FINAL REPORT
CLIMATE CHANGE ADAPTATION PROJECT

Adaptation Strategy Priority:
Improved water resource management, including ground water

THE DEVELOPMENT OF INTEGRATED WATER RESOURCE
MANAGEMENT FOR ADAPTATION STRATEGIES BASED ON
GENDER PERSPECTIVE TO CLIMATE CHANGE IN BAYAN,
NORTH LOMBOK

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JULY, 2013
APPROVAL PAGE

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2. Adaptation Strategy Priority: Improved water resource management, including groundwater

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4. Research Time Period: 1.5 years (18 months)

5. Research Location: Bayan, North Lombok

6. Funding
   Total expenditure to project for year 1 (January – Dec. 2012): Rp. 56,872,500,-
   Total expenditure to project for year 2 (January – June 2013): Rp. 78,127,500,-
   Total expenditure from other sources: 

   Mataram, 24 July 2013

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## CONTENTS

### Contents

Summary .................................................................................................................. 3  
Introduction ........................................................................................................... 3  
  Background ......................................................................................................... 3  
  Purposes of the Research .................................................................................. 6  
  Research Urgency .............................................................................................. 7  
II. Literature Review .............................................................................................. 9  
  Climate Change Adaptation and Water Issues .................................................. 9  
  Integrated Water Resource Management (IWRM) ........................................... 10  
  Gender Mainstreaming in IWRM in Kecamatan Bayan .................................... 11  
III. Research Methods .......................................................................................... 14  
  Data Sources .................................................................................................... 14  
  Sampling ........................................................................................................... 14  
  Method of Collecting Data and Verification of the Result ................................. 16  
  Analysis ............................................................................................................ 17  
IV. Result and Discussion ...................................................................................... 18  
  Phases of the Activities ..................................................................................... 18  
    The First Phase (December 2011 - September 2012) ................................... 18  
    The Second Phase (November 2012 - June 2012) ....................................... 23  
  Water Management in Kecamatan Bayan ......................................................... 27  
    Desa Bayan (Bayan Village) ......................................................................... 27  
    Desa Loloan (Loloan Village) ...................................................................... 28  
  The Water Management in Bayan .................................................................... 30  
    Technical Aspect ............................................................................................ 30  
    Stakeholder Aspect ....................................................................................... 33  
  Gender Mainstreaming in IWRM in Bayan ....................................................... 34  
The Implementation of the Desired Livelihood Adaptation Strategies in Kecamatan Bayan .... 49  
The Consolidation Workshop with Bayan Community Representatives (including The Men’s and Women’s Desired Future Strategies of Adaptation in Facing the Environmental and Climatic Threats on The Water Resources) ....................................................... 49  
Honey Bee Keeping Training ................................................................................ 54
The Training on the Water Resource Management(Clean Water and Irrigation Management, and the Organizational Managerial Skills of the Water Resources Institutions).......................... 55
Livelihood Outcomes: ............................................................................................................ 56
Benefits of Using Participatory Action Research Methods: .................................................. 57
V. Conclusion and Recommendation ..................................................................................... 58
  Conclusion ............................................................................................................................ 58
  Recommendations .............................................................................................................. 59
REFERENCE .......................................................................................................................... 60
APPENDIX I ............................................................................................................................ 61
Summary

The research has been conducted in Kecamatan Bayan investigating about the nature of some existing water resource managements in Bayan, the men’s and women’s roles, access, control, participation and benefit in the water resource management, their awareness of the environmental and climatic threats for the sustainability of their water resources, and their desired future strategies of adaptation in facing the environmental and climatic threats on their water resources. This study is expected to release some scenarios to reaching the IWRM goals. Gender Mainstream in Developing Integrated Water Resource Management in Bayan, North Lombok uses the case study method. Participatory Action Research (PAR) method was used in this research with the location undertaken in Desa Bayan as the upper area and DesaLoloan as the lower one. Both desas (villages) have local-based water management with the recognition of women involvement are still at the household level.

Introduction

Background

Integrated Water Resource Management (IWRM) is a process in developing, distributing, and monitoring water resources to community by considering many related sectors among them. The principal of IWRM does not only consider about economic aspect, but also social and environmental aspects. The other key principles of IWRM are the management should be developed based on the lowest appropriate level. Moreover, government should consider about integrated policy and regulation frameworks. Lastly, women should be taken into account to involve as the part of IWRM as they are the central of prerequisite, management, and protection of water resources (Global Water Protection in Gender and Water Alliance 2006).

Bayan is a kacamatan (sub district) in North Lombok District, West Nusa Tenggara Province. This area is located in the foot of Mount Rinjani. Bayan is one of the main
water resources areas in Lombok Island, areas in Lombok Island, which mostly comes from big reservoir of SegaraAnak Lake locating at the Rinjani Mountain. The water resource system in Bayan area belongs to Kali Putik Watershed, which mainly river is LokokReak and Koangan. There are also 5 famous dams along those rivers irrigating about 2.190 ha paddy field in Bayan area, namely: TeresGenit, SindangGile, Sopak, Loloean and BatuRakit.

Water for Bayan community is very accessible for many years. Local people use the water in many sectors, such as agriculture, domestics, electricity and sanitation. However, these days Bayan faces environmental threats, such as forest degradation and climate change those threaten the amount of water that exists in Bayan water resources. Beside environmental issues, Bayan faces many social problems, the population growth which makes the numbers of people need water supply also have increased rapidly. This become worst since the water used in this area is not only from Bayan but also from West Lombok and Kota Mataram.

Horizontal and vertical conflicts in Bayan have been reported recently as the increasing demand of water resources from many stakeholders, such as local community in and out of Bayan, and between Bayan society and the government's water management (PDAM). Bayan as the water catchment area has to share the water with PDAM, which was previously, the people in Bayan used to get water for free and as much as they wanted, but now they have been experiencing lack of water so many times. Meanwhile, there were some internal conflicts among dusuns (sub-village) in Bayan. People in upper Bayan area usually cut the water flow for the people in the downstream, which impacted high tension between dusuns.

To overcome the conflicts and the water scarcity threats, there have been some initiatives to develop organizations to manage water locally. The aims of the organizations are to minimize the potential conflicts that can be occurred anytime. The existences of water resources managements have helped community to getting water in
an easy way because the water installation already reached the community houses. Nonetheless, the consequence of the water resources management programs is lower access to free water resources as everything has to be paid, which is very different from the past time when the local people were able to access water as much as they want.

One of the biggest impacts of the situation is women's life as their activities are mostly related to water use. They need water for domestic purposes such as cooking, washing, and bathing for them and their family. Some of them also need water for irrigation, livelihood and sanitation. However, some studies show that women have been considered limitedly for the biggest impacts of the water management policy. They have limited access into land, water, and management in community. Hence, it is projected that the policy without considering gender aspect will lead to worsen livelihood condition of women themselves.

For the meantime, climate change also becomes a threat that might be not too big issue for the community. In fact, the climate change can lead to some natural disasters such as flooding, drought, or plant pest and diseases. Again, these situation is highly likely will influence the women's capacity to adapt to the climate change impacts.

IWRM is a cross-sectored program because there are different stakeholders and purposes of using the water by people, depend on gender, and social and economic situations. One of the main key concepts of IWRM is considering women in management as the main water user (Wilk, J. and Wittgren, H.B. 2009). Therefore, the women should be taken into account in all aspects of the water resource management process such as participation, access, benefits, and control.

The research that was conducted in Bayan investigating the existing water resource management in Bayan that runs by both local community or government in the term the access, control, benefit and participation. Those will also be assessed from gender perspective in order to reach the IWRM that mainstreaming gender. This study also
expected to explore the men’s and women’s adaptation strategies in facing the problems of water scarcity threats, and finally to release some scenarios to reaching the IWRM goals.

** Purposes of the Research **

The research will be conducted in order:

1. to understand the nature of some existing water resource management in Bayan.

2. to do a case study on:
   a. the men’s and women’s roles, access, control, participation and benefit in the water resource management.
   b. their awareness of the environmental and climatic threats for the sustainability of their water resources; and
   c. to investigate their desired future strategies of adaptation in facing the environmental and climatic threats on their water resources.

3. to develop some alternative strategies for the development policies on the Integrated Water Resources Management (IWRM) in Bayan

4. to do verification stages with trial activity stages to getting the best strategy for the IWRM Development in Bayan, North Lombok.

Based on those purposes, the research questions developed and should be answered in this research are :

1. How does the Bayan society manage their water resources currently?
2. How are the men's and women's access and control power over the resources, benefits, and participation in managing their water resources? Is there any difference between men's and women's participation?

3. In what level of awareness are the women and men in Bayan about the environmental and climatic threats for the sustainability of their water resources?

4. What are the men and women's future adaptations strategies in facing some environmental and climatic threats for the sustainability of their water resources?

5. What are the programswill be offered for the IWRM development in Bayan based on this research?

Research Urgency

The National Park of Mount Rinjani (TNGR) is the main water resource in Lombok Island. There are up streams of some main rivers. Bayan is one of the areas in the foot of Mount Rinjani, where this area is the main water catchment. Water from Bayan is not only distributed around North Lombok, but also almost all of the west part of Lombok in order to supply people's needs of water.

However, climate change, forest degradation and unintegrated water management are the most terrible threats for the water resource sustainability in Bayan. Someday, those threats will lead to water scarcity and water use competition among community. Therefore, IWRM is the best solution in order to accommodate all stakeholders and sectors in saving water resources for the future. IWRM considers about social, economic, environment, and policy for sustainable water resource. What is more, women are taken into account as the main users of water resources for their livelihood.

Realising the urgency of IWRM and the importance of adopting the management principles, this research will be conducted in order to investigate the relations between water distribution and the adaptation strategies by community from gender perspective.
In Bayan. Furthermore, this research analysed about all possible stakeholders in IWRM, collect their aspirations about water management, and investigate the impacts of water resource management for local people, especially women as the main stakeholders of water usage. It is expected that the research will also collect baseline data of water use in Bayan. Moreover, this research will help to find the best solutions for conflict management of water resources use. Those studies will be important to develop policies scenarios for water resources management in Bayan. The scenarios will be the recommendations for the government in doing IWRM for the sustainable Mount Rinjani water resources. Implementation of the scenarios as the output of the research will be a very important desired step that can be done in the development of IWRM in Bayan. However, the best scenarios could be implemented if they are tested in order to get the best desired and suitable scenario. Hence, the research activity in the second year will be the scenarios verifications, which include some participatory activities such as planning, action, and evaluation. The verification step will produce the best scenario that will be implemented by all of the IWRM's stake holders in Bayan.
II. Literature Review

Climate Change Adaptation and Water Issues

Many researchs have shown that the climate has been really changed. One of the research found that there have been significantly increased of the earth temperature for a recent hundred year (National Research Council 2006). The impacts of the climate change have threatened people’s life, yet those are different in every area (Brekke, at all 2009). One of the biggest issues that is the focus discussion currently is the impacts of the climate change on water resources sustainability.

Even though there are fewer studies on these climate-related problems, many people have realised that the environment vulnerability becomes deteriorated. Flood and drought are the common phenomenon recently. During 1907-2007, there were 109 flood cases in Indonesia, caused damage $2,007,690,000. While, during the periods, there were 9 drought cases, which caused damage $160,200,000 (Pribadi 2008). Those have impacted to the decreasing ground water level and increasing water erosion, which are also the most observed issues globally (Wilk, J. and Wittgren, H.B. 2009).

The adaptation strategies have to be taken in order to avoid disadvantage effects for human life. Most people in developing countries such as in Indonesia use traditional and poor strategies for adaptation. The ideas are not directly to water-related activities but they are enough for anticipating the impacts of climate change. The traditional activities include low quality technique of maintaining irrigation for water efficient, and water harvesting in order to anticipate lack of water condition at certain times for consumption or irrigation (Wilk, J. and Wittgren, H.B. 2009).

Wilk, J. and Wittgren, H.B. (2009) also state that:

"The most successful and sustainable climate change adaptation strategies will be those that can simultaneously reduce vulnerability toward a variety of stressors including
present climate variability and future climate change, globalization, urbanization, environment degradation, disease outbreaks, and market uncertainties.”

However, the only way for government to recognize what people’s problems is by facilitating and broadening opportunities for make the people keep in resilient livelihood strategies. Furthermore, government could support people in adapting to climate change by understanding people’s limitation to adapt to various limitations and barriers to their strategies of adaptation.

The best policy of accommodate the problems in the impacts of climate change adaptation is through Integrative Water Resource Management (IWRM) in the climate change adaptation.

**Integrative Water Resource Management (IWRM)**

IWRM is a holistic and cross-sectoral approach in water resource management. It is a systemic and sustainable process of developing, allocating and monitoring water resources. The strategy offers a useful framework of planning and action in climate change adaptation. IWRM as a concept was first presented at the International Conference on Water and Environment in Dublin, and in Chapter 18 of Agenda 21.3 consensus document from the United Nations Conference on Environment and Development (UNCED) in Rio, both in 1992.

Community has to be resilient in the climate change situation. The resilient situation can be reached by understanding the principles of IWRM itself. “The IWRM has four principles, which are:

1. Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment.

2. Water development and management should be based on a participatory approach, involving users, planners and Policy-makers at all levels.
3. Women play a central part in the provision, management and safeguarding of water.

4. Water has an economic value in all its competing uses and should be recognized as an economic good” (Global Water Partnership 2000).

There is no fixed framework of IWRM in each area. The system of IWRM depends on the social, economic and environmental situations of the area (LendangNangke village in East Lombok District, water resource practiced is based on the community local wisdom. In the village, community strongly believed that water is God’s given that have to be conserved. People participated in the management, especially in water access, taking benefits, and control. They also took part in water resource conservation from the payment they gave every month (Latifah 2010). While Gabizon et al. (2003) found that in rural Romania, water resource management involves women needs as the main issue. The water pollutions of their ground water have impacted to the long term and short term health of the children. Women were encouraged to take part in access and control to hygiene water for their domestic use. Those kinds of involving community and various sectors are the best practice of implementing IWRM in order to sustain water availability especially in facing uncertainty impacts of the Climate Change.

Gender Mainstreaming in IWRM in Kecamatan Bayan

Gender is not only about women. Gender is different functions of roles, duties and responsibilities between men and women. The differences are constructed by social influence (BKKBN 2007). In the developing countries such as in Indonesia, most women experience disparities in almost all aspects of the life. They have limited access to participation, benefit shares, and decision making.

Gender mainstreaming is a concept of encouraging gender equity through program policy that considering men and women’s needs in the same way in participation, action, monitoring and evaluation (ECOSOC 1997).
In water resource management, gender inequality in applying strategies and policies lead to social, economic and environmental exploitation, inappropriate using, competing, inequality benefits and burden. Those problems often cause unsustainable water resource management.

Domination of individual or groups of people in many rural regions guides to the superior and inferior position. The control of individual or certain groups on other groups because of different level of power, wealth, and position usually influence their need and concern expression. When water scarcity threatens people, the lower will be less compete than the more power. In this matter, unequal women’s position is placed them in drawback position. Hence, by using gender analysis, it will help the management organizations in to meeting men and women’s need equally (GWA 2006).

Global Water Partnership (2000) states that one of the key concepts of IWRM is:

"Women play a central part in the provision, management and safeguarding of water."

The declaration above shows that the world recognises the most significance of women's role in sustaining water supply for community. The IWRM cannot avoid women's existence in participation, access to water, taking benefits, and control function. Therefore, in case of Bayan community, the women in water resource management and climate change adaptation program have to be taken into account in order to develop the IWRM for sustainability of water supply.

Participatory Action Research (PAR) method was used in this research. PAR is an appropriate method to involve the participants to look at their condition, to evaluate it and tell us about their own experience. In Bayan Sub-district, there are various systems of the water resource management, depend on the water debit, the water flow, the level of community participation, and so on. Even, the local water resource management involves cross villages in Bayan. Thus, case study in some water flow also was needed in the study in order to understand how they manage each of their water
resource so far. The dusuns were chosen based on the specific characters in each of the management.

In this research, the Bayan society (men and women) were invited to discuss about the water resources management in their dusuns, their access, control, benefits, participation, the climate change, and their current and future adaptation.

The data was primary and secondary data. For primary data, it has been collected from preliminary survey, observation, FGD and in depth interview. In the meantime, the secondary data was collected from water resource management files and the files about social economic situation in the government offices such as the village offices, the Statistic Bureau, the Water Department, and other resources, herewith the current progress achieved by this research until July 2012.
III. Research Methods

The research was conducted by using Participatory Action Research (PAR) method, which is defined by Baum et al. (2006), that PAR is preferable when researcher and participants do self reflection together to learn from the process and get self improvement from it. The process of PAR should be empowering and lead to people having increased control over their lives (adapted from Minkler and Wallerstein and Gratch in Baum 2006). The Development of Integrated Water Resource Management for Adaptation Strategies Based on Gender Perspective to Climate Change in Bayan, North Lombok used the PAR method because the researchers and the Bayan societies did evaluation on the nature of their water resources and the management, the climate change and its impacts on the water resources, and the livelihood strategies in facing the climate change. The researchers and the societies also tried to identified potential livelihood related to overcome the water problems in Bayan area, then they tried to implement the strategies the had identified.

Data Sources

The data sources of the research were primary and secondary data. The primary data was from interview with respondents and key informants. Meanwhile, the secondary data was collected from any related documents or files from government and the related offices.

Sampling

a. Areas of collecting data

The data was collected in Desa Loloan and Desa Bayan (Dusun Teres Genit and others) in Kecamatan Bayan, North Lombok District. The location of the research is presented in the maps below:
association/irrigation), PLTMH (electricity board management), men’s group (farmer, teacher, senior and youth, and others), women’s group (member of water board management, housewives, senior and youth).

**Method of Collecting Data and Verification of the Result**

There were several techniques used in order to collect data and verify the offered scenarios in this research. Those were:

1. **Observation/Survey**

   The observation/Survey was conducted by observing some related objects of the research. The pictures were taken in order to help the researchers to make a comprehensive description about the objects of the research.

2. **In-depth Interview**

   Interviews were carried out to the respondents guided by questioners. The numbers of men and women being interviewed were equal.

3. **Focus Group Discussion (FGD)**

   4 (four) FGDs were carried out with male and female groups in each of the desa.

4. **Workshop**

   Some workshops had been conducted in order to socialize the result of the research. First, some stakeholders in Bayan discussed about the best Climate Change adaptation strategies can be implemented in the kecamatan. Second, a workshop had been conducted to socialize the result of the research to the government.

5. **Capacity Building**
Several capacity building activities were conducted in the second year of the research. The activity involved the existing elements in community and other stakeholders in IWRM. Capacity building was conducted through some activities, such as training and practical sessions. The actions were expected to resulting in the Knowledge, Attitude, Skill, and Aspiration (KASA) change of the community and other stakeholders of the IWRM in Bayan.

Analysis

The analysis was done during the first phase consisting of water analysis, stakeholder analysis, gender analysis and SWOT analysis. The water analysis was done to get the information about water biophysics and management in Bayan. The stakeholder analysis done with the objection is to identify the stakeholders with their level of power and interest in water resources management in Bayan. The gender analysis was done in order to find out how women and men’s roles in water resource management in term participation, access, control and benefit. Based on the analysis, SWOT analysis was done. The purpose of SWOT analysis is to set some strategies based on the identification of strength, weakness, opportunity and threats in term of water resource management in Bayan. Based on the processes and the involvement of identified stakeholders, it is expected that the suitable activities that will enhance women and men participation, access, benefit use, and power in managing water can be set up.
III. Result and Discussion

Phases of the Activities

The First Phase (December 2011- September 2012)

The activities in the first phase emphasize in collecting the baseline data and analysis the existing Bayan water management and develop some strategies/scenarios on Climate change adaptation. The water, stakeholder, gender and SWOT analysis have done. The strategy and scenarios were developed based on those analysis. The activities can be seen in the picture and detailed in table below:

![Flowchart](image)

**Picture 1.** The activities flowchart until September 2012

This research has been started since January 2012. Some research preparations had been done and the regular team meetings have been conducted to ensure that the research can be carried out on the track. The schedule, equipment, accommodation and people was set up in this meeting. Location surveys were done twice in order to understand the situation and to choose the focus area. After surveying the area, the team started to collect the secondary and primary data through documentation study and biophysic survey relating with water condition, in-depth interviews and Focus Group Discussions (FGDs). The activities of interviews and FGDs were conducted separately between men and women. Those are very important so each group couldn’t influence
each other in answering or giving the information. All interview and FGDs were done in two villages with the same list of questions.

Table 1: Detailed activities until September 2012

<table>
<thead>
<tr>
<th>No</th>
<th>Activities</th>
<th>Desired Research Outcomes</th>
<th>Progress</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Preparation</td>
<td>All of equipment and instruments are ready for starting the research</td>
<td>- Research Preparation meeting (team consolidation)</td>
<td>January 10th</td>
</tr>
<tr>
<td>2</td>
<td>Activities</td>
<td>The information of water balance in Bayan area</td>
<td>- Location survey</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Water balance Analysis</td>
<td></td>
<td>- Evaluation meeting based on survey result</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Condition of the Water Condition: Debit and water quality)</td>
<td></td>
<td>- Invite an informant from Bayan and discuss about water distribution in Kecamatan Bayan</td>
<td></td>
</tr>
</tbody>
</table>

- January 14th and February 15th
- February 22nd and March 6th
- March 12th
<table>
<thead>
<tr>
<th>Stakeholder Analysis (stakeholder Identification)</th>
<th>The information of stakeholders with their power and interest in water resources management in Bayan</th>
<th>Permit propose to DesaDesa Bayan and DesaLoloanto do field research in those areas</th>
<th>March 22nd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender Analysis</td>
<td>the data from WBA and stakeholders analysis with the current situation in community such as people's adaptation strategies, their desired future</td>
<td>Water secondary data collection on Desa Bayan secondary data collection and PLTMH (micro-hydro)</td>
<td>Starting on March</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Evaluation meeting based on data collection</td>
<td>April 12th and 19th</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preparation meeting for in-depth interview</td>
<td>April 28th</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In Depth Interview in Desa Bayan (DusunTeresGenit) , with head of Dusun (also head of PLTMH in</td>
<td>May 12th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>May 14th</td>
</tr>
</tbody>
</table>
| adaptation and management strategies, participation, access to water resource, water use, and control over the water resource. The activity also will involve gender issues and gaps in water resource management in Bayan currently. | TeresGenit) and with the head of P3M(clean water management) inTeresGenit
- In Depth interview with PLTMH women member management inTeresGenit
- Preparation meeting for mens' group FGD
- FGD with mens' group in TeresGenit
- In-Depth interview with woman-headed household (WHH) inTeresGenit
- In-Depth interview with 2 women (house wives) in TeresGenit
- Preparation for |
<p>| • May 17th | • May 19th |
| • May 20th | • May 30th |
| • May 31st | • June 5th |</p>
<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Womens' group FGD in TeresGenit</td>
<td>June 7th</td>
</tr>
<tr>
<td>FGD for womens' group in TeresGenit</td>
<td>June 20th</td>
</tr>
<tr>
<td>In Depth dengan Kadus Telaga Segoar</td>
<td>June 23rd</td>
</tr>
<tr>
<td>Result activities evaluation in TeresGenit</td>
<td></td>
</tr>
<tr>
<td>Preparation for mens' group FGD in Loloan</td>
<td>July 2nd</td>
</tr>
<tr>
<td>FGD for mens' group in Telaga Segoar, Desa Loloan</td>
<td>July 4th</td>
</tr>
<tr>
<td>Preparation for womens' group FGD in Loloan</td>
<td>July 10th</td>
</tr>
<tr>
<td>FGD FGD for mens' group in Telaga Segoar, Desa Loloan</td>
<td>July 11th</td>
</tr>
<tr>
<td>Result activities evaluation in Loloan and</td>
<td>July 28th</td>
</tr>
<tr>
<td>A-SWOT Analysis</td>
<td>progress report preparation</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>The planning step will involve all identified stakeholders and do SWOT analysis in order to identify the strength, weakness, opportunity, and threats of the tested strategy and also to identify the suitable activities those will enhance their participation, access, benefit use, and power in managing water.</td>
<td>• Analysis Analysis by researchers</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Second Phase (November 2012 - June 2012)

The activities in the second phase emphasize in implementing some strategies/scenarios on climate change adaptation. The activities can be seen in the picture and detailed in table below:
Table 2. Detailed activities until June 2013

<table>
<thead>
<tr>
<th>No</th>
<th>Activities</th>
<th>Desired Research Outcomes</th>
<th>Progress</th>
<th>Date</th>
</tr>
</thead>
</table>
| 1  | Verification phase | - Scenarios can be implemented in short term and in small scoop to enhance the water management in Bayan | - SWOT analysis finalization and team meeting to prepare Bayan stakeholders workshop.  
- Workshop with some of key stakeholders in community and water management in Bayan | - Starting September 18th – November 23rd  
- November 24th |
They are agree if the management little bit enhance the payment rate, because they get enough water and the availability of the managements are very helpful for their daily life.

Stakeholder Aspect

From the stakeholder analysis, it is recognized that there are some stakeholders in the water management, which are the informal leaders, the village government, the Water Department, the Social Department, the Mining Department and the people who are managed by the residents as the water management administrators through public meetings. The biggest powers are held by the residents and the informal leaders. Generally, for the informal leaders, they can influence the residents to decide some matters. For example, when there was no P3M to manage the clean water. The absence of the clean water management led to the resident's conflict between upper and lower houses. Then the informal leader initiated the establishment of the clean water management inter-dusun to resolve the conflict.

The roles of the water resource management administrators are to ensure the smooth and enough water distribution and payment, and to fix some problems in the process of water distribution such as installation problems as soon as possible. For the canal's troubles, the three managements-P3A, PLTMH, and P3M- and the residents coordinate in building the canal. They also cooperate in maintaining the production of the springs by planting reforestation and setting rules that called "awiq-awiq". Awiq-awiq is very strong rules that are made and agreed by a community. This is sort of a local wisdom that must be obeyed by the community. The people who break the rules will get moral and financial or property punishments. The awiq-awiq is able to reduce deforestation that is done by the local people so that they are able to conserve their forests.

The roles of the village government are to facilitate the local management with the government in Kecamatan, District, or Province. The village government also receives
the reports from the government if there are the problems in the water resources. Then the government gives some suggestions to the management about some of the problem-solving. The management—especially the PLTMH—is able to contribute some funding for the village government to support the village development.

Meanwhile, the Water Department coordinates with the P3A consumers in the irrigation management. The department provides and pays the irrigation technician to help the distribution of the water irrigation. The Social Department and the Mining Department are the donators of the clean water and the PLTMH infrastructures in sequence. The departments do not only fund the infrastructures, but also supervise the operational such as the technician trainings.

**Gender Mainstreaming in IWRM in Bayan**

There were twice data collections in the research, at the beginning of the research and the end of the research (after eighteen months).

**THE FIRST DATA COLLECTION**

From the gender aspect, it has been studied about the men’s and the women’s roles, access and control in the water managements, and who get the benefit from the water management facilities.

**Roles:** the role in this aspect means the residents’ participation—men and women—in the water management activities. The results show that there are different roles between women and men in the management activities. The Table 2 to Table 5 explains the detail of the condition.
<table>
<thead>
<tr>
<th>Aspect</th>
<th>Female</th>
<th>Male</th>
<th>Exp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td>Only one woman in PLTMH management (treasurer)</td>
<td>Almost all are men except the PLTMH treasurer</td>
<td>M &gt; F</td>
</tr>
<tr>
<td>Fixing the infrastructure</td>
<td>Women involve in the fixing the local trouble (neighborhood and the household level)</td>
<td>Mostly done by men</td>
<td>M &gt; F</td>
</tr>
<tr>
<td>troubles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>Women participate in maintaining the water supply</td>
<td>Men’s participation is the same as the women’s</td>
<td>M = F</td>
</tr>
<tr>
<td>Meetings</td>
<td>Not many women attend the meetings except there are no men in the family member in the time of meetings</td>
<td>Always attend the meetings</td>
<td>M &gt; F</td>
</tr>
<tr>
<td>How to deal with the limited access to water</td>
<td>Men and women look for water together, and reducing the daily water consumption.</td>
<td>Men help the women to find the nearest source of water, and help the women to get the water.</td>
<td>M = F</td>
</tr>
</tbody>
</table>

**Note:** M = Male, F = Female, " >" means "more dominant", " =" means "equal".

Source: the processed data.
They show that men were more dominant in participating in the water resource managements. The managements only accommodated a woman in their organizations. The reason of this condition because the human resource of the women in Bayan wa men low, so that they were considered that they had low skills in involving in the management.

Moreover, there is a gender stereotype among the women about their roles in the water management. They think that managing the water resource is only the men's role. The women's role is being responsible to their household condition. So as fixing infrastructure problems, only men participate in in the activities, because of the time of doing them. Especially in Desa Bayan, the men usually fix the problems in the morning, when the women are busy to cook for their family. However, in DesaLoloan, there are some women- but not as many as men-participate in fixing the problems. In this case, the women take dominant roles in the household level. They fix the local problems such as the water problems in the house or the neighbourhoods.

Discussion meetings, women only attend the meetings if the husbands or the adult sons or mothers are not available in the house. The women represent the men in the house when the men are away or not available (for example, the women-headed household). They also participate less actively in every meeting because they think that all the issues in the meetings are men's business.

Access: Access in this research means the opportunities for men and women to participate in the decision making in the water management and the use of the water. The detail is in the Table 3 below:
Table 3. The Gender-based Access of the Water Resources in Bayan

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Female</th>
<th>Male</th>
<th>Exp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td>The opportunities in involving in the management systems are lower than men</td>
<td>More opportunities in involving in the management systems</td>
<td>M &gt; F</td>
</tr>
<tr>
<td>Organization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water use</td>
<td>The sum of water use between men and women are similar. For irrigation, the managements mainly determine the sum of water can be accessed</td>
<td>The sum of water use between men and women are similar. For irrigation, the managements mainly determine the sum of water can be accessed</td>
<td>M = F</td>
</tr>
<tr>
<td>Controlling</td>
<td>There are opportunities for women to report the problems or to report the facilities damaged</td>
<td>There are opportunities for women to report the problems or to report the facilities damaged.</td>
<td>M = F</td>
</tr>
<tr>
<td>Meetings</td>
<td>Women are not invited in the meetings but some of them come as the listeners</td>
<td>Only men are invited</td>
<td>M &gt; F</td>
</tr>
</tbody>
</table>

M= Male; F=Female

Source: the processed data.

Table 3 shows that the women's access is more limited than men's, especially in the management systems and the public meetings. In P3M, the women are recommended to be involved in the management as the main clean water users are the women for cooking, washing, bathing, looking after cattle, and other household chores. So as the
more women should be involved in the systems because the electricity has increased the improvement of the women's economic activities such as making ice for pastries, getting information from the electronic medias, rice cooker, charging mobiles, and so on. However, the women are considered less skilful as they have lower nakedness than men. Besides, the management work is considered very tough so only men can do it.

In such meetings, the women are not the target to attend the meetings. Only head of households (mostly men) are invited to the meetings. The women will attend the meetings if only the man was not available in the house.

Female control in this study means men's and women's roles in decision making and the right to manage the water provision, which is described in Table 4 below:

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Female</th>
<th>Male</th>
<th>Exp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Distribution</td>
<td>Water distribution for each management system (P3A, P3M, PLTMH) becomes the management's right to determine it. The members do not take part in it.</td>
<td>Water distribution for each management system (P3A, P3M, PLTMH) becomes the management's right to determine it. The members do not take part in it.</td>
<td>M=F</td>
</tr>
<tr>
<td>The water and electricity use</td>
<td>Women are free to decide the sum of water or electricity they want to use. It depends on the ability of each</td>
<td>Women are free to decide the sum of water or electricity they want to use. It depends on the ability of each household</td>
<td>M=F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>household to pay the bills (especially for the electricity), but</td>
<td>to pay the bills (especially for the electricity), but the only</td>
<td></td>
</tr>
<tr>
<td></td>
<td>the only rule is the consumers have to report the new devices</td>
<td>rule is the consumers have to report the new devices those need</td>
<td></td>
</tr>
<tr>
<td></td>
<td>those need electricity they have. For P3M (clean water), the</td>
<td>electricity they have. For P3M (clean water), the consumers can</td>
<td></td>
</tr>
<tr>
<td></td>
<td>consumers can use as much as they want with the same payment</td>
<td>use as much as they want with the same payment rate.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>rate.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>II.</strong></td>
<td><strong>Payment/bill rate</strong></td>
<td><strong>The bill rate is decided through a public meeting. The decision</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The bill rate is decided through a public meeting. The decision</td>
<td>making is dominated by men. Women are not involved</td>
<td></td>
</tr>
<tr>
<td></td>
<td>making is dominated by men. Women are not involved</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>III.</strong></td>
<td><strong>Conservation of the indigenous forest</strong></td>
<td>**Men and women have the same rights in conserving the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Men and women have the same rights in conserving the</td>
<td>indigenous forest. The decision is made by a public meeting,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>indigenous forest. The decision is made by a public meeting,</td>
<td>which is dominated by men</td>
<td></td>
</tr>
<tr>
<td></td>
<td>which is dominated by men</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Information about the rules of the awiq-awiq</strong></td>
<td><strong>Men involve in decided the rules of the <em>awiq-awiq</em>. They know</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Women lack of information about the rules of the <em>awiq-awiq</em> and</td>
<td>and understand about the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>they do not involve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involvement in the structure of the management organizations (P3A, P3M, PLTMH)</td>
<td>Women do not have control over the determination of organization structure</td>
<td>Men dominate the control over the determination of organization structure</td>
<td>M&gt;F</td>
</tr>
</tbody>
</table>

**Note:** F = Female

Data shows that man and woman consumers have very little right to distribute the water. The water distribution is the management's responsibility in order to avoid some conflicts among consumers. Men have the biggest right in controlling the irrigation. Meanwhile, women have dominant control on the clean water for domestic chores. But men and women have similar control in electricity use.

Women has very low even no contribution in deciding the bill rates, participating in conservation of the indigenous forest, information about the rules of the awiq-awiq, and involvement in the structure of the management organizations (P3A, P3M, PLTMH), because the stereotype among the local society is only men can do those roles.

**Conclusion:** This research investigates whether the water resource managements give benefit for men and women in the village. It has been found that the water resource managements in Bayan give high benefits for men and women. Table 5 below explain the benefits from gender perspective:
<table>
<thead>
<tr>
<th>No</th>
<th>Aspect</th>
<th>Female</th>
<th>male</th>
<th>Exp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Water availability</td>
<td>Water always available for daily activities so that help the women in doing the house chores</td>
<td>Irrigation (P3A) has enough water for the rice fields. The management help to minimize the conflict of the water use among the farmers. The water always available as there are coordination between P3A, P3M, and PLTMH</td>
<td>M=F</td>
</tr>
<tr>
<td>2</td>
<td>Work time allocation</td>
<td>The water availability has reduced the time allocation for women to find and get water far away from their houses, hence the women have enough time to take rests and interact with their family. Hence their family becomes more peaceful.</td>
<td>Similar with women, men do not have to go far away to get water because there are pipes to drain the water to the neighbourhood.</td>
<td>M=F</td>
</tr>
<tr>
<td>3</td>
<td>Business opportunity</td>
<td>Women can sell ice, have lamps, and get information from TV</td>
<td>Opportunities in rising cattle and fish</td>
<td>M=F</td>
</tr>
</tbody>
</table>
To enhance women's knowledge and skills

| No. | Agricultural product | Rice product has been increased from 3 ton in the past, now the yield can be 7-10 tons per hectare. | M |

M=male; F=female
Source: processed data

THE SECOND DATA COLLECTION (AFTER EIGHTEEN MONTHS)

a. Participation

Table 6 - Table 9 below presents the results of gender analysis, by examining people's perspectives and water resource managers in Bayan about aspects of participation, access, control and benefits for men and women after the socialization of gender issues.

Table 6. Bayan public understanding about participation in water management, by gender

<table>
<thead>
<tr>
<th>No.</th>
<th>Aspect</th>
<th>Female</th>
<th>Male</th>
<th>Exp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organizations</td>
<td>Women need to be included within the organization, but they do not have to participate in physical activity because it was very heavy work (channels repaired done at night and</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Number of men and women do not need to be the same, because the board is also responsible for handling damage, whereas women are only suitable as secretary and treasurer.</td>
<td>M&gt;F</td>
</tr>
<tr>
<td>1. Repairs</td>
<td>Women did gotong-royong at a location close to their house</td>
<td>This job is male dominant. Women do not have the skills to fix the channel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Maintenance</td>
<td>Women also participate in supervising for smooth availability of their water supply</td>
<td>Participation between men and women in the maintenance is balanced</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Meeting</td>
<td>Women rarely participate in the meeting, unless the husband or the boys went somewhere. But they began to realize that they should be involved in the meetings, not to replace anyone else, in particular with regard to water management</td>
<td>The men's opinion was that women should also attend the meetings. But what happened was, more women gave their comments only, but they did not give advice, so it needs to increase the knowledge of women.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Solving the water needs when the water infrastructure was damaged</td>
<td>Looking and collecting water together between husband and wife. Reducing the frequency of taking bath</td>
<td>Helping wife to look and collect water from alternative places</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*M = Male; F = Female
Source: processed access data

Table 6 shows that the people's understanding about women participation in water management has slightly been changed. Their current understanding was the boards' main job was to maintaining the physical damages such as damaging in the water channels or other infrastructures and facilities. That was why those...
kind of work is not suitable for women. Hence, women are suitable only for doing administration or treasury. The form of participation that was expected to do by women was to helping the boards in controlling any damage they found surround their living area, then they reported it to the boards.

However, there were several people’s opinion saying:

"women should be encouraged to participate in the structures of the water management institutions, because the women are the main water users. Hence, it is important to enhance women’s capacity building so that they are able to participate in the [water management] organization”

3. Access

Next is the boards and the people’s understanding about access in the water resource management in Bayan after this research had been run for 18 months. Access is the opportunity given to men and women in participating in decision making related to water resource management, and the opportunity in using the water.

Table 7. Understanding about the Access in the Water Resource Management, by Gender

<table>
<thead>
<tr>
<th>No</th>
<th>Aspect</th>
<th>Women (F)</th>
<th>Men (M)</th>
<th>Exp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The organization of water resource management</td>
<td>Women agreed that women should be involved in the organization, because the work is not about physical activities only.</td>
<td>Men agreed that women should be given an opportunity to access the management but it is not the same as the men’s access as the work in the organizations is not easy. It is impossible for women to do it. Hence the work will not run well.</td>
<td>M&gt;F</td>
</tr>
<tr>
<td>2.</td>
<td>Water use</td>
<td>Access to use water is</td>
<td>Access to use water is the</td>
<td>M=F</td>
</tr>
</tbody>
</table>
Table 7 shows that women had more limited access than men, especially in the management and meetings. Women should be involved especially in P3M as they are the main users of clean water, such as for cooking, washing, bathing and for livestock. Similarly to PLTMH, the availability of electrical facilities could increase the economic activities for women such as selling ice cubes. The women could also increase their knowledge by watching TV. Women deemed incapacitated by the society, because the management is hard work. So only the men who deserve to do it. Meanwhile, the understanding of men and women about women's participation in the meeting activity has begun to change. There are some people and boards suggested that women should be involved in the meetings, so that the women could express their opinions.
Another aspect identified in this research was Control. This aspect studied the roles of men and women in decision making (rights) in water resource management. This will be explained in the Table 8 below:

**Table 8. The Understanding about the Control on the IWRM in Bayan, by gender**

<table>
<thead>
<tr>
<th>No.</th>
<th>Aspect</th>
<th>Women (F)</th>
<th>Men (M)</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Water distribution</td>
<td>Water distribution for the three managements is the only rights of the boards and administration. The customers did not have involve in the job.</td>
<td>Water distribution for the three managements is the only rights of the boards and administration. The customers did not have involve in the job.</td>
<td>M=F</td>
</tr>
<tr>
<td>2.</td>
<td>Water and electricity use</td>
<td>Women are free to determine the amount of water that will be used, depending on ability to pay dues (no restrictions on the use of electricity. They only required to report if any additional use of power tools)</td>
<td>Men do not have the authority to use irrigation water (P3A) arbitrarily. For irrigating rice fields, the number and frequency determined by the board.</td>
<td>M=F</td>
</tr>
<tr>
<td>3.</td>
<td>Contribution (payment)</td>
<td>Cost per unit of water use was set by consensus, but the men decided. And they argued that women should also be involved</td>
<td>Cost per unit of water use was set by consensus only by men</td>
<td>M&gt;F</td>
</tr>
<tr>
<td>4.</td>
<td>sanctions for rule violation</td>
<td>There was a set of <em>awiq-awiq</em> that was applied for men and women</td>
<td>There was a set of <em>awiq-awiq</em> that was applied for men and women, but not many of the people knew about it.</td>
<td>M=F</td>
</tr>
<tr>
<td>5.</td>
<td>Keeping of Indigenous Forest</td>
<td>Men and women have the same responsibility to preserve indigenous forest. The decision was determined through community consultation.</td>
<td>Men and women have the same responsibility to preserve indigenous forest. The decision was determined through community consultation</td>
<td>M=F</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>No.</th>
<th>Aspect</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Water distribution</td>
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</tr>
<tr>
<td>2.</td>
<td>Water and electricity use</td>
<td>Women are free to determine the amount of water that will be used, depending on ability to pay dues (no restrictions on the use of electricity. They only required to report if any additional use of power tools).</td>
<td>Men do not have the authority to use irrigation water (P3A) arbitrarily. For irrigating rice fields, the number and frequency determined by the board.</td>
</tr>
<tr>
<td>3.</td>
<td>Contribution (payment)</td>
<td>Cost per unit of water use was set by consensus, but the men decided. And they argued that women should also be involved</td>
<td>Cost per unit of water use was set by consensus only by men</td>
</tr>
<tr>
<td>4.</td>
<td>sanctions for rule violation</td>
<td>There was a set of awig-awig that was applied for men and women</td>
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</tr>
<tr>
<td>5.</td>
<td>Keeping of Indigenous Forest</td>
<td>Men and women have the same responsibility to preserve indigenous forest. The decision was determined through community consultation.</td>
<td>Men and women have the same responsibility to preserve indigenous forest. The decision was determined through community consultation.</td>
</tr>
</tbody>
</table>
Table 8 shows that there have been changes in the understanding expressed the opinion that women should be involved in determining the amount of contributions for the water and the determination of the management boards, so that women gain control, means women were involved in the decision making of the two aspects. The reasons were, firstly, controlling is not only men's job but also women's. Secondly, the allocation of water use was mainly determined by the women. Meanwhile, for the distribution of irrigation water in particular (P3A), both men and women did not have control because that was the absolute right of the board. That was done in order to avoid injustice distribution of water to the fields so as to minimize conflicts.

4. Benefit

The last aspect assessed in the gender roles analysis is benefit. Benefit in this research means how much benefit is felt by men and women in the presence of water management. It was showed that the water resource management gave benefit for men and women in Bayan. This is presented in the table 9 below:

Table 9. The Benefits of the Availability of Water Resource Management, by Gender

<table>
<thead>
<tr>
<th>No.</th>
<th>Aspect</th>
<th>Women</th>
<th>Men</th>
<th>Exp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Water Availability</td>
<td>Water is always available for everyday purposes. So that women are more easily to carry out their household activities</td>
<td>The Irrigation management (P3A) led to the farmers can irrigate regularly and reduce conflicts that often occur.</td>
<td>M=F</td>
</tr>
</tbody>
</table>
Water is always available in the house because there is coordination between P3A, P3M and PLTMH

<table>
<thead>
<tr>
<th></th>
<th>Work time allocation</th>
<th>Less working time allocation. Therefore, the women had free time to take a break so that they had enough time to maintain relationship between family members, hence their family becomes harmonious.</th>
<th>Similar as the women’s opinion that the water availability led to less time to help their wife to look for water.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Business Opportunity</td>
<td>Women can sell ice cube or ice cream. Lights and TV are available hence the women are able to study.</td>
<td>There are opportunity to raise cattle and do pond fish business.</td>
</tr>
<tr>
<td>3.</td>
<td>Agricultural Production</td>
<td>Higher rice production. In the past, the yield was only 3 tons per hectare, but now 7-10 tons per hectare.</td>
<td><strong>M=F</strong></td>
</tr>
</tbody>
</table>

M = Male; F = Female

Source: processed Access Data

Table 8 shows that there is no change of the benefit got by men and women in the water resource management for the eighteen months of this research, men and women got the same benefits in the all aspects.

4.4 The Men’s and the Women’s Awareness on the Environmental and Climatic Threats for the Sustainability of the Water Resources

The Awareness about Climate Change:

- They already aware about the climatic changes. Weather and seasons are difficult to predict
- Because of a divine destiny
• the failure of human actions (for example logging)
• Reforestation leads to more rain
• Pollution

The Awareness on Environmental and Climatic Threats

• Land slide in some spots along the Irrigation Chanel
• Increase in population leads to more competition ion water use
• Lack of installation maintenance
• Lack of water supply
• Lack of commitment in Managing water for consumption (P3M)
• Lack of consideration in plant varieties planted by the farmers in water allocation
• Water debit has been reduced during the dry season (not enough for farming)

The Implementation of the Desired Livelihood Adaptation Strategies in Kecamatan Bayan

In the second year of the research, there were the Socialization and Consolidation Workshop between the researcher team and the stakeholders in the IWRM in Bayan, involving men, women, formal and informal leaders. After the workshop, the implementation activities had been conducted in order to try the adaptation strategies that had been agreed.

The Consolidation Workshop with Bayan Community Representatives (Including The Men's and Women's Desired Future Strategies of Adaptation in Facing the Environmental and Climatic Threats on The Water Resources)

The workshop was conducted in the University of Mataram. The participants were some stakeholders such as: women group, men group, Camat Bayan (the Head of Bayan sub district), KepalaDusun, youth leader, and the members of the water management institutions.
The first activity was the explanation of the first year results of the research. That was followed by a discussion to clarify the information collected from the previous activities. The results of the clarification in the first year were explained in the gender roles in the table 2, 3, 4, and 5.

Furthermore, the discussion was conducted in identifying the potential natural and human resources can be developed in adapting to climate change. In Desa Bayan, there were strengths, weaknesses, opportunities, and threats being identified in the adaptation strategies of climate change related to the water resource management.

1. Strength

There were several strengths have been found from this research. The main strength was water is available for consumption and agriculture for the whole year, especially in Desa Bayan. The springs are close to the dusuns (sub-villages) and the infrastructures have been built close to their living areas.

It also has been identified that the community-based institutions of water resource had been existed and independent. The institutions were P3A for irrigation, P3M for consumption, and PLTMH for micro hydroelectricity. Each of the institutions had their own structure of the organization and the boards. There was the consumers’ payment allocated for the boards. They perceived that there was good relationship the institutions. They developed clear coordination, decision making, rewards, punishment, and payment mechanism. They also tried to encourage all of the stakeholders’ participation to managing their water resource.

Moreover, the societies still maintained the very high loyalty to the awiq-awiq and other local values in order to keep their water resources. The awiq-awiq is traditional rules that are made and developed together within the societies. Anyone who break the rules will get social and material punishment. For example, whoever do illegal logging have to cook and share their cattle (beef) or goats and sacks of rice for their community. What is more, their loyalty to the formal and informal leaders was also the strength they have. They were still willing to obey what their leaders said.
The next strength has been identified was the societies’ support and participation in keeping the sustainability of their water resource was still high. Water is a very important aspect in their life as most of the people in Bayan were farmers. In the village that has limited access to water such as in DesaLoloan, the people had tried to adapt to difficult time in accessing water especially during the dry season. The P3M institution (for water consumption) distributed the water in rotation, which was once a day per Dusun. They also tried not to raise cattle or other livestock, which need much water.

2. **Weakness**

They experienced very poor organizational management and administration skills for the P3A, P3M, and PLTMH. There was limited access to capacity building activities as there were limited training from the government or other programs in the village. They did administration training once in the past, but that was not enough as the training was very short and limited practical session.

The society also had limited awareness about the concept of infrastructure maintenance. They said that they did not put the post for the infrastructure maintenance from the water payment from their customers. Moreover, the available infrastructure was not enough to fulfill the societies’ needs of water as the population is getting increased.

The other weakness was limited participation of the women in the water resource management. Their involvement in the management was very low as they had limited access to education. They were considered as “very low quality of human resources”. However, the society started to realize that the women also are potential to be involved in the public activities. Hence the women are encouraged to study as high as possible like what men are. The other problem was there was lack of education facilities in Bayan both formal and informal.
Furthermore, the societies found the difficulties in finding alternative livelihoods. They relied on agriculture sector as it was hereditary activities in the community. However, in the extreme weather such as drought in DesaLoloan or unexpected rainy season, they were failed to get sufficient yield. In the dry season, the people found lack of water and there were many water conflicts among farmers. Meanwhile, during the rainy season, the people did not use the water efficiently for their daily needs.

The difficult situations as mentioned above were worsen as the societies especially the women had limited access to the information about development programs from the government or the NGOs. In the term of the local government’s responds, the societies perceived that the local government had very low responds to the programs run by other parties.

3. Opportunities

The societies realized that the water availability was still sufficient for their needs in general. They also still had access to other water resources if they had problems with their current water resources. The good thing was the societies realized that the water is very important for their life. They supported the every programs run in their villages and they were keen on joining all the community-level activities related to water resource management. During this research, it was realized by the researchers that the people in the research location were very welcome, friendly and enthusiastic. Many of them participated in all of the research stages. Furthermore, the people kept maintaining good communication among stakeholders in the community.

It was also revealed that gotong-royong was still held by the community and they highly valued the leadership among them. So, it is easier to approach the community through the informal leaders. Moreover, they were willing to encourage the women participation in the water resource management activities. They had realized that women were potential stakeholders in the water resource management, especially in the administration work in their water management organizations.
The last but not least, Bayan has very reach natural resources those are potential to be developed as many of them are adaptive to various weather conditions. One of the recent potential natural resources was Trigona spp. That is small kind of bee around the forest where the people live. Trigona is able to live in various environment and eats any kind of flowery foods. Hence this bee keeping activity is an alternative adaptable livelihood.

4. Threats

Population growth may increase competition in getting water as more and more people need water. That led to some conflicts in accessing water (irrigation) between farmers especially during the dry season in Desa Loloi. Other conflicts also happened between dusuns or desas between the upper stream and lower stream.

Moreover, political interest influenced the community activities. Political inclusion can lead to divisions in the society in Bayan. Therefore they can be suspicious of each other and may lead to a program failure in the community.

Meanwhile, inappropriate approach methods in socializing the programs into the community led to low responds from the societies as their low level of education. For example the term “gender” should be used carefully as they may be mis-interpreted by the societies. The gender perspective in the development activities may not seem antagonistic for the societies.

Furthermore, limited agricultural and its diversification skills those lead to higher pest attack threat to the agricultural commodities. Meanwhile, the people’s awareness about the threats of the climate change impacts were very low.

Last but not least, there was a people’s habit in borrowing money when they do not have jobs. In certain times in a year, such as after planting when there is no jobs on farms, people did not have sources of income. That was difficult for the farmers to fulfill their daily need. Hence they borrowed money from their future collectors as they did
not have access to the formal financial institutions. That was a threat as the collectors would determine the price as they wished, hence the farmers could get very low price or low interest from their farms.

5. **Strategies**

There were some strategies of Climate Change adaptation came up from the discussion with the stakeholders in Bayan. They were:

a. The strengthening of water resource management institutions

b. Adaptive capacity building in facing the impacts of climate change.

c. Encouraging women participation in the organizations of the water resource management in the villages.

d. Developing awiq-awiq on the water resource management in- and inter-village.

e. The farmers get some trainings on various alternative livelihoods in order to anticipate difficult situations.

f. To develop installation to access alternative water resources

Honey Bee Keeping Training

After assessing the natural resources and the potential market of the product, it was decided that beekeeping training should be given to the community. Trigona was the bee species chosen in the training activity as it can live in various environments and eat almost all kinds of flowers. The feeds are available in both much or lack of water conditions.

As a pilot project, the training involved 3 (three) women and 7 (seven) men in the training. In the training, they were introduced to Trigona bees, colony propagation, harvesting techniques of honey and propolis, and honey packaging. Of this training, they
• Improvement of their knowledge and skill in the organisation, administration and accounting
• Improvement of their knowledge and skill in water installation maintenance.
• The involvement of women in any process have been increased.

The Outcomes from the training were:

• Developing group and mutual agreement about water usage (50 household will be divided into 10 groups)
• Water installation will be fixed
• Water meter will be installed (10 equipments for 50 users) and others (40 equipments for other 200 water users) will use their own fund.
• Communication forum related with water management will be regularly held. Furthermore, women participation will be encouraged.

Livelihood Outcomes:

There were some potentials livelihood outcomes resulted from this research. Those were:

• More income (from beekeeping)
• Opportunities to increase well-being: high economic value of beekeeping and effective use of water
• Reduced vulnerability (helping them to identify their need of adaptation strategies)
• Improved food security (because there will be potentially increase in their income)
• More sustainable use of natural resources (to change the people’s mindset and lifestyle in natural resources management, especially the water use)
are expected to be able to develop their beekeeping more seriously. They were also given 30 colonies as the stimulators (3 boxes each participant).

The were outputs from the training activity. Firstly, there was increasing in community awareness relating with development of potential local natural resource. Secondly, the training implemented Livelihood opportunity as climate change adaptation strategy. Thirdly, the training has opened an opportunity to increase community welfare. Surprisingly, from ten people being trained and given 30 boxes of Trigona (under CCAP funding), there are hundreds boxes spread out in Desa Loloan dan Desa Bayan recently.

The Training on the Water Resource Management (Clean Water and Irrigation Management, and the Organizational Managerial Skills of the Water Resources Institutions)

The activities in the training on the technical aspect of water management (PDAM) were:

- Training on administration and accounting skills (the Faculty of Economics UNRAM)
- Coordination and communication between water management stakeholders (government in the district and village levels, agriculture extension officers, PDAM)
- Group and mutual agreement development between household
- Giving 10 water meter (1 group) and installation assistance (CCAP fund)

The Outputs of the Implementation Activities (Based on Evaluation Process):

- The men and the women have realized that the water has economic value (wasting water means wasting money)
- The community awareness of water resource management increase (water is not belong only to one village, but must be shared with others)
Benefits of Using Participatory Action Research Methods:

The Participatory Action Research Methods being applied in this research, resulted in some benefits after eighteen months of the study. Those benefits are:

a. There was an encouragement to women to participate in every activity conducted as the set of the research activities. So, attending the meetings or trainings were not only men’s domination.

b. The people (the men) have been motivated to encourage the women’s involvement in the water resource management, at least, in the administration work. So, this needs further encouragement and socialization about how important to encourage women involvement in the water resource management activities.

c. There were more women involve in business activities as part of the adaptation strategies in climate change, by using the natural resources, which are available around their living area, such as Trigona bee keeping activity.

Table 10 below shows the men and women participation in the research.

Table 10. The Men and Women Participation in The “the Integrative Water Resource Management based on Gender Perspective in Bayan” Project

<table>
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</table>

V. Conclusion and Recommendation

Conclusion

1. Bayan society understand well that the water resource is a 'together need' and should be managed with the involvement both men and women. They realize that developing a good relationship between different management for different water purpose in term coordination, decision making, reward and punishment and also payment mechanism is very important to find the best solution among them and to hinder the water conflict in the future resource management.

2. The technical aspect of water management including providing infrastructure, maintenance, and systems of water distribution is still dominated by men. Even though, they have started involving a woman in PLTMH management as the treasure. So, we need to encourage the women’s roles in access, control, participation, and benefit to meet the gender equality in the water

3. From the stakeholder analysis, it was recognized that the community and the informal leaders play the biggest power role in the water resource management.

4. From gender analysis, it was recognized that men are more dominant in participating in the water resource managements due to a gender stereotype among the women about their roles in the water management, which influence the women’s
participation. The women’s participation is more limited than men’s, especially in the management systems and the public meetings.

5. The implementation stages that involved the trainings on beekeeping and the water resource management, have been able to open opportunities to improve the water resource management skills by men and women in Bayan and to improve people’s income.

Recommendations

There are some recommendations resulted from the research such as:

1. There should be some efforts to communicate the research results and the implementation activities to the higher government levels in order to sustain them in the community.

2. There should be sustainable supervision for the community to support the men and women participation equally.

3. There should be more intensive and regular communication among the stakeholders in the water resource management, especially the government from the lowest to the higher levels and the community.
REFERENCE


APPENDIX I

1. Survey of Location

Picture 1. Water Spring in Bayan

Picture 2. The Indigenous Forest
Picture 3. The Spring’s Mapping by Using GPS

Picture 4. The pipe for Clean Water by Community Self-Help Group (P3M)
Picture 5. The Rice Fields in Desa Bayan

Picture 6. The Irrigation (P3A) in TeresGenit

Picture 8. The Water Tank (Blue Painting Tank is the New One)
2. DesaTeresGenitFGD and In Depth Interview Activities

Picture 9. P3M (The Clean Water Management) for the Mosque

Picture 10. In-Depth Interview with the Women in PLTMH Management
Picture 11. In-Depth Interview with the Woman Consumers

Picture 12. FGD with Men Group and the Visited Evaluation by The CCAP Team
Picture 15. In-Depth Interview with One of The Water Management Board Member in Loloan
Picture 16. FGD with Men Group in DesaLoloan

Picture 17. FGD with Women Group in DesaLoloan

Picture 18. Berugak-the Community Centre in DesaLoloan
Picture 21. More and more people started beekeeping at their house

Picture 22. Training on the water resource management (PDAM and Irrigation)
Picture 23. Clean Water Management (The Installation Maintenance)

Picture 24. The training on the organizational management and administration