTIBILITY RATING***	***NO. AFFECTED***	
		Families	***Persons***
1. Caligayan	High	48	245
2. Camasi	High	184	920
3. Cumabao	High	85	413
4. Antagan 1	High	281	1,254
5. Arcon	Moderate	21	109



LEGEND :

High susceptibility to landslide

Areas with high landslide susceptibility rating have active/recent landslides and tension cracks that would directly affect the community. Those with steep slopes and drainages that are prone to landslide damming are also highly susceptible to landslides.

Moderate susceptibility to landslide

Areas with moderate landslide susceptibility rating have inactive/old landslides and tension cracks which are located away from the community. These areas usually have moderate slopes.

Low susceptibility to landslide

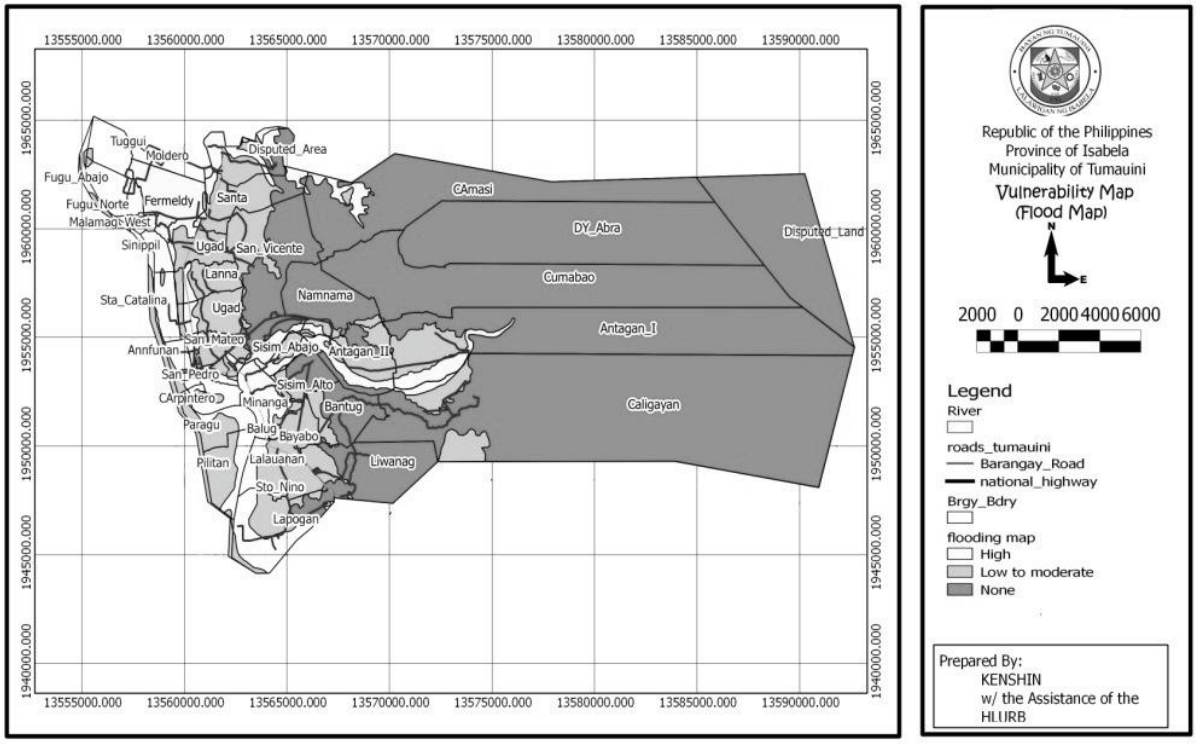
Areas with low to gentle slopes and lacking tension cracks have low landslide susceptibility rating.

Map 1: Current landslide susceptibility (MDRRMO)

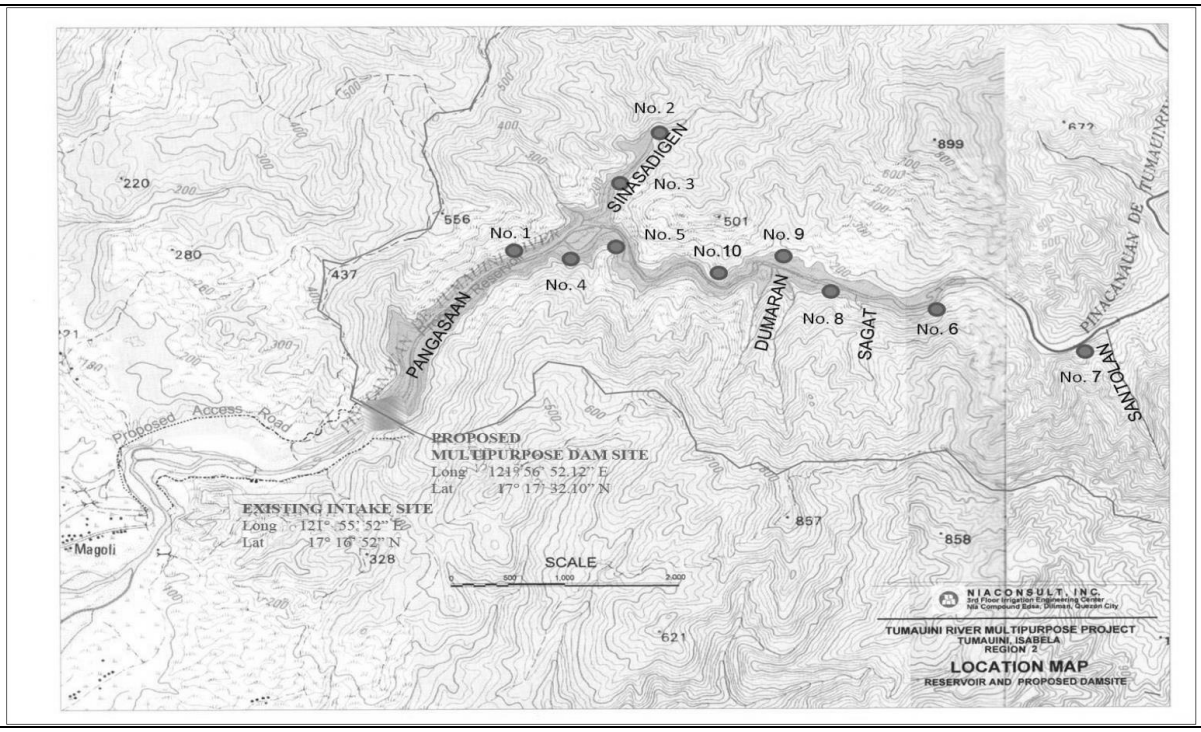
Table 3: Flood prone areas (MDRRMO)

Barangay	**Susceptibility Rating**	**No. Affected**		**Remarks** (Others affected)
		Families	**Persons**	
1. Annafunan	High	15	82	Agricultural lands
2. Arcon	High	25	130	Agricultural lands
3. Balug	High	30	168	Agricultural lands
4. Bantug	High	50	210	Agricultural lands
5. Bayabo East	High	-	-	Agricultural lands
6. Caligayan	High	72	327	Agricultural lands
7. Carpintero	High	207	1,055	Agricultural lands
8. Compania	High	219	1,141	Agricultural lands
9. Cumabao	High	-	-	Agricultural lands
10. Fermeldy	High	175	1,121	Agricultural lands
11. Fugu Abajo	High	212	877	Agricultural lands
12. Fugu Norte	High	158	873	Agricultural lands
13. Fugu Sur	High	29	166	Agricultural lands
14. Lanna	High	304	1,591	Agricultural lands
15. Lapogan	High	-	-	Agricultural lands
16. Lingaling	High	20	108	Agricultural lands
17. Liwanag	High	-	-	Agricultural lands
18. Malamag East	High	49	275	Agricultural lands
19. Malamag West	High	-	-	Agricultural lands
20. Maligaya	High	20	120	Agricultural lands
21. Minanga	High	131	727	Agricultural lands
22. Moldero	High	228	1,092	Agricultural lands

Barangay	**Susceptibility Rating**	**No. Affected**		**Remarks** (Others affected)
		Families	**Persons**	
23. Sta. Catalina	High	135	649	Agricultural lands
24. Sta. Visitacion	High	-	-	Agricultural lands
25. Sto. Nino	High	-	-	Agricultural lands
26. Sisim Abajo	High	24	226	Agricultural lands
37. Sisim Alto	High	-	-	Agricultural lands
28. Tunggui	High	133	678	Agricultural lands
29. Antagan 1	Moderate	50	222	Agricultural lands
30. Antagan 2	Moderate	118	459	Agricultural lands
31. Sinippil	Moderate	49	328	Agricultural lands
32. Ugad	Moderate	300	1.231	Agricultural lands
33. Santa	Moderate	47	213	Agricultural lands
34. Lalauanan	Low	-	-	Agricultural lands
35. San Mateo	Low	-	-	Agricultural lands
36. San Vicente	Low	-	-	Agricultural lands
Total		**2,800**	**14,069**	



Map 2: Current flood map (MDRRMO)



Map 3: Sampling plots (NIA)

DISCUSSION

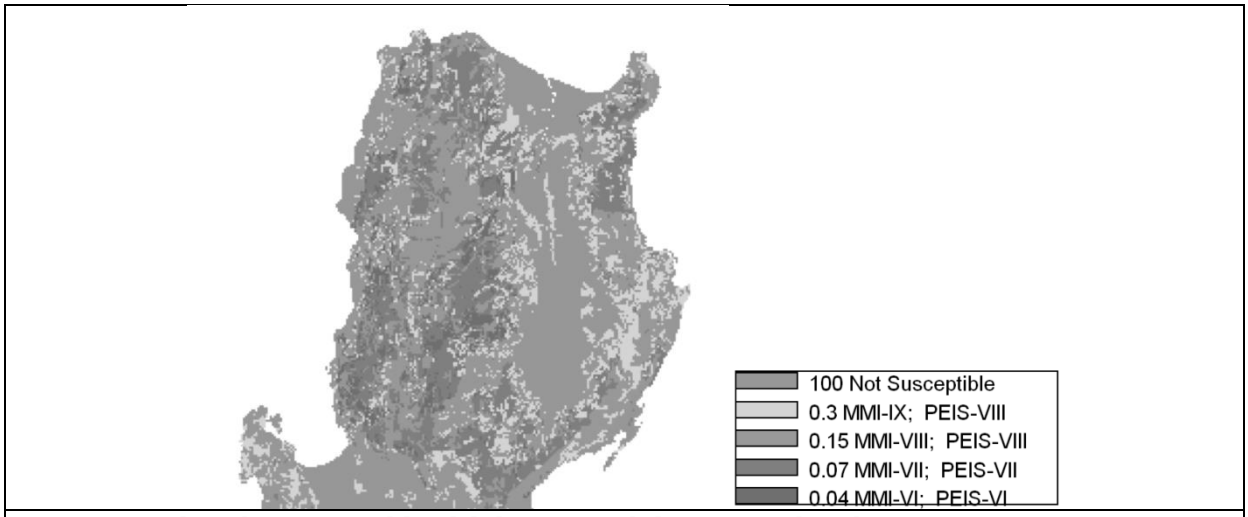
The researchers conducted interviews in 4 different barangays to get a clear image of the current situation with regard to floods and landslides. The barangays in which the interviews were taken were chosen because of their locations in respect to the dam. Answers given by the respondents show exactly where the flood prone areas are. Getting information about landslides with this method proved to be a little more challenging. Every single respondent said there were no landslides in the area they worked, but they did not know about the slopes near the reservoir and the river. The chairman of the people's organization of Maguli was able to testify that there were landslides and erosions upstream, because the water downstream turned brown after they occurred. To get more accurate information, a visit to the Municipal Disaster Risk Reduction Management Office (MDRRMO) was made. The map they provided shows that the TRMP will be constructed in an area that has a moderate to high susceptibility to landslides upstream and this could cause trouble with accelerated sedimentation when the dam is in place. Just like the answers obtained in the interviews, the map shows that the downstream area is not prone to landslides.

With regard to floods, the interviews proved to be a reliable method, with respondents giving concordant answers per area. Antagan 1 does not have floods that reach the houses, but the floods affect the farmlands of the people. Antagan 2 already suffers floods in Purok 1 and 2; the water even reaches the level indicated in Picture 1. The impact of these floods was that animals and crops were lost and houses had to be abandoned because they are built beside the riverbank and continued to be flooded and eroded. Namnama has never experienced floods but suffered droughts in the dry season. Cumabao also has not experienced floods in the past.

Picture 1: The height of the water during past floods

To answer the second sub-question, the researchers visited the Department of Environment and Natural Resources (DENR) and conducted an interview with their head. Additionally, all respondents in the barangays were asked what they thought the effects of the construction of the dam would be on floods and landslides. Some respondents worried that during the dam construction, it is very likely that a continuous rain will bring a huge flood which cannot be controlled because the construction is ongoing just like what happened in Magat dam. Sammy Devina (chairman of people's organization) says NIA has guaranteed that no flooding will occur even with one year of heavy rainfall during the construction of the dam. In the feasibility study however no information is given on how this will be accomplished apart from an early warning system.

To say something about the landslide vulnerability, the observations of the DENR and the researchers will be used. At the time of writing, there are no tests done or samples examined from the construction site. Both the DENR and the researchers observed that the area seemed vulnerable because of the steep slopes roughly measured at 50% that are completely deforested. It must be said that the area seemed to have very thin topsoil with rock or limestone underneath it. This means that the impact of the landslides on the dam could be relatively small. However, the head of the DENR stated that if the mountains consist mainly of limestone the construction might not even be possible and because of the combination of steep slopes with mild earthquakes, the area is susceptible for earthquake-triggered landslides (Map 4). This could be a threat to the dam because of rapid sedimentation of the reservoir.



Map 4: Earthquake triggered landslide susceptibility map (Phivolcs)

To assess the changes in flood and landslide vulnerability of the area, we asked the respondents if they expected the dam to have a positive or a negative effect on these hazards. Only 10% of the respondents said that the landslides will worsen and 90% said that it would be prevented after the construction of the dam.

The residents' perception is different concerning the impact of the dam construction on the occurrence of floods in the area. 77% of the respondents said that floods will worsen while 23% believe otherwise. Respondents from Antagan 1 and Antagan 2 believe that the floods would get worse; their proximity to the dam makes them more vulnerable to its effects. Antagan 2 is already a flood prone area, but Antagan 1 would become a new vulnerable area after the construction according to the respondents.

The researchers also looked into the impacts of the proposed dam construction on typhoon occurrence. Based on the feasibility study of NIA, "estimation of the peak discharge using hydrograph analysis method, it was assumed that the hourly increments of the 24-hour rainfall were rearranged so that the peak occurs at the 16th hour (2/3 of 24)." It was further assumed that the storm occurs at a time when the watershed is fully saturated so that 100% of the rainfall flows as direct runoff (NIA). It was also found that the floodgates have the capacity to release all the water, for this they took the amount of rainfall that fell during the typhoon Ondoy in 24 hours (NSCB). This means that the dam will neither prevent nor cause floods in case of a typhoon, because the water will just be let through.

The mitigating measures being implemented by local people, government and the proponent of the dam, are very few in number. The local people will evacuate when necessary while some will observe if there will be a flood. This is exactly what the people in the flood prone area of Antagan 2 already do. The MDRRMO whose task it is to take mitigating measures has detailed plans on how to minimize risk in the area. However they did not know about the proposed dam in Tumauini River, this means the mitigating measures planned in case of disasters will not take the construction of the dam into account.

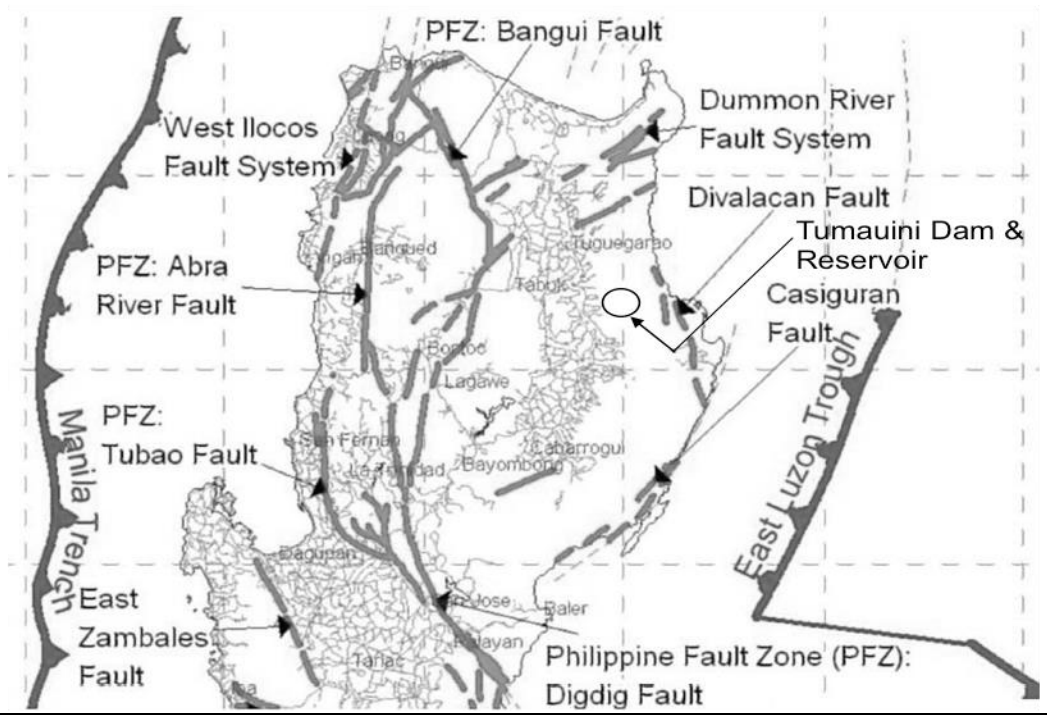
Table 4: Mitigating measures taken by the proponent (NIA)

Project phase	**Development processes/technology/equipment**	**Emissions/Wastes/Hazard**	**Mitigating measures**
Dam Construction	Type: central core earth and rock fill. Activities are: tunnelling, core trenching, embankment works, outlet works and bridge construction. Concrete aggregates will be sourced from the sand and gravel dposits as well as boulders from upstream of the dam. Equipment to be utilized are: backhoe, bulldozer, road roller/compactor, dump trucks, cement mixer and service vehicles.	Oil spills, exhaust fumes, particulate matters caused by passing vehicles	Motorpool to keep vehicles in top condition; impose speed limit
Operational Phase	During the 50-year life span of the dam, the dam facilities and reservoir will be under the operational jurisdiction of NIA but with oversight supervision from the Protected Area Management Board of TWFR. The irrigation component will be under NIA-Tumauini Irrigation System jurisdiction and governance.	Soil erosion, sedimentation, landslides, floods, earthquakes, dam collapse, sabotage	Rainforestation, vengeneering, regular maintenance/ desiltation of canals, electronic flood warning system, information and education campaign (IEC); Dam design based on 1,000 year flood return period and seismic design coefficient of 0.20g ; security measures.

The researchers encountered problems, especially the technical people, with regard to measurements because of lack of availability of equipment to be used and consequently, lack of time. They noted, however, that there were few trees in the area which makes it vulnerable to landslides especially in the upstream. This would have an impact on the dam, eventually. But then it is remarkable that from the people in the affected area, illegal logging has already stopped since 2010 through the leadership of the DENR. We also observed that the LGU employees do not have enough idea and information about the realization of the dam. Therefore, it is highly recommended that massive information dissemination about the project be done especially to its local leaders.

We also noted that samples of soil used in the feasibility study of NIA were taken farther from the dam site which can only be useful in predicting landslides upstream. It is highly recommended samples should also be taken on and near the construction site to guarantee the feasibility of the dam. The researchers conducted separate interviews with the head of the DENR and with the MDRRMO of Tumauini for their perception about the dam. For the first one, the interviewee had a positive view about the dam especially on the development of the nearby barangays. She also believes that the dam will not bring any hazard because the materials that will be used meet the required strength to resist any phenomenal disasters, especially flooding. Nevertheless, the DENR is currently conducting soil tests to check if it is not limestone to make sure that the site is suitable for dam construction.

The researchers discovered from the people that Tumauini, including the area where the dam will be constructed, had already experienced mild earthquakes. Nonetheless, such did not bring any damage on whatever aspects of their livelihood. To justify this, MDRRMO stated that Tumauini is not located on a fault line especially TWFR (Map 4).



Map 5: Active faults and trenches in central-northern Luzon (Phivolcs)

Respondents from Antagan 2, which is inherently a sensitive area in terms of flood, shared with us about their overlaying existing flood control, which had been constructed and destroyed by flood for three times. They believe that the materials used do not have enough strength to resist the strong current of the water.

Nevertheless, the people have observed that the present intake already has a crack due to the lack of maintenance. And this is certainly seen as one factor that will make the proposed dam construction more vulnerable.

Picture 2: D*amaged flood control at Antagan*

ACKNOWLEDGEMENT

We sincerely acknowledge with deep appreciation and gratitude the following people and institutions who have extended their knowledge, time, effort, expertise, immeasurable assistance and full support that significantly contributed to the completion of the study:

The LGU of Tumauini particularly the Municipal Disaster Risk Reduction Management Office, for the accommodation, support and assistance.The DENR staff, especially Ma'am Luz S. Soriano, for their continuous supervision on protecting and conserving the environment and for giving valuable information that contributed to the success of the study.

The members of the people's cooperatives in Antagan 1 for their assistance and support. The barangay officials of Antagan 1 for giving us permission to conduct research in the area. The National Irrigation Association of Cauayan, Isabela, for providing important information needed for this study.

The respondents of this study, for having sincerely participated by expressing their opinions, sentiments, and for their cooperation during the interviews. The host family, Tatay Ismael, Nanay Betty, Kuya Culas, Ate May-may, Shiela and Don Don for their hospitality and moral support.

Our beloved families, for the encouragement and support that served as an inspiration for us to give our shot in doing this study. Above all, we thank the Almighty God who gave us wisdom, knowledge, blessings, guidance and strength in facing life's trials.

To all of them, this work is humbly and willingly dedicated.

REFERENCES

Municipal Disaster Risk Reduction Management Office (MDRRMO). 2012. Gawad Kalasag report, Municipality of Tumauini, Isabela.

National Irrigation Association (NIA). 2012. TRMP Feasibility study report, Cauayan City, Isabela.

National Irrigation Association (NIA). 2012. Project Description for Scoping Basic Project Information.

Coburn, A.W. 1994. Vulnerability and Risk Assesment 2nd edition. Cambridge, UK.

Kamala, A. 1989. Environmental Engineering. New Delhi, India.

Dr. Combalicer, E.A. 2012. Assessment of vulnerability to climate change. Los Banos, Philippines.

Bower, B.T. 1981 Incentives in water quality management France and the Rurh area. Resources for the future, inc.

Http://erdb.denr.gov.ph/pub_det.php?j=24. Downloaded on 25 January 2013.

http://www.phivolcs.dost.gov.ph. Downloaded on 26 January 2013.

http://www.nscb.gov.ph/headlines/StatsSpeak/2009/110909_rav_mrsr_typhoons.asp Downloaded on 29 January 2013.

APPENDIX 1

Questionnaire

1. What is your name?
2. How old are you?
3. How long have you been living here?
4. How many people are there in your family?
5. What is your occupation?
6. Do you know about the proposed dam in Tamauini river?
7. Are you aware of the advantages and disadvantages of the project.
8. What is your perception of the proposed dam? Do you agree?
9. What kinds of hazards/disasters have you experienced in this area?
10. What were the impacts of these hazards?

THE ECONOMIC IMPACTS OF THE PROPOSED TUMAUINI DAM

Zyra Z. Cabaldo & Stephen Ivan aan den Toorn

INTRODUCTION

The common purposes of building a dam are to stabilize water flow-irrigation for agricultural purposes, water supply, power generation in which hydroelectric power is one of the major sources of electricity in the world, flood prevention, land reclamation for human use, water diversion, navigation and for recreation/aquatic beauty. Once completed, if it is well designed and maintained, a hydroelectric power source is usually comparatively cheap and reliable which may contribute a lot in the economic condition of a certain community.

The main purpose of the Tumauini River Multipurpose Project (TRMP) is to increase the agricultural yield of the present irrigation scheme, henceforth known as Tumauini River Irrigation Scheme (TRIS). The original TRIS was built for 6,100 ha of irrigated lands, but a shortage of irrigation water limited the prepared land to 3,020 ha. However, the availability of water limited this amount further. The TRMP was proposed as an addition to fully develop the original 6,100 ha plus an extra 2,100 ha of land (Saw 2012).

The proposed dam is likely to have numerous side effects on the local economy. The specific changes can either benefit or impede the local population. The purpose of the dam is mainly to provide adequate water supply for irrigation and to increase crops production and promote fisheries, tourism and job creation as well, which will eventually add to the local government and business revenue for the progress and development of the community particularly in the areas of Antagan and Maligaya. However, there is no guarantee whether everyone indeed benefits from its construction.

RESEARCH QUESTIONS

To research our topic, we have formulated the main question as follows: *What are the Economic Impacts of the Tumauini River Multipurpose Project (TRMP)?*

To gather specific information, we formulated sub questions which are:
What are the economic impacts on agriculture, aquaculture, tourism, employment and immigration of the TRMP?
What are the different viewpoints of the local population, businessmen and government agencies regarding the TRMP?

METHODS

Table 1: Time schedule

Informant/s	***Activity***
NIA	Present agricultural yield and its projected increase
LGU	Government views on economic aspects
ISELCO II	Hydropower Information
Out of School Youth	Views of the youth concerning the dam
Barangay Captain	Local government views on economical aspect
Local Businessmen	Earning Expectations
Fishermen/Farmers	Present and Future yield

January 20	January 21	January 22	January 23
Farmers/Fishermen	NIA	NIA	LGU
	Out of School Youth	Barangay Captain	ISELCO II
	Fishermen/Farmers	Local Businessmen	

Qualitative Interviews

We chose to focus our interviews on key informants rather than via random sampling method. We interviewed farmers/fishermen and businessmen who we happened to encounter.
For the general plan of the proposed project, we interviewed Ir. Salvador and three (3) Irrigation Association (IA) members of National Irrigation Administration (NIA). For fisheries, we visited several fishermen to gain relevant information regarding their current and expected rice and corn production per hectare annually and their view on the economic effects following the dam construction. For agriculture, farmers, the Barangay Captain of Antagan I and the Department of Agriculture (DA) of Tumauini Municipal Office were the informants. For tourism and employment, we conducted interviews with the Local Government Unit (LGU), Isabela Electric Cooperative (ISELCO II) and some small business owners.

The advantage of this method is that we could efficiently gain the information that we need from relatively few informants. The main downside is that information is hard to cross-reference which may cause incorrect information to go undetected.

RESULTS

The economic impacts of the TRMP are more than just the added value delivered by the irrigation scheme. The reservoir area will also be used for fisheries and tourism is expected to increase for its esthetic value. This in turn may boost the local business and employment possibilities for the nearby barangays and municipalities. These links between economic sectors are critical to understanding the total economic impact that such a dam might have on a region (Figure 1). To answer the research question, we looked into the different sectors to see if they have been taken into consideration.

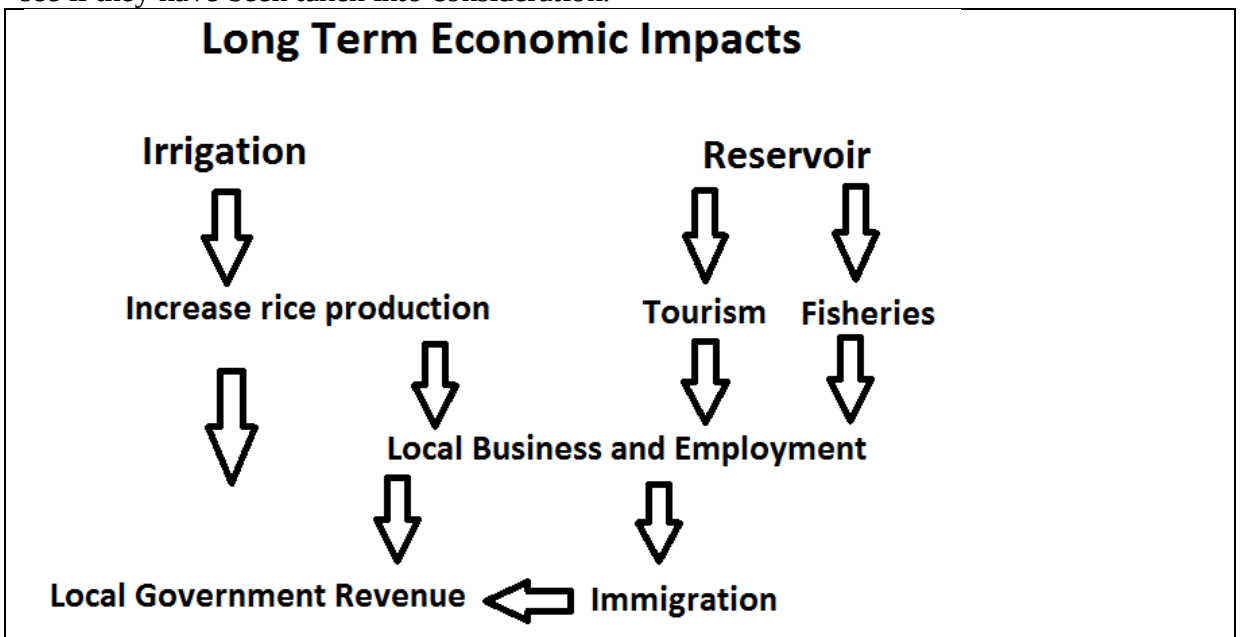


Figure 1: Economic impacts in the long run

Agriculture

The proposed Tumauini dam's primary function is to improve the irrigation of farmers in the beneficiary regions. For this reason, it is recognized by the various actors that the agricultural benefit has precedence over other types of impacts.

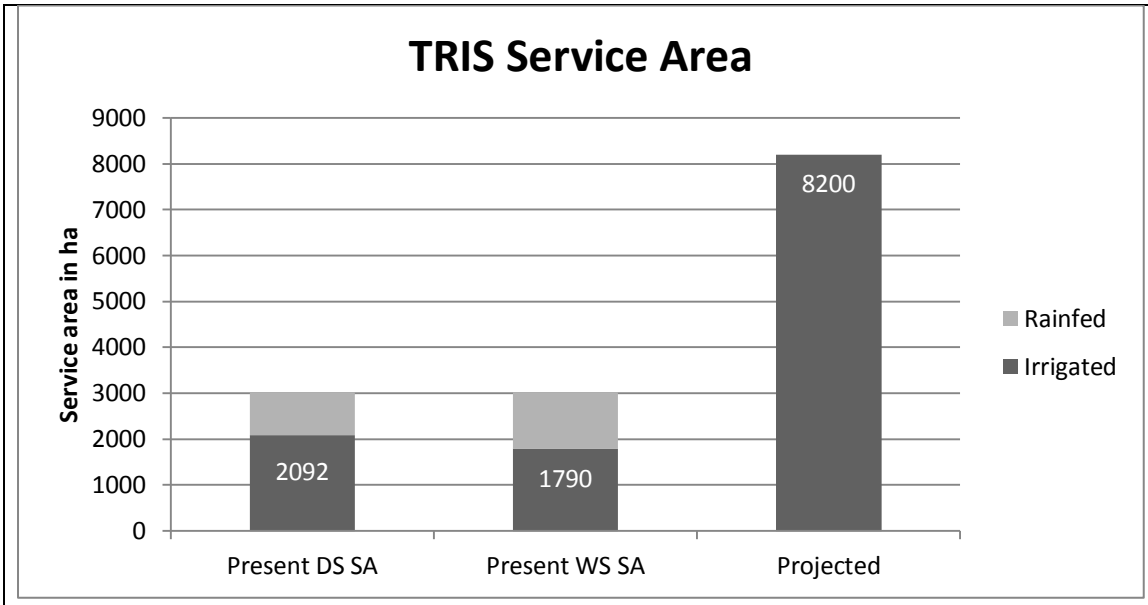


Figure 2: Service area of the TRIS in ha

The present irrigation scheme serves 3,020 ha of farmlands overall in the Tumauini region, of which 2,092 ha is irrigated during wet season and 1,790 ha during dry season (Figure 2). The irrigated regions produce rice of either the hybrid or the inbred kind, while rain-fed farms are usually cultivated with a mixture of rice and corn. The rice from rain-fed areas is mainly for personal consumption while the corn is grown purely for profit. The main reason for this is that the water requirements and investment costs are less than rice. Once the field is irrigated, rice matures faster and water supply is more secure increasing the profit. However, irrigation water is not free and the price depends on the season with 150 kg of rice per hectare during the dry season and 100 kg of rice in the wet season. Most farmers pay their fees in cash for around P15/kg of rice. Depending on the crop that is grown, the total earnings of a farmer per hectare can strongly fluctuate. One hectare of corn has a net profit of around P30,000 per cropping while irrigated rice earns P50,000. On average, this means the farm income of 8,626 households is P32,128.24 totaling the economic value of the TRIS at P277 million (Figure 3). (Saw 2012).

Picture of Magoli irrigation water intake (Photo by S.I aan den Toorn 2013)

The future irrigation scheme aims to increase the total farmlands to 8,200 ha (Figure 2) and fully irrigate them. Besides simply increasing the amount of irrigated land, the Tumauini River Multi-Purpose Project will also increase the yield per hectare by converting present rain fed land to irrigated land causing a switch from corn to rice and by increasing the total amount of harvests to five every two years. However, we have heard contradictory information regarding the price for irrigation water. Engineer Salvador of NIA expects an increase in the price for irrigated water to 275 kg of rice per hectare during the dry season and 225 kg during the wet season, but the attendants of the public scoping were informed that the rates would stay the same (NIA 2012). The expected economic value of agriculture in the region is estimated to be P96,000 annually per household totaling at P1,028.7 million which is spread out over the various barangays in the three beneficiary municipalities of the dam (Figure 3). (Saw 2012)

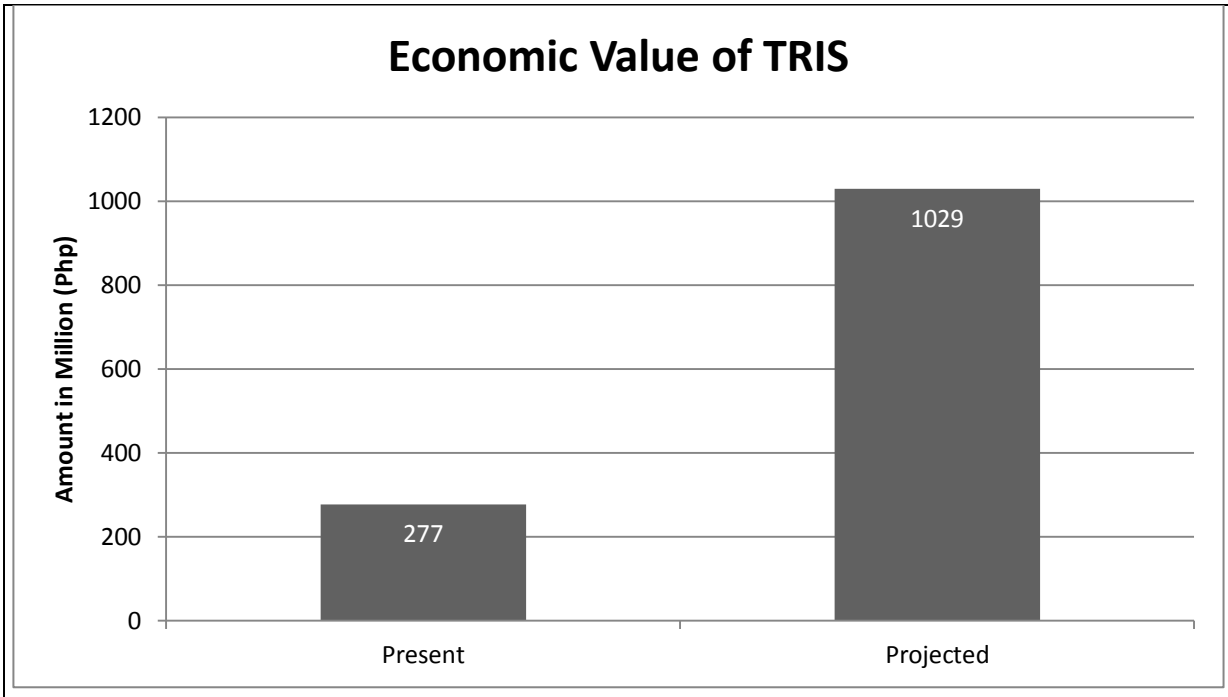


Figure 3: Economic value of TRIS in Peso

Fisheries

The creation of an area for aquaculture behind the dam is one of the major secondary economic impacts. By setting up fish cages, the local farmers can increase their income. The standard number of fingerlings per cage at present is fifty (50) which are harvested every four months and one thousand (1000) fingerlings is the usual startup which costs P5,000. Some fishermen practice the *Massive stocking* for more harvests which is expected to be the case for most cages once the dam is built.

Presently, there is no need for fishermen to secure permits since downstream fishing is open for all, even to people from outside. Permits for fisheries will in the future be secured at Bureau of Fisheries and Aquatic Resources (BFAR) located in San Mateo, Isabela after the project. Not all fishermen are allowed to have their own fish cages due to limited space of 14 ha available for fish cages, especially in other barangays considering the number of interested fishermen in Antagan I, where the project will be located (NIA 2012). The expected amount of fishes per harvest is 16.8 million with the gross value of P420 million. Expected expenses to be deducted are: capital, feeds, nets, floats and frames.

The prohibition of illegal forms of fishing, such as electric fishing and poisoning in which even young fishes are caught, shall be enforced after the construction of the project. However, people, both within and outside the community, currently practice it for consumption. Those who have their own ponds gain profits by selling it to the people within the area ranging from P90-110/kg on cash and credit bases, respectively. Fishermen sell it to the market at an average price of P160/kg (usually 3 pieces, depending on size). It is rather difficult to estimate the profits based on the information we gathered and the agencies have not finalized the plan.

Employment
The building of the dam will have a short-term boost of the local earning by employing 2,300 local workers. Their salary will be based on the minimum wage which is P340/day, but there are many people in the vicinity without a job. The NIA will employ approximately twice or thrice the current number of workers after the construction of the project. The IA shall employ several office workers and Engineering/Computer related graduates, since the NIA is planning to hand over the management to them or the Irrigation Management Transfer (IMT) for the Farmers and Irrigators Association. However, the true long term employment benefits are to be found on the farms and in private businesses.

Tourism
Increased tourism is seen as a minor factor in the development of the dam. Despite this, there are several ideas from both the local government and the local businessmen to make use of tourism. The barangay captain of Antagan I plans to invest part of the increased IRA from dam taxes to beautify the barangay and make the area more attractive to tourists which in turn will stimulate the local economy. Development and eco-tourism are not included in the first phase of the planned project but expected in the last phases.

Immigration
The employment opportunities are most likely to attract migrants from other regions in the Philippines. This will profit Tumauini in several ways. First is the increased tax revenue. The second is a boost of external investment in the area which in turn might attract even more migrants and investors. Finally the increase in population and tax revenue will help the Tumauini LGU to achieve its goal of becoming a city.

Local Views
The view of the people that we interviewed (5) is very positive regarding the proposed irrigation system. Farmers who cultivate rain-fed fields are all planning to switch to rice cultivation. Their only real concern is that if the dam collapses, many people will be affected particularly in Antagan II which is known to be lower than Antagan I. Land properties of people which will also be affected during the road concreting as part of the project are to be compensated, because the law provides that the government can take any part of their lands if necessary for government purposes. Some of the local youth would invest their earnings from being construction workers into their own education. Generally, there are no other negative economic effects mentioned.

Local Businessmen Views
The general view of businessmen on the proposed dam is divided between positive and unawareness. In Antagan I, people are aware and several local businessmen have plans to expand their businesses. In contrast, businessmen from Maligaya who will be affected by the dam since they supply products and equipment directly to farmers are not aware of the project. As a result they prefer to react to demand rather than invest beforehand.

Government Views

Basically, the views of the government agencies are positive. For NIA, there is 98% assurance that the dam will be built since they are the initiator of the project. Not all offices under the LGU of Tumauini know or are well-versed with the government project. They just know about the primary goals of the dam such as secure water supply, irrigation and rice sufficiency. However, they are not informed about the possible secondary impacts which may affect the agencies other than the DA. As for the Barangay Captain of Antagan I, he was very positive with the project since his area will benefit the most in terms of IRA increase. The IA's favor the project because all will benefit from it but the representative from Antagan II mentioned that the expected fisheries will prioritize Antagan I, which is nearer.

DISCUSSION

Most informants were positive about the economic aspects of the proposed dam. However, not all informants are well oriented with the general plan and the far-reaching secondary economic impacts. This was especially noticeable amongst the Maligaya businessmen whom, despite frequently dealing with farmers, had not heard of the proposed dam. In contrast, some interviewees contributed to the knowledge of several actors. For instance, in Antagan I, all fishermen are farmers and some are even store owners and barangay staff.

One of the controversial points is the future irrigation fee. There is a contradiction among the expectations of farmers, Barangay Captain, DA, and NIA regarding the irrigation price after the proposed dam. The farmers and the Barangay Captain are expecting a decrease or similar rate for the irrigation fee after the project, which was confirmed in the public scoping of NIA. However, Engineer Salvador of NIA mentioned an expected increase of the price. As a recommendation, the NIA should call for a general orientation amongst farmers and other actors concerning irrigation fees in the future.

Another issue that we encountered is that some of the LGU offices are not well informed regarding the secondary effects of the proposed dam which will affect their departments. The DA, as one of the well oriented agencies, was able to share information about the general economic impacts, because the farmers, as their main concern are the first to be affected. The Project Development Officer III of the Municipal Planning and Development Council (MPDC) was aware of the dam, but has not yet made any projections of the possible secondary effects. The Treasury Office Staff was not able to give information on taxation and funding, because the treasurer was not around. As an overall observation, most LGU offices have relatively little knowledge of the economic impacts of the TRMP.

As a research group, the main problem that we encountered was time restraint. For instance, we were not able to visit the BFAR office which is located in Tuguegarao City and supposedly a good source of information regarding fisheries, permits, etc. We also were not able to interview the Department of Labor and Employment (DOLE), as recommended by the DA, about the salaries of the construction workers during the project and the expected salaries and/or numbers of employees in the long run.

ACKNOWLEDGEMENTS

This research is made possible with the help of the following persons: the Barangay Captain of Maligaya, Mr. Romeo Alcaraz, and other barangay officials for their hospitality in providing us a room in Barangay Hall where we stayed for four nights and five days during the fieldwork. To Mr. Reynaldo Rapadaz, barangay captain of Antagan I, Mr. Rolando Galicia, barangay councillor and Mr. Roberto D. Agcaoili, the president of Antagan II on behalf of the farmers and fishermen for their participation by giving us the opportunity to gather relevant information through interviews. The cooperation and assistance of local businessmen and farmers was indeed a great help. We would also like to thank Engineer Salvador of NIA and LGU Tumauini Officials especially Mrs. Dulce Fe Baquiran of DA and Mr. Gregorio M. Bunagin of MPDC for giving us accurate information that we needed.
Above all, our Almighty God for giving us the strength, wisdom and courage to do this research. To Him be the glory.

REFERENCES

Saw, V.I., 2012. NEWS Workshop Tumauini River Multipurpose Project

National Irrigation Administration (NIA) 2012. Project Description for Scoping Basic Project Information

CONCLUSION: RAPID ASSESSMENT TOOL

Channa van Leijsen

This last chapter will provide a conclusive assessment for the TRMP and its impacts. Our method for this is based on the Rapid Basin-wide Hydropower Sustainability Assessment Tool, created by the Asian Development Bank for their projects in the Mekong River (ADB 2010) which we adapted to enable its application for our case (See Appendix I for adapted topics and criteria). The 9 different topics assessed are all covered in the field studies of the students, and based on their findings, they filled in the tool. The overview that is created provides us with a way to assess the strengths and weaknesses, risks and opportunities of the proposed project, and a possibility for recommendations and a final review of the project.

SUMMARY OF TOPICS AND CRITERIA

Topics	**Criteria**
1. Economic development	1.1 Relative contribution of the project to national and local economies
	1.2 Synergies and trade-offs with other economic sectors in the watershed
2. Social and cultural well-being	2.1 Understanding and protection of culturally significant sites and non-material uses of resources in all stages of the project
	2.2 Protection of livelihoods, land, water access rights, entitlements and resettlement
	2.3 The project and poverty reduction and equitable sharing of benefits
3. Environmental quality and natural resource management	3.1 Understanding and protection of ecosystems, flora, fauna and unique biodiversity/habitats
	3.2 Management and monitoring of environmental impacts, incl. solid waste and sewage, resulting from the project
4. Planning and coordination	4.1 Alignment with local, national and international agreements, policies, plans and commitments
	4.2 Coordination and planning between different actors (incl. roles and allocation of responsibilities)
	4.3 Capacity building of key agencies and actors
	4.4 Multi-criteria assessment for site selection
5. Irrigation, environmental flows and downstream regulation	5.1 Knowledge of water quality, water quantity, water flows and impact on river morphology, erosion and sediments
	5.2 Structural provision and operational procedures for sediment management and sediment flushing during all project stages
	5.3 Structural provision and operational procedures for downstream flow regulation
	5.4 Flood and drought management upstream and downstream of the dam
	5.5 Planning, maintenance and management of irrigation system
6. Fish passage and fisheries management	6.1 Understanding, monitoring and management of fisheries resources
	6.2 Development of reservoir fisheries
7. Sharing of benefits and use of innovative financing measures for sustainability	7.1 Equitable water resource allocation between sectors
	7.2 Payment for environmental services
	7.3 Carbon financing opportunities to fund sustainability measures
	7.4 Project revenue to fund sustainability measures
8. Provision for safety and disaster prevention and management	8.1 Dam safety management system (DSMS), and (natural) disaster preparedness
	8.2 Emergency preparedness plans (EPP), flood management plans and coordination
9. Communication, stakeholder and community involvement and support	9.1 Strategic communication program regarding the project for all stakeholders
	9.2 Informed participation and representation in decision making at all stages of the project cycle
	9.3. Information sharing and access to data and reports
	9.4 Level of knowledge and awareness about the project at community level
	9.5 Community support for the project

STRENGHTS, WEAKNESSESS, OPPORTUNITIES, RISKS AND RECOMMENDED ACTIONS

Topic 1: The project and economic development	
Strengths • Farmers mainly benefit • Multiple Secondary Effects	Weaknesses • Many Secondary effects are not further elaborated
Opportunities • Research on the secondary effects	Risks • Encounter economic uncertainties after the project
Recommended actions Research and disseminate information among different actors regarding secondary impacts.	

Topic 2: Social and cultural well-being	
Strengths • Providing alternatives for the livelihoods of all the people in the dam affected area. • Equitable sharing of irrigation and hydropower benefits that derive from the dam.	Weaknesses • Weak understanding of the culturally significant sites and non-material use of resources of indigenous people. • Focus is too much on the substitution of involuntary resettlements rather than the protection of current livelihoods.
Opportunities • Large scale employment among village people. • Provision of hydro power and irrigation throughout the whole village. • Investment in local economies by for example, eco-tourism, selling of local produce to construction workers.	Risks • Destroying livelihood and cultural significant sites of Agta. • Undermining indigenous people rights. • Loss of current livelihoods
Recommended actions • Provide opportunities for local people to express their opinions about the project, and take into consideration that the presence of barangay officials can cause people to keep silent. • Make an assessment of the possible protection of livelihoods, instead of immediately forcing (involuntary) resettlement. • Prioritize the social acceptability survey in order to inform people about the project, the details of the project and the positive and negative effects that will derive from it.	

Topic 3: Environmental quality and natural resource management	
Strengths • Reforestation and agroforestry projects. Especially the use of Narra and other native species in reforestation projects and fruiting trees (which are very attractive to several bird species, as well as deer) in agroforestry projects. • The aquaculture projects mentioned in the EIS report can provide good food sources for local residents, and may prevent electro-fishing.	Weaknesses • The lack of information regarding the conservation of local wild mammals (deer, wild pigs, monkeys) and reptiles. • Lack of information regarding the conservation of freshwater fauna requiring (fast-)flowing and/or shallow water (shrimp, crabs, mudfish). • Lack of information regarding the provisions for the workers. (Where will they live, sewage, etc.) • No information on actions taken against electro-fishing.

Opportunities	Risks
• Local population can benefit greatly from reforestation and agroforestry projects, both directly and indirectly. The fruiting trees used for the agroforestry are a food source for local deer and several bird species • The aquaculture may also be quite profitable for local people, and can provide a stimulus for the Mozambique Tilapia.	• Electro-fishing poses a large risk to the fish stock in the lake and river, as it kills most, if not all, young fish. • The likely lack of shrimp in the lake could also pose a problem, as they are an important food stock. • Workers staying at the dam site could also prove a risk, both by hunting local wildlife (illegal), and by their waste products (sewage, pollution from building equipment).
Recommended actions • Survey for mammals and reptiles in the area and if necessary, a plan for their conservation. • Involving the current electro-fishers in aquaculture. • Perhaps test the waters for pesticide presence, as some fishers may use pesticides ('disease') to catch shrimp. • If possible, a plan for conserving and stimulating shrimp (and freshwater crab) population. • Removing Channeled Applesnail from the area (invasive species). • Waste-management plan for the workers at the dam site, including sewage, domestic waste, pollution form building equipment etc.	

Topic 4: Planning and coordination	
Strengths • Hierarchy of government – every actor/agency is designed to do their own part wherein each has significant roles upon coordination, which is to plan; to supervise; to verify and to implement. Furthermore, their specializations and authorities on specific matters are integrated to guarantee the general welfare of the people, the sustainability of the project and the protection of the environment. • Public consultation is required to assess the social acceptability of the project.	Weaknesses • The knowledge on prescribed procedures and current status of the proposal appears to be limited to some key actors, while this is essential for an efficient and effective decision making process wherein the general welfare of the people, the sustainability of the project and protection of the environment can be guaranteed. Furthermore, the inclusion of many actors can cause miscommunication and uncertainty about actors' accountability. • The value of the public consultation depends highly on the attendants and the information provided by the agencies in charge of the consultation.
Opportunities • The expertise of all the different agencies as well as the prescribed procedures can contribute to the assurance of the project's sustainability, the general welfare of the people and the protection of the environment. • The public consultation informs people about the impacts of the project, as well as provides a platform for people to express their opinions on the project. The results from the public consultation and opinions expressed can help to improve the project details.	Risks • Lack of knowledge on procedures by actors and miscommunications and uncertainty between actors can cause delay and unwanted effects. • Public consultation is essential to assess the social acceptability of the project. However, participants in the consultation are dependent on the information provided by the proponent. If all the information disseminated is focused on the positive effects, the conclusion about the social acceptability might not reflect the actual situation.

Recommended actions

- Increase knowledge on prescribed procedures among all actors involved.
- In addition, actors should be better informed about the current status of the proposal. Active dissemination of information on this matter by the proponent should be improved.
- Use the public consultation as an opportunity to gain insight into the opinion of the community and other actors involved. Inform them of all the benefits and possible negative impacts, so they are able to form a well-advised opinion based on all the aspects. This will be extremely useful to make improvements in the project details and gain support from the community.

Topic 5: Irrigation, environmental flows and downstream regulation

Strengths	Weaknesses
• There is a lot of information on water flows. • Current irrigation system works well, well maintained: with new project more water to distribute to the farmers during dry season. • IAs are well organized.	• The study of sedimentation is outdated. • Farmers are not well informed about floods. • Officials give no information about floods.
Opportunities	**Risks**
• Distribution of information under the local farmers to get more support .	• Too little knowledge about relation between flooding and irrigation. • In addition, the risks of sedimentations are unknown. • Flash floods in low areas will destroy income of farmers.

Recommended actions

- Update the study on sedimentation.
- Gather more information on flooding.
- Distribute information better.

Topic 6: Fish passage and fisheries management

Strengths	Weaknesses
• Sufficient knowledge on the proposed aquaculture scheme.	• Lack of information on upstream and downstream and on the conservation and impacts on wild fisheries.
Opportunities	**Risks**
• Upstream and downstream fishing research for better profitability.	• Unexpected negative effects on wild fish and up- and downstream fisheries.

Recommended actions

- Research the chain effects on fisheries, wildlife and aquaculture.

Topic 7: Sharing of benefits and use of innovative financing measures for sustainability

Strengths	Weaknesses
• Dam can be a barrier to illegal logging. • People are willing to pay for known environmental services, such as clean water and erosion, flood and drought protection. • People are already used to pay for ES, like the irrigating fee. • Sustainable water, flood and drought protection are likely to be improved by the dam.	• The road offers an easier way for illegal loggers to get into the area. • People are not well informed about all the ES delivered by the Tumauini watershed. • Also people are not well informed about the environmental services that will be changed by the dam. • No systematic PES is included in the project plans.

• More control and guarding people in the area to conserve the sustainability of the watershed. • Providing work and profitable farming in the area, empowers local people to protect the watershed, also decreases the motives for illegal loggers to earn money with logging. • Fish cages will increase fishing outcomes.	• The paying system is not sustainable, local initiatives, external sponsors or DENR is paying for reforestation. • DENR is responsible for the forest and reforestation, but the farmers, NIA and the TUMP are depending on these services. • Migrating and local fish will be affected.
Opportunities • Controlled and sustainable watershed management. • Incorporate the protection of the Tumauini watershed and the ES delivery with paying for services. • Sustainable fish production reduces motives to use electro or chemical fishing.	Risks • The road and the expected local population growth could stimulate overexploitation from the watershed, overexploitation of fish, wild animals, fruit and wood, for private or commercial use. In this way, sustainable forest protection is threatened. • Erosion protection and reforestation is not coordinated well with the TMRP, resulting in an unnecessary amount of erosion and decreased lifespan of the dam. • Local and migrating fish will be reduced and ecosystems, including fish eating organisms, could be affected.
Recommended actions • Educate local people about environmental services of the Tumauini watershed; use their willingness to pay for sustaining the quality of the watershed. • Formulate a clear plan about the protection of the watershed, regarding the road. • Include a payment for reforestation projects as an environmental service. For example, a reforestation fee included in paying for irrigation.	

Topic 8: Provision for safety and disaster prevention and management	
Strengths • There will be a strong focus on disaster prevention and management. • Use of good equipment during the construction. • Plans for risk reduction during the construction.	Weaknesses • There is lack of communication leading to no cooperation from the people. • Lack of information dissemination to local government.
Opportunities • The TRMP would benefit from collaboration between the NIA and MDRRMO to make an emergency preparedness plan. • There will be an opportunity to conduct seminars and trainings to educate people.	Risks • There is too much focus on disaster prevention and not on emergency preparation. • Reliance on a report dating from 1990 for the sedimentation and expected life span. • People living near the dam oppose because they don't have enough information on how the dam affects floods.
Recommended actions • Disseminate the plan better to local people and local government officials. • Update the report on sedimentation of the reservoir. • Inform people living close to the dam on its impact on floods.	

Topic 9: Communication, stakeholder and community involvement and support	
Strengths • There is an infrastructure for the dissemination of information about government projects. • The barangays are capable of distributing information to the community on the general barangay assembly's. • The majority of the people agree with the proposed project.	Weaknesses • The amount of information disseminated to the communities is very little. • 79% of our 42 respondents are not content with the amount of information they received. • There are still a lot of questions about the safety of the dam. The fear of floods as a result of the construction of the dam is high.
Opportunities • There is no widespread opposition against the Tumauini Multipurpose River Project. If the people in the Tumauini area are better informed about the possible risks, their fears about the safety of the dam might decline. If NIA improves the information dissemination to the affected communities, the chances of widespread support for the TMRP will be high.	Risks • If NIA fails to improve the amount and quality of the information provided to the communities, they risk negative public opinion on the TMRP. If flash floods occur after the dam is built, affected communities will blame the dam and NIA.
Recommended actions • NIA should use existing dissemination infrastructure like the general barangay assembly. Although this is a very useful way to provide information to the community, not everyone will be reached in this way. That is why they must also use other mediums like leaflets, posters and commercials on radio in order to inform the people who don't have time to attend the general barangay assembly.	

SCORING JUSTIFICATION

Scoring justification		
Criterion	**Score**	**Justification**
1.1	3	Primary benefits have been quantified, but the secondary effects have not been worked out
1.2	3	Synergies between the dam, hydropower and aquaculture have been researched well. However, synergies with irrigation, employment and tourism were not considered to be important enough at present
2.1	2	The majority of our respondents do not have rights of their land and/or the resources they use for non-material purposes.
2.2	3	Contribution and alternatives of resettlement are costed and will be paid by NIA.
2.3	4	Improvement of irrigation system is meant to improve the income of the farmers and local workers in the village and the upland areas.
3.1	4	Very good reforestation projects, but lack of information on critical habitats and mammal conservation.
3.2	2	Lack of information regarding waste management at the dam site.
4.1	4-5	Policies, plans and agreements are in place for sustainable development. Actors' authority, responsibility and accountability concerning the project as a whole and its individual aspects have been formalized in policies and regulations. Agreements are mainly focused on social acceptability and sustainable development, but since not all impacts are actively communicated, it is not yet clear whether the project will be a major contributor to sustainable development.

4.2	3	Actors' authority, responsibility and accountability concerning the project as a whole and its individual aspects have been formalized in policies and regulations. The actors work together to reach an efficient and effective implementation. Furthermore, the various roles and authorities are in place to guarantee a project with as little adverse impacts as possible, and mitigating measures are in place where needed. However, the framework in place for public consultation shows significant gaps. There is an asymmetrical supply of information, with the NIA beholding technical expertise and control of active dissemination of (new) information to other actors and levels in the decision making process. Information provided appears to be focused on the positive effects and the public consultation has not been perceived as a consultation, but more as an announcement. There are also discrepancies between information gathered from Barangay officials and other public officials concerning a survey being conducted in the Barangays to assess social acceptability.
4.3	4	Key line agencies (NIA, LGU, NEDA, PEMO, PENRO, etc.) have exercised their functions in line with the project involvement. Extensive study, feasibility study, general assembly/forum (August 2012), survey, etc. will be/were (according to key informants) conducted for the purpose of implementing the project, public consultation, project presentation and information dissemination so as to build the capacity of stakeholders and/or actors. However, some parts of the procedures to be conducted were unclear. In view of the boundary among the feasibility study, EIA and approval of NEDA, it seemed like the provided information are not inconformity with each other.
4.4	2	Only one sustainability criteria is met; the upgrading of the existing facilities.
5.1	2	No complete study has been undertaken with regards to river morphology and erosion. There has been on study on sedimentation, but only on the amount and not on grain sides.
5.2	1	There are no studies on sediment flushing, only on the amount of sediment in the river each year.
5.3	3-4-5	The Afterbay dam will make sure that enough water will reach the irrigation intake, so plans have been made with regards to irrigation and water delivery downstream of the main dam.
5.4	2	There is a spillway for flood management, but no plans for a drought.
5.5	5	8 of 12 IAs are under contract to maintain the system in their area, 4 of 12 are busy to become under that contract and already do some tasks for NIA.
6.1	3	The information on aquaculture deserves a score of 4, but the information on conservation and wild biodiversity is lacking thus deserving a score of 2.
6.2	4	Based on the information that we gathered on reservoir fisheries, we could give it a score of 4. But we have no information regarding upstream and downstream.
7.1	3	Regulatory framework for benefit sharing is in place. Indigenous people in the affected area will be able to share in the benefits from the project. In addition, they will be awarded with the rights on Ancestral Domains they are entitled to. However, the indigenous community is not aware of the rights they are entitled to and thus might not be able to negotiate in the process and influence the arrangements.
7.2	2	Concluding from the achievable information no payment for environmental services (PES) is included into the planning. If there was PES included into the project plan, it would be a unique selling point (USP) to promote the project to the public. According to the other well-spread USPs it is unlikely that the PES is included in the project, but not well disseminated. Even though possibilities to pay for environmental services are already there. Especially in the case of

		reforestation which delivers wood, food, clean air, habitat and protection like anti-erosion people are willing to pay and the lifespan and the image of the TUMP is improved.
7.3	3	
7.4	-	Not enough information.
8.1	2.5-conditional, 1-unconditional	There are safety measures to prevent defects, but we don't know if there is a dam break analysis and a maintenance plan. Also the emergency preparedness plan for the area has not been updated for the construction of the dam.
8.2	3-conditional	The EPP and flood management plans meet almost all criteria, but the communication and community awareness is lacking.
9.1	2-3	Roles of stakeholders are formalized, as well as means of communication, such as public consultation. However, knowledge of the procedures seems to be limited to some key actors and information on the current status of the proposal shows discrepancies between various actors. Information provided appears to be focused on benefits; other impacts have not been actively communicated. This fact is expressed in the community awareness, as most respondents testify not to be content with the information provided.
9.2	2-3-4	Policy, regulations and an implementation framework are in place. Requirement for public consultation has been met by means of a forum in August 2012, including key actors. However, the value of this public consultation is questionable, as people have mainly been informed on all the benefits and there was a very meager representation of the general public at the meeting. Respondents testified that they have received information on the positive effects of the dam during this consultation, but have not actually been consulted on the proposal. Hence, public consultation has had a minimal impact on the decision making process. Respondents have testified they would like a public consultation, to be able to express their opinion, but also to be aware of the opinions of community members.
9.3	4	Formal requirements are met and the access to data and reports is available. The information that is available is focused on the technical characteristics and the benefits. Information on impacts is available but not actively communicated. Questions still remain on the possible impacts.
9.4	3	Most people are aware of the fact that there is a proposed dam project. People who live near the proposed dam site and Antagan 1st are well informed. The further away the barangays are situated from the proposed dam site, the less information the communities have. They are aware of the improvement of the irrigation system, but they still have questions about potential risks, like flash floods. There is a need to distribute more information so that the people in the community feel well informed and part of the project. Moreover, people need to be more informed about their property rights.
9.5	3.5	60 % of the population agrees, however there is still some opposition (25 %). Community support is not assessed at the early stages of project preparation. Project affected communities are not engaged in a meaningful consultation process throughout the project development stages. Only 21 % of the people are content with the amount of information they have received. 79% of the people want more information on the TMRP. People want more information about the possible risks, but they are reluctant to ask critical questions in front of the Barangay Captains, other government officials and the NIA.

EVIDENCE LIST

Criterion	Evidence used (technical reports, databases, policies, plans, agreements, regulations, interviews, observations etc.)	Comments
1.1	Interviews, NEWS Workshop Tumauini River Multipurpose Project	
1.2	Interviews, Public Scoping Report	LGU has not considered most secondary effects
2.1	Interview questions for agta: "Do you know about the IPRA?" and "Do you have rights of your land?"	
2.2	Interview with DENR "What will happen to dam affected land which belongs to the stewardship and/or NGP program?"	
2.3	NEWS workshop Tumauini River Multipurpose Project, interviews with DENR	The plans for poverty reduction are mainly included in side projects
3.1	EIS Report, personal observations, survey	
3.2	NIA Feasibility Study Report (2012), interviews	
4.1	Interviews with NIA officials, LGU officials, Barangay captain Antagan I, Policies and regulation concerning the EIA process and assessing of social acceptability	
4.2	Interviews with NIA officials, LGU officials, Barangay captain Antagan I, Policies and regulation concerning the EIA process and assessing of social acceptability	
4.3	Interviews with NIA officials, LGU officials, Barangay captain Antagan I, Policies and regulation concerning the EIA process and assessing of social acceptability	
4.4	TRMP feasibility study report (2012), Interviews with local people	The plan to construct a dam on this site has been there for 30 years. There are no records of alternative sites.
5.1	Feasibility Study Report (1998 and 2012)	Sedimentation report is outdated (written in 1990)
5.2	Feasibility Study Report (1998 and 2012)	
5.3	Feasibility Study Report (1998 and 2012) and interviews	
5.4	Feasibility Study Report (1998 and 2012) and interviews	
5.5	Interviewed local farmers; observations	
6.1	Interviews, Public Scoping Report	The plans for the aquaculture are detailed, while the effects on conservation and fish biodiversity have barely been taken into consideration
6.2	Interviews, Public Scoping Report	No information

Criterion	Evidence used (technical reports, databases, policies, plans, agreements, regulations, interviews, observations etc.)	Comments
		upstream or downstream
7.1	Feasibility Study Report (NIA 2012), interviews with indigenous community (Agta's) in affected area	
7.2		
7.3		
7.4		
8.1	TRMP feasibility study report (2012), interview with MDRRMO, interviews with local people, interview with DENR specialist	An interview with the MDRRMO made clear that there is an emergency preparedness plan, but it is not adjusted for the construction of the dam because they were not aware of the plans
8.2	TRMP feasibility study report (2012), interview with MDRRMO, interviews with local people	We learned from the interviews that some officials and local people were not aware of the plan
9.1	Interviews with NIA officials, LGU officials, Barangay captains and Barangay officials, community members from Barangays Antagan 1, Antagan 2, Caligayan, Namnama, Cumabao, Magoli. Policies and regulations concerning the EIA process and assessing of social acceptability	
9.2	Interviews with NIA officials, LGU officials, Barangay captains and Barangay officials, community members from Barangays Antagan 1, Antagan 2, Caligayan, Namnama, Cumabao, Magoli. Policies and regulations concerning the EIA process and assessing of social acceptability	
9.3	Interviews with barangay captains and officials, LGU officials, NIA officials, DENR-PENRO, EMB, community of Antagan 1; Antagan 2; Cumabao; Namnama; Magoli and Caligayan. Policies on EIA and public scoping.	
9.4	Interviews with the community of Antagan 1; Antagan 2; Cumabao; Namnama; Magoli and Caligayan. Interviews with DENR and people who farm upstream	
9.5	Approval ratings are based on 72 interviews conducted by Roxsan Antonio, Daniël Kan and Hannah van Meurs (Awareness, perception and attitude of the people in Tumauini, Isabela on the Tumauini multipurpose river project) and interviews conducted by Kathlyn An Eugenio, Luuk Gremmen and Jasmin Talub (Vulnerability and disaster assessment of the proposed dam in Tumauini watershed forest reserve). the numbers of people content and not content with the amount of received infomationa are based on 42 interviews conducted by Roxsan Antonio, Daniël Kan and Hannah van Meurs (Awareness, perception and attitude of the people in Tumauini, Isabela on the Tumauini multipurpose river project)	

FINAL CONCLUSION ABOUT TRMP

The average score for the TRMP based on the rapid assessment tool is a 3.0. (NB. For criteria with more than one score the median of the scores was used in the calculation. Criterion 7.4 is excluded from the calculation due to lack of information).

A couple of criteria stood out positively in the assessment (score of 4 or 5):

- 2.3 (Poverty reduction and equitable sharing of benefits);
- 3.1 (Understanding and protection of ecosystems, flora, fauna and unique biodiversity and/habitats);
- 4.1 (Alignment with local, national and international agreements, policies, plans and commitments);
- 4.3 (Capacity building of key agencies and actors);
- 5.5 (Planning, maintenance and management of irrigation system);
- 6.2 (Development of reservoir fisheries);
- 9.3 (Information sharing and access to data and reports).

And the criteria that should receive some more attention (score of 2 and 1):

- 2.1 (Understanding and protection of culturally significant sites and non-material uses of resources in all stages of the project);
- 3.2 (Management and monitoring of environmental impacts, incl. solid waste and sewage, resulting from the project);
- 4.4 (Multi-criteria assessment for site selection);
- 5.1 (Knowledge of water quality, water quantity, water flows and impact on river morphology, erosion and sedimentation);
- 5.2 (Structural provision and operational procedures for sediment management and sediment flushing during all project stages);
- 5.4 (Flood and drought management upstream and downstream of the dam);
- 7.2 (Payment for environmental services (PES).

References

Asian Development Bank. 2010. Rapid Basin-wide Hydropower Sustainability Assessment Tool

Appendix I: EXPLANATION OF TOPICS AND CRITERION

Adapated from ADB (2010)

Topic 1: the project and economic development

Criterion 1.1 Relative contribution of the project to the economy

5 – In addition, economic assessments of the project factor in full costs of mitigation measures for social and environmental impacts over the life of the project. Funding agreements are in place for mitigation and compensation measures.

4 – In addition, the opportunity cost of the project is quantified. Options that minimize adverse impacts and achieve an overall positive economic contribution are selected.

3 – Economic development plans estimate the relative contribution of the project to the economy. The environmental, socio-cultural and socio-economic impacts and costs of the project are quantified where possible.

2 – There is an assessment of the economic contribution of the project, but the assessment has significant gaps and/or not all impacts are costed.

1 – There is no consideration of the overall economic contribution of the project on the economy and/or the project has an overall negative contribution.

Criterion 1.2 Synergies and trade-offs with other economic sectors in the watershed

5 – In addition, it can be demonstrated that options chosen for the development of the project represent the best balance of economic growth between sectors. Formal legally binding agreements are in place to protect the economic viability of other sectors and include compensation provisions for sectors negatively impacted by the project.

4 – In addition, other sectors affected by the project are represented in a meaningful consultation process in the decision making.

3 – Development plans or commitments for other sectors and sub-sectors in the project impact area are in place. The synergies and trade-offs between the project and other economic sectors in the area (e.g. agriculture, tourism, fisheries) are assessed to determine the synergies, trade-offs, costs and benefits between the other sectors and the project.

2 – Links between the project and the growth of other sectors have been made, but there is no assessment that qualifies the impact on other sectors and/or no plans have been made to address these impacts.

1 – The project is likely to significantly disadvantage other sectors and/or there is no consideration of other sectors.

Topic 2: Social and cultural well-being

Criterion 2.1 Understanding and protection of culturally significant sites and non-material uses of resources in all stages of the project

5 – In addition, legally binding negotiated agreements are/will be in place for the project to protect these values and uses and are the result of a meaningful consultation process. Negotiated compensation agreements are in place where impact to values is unavoidable.

4 – In addition, a regulatory framework for the protection of cultural values and non-material use of resources is in place and the project is consistent with it. It can be demonstrated that the project has broad community support from the traditional resource users and ethnic groups impacted directly or indirectly by the project.

3 – Baseline watershed-wise assessment of cultural and heritage values (using anthropologists, archeologists and other appropriate expertise in culturally appropriate meaningful consultation with traditional resource users) is in place. Policy/regulation/management plans are in place to protect cultural values and traditional resource uses of the different indigenous peoples and ethnic groups in the watershed. The project is/will be consistent with these, or the project developers and operators assess impacts according to minimum acceptable international standards.

2 – There is no assessment of cultural and heritage values across the watershed and of the project's impact on traditional/non-material resource uses. The assessment is not comprehensive and/or does not cover all the communities affected by the project. There is a limited policy framework in place to protect and/or compensate affected groups.

1 – There is no assessment or understanding of cultural or heritage values, or traditional non-material uses of existing resources. The project is likely to have significant impact and/or there is no policy framework in place to protect and/or compensate affected groups.

Criterion 2.2 Protection of livelihoods, land, water access rights, entitlements and resettlement

5 – In addition, all recognized project affected groups and/or resettled groups, have/will negotiate mutually agreed, formal and legally enforceable mitigation, compensation and development agreements for livelihood protection and access to land and water resources that are funded over the life of the project .

4 – In addition, the project includes a process of meaningful consultation and good faith negotiations to protect and enhance livelihood opportunities for project affected communities/resettlement groups at all stages of development. National and local legislation/agreements are in place to protect land and water access rights and entitlements of the affected communities and is consistent with these or minimum acceptable international standards.

3 – An understanding of the links between natural resource use, livelihoods and socio-cultural wellbeing is in place. Assessment of livelihood needs and land and water access rights and entitlements is conducted at the village level as the highest priority. Plans to protect and improve livelihood opportunities of the basin population are in place. Policies and regulations that address the (involuntary) resettlement requirements, prioritizing the avoidance of resettlement is in place. The project is/will be consistent with these/or is consistent with minimum acceptable international standards for livelihood protection.

2 – There is an assessment of the impact of the project on livelihood issues, land and water rights and entitlements in the watershed, but the assessment is not comprehensive/at a local scale and/or costed in economic studies. Loss of livelihoods/(involuntary) displacement has/will likely occur as a result of the project.

1 – The project will/has result(ed) in significant livelihood loss of individuals or groups and loss of access to land and water resources and/or there is no assessment of livelihood issues. There is no attempt to avoid or minimize resettlement and/or the project is likely to result in significant (avoidable) physical displacement of people.

Criterion 2.3 Poverty reduction and equitable sharing of benefits

5 – In addition, it can/will be clearly demonstrated that the project has/will contribute to the progressive improvement of social indicators in the basin over time across different social, ethnic groups and indigenous groups. Poverty reduction targets are in place and the project's impact on these targets is monitored. The project does not/will not result in the economic disadvantage to any vulnerable or disadvantaged groups in the watershed.

4 – In addition, the project is embedded into poverty reduction plans and/or regulations exist to secure social advancement initiatives.

3 – A baseline inventory of poverty condition and trends across the impact area is in place and is included in the planning of the project. Project plans prioritize and clearly demonstrate how the project will contribute to poverty reduction, social advancement and equity (e.g. education, gender, equality, health, employment, life expectancy, status of vulnerable groups, infant mortality etc). The plans also illustrate a clear priority for directly assisting vulnerable or marginalized groups.

2 – Studies in poverty reduction/social advancement exist, but the studies are limited and/or there is no coordinated approach. It is unclear how the project will contribute to poverty reduction.

1 – There are no poverty reduction plans in place. The project is unlikely to contribute to alleviation of poverty/social advancement and may have significant adverse impacts.

Topic 3: Environmental quality and natural resource management

Criterion 3.1 Understanding and protection of ecosystems, flora, fauna and unique biodiversity and/habitats

5 – In addition, an ongoing ecosystem health monitoring, research and review program is in place. The project does not/will not result in a net loss of ecosystem integrity. Operators pro-actively contribute to the efforts for ecosystem protection through ongoing research and improvement of management measures over time.

4 – In addition, formal conservation management plans and agreements are in place for the project area and include legal protection of high value biodiversity and critical habitat sites. The project includes agreements and management plans for the protection of ecosystem integrity at all stages of development.

3 – An understanding of ecosystem connectivity, biodiversity values, critical habitats and ecosystem processes is in place as a result of comprehensive scientific assessment. Policy and regulations are in place to protect ecosystem integrity. The EIA addresses the impact of the project on ecosystem integrity and meets national or international minimum acceptable standards.

2 – Assessment of ecosystem integrity is evident but there are gaps in the assessment. Policy and regulations exist but are not comprehensive or consistent across the project area.

1 – No understanding of ecosystem integrity and/or no regulations are in place for ecosystem protection. The project is likely to have a significant impact on ecosystem integrity and/or these impacts are not assessed.

Criterion 3.2 Management and monitoring of environmental impacts, incl. solid waste and sewage, resulting from the project

5 – In addition, programs to mitigate impacts from the project adapt and improve over time as knowledge increases. Management plans and agreements include flexibility to adapt to future climate change (and other) scenarios.

4 – In addition, the project agreements at all stages of the project life cycle include requirements for the protection and monitoring of ecosystem integrity/solid waste/sewage as an integral part of development and operation over the life of the project.

3 – A regulatory framework is in place for environmental protection/solid waste and sewage and includes provision for the approval and implementation of management plans and the monitoring of compliance against management plans. The project is consistent with these requirements and/or meets minimum acceptable international standards for environmental protection.

2 – Management plans exist but with significant gaps and/or the project is not consistent with all of the plans and policies for the project area and/or the regulatory framework is not effectively implemented.

1 – No regulatory framework is in place for managing impacts to ecosystems/solid waste/sewage and/or the project is not consistent with policies and plans.

Topic 4: Planning and coordination

Criterion 4.1 Alignment with local, national and international agreements, policies, plans and commitments

5 – In addition, the project is/will be fully consistent with local and national sustainable development agreements within and across jurisdictions. The project is/will be a major contributor to sustainable development.

4 – In addition, policies, plans and agreements are integrated across sectors and jurisdictions and the project is aligned with these and integrated with the management objectives of other sectors. The project agreements for sustainable development are in place.

3 – Local and national policies, plans and agreements are in place for sustainable development in the watershed and/or may have minor gaps. The project is consistent with the policies/plans/ agreements. The EIA addresses sustainable development issues.

2 – Policies, plans and agreements are in place, but inadequately integrated and/or the plans have significant gaps. The project is not consistent with the policies/plans/agreements.

1 – No/limited plans in place and/or the project is unlikely to contribute to sustainable development in the watershed.

Criterion 4.2 Coordination and planning between different actors (incl. roles and allocation of responsibilities)

5 – In addition, agreements exist within and between jurisdictions to control the order and pace of development to minimise adverse impacts.

4 – In addition, project implementation planning includes meaningful consultation with stakeholders and agreements to address impacts to other sectors during the project implementation stage (e.g. transport).

3 – Project implementation planning incorporates consideration of the criteria listed below;

- The potential for conflict;
- Social and environmental impacts and during implementation stage;
- Disruption to communities and pressure on resources (e.g. roads) and other sectors during implementation stage; and
- How the order and pace of development can be planned to reduce impacts and enhance benefits.

2 – Limited co-ordination of project implementation planning.

1 – Projects developed in an *ad hoc* manner with no consideration of optimising the implementation.

Criterion 4.3 Capacity building of key agencies and actors

5 – In addition, comprehensive, active and well-funded capacity building activities for co-operation and improvement of integrated planning are in place and implemented.

4 – In addition, the plan is adequately resourced to meet the demands and pace of development in the project area and is applied consistently in all relevant jurisdictions. It addresses building the capacity of stakeholders to interact and speak on behalf of their interests.

3 – A capacity building plan is/will be in place for key line agencies, stakeholders targeting improved understanding of project sustainability issues and measures and multi-stakeholder approaches to resolving issues.

2 – Capacity of key agencies and stakeholders has been assessed and some planning work to address gaps but not comprehensive or adequately resourced.
1 – Limited understanding of capacity for key agencies.

Criterion 4.4 Multi-criteria assessment for site selection
5 – In addition, all or nearly all of sustainability criteria listed are addressed
4 – In addition, five or more but not all of the listed sustainability criteria addressed
3 – Modelling of different development siting and design options takes place and considers multiple sustainability criteria.
2 – Scenario modelling/options assessment including one or less of the listed criteria considered.
1 – No modelling of scenarios/options assessment conducted at project area level.
Sustainability criteria:

- Prioritize upgrading existing facilities;
- Prioritize alternatives that have multiple-use benefits;
- Prioritize alternatives on already developed dams;
- Prioritize alternatives that minimize the area flooded per unit (GWh) of energy or irrigation area;
- Prioritize alternatives that maximize opportunities for, and do not pose significant unsolvable threats to, vulnerable social groups;
- Prioritize alternatives that enhance public health and/or minimize public health risks;
- Prioritize alternatives that minimize population displacement;
- Prioritize alternatives that avoid exceptional natural and human heritage sites;
- Prioritize alternatives that have lower impacts on rare, vulnerable or threatened species, maximize habitat restoration and protect high quality habitats.

Topic 5: Irrigation, environmental flows and downstream regulation

Criterion 5.1 Knowledge of water quality, water quantity, water flows and impact on river morphology, erosion and sedimentation
5 – In addition, management approaches for erosion, sedimentation, water quality and quantity and water flows are integrated with the management approaches of other sectors (e.g. mining, agriculture). An ongoing process of monitoring and review is in place and improvement in practices over time can be demonstrated.
4 – In addition, regulations and management agreements are in place and effectively implemented by line agencies for sediment and water quality and quantity and water flow management.
3 – Baseline erosion and sedimentation, and water quality and quantity and water flow conditions inventory is in place. It includes sediment budgeting which distinguishes between the different qualities of sediment (e.g. grain size and quality). The impact on river morphology, erosion and sedimentation, and water quality and quantity and water flows is assessed in environmental impact assessment studies.
2 – Assessment of erosion and sedimentation, and water quality and quantity and water flows condition but not comprehensive. Assessment of project impacts on river morphology not rigorous.
1 – No assessment of erosion and sedimentation, and water quality and quantity and water flow condition or understanding of impacts on river morphology/or project likely to significantly impact river morphology and sediment flows and water quality and quantity and water flows.

Criterion 5.2 Structural provision and operational procedures for sediment management and sediment flushing during all project stages
5 – In addition, engineering improvements are assessed and implemented where possible for the dam. A process of ongoing monitoring, research and review is in place and improvement in practices over time can be demonstrated. The management of sediment flows is highly integrated with management approaches of other sectors (e.g. agriculture and fisheries).
4 – In addition, a regulatory framework including requirements for compliance with standards set is in place and implemented to ensure structural and operational provisions are/will be applied consistently across the project area to achieve sediment management objectives. A sediment management agreement is in place which includes objectives for sediment flows.
3 – A regulatory framework and agreed standards exist for the structural and operational requirements of the project to manage sediment transport at all project stages, including construction. Operations have/will have sediment management plans, including environmentally friendly sediment flushing and are consistent with a regulatory framework.
2 – Regulations and/or management plans for sediment management exist but there are significant gaps. There are studies on sediment transport but the studies have significant gaps. Evidence of sediment management in the operations and structures of the project exists but is not consistent or there are significant gaps.

1 – No structural or operational provision for sediment flushing for existing or proposed dams is evident.

Criterion 5.3 Structural provision and operational procedures for downstream flow regulation
5 – In addition, engineering improvements are assessed and implemented where possible for the existing dam. A process of ongoing monitoring, research and review is in place and improvement in practices over time can be demonstrated. Management of environmental flows is highly integrated with management approaches of other sectors (e.g. irrigation and fisheries).
4 – In addition, the project has/will have downstream flow management agreements consistent with objectives for downstream flow regulation and environmental flows that include structural provisions and operational procedures and consistency in dams across the basin.
3 – A regulatory framework exists for the project area that sets standards for the structural and operational requirements of the dam to manage downstream flow requirements (e.g. multi-level outlets). Requirements for downstream flow regulation and environmental flows are addressed in the project feasibility and design studies.
2 – Regulations and/or management plans for environmental flows exist but with significant gaps. Studies of environmental flow requirements exist but there are significant gaps in the studies. Evidence of environmental flow or minimum release in the operations and structures of the project exists but is not consistent and/or there are significant gaps.
1 – There is no structural or operational provision for sediment flushing.

Criterion 5.4 Flood and drought management upstream and downstream of the dam
5 – In addition, there is a coordinated agreement between operators and national and local line agencies/planning authorities to achieve the objectives of flood and drought management plans in the basin and protect ecosystem integrity.
4 – In addition, the project is embedded into national and local flood and drought management agreements.
3 – Flood and drought management policies, plans and provision are in place. The EIA and/or feasibility study includes opportunities and risks for flood and drought management whilst also addressing the importance of flood events (e.g. flood pulse) for ecosystem integrity and floodplain productivity.
2 – Planning for flood and drought management in the project area contributes to flood and drought management but only in a minor way.
1 – No flood or drought management plans in place for the project area.

Criterion 5.5 Planning, maintenance and management of irrigation system
5 – In addition, the majority of Irrigators Associations has reached the highest level of independence/responsibility and is managing the system autonomously with broad support by beneficiaries.
4 – In addition, maintenance and management of the irrigation system is decentralized to Irrigators Associations who are sustained from a share in the benefits from the system.
3 – A maintenance or management system is in place for the irrigation system and the system is well implemented and followed by the majority of beneficiaries.
2 – A maintenance or management system is in place for the irrigation system but it is inadequate and/or not being implemented well.
1 – No maintenance or management system is in place for the irrigation system.

Topic 6: Fish passage and fisheries management

Criterion 6.1 Understanding, monitoring and management of fisheries resources
5 – In addition, improvement on fisheries management practices and understanding of requirements to maintain fisheries productivity can be demonstrated over time.
4 – In addition, studies and impact assessments include a process of meaningful consultation with fisheries dependent communities. Agreements exist for monitoring and research into fisheries resources between the two sectors. Impacts on fisheries resources from the project's operations are monitored and results inform improved practices and standards.
3 – There has a comprehensive scientific assessment on fisheries resources, critical habitats, ecosystem processes and migration requirements. A regulatory framework is in place in the watershed that includes protection of fisheries resources and requires that the project plans, incl. the EIA, address the impact of the project on fish migration, fisheries resources and fisheries dependent livelihoods.
2 – There are studies into fisheries resources but these studies have significant gaps. The project plans consider the project's impact on fisheries but there are significant gaps and/or these plans are not applied consistently.
1 – There is no assessment or study on fisheries resources.

Criterion 6.2 Development of reservoir fisheries

5 – In addition, a process of ongoing monitoring, research and review is in place to improve productivity of reservoir, upstream and downstream fisheries and is integrated with management approached of the fisheries sector. Improvement in management practices of fisheries over time can be demonstrated.

4 – In addition, management plans and negotiated agreements are in place and there are set objectives for the development and management of reservoir, upstream and downstream fisheries. The project is consistent with the objectives of fisheries management plans and there are agreements for compensation, in case (negative) impacts to the fisheries sector are unavoidable.

3 – An understanding of the habitat range and migration requirements of fish is in place and included in the EIA. Furthermore, the EIA addresses the impact of dam structures and operations on upstream and downstream fisheries and the requirements for the establishment of reservoir fisheries.

2 – Studies of fish migration and habitat range are conducted but the studies have significant gaps. The project's impact assessments consider upstream and downstream fisheries but the assessments have significant gaps and/or there is minimal evidence of management practices put in place.

1 – No or minimal assessment of fisheries issues in the project's impact assessment.

Topic 7: Sharing of benefits and use of innovative financing measures for sustainability

Criterion 7.1 Equitable water resource allocation between sectors

5 – In addition, a formal process of free and prior informed consultation has/will be conducted to resolve benefit sharing issues. It can be demonstrated that the project has/will have broad community support at the local level. An ongoing process of monitoring and review for benefit sharing mechanisms is in place.

4 – In addition, benefit sharing arrangements are/will be negotiated with affected communities, bound in formal agreements or contracts and legally enforceable across jurisdictions for the life of the project.

3 – A regulatory framework for benefit sharing is in place. The framework reflects on: equitable sharing of project services (water, electricity, other infrastructure); protection of natural resource access entitlements/permission; project revenue sharing across the affected communities including vulnerable social groups; revenue allocated to environmental protection in the watershed; and inclusion of vulnerable social groups, indigenous peoples and ethnic minority groups in benefit sharing negotiations at the local level.

2 – Benefit sharing assessments are conducted for projects but not comprehensive or inclusive of all groups in different jurisdictions. There is no legal framework in place and/or there are only some policies that are not enforceable.

1 – No assessment of natural resource access entitlements or how project benefits can be shared across the watershed, no legal mechanisms in place.

Criterion 7.2 Payment for environmental services (PES)

5 – In addition, PES scheme is accompanied by communication and awareness campaigns to raise awareness of sustainable land use practices in the watershed. Funds raised from the PES scheme are allocated to support traditional resource managers and management practices in the watershed.

4 – In addition, PES scheme(s) is/are negotiated and bound in formal agreements or contracts between parties, consistent with national laws (which may be in different jurisdictions) and supported by a long term sustainable financing model and a robust monitoring and review process.

3 – A policy or commitment on PES schemes is in place. PES schemes (e.g. planting trees in headwater forests) that lever off development and contribute to more sustainable land and water management practices through local action are/will be identified and are/will be implemented in the watershed.

2 – Assessment of PES opportunities but not comprehensive or incorporated into planning.

1 – No assessment of PES opportunities.

Criterion 7.3 Carbon financing opportunities to fund sustainability measures

5 – In addition, carbon finance is/will be used to fund sustainability measures over the long term and to support poverty alleviation in the project area.

4 – In addition, negotiated agreements do/will exist to direct carbon finance to defined sustainability measures in the project area and are/will be implemented.

3 – National and/or local policy and framework in place to access carbon finance. Assessment of opportunities for carbon financing within a national framework is/will be conducted for the project. Application for finance is made and a model for allocating the revenue is agreed between the developers and national/local governments.

2 – Some assessment of carbon financing opportunities, but no application made.

1 – No assessment of carbon financing opportunities for the project.

Criterion 7.4 Project revenue to fund sustainability measures

5 – In addition, improvement in the funding of sustainability measures in the project area from the project revenue can be demonstrated over time.

4 – In addition, legally binding negotiated agreements do/will exist in the project area to direct project revenue to defined sustainability measures in the project area and are/will be implemented.

3 – A regulatory framework for allocating an agreed portion of the project revenue to fund sustainability measures in the project area is in place. Social, environmental and cumulative impact studies address the financing of sustainability measures in the project area from project revenue and these costs are included in project feasibility studies.

2 – Assessment of project revenue financing opportunities in project feasibility studies, but not comprehensive and/or no evidence of implementation.

1 – No assessment of project revenue related financing opportunities for sustainability measures.

Topic 8: Provision for safety and disaster prevention and management

Criterion 8.1 Dam safety management system (DSMS), and (natural) disaster preparedness

5 – In addition, DSMS is/will be applied consistently across the project area and in different jurisdictions. Routine emergency drills and reinforcement of possible evacuation plans are/will be supported by the operators in the project area. In addition, operators cooperate with each other to comply with all aspects of the cascade DSMS and have a process of continual improvement and refresher training for all staff.

4 – In addition, downstream communities are/will be regularly consulted on all aspects of dam safety and a community awareness program is/will be in place. Plans are/will be developed in conjunction with relevant regulatory authorities and stakeholders across jurisdictions. Plans consider broader issues such as road safety, child safety and drowning risks as a result of reservoir development.

3 – A comprehensive Dam Safety Management System (DSMS) is/will be in place for design, construction and operation stages for the project. It includes as a minimum, (i) an emergency preparedness plan, (ii) construction supervision, instrument and quality assurance plans during construction, and (iii) an operation and maintenance plan and an annual public dam safety report during the operation period. It meets accepted standards for dam safety and has been subject to independent expert review. It includes a process of continual improvement. Additionally, a dam break and other analysis is/will be prepared for the project. The dam safety plans address impact of dam break and appropriate structural and operational mitigation strategies are in place where risk and uncertainty warrants inclusion as part of the DSMS.

2 – Dam safety system evident but does not comply with international standards. There is a dam break analysis for the dam but the analysis has significant gaps and/or there are minimal plans in place to address operational issues.

1 – Very poor or absent dam safety practices and no dam break analysis for dam.

Criterion 8.2 Emergency preparedness plans (EPP), flood management plans and coordination

5 – In addition, operators do/will cooperate with each other to comply with all aspects of EPP and have a process of continual improvement and refresher training for all staff. The project is is/will be embedded into national emergency flood management plans which include the flexibility to prioritize flood management over other operational considerations during emergency flood events.

4 – In addition, different operators do/will coordinate with each other and share resources to develop EPP. In addition, there is/will be a high level of integrated planning for emergency flood management between key players and potentially affected communities.

3 – An emergency preparedness plan and emergency flood management plans and policies of international standards has been/will be developed for the project in conjunction with relevant regulatory authorities and stakeholders across jurisdictions The EPP includes as a minimum, consistent signage, exclusion zones, dam release notification and warning systems, community awareness, emergency preparedness, flood management, monitoring, inspections, training, incident response, communication, and allocation of responsibilities.

2 – An EPP in place but does not meet accepted standards. Planning for emergency flood management in project area but significant gaps and/or only to protect the structure(s).

1 – No EPP for the project. No plans in place to address emergency flood management.

Topic 9: Communication, stakeholder and community involvement and support

Criterion 9.1 Strategic communication program regarding the project for all stakeholders

5 – In addition, formal communication agreements between stakeholders, representative committees and regulatory agencies exist. Improvement in strategic communication on the project is evident over time.

4 – In addition, formal lines of communication with stakeholders are established and formalized through representative committees, organisations and other relevant institutions.
3 – The project is well communicated and expectations and the roles of different stakeholders are formalised in policy and regulations. Stakeholders are well informed of the project, how they will be affected and what rights they have to participate in the planning process.
2 – Communication between planners, developers and operators and stakeholders on project but significant gaps and limited practices in place.
1 – No communication with stakeholders on the project.

Criterion 9.2 Informed participation and representation in decision making at all stages of the project cycle
5 – In addition, the project has broad community support and review and monitoring of stakeholder concerns and community support of the project is ongoing and future development is informed by the learning of past experiences.
4 – In addition, management plans are implemented in accordance to legal requirements and agreements and the process of informed participation is in place for the life of the project and includes grievance mechanisms (the right to complain and a mechanism to address complaints).
3 – Policy, regulations and an implementation framework are in place and implemented for meaningful and free and prior informed consultation to be an integral part of the development process of the project and at all stages of the project life cycle.
2 – Policies or regulations exist but significant gaps and/or not effectively implemented. Identification of stakeholders is limited and consultation process has minimal impact on decision making.
1 – No engagement with project stakeholders, significant opposition to the project.

Criterion 9.3. Information sharing and access to data and reports
5 – In addition, formal agreements are in place for the sharing of data about the project between different stakeholders and data is stored and maintained in a way that it is easily accessible. Data are shared openly between different developers, operators and other water users in the basin to allow for open consultation on key issues.
4 – In addition, a regulatory framework exists for the regulatory and public reporting of project data and information and project notification. The project development information, feasibility studies and technical reports are available for use in environmental impact assessments.
3 – Data are available to different stakeholder groups and the EIA and other reports are accessible to government line agencies and local organisations, with information on the project development being available to the public where appropriate. Information is shared between different operators and developers and other water users when required for joint planning of sustainability issues (e.g. environmental flows, fish passage).
2 – Information sharing is in place but limited and not all information shared with key stakeholders or other local and national institutions.
1 – No information sharing or public availability of data or reports.

Criterion 9.4 Level of knowledge and awareness about the project at community level
5 – In addition, the community is informed prior to and involved in decisions about changes to project design and implementation.
4 – In addition, a mechanism is in place through which community members can locally avail of information about the project whenever they desire such as freely available project documents in community centers and/or locally based project representatives that can be contacted for information about the project.
3 – The majority of community members is informed about the project and is aware of the most important impacts of the project on their lives.
2 – Some community members know about the project but the majority of community members is not or ill informed.
1 – Community members know nothing about the project.

Criterion 9.5 Community support for the project
5 – The project receives broad community support from affected groups.
4 – For the project, community support is high and/or there is no significant opposition.
3 – Community support is assessed at the early stages of project preparation. Project affected communities are engaged in a meaningful consultation process throughout the project development stages.
2 – Some affected groups are supportive of the project but opposition is strong.
1 – Significant widespread opposition to the project by project affected communities and other stakeholders.

The Water Course 2013 Football team in Los Baños. The traditional football match against the international team of ICRAF and IRRI was won this year with 7-6.

Restoration of rice terraces in Batad, Banaue by students and staff on the last day of the water course 2013 (photo by Merlijn van Weerd)