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## MANGROVE MANAGEMENT AND REHABILITATION, INDONESIA

### Community-Based Mangrove Management and Rehabilitation in North Sulawesi Province, Indonesia

Indonesia's coastline was historically an important mangrove forest area, and most of what remains – some 5,000 hectares – lie within North Sulawesi Province. To date there has been little effort to protect these fragile habitats and as the result there has been significant degradation of mangroves due to the construction of shrimp ponds and local harvesting for wood for boats, building, and firewood. Yet despite their importance to local people, proper management of the mangrove ecosystem and efforts to rehabilitate what remains are still in a concept form. The economic instability of Indonesia furthermore undercuts efforts to reduce the reliance of local people on natural resources.

Aquatic expert and lecturer, Dr. Rignolda Djamaluddin is Director of KELOLA, a Natural Resources Management team, and leads a project to improve the management and rehabilitation of North Sulawesi Province's last mangroves. Through the project, Rignolda is working with local people to develop rehabilitation programs to restore the mangrove habitat and halt further destruction. He is teaching local people why mangroves are physically important in protecting coastal areas. With the help of Mangrove Action Project, Rignolda has constructed a mangrove centre, known locally as Daseng Lolaro, at Tiwoho Village, North Sulawesi. The centre contains a library, meeting rooms, laboratory, waste water garden, and a mangrove nursery, as well as rooms for workshops and training. Near the centre, 60 hectares of mangrove are being restored as a demonstration site for physical restoration of previously disused shrimp ponds.



The main target of the project is the local community living in the northern part of the Province, Likupang Sub-District. Local government institutions – in particular those are responsible for mangrove management – are also a key focus. North Minahasa Office of Forestry and Tourism and North Sulawesi Rehabilitation Office is being involved to increase institutional capacity for conservation, as are local NGOs and university conservation groups.

It is hoped that through training and hands-on conservation, a basic knowledge of how mangroves function and how to restore them will be gained, which – with the addition of alternatives for income generation – will lead to sustainable use.

# WHITLEY FUND FOR NATURE

## 1. Executive Summary

No priority has been given to mangrove conservation over the country and in particular in North Sulawesi Province where some 5,000 hectares of mangrove areas is located. As the result, there has been significant degradation of mangrove ecosystems over this province due to the construction of shrimp ponds, and local uses for boat and building materials and for firewood. Better management of mangrove ecosystems and efforts for rehabilitating this ecologically important ecosystem is still in a concept form. In the future, the sustainability of this ecosystem will still be in problem because of the economic instability faces by the Country. In this project, better management and rehabilitation programs would be initiated and implemented in this region, so that the current level of mangrove degradation would be decreased, and a number of already degraded mangrove areas would be rehabilitated.

## 2. Project Area

This project is located in North Minneha Regency, North Slaws Province, Indonesia. There villages (Ahoy, Thermal, and Sera wet) where some 70 % of mangrove areas is located are selected to be targeted villages of the project. Figure 1 below depicts the project area.



**Figure 1.** The project area; villages of Bahoi, Teremal and Serawet in North Minahasa Regency,

### 3. Project Outcomes

#### Data and Information

##### *Bahoi Village*

Administratively the Village is included in the Sub-Regency of West Likupang, and it covers the total area of 250 ha. The total population of the Village is some 420 people or 120 families. Composition of the people consists of two tribes, Sangirnes and Minahasanes. Farmers are dominant (70%) in this Village and the remaining are traditional fishers. Most of fishers are fishing for pelagic fishes such as *roa*, *teri*, *malalugis*, *lompa* and *tandipang*.

The extent of mangrove is approximately 50 ha, dominated by two species of lolaro (*Rhizophora apiculata*) and posi-posi (*Sonneratia alba*). In general the mangrove is in good condition. The local people and Coastal Network are playing significant role to protect the mangrove. Under a village ordinance the use of mangrove is regulated. It could be happening some times ago that some three hectares of mangrove were cut to give access for small boats to approach the coast.

##### *Teremal Village*

This Village covers an area of 350 ha, and administratively is included in the Sub-Regency of West Likupang. The total population is 715 people or 189 families. Composition of the people consists of two dominant tribes, Sangirnes and Gorontalones. Most of the people are farmers (75%) and the remaining are traditional fishers.

The extent of mangrove is approximately 22 ha, dominated by three species of ting (*Ceriops tagal*), lolaro (*Rhizophora apiculata*), posi-posi (*Sonneratia alba*). In general the mangrove condition is under pressured due to small scale exploitation for fire wood. About 40 % of landward area of mangrove dominated by ting and lolaro has been subjected to mangrove cutting. It was identified in the field that there are 15 families still cutting mangrove at regular basis to supply fire wood in Manado markets.

It seems that the village ordinance of coastal resources management has not an impact on sustainable mangrove use. The condition of community-based Protected Coastal Area has been subjected to illegal fishing (bombing and poisoning). Little effort has been conducted by local people and Coastal Network to protect the mangrove area from being cut.

##### *Serawet Village*

The Village area is some 1,027 ha, and administratively included in the Sub-Regency of West Likupang. The total population is 247 families (1037 people). Five tribes (Sangirnes, Minahasanes, Gorontalones, Bugines, Javanese) structure the population. Two dominant livelihoods are farmers and fishers.

The Village covers a total 900 hectares area of mangrove. The mangrove is dominated by three species of ting (*Ceriops tagal*), lolaro (*Rhizophora apiculata*), and posi-posi

(*Sonneratia alba*). In 1985 a some 500 hectare of mangrove was cut for shrimp ponds. Unfortunately, the shrimp ponds operated for only several years. In addition, a small number of local people still use mangrove for fire wood.

Local people in collaboration with Coastal Network have tried to rehabilitate of approximately 40 hectare area of disused shrimp ponds. Due to some technical problem the rehabilitation process has not been successful. It is interesting that a group of local people leaded by Pak Muhamad Daomba has an initiative to plan mangrove at any time they visited mangrove area. It is expected that the group already planted many mangrove seedlings.

## **Capacity Building**

### *Community organising*

In Bahoi Village the project was introduced firstly to Pak Max, the Coordinator of Bahoi Coastal Network. Pak Max has an important role to facilitate the project team in communicating the project to village government and local primary school. In the meeting with the village government, it was informed that the village has a village ordinance to manage the coastal resources, and the authority of coastal management is under controlled by the local Coastal Network. The village government supports totally the implementation of the project. In the meeting with local primary school facilitated by Pak Max, the local school agreed to integrate coastal and marine curriculum included mangrove education into local subject, and the project team was invited to join the school's teachers in implementing the curriculum. With the local Coastal Network, the project team has a commitment to strengthen the network capacity and to accomplish all the project agendas.

In Teremal Village the project was firstly discussed with the village leader. In the meeting with the village leader three issues were addressed; the presence of coastal management village ordinance, the existence of local Coastal Network, and the current condition of the protected coastal area. Other important information obtained from the meeting is that the village ordinance has not been effective to support the development of community-based coastal resources management. Moreover, degradation of coastal resources tends to increase due to the practice of illegal fishing by surrounding villages. There is also a small group of families still cut mangrove for fire wood. The project team is challenged to make the village ordinance to be in use and effective. With local primary schools the project team discussed the idea of integrating coastal and marine curriculum in the local subject. Because the local Coastal Network is not active, the process of community organising in Teremal is mostly through primary school teachers.

In comparing to other villages, meetings and discussions in Serawet Village are more frequent. The project team is working closely with the Coordinator of North Minahasa Coastal Network to introduce and to implement the project agendas. Every Wednesday there is a regular meeting of local Coastal Network to evaluate to discuss any issue of coastal resources management. The project team ususally involves in the meeting. Mangrove rehabilitation techniques and capacity building of the Coastal Network are two main topics discussed with the Network.

### *Technical support*

Technical supports are provided to local communities in implementing several field works. In Bahoi Village the project team supports the local primary schools and Coastal Network in setting a field mangrove herbarium. The herbarium is now being constructed at selected area of some 25 x 25 meters with local species of mangrove planted inside. The project team also provides technical assistance (e.g. site assessment, seedling selection, plantation method) during the implementation of mangrove artificial plantation at 3 hectares disused shrimp ponds located in Tiwoho Village.

The project team supports primary schools teachers in practicing several field works on mangrove education. Supports are given in aspects of mangrove observation methods, species identification method, and characteristics of mangrove habitats.

### **Seminars/workshop**

The practice of mangrove rehabilitation concept through hydrological restoration at Mangrove Centre in Tiwoho was presented in the Seminar conducted by the Coastal Natural Resources Management Department at the Faculty of Fishery and Marine Science Sam Ratulangi University. In the seminar that was conducted on July 13 2006 the project team had an opportunity to explain and inform the whole process and results gained from the implementation of cost-effective mangrove rehabilitation focussing on hydrological restoration. The paper that was presented in the seminar has been documented in form of seminar proceeding in the Department.

One day Seminar in form of Focus Group Discussion was conducted on January 6, 2007 at Community Study Centre in Tiwoho Village. This seminar discussed issues on environment and coastal and marine natural resources management in the North Sulawesi Province in general and the project area in particular. Participants of the seminar included government institutions (Forestry Office, North Sulawesi Conservation Board, Rehabilitation Office, Environment Management Office, Bunaken National Park Authority, and North Minahasa District Government Representative), scientists from the Faculty of Fishery and Marine Science Sam Ratulangi University staffs, local NGOs, university student organizations, and local communities. In brief, the seminar results in a commitment to protect the environment from people-related damages and to promote sustainable coastal and marine resources through a collaborative work.

### **Development of coastal and marine environment curriculum**

The project team works intensively with primary schools in Bahoi, Teremal and Serawet to develop a coastal and marine environment curriculum. Mangrove education is integrated in this curriculum. To support the implementation of the curriculum a simple handbook and syllabus are provided. The whole process and description of the handbook and syllabus provided by the project team and primary school teachers are as follows:

#### *Handbook*

It is a common problem that teachers have insufficient knowledge of coastal environment. They are not specifically prepared with such knowledge because coastal environment is only a minor subject (local subject) in the National Curriculum. Local school's initiative is of importance in developing local subject indeed.

It was revealed in the previous discussion with school teachers that a handbook is crucial to be provided. The handbook covers all teaching materials of coastal environment that include four main aspects, as follows:

- Participative mapping;
- Identification techniques for fish, coral, mangrove, sea grass and seaweed;
- Coastal and marine ecology in general (fish, mammal, coral, mangrove, sea grass and seaweed, mollusk);
- Sustainable usage concepts and community-based coastal resources management (traditional roles, eco-tourism, mangrove rehabilitation, etc.).

It took almost three months, from May to July 2006, for the project team to complete the handbook. Content of the handbook is designed in a simple format with a lot of pictures to help teachers in understanding any information, concepts and ideas inside. An art designer was involved in the creation of the handbook. All schools in this project receive original form of the handbook.

### *Syllabus*

In creation the subject syllabus, the project team has been working intensively with a number of involved teachers in this project. The syllabus should meet any requirements outlined in the Competence-based National Education Curriculum of 2004.

In the National Education Curriculum there is a local subject. Local schools are given authority to manage local subject based on local condition. In practice, most of local schools in the coastal areas of North Sulawesi Province are not included coastal and sea environment in their local subject due to lack of teaching materials and teachers capacity. It is very common for local schools in this Province to lecture terrestrial plants cultivation and local cultures in their local subject.

The syllabus of coastal environment has to be integrated in the local subject. Time allocation for the subject is some 40 – 60 minutes per week, not including field activities. It is considered that the subject is appropriate for students in Year 4 to 6.

Within three months, from July to September 2006, the project team and teachers representing each school were working intensively to formulate the syllabus of coastal environment for students in Year 4 to 6.

### *Curriculum implementation*

All schools are interesting to implement the curriculum. But, they need a kind of recommendation from the Office of Education to formalize the process. It is actually not a problem because the Education Office of North Minahasa Regency fully supports the project, and provides an official supporting letter of the project implementation.

With the help of the project team, each school arranges its team of teachers to manage the subject. Ideally, each class/year has a responsible teacher, so that each school may have three teachers of year 4, 5 and 6. However, this ideal condition is only the fact in SD Negeri Maliambao in Teremal and SD Negeri in Serawet.

In the beginning of the curriculum implementation, the project team was working with involved teachers to integrate the subject in the school's timetable for two semesters. Serious discussion had also been focussed on several aspects of teaching materials and supporting facilities. Because some teachers were not confident in lecturing several

teaching materials, they were supervised by a team member of the project during in class and out class activities.

In class activities are made interactive. Material presentations in form of texts, pictures, photos, and films are interesting for students. They respond actively to the lecture, making many questions and statements. Students seem to be familiar with any aspects in the subject. Active response of students to the lecture facilitates teacher in lecturing process.

Out class activities are more interesting. Students are enjoyable and participate actively in observing coastal environment and organisms they found. Their local knowledge and closed relationship to coastal environment in combination with knowledge they get in the class push them to know more detail of coastal environment and organisms within it. Two hours in the field seem to be not enough for students in observing marine organisms and practicing related research methods.

Evaluation on students' understanding to the subject is conducted at the end of semester period. Teachers with the help of the project team provide assignments to be tested in the subject examination.

### **Networking**

With the support of North Minahasa Regency Office, the project team has been working closely with primary school teachers in the villages of Serawet, Bahoi and Teremal in developing a coastal and marine curriculum. Within six months, a syllabus and supporting materials of the curriculum had been resulted by the team work consisting of primary school teachers and the project team. The curriculum is now implementing by the primary schools in the Regency as part of their local subject. Mangrove education and its sustainable management has been important part of the curriculum. There is a regular agenda for KELOLA's staffs to support the primary schools in implementing the curriculum.

A strong collaboration between KELOLA and Coastal and Marine Management Groups exists in the Regency. This collaboration is having an important effect in the implementation of the project and its future development. Within the Regency, these Groups exist at every village and are legally acknowledged under local regulations. Under these regulations the groups have responsibility in managing coastal and marine resources at village level. In the village, members of the group are those represent formal village institutions, youth and women organisations, and individuals. These groups have a coordinative structure and network.

A formal communication and collaboration is also made with the village government as the representative of the Government at village level. The project is fully support by the village leaders in the project area. They involved actively in communicating the project activities to villagers and to encourage them in supporting the project. At any instances of formal and informal village meeting the project agendas were discussed. It is actually the fact that the project agendas are in line with village agenda of coastal and marine management as regulated in the village ordinance.

Other stakeholders involved in the project implementation. North Sulawesi Wahana Lingkungan Hidup (Indonesian Friends of the Earth) involves in the implementation of mangrove education at primary schools. Students and several lecturers from the University of Sam Ratulangi (Unsrat) took part in mangrove training and artificial

plantation. Intensive communication to related government institutions (Forestry Office and Rehabilitation Office) is still in process in order to put into practice the mangrove management program within the project area. One day Seminar on January 6, 2007 is the first inter-stakeholders formal discussion.

On November 6, 2006, the project area was visited by delegations from South Province of Thailand to learn how the mangrove management practiced in the project area. The project area is also attractive for the Luwuk Legislative Members in South Sulawesi Province that visited the area on January 20, 2007.

### **Information services**

In general, any related information of the project is continuously broadcasted through the Tiwoho Community Radio. This Radio is operated by local community at Tiwoho Village under supervision of KELOLA's staffs. Broadcasted project information seems to be effective in educating surrounding villages of mangrove issues. In addition, the project implementation was also informed to public through interactive dialog on January 14, 2007 in the local radio of TRI JAYA FM.

The project also provides local communities with mangrove information in form of documents/papers. Requested papers include mangrove rehabilitation concept, crabs culture in mangrove forest, and sea cucumber (locally called *teripang*) culture technique. In the Village of Serawet, there is a mangrove information board managed by the local Mangrove Management Group. This information board is used to inform mangrove issues in form of leaflet, bulletin and newspaper.

### **Mangrove training and rehabilitation**

Information and knowledge of mangrove have been transformed in several ways to targeted participants of the project. Primary schools teachers learn mangrove from the process of mangrove syllabus making and through the process of in class and out class activities. Students in year 4, 5, and 6 of the three villages in the project area get mangrove knowledge since mangrove education integrated in the local subject. North Sulawesi WALHI (Indonesian Friends of the Earth) that takes part in the mangrove education process also learns much of mangrove knowledge and its implementation in the field. The Coastal and Marine Management Boards of the Regency take benefits on mangrove knowledge since they involve actively with the project team in promoting mangrove education to local primary schools, community organising, and implementation of some field agendas of the project.

A training of mangrove was conducted on August 3, 2007 at Community Study Centre in Tiwoho Village. Some 25 participants representing local villagers, NGOs and primary school teachers took part in this training. This training focuses on aspect of general knowledge of mangrove (bio-ecological aspects), mangrove observation techniques and rehabilitation techniques.

The practice of mangrove rehabilitation was conducted on August 4, 2007. Some 60 participants from local villagers, primary school students and teachers, Alumnus of Fishery and Marine Science faculty of Sam Ratulangi University, under-graduate students and lecturers of Hydro- Oceanography Laboratory of Fishery and Marine Science faculty Sam Ratulangi University, reporter of local news (POSKO and KOMENTAR), and all KELOLA's staffs took part in this activity. About 2,000 seedlings of four mangrove species (*Aegiceras*

*corniculatum*, *Avicennia marina*, *Bruguiera gymnorrhiza*, *Rhizophora apiculata*) were planted on 3 hectares disused shrimp pond mangrove area experienced failure in natural secondary succession and artificial plantation. This artificial plantation focuses mainly on aspect of plantation technique rather than the quantity of planted mangrove seedling and the extent of rehabilitation area.

## **7. Monitoring and Evaluation**

Monthly meeting is conducted to evaluate progresses of the project. Result of evaluation is documented in monthly report. Team of evaluation leaded by the project team leader have been conducted two times comprehensive evaluations in the field. All participants of the project were involved during the evaluation, and any results of evaluation have been used for the improvement of the subsequent project activities.

Generally, results of evaluation indicate that the project has been successful in the previous six months. The involvement of the project team in the primary school programs seems to have been an effective way in developing program in the field. The role of school teachers is significant in communicating the project to other stakeholders and in organising networking among stakeholders. A strong relationship between the project team and Coastal Network is another important achievement of the project.

A comprehensive evaluation of the project implementation was conducted on February 28, 2007 at Community Study Centre at Taboo with the presence of all project participants. In this evaluation, primary schools teachers suggested that the coastal and marine environment curriculum needs to be introduced formalised in the local subject, and out class activities have to be more intensive. The North Minnehaha Coastal Network proposed programs of Coastal Network Strengthening and addressed the urgent need to rehabilitate degraded mangrove areas in the North Minnehaha Regency.

## **8. Recommendation**

The project has been successful to establish the network with local primary schools with the support of the Education Office in the Regency. The coastal and marine curriculum is now practiced by local primary schools, although the capacity of teachers and supporting teaching materials are limited. The network with local primary schools seems to be effective in continuing the implementation of mangrove project in the area. The North Minnehaha Regency Coastal Network is potential group of local people in regarding to coastal resources management in the project site. These network and collaboration have to be encouraged and strengthened for better achievement of the mangrove project in the area.