EXAMPLE 1 EXAMPLE 1 EXAMP









Bitturi Bay Kature Reserve Management Plan 2006-2080

Collaboration Between BKSDA Papua II Sorong and The Nature Conservancy

BINTUNI, AUGUST 2005







BINTUNI BAY NATURE RESERVE MANAGEMENT PLAN IRIAN JAYA BARAT PROVINCE 2006-2030

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RENCANA PENGELOLAAN CAGAR ALAM TELUK BINTUNI TAHUN 2006 – 2030





EXECUTIVE SUMMARY

Bintuni Bay Natural Reserve (CATB) is a one of conservation area in Bintuni Regency that is dominated by mangrove forest type. Because of its uniqueness and there are a variety of flora and fauna species that are endemic for Papua, therefore government through a Decree of Ministry of Forestry No. 891/KPTS-II/1999 regarding determining the area of forest and water territory of Province Papua appointed the area of Bintuni Bay Natural Reserve to be as a Natural Reserve with the area of 124,850 Ha. Since that time, the management of CATB is under the Natural Resources Conservation Center (BKSDA) Papua II sorong – Section of Region Conservation I Manokwari. Programs that have been done are just limited about protection of the area while programs that toward preservation of the area function have not yet been undertaken.

In the age of decentralization of forestry sector in line with imposition of special autonomy for Papua Province and also with the implementation of paradigm of forest management community-based, it has been resulted in a new dilemma for management of conservation area in the regional level. The pressure of community on forest resources is more incessant appear, either it is seen from the claim of the community as the owner of "ulayat" right about their right on the forest area and even the activities of exploiting resources inside the reserved area are more uncontrollable. To respond on the problems, especially for the area of Bintuni Bay Natural Reserve (CATB), as one of strategic conservation area where directly bounded to center of the city and as a place where the Community in Bintuni and its surrounding are rely their life mainly on fisheries product such as prawn, fish, and crabs, it is necessary to provide a strategic plan that can manage the high exploitation of the area.

In the efforts to manage the Bintuni Bay Natural Reserve better, The Nature Conservancy (TNC) in this case Southeast Asia Center for Marine Protected Areas (SEACMPA) that located in Denpasar, Bali, has organized a Compiler Team that is responsible for composing Management Plan of Area (RPK) that consisted of several components such as component of area management (BKSDA Papua II, c.q. KSDA Resort Bintuni), intellectual (universities), and NGO (Non-Government Organization) and also supported by the element of Regional Government of Bintuni Bay Regency. This team is formed to assist the regional government (PEMDA) and Center of Natural Resources Conservation (BKSDA) Papua II in formulating Management Plan of Bintuni Bay Natural Reserve in participative ways that are able to maintain and to sustain the area function according to its allotment.

The document of Management Plan of Bintuni Bay Natural Reserve is aimed as an effort to answer various challenges that appear as a consequence of the implementation of Regional Autonomy and of the increase of people insisted for direct involvement in development process in Forestry sectors. This challenging, basically, is a form of public demand that need a program of area management of Bintuni Bay Natural Reserve that can be implemented, and its substance is an agenda compilation from the aspiration of all the interested people that related with area management.

Document of this management plan is aimed at to accommodate a various aspiration from stakeholder and to formulate that aspiration into strategic plan and action plan. Besides that, the composing this document is intended to create one of management that is able to give a foundation for planning and development the area of Bintuni Bay Natural Reserve by the government of Bintuni Regency. With the present of this document it is hoped that it can



promote an undertaking of the management of CATB area that are accommodative, democratic, participative, and responsibility.

The compilation process of the document of Management Plan Bintuni Bay Natural Reserve, in Bintuni Regency, by the Composer Team it has been done through several phase (1) Consulting, coordinating, and socializing of the composing activity for RPK of Bintuni Bay Natural Reserve to Bupati Bintuni Bay, interested office (institution) in Bintuni Bay, representative of "adat" community whom occupy inside and around CATB area, and NGO Mitra Pesisir, on the end of March 2005; (2) Kampong (village) meeting and Rapid Social Assessment (RSA) in 14 kampong/subdistricts where situated inside the area of Bintuni Bay Natural Reserve, and also Rapid Biological Assessment (RBA) in order to data collection for data SOSEKBUD and biological area, it was done on the end of March to the early of May 2005; (3) Special workshop with all people whom reside inside and surrounding the area and representing by head of kampong, head of tribe, and community figure in every kampong where have a direct access to the area of Bintuni Bay Natural Reserve on June 1, 2005; (4) Workshop of description and formulation on draft of Management Plan of CATB that was held on June 2, 2005 in Bintuni; (5) Scientific review on draft of Management Plan of Bintuni Bay Natural Reserve by reviewer, in order this document can be scientifically accounted for; and (6) Presentation Draft of Management Plan Bintuni Bay Natural Reserve that was done on July 22, 2005 in the Department of Forestry, c.g. Forest Preservation and Natural Conservation, Jakarta. The program were attended by Bupati of Bintuni Bay, Rector of Papua University, Head of Bappeda West Irian Jaya Province and Bintuni Bay Regency, related office (Forestry Office, and Marine and Fishery Office) in Bintuni Bay, Coordinator of Monitoring Board, and Community of Bintuni Bay that was represented by "adat" community that dwelling inside and around of CATB area.

Vision of Management of Bintuni Bay Natural Reserve for year 2006 – 2030 is to realize "Management of Bintuni Bay Natural Reserve Area in Sustainable and Efficient" The scenario that as a dream or hope of the holder of interest and community of Bintuni for the next 25 years is "In 2030 Management of Bintuni Bay Natural Reserve will be Running Ideally and Optimal, because Government Policy that accommodative and supported by Institutional that a holder of an interest that democratic.

To support the realization of vision on management of Bintuni Bay Natural Reserve, in this document has been formulated in detail Management Activity Plan that are focused on seven aspect, namely area stabilization, Increasing of effectivity Area Management, Development species conservation and biodiversity, Protection and Securing of area, Promoter/Institutional, Benefit, and also facilities and infrastructure that supporting management program.

In the program implementation of Area Management Plan, it will be monitored and evaluated by internal elements of management Bintuni Bay Natural Reserve or by Independent Communication Forum. In time goes, management issues of new area will appear, so that in further plan program it will found some certain strategies that are irrelevant anymore. So that, program priority should be evaluated and modified. In addition, in this document it has composed Budget Plan and possibilities of fund resources that can be obtained to support program implementation of management plan five years and twenty five (25) years.

The Nature Conservancy



SPEECH OF BUPATI

Bintuni Bay Natural Reserve is the one of conservation areas located in Bintuni Bay. This nature reserve is a proud of people of Bintuni Town and it has been known well in international world and also as a place for the people relies on their life. The management effort that aimed at to preservation and to sustain the area of Bintuni Bay Natural Reserve is a reflected of our responsibilities as a mankind that created by God on the grace that has been given to the people of Bintuni Bay.

The existence of a conservation area in a region is able to give a great benefit, not only for the place where the conserved area situated, but also for the global environment. The composer Team of Area Management Bintuni Bay Natural Reserve that formed by The Nature Conservancy (TNC), South East Asia Center for Marine Protected Areas (SEACMPA) Bali, that consisted of the element of area management (BKSDA Papua II, c.q. Resort KSDA Bintuni), universities, and supported by Regional Government of Bintuni Bay Regency, has composed a management plan and it is a good momentum in which there a lot of institution that struggle together in managing the area of Bintuni Bay Natural Reserve.

High concern from the people and hard work from the team of Management Plan of Bintuni Bay Natural Reserve was noticed from the enthusiasm of all stakeholders followed the formularizing process, began from public consultation process, either in kampong meeting, intern discussion with related institution in the local region, or in participating on workshop at regency level, all are a fact of our concern in order to save this area. Therefore, government of Bintuni Bay Regency is very welcome the document of Management Plan of Bintuni Bay Natural Reserve for 25 years that has been formulized and organized by the Team together with the stakeholders. The government of Bintuni Bay Regency is still looking forward to supporting from all components, especially all people of Bintuni Bay in an endeavor of its implementation. The government of Bintuni Bay wishes also that with the present of the document of Management Plan Bintuni Bay Natural Reserve, the synergy and performance of the stakeholders in both management and development of the area can be implemented in effective, transparent, and responsibly, so that the effort to realize the area management of Bintuni Bay Natural Reserve in a sustainable and efficient manner can be implemented.

In connection with the effort to realize the above objective, I demand in a special to the management of nature reserve to seriously implement and also to do a coordination action of some programs that explicit in action plan of such document together with the head of office and agency related. To the community of Bintuni Bay Regency as a whole, I demand to fully support an effort of the implementation of the program in the field. To everything that maybe appear or find in field, included a possibility of interest conflict, in or during the implementation





of this program, I request to solve it together transparently, participatively, and rely completely on democratic principles.

On behalf of the government of Bintuni Bay Regency I thank and appreciate to the Team of Construction Area Management Plan for all their efforts and hard works that have been undertaken so far. The expression of thanks and appreciate I grant to the supported institute The Nature Conservancy (TNC), South East Asia Center for Marine Protected Areas (SEACMPA) Bali, that have assisted and facilitated the construction process document of Management Plan Bintuni Bay Natural Reserve, Bintuni Bay Regency. I thank also to the all components either the technical agency or other office related in the surrounding of Bintuni Bay Regency, education and research institute and the technical implemented unit of Department of Forestry in Bintuni Bay Regency that has supported in contribution of thought and active participation in process of document construction of Management Plan Bintuni Bay Natural Reserve. The same thanks and appreciation, I offer to the all people whom cannot be mentioned them one by one for their participation in the construction of this management plan.

Document of Management Plan Bintuni Bay Natural Reserve is an early and good momentum for development and management the conservation area in Papua Land, especially sustainability and protection of conservation area in Bintuni Bay Regency. However, to add the significance and benefit value of this document, so that once again I invite all stakeholders and all Bintuni Bay people for in togetherness to hold up the program implementation as according to this management plan.

Finally, only to God Almighty we glorify and thankful, so that we are able to enjoy our better life until today.

Bintuni, August 2005 Pejabat Bupati Teluk Bintuni AR DRS J. PAIKI





SPEECH OF THE HEAD OF NATURAL RESOURCES CONSERVATION CENTER (BKSDA) PAPUA II

The alteration in the policy intention of Department of Forestry RI that its priority program more focused on land conservation and rehabilitation is a good chance in an effort of rescuing the forest area in Papua. However, management of conservation area becomes dilemma and not constructive in Papua, if confronted in the decentralization age of forest management in the local region, the participation of "adat" community and the establishment of conservation area that not much accommodating a various community interest in the past. In addition, the interest claim for the life basic need of people in Papua, particularly the community living inside and around conservation area makes it as a challenge that should be solved soon together with the conservation activist and environment observer in Papua Land.

The problem of conservation area management policy and the people interest, particularly the community living inside and around the conservation area in Papua is crucial that must be soon solved. Besides that, management pattern or policy instrument that used in managing the conservation area so far in Papua not much accommodating the people interest and aspiration, so that management of conservation area cannot be implemented effectively, sustainably, is not giving a benefit to the people.

Process of formularizing a document of Management Plan Bintuni Bay Natural Reserve that has been thought up by The Nature Conservancy (TNC) is a wise first step and a fact of the care of the conservation activist and environment observer Bintuni Bay Regency and its surrounding in an effort to realize management of area conservation in Papua in a participative, transparent, democratic, and responsibly manner. This effort is a one of helps that is values for us to manage conservation area in Papua, and mainly in working region of Natural Resources Conservation Center (BKSDA) Papua II Sorong. The help is very significant for us because of our resources are limited and also less proportional with the area of conservation in the territory region of BKSDA II Sorong.

The making of Management Plan Bintuni Bay Natural Reserve document that was thought up by the Team formation of management plan CATB area and was coordinating with BKSDA Papua II is also as a step that in line and compatible with the program and determine procedure and management of a conservation area. Besides that, formularizing process that involved stakeholders and people in Bintuni Bay Regency gives an important meaning in developing and changing the paradigm of management policy that is more accommodative, transparent, and democratic. So that, the management policy of area conservation in Papua will be participative that can accommodate all aspiration the stakeholders in the area. As a result, implementation management area program will be more effective and synergic and be able to minimize conflict as occurred so far.





Therefore, BKSDA Papua II Sorong is well welcome and wishing congratulation for the finalizing the document Management Plan Bintuni Bay Natural Reserve. Furthermore, to realize that resources in BKSDA Papua II are still limited, so that contribution and support from stakeholders and Manokwari community are very demanded in implementation program in the future.

In this opportunity, we would like to thank the Tim Facilitating of formularizing Management Plan CATB for their effort and hard work that they have given. We are thankful also Bupati of Bintuni Bay and Government of Bintuni Bay Regency for all supports and helps that they have given. Our thankful also is given to The Nature Conservancy for providing help in facilitating during a process of constructing this document. Our same thanks; we give to all people whom have helped in finalizing this document, in which we cannot mention them one by one.

Management and preservation the conservation area in Papua Land, especially in the region of Bird Head of Papua Island, are not only the responsibility of BKSDA Papua II as the holder and the carrier of area management task, but it is the responsibility of us and all Papuan in order to preserve and to inherit the nature richness that is uniqueness and extremely rich to the next generation in this land.

Finally, all praises and thankful, we give to God Almighty who has given protection, blessings and mercy that are invaluable, so that the process of this program can be well accomplished.

Sorong, August 2005

Head of BKSDA Papua II,

Ir. Fransisco Moga, MP.



FOREWORD

Glorify and Thankful we prayed to Sovereignty God who has helped giving strength and health, accompanying and guiding us, so we are able to well accomplish the process of formularizing the document of Area Management Plan (RPK) of Bintuni Bay Nature Reserve (CATB).

This document is made through a series of phase of discussion program both formal and informal that have been done by Composer Team RPK of Bintuni Bay Nature Reserve either in internal team such as consolidation and coordination that was implemented regularly, or in external team such as public consultation and field survey. Series of process phase that have been carried out by Composer Team of RPK CATB, in general, there are consisted of several phases of program, namely:

- Formularizing a work-plan for the internal purpose of the Composer Team RPK of Bintuni Bay Nature Reserve; held in TNC Office, Southeast Asia Center for Marine Protected Areas (SEACMPA) Bali on March 6 – 8, 2005.
- Tracing information that has been conducted in Bintuni Bay Nature Reserve collaborating with some stakeholders such as Papua State University (UNIPA), CRMP Jakarta and Bintuni Coastal Partnership (Mitra Pesisir Bintuni), Regional Government Bintuni Bay included some related offices, BKSDA Papua II and KSDA Resort Bintuni, BP Tangguh, TNC Bali, and some of local NGO in Manokwari, held on February – April 2005.
- 3. Consultation, coordination, and socializing the program of formularizing RPK Bintuni Bay Nature Reserve to Bupati of Bintuni Bay, Related Office in Bintuni Bay, Community that represented by "Adat" Community Institution (LMA) Bintuni and Lemasom, and Mitra Pesisir NGO, held on March 2005.
- 4. Village meeting and Rapid Social Assessment (RSA) in 14 kampongs/subdistricts located inside and around Bintuni Bay Nature Reserve, and also Rapid Biological Assessment (RBA) in order to collect data on SOSEKBUD and biology of the area; implemented during end of March to early of May 2005.
- 5. Special workshop with all people whom reside inside and surrounding the area and representing by head of kampong, head of tribe, and community figure in every kampong where have a direct access to the area of Bintuni Bay Nature Reserve on June 1, 2005.
- 6. Workshop of description and formulation on draft of Management Plan of CATB that was held on June 2, 2005 in Bintuni.
- 7. Scientific Review on draft of Area Management Plan of Bintuni Bay Nature Reserve by Dr. Sukristijono Sukardjo, DS.c, APU (Mangrove Researcher, Center of Research and Development Oceanology (Puslitbang Oseanologi-LIPI).
- 8. Presentation Draft of Management Plan Bintuni Bay Nature Reserve that was done on July 22, 2005 in the Department of Forestry, c.q. Forest Preservation and Natural Conservation, Jakarta. The program were attended by Bupati of Bintuni Bay, Rector of Papua University, Head of Bappeda West Irian Jaya Province and Bintuni Bay Regency, related office (Forestry Office, and Marine and Fishery Office) in Bintuni Bay, Coordinator of Monitoring Board, and Community of Bintuni Bay that was represented by a leader of "adat" community and Lemasom.
- 9. Approval of document Area Management Plan of Bintuni Bay Nature Reserve by Directorate General Forest Protection and Natural Conservation (Dirjen PHKA) in Jakarta.

The contents of this document are consisted of general description of area, policy, problem analysis, action plan, budget, organizing, and monitoring and evaluation, Specifically for



action plan is focused on seven aspects, namely Area Stabilization, Improvement effectivity of Area Management, Development Species Conservation and Biodiversity, Protection and Securing of Area, Promoter/institutional, benefit, and aspect of supporting facilities and infrastructure of Management Program.

Document of Area Management Plan of Bintuni Bay Nature Reserve is as a general guidance for program that is hoped to be realized by the stakeholders in the program of management the CATB area according to the authorities and main duties and function. Implementation of further management action is a main duty and function and also authority of BKSDA Papua II, Government of Bintuni Bay Regency and the stakeholders in the area, and then it is not a task of Composer Team RPK CATB. However, the implementation of program is not a side responsibility of area management and regional government, but it is a mutual responsibility of the stakeholders in the area and also the Bintuni Bay community in supporting and succeeding its implementation.

With finalizing the document of Management Plan Bintuni Bay Nature Reserve, in this opportunity, we would like to give our thanks to:

- 1. Bupati Bintuni Bay that has given his serious attention and supported us, so that all activities process can be well run.
- 2. Regional Planning Board (Badan Perencana Daerah) Bintuni Bay Regency and its staffs for helping and guidance during process of formularizing this document.
- 3. Head of Natural Resources Conservation Center (BKSDA) Papua II for supporting, helping and cooperating that given to us, so that coordination and collaboration could be done smoothly and successful.
- 4. The Nature Conservancy (TNC), Southeast Asia Center for Marine Protected Areas (SEACMPA) Bali, for supporting, aids and facilities, so that the composing process of this document could be well realized.
- 5. The Papua State University (Unipa) Manokwari and Trisakti University Jakarta for providing technical assistant and information so that this document can be well completed
- 6. Friends in PS2AL Bogor for their support and information; and from BP Indonesia especially Mr. Jalal, Piere and Habel. Thanks
- 7. Technical related institution and offices and also to all parties that we cannot mention one by one here.
- 8. People of Bintuni Bay, especially the community living in Kampongs inside and around the area of Bintuni Bay Nature Reserve.

May this document can become a book guidance and basic instrument for BKSDA Papua II Sorong and the government of Bintuni Bay Regency as an effort in development of management program of Bintuni Bay Nature Reserve area, so that providing benefit as much as possible for the community of Bintuni Bay and also to realize the management of Bintuni Bay Nature Reserve area in a sustainable and efficient way.

Mendama Tambe Jaga Tane Cagar Alam Teluk Bintuni

Bintuni, August 2005

The Nature Conservancy

Team of Bintuni Bay Nature Reserve





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I. INTRODUCTION

A. BACKGROUND

The experience of monetary crisis and its impact either on economic system or national environmental (ecology) system, should realize the Indonesian nation to improve management of nature resources and environment in order to achieve the sustainable development. One effort that should be done for the sake of the entire resource management is the optimalization of the right use of resources that could cover all the interest components.

A coastal area has a good prospect to increase the national economy, either because of the number and the growth rate of the population is large in this area or the richness of its Nature resources. On the other hand, however, these advantages are also creating some stresses on the resources. It is indicated with coming out of some problems in the coastal area. Some of marine and costal areas in Indonesia, such as Northern coast of Java, Malacca strait, Jakarta Bay, and etc, have been damaged which over the tolerant of environmental carrying capacity, like over exploitation of mangrove and coral reef that eliminates their function as Nature protection against storm and wave, over fishing that causes some species fish that have an important of economic value will disappear, and also pollution of coastal marine could decrease fish production by destroying fish nursery and other value habitat (Cicin-Sain and Knecht, 1998).

One of the ecosystems found in the coastal area that has an important role in the management of coastal and marine resources is mangrove ecosystem. The most important of mangrove function for coastal area is as a connecting of land and sea, also as a substance for several Nature phenomena caused by marine, such as abrasion, wave, storm, and also as a buffer for other living organisms which functioning as source of income for people there. Beside that, other important ecological function of mangrove forest are as nursery ground, feeding ground, and spawning ground for some of marine organisms (fish, shrimp, and crustacean), either living in shore or offshore marine. According to Kusmana and Onrizal



Figure I-1. Bintuni Bay Nature Reserve

(1998) at the ecosystem level as a wetland, a mangrove forest generally functioning as (1) land development and mud sedimentation, (2) fauna habitat mainly marine fauna, (3) agricultural land and salt pond, (4) protecting marine ecosystem globally, (5) beauty of unfolding land, and (6) education and training.

Mangrove forest is close related with fishery production level. This fact can be seen that

some potential fishery areas in Indonesia such as in the eastern sea of Sumatran, the southern and eastern sea of Kalimantan,



Cilacap coast and southern coast of Papua, where all areas are still boundary with the huge and virgin mangrove forest. In other side, it was known that a decrease of fishery production in Bagan Siapi-api which before the Second World War it was a place of main production of fish in Indonesia, it is because of deterioration of mangrove in its environment (Noor et *al.* 1999).

How large the role of mangrove forest or mangrove ecosystem for life it can be known from how much species of fish and animals that living either in marine, inland, or in the vicinity of



mangrove trees. Another important function is as а production of organic material that is a main link of food web of forest mangrove Fallen ecosystem. leaves of mangrove will be decomposed to be *detritus* particles through а decomposition process

Figure I-2. Mangrove Forest in Bintuni Bay Nature Reserve

by microorganisms. Detritus is a food for worms and mysidceae (small shrimp/rebon). Then, detritus-eater animals will be a food for fish larvae, shrimp, and other animals. At the next stage, those animals will be a food for other larger animals and so on to produce fish, shrimp and several other foods that are useful for human kind (Sugiarto and Willy 1995 In: Suhaeb, 1999).

Mangrove ecosystem provides food, shelter and reproduction place for wildlife, and also for some endemic and endangered species such as Sumatran tiger (*Pantera tigris sumatranensis*), bekantan (*Nasalis larvatus*), and some species of berang-berang (otters) (Noor 1995). The high economic-value product of mangrove ecosystem is fishery. A lot of fish species that have a high economic-value spent more than half of their life cycles in mangrove habitat (Sasekumar *et. al.*, 1992).

The human community living in the neighborhood of mangrove forest is also highly depending on the mangrove ecosystem, because the community can play a role as a destroyer or a protector of mangrove forest. Therefore, it is needed efforts that they can improve and increase people participation and a good management so the multiple function of mangrove forest can be well run and be optimal used.

Indonesia has a large area of mangrove forest, it is about 4,152,000 ha, but according to Spalding (1997) *in* Noor *et al.* (1999), this area has reduced up to 40% mainly in 1990-1999. The decrease of mangrove area in coastal site is indicated by the mangrove area that was deterioration. Based on data provided by the Forestry Department in 1997, from the total 8.7 ha of mangrove forest, 5.9 ha has been damaged, and only remain 2.8 ha that has good condition. The causing factors that deteriorated such as mangrove conservation activities are changing to other purposes which are main affected by society demanding for settlement,



pond, agricultural land, ship landing, and other buildings. From the main environmental issues it can be drawn a conclusion that mangrove forest as an ecosystem in coastal area has been deteriorated; the area and quality have been reduced up to 68 percent.

In line with more mangrove eroding, the abration-erotion rate in coastal area shows a trend that much higher. The occurrence of abrasion-erosion process is indicated with the facts that showing up the coastline in several places for example in west Kalimantan and in Rembang Regency in which it almost reaching road surface, destroying coconut plantation area and some other agricultural lands belong to the local people. The damage of coastal area has a big impact more than 80 percents, in which the abrasion has moved away about 3 - 5 m from the position of five years ago which about 30 - 40 m.

Irian/Papua Island is an island that has large enough of biodiversity. The island has 5-7% of worldwide biodiversity. It can be understood because geographically Irian Island has wide variances, beginning from mountain with ice covering, mountainous vegetation, and lowland until to pitch forest. In Irian it can be found also 14 ecoregion terrestrial and 5 ecoregion marine. From these 19 ecoregions, 8 ecoregions that documented by Global WWF have 200 habitats.

Inside Bintuni Bay area that is ecoregion # 129 there is a very wide mangrove area and even it is the widest of mangrove area all over the world. Satellite Citra analysis TNC (2003) showed that in the Bintuni Bay there is still a mangrove forest with the area of 435,168 ha, and it is the largest mangrove area where located in one area in Indonesia. A research done by Ruitenbeek (1992) found out that mangrove forest in Bintuni Bay supported the existences of some industries and it is large enough economically. From fishery sector it yielded

The Nature Conservancy



Figure I-3. Abration in Mangrove Forest at Bintuni Bay Nature Reserve

US\$ 35 million yearly, chips wood US\$ 1.5 million and artisanal fishery US\$ 10 million yearly.

Nature Reserve in Bintuni Bay has been proposed firstly by WWF in the early of 1980 with the total area of 450,000 ha (Petocz, 1983). This propose then being followed up with official remarks from Department of Agriculture of Republic of Indonesia through a ministerial directive of the Ministry of Agriculture number 182/Kpts/UM/II/1982 which determined the area of Nature reserve was 300,000 ha. In 1991 PHKA/AWB revised the areas and proposed it to be 260,000 ha (Zuwendra et al., 1991). The execution of area boundary in 2000 by Biphut Manokwari decided that the final area of the reserve was 124,850 ha, and it was indorsed with the Ministerial Directive of the Ministry of Forestry number 891/Kpts-II/1999. In the same time, the economic development in the Bintuni Bay keeps growing up. Shrimp industry, woodchips and LNG and establishing of new regency has been demanding for developing many infrastructures. As a result of this development, either directly or indirectly, it can have an impact to the Bintuni Bay Nature Reserve.



Up to now, a plan for managing the Bintuni Bay Nature Reserve has not yet been arranged. Now days the area is under control by Head of Resort and it has only forest rangers with supporting facilities are very limited to do a monitoring task. Unavailability of the management plan makes activities to manage the Nature reserves are unsystematic and even they almost are not at all. As a result of new regency, the regency government needs a good management of Nature reserve. USAID and CRMP/Coastal Partner have made the management plan of coastal area of Bintuni Bay, the document has been used also as a reference to prepare the management plan for the conservation area of Bintuni Bay Nature Reserve. Besides that, in Bintuni Bay Development Strategy, to involve supporting from the external government is an important concern for development of Bintuni Bay. UNDP and BP have been involved in utilization of Nature resources and the development of institutional government capacity.

In the area of the Bintuni Bay Nature Reserve, particularly, it has been done several surveys and researches, especially in mangrove ecosystem areas. The results of those surveys and researches might be used as ecological information of Nature reserve areas. The survey indicated that mangrove in Bintuni Bay Nature Reserve is categorized to the system that relatively uncomplex – there are only 20 mangrove species, compared to the lowland forest in surrounding that has 1200 plant species. However, the mangrove ecosystem of Bintuni Bay Nature Reserve has an important role for the economic growth in Bintuni Bay region. The dependency of people on fishery resources from the area, the exploitation of wood for firewood and building material and the sedimentation as an impact of improper management on the upstream area, will become a threat for Bintuni Bay Nature Reserve. The management existence of Bintuni Bay Nature Reserve that available is relatively not yet effective and efficient. Therefore, it is hope that with the good management plan for Bintuni Bay Nature Reserve, the mutual monitoring between BKSDA Papua II and the Regional Government of Bintuni Bay Regency will be more easily.

B. OBJECTIVES

The objectives in managing the Bintuni Bay Nature Reserve beside to sustain the mangrove forest habitat, nypa forest and the coast inside the area are the following:

- 1. Guarantee the protection for life of coastal area biota and territorial water, and also to protect endangered species.
- 2. Assurance the sustainability of Nature resources for research, science, education, limited use for local people and Nature tourism development.
- 3. Organize a certain structure for joint management that more independent and proper capacity.



4. Implement the traditional use zone with providing an exploitation right of fishery resources inside the reserve area especially for the local people living surrounding the area.

C. TARGETS

The target of management Bintuni Bay Nature Reserve is to achieve the sustainability and protection biodiversity inside the area of Bintuni Bay Nature Reserve through the pattern of comprehensive management that is not only efficient, but also effective. Therefore it will be able to guarantee the existence of endangered and endemic biota, and also to guarantee the utilization of resources by sustainable use in order to support local economic development.

In General the target of management included the aspects of (i) protection, (ii) conservation, (iii) education, (iv) utilization resources under the principle of environment and sustainable, and also (v) improvement of management system.

C1. Protection

- \notin Legalization on the area boundaries both in the mainland/river and in the sea.
- ∉ Applying of zonation system in Bintuni Bay Nature Reserve that protects all regions where has high biological value.
- ∉ Applying effective monitoring system by forest rangers officers of Bintuni Bay Nature Reserve to enforce the regulation.
- ∉ The understandable and applicable regulation of Bintuni Bay Nature Reserve and it can guarantees the protection of Nature resources and respects the traditional use.
- ∉ Protection and maintaining the function of spawning ground of fish and waters biota.
- e Protection and preservation of fauna and flora of the area in their Nature habitat.
- ∉ Harvesting activities are limited that not threatening any species population inside the area of Bintuni Bay Nature Reserve.

C2. Conservation

- ∉ Flora and Fauna of the reserved area are preserved in their Nature ecosystem.
- ∉ To intervene the effective management if there is a species or ecosystem that be threatened.
- \notin Maintenance as well as possible the migration routes of animals inside the area.
- ∉ Development and application in effective ways the monitoring and evaluation system.
- \notin Rehabilitation or recovering of region that have environmental degraded.



C3. Education

- ∉ To develop facilities and infrastructure for education and research regarding Nature resources conservation in Bintuni Bay Nature Reserve.
- ∉ To enhance the awareness and responsibilities of the community live around Bintuni Bay Nature Reserve on the preservation area.
- ∉ To improve the skill of the local people to provide a community protection on the area of Bintuni Bay Nature Reserve.

C4. Resources Utilization

Fisheries and Hunting

- ∉ Utilization of fisheries and hunted animals resources on the area traditional use.
- ∉ Protection on fish spawning especially where located inside the area of Bintuni Bay Nature Reserve.
- ∉ To develop indigenous knowledge that supports the sustainable use of fisheries and hunted animal resources.

Research

- ✓ Organizing the agreement regarding the intellectual ownership rights especially for indigenous knowledge
- Implementation a monitoring and biological inventory plan for habitat in Bintuni Bay Nature Reserve, particularly for the habitat that vulnerable and species that in endangered status.
- ∉ Preparing a research plan as whole and will be carried out by collaborating with intellectual partners especially for handling the important issues for the area.

C5. Improvement Management System

- ∉ Development and Application of sustainable management system for Bintuni Bay Nature Reserve.
- ∉ Improvement human resources capacity especially they who direct involved in management of Bintuni Bay Nature Reserve.
- ∉ Enhancement facilities and infrastructure of Nature resources
- ∉ Improvement local stakeholder positive participation in order to support area management
- ∉ Training for improvement the skill of officers mainly the rangers of Bintuni Bay Nature Reserve so that they are able to monitor ad manage Bintuni Bay Nature Reserve more independently.



D. SCOPE

Management plan of Bintuni Bay Nature Reserve consisted of Long-term Management Plan (25 years) and Short-term Plan (5 year First). The plan are composed of policy, problem analysis, detail activity and phasing activity either for development of facilities-infrastructure, area potential management, forest protection and security, coordination, research and education.

E. VISION AND MISSION OF BINTUNI BAY NATURE RESERVE

Concept for the area management is necessary to have an ideal goal. Therefore it should have a vision and mission, in which this concept will be struggled by the management. The concern center or management vision of Bintuni Bay Nature Reserve until year 2030 is **REALIZING THE MANAGEMENT OF BINTUNI BAY NATURE RESERVE AREA ACCORDING TO ITS FUNCTION SUSTAINABLY AND EFFICIENTLY**. The Vision or concern center can be realized if only all stakeholders build a commitment that reflected in concerning to implement an action to preserve the area of Bintuni Bay Nature Reserve and also to build public awareness in the entire region of Bintuni Bay Regency.

Mission is a declarative description regarding the objectives that want to be achieved by an institution, organization, or activity. Based on some management issues as described in the following chapter, therefore missions that are assigned in managing the Bintuni Bay Nature Reserve for the next 25 years, are:

- 1. To enhance database and information system adequately.
- 2. To increase an effort for law enforcement on the activities that can degrade the area quality.
- 3. To improve the people awareness inside and around the area about the importance of the existence of the area as a life support system.
- 4. To improve the community life quality in and around the area through empowerment program.
- 5. To create an integrity and quality of Bintuni Bay Nature Reserve area.
- 6. To improve the performance and the capability of the area management.

This mission will be described further to be a program and action plan in document of Management Plan of Bintuni Bay Nature Reserve.

F. APPROACH METHODS

Considering that targets of this study is to be composed a management plan of Bintuni Bay Nature Reserve area and its surrounding (year 2005 – 2024) through an ecosystem approach and community based, and be available of action plan for five years.



The action plan of conservation management area of Bintuni Bay Nature Reserve has a number of action component that based on area potency and also area problems, so that it is needed a principle for integrated approach in arranging Management Plan Bintuni Bay Nature Reserve. It is intended so that the management plan can be used as guidance for Nature Resource Conservation Center (BKSDA) the region of Papua II – Sorong and Department of Forestry c.q. Directorate General Forest Protection and Nature Conservation, and also Regional Government of Bintuni Bay Regency to manage the conservation area of Bintuni Bay Nature Reserve. The approach framework that will be used in arranging management plan it is presented in Figure 1.4.

To look at the function and the role of each of the stakeholders, it was done a stakeholder analysis, especially the stakeholder whom has a role on Bintuni Bay Nature Reserve (BBNR/CATB) area. It is so that the obtained data and information regarding condition, activities, perception and aspiration about BBNR covering all stakeholders (Table 1.1).

	Table I.1. Stakeholder in around	l Bintuni Bay Nature R	Reserve (BBNR)
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No	Stakeholder
1	Department of Forestry BKSDA Papua II Bintuni Resort
2	Bappeda Bintuni Bay
3	Forestry and Environment Service of Bintuni Bay
4	Fishery and Marine Service of Bintuni Bay
5	Harbour-master of Bintuni Bay
6	Agriculture and Plantation Service of Bintuni Bay
7	Non-Government Organization (NGO)
	1. Costal Partner
	2. Custom Society Institute Bintuni
	3. Custom Society Institute Lemason
	4. Dialogue Forum of Bintuni Bay Community Development Foundation
	/ YFDPMIB
0	5. Youth Union of Bintuni Bay
o	Community
	A. Community inside area * Idoor District
	1 Mamuranu Villago/Anak Kasih (Lovo Child)
	2 Tirasai Village
	B. Touching to the areas
	* Bintuni District
	1. Pasamai Village
	2. Bumi Waraitama Village (SP 1)
	3. Banjar Ausoy Village (SP 4)
	4. Tuasai Village
	5. Argo Sigemerai Village (SP 5)
	6. Korano Jaya Village (SP 2)
	C. Outside Area
	* Bintuni District
	1. East Bintuni Sub-district
	2. West Bintuni Sub-district
	* Idoor District
	1. Yakati Village
	2. Yensei Village
	* KURI DISTRICT
	1. Naramasa Village



Some stakeholders that have been seen their roles and functions are: Department of Forestry-BKSDA Papua II Sorong, Sub-BKSDA Bintuni Resort, Forestry and Environment Service of Bintuni Bay Regency, Fisheries and Marine Service of Bintuni Bay Regency, Agriculture and Plantation Service of Bintuni Bay Regency, NGO (e.g. Coastal Partner, Customary Society Institute-CSI Bintuni, CSI-Lemason, Forum Dialogue Institution of Bintuni Bay Community Development, The Youth Union of Bintuni Bay), and the people from villages whom have a boundary with or inside the BBNR. Interview to the government institutions was done purposively, in which for the government there were two people, for the NGO there was one person, meanwhile for the community group there were five people (head of village, religious leaders, traditional leaders, and two members of Community. Total of respondents were 87 people, in which 70 respondents were the members of BBNR community.

Rapid Socio-economic Assessment Method – RSA method has been applied to obtain the figure of perception and social economic-cultural condition of the local people whom living in neighborhood of the BBNR areas. RSA is an in-depth-interview approach and focused group discussion (FGD) in which the researchers only became a discussion facilitator.

FGD has been conducted to get a lot of information in relatively short time. However, Interview in-depth has been done to dig up data based on certain cases that could not be uncovered from discussion, such as experiences, senses and motive from individual or groups. Interview done with using questionnaire in order to make questions more focus, and to avoid not asking things that should be asked.

Data used are secondary and primary data. Secondary data gathered from several related institutions and NGOs that active in Bintuni Bay development. Primary data have been collected during the period of composing process of the management plan of Bintuni Bay Nature Reserve. Data have been analyzed qualitatively to figure out the relationship between one data and others. In addition, to get the management plan of Bintuni Bay Nature Reserve, it was done SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis.

Biological aspect of the areas has been studied based on field survey and crossed study with publication and research reports that has been conducted in Bintuni Bay Nature Reserve areas and adjacent, and some information which was obtained from literature study, interviewed with stakeholders. To study structures and species composition of flora and its potency, sampling has been taken with using line-plot sampling method, and also with exploration in several location where determined based on ecosystem type (Soerianegara, 1998). In each observation plot it was conducted a record of kind of species, amount, height, and diameter (for vegetation level of standing and tree). Besides that, in the location of flora observation, it was done also an observation for the existence of wildlife species with using direct seen, footprint/trail, and noisy methods. In addition of direct observation, information of the wildlife existed in Bintuni Bay Nature Reserve was also obtained from interviewing the local people whom living in villages found inside or nearby the visited areas.



Management Plan of Bintuni Bay Nature Reserve





Figure 1-4. General Framework of Organizing Management Plan of Bintuni Bay Nature Reserve

Introduction

I - 10



Several things that should be considered in arranging Management Plan of Bintuni Bay Nature Reserve are as follows:

- a. To achieve the benefit of conservation area of Bintuni Bay Nature Reserve in sustainably and integrated it is necessary to consider the vulnerability of conservation area ecosystem, Nature resources capacity and people dependence in around Bintuni Bay Nature Reserve.
- In making decision and other programs especially in management plan of conservation area of Bintuni Bay Nature Reserve it is important to involve component of fisheries and marine sector, costal partners and custom "adat" community;
- c. In order to establishment the benefit of resources in the area of Bintuni Bay Nature Reserve, therefore the regulation about an access to the resources should consider community right in surrounding the area of Bintuni Bay Nature Reserve and the activity that practiced from generation to generation that reflected indigenous knowledge in Nature management as long as the method is adequate with the sustainable development principle.
- To involved people since the beginning of plan is aimed to avoid conflict among the user of conservation area especially with the user group from the environment in around Bintuni Bay Nature Reserve;
- e. To solve conflict that maybe happened from the related sector to the conservation area and among the user group of Bintuni Bay Nature Reserve area it should be determined a right procedure and mechanism at administration level;
- It must being increased the public awareness about the importance of protection and management of Bintuni Bay Nature Reserve and for the Arrangement of the Bay Area Use Plan and their participation whom affected in management process;
- g. To help making decision regarding Bintuni Bay Nature Reserve it is necessary to be done a study with considering ecology, economy, social and cultural factor;
- h. To planning the arrangement of Management Plan of Bintuni Bay Nature Reserve it is important to consider some main aspect that be a guidance, namely:
 - ∉ Existence of <u>ecological related</u> either between mangrove ecosystem and water territory inside the conservation area with the cultivation area of people;
 - ∉ In a conservation area, The Arrangement of Management Plan usually there are more than one group of Nature resources and environment services that can be developed for the development purpose;





- ∉ Either ecological and economic, the use of conservation area in monoculture perspective, it is very vulnerable on internal or external change toward the failure of business;
- ∉ Conservation area of Bintuni Bay Nature Reserve in general is <u>open access</u> <u>resources</u>, even though specifically in Papua there is a custom right regulation, but the access is quite be opened to be used by all people.
- i. Sustainable development principles become guidance in arranging the Management Plan of Bintuni Bay Nature Reserve area. Dimension factor of ecologic, social-economy, social-cultural, law and institutional are the factors that plays a role in organizing Management Plan of Bintuni Bay Nature Reserve (Figure 1-5).



Figure I-5. Hierarchy of Priority Determination on Management Program of Bintuni Bay Nature Reserve

Indicator criteria of sustainable development

Ecology:

- a. Sustainability of ecosystem and its function (mangrove forest)
- b. Sustainability of species biodiversity that protected and endemic
- c. Carrying capacity of environment on utilization activities
- d. Maintenance of water quality (sedimentation is not so big)




Economy:

- e. Increasing Regionally Generated Revenues (PAD)
- f. Impact on macro economy
- g. Improvement people welfare especially the user of mangrove area
- h. Continuity of business and accountability

Social Culture:

- i. Maintenance the indigenous knowledge and local culture
- j. People security and peacefulness
- k. People health
- I. Improvement knowledge and skill

Regional:

- m. Area Accessibility
- n. Position of Area from the point of view of Province and Regency Spatial system
- o. Position of area based on geographical condition
- p. Status of Land ownership





II. GENERAL DESCRIPTION OF AREA

A. HISTORY OF AREA

A.1 General Information of Area

A.1.1 History of Area Determination

The Bintuni Bay Nature reserve (CATB) was proposed at the first time by WWF in 1980s. Several considerations as a based to propose the area to be a conservation area are the followings:

- 1. The existing mangrove is the best family mangrove found in Papua (former named Irian Jaya);
- 2. The area is important for buffering activities of commercial fisheries and shrimp industry;
- 3. The area is an important habitat and central of most dense population for the reproduction of some species of estuary crocodiles (*Crocoylus porosus*), in this area there are about 160 bird species, more than 17 marsupial, and about 39 mammals species (Petocz, 1987).

In terms of the surface area, the area has been changed several times. The area proposed by WWF in 1980s covered about 450,000 ha (Petocz, 1983) (Figure II.1).



In the early of 1982, Department of Agriculture of the Republic of Indonesia proposed an area of proximately 357,300 ha included mangrove forest group Aramasa River, Weperar River, Wagura River, and Kaitero River to be enacted as the area of Bintuni Bay Nature Reserve. However, the area just has been formallegally designated as nature reserve area on November 10th 1982 through Ministerial directive of Ministry of Agriculture number 182/Kpts/UM/11/1982 that covers the area of 300,000 ha.

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The surface area was actually smaller than what it has been proposed before i.e. 357,300 ha. It is because the area 57,300 has been functionally conserved to be a production forest referring to Forest Agreement No: FA/N/024/XII/1982, on December 22nd, 1982 between the Ministry of Agriculture of the Republic of Indonesia and PT. Bintuni Utama Murni Wood Industries (PT BUMWI) regarding realization letter of request of PT. BUMWI No. 07/su-1/1980 dated January 9th, 1980 that was addressed to Ministry of Agriculture in order to get the Commercial Forestry Concession (HPH) in Irian Jaya Province region.



Figure II-2. The area of Bintuni Bay Nature reserve made by Sub Biphut Manokwari 1999.

In 1991, AWB/PHKA conducted a study for revising the area of Nature reserve as it has been determined by Decree of Ministry of Agriculture No. 182/Kpts/UM/11/ 1982 and the propose of WWF/IUCN/PHPA in 1983. It is due to there is an overlap of the allocation between CATB and the area of Commercial Forestry Concession (HPH) in the adjacent of Bintuni Bay, such as PT. Henrison Iriana, PT. BUMWI, and PT. Yotefa Sarana Timber.

Based on some alternatives above, AWB/PHKA proposed an area about 260,000 ha as Bintuni Bay

Nature reserve area included the bay water territory of about 60,000 ha with the coordinate of within east longitudes $133^{\circ}13' - 134^{\circ}02'$ and south latitudes $2^{\circ}02' - 2^{\circ}30'$.

In 1997, the first implementation of boundary in Nature reserve was done by PT. BASRICO CEMERLANG, which was an HPH area association boundary of PT. Henrison Iriana with the boundary length that was realized 77,247.76 meters. Furthermore, the second phase of the boundary regulation was implemented by Inventory and Forest Mapping Substation / BIPHUT Manokwari in 1999, that was outside and zone boundary (coiled / ring meet] with the realization of boundary length was 172,846.20 meters. This area then was determined with the Ministerial Directive of Ministry of Forestry No. 891/KPTS-II/1999 regarding determination of Provincial Forest Areas and Papua territorial waters as Nature reserve. Therefore, the total area of Bintuni Bay Nature reserve is 124,850 ha [Figure II.2].



A.1.2 Site and Area

Based on the allocation of Governmental administration, the area of Bintuni Bay Nature reserve (CATB) is located in the authority region of Regional Government of Bintuni Bay Regency, West Irian Jaya Province (IJB). Bintuni Bay Regency is one of the regencies, which is formed as a result of the development of Papua Province. The regency was just officially recognized in 2002. At the District level, this nature reserve area is under the administrative region of Bintuni District, Idoor District, and Kuri District.

Based on the region allocation of forest management and Natural Resources Conservation area (KSDA), the Bintuni Bay Nature reserve (CATB) is in the region of KSDA Resort Bintuni and KSDA Resort Babo, Conservation Section of Regional I Manokwari, Natural Resources Conservation Station (BKSDA) Papua II which situated in Sorong, West Irian Jaya.

The Bintuni Bay Nature Reserve is situated in eastern side of water territory of Bintuni Bay. Geographically, it is located between 02°.02'-02°.30' South Latitude and 133°.31' -134°.02' East Longitude, with the regional boundaries as follows:

- ∉ In the North, it is bounded with the HPH area of PT.Yotefa Sarana Timber
- ∉ In the South, it is bounded with Naramasa River and HPH PT BUMWI
- ∉ In the West, it is bounded with Wasian River, and Bintuni Bay Water territory
- \notin In the East, it is bounded with District Idoor and HPH PT Henrison Iriana

According to the Decree of Ministry of Forestry No. 891/KPTS-II/1999 regarding the determination of Forest Area and Water Territory of Papua Province, the area of Bintuni Bay Nature Reserve is 24,850 ha, where more than 90% is mangrove forest ecosystem.

A.1.3 Accessibilities

Bintuni Bay Nature reserve area (CATB) can be accessed from some places. To reach the area from the Capital of West Irian Jaya Province (Manokwari) or from Sorong, it can be taken by using airplanes like Twin-Otter type (light aircraft) that belongs to Merpati Nusantara Company to Bintuni Town (the Capital of Bintuni District) in about 45 minutes; or the other way, by land transportation like Toyota Hard-top from Manokwari which takes about 10 to 12 hours. Meanwhile from Bintuni Town, the CATB area can be accessed by two ways, namely (1) by using four-wheel and two-wheel vehicles to the north boundary of area with the time taking about 10 - 15 minutes; (2) by using longboat to sail along Steenkol/Wasian River to the west boundary of the area with the travel time about 30 to 45 minutes. From field observation, the CATB area can be also accessed from several villages that located in the north boundary of area as presented in Table II-1.





Table II-1. District and Villages that have the nearest access to the Bintuni Bay Nature reserve Area

No.	Villages	District	Distance to CATB	Means and Types of Transportation
1	East Bintuni Subdistrict	Bintuni	∂ 2 km	River and Land Road, row-/motorboat and two/four-wheel vehicles
2	West Bintuni Subdistricts	Bintuni	∂ 3 km	River and Land Road, row-/motorboat and two/four-wheel vehicles
3	Kampong Pasamai	Bintuni	∂ 2 km	River and Land Road, row-/motorboat and two/four wheel vehicles
4	Waraitama/SP 1	Bintuni	∂ 2K m	Land Road, two/four-wheel vehicles
5	Korano Jaya Village/ SP 2	Bintuni	∂ 1 Km	River and Land Road, row-/motorboat and two/four-wheel vehicles
6	Banjar Ausoy Village/SP 4	Bintuni	∂ 1 km	River and Land Road, row-/motorboat and two/four-wheel vehicles
7	Tuasai Village	Bintuni	∂ 1 km	Land road, two/four-wheel vehicles, on foot
8	Argo Sigemerai Village/SP 5	Bintuni	∂ 2 km	Land Road, On Foot
9	Tirasai Village	Bintuni	inside CATB area	-
10	Mamoranui Village	ldor	inside CATB area	-
11	Anak Kasih Village	ldor	inside CATB area	-
12	Yakati Village	ldor	∂ 15 km	River, row-/motorboat
13	Yensei Village	ldor	∂ 10 km	River, row-/motorboat
14	Naramasa Village	Kuri	∂ 5 km	River, row-/motorboat

Source: Survey Result of Tim TNC (2005)

A.2 Physical Condition of Area

A.2.1 Climate

The Bintuni Bay Nature reserve area falls into tropical zone and based on Koppen Climate Classification, it is classified into Afa Climate type, which is a wet tropical region with high temperature. However, if based on Schmidt and Ferguson Classification, this Reserve Area is a type A climate, the very wet zone.

The monthly rainfall in the area of Bintuni Bay Nature reserve is varied enough. The highest monthly rainfall is occurred on February with the maximum precipitation is 38.61 inches (980.69 mm), and the average of precipitation is 17.32 inches (439.93 mm); while, the lowest monthly rainfall is occurred on September with the maximum precipitation is 5.17 inches (131.32 mm) and the average of precipitation is 3.34 inches (86.36 mm).



The area of Bintuni Bay Nature reserve and its surroundings the air temperature is varied from 20.02°C to 37.26°C for data base three-year observation.

The maximum temperature occurred during Northeast Monson season, that is when the maximum rainfall. During annual cycle period, however, the average monthly temperature is varied ranging from 25.74° C to 27.50° C with the variation not more than 2° C. The monthly average value of air temperature is 26.92° C with almost 54% measurable data is in the range of 23° C to 27° C, in which the highest average of monthly temperature is occurred on January.

The humidity in the area ranged from 40% to 100%, however, most of the observation results were more than 90%, and with the average for three years was 90.2%. The highest humidity is happened on night when air temperature is low and there is raining.

Data of wind speed for three years (1997-2000) figured out that the wind speed in Bintuni Bay and its surrounding are generally slow to moderate with the average of 8 m/second (28,8 km/hour).

The maximum barometric air pressure in the vicinity of Bintuni Bay Nature reserve is 1.013 millibar (mb) and its minimum is 998,6 mb. The average air pressure through measurement period is 1,006.1 mb. with measurement range relatively lower, and about 90% of data are ranging from 1,002.5 mb to 1,010 mb (BP Pertamina, 2002).

A.2.2 Geology

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Physiographically, the area of Bintuni Bay Nature reserve (CATB) is composed of swamp / tidal swamp that commonly are consisted of mangrove vegetation. Soils in the area are formed from main material of younger or recent alluvium from quarter age that covered Tertiary acid sediments and Pleistocene such as sandstone, shale, and conglomerate (PT BUMWI, 1994).

The area of Bintuni Bay Nature reserve is the place subject to earthquakes and it is usually followed by tsunami wave because of the area is inside the active tectonic zone due to collision of two large plates.

A.2.3 Watershed (DAS) and Hydrology

Generally, the area of Bintuni Bay belongs to the watershed block of Muturi, Aramasa, Korol-Bomberai, and Remu. Inside the areas of Bintuni Bay Nature reserve there are some big rivers that empty to Bintuni Bay and they are sub-watershed from those watersheds begin from west side, i.e. Wasian River, Muturi River, Bokor River, Tirasai River, Sumber River, Kodai River, Rarjoi River, Kamisayo River, Tatawori River, Sorobaba River, Yakati River, Yensei River, Sobrawara River, and Naramasa River. Those rivers are functioning as cistern



areas for some of tributaries that empty to them and then they arrange drainage to Bintuni Bay.

Those rivers have large enough of flow velocity, therefore on rainy season particularly in the part of upper course of the rivers, the discharge of those rivers can rise several times and sometimes can cause flood (inundate surroundings). At the rainy season and the discharge increase, usually the color of river water turns to brown. It indicates that erosion has been occurred on the areas that drain the waters to the rivers at below. Besides the three rivers that always full-water, there are some dry rivers that have water (flood) when there is heavy raining.

The needs of drinking water and traditional bath place and toilets (MCK) for the community whom living in around of Bintuni Bay Nature reserve area, especially in the capital of Bintuni District, Idoor, and Kuri, are obtained from the well and from small rivers that flow across the edge of the villages. The community of Bintuni District (the capital of Bintuni Bay Regency) has water for drinking and washing from drilled well. The water needs for the people living in the villages outside the capital of district is much more supplied from large rivers or small rivers that flow nearby their villages.

A.2.4 Soils

The area of Bintuni Bay Nature reserve is predominantly covered by mangrove vegetation with soil type of organosols, peat, and alluvium with their characteristics as presented in Table II.2.

Soil Type	Characteristics
Organosols Organic	Water-logged, silt loam, gray, acid, high comparability, low-moderate permeability, low carrying capacity, and thickness 1.5-2 m
Alluvium	Fine – coarse Texture, low-high porosity, dark, poor drainage, alkaline, and little acid.

Table II-2. Soil Type found in the most of Bintuni Bay Nature reserve Area.

Source: Result Survey of TNC Team 2005 and Regional Govt. of Papua Prov., Regency Govt. Manokwari, UNIPA, CRMP, 2003.Gov. of Papua Province, Regency Gov. Manokwari, UNIPA, CRMP, 2003.

Areas that directly border on Bintuni Bay waters their soil are fluvial deltaltic with characteristics of fine bent, low relief, muddy, and beetling sand.



A.3 Biological Condition of Area A.3.1 Ecosystem

The area of Bintuni Bay Nature reserve consisted of two main types of ecosystem, namely lowland rain forest and mangrove ecosystem. Besides the two such ecosystems, in the Bintuni Bay Nature reserve area, it is also found the mix swamp forest ecosystem, but it is small area. The entire ecosystem is natural ecosystem and some of its vegetations are well maintained. The result of field survey by visiting several ecosystem sites (**Figure II.3**) indicated that in general vegetation condition of the two ecosystems is still well maintained, nevertheless some of them in the small extent of area have been degraded due to human activities.



Figure II-3. Survey Activity Location Map of Mangrove in the area of Bintuni Bay Nature reserve 2005

A.3.1.1 Lowland Rain Forest

This ecosystem is spread out mainly in the north and east boundaries of Bintuni Bay Nature reserve. It is a special uniqueness that in some sites of CATB area, this type of ecosystem can be found also in some mangrove islands, either in the form of low mountainous plain or small hills. These facts can be found in Mangrove Island of Maniai, Nusuama, Kamai, and Modan Island. The Lowland Rainforest makes canopy and sub-canopy layers (**Figure II.5**) with the species diversity is high enough and estimated that 60 - 90% of plants in the ecosystem are endemic species.





Ecosystem type of lowland forest (dryland forest) is mostly existed behind the formation of transition mangrove forest and in some parts of the areas it can be found lowland forest community is directly behind the formation of mangrove forest (**Figure II-4**).

Lowland rainforest ecosystem plays an important role as a buffer system to the area. In the forest ecosystem growing several kinds of flora species, begin with



behind mangrove forest formation of Simeri River in Bintuni Bay Nature reserve area

low-order plants such as fungi, and up to high-order plants. Lowland Forest in CATB area keeps various species of woody plants (trees) that have high economic values, such as matoa (*Pometia* spp.), ironwood/merbau (*Intsia bijuga* and *I. palembanica*), pulai (*Alstonia* spp.), Nyatoh (*Palaquium* sp.), Medang (*Litsea* sp.), and also some species from the families of Dipterocapaceae such as mersawa (*Anisoptera* sp.), resak (*Vatica papuana*), and hopea (*Hopea* sp.).

Generally, ecosystem is composed of primary vegetation (Primary Forest) and secondary vegetation (Secondary Forest). The ecosystem where composed of primary vegetation is seen still natural and has characteristics of distinct strata canopy. At the top and the central it is dominated by woody plant species, such as ironwood/merbau (*Intsia bijuga*) and matoa

(*Pometia* sp.). However, in the bottom stratum, it is grown with shrubs and bushes that support various climber plants, epiphyte, ferns, and palm species (*Palmae*) also included a variety of rattan species.

Meanwhile, in the secondary lowland rainforest (ex-dryland cultivation), it is dominated by pioneer species like makaranga (*Macaranga mappa* and



Macaranga tanarius) and wild pepper (*Piper* sp.). Mostly of the secondary lowland forest is remnant of community garden (**Figure II-6**) and remnant of log yard of HPH and Kopermas (Community Cooperation) that was operated in around Bintuni Bay Nature reserve area.

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In addition to be as flora habitat, lowland rainforest ecosystem is also a habitat for a variety of reptile species such as siamense crocodiles *Crocodylus novaguinensis*), crown pigeon (*Goura cristata*), birds of paradise (*Paradisae minor*), Echidna short-beaked (*Tachyglossus aculeatus*), Echidna long-beaked (*Zaglossus bruijni*), "tikus berkantung" (*Dasyuridae*), common bandicoot (*Peroryctes raffrayanus*), kuskus (*Phalanger orientalis*), stunted possum (*Cercatetus caudatus*, *Distoechurus pennatus*, and (*Pseudocheirus spp.*), tree-kangaroo (*Dendrolagus ursinus*), wild wallaby (*Dorcpsis spp.*), common-wild wallaby (*Macropus agilis*).

According to Zuwendra, *et al.* (1991) in the clear river inside ecosystem of lowland forest, it can be found rainbow fish from the genus of *Melanotaenia*, which is an endemic species in Bintuni Bay Nature reserve.

Lowland forest ecosystem, particularly in the outside boundary of Nature reserve area is also considered as a buffer zone that functioning as a defensive wall against degradation of mangrove ecosystem, which is the largest ecosystem in the area.



Figure II-6. Type of the secondary lowland rainforest nearby Mamoranu village, Bintuni Bay Nature reserve Area

A.3.1.2 Mangrove Forest

The vegetation of mangrove forest in Bintuni Bay, in general it can be divided into three zones based on tree species that forming dominant canopy, namely *Avicenia-Sonneratia, Rhizophora-Sonneratia,* and *Rhizophora-Bruguiera* zones. Besides of forming a zoning as mentioned above, it is found also several species that forming genuine standing.



Figure II-7. Mangrove Vegetation Zone Avicenia Sonneratia in Maniai Island, Bintuni Bay Nature reserve

Based on the field observation, *Avicenia-Sonneratia* and *Rhizophora-Sonneratia* zone is an outer side of mangrove community zone and it is directly opposite the water territory of Bintuni Bay. Species found in this area was dominated by species of *Avicenia alba*, *Avicenia marina*, and *Rhizophora mucronata*, and the average height of the trees is 10 m. Substrate under the standings in the zone is soft-mud sediment and free soil that deposited by tidal. However, the substrate in mangrove of *Avicenia-Sonneratia* zone is more solid. The tidal in this zone is



more distinct in the changes of water surface. Meanwhile *Rhizophora-Bruguiera* zone is a mangrove forest area that usually grown toward mainland, especially along the big and small river edge that empty to Bintuni Bay. Commonly, *Rhizophora* spp. and *Bruguiera* spp. is the trees that forming the main canopy inside this zone. Furthermore, species that mostly discovered in this zone are *Rhizophora mucronata*, *R. Apiculata*, *Bruguiera Gymnoriza*, *Bruguiera parviflora*, *Xylocarpus* spp., *Ceriops tagal*, and *Avicenia officinalis*. In this zone it



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Figure II-8. Vegetation mangrove Zone Rizhiphora-Bruguiera in Tirasai River, Bintuni Bay Nature reserve

also found species of ground plants, i.e. Acanthus ebracteatus, Acanthus ilicifolius, Aegiceras corniculatum and Avicenia intermedia (red api-api). Substrate grown under the standing in this zone is harder and solid (not loose) and it is dominated by clay faction. The tidal and flood is very obvious with the changes of water surface.

Besides that, in the intertidal zone and fresh water, and salt water in mangrove forest and the zone of flood river edge land and formation covers flood land, it is found

vegetation of nipah (*Nypa fructicans*) that grows up mix with mangrove standing and usually spread out between semi saline and to permanent fresh water. In the area that more toward mainland, nipah species (*Nypa fructicans*) grows mix with mangrove species *Xylocarpus moluccensis* (Wamesa: black kabau) and *X. granatum* (Wamesa: red kabau) (**Figure II-9**). In the area where close to tidal zone, this vegetation grows together with mangrove and their density is high enough, that is from genus of *Rhizophora, Bruguiera, Sonneratia,* and *Avicenia* (**Figure II-10**). The present of mangrove species is more decline or not be found at all in the area that more toward mainland along the river.



Figure II-9. Type of nipah vegetation (*Nypa fructicans*) in Yensei River in Bintuni Bay Nature reserve

Figure II-10. Nipah vegetation (*Nypa fructicans*) the mix of tidal zone in Tirasai River, Bintuni Bay Nature reserve





Forest mangrove in the area of Bintuni Bay Nature reserve can be classified into several blocks, namely the mangrove forest block of Wasian River, Muturi River, Weperar River, Modan River, and Naramasa River. At the outside of mangrove vegetation that is directly bounded to the coastline or the bay estuary, total structure of its tree is smaller than the mangrove vegetation that grows in the area where situated toward behind the area, particularly at along the big rivers that empty to Bintuni Bay. The result of secondary data tracing is known that quantitative information on mangrove potency in the area of CATB is relatively insufficient. The next one is some quantitative information regarding mangrove potency in several parts of CATB that has been successfully collected from the result of field survey done by TNC Team (2005).

Mangrove forest of Wasian River Block. Mangrove community in this area makes a formation of *Avicenia-Sonneratia* (Outside) and *Rhizophora-Bruguiera* (central part). In the outside of the area (close to the beach) that is an area of mud sedimentation, it is dominated by species of *Sonneratia alba* with the density of 270 trees/ha, and for the stake level and nursery their density are 470 tree/ha and 5,000 seedling/ha, respectively. Meanwhile at inside (central part), it was predominantly with *Rhizophora apiculata* that dominates all vegetation level with density of 260 trees/ha for tree level, 730 trees/ha for stake level, and 6,000 seedlings/ha for nursery phase.

Mangrove Forest of Kaboi Island Block (In front of Tirasai Estuary). The observation was done with making a transect and its sub-plot 100 meters long and perpendicular with from the edge of river of coast to the inner part of the island with the azimuth of 1800, and a coordinate of $133^{\circ} 2' 31.6"$ E and $02^{\circ} 16' 86.8"$ S. The total of observation plot was determined as much as 4 plots that was made continually from the edge of rivers or coast, and made a note of every species, trunk diameter (stake and tree), and height (stake and tree).

Observation result indicated that in this area it was dominated by *Rhizophora mucronata*, *Bruguiera sexangula*, *B. Parviflora*, *B. Gymnorrhiza*, and *Ceriops tagal*. Analysis result of vegetation indicated that at the level of seedling/nursery, stake, and trees, the species of *R. mucronata* indicated the highest density i.e. 5000 seedling/ha, 363 trees/ha, and 162 trees/ha and simultaneously it becomes the species that dominated in all vegetation level (Appendix 4 and 5).

Mangrove forest of Nusuama Island Block (Coordinate: 133°51'86.5"E, 02°18'36.7"S). Method used in this mangrove vegetation observation in the area is an exploration in a certain tract which accompanying by local informan to observe species composition of the existing mangrove. The observation result showed that species found is almost similar with the species found in Maniai Island (Pitaboni Cape), which was dominated, by species *Rhizophora mucronata*.

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coordinate point for observation plot of mangrove vegetation in Kaboi Island in CATB area.

The other species found in this area are Aegiceras corniculatum, Bruguiera sexangula, Avicennia alba. В. parviflora, Ceriops decandra. В. Gymnorrhiza, and Ceriops decandra. The species discovered in this area are not much different with the mangrove species of mangrove forest of Nusuama Island Block. It is because the habitat condition and position of these two places are relative similar.

Mangrove forest of Simeri River block. The observation in this area is carried out with observing in several parts of forest with using longboat and plot observation (Coordinate: 133°56'37.1"E, 02°07'07.0"S). Observation result of several parts of the forest showed that in the area of the river edge, mangrove vegetation was dominated by *Xylocarpus* spp. and *Bruguiera* spp. The mangrove forest in this area is seemed as old forest or secondary

mangrove forest that forming small islands with characterizing of trees *Xylocarpus* spp. that grows stunted like a giant bonsai.

Vegetation analysis results of transect observation indicated that at the nursery and stake level, *Rhizophora mucronata* and *Xylocarpus molucensis* are predominant species with the Important Values of nursery level 68 and 56, and for stake level 178 and 55 respectively



Figure II-12. Mangrove vegetation of Simeri River in CATB area.

(**Appendix 6**). Meanwhile, at the tree level, it is dominated by *Rhizophora mucronata* (INP=180) *and B. gymnorrhiza* (INP=120.) (**Appendix 7**).

Mangrove forest of Taberai River Block. Observation plot on mangrove was made perpendicular from the Island with Azimuth 280⁰ and with the coordinate of 133°57'08.2"E, 02°12'05.1"S. Observation result designated that in this area was dominated by *Bruguiera gymnorrhiza* and *Ceriops decandra*. On the other hand, the



population of *Rhizophora* was not many discovered in this area, as them same also with *Aegiceras corniculatum* and *Xylocarpus* that were very rare found in the edge of rivers.

Mangrove forest of Maniai Island (Pitaboni Cape) Block. At the mangrove forest block of Maniai Island/Pitaboni Cape (2^0 16'86.8"S, 133^0 52' 31.6" E), the seedling level observed was eight mangrove species from three families (Rhizophoraceae, Myrsinaceae and Avicenniaceae), namely *Rhizophora mucronata, Aegiceras corniculatum, Bruguiera sexangula, Avicennia alba, B. parviflora, Ceriops decandra,* and *B. Gymnorrhiza,* yet at the stake level *Ceriops decandra* was not found (**Appendix 8**). The result pointed out that at the seedling/nursery level, *R. mucronata* showed the highest density (11875 seedling/ha) all at once it was a predominant species (INP=84,44) with distribution that is very equal (F=0,75), but for the stake level, it was dominated by *Aegiceras corniculatum* (INP=64,70), density 500 seedling/ha, and it was distributed very equal (F=0,42). This indicated that especially in the mangrove area of Pitaboni Cape, the regeneration growth of non-pioneer species was already stabile enough.

At the vegetation level of pole, species found was a little decrease just only five species, however at the three level it increased again to be 10 species (**Appendix 9**). Mangrove vegetation at the pole and three level, *Rhizophora apiculata* was a dominant species (INP=140,85 and 96,48), and all at once it was a species that had the highest density (150 trees/ha and 104,17 trees/ha) with very equal distribution (F=0,58 and 0,75).

The interested matter to be considered that decreasing of a certain species at the pole level, which was indicated that in population dynamic of mangrove species in this area, there was occurred of species decline (mortality) on the certain species, so that indepth study is necessary to be conducted in order to observe a population development (population dynamic) either species or total of mangrove species which begins from seedling level to tree level.



Furthermore, it was found that mangrove forest in Pitaboni Cape had an unclear zonation (*irregular zonation*), where in one transect there was a species mix up to the rear zone (**Figure II-13**). It is maybe because the substrate condition in the area was almost equal (uniform) due to they always immersed during high tide, so that this species





that should not in the front, central, or rear of zone, they can grow and be associated each other.

Mangrove forest of Sumberi River Block (02[°] 04'.012"S, 133[°] 53[°].780[°]E). In this mangrove forest block it was discovered nine species for seedling level, namely, *Rizophora apiculata, Aegiceras corniculatum, Bruguiera gymnorrhiza, Xylocarpus granatum, Ceriops decandra, C. tagal, R. mucronata* and *D. spathacea*. However, at the stake level, it was found only three species, i.e. *Ac. Speciosum, X. Granatum,* and *D. spathacea* (**Appendix 11**). This result indicated that at the seedling and stake level there were dominated by *Acrosticum speciosum* with the highest density (9167 seedlings/ha and 600 seedlings/ha), all at once they became dominant species (INP=62,94 and 100,00), yet their distribution is almost similar with other species. However, the vegetation mangrove of pole and tree level was dominated by *Rizophora Apiculata* (INP=86,50 and 113,18), the highest density of each level 50 trees/ha



and 100 trees/ha, and their distribution was almost similar with other species for stake level, and at tree level, their distribution was wide enough comparing to other species (**Appendix 12**).

The interested thing to be concerned from data obtained (**Appendix 11 and 12)** is the lost of a certain species such as *Rizophora Apiculata* and *Bruguiera gymnorrhiza* at

reaching stake and pole level, then they appeared again at the tree level. It is assumed that there was a lost (mortality) during population dynamic process in this area, but it is necessary to be studied more about the cause that made the total of such species was declined.

Zonation pattern of mangrove forest in Sumberi River (**Figure II-14**) is not much different with the mangrove forest in Pitaboni Cape where there was still a species association in the central and the rear zone. In this forest community it was seemed an obvious different between plot, more inside more appear toward transition vegetation that was characterized by the growing of vegetation species that transition to the lowland forest and fresh water swamp such as *Xylocarpus granatum* and *D. spathacea*. Different from mangrove forest of Pitaboni Cape, the canopy composition of mangrove forest in this area is seemed not regular enough and began forming a stratum. This is because the species composition of this community just being heterogeneous with the present of some transition vegetation species of lowland forest.





Mangrove Forest of Tirasai River Block. The area along of Tirasai River was dominated by the species of ringworm mangrove (*Rhizophora mucronata*). The other species that grown up are *Bruguiera parvifolia*, *Xylocarpus moluccensis*, *Xylocarpus granatum*, *Avicennia alba*, *Aegiceras corniculatum*, *Pandanus odoratissima*, *Sonneratia alba*, and *Bruguiera gymnorrhiza*. In the upstream side, it was found also *Nypa fruticans*, palm species that grows in the river edges.

The observation result of the field showed that in the outside curve of the Tirasai River, there was found a lot of *Bruguiera parviflora*, then *Rhizophora mucronata* at the second stratum. However, in the inside curve it was dominated by *Sonneratia alba* and *Avicenia alba*. The difference of dominant species between inside and outside of the river curve maybe influenced by a sedimentation or deposit factor of mud substrate. Inside the river curve, its current is slow, so that its water carrying capacity goes down causing there is a mud concentration (accretion) from the river upstream. Soft mud sediment as a result of sedimentation process is very sufficient for a habitat of pioneer species such as *Sonneratia alba*. However, in the outside of the curve, the river current is relatively strong, it causes an abrasion at the edge and sedimentation process be slowly or even not happened so that the pioneer species cannot grow.

From the observation in the field it was attained the average value of vegetation cubication of pole and tree level for hectare of mangrove area that is 107.4 m/ha (Appendix 9 and 12). The highest of cubication value was indicated by *A. alba* and *R. apiculata* with their potencies are 65.42 m^3 /ha and 44.80 m^3 /ha (**Appendix 10 and 13**).

A.3.2 Species

At the previous sub-chapter it was described about natural ecosystem composing the Bintuni Bay Nature reserve area that was also a habitat for a variety of flora and fauna species. There are a lot of important species that was associated with the habitat and other biological characteristics. Therefore it is necessary to recognize the species diversity in the area, including the rare and the protected flora and fauna species and the key species.

Table II-3.	Mangrove pure species in mangrove ecosystem of
	Bintuni Bay Nature reserve area

No.	Species	Family
1	Avicenia alba	Aviceniaceae
2	Avicenia marina	Aviceniaceae
3	Bruguiera gymnorrhiza	Rhizophoraceae
4	Bruguiera sexangula	Rhizophoraceae
5	Bruguiera parviflora	Rhizophoraceae
6	Ceriops decandra	Rhizophoraceae
7	Ceriops tagal	Rhizophoraceae
8	Rhizophora apiculata	Rhizophoraceae
9	Rhizophora mucronata	Rhizophoraceae
10	Sonneratia alba	Soneratiaceae
11	Sonneratia caseolaris	Soneratiaceae
12	Xylocarpus granatum	Meliaceae
13	Xylocarpus moluccensis	Meliaceae

Source: Survey result of TNC Team, 2005



A.3.2.1 Flora

The flora species found in the area of Bintuni Bay Nature reserve is close related to the ecosystem composing the area, as it was detail explained before.

The mangrove forest ecosystem is dominated by mangrove flora and other species that commonly associated with mangrove vegetation. Field survey conducted Table II-4. Mangrove associated species in mangroveecosystem of Bintuni Bay Nature reserve area

No.	Species	Family
1	Acrosticum sp.	Pteridaceae
2	Cerbera manghas	Apocynaceae
3	Dolichandrone spathacea	Bignonaceae
4	Heritiera littoralis	Sterculiaceae
5	Lumnitzera littorea	Combretaceae
6	Myristica hollrungii	Myristicaceae
7	Nypa fruticans.	Palmae
8	Acanthus ilicifolius	Acanthaceae
9	Aegialitis annulata	Plumbaginaceae
10	Aegiceras corniculatum	Myrsinaceae
Source	Survey result of TNC Team 200	5

Source: Survey result of TNC Team, 2005.

by TNC Team (2005) has been successfully identified the original mangrove species that occupy mangrove ecosystem in the area of Bintuni Bay Nature reserve as presented in Table II-3.

Field observation designated that mangrove species in Table II-3, and they were enriched again with vegetation species grown and associated with mangrove species as presented in Table II-4.

No.	Species	Family
1.	Intsia spp.	Caesalpiniaceae
2.	Pometia spp.	Sapindaceae
3.	Callophylum sp.	Guttiferae
4.	<i>Terminali</i> sp.	Combretaceae
5.	Canarium sp.	Burseraceae
6.	Vatica papuana	Dipterocarpaceae
7.	Annisoptera sp.	Dipterocarpaceae
8.	<i>Hopea</i> sp.	Dipterocarpaceae
9.	Baccaurea	Euphorbiaceae
10.	Gnetum gnemon	Gnetaceae
11.	Gigantochola sp.	Graminae
12.	Garcinia sp.	Guttiferae
13.	Litsea sp.	Lauraceae
14.	Arthocarpus sp.	Moraceae
15.	Ficus sp.	Moraceae
16.	<i>Eugenia</i> sp.	Myrtaceae
17.	Calamus sp.	Palmae
18.	Pandanus sp.	Pandanaceae

Table II-5. Vegetation species dominated lowland forest
ecosystem in Bintuni Bay Nature reserve area

Those species are not yet included species from epiphyte and liana class that much appear distribute in the area. It indicates that the diversity of mangrove species in Bintuni Bay is categorized high.

In addition to the ecosystem flora of mangrove forest, the lowland rain forest in the area of Bintuni Bay Nature reserve is also reserving the diversity of flora that relatively high, particularly from the woody plant species (Table II-5).

Source: Survey result of TNC Team, 2005





At the canopy stratum, there were dominated by the families that among them are Leguminosae, Dipterocarpaceae, Moraceae, and Caesalpiniaceae. Meanwhile, at the bottom stratum, it was grown up by shrub and bushes that they support various climber plants, epiphyte, including orchids, ferns, and kinds of palm (Palmae), and also kinds of rattan. Unfortunately, base data regarding list of flora that exist in the area of Bintuni Bay Nature reserve is not



Figure II-15. Orchid species (*Bulbophyllum* sp.) found in lowland forest and mangrove in the area of CATB

yet available. From some data that has been identified, most of endemic species and some genus have been protected by the Indonesian Law, for example the genus of *Nepenthes* (Family Nepenthaceae). It is possible that species discovered in this area, they can be found also in Bintuni Bay Nature reserve. According to the information got from the area organizer and the local community, in the ecosystem of lowland forest, there are orchid species from the genus Bulbophyllum, which by Indonesian law, they are protected.



Figure II.16. Survey Activity Location Map of Fauna in the area of Bintuni Bay Nature reserve 2005



A.3.2.2 Fauna

The result of field observation in the several sites inside the area (**Figure II-16**) showed that Bintuni Bay Nature reserve has fauna diversity that is high enough. This is supported with the physiography condition and the availability of resources such as feed, water, shelter, and breeding place that are sufficient with the living of wild life, either birds, mammals, reptiles, amphibian, and also avertebrata class.

Amphibians and Reptiles

The CATB area and its surrounding is an essential habitat for the proliferation of reptiles and amphibians species. Results of direct seen and interview with the local community, in the area of Bintuni Bay Nature reserve it could be found several species of reptiles and amphibians as presented in Table II-6.

Table II-6.	Herpetofuana species discovered during field survey in and around the area of
	Bintuni Bay Nature reserve

				Conservation Status				
No.	Scientific Name	Indonesian Name	Location	Endemic	Protected	CITES ¹	RDB ²	
1	Crocodylus porosus	Buaya muara	Tirasai River	1/2	Н	I	V	
2	Crocodylus novaguinensis	Buaya air tawar	Yakati Village	1/2	Н	I	-	
3	Hydrosaurus amboinensis	Soa-soa	Sumberi R	1/2	-	-	-	
4	Varanus sp.	Biawak	Mamuranu V, Tirasai V	1/2	Н	П	-	
5	Varanu sindicus	Biawak bakau	Mangrove Forest Mamuranu V	1/2	С	-	-	
6	<i>Enhydri</i> s sp.	Ular bakau	Mangrove near Mamuranu V	-	-	-	-	
7	Hydropis sp.	Ular sanca	Lowland Forest Tirasai	-	-	-	-	
8	Boiga irregulatus	Ular coklat pohon	Lowland Forest Anak Kasih	-	-	-	-	
9	Litoria infrafenata	Katak pohon hijau	Lowland Forest Anak Kasih, Tirasai, and Mamuranu	-	-	-	-	

Source: Survei Result of TNC Team, 2005. Notes:

H = Ministry of Agriculture Decree No. 716/KPTS/Um/I0/1980

Ministry of Agriculture No. 327KPTS/Um/5/1978

C = Ministry of Agriculture V = Vulnerable (rentan)

¹ Convention on International Trade in Endangered Species

² IUCN Red Book List of Threatened Species

Herpetofauna that presented in Table II.6 is fewer compared to the result survey that has been done by BP Pertamina (2002) in the mangrove ecosystem and lowland forest of Saengga and Tanah Merah which was almost similar with those discovered in Bintuni Bay Nature reserve, that was 27 species of reptiles and 9 species of amphibians. This gives a possibility for discovering other herpetofauna species besides what has been presented in Table II.6.

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There are three species, namely estuary crocodile (Crocodylus porosus), fresh water crocodile (Crocodylus novaguinensis), and mangrove monitor (Varanus prafinuvi), which are classified into wildlife species protected by laws in Indonesia (Petocz, 1983). The two reptiles, C. porosus and C. Novaeguinensis are endemic species for New Guinea and it was written in App. I CITES, those are species in endangered status in IUCN Red Data Book (IUCN, 1979), and also classified into animal species that protected by laws in Indonesia, (Ministry of Agriculture No. 327/Kpts/um/5/1978 and No. Decree 176/Kpts/um/10/1978).



Figure II-17. Estuary crocodiles (*Crocodylus porosus*) found in the area of CATB

Birds

The area of Bintuni Bay Nature reserve and its surrounding has bird species diversity that is high enough. This is supported by physiography condition and the availability of resources such as feed, water, shelter, and breeding place, which are life supporting components for that wildlife. During survey that conducted by TNC Team (2005) with using direct seen and noisy method, and based on information gathered from local community, it was concluded that the area of Bintuni Bay Nature reserve is a habitat for approximately 26 bird species that distributing in several sites of CATB area as presented in Table II-7.

				Conservation Status				
No.	Scientific Name	Indonesian Name	Location	Endemic	Protected	CITES ¹	RDB ²	
1	Ardea sumatrana	Cangak laut	Muturi River	-	F	-	NeT	
2	Cacatua galerita	Kakatua Jambul Kunig	Tirasai R, Sumberi R, Simeri R, Naramasa R, Mamuranu Village	1⁄2	B,C	II	-	
3	Casuarius bennetti	Kasuari kerdil	Anak Kasih Village, Mamuranu	1⁄2	А	II	NeT	
4	Cicinnurus magnificus	Cenderawasih molek (Magnificent Bird of Paradise)	Yakati River	1⁄2	-	II	-	
5	Cinclosoma ajax	Anis puyuh ajax	Tirasai downstream	1⁄2	-	-	-	
6	Colacalia esculenta	Walet sapi	Muturi R, Wasian R	-	-	-	-	

Table II-7. Bird species discovered during field survey in and around area of Bintuni Bay Nature reserve





				Conservation Status				
No.	Scientific Name	Indonesian Name	Location	Endemic	Protected	CITES	RDB ²	
7	Dacelo gaudichaud	Kukubara perut merah	Naramasa R	1/2	F	-	-	
8	Dicrurus hottentottus		Tatawori R	-	-	-	-	
9	Egretta ibis	Kuntul Kerbau	Muturi Downstream	1⁄2	-	Ш		
10	Egretta intermedia	Kuntul perak (Bangau putih)	Naramasa R	-	-	-	-	
11	Egretta sacra	Kuntul karang	Naramasa R	1⁄2	A,D,E		-	
12	Eopsaltria pulverulenta	Robin bakau (Manggrove robin)	Wasian R, Muturi R, Tatawori R	-	-	-	-	
13	Falcon cenchroides	Alap-alap layang	Tirasai R, Sumberi R, Simeri R, Naramasa R, Mamuranu B	-	-	11	-	
14	Geoffroyus geoffroy	Kakatua paruh merah	Anak Kasih Village	-	-	-	-	
15	Goura cristata	Mambruk ubiaat (dara mahkota)	Naramasa B, Mamuranu B	1⁄2	-	I	Vul.	
16	Gygas alba	Dara laut putih	Tatawori R	-	-	-	-	
17	Halcyon cholaris	Cekakak sungai	Sumberi R	1⁄2	F	-	-	
18	Larus novaehollandia	Dara laut putih	Muturi Downstream	-	G	-	-	
19	Lorius lory	Nuri kepala hitam	Muturi R,Tirasai R	1⁄2	С	П	-	
20	Milvus migrans	Elang paria/ Alap-alap malam	Tirasai R, Sumberi R, Simeri R, Naramasa R, Mamuranu B	-	G	II	-	
21	Nectarinia aspasia	Burung madu hitam	Sumberi R, Anak Kasih R	1⁄2	A,E,F	-	-	
22	Nectarinia jugularis	Burung madu sriganti	Sumberi R	1⁄2	A,E,F	-	-	
23	Paradisaea minor	Cenderawasih kuning kecil	Anak Kasih Village Mamuranu	1⁄2	A,E,F	П	-	
24	Philemon buceroides	Cikukua tanduk	Kodai R	-	F	-	-	
25	Probosciger aterrimus	Kakatua raja	Around Naramasa Village	1⁄2	В		-	
26	Stercorarius pomarinus	Camar	Wasian R	-	-	-	-	
27	Sterna albifrons	Dara laut kecil	Modan Island Water Territory	-	A	-	-	

Source: Survei Result of TNC Team, 2005

Notes:

Wildlife Conservation Regulation 1931 No. 266 А =

Decree of Ministry of Agriculture No. 421/KPTS-Um/8/1970 August 26, 1970 Decree of Ministry of Agriculture No. 7421KPTS/Um/12/1978 December 2, 1978 B C =

- Decree of Ministry of Agriculture No. 757/KPTS/Um/12/1979 Government Regulation NO.7 of 1999, 27 January 1999 D
- Е =
- F Decree of Ministry of Agriculture No. 301/KPTS-Um/6/1991 June 10, 1991 =
- G Wildlife Conservation Regulation 1935 No. 513 =
- NeT = Near Threaten
- ۷ Vulnerable =

¹ Convention on International Trade in Endangered Species

² IUCN Red Book List of Threatened Species



The total of species (Table II-7) are less than that was obtained by the survey conducted by Zuwendra *et al.*,(1991) whom reported that in the area of Bintuni Bay (included the area of Bintuni Bay Nature reserve) at least there were observed 95 bird species, which consisted of 75 permanent species and 20 migrant species. Among those species, there are 45 species that has been protected by laws. However, the study that carried out by BP Tangguh in order to providing a document of ANDAL, reported that in the area of Bintuni Bay, especially, the area of Saengga and Manggosa River where their ecosystem is similar with that of Bintuni Bay Nature reserve, it was observed successfully more than 140 bird species (BP Pertamina, 2002). This indicates that a diversity of birds in the area of Bintuni Bay Nature reserve is high enough and so that it should be received a serious attention either from protection or research. High possibilities that by the accurate study, the species diversity as presented in Table II.7 above might be increase.

Based on the literature study, the Bintuni Bay Nature reserve is the habitat for endemic species of Papua wildlife and for the fauna protected by the laws. Results of summary made from supporting references that among them Petocz (1987), Petocz and Raspado (1994), Behler et al., (1986), Zuwendra et al., (1991), Rudiyanto (1996), and BP Pertamina (2002) showed that from those bird species found in the Bintuni Bay Nature reserve area (survey result of TNC Team, 2005), 14 species of them are endemic species, and the other 14 species have been protected either by Indonesian law or International law (CITES and IUCN) as presented in Table II.7. According to the Convention on International Trade in Endangered Species (CITES), among the bird species that can be found in CATB, one species of crown pigeon (*Goura cristata*) falls into Appendix I, other seven species (*P. minor, F. cenchroides, C. magnificus, M. migrans, C. galerita, L. Lory,* and *Casuarius bennetti*) fall into Appendix II, and one species *Egreta ibis* falls into Appendix III. Besides that, according to RDB (Red Data Book) crown pigeon that categorized into "almost threatened", i.e. *A. sumatrana* and *C. bennetti* (Conservation International, 1999).

Total of endemic species in the area of Bintuni Bay Nature reserve that was recorded during survey is almost the same with the amount of the endemic bird species that recorded by Zuwendra et al. (1991), which reported there are at least 12 species endemic. It is indicating that the area of Bintuni Bay Nature reserve is crucial as habitat and breeding place for endemic species particularly avifauna animals.

The area of Bintuni Bay seems to be a region for feeding sources (winter ground) for some migrant bird species. In the survey, it was noticed hundreds of pelican bird (*Pelecanus conspicillatus*) and king umukia (*Tadorna rajah*) in several parts of the nature reserve and especially in the estuarine region with sandy landscape. According to information gathered from the local people, those birds usually come the area on April to May and then leave it on December at wave season.





Mammals

Result of the observation during survey with using direct seen and footprint/trail, and also with gaining information from local people, in the reserve area it was found 12 species of mammals, two of them have been protected by laws and recorded in Appendix II of CITES (Table II-8).

				Conservation Status				
No.	Scientific Name	Indonesian Name	Location	Endemic	Protected	CITES ¹	RDB ²	
1	Pteropus neohibernicus	Kelelawar besar	Mamuranu , Anak Kasih, and Tirasai Village	1⁄2	-	-	-	
2	Spilocuscus maculatus	Kuskus bertotol	Naramasa	1⁄2	Ι	II	-	
3	Phalanger orientalis	Kuskus kelabu	Mamuranu B, Anak Kasih B	1⁄2	I	II	-	
4	Cervus timorensis	Rusa	Mamuranu B, Anak Kasih B	Intr	А	-	-	
5	Dorcopsis muelleri	Walabi hutan	Naramasa B	1⁄2	-	-	V	
6	Dendrolagus ursinus	Kangguru pohon	Mamuranu B, Anak Kasih B	1⁄2	В	-	-	
7	Peroryctes raffayana	Bandikot	Mamuranu B, Anak Kasih B, Tirasai B	1⁄2	-	-	-	
8	Sus crofa	Babi hutan	Mamuranu B, Anak Kasih B, Tirasai B	Intr	-	-	-	
9	Pteropus conspilicatus	Kelelawar	Anak Kasih B	1⁄2	-	-	-	
10	Pogonomys macrourus	Tikus hutan dataran rendah	Anak Kasih B, Tirasai B	1⁄2	-	-	-	
11	Isodon macrourus	Tikus tanah	Mamuranu B, Anak Kasih B, Tirasai B	1⁄2	-	-	V	
12	Pristis microden	Cucut gergaji	Water territory of Bay	1/2				

Table II-8. Species of mammals found during field survey and based on information gathered from local people in and around the area of Bintuni Bay Nature reserve

Source: Survei Result of TNC Team, 2005...

Notes:

Wildlife Conservation Regulation 1931 No. 266

А В Decree of the Ministry of Agriculture No. 421/KPTS-Um/8/1970 August 26, 1970 =

T Decree of the Ministry of Agriculture No. 66/KPTS/Um/2/1973 =

V Vulnerable =

Intr Introduce

¹ Convention on International Trade in Endangered Species

² IUCN Red Book List of Threatened Species

Observation result on mammals species as presented in Table II.8 is almost similar with mammals species found in the survey done by Zuwendra, Erftemeijer, and Allen (1991), which reported that in the area of Bintuni Bay Nature reserve could be found mammals such as short-beaked Echidna (Tachyglossus aculeatus), Long-beaked Echidna (Zaglossus bruijni), genera of strange "tikus berkantung", Dasyuridae, and common bandicoot (Peroryctes raffrayanus), "kuskus" (Phalanger orientalis) on mangrove forest habitat, dwarf possum (Cercatetus caudatus, Distoechurus pennatus, and Pseudocheirus spp.), tree



kangaroo (*Dendrolagus* fursinus), wild wallaby (*Dorcpsis* spp.), common-wild wallaby (*Macropus agilis*), and various species of Chiropteran that their diversities are so wonderful, such as tube-nosed bat, flying fox, shallow-tailed bat, horseshoe bat, and mastiff bat. However, the amount of those species is very smaller than those found by PT Geobis Woodward-Clyde Indonesia in 1998, which reported that in the area of Bintuni Bay/Bearau could be found more or less 70 mammals species that consisted of 36 species of bat (*Chiroptera*), 17 species of marsupial (*Marsupialia*), 15 species of sever animals (*rodents*), also deer and wild pigs as well.

The water territory of Bintuni Bay Nature reserve is a habitat for some of dolphin species such as white-fined *Seusa plumbea*, which according to information from the local people, this species sometimes appeared play in group follow the trace of shrimp-capturer in order to find smaller fish as their feed. Information gained from the inhabitants that in several estuarine sites of big rivers in the area of Bintuni Bay Nature reserve can be found also the genera of *Delphinidae*. Moreover, a kind of large whale has been appeared in the deeper part water part of Bintuni Bay.

Fish

Result of field observation showed that the tidal region there is a lot of saw-fishes, sharks, and red fish. Information gathered from the local people that shark-saw fish (*Pristis microden*), which is the largest fish and has been protected by the laws, sometimes they entered up to the rivers in the area of Bintuni Bay Nature reserve. The shark species found in the water territory of Bintuni Bay Nature reserve is stupid shark (*Chyloscyllium punctatum* and *C. Brevipinna*), which their body can reach three meters long. Information gained from traditional fishermen (local inhabitatnts), it was known that *Lutjanus johnii* (fish red) and *Himantura uarnak* (ray fish) is also frequently caught when fishing in the rivers nearby forest mangrove in the area of Bintuni Bay Nature reserve.

Referred to the above information, the roles of Bintuni Bay Nature reserve area are very crucial for the community living adjacent to the area in order to meet their daily needs especially fish, either for subsistent needs or selling as a family's income-source.

Based on field survey as well as information from local people that fresh-water fish "*ikan pelangi*" (rainbow fish) of genus *Melanotaenia* can be found in the fresh-water area. This fresh-water fish is endemic and live in the rivers, swamps, and lakes surrounding the area. It has been very good prospect as an ornamental fish which can be a value added for the local people.

Avertebrata

The water territory surrounding the area of Bintuni Bay Nature reserve is a habitat for some kinds of avertebrata, particularly shrimp species. Some of them found in the area are tiger





prawn (*Penaeus semisulcatus* and *Parapenaeopsis sculptilis*), endeavour prawn (*Metapenaeus monoceros*), banana prawn (*Penaeus marguensis* and *Penaeus indicus*), king prawn (*Penaues hatisalcatus*), and lobster

(*Panulirus ornatus*). This makes the water territory surrounding the area of Bintuni Bay Nature reserve become important habitat for shrimps (prawns) that might support commercial shrimp industry in the Bintuni Bay Regency.

It is also in the water territory of the Bintuni Bay Nature reserve area, it was found a kind of other avertebrate such jelly fish (*Scyphozoa*), salps (*Salpa* sp.), mantis shrimp (*Squitta* sp.), *Crinoid sealilies*,



Figure II-18. Mud Crab (*Scylla* sp.) where normally sell and can be found in BBNR

Gorgoniau corals (Gorgonaceae), bailer's shells (*Nilo acthiopicus* and *Syrinx aruanus*), also a kind of mangrove crabs (*Scylla* sp). (**Figure II-18**).

B. CHARACTERISTICS OF SOCIAL-ECONOMY AND CULTURE

B.1 Population

The population occupied in 14 villages in around (outside, overlap, and inside) the area of Bintuni Bay Nature reserve (CATB) until March 2005 is 9,557 people. Based on line-inheritage, the population there can be differentiated two classes, namely the indigenous people and the comer people. The indigenous people are the inhabitants who are occupied around the nature reserve area, and they are known as the right holders of adat law. In the contrary, the comer residents are the people who come from the transmigrant community or traders, including the papuaness people who come from Sorong, Biak, Serui, and other places outside of Bintuni Bay). In terms of ethnicity, the population dwell in the adjacent to the reserve area besides of the native ethnic (Papuans), are also some of ethnic comers whom come from outside Papua, such as Javanese, bugisnese, and ambonese.

Based on the interview and field observation, from 14 villages around the area of CATB, Anak Kasih and Tirasai village are the new villages but they are not yet definitive. Anak Kasih is a new village that was established in 2002, it was begun with the mobilization of the people whom holders "ulayat" right in Anak Kasih when the kopermas (public cooperation) initiated to operate. Some of the people came from Mamuranu village that in the beginning only made a hut and garden in the adjacent to the log yard area that was established by kopermas. Mamuranu is the village that located inside the CATB area, which is already there before the area proposed and determined as Bintuni Bay Nature reserve. In 2003, the Social Office of





Papua Province provided semi-permanent housing as much as 54 housings, however the housings making was not coordinating especially with the BKSDA Papua 2, and also with the local churches.



Tirasai village, in the beginning is only a hut as the place use for hunting activities. In 1992, the location was established by PT. Henrison Iriana as log yard place. When the present of Kopermas, the family group of Imeri intended to establish a new settlement in Tirasai log yard. The community demand to develop a new village was appeared from the proposal that they applied to the Regional Government of Bintuni District for a new settlement in the location of log yard in Tirasai in 2002. The

regional government did not coordinate this matter with the KSDA Papua II of Bintuni Resort, but directly gave a recommendation that their proposal would be followed up. Therefore up to now, the community of Tirasai population is high enough who dwelled there while waiting for the official letter regarding the status determination of the village.

			Household	Popul	ation	Total
NO.	Sub district/Village	District	(family unit)	Female	Male	lotal
1	East Bintuni	Bintuni	325	735	853	1588
2	West Bintuni	Bintuni	606	1310	1471	2781
3	Pasamai	Bintuni	42	74	82	156
4	Waraitama/SP 1	Bintuni	254	354	375	729
5	Korano Jaya/SP 2	Bintuni	123	257	271	528
6	Banjar Ausoy/SP 4	Bintuni	191	347	445	792
7	Tuasai/Beimes/Ingruji	Bintuni	209	282	274	556
8	Argo Sigemerai/SP 5	Bintuni	242	599	710	1309
9	Tirasai	Bintuni	28	58	89	147
10	Mamuranu	Idoor	20	55	70	125
11	Anak Kasih	Idoor	15	36	47	83
12	Yakati	Idoor	60	140	202	342
13	Yensei	Idoor	50	92	127	219
14	Naramasa	Kuri	35	85	117	202
	Total	•	2200	4424	5133	9557
	Percentage (%)		•	46,29	53,71	100

Table II-9. Population in the surrounding Bintuni Bay Nature reserve area by sex

Source: Village Monography March 2005, Survey Result of TNC Team, 2005 processed

In 1994 most of the people in Pasamai participated in the Village Development Program (Program Bina Desa) of PT. Henrison Iriana. However, in the early of 2005, they returned to General Description of Area II - 25





Tirasai with some reasons, and in Tirasai they occupied the housings of ex-Kopermas workers that have been abandoned. The distribution of population inhabited surrounding the reserved area by villages (Figure II.19) and sex is presented in Table II-9.



Figure II-20. Location Map of Vilagges located inside and surrounding the area of Bintuni Bay Nature reserve 2005

The vilages of Waraitama, Korano Jaya, Banjar Ausoy, Tuasai and Argo Sigemerai are transmigrant settlement where situated attaching to the area of CATB. Mamuranu village is a village that located inside the reserved area and it was already there before the area of CATB establihed. However, Anak Kasih and Tirasai are new villages that located inside the reserved area. Nevertheles, Yakati, Yensei and Naramasa are the villages where by position they are situated outside the reserve area, the high use of the natural resources from the area make them have close related to the area itself.

The area of Bintuni District is 7.926 Km² (Atlas of Bintuni Bay Coastal Area Resources, 2003), yet Idoor and Kuri District no data about the region area available due to they are new districts.). According to Table II.9, the population density in around the area of CATB is still low (1.2 people/km2). However, togeteher with the development of Bintuni Bay Regency as a new development district, the potency of the comer population is increse as a result for the future it can be predicted that the population will be more rapid increase.



Table II.9. also showed that proportional distribution of male population is higher than that of female. The comparison ration between male population to female population is 1.16. The result of field survei and it was supported by the study result done by Yalhimo (2003), makes a figure that the population inhabits the area adjacent to the Bintuni Bay Nature reserve are in productive age (19-50 years old) or about of 49.63%, then follow by the population within school age (7–18 tahun) or 22,86 %. Distribution of population occupied the villages around the area of Bintuni Bay Nature reserve by age class is presented in Table II.10.

		_		Total			
NO.	Sub district/villages	Districts	0-6	7 -18	19 - 50	> 50	(People)
1	East Bintuni	Bintuni	214	342	815	217	1588
2	West Bintuni	Bintuni	243	617	1459	462	2781
3	Pasamai	Bintuni	31	37	63	25	156
4	Waraitama/SP 1	Bintuni	84	170	351	124	729
5	Korano Jaya/SP 2	Bintuni	74	114	260	80	528
6	Banjar Ausoy/SP 4	Bintuni	101	152	401	138	792
7	Tuasai/Beimes/Ingruji	Bintuni	72	105	318	61	556
8	Argo Sigemerai/SP5	Bintuni	211	320	605	173	1309
9	Tirasal	Bintuni	15	36	72	24	147
10	Mamuranu	Idoor	26	29	55	15	125
11	Anak Kasih	Idoor	13	18	43	9	83
12	Yakati	ldoor	35	107	125	75	342
13	Yensei	Idoor	29	63	97	30	219
14	Naramasa	Kuri	15	75	80	32	202
	Total	•	1163	2185	4744	1465	9557
	Percentage		12,17	22,86	49,63	15,34	100

Table II.10.	Population reside in	n around of Bintuni Bay	Nature reserve area	by Age Class

Source: Village Monography March 2005, Survey Result of TNC Team, 2005 processed

B.2 Livelihood

The community who live (outside, attach, or inside) Bintuni Bay Nature reserve (CATB) are majority have livelihood as farmers (45.80%), then followed by fishermen (18.82%). It is because the villages that attach with the CATB area are the transmigrant settlement, so that their community is many that have livelihood as farmers. However, the villages that are inside CATB area such as Mamuranu, Anak Kasih, and Tirasai and also the villages that are outside the CATB area, such as Yakati, Yensei



Figure II-21. A fishermen of Korano Jaya Village with catching



and Naramasa, but the livelihood of their people depended on resources inside the reserve area have the livelihood of their community as fishermen (18.82%), hunter (2.82%), and sago beater. The three livelihoods are very relying on the natural resources from inside the CATB area; therefore their dependence on natural resource of the reserve area is high enough.

With the percentage of population more than 20% who relies directly on natural resources of CATB, and with the rate of population growth 1-2%, so that it can be predicted that in the future the pressure on CATB area will be increase. Therefore, it is required a good management for CATB area by collaborating with the local community, so that the CATB area could be maintained its sustainability, and the community can still do their daily activities. The complete condition of population based on livelihood can be seen on Table II.11.

		Livelihoods (People)							
District	Villages/Subdistricts	Fisherman	Farmers	Hunting (Deer, Crocodile Pigs)	Sago Beater	Laborer	Civil Servant Military	Privates	Others
Bintuni	East Bintuni	138	61	0	0	17	17	28	64
	West Bintuni	161	148	0	0	74	59	87	77
	Pasamai	11	25	0	0	0	2	3	1
	Waraitama/SP 1	16	187	0	0	13	3	24	11
	Korano Jaya/SP 2	1	96	0	0	14	8	14	54
	Banjar Ausoy/SP 4	27	154	0	0	0	29	26	9
	Tuasai/Beimes/Ingruji	0	196	0	0	0	2	4	7
	Argo Sigemerai/SP5	8	184	0	0	5	21	37	12
	Tirasai	13	6	9	0	0	0	0	0
Idoor	Mamuranu	9	2	7	0	0	2	0	0
	Anak Kasih	7	1	7	0	0	0	0	0
	Yakati	20	0	19	18	0	3	0	0
	Yensei	16	9	10	12	0	3	0	0
Kuri	Naramasa	14	4	15	0	0	0	2	0
	Total	441	1073	67	30	123	149	225	235
	Percentage	18,822	45,80	2,86	1,28	5,25	6,35	9,60	10,04

Table II-11. The livelihood of people lived in around Bintuni Bay Nature reserve area

Source: Village Monography March 2005, Survey Result of TNC Team, 2005 processed

B.3 Education and Health

B.3.1 Education

The education quality of the people live in and around the area of Bintuni Bay Nature Reserve generally is low, with the condition of education equipmentn and infrastructure is unsuficient,



particularly the number of teachers per school is still low. For example, the average number of teacher in Basic School level in each village is 1-3 teacher/s. In general, for Bintuni Bay Regency level, the implementation of education has been doing at any education level, from the Kindergarden until Higher Education. The infrastructure of education which is available in the area of CATB is presented Table II-12. Based on the interview result with the people in around the CATB area, their knowledge and understanding on Nature reserve and Nature preservation is still low (84%). It is because the information regarding Nature reserve and Nature preservation that they have been received is minimum, and due to lack of information facilities and media.

District				Total			
District	villages/Subdistricts	тк	SD	SMP	SMU	РТ	(unit)
Bintuni	East Bintuni	1	2	1	2	1	7
	West Bintuni	2	3	1	2	0	8
	Pasamai	0	0	0	0	0	0
	Waraitama/SP 1	0	0	0	0	0	0
	Korano Jaya/SP 2	0	1	1	0	0	2
	Banjar Ausoy/SP 4	1	1	1	0	0	3
	Tuasai/Beimes/Ingruji	0	1	0	0	0	1
	Argo Sigemerai/SP5	1	1	0	0	0	2
	Tirasai	0	0	0	0	0	0
Idoor	Mamuranu	0	1	0	0	0	1
	Anak Kasih	0	0	0	0	0	0
	Yakati	0	1	0	0	0	1
	Yensei	0	1	0	0	0	1
Kuri	Naramasa	0	1 (Rusak)	0	0	0	1
	Total	5	13	4	4	1	27

Table II-12. Education facilities in around the area of Bintuni Bay Nature Reserve in 2002

Source: Monograph of Villages on March 2005, Survey Result of TNC Team, 2005 Processed

Table II-12. showed that almost all the villages have education facilities already for Basic School level (SD), however, the Junior High School (SMP) and Senior High School (SMU) level are still concentrated in the town of Bintuni Bay Regency (East Bintuni and West Bintuni Subdistrict) and the area of transmigrant settlement as well (Korano Jaya Village/SP2 and Banjar Ausoy Village/SP4).

The facilities of advanced education, which are concentrated in the Capital of Regency or in transmigration area result in many school-aged children who are basic-Scholl graduated, cannot continue their study to the higher level (SMP). The same problems are also for graduated Junior High School who wants to continue their study to Senior High School (SMU). The main problems they feel are distance between their settlements to the advanced



school, furthermore transportation facilities are rare and not smooth yet. Therefore, students cannot come to school on time, and even many of them are compelled to attend the school (vacant themselves) for a long period.

The other distinct problems that are almost similar with happening on schools around the CATB area are the lack of teachers, especially teachers for Natural Science (IPA) and English, both SMP and SMU level.

B.3.2 Health

The health facilities that are available in the villages around the area of Bintuni Bay Nature Reserve are very limited. Public Health Center (Puskesmas) and the Subsidiary of Public Health Center (Puskesmas Pembantu/Pus Tu) are only in the Regency Capital (West Bintuni) and in transmigration settlement (Banjar Ausoy/SP4); meanwhile several other villages in the area have only Villages Polyclinic (Polindes) or Integrated Service Station (Posyandu). Even more in the certain villages, there are no health facilities at all as presented in Table II-13.

Districts	Villageo/Cubdiotrieto		Total		
Districts	villages/Subdistricts	Puskemas	Pustu	Polindes/P'Yandu	(unit)
Bintuni	East Bintuni	0	1	1	2
	West Bintuni	1	0	1	2
	Pasamai	0	0	0	0
	Waraitama/SP 1	0	0	0	0
	Korano Jaya/SP 2	0	0	0	0
	Banjar Ausoy/SP 4	1	0	0	1
	Tuasai/Beimes/Ingruji	0	0	0	0
	Argo Sigemerai/SP5	0	0	0	0
	Tirasai	0	0	0	0
Idoor	Mamuranu	0	0	0	0
	Anak Kasih	0	0	0	0
	Yakati	0	0	0	0
	Yensei	0	0	0	0
Kuri	Naramasa	0	0	0	0
	Total	2	1	2	5

Tablel II-13. Health Facilities in around Bintuni Bay Nature Reserve area 2005

Source: Survei Result TNC Team, 2005.

However, the routine visit of medical servants (paramedic) is still being done from village to village. The obvious problems in the visit of the medical servants are transportation. For instance, go to Yakati and Yensei Village, it should be done by using longboat for 4 to 6 hours depending on tidal condition. The health workers available in the area around Bintuni Bay Nature Reserve are still limited as shown in Table II-14.





Districts	Villagos/Subdistricts	Health Workers						
DISTINCTS	Villages/Oubuistricts	Docters	Paramedic	Nurse/Obstetrician	Midwife			
Bintuni	East Bintuni	0	1	0	4			
	West Bintuni	1	7	12	3			
	Pasamai	0	0	0	1			
	Waraitama/SP 1	0	0	0	0			
	Korano Jaya/SP 2	0	1	0	1			
	Banjar Ausoy/SP 4	1	2	4	0			
	Tuasai/Beimes/Ingruji	0	0	0	2			
	Argo Sigemerai/SP5	0	0	0	0			
	Tirasai	0	0	0	0			
Idoor	Mamuranu	0	0	0	1			
	Anak Kasih	0	0	0	0			
	Yakati	0	0	0	3			
	Yensei	0	0	0	2			
Kuri	Naramasa	0	0	0	1			
	Total	2	11	16	18			

Table II-14. Health workers available in the villages around the Bintuni Bay Nature Reserve area 2005

Source: Monograph of Villages on March 2005, Survey Result of TNC Team, 2005 Processed

Table II-14 showed that medical servants such as doctors, paramedics, and nurse whom existed in the around of Bintuni Bay Nature Reserve area are very limited. In the Regency Capital there are only one doctor and some paramedics and nurses whom serve at Puskemas. As a consequent, the medical service by health workers as a community needs is not fulfilled. Specifically for the childbirth service, the community much more use the midwife (traditional healers) service whom there are many enough and even almost available in every village in the surrounding of Bintuni Bay Nature Reserve area.

Kind of diseases which is commonly suffered by the people live in the reserve area are malaria, diarrhea, skin disease, infection of upper respiration tract (ISPA), yaws, and eyes disease; from those diseases, malaria, diarrhea and ISPA are the diseases that are much suffered and the main cause of death. Study result of Yalhimo (2003) showed that in 2003 there were 246 malaria case and 135 diarrhea case, 59 ISPA case compared to 22 skin disease case, 27 yaws case, and 55 eyes disease case. The prominent of malaria case, diarrhea, and ISPA it is assumed that it was brought about the community resettlement located too close to swamp and mangrove forest where they are a breeding habitat for malaria mosquito; lack of drinking water sources and it does not fulfill the health standard requirement, and also environment condition of public road that so dusty during dry season hence it makes the air quality be poor due to it contained a lot of dust.





B.4 Religion

The people inhabit in area around Bintuni Bay Nature Reserve are majority of them have a certain religion such as Christian-Protestant, Catholic, and Islam. It is supported by the sufficient of the religious facilities (Table II-15).

<u> </u>			
Table II-15.	Population inhabit area	around the Bintuni Bay	/ Nature Reserve by Religion

District	Villages/Subdistricts	Christian Protestant	Numbers of House of Prayer	Catholics	Numbers of House of Prayer	Islam	Numbers of House of Prayer
Bintuni	East Bintuni	997	1	178	0	413	2
	WestBintuni	2395	4	204	1	182	0
	Pasamai	52	0	104	1	0	0
	Waraitama/SP 1	203	1	37	0	489	3
	Korano Jaya/SP 2	47	1	12	0	469	6
	Banjar Ausoy/SP 4	70	1	38	0	684	5
	Tuasai/Beimes/Ingruji	556	3	0	0	0	0
	Argo Sigemerai/SP5	77	1	27	0	1205	6
	Tirasai	147	0	0	0	0	0
Idoor	Mamuranu/ Anak Kasih	208	1	0	0	0	0
	Yakati	342	1	0	0	0	0
	Yensei	219	1	0	0	0	0
Kuri	Naramasa	187	1	8	0	7	0
	Total	5500	16	608	2	3449	22
	Percentage	57,55		6,36		36,09	

Source: Monograph of Villages on March 2005, Survey Result of TNC Team, 2005 Processed

Table II-15. showed that a number of people whom adheres to Christian-Protestant Religion is higher (57.55%) than those of other religion. The hosues of worship, in general, are already existing in every village.

B.5 Indigenous Knowledge

The people who occupy the area of Bintuni Bay Nature Reserve have still believed that in a certain places in their territory where they consider as a holy site (taboo place). Interview result with the "adat" figure of Naramasa (Mr. Set Efredire) indicated that Modan Island is a taboo place where the people believe in the island there is a white crocodile; hence it is not allowed for anybody to come there. The Modan Island is an "adat" land for Kuri tribe. Besides that the other place that people consider as a taboo place is Asi Inabuo River in Jawarupai Island. Besides those places, there are still some places where they are protected by the people due to the ritual values such as spring, cave, certain trees, etc. When look at carefully at the regulations regarding the use of such forestland, basically it is same direction with conservation principles.





One of the natural resources management inside the CATB that related to community indigenous knowlege, especially "adat" community of Wamesa is the activities of harvesting marine products in mangrove such as crabs (local name "karaka"). In the process of harvesting crabs, people did not take all crabs that found in one hole wit considering that the remind crabs will multiply in number. In addition, when harvesting the yield of sago trees, the "adat" community of Wamesa cut the old sago tree only. Indicator used is the tree that has flowered and produced pistils.

B.6 Natural Resources Use

B.6.1 The viewpoint of "Adat" Community on Natural Resources (Land and Forest)

The "Adat" people who reside in the area of Bintuni Bay Nature Reserve (CATB) consider land and forest as important and benefit things for their life as a holder of "ulayat" rights. Therefore, they try to own the land as large as possible to be protected for such a long time and also to be inherited from generation to generation.

The people settle in the surroundings of CATB consider land and forest as an unity that cannot be separated. Moreover if the land contains mining resources. This makes the people start thingking about their land and forest status that in the present which have been exploited by other people, such as for transmigrant area or for Commercial Forestry Concession (HPH). According to the traditional leader of Bintuni Mr. Otto Manibuy, the "adat" community should receive a compentation if their "adat" land is exploited for other purpose. It is intended so the "adat" people are not only as an audience but also come across to the result of the activities undertaken.

The "adat" people view forest has a economic function because forest is a place where they rely their daily life on it. Forest for the "adat" community is functioning as a place for hunting wild animals such as deer, wild pigs, and a kind of certain birds as a protein source for families, and other birds such as parrot, cockatoo, and crown pegeon for sold. Forest is also a source for vegetables, seeds, and medicines.

Forest for the people inhabited surroundings CATB has a social function also. According to "adat" people, forest is a unifying means of social relationship between the people within one tribe or from other tribe. The people of Wamesa tribe that claimed for the most part of the forest inside the CATB have their members whom live spread out in the vicinity of CATB area and in Bintuni Town. With such condition, their sense of solidarity are still strong because of their sense of belonging for their "adat" forest.

Besides that, high and low of social status of an individual or group in one family, clan, or tribe, can be determined by how large the land owned by person/group/clan/family/tribe. For



example, in Sough tribe who occupies the CATB, the families of Iba, Tiri, Sayori, Yettu, and Homa claimed as a family with high social status because they have land area that very large where spreads from the Arfak mountainous up to the Coastal of Bintuni Bay.

B.6.2 The Use Pattern of Natural Resources

The use of natural resources such as land and forest by the people live around the area of Bintuni Bay Nature Reserve (CATB) is still relying on the indigenous knowledge. Socially and Culturally, the people have a strong relationship with forest, hence they are able to maintain their life from generation to generation until the present.

Traditionally, the use pattern of land resources usually refers to the institutional system that covers regulation, values, norm and "adat" law that organizes about who, when, and where an individual or group may utilize land including conflict inheritance system and its solving methods. This pattern is unwritten regulation that is agreed together by the landowner, which has been done traditionally from generation to generation.

Forest use and management done by people in around the area of CATB indicated that forest is main life resources. Forest is used to satisfy a variety of needs such as garden activity (shifting cultivation), hunting wildlife, fishing, sago beater, and also as a place acquiring rawmaterials for house building.

In farming practices, for instance, the people rely their life on the garden in which they are also tied down on the regulations that they have accepted. These regulations are:

- (1) Land that would be cultivated must belonging to the family/clan/member of tribe;
- (2) Land that would be cultivated should close to the land which belong to member of other clan or tribe with hope that it would make it more manageable and controllable;
- (3) Land boundaries that have been agreed, it must not be changed without any agreement
- between member of clan or tribe with hoping that in its management it will not disturb an interest of other member;
- (4) Land clearance, tree cutting, burning, fencing, and planting, if as possible, they must be undertaken together between other clan or tribe member so that if there is a disaster such as flood, dried, or forest fire, it can be managed and handled together by the such members or tribes.



Figure II-22. The fish catching with using "JARING BALABUH" that practiced by local people in the CATB area


Regulation is also made for hunting wildlife, which the use pattern be applied in the forest area where belongs to the clan or tribe concerned. This is always considered because if hunting practice done without boundaries regulation on" ulayat" land of clan, it will result in conflict. Based on the use of hunting yield in hunting practices, there is a hunter succeed, and there is failed. The succed hunter always share his yield to neighbours in a radius of two houses, also to closed family like grandparents, parents, own sibling relatives, or closed relatives in outside the such radius.

In processing vegetables and fruits to be consumed such as leaves, flowers, fruits, shoot or fruits that grow in around the village or garden, it can be claimed as own private by whom the first time find, clean or the land owner where the plants exist and then it will be inherited to their descendant. In terms of collecting of building materials, trees and plants that commonly used for building or household needs that grow around settlement, near garden, or in the taboo area, it can be claimed as own private by them whom find first and clean it, and it can be inherited also to their descendant.

The use pattern above is more related with the regulation principles in satisfying the family subsistent need. However, together with the age development, which outside people starts entering, the land owners are interested to surrender their resources to be used. This made

the indigenous knowledge that contained conservation values on land resources will be more eroded.

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When entering the economic capitalist system that based-use money, the utilization of forest is more toward the economic principles that result in material profit. This is because of when a number of HPH operates, conversion forest for transmigration program, settlement, etc it causes there is a changes of ownership



Figure II-23. Kind of drill snail *Bactronophorus* sp. collected by local people in CATB area

structure and allocation pattern that it has been practiced by the people for a long time. The communal forest area has been conversed to some purposes and people received a direct compensation. Generally, the compensation is a cash money and housing development and of course it will have an impact on the changes of forest function for some of stakeholders.





B.6.3 The Use of Natural Resources in the CATB area

The area of Bintuni Bay Nature Reserve, physically, it is surrounded by people settlement

where from generation to generation has been interacted in terms of utilization of natural resources either flora or fauna and the land for garden. The use of some kind of flora by the people more intended to wood as for firewood and building materials, such as making of traditional house poles and fence poles. The utilization of fauna more focuses on the water territory fauna, like fish, crabs, prawns, and shells (local name: bia).



The interaction pattern of the people in around

of CATB area is in livelihood form, in which most of the people have their livelihood as fishermen, hunting and sago beater. If look at that pattern, so the use of natural resources in the area of CATB is intensive enough, in which people harvest the natural resources almost every day. Kind of fauna exist in CATB area such as crocodile, deer, and some bird species that many are being used by the local people as hunted animals. Specifically for crocodile, deer, and pigs are the fauna that always be hunted and it has become livelihood sources for



Figure II-25. Mud crabs that normally collected by local people in BBNR and surroundings

some people in Naramasa, Yakati, Yensei, Mamuranu, Anak Kasih, and Tirasai Villages. Crocodile is taken its skin, while deer and pigs are taken meat for making dried meat. In addition to, natural forest of mangrove forest as a land in the transition area, it has been used for gardening. The activities of such utilization have been practiced since the past age and it becomes heritage for the present generation.

Catching and collecting of Marine Products

Fish catching and other fisheries product inside and around of the CATB area, generally, are simple. The catching facilities used are traditional, such as spear, landing net, and fish trap. Besides that, most people in the reserve area have known and used modern catching equipments that adopted such as "rawai", and trammel net.





In the activity of fish catching and other fisheries product, the local people reside inside or around the reserve area recognized some methods of traditional cathing, namely " "PELEKALI, JARING BALABUH, and MANCING".

"PELEKALI", is a catching fish with the technique of cutting off the small river downstream in the area where affected by tidal and using ex-trawl net. This technique has been practiced for such a long time and from generation to generation with using one of physical characteristic of area where affected by sea tidal. When the river is high tide, in the estuarine area it is spread out ex-trawl net up to the river bottom with the help of mangrove pole from species of Rizophora sp. Holes that are formed during low tide, then it be given a kind of poison which taken from plants known as "akar bore/tuba" that can make fish intoxicated.

"JARING BALABUH" (FLOATED NET), that is catching technique for fish, prawn, and other fisheries products traditionally by using net float (locally: net balabuh).

" MANCING" (TO FISH), that is catching of marine products especially fish in and around the area of Bintuni Bay Nature Reserve by local people using row- or motor boat. A tool used is fishing rod (nylon and fish-hook). Collecting of such marine product meant here is harvesting / collecting of fishery product such as crabs (mud crabs) which in referred to local term " Karaka", shells / snail (shellfish), and " Tambelo", a kind molusca (marine borer) which was life in bole of death mangrove. Gathering of marine product is usually done in mangrove forest community by local resident, which live around Bintuni Bay Nature Reserve area. Technique of harvest still done traditionally by using "pengait" (hook) made of iron with length ± 1 m, crate, and sack (noken). Exploiting of various fish and prawn species caught by using catch tools anchoring net (jarring "berlabuh"), and for the "pele kali", fishing rod, bore root (tuba) and also use machine / without machine boat. Area of fish catching done by people around the area of CATB, almost cover the whole area especially in River of Tirasai, Muturi, Bokor, Kodai and also other small rivers. While for catching crabs (karaka) it uses hook iron tools. Result of interview with fishermen indicated that, once go out to sea (one day night, 24 hours) they earn to yield 10-30 fish string. In general fishermen go out to sea not every day, within a week they go out to sea 2-3 times. Therefore the average gross yield in once go out to sea is Rp.100.000-300.000, the income not yet been reduced by fuel (gasoline price Rp. 4.500 /liter) which needs about 15 liter (± Rp.70.000) and divided with other fisherman (1 boat 2 people). If assumed the average net revenue = Rp. 200.000 - 70.000 = 130.000 / 2 = Rp. 65.000 / people once go out to sea, hence the average income per month is Rp.650.000-Rp.975.000. While for them catching crab (karaka) in general use boat without machine or / rowboat (kole-kole) and once go out to sea can yield 7- 10 crabs, so that can get the average income of Rp. 50.000-100.000 /once go out to sea. Gathering of fishery product by local people only be undertaken at of low tide, especially when the transition of high tide and low tide that usually occur in the day time. Result of interview with some traditional fishermen





(collectors) that in once intake, each person can gather / take 10-15 crabs / people for " karaka" and 1-3 bag / people for the shell/snail.

 Table II-16. Fisheries Products produced in the Area of Bintuni Bay Nature Reserve (CATB)

 and their Price

No	Kind of Fisheries Product	Units	Price (Rupiah)
1	Ekor Satu Fish	string (3-5 pieces/ ±1 Kg)	10.000
2	Sembilan Fish	String (3-5 pieces/ ±1 Kg)	10.000
3	Kepala Batu Fish	String (3-5 pieces/ ±1 Kg)	10.000
4	Congge Fish	String (3-5 pieces/ ±1 Kg)	12000
5	Lasi Fish	String (3-5 pieces/ ±1 Kg)	10.000
6	Bubara Fish	String (3-5 pieces/ ±1 Kg)	10.000
7	Red Kakap Fish	pieces	10.000-35.000
8	Sisip Fish	String (3-5 ekor/ ±1 Kg)	10.000
9	Prawn	Kg	25.000
10	Crabs	pieces	7.000-10.000
11	Tambelo	bag	5.000-10.000
12	Shell/snail	bag	5.000-10.000

Source: Survey Result TNC Team, 2005.

Utilization of Plant

Existence of lowland forest ecosystem and mangrove ecosystem in the reserved area is very important, especially by the traditional community whom living around the Bintuni Bay Nature Reserve. This Forest for local people is the source of foodstuff, medicines, firewood, and construction material.

Special for exploiting as firewood, the community only exploited fallen-off branch and stick without cutting away trees. This makes mangrove forest especially in the area of CATB still be well-maintained. Equipments used for cutting mangrove trees still simple, that is using big knife and axes. Intake of firewood done by collecting stick / branch in lowland forest and tree of death mangrove and trees of mangrove that fallen down naturally (caused of wind and of old tree). The present of palm species in lowland forest ecosystem make this forest become important for the community around. The around people much use one of this flora components for a various need.





Survey result of TNC Team (2005) indicated that the people of Sough tribe which living around Bintuni Bay Nature Reserve area exploited some palm species which grow in lowland forest of CATB as food-stuff, construction material, traditional medicines, and also weapon and tools (Figure II-26 and Tables II-17).

No	Species (nama lokal)	Benefits		
1	<i>Caryota rumpiana</i> (guta more)	∉ Shoot taken as food stuff ∉ Palm fiber used house roof		
2	<i>Calamus</i> sp.1 (aitaga moredek)	∉ Trunk is peeled and cleaned and used fort tying fence and house pillar and bow rope		
3	<i>Calamu</i> s sp.2 (aitaga cidemeh)	∉ Leaves used for food wrapping, especially meal roots		
4	<i>Calamu</i> s sp.3 (aitaga besameh))	 ∉ Trunk directly used for tying house pillar ∉ Trunk splitted, cleaned for bow rope ∉ Trunk plaited for basket making or other plaited products 		
5	<i>Licuala</i> sp. (beimes)	 ∉ Trunk splitted in certain size and used for house floor and chairs duduk (para-para) ∉ Trunk splitted, scrapped for bow making 		
6	<i>Pinanga</i> sp.1 (Amough)	∉ Trunk splitted and scrapped for bow making and spear head (traditional weapon)		
7	<i>Pinanga</i> sp.2 (Humog)	 ∉ Trunk splitted, cleaned, and use for house floor ∉ Trunk splitted and cleaned for arrow making 		
8	<i>Pinanga</i> sp.3 (Corohuij moro)	 ∉ Trunk splitted, cleaned and used as house floor ("para-para") ∉ Trunk splitted and scrapped for arrow making ∉ Leaves used for wrapping food 		

Table II-17.	Utilization	of palm by	local people	e surrounding the	e Bintuni Bay	Nature Reserve
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Source: Survey Result TNC Team, 2005

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assessories of local canoe by local people in BBNR.



Exploiting of mangrove resources can be seen from two levels, that is exploiting of ecosystem mangrove level as a whole and ecosystem component level of ecosystem as a main component of life (primary biotic component). Specifically for society which living in and around Nature Reserve area, generally still limited to exploiting of ecosystem component level (fauna and flora) as life primary component in mangrove forest. Exploiting of mangrove forest in Area of Bintuni Bay Nature Reserve only limited to exploiting of mangrove forest in traditional scale (traditional uses). Exploiting of mangrove forest flora by traditional is in general conducted by local society for household needs. Kind of flora used only limited to mangrove and of nipah. Exploiting of type of mangrove by local society is generally used for firewood, tool, house construction material, equipment of traditional boat (Figure II-27), and also for pillars fence in activity of fishing which in referred to local term "tiang belo" (Figure II-28).



Figure II-29. Traditional house of local people that most of raw material orriginally from nypa vegetation in area of Bintuni Bay Nature Reserve

Special for the nipah vegetation, the native people in around of Bintuni Bay Nature Reserve, that is Sough tribe, Kuri, and Wamesa in life across generation have exploited seven parts of nipah that able to be used, that is young leaf, leaf bone, petiolus, sprout, panicle fruit and root. Utilization of nipah by the community of these tribes is for example food/beverage stuff, construction material like for the house roof and wall (Figure II-28), medicines, energy, tool, and traditional boat facilities (Figure II.29), and crafting.





Berikut adalah rangkuman pemanfaatan komponen flora pada ekosistem mangrove di kawasan Cagar Alam Teluk Bintuni, seperti disajikan pada Tabel II-18.

TableII-18. Utilitation of flora components in mangrove ecosystem by community inside and
around the area of Bintuni Bay Nature Reserve

No.	Use Purpose	Species used	Parts used	Technique of use
1	Food and baverage stuff	Nypah Fructicans	Fruits	Fruits easily splitted, meat for eating and drinking, taste as young coconut
			Panicles	Panicle cut and tapped for juice (bobo), a kind of traditional drinks
			Petiolus	Petiolus cut in small pieces, peeled, smoked, when dried then burnt for ash that used as salts and kept in bamboo
2	Building material	Nypah Fructicans	Leaves	Raw material for roof and wall, hut, and row. It can be used for $3-5$ years
			Panicles	 ∉ For wall, nypa penicles dried and cut then arranged for wall purpose ∉ For sitting purpose, panicles cleaned then stuck along net spreading as net holders to prevent net brought by stream of tide, or cut for sitting facilities that used when fishing
			Shoots	shoot cleaned from leaves and splitted into two parts then used for tying or nails
		Rhizophora sp.	Trunk	Used directly for house pillar
3	Medicines	Nypah Fructicans	Roots	Roots burnt and charcoal put at pain teeth
		Rhizophora sp.	Bark (skin)	Skin scrapped for treat scabbies infection
4	Energy (fuel)	Nypah Fructicans	young leaf and penicles	Dried youngleaf and panicles burnt
		<i>Bruguiera</i> sp.	Trunk	Used directly for firewood
		Rhizophora sp.	Trunk, branch	Used directly for firewood
5	Tools		young leaf	 ✓ young leaves sewn at soft material with length ∂ 50 – 60 cm, then form as tube alike with diameter 25 – 30 cm and height 80 – 100 cm for a place of sago meal, sago filters and Kamboti (bag subtitute) ✓ as a wrapper when cook (burn) food ingredients such asgo, fish, and meat.
			penicles	Bone leaf cleaned and make as spoon (gata-gata) used for eating traditional food (papeda)
			veins	for brooms to clean inside and around houses
6	Crafting		young leaf	Young leaf for crafting, such as cup, basket open at upper side (idate) and close (kirore)
7	Traditional row equipmentsl	Nypah Fructicans	leaf	Raw material for row roof that can be used for 3 - 5 years
		Rhizophora sp.	Trunk	Used directly as pole for row housing
8	Belo pillar	Rhizophora sp.	Trunk	Used directly for pile (belo) for to put net aor trawl when "pele kali"

Source: Survey Result TNC Team, 2005





Hunting Place

The people Society residing around the Bintuni Bay Nature Reserve area with the main ecosystem is mangrove which rich of various wild animal species such as wild pig (*Sus* sp.),

deer (*Cervus timorensis*), and also various species of birds and mammals. This condition cause in living across generation always practice hunting activity and catch wild animal to fulfill the requirement of animal protein. In fulfilling the requirement of protein, people which living around Bintuni Bay Nature Reserve still depend on nature resources. The roles of area of CATB become important as animal protein source for people around. Besides using of fishery product in the form



of fish, prawn, and crab, society who lives in and around CATB, especially in the villages of Naramasa, Yakati and of Yensei also do hunting for crocodile in the River of Naramasa, Sobrawara, Yensei and of Yakati. When they hunt crocodile, minimum there are 2 people (one boat) and do it at the nighttime. Tools that they use such as lance, big knife, flashlights and also rowing boat (kole-kole). Hunted crocodile must have body diameter between 12 until 20 inch, because the crocodile in such body size is saleable in marketing. Hide crocodile price in this time, that is about of Rp. 15.000 / inch. Besides taken the skin, crocodile flesh is consumed by people and also " tangkur" crocodile saleable enough in market. The buyers of skin, flesh and other part of crocodile body almost each week come to the villages, this indicates that demand of such commodity is high enough high. Based on the interview result



Figure II-31. Cage Model for growing young crcodile in Yensei Kampong, Idoor Districts

with the people hunting crocodile, the catching yield in this time is much more difficult. If compared to 5 until 10 year ago, during one week hunting, they were able to catch 7 until 10 crocodiles. Now once hunting needs time 1 - 2 weeks and only obtaining 3 - 4 heads in average. Efforts of people to grow baby crocodile have started practicing in the villages of Yensei, Naramasa, and East Bintuni. In this activity, about 7 - 10 crocodile baby put in cage of 4m x 6 m (Figure II-30). Effort developed by the community of Yensei, Naramasa, and Bintuni

is applicable to develop in other villages or just develop its scale business, so that pattern of crocodile exploitation by intake from nature can be decreased. Other hunting to fauna which done in the area of CATB are pigs and deer. Deer and pig there are many in lowland forests





around the mangrove forest. In hunting pigs and deer, it was practiced a person alone or by group. Tools used such as lance, big knife, arrows, traps and also dog. Deer meat and pig are sold in form of dried meat (dendeng). The marketing price now is Rp.15.000 / kg.

Garden Site

The community field crops and garden found inside the area generally they are located far away from settlement. Farm or garden is in general practicing by people, either they who live inside or outside of the CATB area. Pattern Farm used shifting cultivation system which cultivated with season crop type, roots, fruits crops and vegetable with the average of farm area is 0,25 - 1,0 ha for every household unit.

The clearing model of community field farm or garden commonly it has several steps, as following:



Figure II-32 Garden Field and ex-garden of local community in Mamoranu kampong inside Bintuni Bay Nature Reserve area

- ∉ Forest floor clearing, that is cutting bushes, cutting away tree of stake and pole level.
- ∉ Cutting away big trees in the field, then let the field for a certain time so that the remain of tree stick and bushes turn to dry. The tree stick and bushes collected at one particular space in farm / garden and or periphery
- ∉ Combustion done after tree stick and bushes are already dry, then result of combustion in the form of ash let to be decomposed or to mixed with soils
- ∉ After that, do planting according to crop species they need
- ∉ After crop harvested, hence they will move to new farm location with land time cultivation (bera period) 1-2 year.

B.6.3 Land Ownership

Result of field survey of TNC Team (2005) succeeding to identify the ownership of farm in the area of Bintuni Bay Nature Reserve according to the territory of customary ("adat") law (Figure II.32).

Traditionally, this area stays in management of custom region of three big tribes namely Tribe of SOUGH (clan of Imeri, Yettu, Tiri, and Pity), and tribe of WAMESA (clan of Fimbay, Masyewi, Maboro, Kindewara, Kawab, Sirimbe, Waney, Tatiri, Kemon, and Susumbokop), and tribe of KURIE from clan of Urbon, Efredire, and Pigo. Special for the tribe of Wamesa, clans which have big enough customary right for land rights in area are Susumbokop, Tatitri,





Maboro, Manibuy, and Kemon, while other clan only owning less than 15 % from total region where as a customary right for Wamesa tribe (Result of Survey Team, 2005).

Tribe of Sough inhabiting rivers area of Wasian, Bintuni till Simeri more recognized as Manikion Parirei. This Tribe especially from clan of Yettu and of Tiri " claiming" their customary law region cover the region of River estuary of Wasian, Bintuni, Tisai, Banjar Ausoy, Muturi and Tirasay. Clan of Imery covers Tirasay, Sumberi, Tikamari, Anak Kasih, and Simeri. While Clan of Iba have customary law region start from River of Sigirau until by Banjar Ausoy. According to information of key figure (Andarias Iba), in Tuasai Kampong, that land which in this time become customary land rights of Iba Clan is given from clan Yettu as recompensation for the help of clan Iba whom have assisted to solve the problem (civil war) what was at that time experienced of by clan Yettu. Result of interview with one of the community figure (Bernadus Sioho) that same thing also happened on clan Sioho whom owning customary land rights in River area of Tikamari and Anak Kasih that was given by Clan Imery.



Figure II-33. Map of Land ownership in Bintuni Bay Nature Reserve areaaccording to custom law region

Tribe of Wamesa clan especially Manibuy " claiming" that before of war tribe their customary region start from River of Simeri till Manibuy. Clan of Tatiri, Susumbokop, Kemon, and Maboro coming from kampong of Yakati " claiming" Mount region of Taberay Island of





Nusuama, Island of Kaboi up to River of Kodai. Clan of Fimbay, Sirimbe, Masyewi coming from kampong of Yensei "claiming" their customary law region cover Island of Maniai, P.Jawarupai and Modan.

While KURIE tribe claim their custom region cover area of around River of Naramasa, Sobrowara, and Modan. According to confession of Kuri people, Island of Modan is owned by people of Yensei (Tribe of Wamesa). Till now the ownership of Island of Modan still become debating between tribe of Wamesa and Tribe Kuri. This Matter happened because according to history narrated by custom figure of Wamesa (Mr. Adrian Tatiri) and Kuri (Mr. Set Efredire), Modan Island at the era of Tidore Empire is a center of regional governance of the Tidore empire territory in Irian. Both of the tribe claim that their tribe is the owner only of Modan Island.

Boundaries of the ownership of custom land, it is not as an absolute custom boundary. Because till now, there is no agreement among the three-big tribe, the agreement concerning custom land boundary need immediately implemented in order not to avoid "conflict" between them. The mentioned confessed also by Sector Head of Sosekbud Bappeda Bintuni Bay Mr. Tessa,S.Sos, that agreement concerning custom land boundary have to being immediately established in order to prevent intertribal conflict, and for the future, Board of Regional Development Plan (Bappeda) of Bintuni Bay will try to facilitate such matter.

B.7 Facilities and Infrastructure of facilities Transportation

Transportation facilities which are available in Bintuni Bay Regency, especially in three

districts (Bintuni, Idoor, and Kuri) where the nearest with the area of Bintuni Bay Nature Reserve, consisted of the transportation facilities of air, land and river/sea.

In the capital of Bintuni Bay Regency, there are an airfield with asphalt construction, which can be landed by Plane Of Twin-Otter (Figure II.33) and Cessna (light airplane). Regular flight to Bintuni Bay Regency served by Merpati Nusantara Agency, with air transport frequency four times a week (Thursday, Wednesday, Friday, and Sunday) from



Figure II.34. Air Transportation facilities kind of Twin-Otter in the Bintuni Airport serving flight to and from Bintuni Town

Manokwari, and twice a week (Tuesday and Friday) from Sorong. Besides also it is able to use a rented flight belongs to AMA from Manokwari. However, the air transportation in Bintuni





Bay Regency is depending on weather, if bad weather, hence no flight can be worked from any agency.

To reach the closest kampongs around the capital of Bintuni Bay Regency can be done by using public four-wheel vehicles (taxi) that are limited in numbers. Beside that, it is also available two-wheel transportation facilities two (motorcycles or "ojek") serving public passenger in town and to kampong in around the Bintuni town. While land transportation serving public passenger whom wants to go out of town or Regency of Bintuni Bay, especially Manokwari, use Hardtop (Figure II-49) with taking time 12 - 16 hour.



Figure II-35. Land cruiser (hardtop) a kind of land transportation serving transportation Manokwari – Bintuni back and forth

Transportation land facilities that connecting the capital Regency of Bintuni Bay to the closest regency (Manokwari Regency) is a dump road (hardening) \pm 74 km and asphalted road \pm 126 km (Local Government Of Prov.Papua, Local Government Of Manokwari, Unipa, CRMP, 2003).

Situation of road transportation in town of Bintuni is asphalted road (mostly have damaged) as long as 13 km that connecting to the settlement locations, while road that connecting capital of Bintuni Regency and kampongs in its around is a dump and compacted road. A number and type of land transportation facilities that available in Bintuni Town was presented at Tables II.20.

Role of river /sea transportation facilities is very importance for kampong around Bintuni Bay Nature Reserve (CATB), especially kampong located in governmental region of Idoor and Kuri District. The main facilities of Transportation are speed boat or longboat (Figure II-36) and rowing boat.

Access to some kampongs around the Bintuni Bay Nature Reserve to downtown of Bintuni use river/sea transportation facilities presented at Tables of II-19.



Figure II-36. Longboat a kind of sea/river transportation facilities used by people inside the area of Bintuni Bay Nature Reserve





Besides that, for sea transportation inters regency, in Bintuni Bay there is a port. Sailing line that has an access from and to Bintuni Bay via Sorong is a regular voyage of PT. PELNI and other private sea transport as presented at Tables II-20.

Tabel II-19. Facilities and Transportation type used by local people surroundings BBNR to reach the Capital City of Bintuni.

No	Kampongs	Facilities and Transportation Type	Travel Time	Notes
1	Mamuranu	River & sea, mechine boat	∂ 3 hours	R.Kamisayo-Sea-R.Wasian
2	Anak Kasih	River & sea, mechine boat	∂ 2,5 hours	R.Anak kasih-R.Manibuy-Sea-
3	Yakati	River & sea, mechine boat	∂ 4 hours	R.Yakati-R.Tatawori-Sea- R.Wasian
4	Yensei	River & sea, mechine boat	∂ 4 hours	R.Yensei-R.Tatawori-Sea- R.Wasian
5	Naramasa	River & sea, mechine boat	∂ 6 hours	R. Naramasa-Sea-R.Wasian

Source: Survey Result TNC Team, 2005

Tabel II-20. Regular Route of PT Pelni's and other Companies' boats

No	Ship Name	Designated Route	
1	KM Papua III	Mkw-Sorong-Babo-Bintuni-Kokas-Fakfak (PP)	
2	KM Lady Marina	Merauke-Agats-Timika-Tual-Kaimana-Fakfak-Bintuni-Sorong (PP)	
3	KM Bintang Satya	Sorong-Babo-Bintuni-Kokas-Fakfak (PP)	
4	KM Raflesia*	Bintuni-Babo-Kelapa Dua-Sorong	
5	KM Semuel*	Not yet operated	

Source: Survey Result TNC Team, 2005

* Armada Belongs to Regional Government of Bintuni Bay

B.8 Estimation of Economic Value of Bintuni Bay Nature Reserve Area

Estimation of economic value of CATB area should be done in order to all parties know how big the economic benefit that can be produced. So that all partied feel responsible to preserve the area of CATB, therefore the next generation still can use the existing natural resources. Estimation of economic value of CATB area has been calculated only for its mangrove forest, because the majority of the area is mangrove forest.

Approach which used in assessing the benefit of CATB area (mangrove forest ecosystem) is a concept of total economic valuation) from goods and services product that useful (use value) and no useful as in direct (non use value) (Figure II.36)

Total economic value (TEV) is the amount of utilization values (use value = UV) and value of non utilization (non-use value = NUV). UV is the amount of direct utilization values (direst use value = DUV), indirect use value (IUV), option value (OV). While, NUV is the amount of





existence values (XV) and bequest value (BV). Thereby, total economic value can be formulated as follows:

$$TEV = UV + NUV = (DUV + IUV + OV (XV + BV))$$

Approach of assessment in calculation of benefit value of CATB area (mangrove forest ecosystem) through the calculation total economic value that using approach of productivity and market values, substitution market, replacement cost, and contingent valuation method, with using hypothetic data concerning readiness of payment and receiving (willingness to pay = WTP, and willingness to accept = WTA) of the user of mangrove forest ecosystem resources.

Concerning to the benefit that is able to be yielded from mangrove ecosystem, Camille Bann (1999) tried to divide it into 3 domain that is: (i) sustainable production function, (ii) environmental regulator function, and (iii) Information function. In holistic terminology, mangrove forest ecosystem is also have uniqueness and functioning in social and economy. Benefit classification and function of this mangrove ecosystem, hereinafter it can be looked at Tables II-21.

Sustainable Function Production	Carrier and Arranger Function		
Fuelwood	Erosion Control		
Charcoal	Absorbent and human waste recycle and other pollutant		
Fish	Maintain biodiversity		
Shrimps	Habitat for migrant		
Tannin	Spawning and breeding ground		
Nypa	Supply of nutrients		
Medicines	Nutrient Regeneration		
Traditional hunting, fishing, and product collecting	To protect and maintain coral reef		
Genetic Resources			
Social Economy/ Conversion Function	Information Function		
Industry and Land Use	Religious and spiritual information		
Ponds	Artistic Inspiration and culture		
Rice Farming	Education Information, history, and science development		
Habitat for Native People			
Recreation Sites			

Table II-21.	Function and Benefit of	Environment of	Mangrove	Ecosystem
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The calculation of economic value of every kind of the benefit of mangrove forest ecosystem for actual value is based on the assumptions at price level, production, the expense cost





around the area of CATB. On the other hand, the assessment of potential benefit in the area is predicted with the assumption approach in assessing of economy (Table II.22).

Table II-22. Basic Assumption of Assessment Mangrove Forest Benefit Type in Bintuni Bay Nature Reserve Nature Reserve

No	Benefit Type	Benefit Value	Bintuni Bay Nature Reserve (Mangrove Forest)	
		(Rp/ha/year)	Basic Assumption for Benefit Assessment (Actual)	
1	Fuel wood	2188	Mangrove Area 112.365 ha. Production 0.0625 m3/ha/year	
			price Rp. 50.000/m3; cost 30 % from revenue	
2	Nypa Leaf Roof	240000	Production 150 bengkawang/ha/year, price of leaf nypa roof Rp. 2000/bengkawang; cost 20% from revenue, with nypa area 480 ha	
3	Fish	104837	Production 1178 Ton/yr; average price Rp. 10000/rope (2 Kg) = Rp 5.000/kg; Large fish (red kakap) Rp.15.000/pieces (2 Kg) So average price Rp 10.000,	
			divided by mangrove area (112.365 ha)	
4	Prawn	789976	Production 1495 ton/yr, price US\$ 6.25/kg (conversion Rp. 9500/US\$), divided by mangrove area (112.365 ha)	
5	Crabs	129024	Production 23,04 pieces/ha/yr with price Rp.7.000/price; cost 20% from revenue	
6	Shell	76200	Production 19,05 kg/ha/yr with average price Rp.5.000/kg; cost 20% from revenue	
7	Wildlife (Crocodile, Deer, pigs, birds)	127264	Based on income of local use (hunting and collecting) Rp. 6,5 million/KK/ year, population 2200 KK,	
			divided by mangrove area	
8	Erosion Control	95937	Assessment based on agriculture local productivity Rp. 4,9 million/KK/ year (2200 KK), divided with mangrove area	
9	Carbon Absorbent	3441763	Predicted from carbon content of mangrove forest 19.926 kg/ha in Riau (E.Hilmi, 2003) and Standing potential 66 m3/ha,	
			conversed into mangrove standing per hectare (107 m3/ha);	
			price carbon/kg = US \$ 10/ton, converse Rp. 9.500/US\$	
10	Optional Benefit of biodiversity	142500	Biodiversity value of mangrove forest per hectare US \$ 1500 km2/yr or about US \$ 15/ha/year (Ruitenbeek, 1991) conversion Rp. 9.500/US\$.	
11	Habitat Benefit	6291000	Benefit value of mangrove habitat US\$ 2516/ha/yr (Meilant, 1996) conversion Rp. 9500 /US\$	
No	Benefit Type	Benefit Value	Bintuni Bay Nature Reserve (Mangrove Forest)	
_		(Rp/ha/year)	Prediction Assumption of Potential Value	
1	Building Wood	942000	Mangrove area 112.365 ha (157trees(trunks)/ha) species Rhizopora sp, sometimes used as construction material	
			price Rp.10.000/trunk,Area harvested potential mangrove standing 22.473 ha (rotation 20 yr), Cost 40% from revenue	
2	Chip	17974000	Standing mangrove potential 107 m3/ha; assumption potency used for chip 80%, i.e. 86 m3/ha, chip wood plant = 300.000 m3/yr export chip price = US \$ 40/m3, conversed (Rp. 9500/US\$), cost 45% from revenue	

Notes: Fish and prawn production (1178 and 1495 ton/year) is total production of water territory of Bintuni Bay 2003 (Source: Atlas Coastal Resources), mangrove standing potential is entire species potency and assumption all used for chip

The assumption of the assessment above in added cost component that is production process cost such labor, and also other production cost. Benefit firewood type, sago up to



wild animal is actual value, which exist so far and has been utilized by the people. Meanwhile, kind of benefit of construction material and chip are potential.

As a resources, assessment of mangrove ecosystem based on benefit and functions produced, either production function, ecological, and social-economic function. Total assessment of economic benefit of mangrove forest ecosystem cover assessment of direct benefit, indirect benefit, choice benefit and existence benefit. Total of economic value, which calculated, is an actual value and potential value. Actual value is value of mangrove forest utilization at present. Potential value is being approximated with calculating the potential benefit that exist or that have an opportunity to be developed if people can optimally use. The performance of benefit value of mangrove ecosystem in CATB area can be seen at Tables of II-23.

	Type of Economic Benefit	Economy Benefit (Rp)		
		per Ha	Total Area	
	Direct Be	enefit		
1	Building Wood	150,720	16,935,652,800	
2	Chip	2,926,000	328,779,990,000	
3	Fuelwood	2,939	330,240,444	
4	Nypa leaf roof	5,126	576,000,000	
5	Fish	31,715	3,563,699,192	
6	Prawn	238,984	26,853,479,297	
7	Crabs	39,200	4,404,708,000	
8	Shell	20,000	2,247,300,000	
9	Wildlife	11,296	1,269,225,100	
		3,425,980	384,960,294,833	
	Indirect B	enefit		
1	Sediment Trap	95,937	10,780,000,000	
2	Carbon Absorption	2,727,916	306,522,322,200	
3	Optional Benefit Biodiversity	158,333	17,791,125,000	
4	Habitat Benefit	6,176,667	694,041,150,000	
5	Abrasion Barrier	5,522,160	620,497,508,400	
6	Inhibitor Intrusion	211,901	23,810,233,392	
		14,892,915	1,673,442,338,992	
Eco	onomic Benefit Area	18,318,895	2,058,402,633,825	

Tablel II-23. Value Prediction of Mangrove Forest Ecosystem in the area of CATB

Source: Calculation of Field Data

Based on the result of data analysis of Table II.23, it is understood that total of economic value of mangrove ecosystem can be differentiated into indirect and direct benefit. There is a direct benefit in the area that cannot be used, and it is categorized as potential benefit or opportunity benefit. Those that can be categorized in here are wood benefit if it is used as a raw material for chip and building wood. As a conservation area, wood from Bintuni Bay



Nature Reserve cannot be used as wood resources especially for commercial purpose. Lost of this opportunity will result in direct benefit for people and benefit of environment service that its value is much higher. If look carefully, it shows the direct benefit and indirect benefit, the direct benefit is 18.7% (Rp. 3.425.980/Ha/year) meanwhile indirect benefit from environment service is 81,3% (Rp. 14.892.915/Ha/year).

Performance of economic value of direct benefit (actual and potential) of mangrove forest by species is as follows: value of mangrove forest stand is 89.9%, included fuelwood, material wood, and chip. The value of direct benefit that utilized by people in the reserved area is 10.1%, i.e. nypa-leaf roof, fisheries product and wildlife (fish, prawn, crabs, shell, crocodile, deer, pigs, and birds).

The value of indirect benefit (actual and potential) of mangrove forest as a function of erosion control Rp. 95.937/ha/year; and as carbon absorbent Rp. 2.727.916 /ha/year. While, optional benefit on biological biodiversity of mangrove forest is Rp. 158.333/ha/year and existing of ecosystem habitat of mangrove forest is still available has economic value Rp. 6.176.667 /ha/year (20,72%).

Estimation analysis on value of mangrove forest in the area CATB is an early figure how much its economical benefit value. This value is still predicted lower, because not all the benefit of mangrove forest calculated such as benefit value of medicine, habitat conversion, endangered species protection, and lowland forest where its area is 10% of the reserved area. Therefore, it is required a comprehensive study regarding economic benefit value of CATB area.

Nevertheless the estimation of economic benefit value of fishery product, wild life and nypaleaf roof, is relatively small, but this value is very important because it is a direct benefit value that everyday it can be made sense for the people live inside or around the CATB area to support their daily life. In economical value, mangrove wood is for fuelwood; building wood and chip indicate highest value, but that value for short-term period. The important thing is if the mangrove forest lost, the other benefit value such as fishery, nypa-leaf roof, wildlife, and indirect benefit such as erosion control, carbon absorbent, and option benefit value of biological biodiversity and habitat existing will lost. Therefore, the sustainability of mangrove forest is necessary to always be preserved, so that other value or benefit that obtained, beside of mangrove stand value can be still attained.

C. PROBLEMS

The result of observation and direct interview with the people in and around the area of Bintuni Bay Nature Reserve (CATB) indicates there are some serious problems that are happened on the area. This can be categorized as threat for the existing of the area now and then.





C.1 Physics

Physical problems here means a physical condition of area in this time which damaged that can threat the existence of Nature preserve area such as area position, infrastructure, management of watershed (DAS), and area overlap.

C.1.1 Area Position

Result of field observation indicated that the position of preserve area of Bintuni Bay where very close and in some part is direct boundary to the people settlement. Even more some kampongs where occupy by native people are located inside the preserved area. Kampongs that situated inside the preserved area are Mamuranu (Coordinate: S 2^{0} 14'8.71" and E 133⁰ 58' 6.09"), Kampong Anak Kasih (Coordinate: E133° 56.092S 2^{0} 03' 0.69" and E 133° 56' 0.92"), Kampong of Tirasai (Coordinate: S 2^{0} 03' 2.31" and E 133° 51' 6.37"). The condition



Figure II-37. Low-land rain forest converted into logyard near Tirasai village in BBNR

cause the accessibility of people around to the area is very easy and a little difficult in monitoring so that the pressure against the area of Bintuni Bay Nature Reserve is high.

Observation result in field also indicated that position of Bintuni Bay Nature Reserve area is also directly bound to production forest where is exploitation area of some Commercial Forestry Concession (HPH) such as PT Yotefa Sarana Timber in the North, PT Bintuni Utama Murni Wood Industries (PT BUMWI) in South, and PT

Manokwari Lestari in East. For the logpond or logyard, some of the wood industry cleared several sites in Bintuni Bay Nature Reserve especially in lowland forest ecosystem and some parts of mangrove forest.

C.1.2 Management Of Watershed (DAS)

Physically, in the area of Bintuni Bay Nature Reserve there are some great rivers and small, which is, have estuary to territorial water of Bintuni Bay and they are functioning as transportation infrastructure for the local people. Result of field observation and also information of people, at the time rain season, the rivers sometimes overflow and the water turning to muddy-brown. This] indicates a level of erosion, which occurred at upstream (upland) as an effect of "deterioration rate" forest land, which is uncontrollably. As a result substrate that brought by floods on the rainy season will heap to form a delta in the river estuary of territorial water of Bintuni Bay. This is probable because of the uncontrollable forest exploitation and not concerning the environment sustainable principles and it much more





happened on lowland rainforest ecosystem potential that saves а number of commercial species. This activity is generally conducted by all owners of HPH and Kopermas whom belongs to concession around CATB.

C.1.3 Infrastructure

Result of observation showed that supporting infrastructure in activity of management of Bintuni Bay Nature Reserve area of 124. 850 ha are very



inadequate. Existing infrastructure in this time only a work hut of 36 m², which it also uses as a house for Head Resort of KSDA Bintuni. This condition is very affected management activity especially for monitoring and protecting the reserved area.

C.2. Biology

Internal biological problems of Bintuni Bay Nature Reserve area are not yet appeared. This because most of the ecosystem of structuring area especially mangrove ecosystem as a main component ecosystem is still natural and well preserved. The biological problem that can be appeared is the problem because of external factor that occurred not as a relation between ecosystem and species. Result of field observation was successfully identified some problems faced at ecosystem/flora/fauna existing in area, that is degradation and structure change of lowland forest, degradation of small part of mangrove forest, and decreasing population of certain wildlife species that dealing with human being activity, natural phenomenon, and social-cultural factor.

Activity of human causing the happening of problems, that is land clearing for the purpose of logpon area done by the holders of HPH around area, settlement, farm and settlement by local resident in and around area, illegal cutting, and development of other infrastructure.

The disturbing of several sites in mangrove ecosystem is also as a result of natural phenomenon due to wind and erosion at the edge of rivers. Result of field observation indicated that there are several parts of mangrove ecosystem, especially at area with wide-open river; it has been damaged resulted of wind and eroding of river boundary by wave at the wind season.

Other factor that contributes in problems of biological environment of area are cultural social, local people whom since a long time ago occupied the land inside or around the Bintuni Bay Nature Reserve area from some generations. Condition of this cultural-social have created an



interaction with area in the form of exploiting of natural resources, either flora or fauna found in the area and its ecosystem. The utilization of flora species by people more addressed to wood as fuel as well as construction material, like making of traditional house pillar and pillar fence house. Exploiting of fauna more focus at hunt of wild animal (like deer, wild pig, cassowary) and territorial water fauna (like fish, crab, prawn, shell). While exploiting of ecosystem, it was only done by local people, which live in area for garden land.

C.3. Social Economics and Culture

Condition of social economic and cultural of local community is very affected on CATB sustainability, especially the livelihood that its working area located inside the reserved area. It is because it related with exploiting some flora and fauna species, in which according to existing regulation that activities is prohibited. However because such activities have been practiced before the determination of the status of CATB, hence the arrangement of regulation that involved all parties must be done. Some problems of social economic and cultural on CATB is a decline of catching and hunting yield as a result of the practice done so far that not friendly environment and hunting of wildlife (crocodile, deer and some bird types), existence of logyard in area, and also overlap between area boundary with usage of other farm.

C.3.1. Harvesting of Fishery Products that Environmental Unfriendly

People who have living as fisherman, around CATB occupy second order (18,82 %). Therefore many people rely their life on catching of fishery products. People whom their livelihood on fisherman use net as catching tools for the " pele kali", anchored net and fishing rod, and also use bore root (tuba). According to information from some fishermen in and around area of Bintuni Bay Nature Reserve, the catching yield, fish, have decreased progressively if comparing with some last year (3-5 last year). Catching yield in the past can harvest "2 to 3 pails" now can only "0,5 until 1 pail". Besides that, the capture area more far, where the past only 15 until 30 minutes from settlement, now it is needed 1 hour or more, even until the around of Bintuni Bay. It is expected caused by catching activity that not concern on environment sustainable that can have an impact on declining of population of waters biota.

Based on the field observation and information from the area manager and some of local fishermen, it has been successfully identified some catching practices such as the use of derris "bore" roots (*Derris alliptica*). It is practicing when "pele kali" that makes fish intoxicated so that easily to catch, indication of fish catching using insect poison (insecticide), and also usage of trawl by shrimp company until into Bintuni Bay Nature Reserve area.



Techniques of fish catching which causing damage are not yet given distinct legal sanction. Lack of facilities and infrastructures of apparatus of BKSDA Papua, II Resort Bintuni, in which only one person with the wide area of 124.850 hectares and also there is no coordination with other officer of law enforce such as police and military (Koramil) resulted in the straightening of law become very weak.

C.3.2. The Hunting of Crocodile, Deer and Some Bird Species

People residing in around area of CATB, there are whose livelihood in hunting (Crocodile, Deer, Pig and some bird species), especially people in Kampong of Naramasa, Yakati, Yensei, Mamuranu, Anak Kasih and of Tirasai. Based on the result interview and field survey,

special for crocodile hunted mainly by people of Naramasa, Yakati and of Yensei. The People hunt as long as River of Naramasa, Yakati until into Bintuni Bay Nature Reserve area, that is River of Sobrawara, used equipment like spear and boat without machine (kole-kole). The demand of crocodile skin according to information of people of Naramasa still high enough, in which almost each week come all collectors of crocodile skin coming from Babo and Bintuni and then pull in Sorong for selling it to Surabaya.

While deer, pig and some bird species are hunted in area of CATB especially around Island of Maniai, Nusuamar and of Modan. Tools often people use for hunting pig and deer are arrow, spear, weapon,



big knife and dog, while for birds just using air gun. Ways of the people use in hunting are two methods that are hunting by a person itself and team (5-10 people). Yield of catching deer and pig, usually selling in the form of dried meat (dendeng).

According to result interview with a few people whose livelihood is hunting, together with more increase of population and more also demand of hunting yield make a number of crocodiles, deer, and some species of birds more decline. The hunted yield in the past (5 - 10 years ago) in 1 - 3 days hunting, it can be obtained 5 - 10 crocodiles, on the contrary at present, the need longer time 1 - 2 weeks, with hunted yield only 1 - 2 animals, or even not gaining any at all.

Referred to above condition, with the increase intense of hunting crocodile, deer and some bird species, hence it can threaten the sustainability especially crocodile, deer and some bird species, in which those fauna are the rich of biological biodiversity that exist in CATB.

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C.3.3. Village Clusters inside the Reserved Area

Based on field survey result indicated that there are some kampongs (villages) that situated inside area of CATB, namely Mamuranu, Anak Kasih and of Tirasai. Those kampongs, particularly Mamuranu Kampong, have been already there before the determination of CATB status. With the existence of those three kampongs, so the people who live in kampong when doing their daily activities are very rely on the natural resources that available in CATB.



Besides that, with the development of new kampong cluster, such as Kampong Anak Kasih and Tirasai inside CATB, make increase a number of people whom depending on natural resources in their daily activities.

The above condition is worst with the establishment of "social resettlement" by Regional Government of Papua Province in 2003, with the development 54 housing semi-permanent in Kampong Anak Kasih (inside the area of CATB), without coordination particularly with BKSDA Resort Bintuni. This will increase a number of people whom will live inside the area of CATB, hence there will be more natural resources that will be taken and then created a number and a variety of flora and fauna inside area CATB more lessen.

C.3.4. Overlap between Boundary Area with the other Land Use

Transmigration settlement in the north side of boundary of CATB began in 1994, giving problems as follows: there is farmland 2 (Lahan Usaha, LU 2) Banjar Ausoy SP 4 (200 hectares) and Waraitama SP 1 (160 hectares) fall within the reserved area. It is because happened no coordination between transmigration staff with BKSDA Papua 2 Resort Bintuni when the time the determination of LU 2.This matter happened for him co-ordinate no [among/between] transmigration [party/



side] with BKSDA Papua 2 Resort Bintuni at the (time) of stipulating of LU 2 and not yet conducted the process of boundary regulation.



Based on the interview result with people in all kampongs around area, more than 60% respondent (46 respondent or 65,7%) less know the existence of area boundary of CATB. This indicated that process of the arrangement of boundary at the phase 1 in 1997 (associated boundary regulation) North and East boundary and phase 2 in 1999 West and South boundary, it is not yet well-socialized or less involved the local people. Therefore in order to management plan, hence it is needed a process for rearrange boundary in which their process involved all interested parties and socialization process.

C.3.4. Existence Of Place Conglomeration of Wood (Logyard) in Area

The existence of commercial forestry concession (HPH) began in 1990 and IPKMA (Timber Clearance Permit of Custom Community)/Kopermas (2002) residing in around and also part of upstream of CATB give big enough impact to sustainability of CATB. HPH /IPKMA released wood henceforth and pull it together in a Logyard. Because transportation facilities to bring the wood out of Bintuni use river transportation and sea, hence the Logyard made in around river and in general its position in area of CATB. Some Logyard inside areas of CATB that is Logyard 4 (in Muturi River) PT. Yotefa Sarana Timber and IPKMA / kopermas, Logyard Anak Kasih in Tikamari River/Anak Kasih was established by IPKMA /kopermas, Logyard Sumberi made by IPKMA/ kopermas, Logyard SP 5 in Sigirang River made by IPKMA/kopermas, Logyard 5 in Awarepi River made by IPKMA/kopermas, and also Logyard SP 4 in Banjar Ausoy River established by IPKMA/kopermas.

The existence of the Logyard result in the coming of people to occupy around Logyard, because in the location have been built up employees house offices which equipped with other facilities such as electrics, clean water and also the other entertainment facilities. Another effect that caused of Logyard, that is easier for people to access people into area of CATB, because land road have been made from the exploited area to Logyard. With this condition hence more and more people will stay in the reserved area and also access for people to exploit natural resources in CATB much more increase and as a consequence it will lessen a number and a variety of existed flora and fauna.

D. INHIBITOR FACTOR

Management of Bintuni Bay Nature Reserve will succeed if can decrease the inhibitor factor. The inhibit factors are condition in which management institution in this case BKSDA Papua 2, does not have authority to solve them. Some inhibit factors faced in management of area of CATB among them are



D.1. Development Of Bintuni Bay Regency Region

The General Spatial Plan (RUTR) of Bintuni Bay Regency has not been available until the present. The only document available is the Spatial Detail Plan [RDTRK) of Bintuni Town year 2004. Based on the RDTRK Document of Bintuni Town, the Town of Bintuni covers Sibena Kampong up to Argosigemerai Kampong (SP5). Spatial Pattern of Bintuni Town that made in form of Strip Development, in which the form of town lengthen from west to east. The condition above makes consequence from there are two activity generators that same their strength. One generator situated in the western tip of the town, West Bintuni and East Bintuni Subdistricts together with Sibena Kampong, that is as an embryo of Bintuni Town; and in Eastern tip of Town, new activities generator that comes out as a result of the existence of the region of governance center of Bintuni Bay Regency (close to Kampong of Korano Jaya) along with activities that follows.

Based on the above condition, hence in the future, start from Sibena Kampong up to Area of governance center of Bintuni Bay Regency, it is predicted that it will become an area of settlement/office/trade and also other activities. If seeing the position that lengthen along the road, where the south side from the road with distance 1 until 5 Km, is an area of Bintuni Bay Nature Reserve (CATB), so that the access of people into the CATB area will more easily. This becomes a serious threat especially for the CATB area in west and north side where close to the settlement and road. With more easily the people to access into the area of CATB, so that the chance for people to take flora and fauna and land for gardening more increase too, as a result the sustainability of CATB will decline.

D.2 Capacities of Area Organizer

One of the determinant factors in managing a conservation area is role and organizer capacity either from the amount (quantity) and capability (quality/skill). Condition in this time (current situation) indicates that Bintuni Bay Nature Reserve with the area that large enough about \pm 124.850 ha, only in observing by a head of resort whom assisted by two people forest rangers. This matter is worst with lack of supporting facilities such as longboat and limited of managerial capabilities. This is very affected or can be said as a inhibit factor in achieving the management and development goals of a conservation area, especially Nature Reserve.

D.3 Role of Community (Community Involvement)

Related with the area sustainability, the role of people around is very strategic and prospective. It says strategic because without real participation of people around, it is not possible that conservation area will be sustainable. It says prospective with confidence that people in and around area will not refuse the empowerment efforts that very direct related with its purpose. Result of field observation indicated that role of people in and around the





Bintuni Bay Nature Reserve in participating for maintaining the sustainability of the area is still low. It can be seen from the disturbance of several sites of the Nature Reserve area where also involved community in and around the area such as land clearing for logyard of Kopermas and land clearing for shifting cultivation activities. High probable that it is because of the community knowledge of area importance is relatively low, and even they don't understand it at all.



III. POLICIES

A. Legal Principles

The regulation of legislation that related to Mangrove Management in Indonesia as follows:

- 1. The 1945 Constitution. Article 33 section 3.
- 2. Act No.5 of 1960 regarding Agrarian affairs
- 3. Act No.11 of 1974 regarding Irrigation
- 4. Act No.31 of 2004 regarding Fisheries
- 5. Act No. 5 of 1990 regarding Biological Nature Resources Conservation and Their Ecosystems
- 6. Act No.9 of 1990 regarding Tourisms
- 7. Act No.24 of 1992 regarding Spatial Plans
- 8. Act No. 5 of 1994 regarding Ratification of Biodiversity Conservation
- 9. Act No.23 of 1997 regarding Environmental Management
- 10. Act No. 41 of 1999 regarding Forestry
- 11. Act No. 32 of 2004 regarding Regional Government
- 12. Government Regulation No.64 of 1967 regarding Authority Delegation of Plantations, Fisheries and Forestry to the First Level "Swantara" Region.
- 13. Government Regulation No. 27 of 1999 regarding Environmental Impact Document /AMDAL
- 14. Government Regulation No. 45 of 2004 regarding Forest Protection
- 15. Government Regulation No. 29 of 1986 regarding Environmental Analysis
- 16. Government Regulation No. 5 of 1990 regarding Fish Farming
- 17. Government Regulation No. 20 of 1990 regarding Air Pollution Monitoring
- 18. Government Regulation No. 27 of 1991 regarding Swamps
- 19. Government Regulation No. 35 of 1991 regarding Rivers
- 20. Government Regulation No. 69 of 1996 regarding The Implementation of rights and obligations and also Type and Procedure of People Participation on structuring Spatial
- 21. Government Regulation No. 47, 1997 regarding National Spatial Zone
- 22. Government Regulation No. 68, 1998 regarding Nature Reserve and Nature Preservation Areas
- 23. Government Regulation No. 63 of 2002 regarding City Park
- 24. Government Regulation No. 34 of 2002 regarding Forest Management, Use and Planning
- 25. Government Regulation in Lieu of Law. No.1 of 2004 regarding The Amendment of Act No.41 on Forestry
- 26. Presidential Decree No. 57 of 1989 regarding Steering Commission for Classification Management of National Land
- 27. Presidential Decree No. 32 of 1990 regarding Management of Protection Area
- 28. Instruction of Minister of Home Affairs No. 26/1997 regarding Mangrove Forest Protection as Green Belt.
- 29. Presidential Decree No. 48/1991 regarding The Ratification of Ramsar Convention



B. Policy of Biodiversity Conservation in Indonesia

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Indonesia gives a full attention to the biodiversity conservation. This policy can be seen in BAPI (The Biodiversity Action Plan for Indonesia, 1993) and IBSAP (Indonesia Biodiversity Strategy and Action Plan, 2003). The condition of Indonesia Biodiversity and degradation process can be seen also in IBSAP. The sources or causes of degradation are among them forest fire, forest clearing, illegal logging, improper technology, and lack of empowering people on biodiversity and environment management. Besides that, degradation process that much faster is due to lack of regulation and legislation and also weak of law enforcement in biodiversity / environment conservation.

There is a little difference between BAPI and IBSAP, i.e.:

- BAPI 1993 is only used for understanding the history of National Action Plan as the first national document about biodiversity conservation in Indonesia.
- IBSAP 2003 as the second national document of biodiversity conservation in Indonesia, replacement of BAPI 1993, it is a main reference that used as a comparison to identify issues of conservation in Indonesia.

B.1. BAPI (The Biodiversity Action Plan for Indonesia) 1993

Before ratification of the United Nation Convention regarding Biodiversity, Indonesia has prepared BAPI. With BAPI 1993, it is hoped that there will be a guidance to set the priorities and investment in conservation and biodiversity sectors particularly for Five-Year Development Plan (Repelita) V and VII until 1999. The goals or targets that have been established are conserving as much as possible biodiversity in order to be a life-support and welfare for Indonesian people.

The main objectives of BAPI 1993 are:

- 1. To delay a lost of primary forest coverage, wetland, coral reef and also either inland habitat or other marine habitat where they are very important for existing biodiversity.
- 2. To develop an availability of data and information regarding national biodiversity, so that they can be used by policy makers and public.
- 3. To extend the use of bio-resources sustainably and more environmental-friendly compared to the practices that have been applied so far.

The priorities of four-main activities of BAPI, are:

- 1. In-situ conservation of national park and protection area;
- 2. *In-situ* conservation outside protected area, including forest area, wet land, and agricultural cultivation land;
- 3. Coastal and marine resources conservation;
- 4. *Ex-situ* conservation through gene and gene plasma bank, variety protection, and breeding program.



In BAPI there is no mentioned explicitly which institution that is responsible for guarantying implementation and achieving targets and goals that have been established. Besides that, BAPI 1993 has no formal-legal ground in national legislation structure so that it has no binding legal force. Social-economic aspect, NGO and international cooperation are also not found in BAPI 1993. Issues in BAPI are:

- 1. Issues related to policy are about Human Resources capacities
- 2. Issues related to biodiversity management are consisted of *in-situ* conservation and *ex-situ* biodiversity, people participation, education and training, and biodiversity evaluation.
- 3. Issues related to information system and technologies are about research and training.

B.2. IBSAP (Indonesian Biodiversity Strategy and Action Plan 2003)

IBSAP 2003 is a completion of BAPI 1993 and also it is a strategy and action plan of national biodiversity. IBSAP 2003 is aimed:

- 1. To analyze needs and priority action of BAPI 1993 in order to know what else that has been obtained and which one has not yet been done. Then, to find causes that why requirement budgets and or motivation are not yet attained.
- 2. To identify up to date needs and priority action and to revise action plan according to the changes that might be happened on environment policy in the future.
- 3. To determine effectively current probabilities and threats existing in conservation and sustainable use of biodiversity, including lack of knowledge; and also to determine real targets and actions to cover the lacks.
- 4. To propose an understandable new strategy together with detail action plan.

Biodiversity issues are as follows:

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- 1. Issues related to policies or institution, it is composed of policy problems that over exploitation, centralistic, sectoral, and impartisipating, and also weak of law enforcement and institution.
- 2. Issues related to biodiversity management, covering over exploitation, bio-resources degradation, globalization of biodiversity business, species introduction and exotic breed, high habitat conservation, environment pollution, and misleading of resources evaluation.
- 3. Issues related to social-economic aspects covering issues of population pressure, poverty, unfairness of benefit allocation, and incapable of human resources.
- 4. Issues related to information and technology system covering issues about improper research and information system, and utilization of improper technology.
- 5. Issues about the roles of NGO and international cooperation related to international collaboration, awareness, understanding and concern.



C. Forestry Sectors

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Forest area management especially mangrove forest in Indonesia is arranged in a national strategy that indicating the environment management pattern in Indonesia Agenda 21. National Strategy of Mangrove Ecosystem and Indonesia Agenda 21 contain:

- 1. Integrated plan and resources development in coastal zone:
 - ∉ Paying attention on monitoring issues, evaluation and resources administration.
 - ∉ Monitoring and protecting coastal and marine environment.
 - ∉ Paying attention on marine pollution problems which affecting inland.
- 2. Sustainable use of marine resources
 - ∉ Focusing to difficulties around balancing between conservation of irreversible nature resources and sustainable use of biological resources.
- 3. To make prosperous and to empower coastal community
 - ∉ Describing poverty problems and economic limited chance that faced by coastal people, and looking for an institution and strategy that they are able to overcome those problems.

Inside the Department, technical department that is responsible for mangrove forest management is Department of Forestry. Foundation and basic principles that will be made it should be based on the existing regulation, relevant scientific background, and international conventions related to the one that Indonesia has participated in its ratification. The policies in the forestry sector are as follows:

C.1. Sustainable Forest Management

Based on Act No. 41/1999 regarding Forestry, mangrove is forest ecosystem, and therefore, Government is responsible for management that is founded on benefit and sustainable, democratic, equity, solidarity, honesty, and integration (article 2). Furthermore, in connecting with damaged mangrove condition, to everyone who owns, manages, and or uses critical or production forest, he should rehabilitate the forest in order to conservation protection (Article 43).

Based on its status, forest is consisted of state forest and ownership forest (article 5, section 1). Regarding that, functional technically, Department of Forestry is running a government functions and development with using forestry science approach for protecting, preserving, and developing forest ecosystem, which is from mountainous areas up to coastal areas in a watershed region, including its social structure. Hence, the targets of Department of Forestry in managing mangrove forest are to develop physical and social infrastructure, either inside the state forest or inside the ownership forest. Further, in order to conduct its function, the Department of Forestry as a structure, requires supporting, such as technology that based on an approaching of marine science (as an infrastructure) which its implementation in form of coastal spatial.



C.2. Strategic Plan of Directorate General of Forest Protection And Nature Conservation

Department of Forestry established a policy with a Ministerial Directive of the Minister of Forestry No. 456/Menhut-II/2004, November 29, 2004 regarding the five-policy priority of Forestry sectors in National Development Program of United Indonesia Cabinet for 2005 – 2009 which is directed to:

- Extermination of wood theft in the state forest and illegal logging trade. This program is minimizing illegal logging and wood theft according to the authority of Department of Forestry.
- 2. Revitalization of forestry sectors, particularly forest industry.
- Rehabilitation and conservation of forest resources.
 This program increases consolidation of all apparatus of Department of Forestry in order to improve rehabilitation and conservation performance.
- 4. Empowering Public Economy in and around forest areas.
- 5. Consolidation of Forest area.

Based on Ministerial Directive of Minister of Forestry No. 123/KPTS-II/2001, April 25, 2001 regarding Organization and net-working system of Department of Forestry, mission and function of Directorate General of Forest Protection and Nature Conservation (PHKA) that is to formulate and to undertake a technical policy and standardization in the forest protection and nature conservation sectors. In implementing the mission that mentioned above, Directorate General of Forest Protection and Nature Conservation is running a function of:

- 1. Preparation formulation of Department of Forestry policy in the sectors of forest protection, forest fire control, land and biodiversity conservation, and eco-tourism and environmental services use.
- 2. Implementation policy in the sectors of forest protection, forest fire control, land and biodiversity conservation, eco-tourism and environmental services use according to the applicable law.
- 3. Formulation of standard, norm, guideline, criteria, and procedures in the sectors of forest protection, forest fire control, land and biodiversity conservation, and ecotourism and environmental services use.
- 4. Provision a technical counseling and evaluation for the implementation of standard, norm, guideline, criteria and procedure in the sectors of forest protection, forest fire control, land and biodiversity conservation, and eco-tourism and environmental services use.
- 5. Implementation of administration in the sectors of forest protection, forest fire control, land and biodiversity conservation, and eco-tourism and environmental services use.

According to the primary mission and function as mentioning above, so that the mission of PHKA is not only inside the conservation area, but also it covers the whole forest areas in



Indonesia. Therefore, in order to undertake the primary mission and function, the organization of Directorate General PHKA both in the central and the regional is as follows:

- 1. Secretariat Directorate General PHKA
- 2. Directorate of Forest Protection

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- 3. Directorate of Forest Fire Control
- 4. Directorate of Land Conservation
- 5. Directorate of Biodiversity Conservation
- 6. Directorate of Eco-Tourism and Environmental Services Use
- 7. Nature Resources Conservation Station (32 units)
- 8. National Park Station (34 units)

Activities of Conservation Management of Bio-nature Resources and their ecosystem are more and more difficult of its challenges, so that it is required strategic activities to support the efforts of bio-nature resources conservation and their ecosystem. Therefore, the whole understanding of conservation position in national development should be fully understood and recognized by all apparatus in the Directorate General of PHKA.

Therefore, in order to implement the activities of bio-nature resources conservation and their ecosystem in the right manner and a certain direction it should be needed an entire plan, synergism and strategic so that it could give optimally a benefit to whole community. In relating to the arrangement of the strategic plan, it should be understood by all organizer elements or other institution about the things that related to the condition of bio-nature resources conservation and their ecosystem at the present.

Strategic Plan of Directorate General of Forest Protection and Nature Conservation is the break down from the Strategic Plan of Department of Forestry, which in proposing of the plan it was based on Act No. 41/1999, Act No.32/2004, Govt. Regulation No. 68/2004, Govt. Regulation No. 34/2004, Govt. Regulation No. 20/2004, Govt. Regulation No.21/2004, Govt. Regulation No. 44/2004, Govt. Regulation No. 45/2004, Ministerial Directive of Minister of Forestry No. 123/KPTS-II/2001, and Ministerial Directive of Minister of Forestry No.SK.456/Menhut-II/2004.

Vision and mission of Directorate General of PHKA are as follows:

1. Statement of Vision

The existence of Biological Nature Resources Conservation and their Ecosystem (KSDAHE) that until the present has not much changed as five years before is covering:

a. Problems of areas

Up to now, the status of conservation area has not yet been fully confirmed, in other words, it is not all of the areas that have distinctive boundary. Therefore, sometimes it causes a conflict with others. Besides that, the management of areas has not yet been undertaken with standard, norm, and distinct criteria, so that KSDHE has not yet been optimal and effective in giving benefits to the people.



b. Forest Protection and Law Enforcement

Impact of multi-dimensional crisis that be experienced by the Indonesian nation resulted the social problems that be more concern, some cases that were happened such as social gap, demand for cultivated land is higher (land hungry) which it makes land conflict, low access for people to forest management, trend to gain income quickly by illegal activities (over cutting, illegal logging, wood smuggling, forest clearance, etc). Disturbances on conservation areas other forest areas are also happened as a result of forest fire (harmful fire). This was happened because of the management of forest was not adequate and also because of lack of resources for controlling forest fire. The forest fire caused a big lost and also an issue about "Transboundary haze pollution" that becomes international concern.

c. The Use of SDAHE

The use of flora and fauna that is not optimal has brought about an impact such as an increase of smuggling of flora and fauna. In addition, The State Revenue Non-Tax (PNBP) in sectors of Nature Resources Conservation (KSDA) is still needed to increase. The benefit of conservation area is not all measured from PNBP, but also other benefit that is not economic perspective must be given an attention and be increased. The important benefit of KSDHE for development should be publicized in order it can give an optimal advantage for people.

d. Institutional

The government and institution that deal with or organize the conservation of biological nature resources and their environment (KSDAHE) are at the present still far away from the standard, norm, and criteria provided. Things that should to be improved, among others: organization level, human resources (SDM), equipment and infrastructure, and also to provide a new management organization.

Considering with things above thus for five years coming, the vision that should be achieved and well-understood by the staffs of Directorate General of Forest Protection and Nature Conservation either in the central or in the regional level is:

"To realize Forest areas and Biological Nature Resources Conservation and their environment as the areas that are legally and formally safe and stabile, Supported by strong institution in management and it is able to give optimal benefit to people".

2. Statement of Mission

To make the vision become true in five years coming, it is required a fact of implementation and showing what things that should occur. From the vision it was established four missions of Directorate General of Forest Protection and Nature Conservation (PHKA), as follows:

THE MISSION OF DIRECTORATE GENERAL OF PHKA:

Mission 1. To stabilize a management of biological nature resources conservation and their ecosystem



In order to achieve the goals of the management of KSDAHE, the conservation areas that be managed must be distinct their boundaries, it is to avoid conflict with others. Besides that, the management that should be implemented in the conservation area must be clear in criteria, norm, and standard for managing conservation areas.

Mission 2. To stabilize the forest protection and law enforcement

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Until the present, disturbances on forest and forest products are more increase, it can be seen from the rate of forest degradation in every year that is about 2.83 million hectares. Besides of that, forest fire is usually occurred every year in dry season. It makes the management of conservation area and other forest areas much more difficult, hence the function cannot be optimal achieved. Therefore, the disturbances on conservation or forest areas and also on plants and wildlife must be eliminated as much as possible.

Mission 3. To develop an optimal use of biological nature resources and their Ecosystem based on the sustainable principles.

The use of nature resources (SDA) must be optimal managed and developed. Up to now, PNBP of PHKA is very small its contribution in forestry sector. The use of potential SDA to be developed is consisted of eco-tourism, environmental service, and the use of plants and wildlife. However, not all the use of KSDAHE services is identical with money. Therefore, it needs a dissemination of information in order to be understood by all people, so that they can well support and undertake the KSDHAE.

Mission 4. To develop an institution and partners for management, protection, and use of biological nature resources and their ecosystem

Institution and law regulation that supported KSDHE are necessary to be increased. Besides of that, the existing of human resources (SDM), budget, equipment and infrastructure should be optimized and increased. Because the management of KSDAHE cannot be done by Government only, the partnership is needed. The partnership pattern should be developed and be realized in the management of KSDAHE.

The objectives of each mission of Directorate General Forest Protection and Nature Conservation are as follows:

Mission 1. To stabilize a management of biological nature resources conservation

and their ecosystem; the objectives are:

- 1. To improve the effectiveness management of KSA/KPA/TB/HL according to the area function
- 2. To develop a new KSA and KPA in 32 provinces
- 3. To facilitate (establishment of areas outside the conservation areas) the management of essential ecosystem





4. To improve the efforts of the preservation of plants and wildlife

Mission 2. To stabilize the forest protection and law enforcement; the objective is:

To improve the efforts of forest protection, the areas of bio-nature resources conservation and their ecosystem and; to control of forest fire and law enforcement.

Mission 3. To develop an optimal use of biological nature resources and their

Ecosystem based on the sustainable principles; the objectives are:

- 1. To improve the use of eco-tourism objects and attractiveness (ODTWA) and environment services, and also to develop Love Nature Building
- 2. To improve the use of Plants and Wildlife (TSL)

Mission 4. To develop an institution and partners for management, protection, and use of biological nature resources and their ecosystem; the objectives

are:

- 1. To establish an organizers institution for KSDAHE
- 2. To develop Human Resources (SDM) that are able to support the management of KSDAHE
- To establish a plan, evaluation and control of forestry development on PHKA 3. sector in the central and in 66 UPT
- To realize the demand of equipment and infrastructure for KSDAHE 4. management
- To establish the regulation and the legislation of KSDAHE 5.
- 6. To improve people participation and other related one in the partnership for the KSDAHE management and forest protection.

The targets of each mission of Directorate General PHKA are as follows:

- Mission 1. To stabilize a management of biological nature resources conservation and their ecosystem; the targets are:
 - 1. The founding of 20 model national park
 - 2. The finishing of confirming process of 150 KSA, KPA and TB
 - 3. The finishing of zoning in 300 KSA, KPA and TB
 - 4. The finishing of site plan on zone use in 200 KPA and TB
 - 5. The accomplishing of the development of TSL habitat in SM, KPA and TB in about 100,000 ha.



- 6. The accomplishing of the function evaluation for KSA, KPA, TB and HL in 200 areas
- 7. The finalizing of the establishment of buffer zone of conservation area in 66 UPT and the development buffer zone of KPA, KSA in 300 locations
- 8. The organizing of the information data and publication of KSDAHE conservation in the central and in the 6 UPT.
- Mission 2. To stabilize the forest protection and law enforcement; the targets are:
 - The accomplishing of the law enforcement against forestry crime; forest clearance, illegal logging, illegal forest product distribution that including TSL, TSL hunting, habitat destruction, forest fire/hot spot and TSL theft in 32 provinces.
 - The realizing of the increase operational ability for forest fire control which is consisted of: prevention, extinction, and handling of post fire in 32 province
 - 3. The enhancing of people participation and empowerment in order to forest protection and forest fire control in 32 provinces.
- **Mission 3.** To develop an optimal use of biological nature resources and their Ecosystem based on the sustainable principles; the targets are:
 - 1. The realizing of the increase of eco-tourism business in 32 provinces
 - 2. The implementing of the use of environmental services in HL, HP and conservation areas (carbon trade priority, water use) in 15 provinces
 - 3. The establishing a conservation cadre at intermediate and top level, and also the developing of nature lover club, self-help community group, profession group, and conservation cadre in 66 UPT
 - 4. The carrying out of study, research and development (kalitbang) plants and wildlife in 66 UPT
 - 5. The carrying out of TSL breeding in 66 UPT
 - 6. The carrying out of hunting programs in 5 TB, hunting park and hunting block (KB and BB)
 - 7. The carrying out of controlling against illegal hunting of TSL in 66 UPT
 - 8. The carrying out of TSL distribution control in 32 BKSDA
 - 9. The carrying out of display and exchange control of TSL in 50 conservation institution
 - 10. The realizing an increase of medicinal plant cultivation in 66 UPT
 - 11. The realizing a control of TSL rising for fun in 32 BKSDA.
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- **Mission 4**. To develop an institution and partners for management, protection, and use of biological nature resources and their ecosystem; the targets are:
 - 1. The realizing an institution that is able to organize KSDAHE management and to support an increase of people welfare
 - 2. The increasing of numbers and competences of human resources for structural, non-structural, and functional apparatus
 - 3. The increasing of planning, evaluation, and control system of forestry development in PHKA sectors
 - 4. The establishing of equipment and infrastructure of KSDAHE management in central and regional (66 UPT)
 - 5. The realizing a regulation and legislation that support KSDAHE management
 - 6. The increasing of people awareness and other participation in supporting an achieving KSDAHE and forest protection.

The strategies of each mission of Directorate General PHKA are as follows:

- a. Mission 1: To stabilize a management of biological nature resources conservation and their ecosystem; the strategies are:
 - 1. The accelerating development process of 20 model national park (TN)
 - 2. The accelerating zoning system in 300 KSA, KPA and TB
 - 3. The accelerating finalization of site plan of zone use in 200 KPA, TB
 - 4. The coordinating of habitat TSL development in SM, KPA and TBA in the area of 100,000 ha
 - 5. The optimalization a function evaluation of KSA, KPA, TB and HL in 200 preservation areas
 - 6. The accelerating finalization the establishment of buffer zone for conservation areas in 66 UPT, and the development of buffer zone of KPA, KSA in 300 locations.
 - 7. The optimalization management of information data and publication of SDAHE conservation
 - 8. The accelerating finalization of the identification of ecosystem types and their representative in conservation areas in 32 provinces
 - 9. The coordination of TSL management and conservation areas which are included in international concession
 - 10. The coordination of care implementation of migrant animal habitat and karst ecosystem in 20 locations



- 11. The accelerating implementation of determination and management of wildlife which are protected and unprotected (3 species)
- 12. The coordinating of management implementation of plants and animals and their habitat in 66 UPT.
- **b.** Mission 2. To stabilize the forest protection and law enforcement; the strategies are:
 - The coordinating implementation of law enforcement against forestry crimes, forest clearance, illegal logging, illegal distribution of forest product including TSL, TSL hunting, habitat destruction, forest fire/hot spot and TSL theft in 32 provinces.
 - 2. The increasing an operational ability of forest fire control, it covers: prevention, extinction, and post management of forest fire in 32 provinces.
 - 3. The enhancing of people participation and empowerment in order to forest protection and forest fire control in 32 provinces.
- **c. Mission 3**. To develop an optimal use of biological nature resources and their Ecosystem based on the sustainable principles; the strategies are:
 - 1. The increasing of eco-tourism business in 32 provinces
 - The optimalization implementing of the use of environmental services in HL, HP and conservation areas (carbon trade priority, water use) in 15 provinces
 - 3. The accelerating establishment of conservation cadre at intermediate and top level, and also the developing of nature lover club, self-help community group, profession group, and conservation cadre in 66 UPT
 - 4. The optimalization conducting of study, research and development (kalitbang) plants and wildlife in 66 UPT
 - 5. The optimalization of implementation TSL breeding in 66 UPT
 - 6. The coordinating on implementation of hunting programs in 5 TB, hunting park and hunting block (KB and BB)
 - 7. The coordinating on implementation control against illegal hunting of TSL in 66 UPT
 - 8. The coordinating on implementation of distribution control in 32 BKSDA
 - The coordination on implementation of display and exchange control of TSL in 50 conservation institution
 - 10. The optimalization on implementation of the increase of medicinal plant cultivation in 66 UPT



- 11. The coordination on implementation of controlling TSL rising for fun in 32 BKSDA.
- d. Mission 4. To develop an institution and partners for management, protection, and use of biological nature resources and their ecosystem; the Strategies are:
 - 1. To realize an institution that is able to organize KSDAHE management and to support an increase of people welfare
 - 2. To increase numbers and competences of human resources for structural, non-structural, and functional apparatus
 - 3. To increase the system of planning, evaluation, and control for forestry development in PHKA sectors
 - 4. To fulfill the equipment and infrastructure of KSDAHE management in central and regional (66 UPT)
 - 5. To realize a law regulation that support KSDAHE management
 - 6. To increase the awareness and the participation of others to support achieving KSDAHE and forest protection.

To achieve the targets of forestry development of PHKA for year 2005 – 2009, the policies referring to five-policy priority of forestry development are as follows:

- a. The policy on extermination of illegal logging in the state forest and of illegal wood trade. This policy is aimed to create the same perception for all stakeholders that the wood theft and illegal wood distribution which happened so far are causing more concern and resulting in the reduce of conservation area function, habitat fragmentation, and problems in social, economic, and cultural aspects.
- b. The policy of rehabilitation and conservation of forest resources. This policy is aimed to protect and to maintain essential of ecological process and living buffer system, to preserve bio-nature resources and their ecosystem, to utilize bio-nature resources and their ecosystem based on sustainable principles and to accelerate recovery of damaged conservation areas, so that they can function normally again.
- c. The policy on economy empowering of community living inside and around forest. This policy is aimed to facilitate and to accommodate people activities in the surrounding conservation areas with this policy it is hoped that the social and economic condition of people living around the areas will be improved by getting a direct or indirect benefit for the business people or their partners.
 - 1. To strengthen institution and to empower the community or the stakeholders with the program of conservation and rehabilitation of nature resources (SDA)
 - 2. The strengthening productive business of community living in the vicinity of conservation areas.



d. The policy on establishment of forest area.

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This policy is aimed to accelerate the establishment of conservation area management. In order to increase the effectiveness of conservation area management, it much depends on status assurance of an area.

Based on vision, mission, objectives, targets and policy, forestry development program in PHKA which referring to the national program as the program in the Medium-term Development Plan (RPJM) 2004 – 2009 and Programs of Forestry Development, comprising:

- a. Program of domestic security establishment
- b. Program of establishment on utilization of forest resources potency
- c. Program of protection and conservation of nature resources
- d. Program of rehabilitation and recovery of forest resources reserve
- e. Program of capacity building on National Resources Management and Living Environment
- f. Program of increase information access of Nature Resources and Living Environment

Five of six programs as mentioned above accommodate forest development programs in PHKA. The programs are:

- a. Program of domestic security establishment
- b. Program of establishment on utilization of forest resources potency
- c. Program of protection and conservation of nature resources
- d. Program of capacity building on National Resources Management and Living Environment
- e. Program of increase information access of Nature Resources and Living Environment

C3. Decentralization of Management Authority

Based on the Act No. 22 of 1999 regarding Regional Government and Government Regulation No. 25 of 2000 regarding the authority of Central Government and Provincial Government, therefore the authority of the Government (the central) on forest and land rehabilitation (including mangrove forest) is only limited in determination the general pattern of forest and land rehabilitation, macro plan construction, determination for criteria, standard, norm, and guidance book, technical and institutional counseling, and monitoring and controlling. However, the implementing of forest and land rehabilitation (in production forest, protected forest, property forest, and owned land) is done by regional government, particularly Regency/city Government, except the area of conservation forest which is still under the authority of Central Government.



C.4. Participative Conservation and Rehabilitation

In programs of conservation and rehabilitation of mangrove forest, the Government is more playing a role as a mediator and facilitator (allocating fund through a determined mechanism). Meanwhile, the community is an executor whom is able to take an initiative.

Based on the Act No. 25 of 1999 regarding the balancing budget of central and regional Government, it is mentioned that the use of Reforestation Fund (DR) amounting to 40% will be allocated to the region producers, and 60% will be managed by the central Government for rehabilitation programs. In addition, Government Regulation No. 104 of 2000 on the Balancing Budget, it is mentioned that the reforestation fund as much as 40% will be used as a Special Grant (DAK) for Forest and Land Rehabilitation of mangrove forest.

Up to the present, the Department of Forestry has been coordinating together with the Department of Finance, the Department of Interior and Regional Autonomy, and National Development Planning Agency (Bappenas) for preparing distribution and management of DAK and DR.

C.5. Institutional Development of Mangrove Forest Management

In its authority of mangrove forest management, the Department of Forestry subordinates Technical Implementing Unit (UPT) for regional level, i.e. Management Center for Watershed (BPDAS); however, organizing on rehabilitation operational is done by provincial government, particularly Regional/City Government (certain office deal with forestry affairs).

To improve the intensity for technology mastery and dissemination of mangrove information, the Department of Forestry has been establishing Mangrove Rehabilitation Center (Mangrove Center) in Denpasar, Bali (for Bali and Nusa Tenggara Region); then, it will be functioned for training purpose, and for preparation and center of mangrove information). To the future, there is being developed Mangrove Information Sub-center in Pemalang -Central Java (for Java region), in Sinjai – South Sulawesi (for Sulawesi, Maluku, and Papua region), in Langkat – North Sumatera (for Sumatera and Kalimantan region).

To direct the goals in according to the spirit of regional autonomy, the Central Government has been determined General and Standard Pattern, and also the criteria for Forest and Land Rehabilitation (Decree of Ministry of Forestry, No. 20/Kpts-II/2001) including in it, forest rehabilitation which is a implementing guidance on forest and land rehabilitation for Central Government, Regional Government (Province and Regency/City) and people as well.

The strategies applied by the Department of Forestry forwarding to the sustainability management of mangrove forest are: (1) Socializing function of mangrove forest, (2) Rehabilitation and Conservation, (3) Fund Support from a number of Sources.

Generally, management of mangrove areas especially Nature reserve area is necessary to agree with the principle of management bio-nature resources and their ecosystem. To obtain those goals, the existing policy should be based on or guided by:



- ∉ Conservation of bio-nature resources and their ecosystem is founded on the conservation of the ability and the utilization of biological nature resources and their ecosystem compatibly and well-balanced (Article 2, Act No. 5/1990).
- ∉ Conservation of bio-nature resources and their ecosystem is aimed to make sustainability of bio-nature resources and their balance ecosystem become a reality so that it could more support the efforts for increasing community welfare and human life quality (Article 3, Act No. 5 of 1990).
- ∉ Conservation of bio-nature and their ecosystem is carried out through activities (Article 5 Act No. 5/1990):
 - Life buffer system protection
 - o Biodiversity preservation of flora and fauna and their ecosystem
 - o Sustainable use of bio-nature resources and their ecosystem

In management of forest mangrove, in particular, planning aspect is very crucial. In this point of view, plan also fills an aspect and information as follows:

- ∉ Forestry plan covers: forest inventory, legalizing forest area, forest area use, forming forest management zone, and forest plan construction (Article 12, Act No.41/1999).
- ∉ Based on forest inventory, the Government is implementing the legalization of forest area in order to provide a law-enforcement on the forest area (Article 14, Act No. 41/1999).
- ∉ Provincial Government determines certain regions as protected areas by Regional Law (Perda). Regency Government simplifies further the protected area into a detail map by Regional Law (Article 34, Presidential Decree No.32/1990).
- ∉ The Government determines a certain zone as a protection zone of life buffer system (Act No.5/1990).

Specifically about plans or activity subjects which is implemented in mangrove forest management, the Department of Forestry at the past, present, and future, implements programs either in form of technical operational or conceptual. Those programs are as follows:

1. Technical Operational

Since Budget year 1994/1995 until official year 2001, the activities of technical operational that was carried out in the field by Center or Sub-center of RLKT (now named as Watershed Management Center, BP-DAS) and as Technical Implementing Unit of Department of Forestry were rehabilitation of 22,699 hectares of mangrove forest outside and inside forest area, such as seed supply, making of trench pond pilot project and mangrove planting, which spread out in 18 provinces.

- 2. The construction of National Strategy of Mangrove Management
- 3. Inventory on degradation of mangrove forest



- 4. Organizing data base of mangrove forest management
- 5. Organizing Spatial Plan for Regency Coastal Area.

C.6. General Policy and Nature Reserve Development Strategy

Forest development and use pattern in the past is only being oriented on timber oriented without concerning and considering to the environmental / ecological, economical, and local cultural values. As a consequent, there is a trend to be over exploited of forest that makes other nature resources potency such as non-wood forest product (flora and fauna) and environment being degraded and lost without giving optimal yields. Such thing has brought about conglomeration and neglected the rights of people living around forest, and eliminated the aspects of environment, economy, social and culture, and also with involving and prioritizing the welfare of the people around the forest.

The laws that regulate on existing and managing of conservation reserve area are among them Act No. 5 of 1990 regarding Conservation of biological nature resources and their habitat and Act No. 41 of 1999 regarding forestry, and also Government Regulation No. 68 of 1998 regarding Nature Protected Areas and Nature Preservation.

Based on the Act No. 41 of 1999 regarding Forestry, we know about forest and its classification as follows:

- ∉ Forest is an ecosystem unity that in the form of land plain composed of biological and nature resources dominated with trees and their association environment, that they cannot be separated each other. Forest has three functions, namely function of conservation, function of protection, and function of production.
- ∉ Biological Nature Resources is biological components in nature which is consisted of nature plants and animal resources together with non-nature components in the surroundings, they establish ecosystem.
- Forest area is a certain area where is determined by Government, that area must be maintained its existence as fix forest. The Government categorizes forest based on a function of:
 - a. Conservation forest
 - b. Protected forest, and
 - c. Production forest

On the basis of Act No.41, definition of conservation forest is a forest with certain characteristics that has main function for preservation of plants and animal biodiversity and their ecosystem. However, in Act No. 5/1990 on Conservation of bio-nature resources and their ecosystem, we understood conservation areas and one of them is nature protected area. In this Act, the definition of nature protected area is an area with a certain characteristics, either in land or in water territory that has a main function as preservation area for plant and animal biodiversity and their ecosystem and also is functioning as life support system zone. One of them is Nature reserve area.



Nature Reserve Area is a Nature protected area that because of their Nature condition, it should be protected and its development occurs naturely. The criteria for determining as Nature reserve area that as found in Government Regulation No. 68/1998 regarding Areas of Nature Reserve and Nature Preservation is:

1 Containing a diversity of plants and animals and ecosystem type

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- 1 Representative a formation of certain biota and their composition components
- 1 Possessing large enough area and in certain form in order to support the effective management and to guarantee the continued existence of ecological process in nature ways
- 1 Possessing potency characteristics and it can become an ecosystem model that its existence needs conservation efforts, and or
- 1 Possessing plants and animals community and their ecosystem that is rare or in danger to be extinct.

The potency use of conservation area can be conceptual a planned implemented if only the role and function of the area potency is known. The role and function of area are a starting point of the use purpose in terms of ecological and financial values. Therefore, the knowledge about the potency values is very important for the empowerment of the benefit of conservation area. The use of such conservation area is aimed to improve the community welfare and at the same time to build the community awareness to maintain, protect, and to increase the function of conservation area. Several functions of conservation area including Nature reserve are as follows:

∉ Function of water regulation. Nature reserve as one of Nature preservation forest area is a forest with certain characteristics that it's main function for life protection and supporting, preservation of plants and animals biodiversity, and sustainable use of bionature resources and their ecosystem.

Nature reserve area is also playing an important role to protect water-regulation function (hydro-orologis). The protection of the function is also functioning in supporting the protection of living buffer system. However, these role and function at the present are seems that they are not yet full considered in terms of financial benefit, and only be assessed under the micro perspective for its ecological values. In the future when water resources are limited, the role of conservation area, particularly Nature reserve with its water regulation function, will play a significant role especially to provide water for settlement area, industry, and others. In mangrove Nature reserve area, the control function of salt-water intrusion and flood control will become a crucial function of areas for people in the area surrounding.

Study related to the above issues should be started and keep being developed, so that the benefit values of conservation area specifically the ecological values will be more recognized by public, and it is hoped that it will remind them to always have an effort for preserving and maintaining the existence of conservation area for the continuation of living buffer system, and the increase of community life quality in the scope of regional, national, and even international.



∉ The use of environmental service in conservation area without damaging the environment and reducing its main function like the use of eco-tourism, the advantage of the beauty and comfort.

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- ✓ The benefit of O₂, CO₂, and heat absorbent. Conservation area in tropical regions play a role that at present is known as world lungs; various plants from bushes to trees are able to absorb carbon dioxide (CO₂) gaseous then changed it to be oxygen gaseous, that make micro climate to be more comfortable. Besides that, some of plants, which are well-cared and well-protected in conservation areas, are also functioning to prevent air pollution and global warming. The use of conservation area to be playing a role as a absorbent of CO₂ gaseous and pollutant matter, and also as oxygen producer or absorption warming effect of green house gaseous not much be presented quantitatively either from ecological or financial. Studies related with the use purpose of conservation area that should be started and to be developed.
- Sources of Germ Plasma. To use conservation area as source of germ plasma is not reducing a main function of areas. The germ plasma is cultivated and developed outside reserve areas for the purpose of mushroom cultivation, wildlife breeding, medicinal and ornament plants, etc.
- Harvesting non-wood forest product in conservation areas. It is a kind of an activity that harvesting non-wood forest product without damaging the main function of conservation area, such as honey, latex, fruits, etc. The works of use and the harvest are aimed to increase the people welfare at the same time to build the people awareness to keep, to protect, and to increase the function of conservation areas.

Based on Article 67 verse (1) Act No. 41 of 1999 regarding Forestry it is mentioned that the community of customary (adat) law as long as they are really still exist and accepted, they should be authorized:

- ∉ To carry out the harvest of forest product to meet the adat community daily need
- ∉ To carry out the activities of forest management based on adat law and it is consistent with the Act.
- ∉ To receive empowering in order to increase their welfare.

The traditional use that is allowed is only the area potency use such as non-wood forest products and environment services. The use is necessary to meet the spiritual need of local community or they who live surrounding the conservation area, and it is implemented by those community themselves by using traditional equipments and it is agreeing with the conservation principles.

In connecting with Act No. 5 of 1990 regarding Conservation of Biological-Nature Resources and their ecosystem, the activities of traditional use are one of the activities that should be adopted in the program of Nature reserve area management.

∉ Research and Education Program. According to the function of conservation areas, Nature reserve areas should accommodate research and education activities. Type and material of research and education should be directed and be fitted to the need and



the development of science and technology. Type of applied research, for example, is a research about conservation technology of nature resources. On the other hand, the research that categorized under the pure research is a research wildlife behavior. This type of research is also accepted to be implemented inside conservation area.

In order to be more efficient and effective, the management, research and education are should be directed to the following programs:

- ∉ Identification of objects and plants, animals, ecosystem, and social, culture, and economy of community.
- ✓ Organization of priorities scale of implementation of research programs that are agreed with the goals and the targets of conservation area management.
- ∉ Development of network system with the community.
- \notin Development of promotion system of research and its results plan to the public.

C.7. Nature Reserve Management

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Looking at condition and problems happened at the present in conservation area, the policy of conservation area management is having paradigm changes. At the past, the management of conservation area was more focused on protection and preservation aspects, which among them are realizing of determination the area for conservation and forest protection, establishing of species list of protected flora and fauna, and other some efforts of securing and protection and other preventive action. Therefore, in order to obtain the entire conservation aspects in development, and the increase of community welfare, whom live in the vicinity of conservation area including Nature reserve, the increase and the development weight of benefit aspect which based on the sustainable principles become a center with being supported of proper protection and preservation. Considering with the development of condition which is there so far, policy of conservation area development, including Nature reserve, is directed to carry a mission about the realizing the optimal benefit of bio-nature resources conservation and their ecosystem for the human welfare. To make real the mission and to integrate it with the Broad Outlines of the Course of the Nation (GBHN) of 1999 which is emphasizing on actualization of sustainable management of forest nature resources, fair and independent as large as possible, people welfare, it has determined conservation program of bio-nature resources and their ecosystem in the management of conservation area, as follows:

- a. To evaluate as a whole the conservation areas so that it can really reflect the purpose of conservation of flora and fauna species diversity, peculiarity, unique and beauty of nature resources.
- b. To develop a biodiversity conservation area that fulfills the requirements and the criteria, either inside or outside the forest area, in order to more guarantee the existences and representative of ecosystem types and other nature phenomena.



- c. To improve development of wildlife either protected or unprotected one through the increase of an inventory activity, rehabilitation and habitat development in order to guarantee species population sustainability and their benefit.
- d. To improve the development of nature protected area (Nature reserve and wildlife reserve) by the assessment of their uniqueness and originality also to develop their management through the suitable development models and it is hoped that they are able to give a benefit for the increase of welfare and the awareness of local community conservation.
- e. To improve development and area management of Nature conservation by stable and proper management development, supporting the sustainable and optimal use of development function of science and research, conservation education and supporting cultivation, it is hoped that it is able to give a benefit for improving welfare and conservation awareness of local community.
- f. To increase the development integration of conservation area with regional development, so that the conservation area would be able to support and to give a significant distribution for the regional development and to improve the prosperity and conservation concern of the community.
- g. To increase the development of biodiversity conservation outside conservation area and outside forest area either in mainland or in territorial waters.
- h. To increase the cooperation with Non-Government Organization in form of positive active participation as an input to the Government for operational implementation of bio-nature resources conservation and their ecosystem.
- i. To motivate and to increase the regional government participation in the conservation area management that was projected in Act No.24 of 1992 regarding Spatial Plan and Act No. 22 of 1999 regarding Regional Government.
- j. To increase the sustainable benefit of forest nature-resources from forest area and conservation area in order to improve the economic value and community welfare of the people living in the forest surrounding by the programs that supported cultivation.
- k. The use and increase of science and technology development for forest and conservation management, hence it would be able to give a benefit and product yield that are environmental friendly and standardized.
- I. To apply and develop the new approach in cost analysis and profit with taking into consideration the environmental and social cost along with the environmental and social impact, and their monitoring and controlling are consistently in the field.
- m. To build and develop active participation of the community whom living in around forest and conservation area to build economic business that based on local nature resources and that able to preserve the potency of biodiversity.
- n. To empower and develop further the indigenous knowledge and tradition of the local community in management and use of nature resources sustainably and eternally in the efforts of forest preservation and nature conservation.



- o. To improve ability and knowledge of the people with various education and training concerning preventive effort and handling of some damage of environment and its preservation.
- p. To develop and dig the source of financing for the conservation of bio-nature resources and ecosystem by using of fund trust or of debt swap nature for and also to motivate organizer of conservation area to develop ability of independent financing in management of his area.
- q. To improve the active role of conservation experts, political community institute and others that is able to urge the making of regulation and institution for supporting the efforts of Nature and environmental preservation.
- r. To increase the law supremacy and to give the firmly and deterring sanction against the trespasser connected with Nature and environmental preservation.

For the attainment of conservation program of bio-nature resources and their ecosystem in conservation area, hence the priority activities which can be implemented are:

- a. The increase of potency inventory of forest area including all flora and fauna potency, environmental service and ecosystem, so that step by step knowledge concerning usefulness and potency of each component compiler of ecosystem and can be laid open and known, and also this matter is important in the sustainable, effective and efficient management plan and use.
- b. The stabilization of area through potency study activity of ecosystem management unit which is effective and efficient, boundary regulation, mapping and legislation of area status, in order to give a certainty in sustainable management and use, and also for the law enforcement in action against the trespasser of area damage.
- c. The improvement of the quality and quantity of human resources to be capable to support all efforts management of conservation area effectively, efficient, and sustainably.
- d. Development of activity research and science, including developing information system and data base as bases to support and also assist the solving of problems faced and decision making in sustainable management of conservation area.
- e. Development participation of spontaneous community in management of conservation area fairly, independently, and sustainably.
- f. Rehabilitate and revitalization degraded and fragmented habitats as an effort to prevent germ plasma extinction and to save the rich of biodiversity.
- g. Development of monitoring and controlling system which followed with the implementation of firmly sanction against any violation and damaging to reserve area or to the potency of bio-nature resources and the ecosystem, so that management and utilization can be implemented more effectively and efficiently.
- h. Institutional development including laws and regulation, management organization that is in conducive ways it is able to improve management and utilization of bio-nature resources and ecosystem sustainably, effectively and efficiently.



D. Regional Development

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Regional development should be considered as an effort of the use of utilization of regional resources so that it is agreeing with the goals as much as possible for the people welfare, therefore the regional development is a part that cannot be separated from the whole goals of development. Bintuni Bay Regency that is a developed regency (November 12, 2002) from Manokwari Regency should overcome soon various problems that faced by the community. Some of the development programs that should be implemented are gap between regions, development of production centers, and to improve the living quality of the community.

According to the above condition, hence the Regional Government of Bintuni Bay Regency is claimed to maximize all existing resources (human, Nature and artificial) to realize development in all areas. One of development capital of Bintuni Bay Regency is nature resources (SDA) that are in the form of SDA forest, fishery, agriculture, mining (coal), and also nature gas (LNG Tangguh). SDA, which is available in Bintuni Bay Regency found in the location of Bintuni Bay Nature Reserve (CATB). Fishery production is the largest SDA that are in areas of CATB. Besides those SDA, flora and also exotic fauna (mangrove, crocodile, deer, and also some bird species) are available too in the area of CATB. As according to its function as a conservation area, CATB has big enough role in taking care of ecosystem sustainability around Bintuni Bay. However along with the development plan to be conducted, area of CATB will not free from the effects to be exploited as development capital. Therefore each of the development plans that will be implemented by local government, there must be co-ordinate with BKSDA Papua 2 which has office in Bintuni Resort.

D.1. Evaluation of City Spatial Plan of Bintuni Bay Regency

The beginning of spatial plan process is starting from the needs to do a change as a consequence of management changes or as a result of situation changes (increase of welfare, nature disaster, social development, etc.). Therefore, basically there must be two conditions which must fulfill in the spatial plan (Clayton and Dent, 1993, in Rustiadi et al., 2003):

- ∉ Community needs for making a change or effort to prevent the happening of undesirable changes.
- \notin The political will and the ability for implementation of the planning.

Thereby, the making of spatial plan is basically not such a compulsion without reasoning, but it is resulted from the needs. The main target of spatial plan principally is to provide the best usage, but usually it can be classified into three general targets: 1) efficiency 2) justice and acceptability of people, and 3) sustainability. Efficiency target refers at economic benefit, which in context of public interest, the spatial utilization is directed to the community welfare as much as possible. The spatial should be a realization of justice and people participation, for the reason the planning must be accepted by community. The spatial plan should also be oriented to the physical and social balancing so that it guarantees the increase of sustainable welfare.





The General Spatial Plan (RUTR) of Bintuni Bay Regency till now is not yet available, so that there are difficulties to know a development direction for regency level. The only document that available is the Spatial Detail Plan [RDTRK) of Bintuni Town year 2004. RDTRK of Bintuni Town can be used as basis to look at the development direction that will affect the reserve areas, because the CATB area is situated near with Bintuni Town. According to RDTRK of Bintuni Town, the capital city starting from Sibena Village up to Argosigemerai Village (SP5), and also have been constructed the center of government of Bintuni Bay Regency which is spaced 27 km apart eastside from Bintuni Town (near by Korano Jaya Village). Besides that, based on RDTRK Bintuni Town, Argo Sigemerai Village is planned as commercial area and new business in regional scale. According to above condition hence it can be seen that Northwest and North boundary of CATB area is very close to villages and other activity center. So to keep well the area of CATB, it is necessary to have buffer area between road and the boundary of CATB area. In addition, to reduce a pressure of land use, any utilization of land should be done in the north side of the trans road Bintuni to Manokwari. Planning of development of agriculture sector / plantation better is developed in north side of Trans Bintuni - Manokwari, because the area is a lowland forest area and it is also far away from the boundary of CATB. Furthermore, to develop other sector like fishery, it is suggested to be practiced outside of CATB area, in order to prevent conflict of interest that may occur in the conservation area.





D. 2. Relationship Between the Space of Nature Reserve Area and its Surrounding.

Geographically, the area of Bintuni Bay Nature Reserve (CATB) is a downstream area (estuary) of several big rivers such as Muturi, Bokor, Tirasai, Kodai, Tatawori, Naramasa and several other small rivers. The river flows down to Bintuni Bay. On the contrary, the upstream areas of those rivers are the forest areas where up to now they are production forests. By the implementation of Forest Timber Concession Permit (HPH), the forest condition at the upstream areas of the rivers is more damaging as a result it caused erosion and sedimentation in every river more increases too. According to the above facts, CATB area should be a buffer area before river flow goes down to the Bintuni Bay.

The conversion of land use in the watershed upstream of the nature forest to be forest industry either by the community or by the HPH, and also the practice of agricultural farming that is not suitable with land carrying capacity causing the erosion rate and sedimentation increase. The increase of erosion rate and sedimentation resulted in the pressure on nature reserve area becomes higher. The sedimentation that entered the reserve area has multiple roles, as buffer potency for mangrove ecosystem, and also as threats. Mangrove only could grow if there is a sediment supply as a growth substrate. However, if the sedimentation increases very fast, the conversion rate is faster, means that the changes of mangrove ecosystem to be lowland forest faster than the forming of new mangrove. If this keep developing, the area of mangrove forest becomes smaller and its existence be threatened. This ecosystem changes caused the lost of economic function of the reserve area as a spawning ground for fish, crabs, shrimps, in which they are livelihood sources for the community living in and around Bintuni Bay Nature Reserve.

In the other side, the transportation mode to and from the regency usually uses rivers. This fact makes an access nearby and inside the reserve area is very intense for such transportation. Wasian River (Steenkol River), which is an eastern side boundary of CATB area, is a "gate" for the entrance of passenger or cargo ship from Sorong or other places. Looking at the estuary position of the river that is more be affected by rivers of CATB area (especially Muturi River) which has high sedimentation, the sedimentation in the downstream of Wasian River as the matter of fact makes narrower its estuary. With such condition, so that it is not impossible in the future that the ships cannot enter to Wasian River anymore. As a result, from the point of view of marine transportation, Bintuni Bay Regency might be isolated. This thing shows that the role of CATB area as buffer zone for the river to flow into Bintuni Bay is big enough, so that it is important for maintaining the sustainability of CATB area.

Bintuni Bay is well-known as a producer place for some fisheries products such as fish, shrimp, crabs, etc. It is indicated with there are some fisheries industries there, on of them is PT. Bintuni Mina Raya that located in Wimro, Babo District. In addition, there are a lot of people living in the vicinity of Bintuni Bay or CATB area whose livelihood as fishermen. The majority (more than 90%) of CATB area is mangrove forest (local name "mangi-mangi") that the entire area is 124,850 hectares. The area is important as feeding ground, spawning ground, and nursery ground for some species of fish, shrimps, crabs, and other marine biota. So it can be concluded that, the CATB area is a "house" or "store" for several fisheries products, therefore it plays an important role for the continued existence of fisheries production in Bintuni Bay and its surroundings.





According to the above explanations, it is indicated that the CATB area should be maintained its sustainability, for it plays an important role in keeping its function as buffer for rivers that flows to Bintuni Bay, and also as a "house" or "store" for several fisheries products, so that Bintuni Bay is still as a place of fish producer. Therefore, in the policy for regional development, it is hoped that it could minimize the access or the utilization of CATB area so that its sustainability can be maintained.



IV. ANALYSIS

A. MANAGEMENT AND POLICY

Aspect of management describes management purposes, evaluation of management condition, and inputs in order to formulate policy strategies. On other hand, aspect of policy describes existing policy development which would be used as a basis for achieving area function and its effectiveness as well. Management and policy in this analysis are emphasized on the purpose of Area Management Plan formulation.

A.1 Problem

A.1.1 Aspect of Management

In managing a conservation area, problem that is of technical or non technical weakness frequently occurs. This problem is also found in Bintuni Bay Nature Reserve. Some problems of management aspect which are successfully identified, among them are:

1. Area formal judicial Status Still Weak

Area status of Bintuni Bay Nature Reserve is still of pointed, not yet definitive-determined status of law. In addition, regional spatial plan is officially not yet formulated. Such condition, legally area certainty becomes highly threatened. Into the future, the pressure to the area is becoming significant due to fast area development process. If the regional government formulates a regional law on regional space plan and in which the nature area is reduced or omitted, so there is no strong reason judicially to cancel due to its status.

2. Lack of coordination between Nature Reserve Management and Regional Government

Bintuni Bay Nature Reserve Area Management is still fully handled by the institution of central government and controlling responsibility under BKSDA Papua II Sorong, or in other words, the management is not in the area so in such condition, management activities is not maximal and effective. Information from technical manager of Bintuni Bay Nature Reserve pointed out that management responsibility is likely under KSDA Bintuni and it is not yet supported by regional government, although it should have been also under the responsibility of regional government.

Regional government condition as newly-formed regency is a cause of the appeared problem. However, the role of the management in following coordination and bureaucracy mechanism with regional government is not fully effective. It is because there is a difference of structure organization and official rank status between the management and offices of regional government. It is worsened by long bureaucracy mechanism to make policy regarding the area management because the responsibility and control is still under the hand of BKSDA Papua II in Sorong.





Weak coordination is also shown between the managemen and provincial government. In the past, Bintuni Bay region formerly had District (Kecamatan) governmental status under provincial government of Papua This status caused distance constraint for communication and coordination. The establishment of resettlement in Anak Kasih Village that is located in the nature reserve area by Social Welfare Affair Office of Papua Province is an of this weakness. However. example determination of new settlement area must be based on regional map and space plan so that



Social Welfare Affair Office of Papua Province in Anak Kasih Village inside Bintuni Bay Nature Reserve Area.

conservation area and its boundaries could be taken into development consideration

3. The Role of management institution not yet maximal.

Regional area conservation management institution, in this context Natural Resource Conservation Agency (BKSDA) Papua II, is a hand of central institution (PHKA). This agency subordinates all conservation area management activities in 14 regencys, such as Biak, Numfor, Serui, Waropen, Manokwari, Teluk Wondama, Teluk Bintuni, Sorong, Sorong Selatan, Raja Ampat, Fakfak, Kaimana, Mimika dan Kota Sorong. Exclusively for Bintuni Bay Regency region, Resort KSDA Bintuni is as area conservation management institution subordinating two nature reserve areas, i.e. Wagura Kote and Bintuni Bay Nature Reserves. If considering geographic condition, large managed area, various managed object and as well as the "complexity" of bureaucracy, then the management institution has too much heavy responsibility to achieve area management purposes. Existing coordination in Sorong, accessibility, and as well as communication to Bintuni Bay region are being considered as a cause to less optimal of management institution role.

4. Lack of capacity and number of management resources inadequate

In conservation area management activities in Bintuni Bay Regency, the managerial responsibility is only handled by three staffs, consisting of 1 head of resort and 2 forest rangers. This is insufficient number management staff comparing to Bintuni Bay Nature Reserve Area of about 124,850 ha, and Wagura Kote Nature Reserve area of about 15,000

ha. Exclusively, for Bintuni Bay Nature Reserve, the area management is managed by head of resort and 3 forest rangers (Table IV-1).

Table IV-1. Personnel condition of Bintuni Bay Nature Reserve
Management until July, 2005.

No.	Status/Rank/Working Experience	Qualification	Notes		
1.	PNS/III-a/22 years	Bachelor in Law	Resort Head		
2.	PNS/II-b/6 years	High School	Forest Ranger		
3.	PNS/II-b/6 years	High School	Forest Ranger		
Source: Resort KSDA Bintuni					



Based on area management personnel in Table IV-1., it shows that management capacity today is still not adequate. In fact personnel members are not qualified for the job whose has no forestry education background. Such management capacity, achievement process to area management purposes would be far from what it is expected.

5. Lack of supporting equipments and infrastructures.

In conservation area management activities in Bintuni Bay Regency, Management institution, today is supported with inadequate equipments and infrastructures. Based on field observation and information from the head of resort, existing equipments and infrastructures is still far from adequate. The area of nature reserve of 125,000 ha is dominated by mangrove and river areas. But, in fact, it is only supported by one motor cycle, no longboat or speedboat (Table IV-2).

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Considering jobs and responsibilities requested, supporting equipments and



Figure IV-2. The only transportation available in the area to support Bintuni Bay Nature Reserve area management.activities

infrastructures is extremely inadequate. It will affect to the purpose achievement of the area management. Effective control and patrol, as well as supervision and coordination with the community in and surrounding the nature reserve area are not possibly supported by the existing equipments and infrastructures. Attempts to develop facilities and officials become a priority to do, so that the management accessibility to the nature reserve area and to the communities during supervision would be much better. Community development would improve community cooperation in nature reserve management, especially in area controlling and protection.

Table IV-2.	Equipment and infrastructure	condition	of Bintun	i Bay	Nature	Reserve	Area
	Management until 2005						

No.	equipment and infrastructure	Unit	Condition	Note
1.	Working house ukuran 36 M2	1	fair	Need repairs
2.	Office motorcycle	1	bad	Need repairs
3.	Typewriter	2	Out of order	-

Source: Resort KSDA Bintuni

6. Basic information of the area

Based on the information given bay the nature reserve area management, it points out that many studies had been carried out in Bintuni Bay Nature Reserve area, however the results of the studies is not well documented as archives left in the management institution, i.e. in BKSDA Papua II, as well as in Resort Bintuni. Results from secondary data searching and collecting, it shows that documented data comes from some stakeholders, such as



Universities, NGO, BP Tangguh, and Regional Government, and in fact basic information is not yet adequate for supporting activities of Bintuni Bay Nature Reserve Area.

Based on the information, the activities which had been conducted in the nature reserve area by Forestry Department, as well as by others, are not well documented by the area management. One example is report on area boundary management activity. This activity had been carried out since 1999, but the products in the form of maps on measurement result and of report on activities is not found in the resort. The weakness of documentation indirectly would be affected area management performance.

7. Available fund is not proportional to huge area of nature reserve

Budgetary policy change for the nature reserve area management switches fund source that previously came from APBN fund, now only receives from Fund for Reforestation (DR). This fund source could only be used for funding area management activities which are categorized as funds for routine activities, such as area monitoring, cadre supervision, and conservation exhibition, not for area developments.

In conservation area management, prevention principle is considered much better than rehabilitation and restoration. However, this principle is not yet implemented in Bintuni Bay Nature Reserve Area management. To days, mangrove forest is relatively still in good condition and damaging pressure is also not yet big enough to affect. Such situation is supposedly as a reason why the area management gets less consideration which is pointed out by the small amount of fund allocation. Bintuni Nature Reserve should have got adequate allocation of fund, especially for monitoring, proportional to its huge area. Dominant accessibility is thorough waters which results in quite high cost for patrol. However, extension works to the community in and surrounding the area is urgently needed in order to get support from the community in the area management.

8. Available software

Technical guidelines and directions for the area management and a kind of software for conservation area management are not yet available in working house of Resort KSDA Bintuni. In fact, this software is extremely needed in community development in the area and surroundings. This problem causes activity of community development hardly to do and to measure. In other hand, management attempts also challenge legality problem in its activities which is resulted from unavailable pocket book on management and coordination guidelines Other problems are found in management pattern and community development in the area in where the people generally is not used to involve with formal condition because they are generally still very traditional. All those are the reasons why such guidelines are very urgent for technical management of the nature reserve.

9. Unclear area boundary in the field.

Clear area boundaries are very important for all stakeholders, so that they will realize and understand the existence of Nature Reserve Area. Unclear area boundaries could result in overlapping of utilization that in turn potentially becomes conflict sources. Based on field



observation, area boundary marker, in the form of pole made from reinforced concrete, found being old and broken-down. Based on the information coming from Head of Resort KSDA Bintuni, area boundary construction had been done in 1997 by the consultant of PT BASRICO CEMERLANG and in 1999 by Sub BIPHUT Manokwari.

Area boundary construction should include mapping and public participation process. Unclear area boundary and insufficient coordination with related institution have resulted in overlapping with other uses, in some parts of Bintuni Bay Nature Reserve Area. In west-northwest border, there is overlapping between the nature reserve area with agricultural land (lahan usaha II) for National Transmigration. In the last area boundary map, transmigration area should have excluded from the nature reserve area.

10. Lack of appreciation of the community to the nature reserve area

Community appreciation and comprehension to the nature reserve area could be measured from how the people treat the area. Bad or good people appreciation to the area is very dependent on their comprehension and knowledge on the area. In fact, it is found in the Bintuni Bay Nature Reserve area that people still have not good appreciation. The indication is that there are many activities found related to land clearing for logyard, cultivation, and resettlement, and tree logging activities, in Bintuni Nature Reserve area. Based on the interview, it occurs because of lack of extension work, information dissemination, and socialization regarding to the area existence. It is understandable because there is a limitation for technical area management being able to visit villages by using water transportation.

A.1.2 Policy Aspect

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Based on the explanation from area management institution, until now, there is almost no policy to be taken by technical management (Resort) to operate the functions of the nature reserve area. Activities which have ever been carried out were of management involvement in definitive boundary management and construction as a joint work with PT BASRICO CEMERLANG Consultant and Sub BIPHUT Manokwari in 1999. Since then, there is no management policy anymore until this plan was formulated. However, area monitoring activities have been conducted several times, but it is only incidental activities which are carried out together with studies or surveys by conservation NGOs. Periodic monitoring activities have not yet been conducted in this area, appently because of unavailable facilities to do monitoring. The only available transportation facility is motorcycle which in fact is not suitable to the area that is characterized by 90% consisting of mangrove forest.

A.2 Alternatives to solve problems

Based on several problems in the nature reserve area management, it is known that the weaknesses are apparently more influenced by internal factors. If these weaknesses are not properly managed, then they would become constraint factors in achieving the purposes of Bintuni Bay Nature Reserve area management. Some alternatives to solves those problems occurring Bintuni Bay Nature Reserve area management which could be taken is presented in Table IV-3.





Table IV-3. Problems dan Management Aspect Solving Problems in Bintuni Bay Nature Reserve.

5.11		Stakeholders			
Problems	Problem Solving Alternatives	Responsible Parties	Supporting Parties		
Weak law judicial area status (CATB area status is pointed)		Directorate General PHKA and BAPLAN	BKSDA Papua II and BIPHUT		
	∉ Recognition to the existence of CATB formally and legally by regional government	Regional government of Bintuni Bay Regency, BKSDA Papua II, and Resort KSDA Bintuni	BKSDA Papua II, Resort KSDA Bintuni, local NGOs		
Insufficient coordination with regional government institutions	∉ Status improvement in area management.	Directorate General PHKA	BKSDA Papua II		
Role of management institution is not yet	∉ Increase management number personnel.	Directorate General PHKA	BKSDA Papua II		
capacity and number of management resources	✓ Improve ability and skill of management personnel through trainings and education on conservation area management more professionally.	BKSDA Papua II	UNIPA, Directorate General PHKA, and BP Tangguh Project		
Inadequate supporting equipment and infrastructures		BKSDA Papua II	BP Tangguh Project, Regional Government of Bintuni Bay Regency		
	✓ Develop supporting equipment and infrastructures, such as resort office, working house, temporary house for patrol, monitoring tower, speedboat and longboat.	BKSDA Papua II	BP Tangguh Project, and Regional Government of Bintuni Bay Regency		
Lack of area basic information	∉ Inventory of area potency comprehensively.	BKSDA Papua II	UNIPA Manokwari (Coordination)		
	✓ Promote research activities with the purpose to describe area condition, in the field of area socio-economic, biological and physical conditions	BKSDA Papua II	UNIPA Manokwari (Coordination)		
	Collect and document data and results of research and activities which have been done in the area by the cooperation with its counterpart such as universities, NGOs (local and international), Research agencies, investors, and regional government	BKSDA Papua II	Unipa Manokwari , NGOs, and Research agencies, BP Tangguh Project (Coordination)		
Available fund is not proportional to the huge area	✓ Sufficient fund allocation for management activities through priority scale mechanism.	Directorate General PHKA	BKSDA Papua II		
	∉ Establish cooperation with stakeholders, such as NGOs and	BKSDA Papua II	UNIPA Manokwari, NGOs, and Research		





		Stakeholders			
Problems	Problem Solving Alternatives	Responsible Parties	Supporting Parties		
	regional government in conducting area management, so that load work would be much lighter.		agencies		
Lack of available software	✓ Make and produce guidelines on species and area management	BKSDA Papua II	BP Tangguh Project, UNIPA Manokwari, NGOs, and Research agencies (coordination)		
	✓ Simplify existing management guidelines so that understandable to the people living in and surround the area, especially for the activities which could increase community participatory.	BKSDA Papua II	BP Tangguh Project, UNIPA Manokwari, NGOs, and Research agencies (coordination)		
Unclear area boundary in the field.	∉ Area boundary maintenance.	BKSDA Papua II	Community groups residing in and surrounding the nature reserve area.		
	∉ Area boundary reconstruction if though being necessary	BKSDA Papua II, BIPHUT	Community groups residing in and surrounding the nature reserve area.		
Lack of appreciation of the community to the nature reserve area existence.	✓ Increase socialization on the importance of Bintuni Bay Nature Reserve area as living buffer system for people in and surrounding the area.	BKSDA Papua II	Community groups residing in and surrounding the nature reserve area.		

Source: Tim TNC, 2005.

B. ASPECT OF AREA BIOLOGY

The development of Bintuni Bay area becoming Bintuni Bay Regency gives some logic consequences among them are increasing population growth and increasing the need of new land for various uses, such as for resettlements, roads, bridges, harbors and other infrastructures. This could trigger a pressure to biological resource and ecosystem more intense in this area, including the ecosystem of Bintuni Bay Nature Reserve Area. Intense pressures could threat the existence and continuation of ecosystem and natural resources, directly such as land conversion, as well as indirectly, such as pollution resulted from waste produced by development activities.

B.1 Problems

B.1.1 Ecosystem

Bintuni Bay Nature Reserve area consists of two main ecosystems, i.e. mangrove forest ecosystem, and low-land rain forest. Both ecosystems are of natural ecosystem and mostly still in good shape, exception for a small part of mangrove forest which has disturbed and



pressured by people activities, such as land clearing for resettlement, logyards, cultivated land, agricultural land for National Transmigration, illegal logging and also cleared land due to natural phenomenon causes such as erosion.

Low-land rain forest Ecosystem

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Based on field observation, it is indication that main problems and threats to the existence of low-land rain forest ecosystem in CATB are of ecosystem degradation as a result of several people activities, such as presented in Table IV-4.

Table IV-4. Problems and threats to the existence of low-land rain forest in Bintuni Bay Nature Reserve area, 2005

Problems	Stakeholders/Causes	Notes		
Ecosystem degradation	Land clearing for logyards by HPH and Kopermas.	Some being done before area boundary determination		
	illegal logging	Activity actors has not yet justified and therefore, is needed more detailed observation.		
	cultivated land	Mainly being done by the local community in and surrounding the area		
	Settlement	Using abandoned logyards and some already existed before the area pointed as Bintuni Bay Nature Reserve area.		

Source: Data Analysis by Tim Survey of TNC, 2005.

Table IV-4 indicates that low-land rain forest ecosystem in the area is facing two main problems, are ecosystem degradation and area overlapping uses. Based on field observation, it is found that some part of the ecosystem in mangrove island and as well as in east, north and north-west borders of Bintuni Bay Nature Reserve have been degraded. Most ecosystem degradation is resulted from people activity, such as land clearing for logyards done by HPH and Kopermas, for establishing cultivated land by local people, and as well as for settlement area of local community. In addition, in some parts of this ecosystem, logging mainly for commercial species such as merbau and matoa is and has been done. There are some logyards in low-land rain forest ecosystem of Bintuni Bay Nature Reserve area (Table IV-5).

Table IV-5. Logyard located in low-land rain forest ecosystem, in Bintuni Bay Nature Reserve area, until 2005.

	Established by	Po	sition	
Logyard		Location	GPS	Notes
			measurement	
Logyard II	PT.Henrison Iriana	S.Tirasai	S 2º 03' 13.9'' E 133º 51' 38.2"	Established before definitive area boundary determination and until now still used by Kopermas dan HPH PT Manokwari Lestari.





		Po	sition		
Logyard	Established by	Location	GPS measurement	Notes	
Logyard III	PT Yotefa Sarana Timber	S. Ausoi	S 2º 06' 04.4'' E 133º 40' 13.4"	Established before definitive area boundary determination and until now still used by Kopermas	
Logyard IV	PT Yotefa Sarana Timber	S. Muturi	S 2º 06' 25.5'' E 133º 43' 49.6"	Established before difenitive area boundary determination and until now still used by PT Yotefa Sarana Timber and Kopermas.	
Logyard Anak kasih	Kopermas	S. Tikamari/ Anak Kasih	S 2º 03' 04.1" E 133º 56' 05.5"	Established after definitive area boundary determination and used as resettlement area of Anak Kasih Kampong.	
Logyard Sumberi	Kopermas	S. Sumberi	S 2º 02' 39.4'' E133 55.02.3"	Established after divinitive area boundary determination and still used by Kopermas.	
Logyard Sp V	Kopermas	S. Sigirau	S 2º 07'.18.3" E133º 37'.86.5"	Established after divinitive area boundary determination and temporary ceased.	
Logyard V	Kopermas	S. Awarepi	S 2º 09' 30.56'' E133º 34' 47.2"	Established after difinitive area boundary determination and not being used any more but now planned to be established Ferry Port (ASDP).	
Logyard SP IV	Kopermas	S. Ausoi	S 2 ⁰ 06'.36.9" E133 ⁰ 40'.57.8"	Established after definitive area boundary determination and not being used any more	

Source: Tim Survey of TNC, 2005.

Table IV-5 shows that Bintuni Bay Nature Reserve area that legally has a status as conservation area could be found several land clearing activities for logyard. Considering the number of those activities in Bintuni Bay Nature Reserve area, it has potentially threatened the existence of existing ecosystem, especially low-land rain forest. The sites after abandoned by HPH holders and Kopermas have not yet been rehabilitated. However, some logyards which have abandoned by HPH holders are still used by Kopermas for temporary log stock pilling sites before loading to sea-going barge.





Based on field observation and information from the community, land clearing for logyard purpose occurred before and after boundary determination of Bintuni Bay Nature Reserve area. The logyards which were established before the boundary determination were mostly done by HPH holders with their concession areas adjacent to the CATB area. However, after the area boundary determination, those areas were not rehabilitated, and indeed, some area is now used for logging activities by Kopermas which operate surrounding the area. While logyards established after the area boundary determination, all were and is operated by kopermas. These land clearing activities were possibly because the logging areas directly borders to low-land rain forest ecosystem of Bintuni Bay Nature Reserve. Other reasons are those HPH holders and Kopermas do not have 'other alternatives' to transport logs/timbers out the forest. In fact, they prefer to transport logs and timbers through rivers in the Bintuni Bay Nature Reserve area so that the establishment of logyards in river edges could not be avoided.

Cultivation activity is also considered as a factor which gives a contribution to the lowland forest ecosystem degradation. Based on field observation, several parts of this ecosystem have been cleared for cultivated land, such as done by local community living in Mamuramu and Anak Kasih Kampongs which are located in Bintuni Bay Nature Reserve area.

This activity is mostly done by the community residing in the area. Cultivated land is located mostly in some mangrove islands in the form of low mountainous



Figure IV-4. Cultivated land owned by local community residing in Mamuranu Kampong, in Bintuni Bay Nature Reserve area

plains or small hills, such as found in Maniai mangrove island, Nusuama, Kamai and modan islands. Cultivation uses slashed and burned method and has been applied for long time from generation to generation. General pattern to clear land for cultivation applied by the local community follows some phases:

- a. Forest floor clearing by cutting bushes and trees with stages of stick and pole;
- b. Cut Big trees grown on the land and allow them to dry for a period of time;
- c. After drying, branches, felt bushes and trees are collected on several location in the land or on the edge of the land, then burn;
- d. Plant planting, according to desired species of plant being grown.

The land generally is cultivated for 1-2 years (3-4 times of harvest), then cultivation activities will move to other land. Fallow period needed to cultivate the previous land is around 3-5 years. Area of cultivated land varies 0.2 - 1.0 ha each family.

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Figure IV-5. One of logyard occupying a part of mangrove ecosystem of Tirasai River, in Bintuni Bay Nature Reserve Area

Land clearing found in and surrounding the area for settlement follows some patterns, such as (i) using abandoned logyards formerly established by Kopermas, such as in Anak Kasih Kampong, (ii) Clearing the land for settlement establishment such as done by PT Henrison Iriana in Tirasai Kampong, (iii) Settlement established by the community such as in Mamuranu Kampong. Land clearing for settlement, such as land clearing for logyard use, was done before area boundary determination, for example in Tirasai Kampong and after the determination, for example in

Anak Kasih Kampong. However, especially community settlement in Mamuranu Kampong which is also located in the nature reserve area has been existed long time before area boundary determination.

Some part of Bintuni Bay Nature Reserve area, mainly northern part which directly borders to some HPH concession areas and Kopermas, has been under a little pressure resulted from forest cutting. Based on the information coming from Bintuni Bay Nature Reserve Area Management, this activity was carried out before area boundary dertermination or is due to "unclear" area boundary in the field.

Low-land forest ecosystem degradation resulted from several reasons mentioned above would gives some consequencies to the ecosystem function. Some disturbances which could result in ecosystem degradation, among them are:

- 1. Micro-climate changes (temperature, air moisture and light intensity) could affect natural regeneration growth in the ecosystem.
- 2. Forest structure changes results in disturbances to the habitat of various animal species in which animals reproduce.
- 3. Invansion of pionner plants such as makaranga (*Macaranga mappa* and *M.* tanarius) to replace the previous native species, such matoa (*Pometia* spp.), merbau (*Intsia* spp.), and species from Dipterocarpaceae familiy.
- 4. Introduced species entering the area might possibly be a source of new pest and diseases.

By considering this condition and further possibilities which might be occur to this ecosystem, so protection, conservation, and rehabilitation would be urgent to formulate and to do in future management plan.

Mangrove Ecosystem

Mangrove ecosystem in Bintuni Bay Nature Reserve area is natural community which has relatively good growth. This mangrove ecosystem, apparently, is quite dynamic such as indicated by increasing areas in some parts and declined areas in other parts which occur



naturally. Mangrove ecosystem in Bintuni Bay Nature Reserve is the largest mangrove area and got the smallest disturbance in Asia Pasific, therefore it is necessary to get into consideration (Ruitenbeek, 1992). Based on field observation, main identified problem faced by this ecosystem is of land degradation resulted from the activities of the people (Tabel IV-6).

The main factor directly causing ecosystem degradation is of land clearing for logyard and settlement, log transportation through rivers by HPH and Kopermas, utilization by local people, and natural cosing factors such as erosion of river edges. Indirectly, this ecosystem also might be degraded as a result of people activities in upland area which does not consider conservation and sustainability principles of forest utilization.

Table IV-6. Problems or threats and degradation causing factors to mangrove ecosystem existence recognized in Bintuni Bay Nature Area in 2005.

Problems	Causing Factors	Notes
Ecosystem degradation	∉ Land clearing for logyard. Done by HPH and Kopermas.	Done before and after definitive area boundary determination
	∉ Log transportation activities, by kayu oleh HPH and Kopermas	Use sea-going barge to transport logs through rivers.
	∉ Settlement and community housings.	Use abandoned logyard. Some established long period before definitive area boundary determination pointed as Bintuni Bay Nature Reserve.
	∉ Utilization of Magrove trees by local community	Use for firewood, house and <i>belo</i> construction materials.
	∉ Erosi tepi sungai, abrasi pantai, dan angin.	Due to natural phenomenon and people activities
	∉ Input (from fresh water ecosystem) change and extraordinary sedimentation	Forest utilization at upper region (upland/ hinterland) does not consider environment conservation.

Source: Data analysis by Tim Survey of TNC, 2005.

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Similar cases, like what is happened in low-land forest ecosystem, is also found in mangrove ecosystem eventhough it is found in area scale smaller than that in low land forest ecosystem. Based on field observation, it shows that a small part of mangrove area, mainly at the edges of rivers was cleared and uses for log stock pilling site (logyard). This land clearing for logyards occurred before and after definitive area boundary determination. Logyards which was established before definitive area boundary determination were mostly done by HPH holders which have concession adjuscent to the nature reserve area. But after definitive area boundary determination, those areas were and are not rehabilitated, indeed, mostly now still



used by HPH and Kopermas operating surounding Bintuni Bay Nature reserve area. On the other hand logyard established after definitive area boundary, all were established and is operated by Kopermas.



In some parts of this ecosystem, it is also found disturbance in smaller scale as a result of log transport done by HPH and Kopermas using river access in the nature reserve area. This activity commonly uses Tug Boat and sea-going barge. Based on field observation and interviews with local people, in some parts of mangrove forest growing along river edges, there are found toppled and broken trees du to tug boat traffic to transport logs to the bay waters.

The pressure to the existence of mangrove forest is also resulted from the utilization of mangrove vegetation by local community living in and surrounding the area. Based

on field observation, it shows that the utilization of mangrove forest in the area is still only limited for traditional uses (household needs), such as firewood, traditional house contruction materials, poles for fencing an area of mangrove waters with the purpose to fish and locally called as "tiang belo". However, according to the information coming from the area management, mainly at north-west, along Wasian river edge, the utilization have already developed for firewood and building/construction materials, since then the people have started to cut mangrove tree of *Bruguiera* sp. It is possible because the settlement is close by, so there is high accessibility to transport the forest products. Along with the development of

Bintuni Bay regency, increasing population growth is a consequence and this through people activities could threaten the existence of mangrove ecosystem in the future.

Degradation of mangrove ecosystem in Bintuni Bay Nature Reserve area is not only because of people factors, but frequently is due to natural phenomenon such as river edge erosion and wind factors. Field observation pointed out that the most degradation found at mangrove ecosystem close to estuary of big rivers such as Wasian, Muturi, Bokor, Tatawori and Naramasa. Obtained climate data explains that between



Figure IV-7. Mangrove forest degradation resulted from erosion occurring in the area close to estuary of Wasian River, in Bintuni Bay Nature Reserve area.

the period of June-August as southwest moonson season is activated, wind is quite strong with the speed more than 90 km/jam. And this causes big waves which hit the big river edges at where mangrove vegetation grown and results in abrasion. Strong wind also topples



mangrove trees in some parts of the area. According to "Landsat" satellite image of 1989 study, Karaka island area is previously of 15.19 ha and currently is reduced to 6.81 ha, apparently is resulted from coastal abrasion.

Another threat on the existence of the ecosystem is input change from fresh water ecosystem. This input change could be in the form of increasing water run-off and decreasing nutrient input simultaneously. Naturally, fresh water input from upper regions is required besides from rain water, as a source of nutrients for organism growth. As received input coming more from water surface run-off, quantitatively amount of fresh water input increases, but qualitatively the amout of organic materials decreases. Because materials transported by surface run-off is mostly coarse materials originating from lower layers of soil and is not humus, a fine organic materials resulted from biomass decomposition on forest floor. These materials will accumulate to form deltas in river loops and as well as in estuaries. If this occurs for long period of time, the growth of mangrove will be affected and going slower (Lugi and Snedaker, 1974). Lugo and Clinton (1975) mentioned that mangrove forest which have the composition consisting of high trees will be very susceptible to the damage if develops in condition of high water surface run-off. Based field observation, it indicated that fresh water input to mangrove ecosystem is mostly in the form of water surface run-off and according to local people information, in rainy season, rivers which empty to Bintuni Bay Nature Reserve Area is frequently overflowed with their water becoming muddy brown. This is an indication that ecosystem condition in upper regions (upland) has been disturbed. The existence of some HPHs and Kopermas operating in upper region is supposedly as a cause for the increasing of water surface run-off into the area. Based on existing climate data, Bintuni Bay Nature Reserve area has a high rainfall of more than 3,000 mm with high monthly rainfall in February, November and December and it ishows that this nature reserve area and its surroundings are very susceptible to erosion/surface run-off if the area is not managed based on the sustainable principles.

Negative implication to the existence of mangrove ecosystem as an impact of some problems mentioned above, is disturbed-important-ecological functions of the ecosystem, such as coastal area protection from strong wind and wave, mudguard, sediment cacthment, detritus producers (litterfall produced by mangrove), nursery, feeding and spawning ground of various water biota.

B.1.2 Flora and Fauna

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Bintuni Nature Reserve area has relatively high biodiversity. Flora in this area forms a mosaic consisting of two main vegetation tipes, i.e. mangrove forest and low land rain forest. Both tipe of habitats are grown various species of vegetation. It could be as a species which has economic values or as key species. Physiographic condition of the area and the availability of resource suc as food, water, protective cover and reproduction site are suitable for fauna living and also support the presence of wild animals, such as avifauna, mamalia, reptile and amphibian.

Among animal species found in the area, some are considered as endemic species and as protected species according to national and international laws. Some species indeed have



been categorized as threatened extinction species.

The main problems regarding to the existence of flora and fauna in the area are the decreasing number of native species, the declining population of some wild animals and lack of basic data on flora and fauna present in the area.

1. Local flora habitat threathened

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Threatened local flora habitat is a result of degraded ecosystem impact due to people activities such as land clearing for logyard use and cultivated community land, and this is strikingly demonstrated in low-land forest ecosystem which is directly borders to the production forest, settlements and cultivated land. Ecologically, those activities will largely influence the ability of native species, which commonly are tolerant species. regenerate and to grow. Regeration stages, initially from seed germination, seedlings, and stick, are very susceptible to microclimate and shading changes



Figure IV-8. Pioneer species invades an abandoned cultivated-land in Mamurana river area of Bintuni Bay Nature Reserve

Micro-climate and shading changes could suppress the growth of those species. Based on field observation in some abandoned-cleared lands, seconder forests occur and are dominated by pioneer species such as makaranga (*Macaranga mappa* dan *Macaranga tanarius*) and sirih hutan (*Piper* sp.).

2. Decreased animal population and diversity.

Field observation shows that decreased animal population and diversity predictedly is resulted from ecosystem degradation and overhunting. Animal hunting is done by local community in and sorounding the area, althought it is done also by people coming from outside of Bintuni town.

Decreased animal population, especially water biota, might be resulted from the use of agriculture pesticide in fishing and sea product collectio. Decreased animal diversity is preditably caused by activities of several forestry industries which use tug boats for transportation through rivers in the area.







The disturbance of some parts of the ecosystem in the area due to people activities gives an implication to the change of vegetation composition and structure and in turn, results in decreased habitat quality. This would influence wild animal life inhabitating several tipes of ecosystem in the area

The local people living in Tirasai, Anak Kasih, Sumberi, Mamuranu, dan Naramasa kampongs told that crown pigeon (*Goura cristata*), kasuari kerdil (*Casuarius benetti*), and lesser bird-of-paradise (*Paradisaea minor*) for examples, 10-year ago are still easily being seen and caught surrounding their kampongs.

In fact, todays, these animals are hardly being seen and rarely found surrounding the kampongs. It is predicted that the animals are very sensitive to disturbeb habitat in where they should have reproduced For reproduction, cenderawasih birds,

magnificus), required forest with dense and compact crowns. In addition, the birds favor to play and reproduce in the forest in where big trees grow densely and the crowns consisting of tree strata. Similarly to the habitat mentioned before, habitats for some mamalias such as deer (Cervus timorensis), wild pig (Sus scrofa), black tree-kangaroo (Dendrolagus ursinus), common spotted cuscus (Spilocuscus maculatus), and grey cuscus (Phalanger orientalis), as well as reptile such as estuarine crocodile and (Crocodylus porosus) mangrove monitor (Varanus sp.) have been disturbed by people activities.



Figurer IV-10. Kasuari kerdil (*casuarius benetti*) have been protected by law and its population is threathened

especially, such as cenderawasih minor (Paradisea minor) and cenderawasih indah (Ptiloris



Figure IV-11. Spotted cuscus (*Spilocuscus maculatus*) have been protected by law and is difficult being found in low-land forest of Bintuni Bay Nature Reserve.

Besides ecosystem degradation, illegal animal hunting is considered as a factor distributing the decreasing of some animal populations in Bintuni Bay Nature reserve area. Based on field observation and information coming from the area management and local community, there are three stakeholders involving in illegal animal hunting, i.e. security, local people and trader/middlemen.

Previously, animal hunting is done by local people for food (subsistence purposes), but along with the population increasing, the demand for hunted animal meat also goes up. Even, visitors who come to Bintuni always look for processed meat of hunted animal (dendeng) for souvenir. Such increasing meat demand causes number of animals being hunted increasing.



Hunting method is by using flashlight and spear, trapping, and sometimes using firegun (involving security).

The decreasing of animal population can be detected by the trend of hunted animal number successfully being catch which tends to decline. Village meeting conducted in some kampongs such as Tirasai, Anak Kasih, Mamuramu, Yensei, Yakati and Naramasa, revealed that the



Figure IV-12. Estuary crocodile (*Crocodylus porosus*) have protected by laws and its population declines du to illegal hunting in Bintuni Bay Nature Reserve Arae.

trend of hunting products have largedly declined for the last ten years. Ten years ago, people hunted wild animal just using traditional tools such as flashlight and spear, and they went for hunting not so far away from their kampongs but the result is satisfied with almost 10 head of deers or pigs being caught. In opposite, todays they are only able to got one or two heads of deers or pigs, and sometimes indeed they fails to get animals anymore although they have already looked for the animals far away from their kampongs. The same trend is also found in the case of fishing, and of searching shrimp and shellfish.

Physiographic condition and adequate food availibity makes Bintuni Bay Nature Reserve area suitable for estuary crocodile (*Crocodylus porosus*) habitat for the animal's growth and reproduction. Survey by WWF-IUCN-PHPA in 1985 and by FAO-PHPA in 1988 revealed that in fact, crocodile population is decreasing sharply. The main causes of crocodile population decreasing are uncontrolled crocodile hunting and egg taking. Cocodile hunting and crocodile egg taking isconsidered as one of the local people livelihoods

It is predicted also that fauna diversity in Bintuni Bay Nature Reserve area is decreasing which is strikingly apperent to the birds habitating mangrove and lowland forest. Based on survey done by Zuwendra *et.al.* (1991), at least 95 bird species could be seen in Bintuni Bay Natuyre Reserve area and in its surroundings. However, during the survey, it is successful to record at least 26 species of birds. Of those number is recorded based on the information coming from local people living in the area. This fact indicates that species diversity, especially avifauna, in the area haven decreased significantly for the last 10-years.

Besides the decreasing of habitat quality resulted from ecosystem degradation, another factor that might contribute to the decreasing of animal diversity is forest exploitation in the area. The use of mechanical equipments results in noise which is resulted from tug boats when sails over rivers in Bintuni Bay Nature area. The noise, then, predictably makes certain animals mainly birds to immigrate to other more secured regions.

3. Lack of available basic data.



Other problems faced by Bintuni Bay Nature Reserve area management, especially in flora and fauna aspects are lack of available flora-fauna basic data. The management has nearly null basic data of flora-fauna, thus the nature reserve area management have never been based on data and information. Lack of basic data of flora-fauna is because studies regarding flora and fauna existing in the area are infrequent. In other hand, adequate basic data, especially quantitative data of conservation area, are a very important factor for area management processes. Some aspects of flora which are inadequate in data and are needed to study among them are check list of plant species, area potency of plants and plant distribution in the area. Supposedly, based on those data, it could be known key species of plants and protected species of plant and this could be very helpful to use in the area management activity formulation.

Lack of available basic data is not only found in aspect of flora but also in aspect of fauna. Secondary data searching and compilation result pointed out that there is lack of information regarding fauna diversity, population dynamics and fauna distribution in the nature reserve area to support attempts in Bintuni Bay Nature Reserve management.

The availability of information is very important to answer two questions frequently being posed and being faced by the management, such as in Bintuni Bay Nature Reserve. The two questions are listed as fallows:

- 1. What species community does occur in the area, where and How many?
- 2. How is the trend of population from times to times?

B.2 Problem Solving Altenatives

If area biological problems which are more influenced by external factors allow to develop, those problems would become constraints in achieving the purpose of Bintuni Bay Nature Reserve area management. Therefore it is necessary to look for their problem solving alternatives (Table IV-7, IV-8, IV-9).

Table IV-7.	Problem and problem solving alternatives on the existence of mangrove and nipah
	forest ecosystem in Bintuni Bay Nature Reserve area.

	Causes			Problem solving	Stakeholders		
Problem				alternatives	Responsible parties	Supporting parties	
Ecosystem Degradation	¢	Land clearing for HPH and Kopermas's logyard.	¢	Ecosystem rehabilitation by using species suitable to site quality.	Forestry Affairs Office of Bintuni Bay Regency	BKSDA Papua II, with attention to Resort KSDA Bintuni (coordination).	
	¢	Log transport by HPH and Kopermas.	¢	Land clearing restriction.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Agriculture Affairs Office of Bintuni Bay Regency (Coordination)	
	∉	Community	∉	Logyard relokasi to	Forestry Affairs	BKSDA Papua	





Problem	Causes		Problem solving alternatives		Stakeholders	
					Responsible parties	Supporting parties
		ressettlemet and housing		outside of Bintuni Bay Nature Reserve area, if possible.	Office of Bintuni Bay Regency	II, with the attention to Resort KSDA Bintuni.
	¢	Mangrove tree utilization by local people.	¢	Area managemen and arrangement into 2 blocks of ecosystems, i.e. Core and Utilization Bloks.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Community Groups of Users
	¢	Edge river erosion, abrasion and strong wind impact.	¢	Minimalize logging activities at upper region (up land) of the area	Forestry Affairs Office of Bintuni Bay Regency	BKSDA Papua II c.q Resort KSDA Bintuni (Koordinasi)
	∉	Input change from fresh water ecosystem Illegal logging.	¢	Take legal action against illegal loging consistently.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Resort Police Office (Polres) of Bintuni (Coordination)
	¢	Cultivated land	¢	Monitoring dan Controlling in continuity on the increasing of log yard area in the nature reserve area	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Agriculture Affairs Office of Bintuni Bay Regency (Coordination)
			¢	Set up cutting restriction marker in the nature reserve are.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve area
			¢	Extention and Supervision on the importance of the nature reserve area existance.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve area
			¥	Involve the community to the activity of protection and monitoring of the nature reserve area	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve area
			¢	Give supervision to cultivators in the area in the application of minimal land utilization technology, but still	Agriculture affairs office and forestry affairs office of Bintuni Bay Regency	 ∉ BKSDA Papua II c.q Resort KSDA Bintuni (co- ordination) ∉ Community





Problem		Droblom colving	Stakeholders	
	Causes	alternatives	Responsible parties	Supporting parties
		considering their needs.		Groups of Users.
		∉ Recommendation for the use of local species instead of the introducted ones.	Agriculture affairs office of Bintuni Bay Regency (Coordinasition).	 ∉ Community Groups of Users. ∉ BKSDA Papua II c.q Resort KSDA Bintuni

Source: Survey Data Analysis by TNC Tim, 2005.

Table IV-8. Problem and problem solving alternatives on the existence of low-land forest ecosystem in Bintuni Bay Nature Reserve Area.

	Causes	Droblom colving	Stakeholders		
Problem		alternatives	Responsible parties	Supporting parties	
Ecosystem Degradation	1. Land clearing for HPH and Kopermas's logyard.	 Ecosystem rehabilitation by using species suitable to site quality. 	Forestry Affairs Office of Bintuni Bay Regency	BKSDA Papua II, with the attention to Resort KSDA Bintuni (Coordination).	
		2. Take legal action against illegal loging consistently.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Resort police office (Polres) of Bintuni (Coordination)	
		3. Monitoring dan Controlling in continuity on the increasing of log yard area in the nature reserve area	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Forestry Affairs Office of Bintuni Bay Regency (Coordination)	
		 Logyard recolation to outside of the area. 	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Forestry Affairs Office of Bintuni Bay Regency (coordination)	
	2. Illegal logging	 Set up cutting restriction marker in the nature reserve are. 	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve are	
		2. Law enforcement.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Resort Police Office (Polres) of Bintuni Bay (Coordination)	




	Broblem solving Stakehol		nolders	
Problem	Causes	alternatives	Responsible parties	Supporting parties
		3. Socialization on the importance of the nature reserve area.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve are
		4. Involve the community to the activity of protection and monitoring of the nature reserve area.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve are
	3. Cultivated land	 Give supervision to cultivators in the area in the application of minimal land utilization technology, but still considering their needs. 	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	 BKSDA Papua II, with the attention to Resort KSDA Bintuni. (Coordination Community Groups of Users.
		2. Recommendation for the use of local species instead of the introducted ones.	Agriculture Affairs Office of Bintuni Bay Regency (Coordinasi).	 Community Groups of Users. BKSDA Papua II, with the attention to Resort KSDA Bintuni.
	4. Resettlement	Extention and Supervision on the importance of the nature reserve area existance.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve are

Source: Survey Data Analysis by TNC Tim, 2005.

Table	IV-9.	Problems	and	problem	solving	alternatives	on	flora	and	fauna	in	Bintuni	Bay
		Nature Res	serve	Area.									

		Problem solving	Stakehol	ders
Problems	Causes	alternatives	Responsible parties	Supporting parties
Declining of endemic flora	habitat degradation	 Ecosystem rehabilitation by using species suitable to site quality. 	Forestry Affairs Offices of Bintuni Bay Regency	BKSDA Papua II, with the attention to Resort KSDA Bintuni. (Coordination).
		2. Law enforcement to stop any activities which result in habitat deteoriation.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Resort Police Office (Polres) of Bintuni (Coordination)





		Problem solving	Stakeholders			
Problems	Causes	alternatives	Responsible parties	Supporting parties		
		 Relocate Log yards to outside of the nature reserve area, if possible. 	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Forestry Affairs Office of Bintuni Bay Regency (Coordination).		
		4. Extension and Supervision regarding the importance of ecosystem compactness as animal habitat and of its existence.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Forestry Affairs Offices of Bintuni Bay Regency (Coordination).		
Decreasing of animal population	Illegal Hunting/Over Hunting	1. Wild animal hunting restriction for non-"adat" community and for the people who do not live in and surrounding the nature reserve area.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve area		
		2. Animal hunting limitation for "adat" community. And for the local people who live in and surround the nature reserve	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve area		
		 Hunting restriction to protected animal with the status of threatened species. 	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve area		
	Poison use	Strong restriction on the using of chemicals in fishing.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve are		
Animal species diversity change	The uses of mechanical equipments by HPHs and Kopermas	 Minimize the use of mechanical equipments which produce high noisiness in the nature reserve area. 	Forestry Affairs Office of Bintuni Bay Regency.	BKSDA Papua II, with the attention to Resort KSDA Bintuni. (Coordination).		
		2. Map important sites for wild animal development such as spawning, nursery and feeding grounds for water fauna, reproduction sites for birds and crocodiles.	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve area		
		3. Community development, for example on raising crocodile in captivity and fish culture using floating "keramba" in rivers.	Marine and fishery Affairs Office of Bintuni Bay Regency	BKSDA Papua II, with the attention to Resort KSDA Bintuni Mitra Pesisir Teluk Bintuni		
		 Natural resource utilization management in the area ("sasi" system) 	Marine and fishery Affairs Office of Bintuni Bay Regency	BKSDA Papua II, with the attention to Resort Bintuni.		





		Droblem colving	Stakeho	lders
Problems	Causes	Causes alternatives		Supporting parties
Lack of basic data	Lack of studies and Lack of flora- fauna monitoring activities in the area	Intensive studies and monitoring activities to flora- fauna existence in the area.	Papua University, Manokwari	BKSDA Papua II, with the attention to Resort KSDA Bintuni Marine and
	the died			Office of Bintuni Bay Regency
				Costal Partnership of Bintuni Bay (Mitra Pesisir Teluk Bintuni)

Source: Survey Data Analysis by TNC Tim, 2005.

C. SOCIAL, ECONOMY AND CULTURE ASPECT

Bintuni Bay Nature Reserve Management Area Plan could be conducted efficiently and effectively if the planning considers all aspect involved including aspect of social, economy and culture.

C.1 Problem

Some problems related to the aspect of social, economy and culture need to take into consideration in Bintuni Bay Nature Reserve Area management plan. Among them are: community participation development, natural resource utilization pattern and education and research development.

C.1.1 Low Community Participation

Participation could be defined as an effort to reveal the involvement of individu or group in certain activity, and if it is correlated to the development it means an effort to take a role in the development. Koentjaraningrat (1980) mentioned that community participation, mainly the involvement of rural community could be grouped into two tipes. i.e: (1) Participation in joint activities of special development project; and (2) Participation individually outside of joint activities.

According to Kontjaraningrat (1980), there are two sources where community participation originates, i.e. community participation due to the support or the motivation from outside and the participation due to their own desire. Based on the condition of community social economy in and surrounding the nature reserve area, community participation which needs to take into account is that required the support or the motivation from outside. In this case, initiation could be done by BKSDA Papua II with the intention to Resort Bintuni or NGOs. NGOs which have conducted activity in envromental management, among them are Mitra Pesisir. This NGO now



is conducting the activity in formulating Startegic Plan of Coastal Area Management of Bintuni Bay Regency. Mitra Pesisir could be taken as a partner in developing community participation.

Based on field observation and information from the area management, participation of the community is still low in Bintuni Bay Nature Reserve Management. It is predictably because the people who live in and surrounding the area have insufficient knowledge in understanding nature reserve area fuctions. And this is approved by the fact that there is an overlapping of area between the nature reserve area and agriculture land (Lahan Usaha II) for transmigrants in Waraitaman and Banjar Ausoy with the total area of 360 ha, and for settlement area (54 houses) in Anak Kasih Kampong. In addition, in the nature reserve area there are also found illegal activities such as wild animal hunting and land clearing for logyard and cultivated land. The causes are predicted due to the lack of sozialization activities to disseminate information regarding the importance of Bintuni Bay Nature Reserve and this is possible largely due to lack of information media and facilities in the region.

C.1.2. Natural Resource Utilization Pattern

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Generation by generation, the local community residing in and surrounding the Bintuni Bay nature reserve area has been interact with the area in the form of natural resource utilization. Most natural resource utilized by the local people, for fauna among them are many kind of fish, shrips crabs, crocodiles, deers, pigs, and birds; while for flora among them are: nipah palm, mangrove trees and sago (surrounding Yensei and Yakati Kampong). Those activities have been done since along time ago from generation to generation and now the resource is as a heritage for today generation.

Field observation and interviews to the community reveals that production trends, especially hunted animal products decrease significantly comparing to the product several years ago. It is much clear, like what the fisherman said during interview activity by which he tried to figure out the decreasing of fishing products being able to take home by comparing the condition of 3-5 years ago with todays: "*Dulu kita kalo mencari bisa bawa pulang 2 sampai 3 ember, sekarang hanya dapat setengah sampe 1 ember* (In the past, if we go to fish we will get 2 till 3 buckets of fish, but now only a half till one bucket)". In addition, they told that now they has to go for fishing a long way about one hour sail, even reaching around Bintuni bay.

Similarly, hunted animal such as deers, wild pigs, and birds, according to the local community now are difficult to be found nearby the kampongs. Ten years ago, those animals are easily visible in big numbers surrounding kampongs such as Mamuranu and Tirasai. Todays condition is far different, for hunting the local people does not go to nearby forest but has to go to mountainous area outside the Bintuni Nature Reserve area.

Mangrove, nipah and sago are utilized by the local people, and generaly are used in small amount for their own needs. Small poles of mangrove commonly uses for fireswood, while the big ones uses for house construction materials. Nipah palm leaves are collected for roof materials, otherwise sago is considered as a main food source for daily consumption, such as found in Yensei and Yakati.



Based on the condition mentioned above, it is recognized that the people especially those have a livelihood as fisherman, hunter, sago harvester are in fact dependent largely to Bintuni Bay Nature Reserve area. Considering decreasing trend of hunting and fishing products, it could be concluded that the fauna population in the area is decreasing. A factor considered as a cause to the condition is related to the pattern of utilization which does not follows principle of sustainable product.

1. The use of Derris roots (Derris elliptica) and Indication of using insecticide

The use of Derris roots (local name: akar bore) is done for "pele kali" that makes fish intoxicated so that it easy to catch them. According to information obtained from fishermen from several kampongs in around CATB, the effect of derris root is disappear fast (2-3 days) in that location, and fish only was affected. Impact of using such Poisson on marine biota is indirectly appeared in particular when using in small dosage. However, if use it continuously, it will be accumulated and it is able to threaten the reproduction of marine biota, but it is still needed further study.

Based on the information from the area management and several local fishermen, there was an indicated of using chemical substance insect killer (insecticide) of Dhesis 2,5 and Apoda in harvesting marine products, especially fish. Nevertheless, the chemical substance can kill not only the fish but also other flora and fauna around the place will be affected too. At the present, it makes a problem, in which water quality more declines (polluted) because of using that substance will affect on the continuity of marine products.

2. The use of Trawl by Shrimp-Catcher Ship (Trawler).

Other condition that makes more reducing of species and numbers of fish inside CATB is beginning in 1988 until February 2005, there are several catching-shrimp companies, which one of them PT. Bintuni Mina Raya where located in Wimro. Today, the company has stopped operating for a while, because there was a change in management. The catching area for the company should in the water territory of Bintuni Bay, yet in fact the company catches shrimps until to rivers inside the Bintuni Bay Natural Reserve area, such as Muturi River, Bokor, and Naramasa. They harvest marine products use trawler and big ship, the company catch all fisheries products that existing, but because the company only take shrimp, so that fish (especially the small one) that caught, the company thrown them away.

Based on the above condition, the catching of fishery product that not environmental friendly is a problem, and must to look for the solution, so that the sustainability of CATB keep to be maintained, therefore its function as feeding ground, spawning ground and nursery ground for fish, shrimp, shell, and other marine biota still be preserving.

C.2 Alternative of Problem Solving

In order that the people around CATB area and other interest parties involved in planning, implementing, and monitoring of the CATB area, as the first step, it is necessary to do a



learning process for all people, through socialization, providing information media about natural sustainability and other activities that cab increase knowledge and understanding.

As an alternative of problem solving for a lack of participation of people and the use of natural resources inside the CATB area that not environmental friendly, it can be done:

- 1. Increase people participation (involved community in every management activity) and intensive extension to the community whom living inside and around the CATB area.
- 2. Development a regulation for exploiting natural resources in the area of CATB that environmental friendly

The people around CATB area are grouped in to several kampongs. This can be a basis for the early of their participation based on kampong (village). Each Kampong has apparatus and commonly grouped according to their each clan. In every kampong, it is developed knowledge and understanding about natural reserve and natural preservation, then make a working group, which their members elected by themselves. After each kampong has its own working group, then make a meeting among the working group from each kampong in order to develop a mutual understanding about natural preservation and to formulate action plan that to be implemented. After that, another meeting will be held with the government staff to synchronize with government development plan.

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As the early step in improvement people participation in develop management plan of CATB area. It has been done a discussion in 14 kampongs where located inside,



Figure IV-13. Group Discussion amongts villagers in Korano Jaya and Yensei village

overlap and outside the area. The discussion was designed in such manner so that the community can follow it and able to active participate and the researchers only function as facilitators. Some strategic issues from the discussion in every kampong are about problem of area socialization, natural resources use (flora and fauna) and also the hope of people to always involve in every activity in CATB area.

Example on people participation in management of CATB area is in about boundaries and area security. In the program of boundary regulation, manager makes it with involving people around the area (they know, participate in the process of establishment boundary and agree to the boundary). Process in development of boundaries that done in around a kampong, the working group in around kampong which will follow actively. The same also in the securing the





area, it is more efficient and effective if the security is done by all people (working group) that exist in around the CATB area, in which there is an agreement before that they should maintain their each kampong area, especially that inside the area of CATB, from the efforts that will be disturbed the sustainability of the area.



Figure IV-14. Stakeholders Kabupaten Meeting in establising the Bintuni Bay Nature Reserve Management Plan, 1- 2 June 2005

Discussion in every kampong, will be followed up with a workshop of Arranging Management Plant of Bintuni Bay Natural Reserve Area on June 1 and 2 2005 for making the same perception of all stakeholders on the area. On the first day of workshop, it was done a special meeting for the community, and then the second day, it was done a meeting with all stakeholders. As the beginning step to do Regulation of the use of natural resources inside the CATB area. The agreements that has made are:

In exploiting natural resources inside the area of CATB, everyone may look for food inside the area without discriminating of tribe/clan/"adat" boundaries, as long as they obey to the regulation that has made. The activities that "allowed" to be done are among them::

- 1. We can harvest fisheries product such as fish, prawn, crabs, snail, or shell and other marine products
- 2. We can make a garden and receive a technical help and assistance from the relevant office (for the community inside the area)
- 3. We can exploitate mangrove wood as firewood for personal use only (not for sale) and catch fish "pele kali"
- 4. We can hunt animals or wildlife such as crocodile, deer, wild pigs and bird
- 5. We can catch fish with using derris roots (akar bore) and net

The activities that "not allowed" to be done inside the area, are:

- 1. Not use chemical substance in catching fish or prawn, or etc
- 2. Not cutting mangrove tree or burn from the natural reserve in large scale for the purpose of wood business or pond or others



- 3. Not cutting trees in dryland forest or mountain inside the natural reserve
- 4. Not allowing ship sailing in rivers for throwing garbage or oil waste or other chemical substance into rivers
- 5. Not big ship or shrimp ship or trawler ship to operate inside the natural reserve area
- 6. Not mining exploration inside the natural reserve area in Bintuni Bay

To support management of Bintuni Bay Natural Reserve area, the community will support in the form of:

- 1. We will report any trespassing of the agreement that occurred to the manager of Bintuni Bay Natural Reserve
- 2. We will arrest directly the trespasser the regulation that has agreed
- 3. Establish working group in every kampong that located inside or around the area that will be involved in the implementation of management program plan

The community is also hope that local government takes a part to support the management program of natural reserve. Therefore people hope that government should do:

- 1. Establish regional regulation about natural reserve
- 2. Development and extension and also assistance continuously to the people inside and around natural reserve, especially for improve the community economy
- 3. We ask the regional government to take community education into more consideration.

Items of the "Community Agreement" are "an effort to manage the utilization of natural resources in Bintuni Bay Nature Reserve area", and this needs to be responded wisely by the management (BKSDA Papua II Sorong with the attention to Resort Bintuni), because this is an inspiration, a wish and an intention of the community in and surrounding the nature reserve area to actively cooperate in the area protection and conservation, but withough ignoring community daily needs. It is realized that the role of the local community is very significant to Bintuni Bay Nature Reserve area conservation.

The community wishes, they may still utilized the natural resources in the nature reserve area, mainly fishery products, wild animals and mangrove in limited ways, just only to fulfil their needs (economy). This utilization should be balanced by restrictions such as restriction on chemical uses in fishing, on cutting mangrove for industry or for aquaculture pond, and on trawler entering to the nature reserve area. This also shows that the community constantly intends to protect the nature reserve area, however this shoud be supported by good socialization and extention by always considering the community economy. It is not possible, somedays investors would come to the area, to offer amount of money for aquaculture pond establishment by using "adat" community whose is in majority inability ecomically. If the social-economy conditions are consistently taken into consideration so the community would not be easily attracted to the investor, just because of economic advantages.

By formulating problem solving alternatives through community participation improvement, socialization, and regulation on natural resource utilization, it is a hope that Bintuni Nature



Reserve area could be protected its sustainability and the people in and surroundings the area could be able to increase their standar of life in social and economy.

The followings are summarized problems and solving problem alternative to community Social Economi and Culture in Bintuni Bay Nature Reserve area as presented in Table IV-10.

 Table IV-10.
 Problems and problem solving alternatives on the aspects of community social economy and culture in Bintuni Bay Nature Reserve Area.

	Problem solving	Stake	holders	
Problems	alternatives	Responsible Parties	Supporting Parties	
Inadequate knowledge regarding the nature reserve	Extention work on the existence of Bintuni Bay Nature Reservei	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve area	
Lack of community participation	Involve the community in every activities	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve area	
non-environmentally sound fishing method (using Derris root/"akar bore"/"tuba") and Indication of insecticide uses)	Intensive extention and information dissemination to the community in and surrounds the nature reserve area, especially to fisherman regarding the danger of chemical uses to continuity of fishing products	Marine and Fishery Affairs Office of Bintuni Bay Regency	 BKSDA Papua II, with the attention to Resort KSDA Bintuni. Costal Partnership of Bintuni Bay (Mitra Pesisir Teluk Bintuni) 	
The use of trawl (pukat harimau) by trawler in Bintuni Bay Nature Reserve area	Law enforcement	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Forestry Affairs Office of Bintuni Bay Regency Bintuni (Coordination).	
The existence of kampongs (settlements) in Bintuni Bay Nature Reserve area	Community development (Training/Technical supervision on making of processed meat (dendeng and abon), handycraft made from crocodile skin, and agriculture methods)	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Forestry Affairs Office of Bintuni Bay Regency Bintuni (Coordination).	
Overlapping between Bintuni Bay Nature Reserve area with other uses.of area	Reconstruction of area boundary markers	BKSDA Papua II, with the attention to Resort KSDA Bintuni.	Groups of Community residing in and surrounding the nature reserve area	

Sumber: Data Survey Analysis by TNC Tim, 2005.

D. SCENARIO OF MANAGEMENT BINTUNI BAY NATURAL RESERVE

Scenario Plan is a mean of strategic management that can stimulate various thought regarding possibilities in the future. This scenario can also produce a strong strategy, stimulate thinking and in-depth debating on the important main issue, and focused the idea to the future and not to the present or the past. In the following there are some scenarios that based on the condition of the area that maybe it can be applied in managing of Bintuni Bay Natural Reserve area until 2030.



D.1 Accommodative Policy and Democratic Institutional

This scenario is an ideal condition that can be realized and it is a scenario that we longed for. This scenario describes a situation in which the policy of Central Government (Department of Forestry) and Regional Government Bintuni Bay Regency can accommodate all stakeholders' purposes, with still concerning function and the allotment of area. An ideal policy and supported by the institutional either the area manager or the other stakeholders in a democratic, will create a program of management Bintuni Bay Natural Reserve which is sustainable, continuously, and efficient.

The characteristics of scenario are:

- ∉ The area status is already clear as a Natural Reserve area through a Decree of The Ministry of Forestry, supported with Regional Government and the existence of Natural Reserve area is clearly seen in Regional Spatial Bintuni Bay Regency;
- Management Bintuni Bay Natural Reserve has been released or published by Central Government, in this case by BKSDA Papua II Sorong and it has been socialized to the all stakeholders. Supporting and active participating from all stakeholders make the management of the area be aspirative;
- ∉ There is no interest conflict anymore among the stakeholders
- ∉ Community realize and in togetherness maintain the integrity of the area;
- ∉ Physical development that not proper with the function and the allotment of the area not be found;
- ∉ There is no claim of "ulayat" right from the "adat" community on the existing of the area;
- ∉ Empowerment for native people/the owner of "ulayat" is done effectively;
- ∉ The limited use by "adat" community under the assistance of manager;

The final target of this scenario is awakening of the public has been formed that the area of Bintuni Bay Natural Reserve its preservation be a mutual responsibility, its benefit will be received together and the area integrity become what we proud of.

D.2. Centralistic Policy and Democratic Institutional

This scenario describe a condition in which the management policy of area that released by government not considering area sustainability and integrity. The policy only based on considering of regional economy and for certain group purpose with the reason of community purpose. However, there is an effort by the environment observer by making an alliance to fight and to maintain the sustainability and the integrity of the area of Bintuni Bay Natural Reserve as an ecosystem area that all People of Bintuni Bay Regency proud of. The group of environment observer comes from the community the owner of "ulayat", intellectual, legislative and local and international NGO that are still concern and fight for maintaining the integrity and sustainability of the area. This group fights to establish the democratic and participative management institutional.

Some characters used for explaining the situation are as follows:



- ∉ Policy on physical facility development in the area is not correlated with the function of the area as nature reserve is still permitted;
- ∉ Facility establishment permit is only for certain groups's interests;

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∉ Environmental-observer groups (kelompok pemerhati lingkungan) collectively fight to defend the area although unilateral utilization by the government is still exist.

In this scenario, Environmental-observer groups are sometimes optimistic, and also sometimes pessimistic in protecting the compactness and the sustainability of the area. However, they are still fighting among various pressures of interests by the belief that fighting in the right things for collective interests, slow or fast, certainly, their goals would become in a reality under the slogan of democratic.

D.3. Accommodated policy and authoritative institutional

This scenario is of Bintuni Bay Nature Reserve management which has issued by the government in the form of Rencana Tata Ruang Wilayah (RTRW) or in the form of Regional Regulations on area management in aspirative ways, however stakeholders do not do it. Stakeholders only do the activities based on the needs and the interests of each institution. In the end, every institutions only give a priority to achieve each own goals without considering collective goals suc as stated in area managemen plan (RPK).

Some characters being able to explain that situation, among them are:

- ∉ Activities conducted in the area by some institutions, done sectorally although the location and targets of the activities lie at the same region;
- ∉ Coordination between technical institutions and other related institutions instansi is not going properly such as what has been planned in the area management plan.

D.4. Centralistic Policy and authoritative institutional

This scenario is of the worse situation possibly occurred, government policy which is not aspirative along with stiff institutional management in policy implementation and authoritative in applying rules without considering any inputs from stakeholders. This scenario is characterized by the policy by with only strong investors given a chance to manage the area according to their own desires without considering the function of the area determination. The management supports it by the reason that it has fallowed the rules, although in fact it is not considered technical impact which would occurs and lastly would change the function of the area.

E. ANALYSIS OF STRENGTH, WEAKNESS, OPPORTUNITIES, AND THREAT (SWOT)

The approach to the analysis of SWOT (Strength, Weakness, Opportunities, Threat) for Management Plan Bintuni Bay Natural Reserve is an approach that based on Strength, Weakness, Opportunities, and threat on the condition of CATB area. Steps on SWOT analysis The Nature Conservancy



that have been done including the steps of identification and assessment of internal and external factors, interrelation component analysis of SWOT and the step of determination of management plan alternative.

In potential analysis, the weakness and strength and opportunities, issues that existed can be identified to be bases for a study, among them are:

- 1. No sufficient base-information available, especially data of Biological quantitative about the area.
- 2. The powerless of law-enforcer against trespasser in Bintuni Bay Natural Reserve.
- 3. Lack of people awareness on the importance of preservation Bintuni Bay Natural Reserve.
- 4. There is a settlement and logyard inside the area of CATB, as a result, the exploitation of flora, fauna, and land more increase.
- 5. High demand on wildlife from certain species such as crocodiles, deer, paradise bird, crown pigeon, and the indication of fishermen community whom used chemical substance for catching fish.
- 6. Development Plan of Bintuni Town where closed to northern boundary of Bintuni Bay Natural Reserve.
- 7. Activities of HPH holders and Kopermas in upland region that less concern on sustainable aspect and at some logyard and wood transportation through rivers inside the area that used mechanic equipments such bulldozer, logging truck, and tug boat, can make noisy and pollution that disturbing a certain animals.
- 8. Lack of facilities, infrastructure, capacity, and numbers of manager resources.
- 9. Land ownership that is "ulayat" right of the community inside and around the area.

E.1 Identification and assessment of internal and external factors

Internal factor is a strength and weakness, however external factor is opportunity and threat. Strength analysis meant potency and superiority that the Bintuni Bay Natural Reserve has, in terms of management and policy, area biology and also socio-economy and culture that appropriate with the objective of Bintuni Bay Natural Reserve management.

The weakness meant the aspect condition of management and policy, area biology and also socio-economy and culture that considered can delay program of management Bintuni Bay Natural Reserve. Opportunity meant external conditions that can bring a profit if they can be used. Some opportunities existed can be developed optimal based on potency, program constrain and plan of management Bintuni Bay Natural Reserve.

Threat is an external condition that if being let, they will become inhibit factors on the success of management Bintuni Bay Natural Reserve program. This threat should be aware and should be handled because it is able to affect for can or cannot the opportunity factors be used.

Results of SWOT analysis for Management and policy aspect, biology area, and Socioeconomy and culture of Bintuni Bay Natural Reserve area are as follows:



Strength

- S1. Decree of Ministry of Forestry NO: 891/KPTS-II/1999 regarding establishment Province Forest Area and water territory Papua, including Bintuni Bay Natural Reserve.
- S2. Act No. 5 of 1999 regarding Natural Resources Conservation and their ecosystem.
- S3. Mangrove ecosystem in Bintuni Bay Natural Reserve area is natural community and their development are still good, so that its ecological function as a place for feeding ground, nursery ground, and spawning ground is well functioning.
- S4. Flora diversity that is high enough start from low-order plant such fungi, and up to highorder plant, both plant species that have economic values and key species with species endemic that is high enough.
- S5 Some of fauna species that exist in Bintuni Bay Natural Reserve area are endemic and they have been protected by national or international law, even some of bird species are including the category of near threatened.

Weakness

- W1. Weak of coordination between management institutes with the regional government.
- W2. Lack of facilities, infrastructure, capacity, and numbers of manager resources.
- W3. No sufficient base-information available, especially data of Biological quantitative about the area.
- W4. Low of the understanding of people and apparatus about nature reserve and nature preservation.
- W5. Weak of law-enforcer against the trespasser who destroyed in the area especially for the fishermen who used chemical substance to look for fish.

Opportunity

- O1. Aids support from donor either from national or international NGO, that concern to the sustainability of Bintuni Bay Natural Reserve ecosystem.
- O2. Act No. 21 of 2001 regarding Special Autonomy.
- O3. CATB area is a livelihood place for some of the community living around the area, so that if there is an extension program about function and benefit of the sustainability of the area, the people will more participate.
- O4. There is no General Spatial Plan for Bintuni Bay Regency available yet, therefore it motivates in planning for providing a General Spatial Plan for Regency to make CATB area as a lungs of Bintuni Bay Regency.
- O5. There are some NGO (e.g. Mitra Pesisir) that have been carried out of environmental management program in the coastal area of Bintuni Bay, in which they can be invited to be a partner in managing Bintuni Bay Natural Reserve area.
- O6. CATB area is functioning as buffer for Bintuni Bay, so that it is necessary to maintain its sustainability.





Threat

- T1. Land ownership is "ulayat" right for the community living inside and around the area.
- T2. High demand on wildlife from certain species such as crocodiles, deer, paradise bird, crown pigeon, and the indication of fishermen community whom used chemical substance for catching fish.
- T3. Activities of HPH holders and Kopermas in upland region that less concern on sustainable aspect and at some logyard and wood transportation through rivers inside the area that used mechanic equipments such bulldozer, logging truck, and tug boat, can make noisy and pollution that disturbing a certain animals.
- T4. There is a settlement and logyard inside the area of CATB, as a result, the exploitation of flora, fauna, and land more increase.
- T5. Development Plan of Bintuni Town where closed to northern boundary of Bintuni Bay Natural Reserve.

E.2 Analysis Interrelation Component of SWOT

Based on the analysis result above, it is arranged a management plan for Bintuni Bay Natural Reserve. The management plan is resulted from the use of strength components of management and policy aspect, Area Biology, and also Socio-economy and culture of CATB area in order to obtain the opportunity (SO), the use of the strength that existed for facing the threats that will come (ST), reducing the weakness from the condition with using a opportunities (WO) and reducing weakness to face the threat that will come (WT).

	Opportunity (O)	Threat (T)
	Strategy	Strategy
	1. Inventory and mapping	1. Reconstruction Boundaries (S1, T4)
	distribution of flora, fauna and ecosystem (S3,S4,S5,O1)	 Limited use of natural resources from Bintuni Bay Natural Reserve area (S2, S3, T4)
		3. Routine monitoring (S3, S4, S5, T2)
Strength (S)		 Monitoring Environmental Impact (S4, S5, T3, T4, T5)
Suchgur (3)		 Protection flora/fauna species and their habitat (S4, S5, T3)
		 Prevention of erosion hazard, sedimentation and Rehabilitation of CATB area (S3, S5, S6,T3, T4)
		7. Extension on the importance the existing of Bintuni Bay Natural Reserve area as a life buffer system (S4,O6,T1)

Table IV-11	. Matrix Analysis	among the SWO	T Components
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	Strategy	Strategy
Weakness (W)	 Information System and Database (W3, O1) Facilities and Infrastructure for Management (W2, O1, O2) 	 Law Enforcement (W5, T2) Joint Patrol and security coordination (W1,W5, T2, T4, T5)
	 Facilities and Infrastructure for Education (W2, W4, O1, O2, O5). Facilities and Infrastructure for Research (W2, W4, O1, O2, O5). 	

F. STRATEGIC MANAGEMENT FORMULATION

Based on SWOT analysis on data obtained from the study on Bintuni Bay Natural Reserve area, the strategic issue that related with the management of CATB that has been successfully identified then be a basis for formularizing the action plans. Description of this action plan becomes an indicator for the success evaluation and basis for monitoring and evaluation.

STRATEGY 1. REKONSTRUCTION AREA BOUNDARY REGULATION

Targets:

Area boundary becomes distinct and recognized by all related people

Action Programs:

- ∉ Develop path stripe along the area boundary in lowland forest
- ∉ Replace broken border pal
- ∉ Set up zinc plat for border sign

Indicators:

- ∉ Availability path stripe along the area boundary in lowland forest
- ∉ Have fixed new and clear border pal
- \notin Have fixed zinc plat as an area border sign on tress along the area boundaries.

STRATEGY 2. LAW ENFORCEMENT

Targets:

Generating a fully understanding on the items that must not be done in the area of Bintuni Bay Natural Reserve.

Action Programs:

- ∉ Generate special regulations regarding ban and sanction for hunting and exploitation of protected flora and fauna
- ∉ Generate simple regulations regarding conditional and sustainable exclusive utilization of natural resources in Bintuni Bay Natural Reserve for "adat" community.





∉ Socialization the regulations regarding ban and sanction on illegal activities in the conservation area to all stakeholders.

Indicators:

- ∉ Availability special regulation regarding ban and sanction against transgression occurred inside the conservation area
- ∉ Have created a fully understanding by "adat" community on limited exploitation by "adat" community
- ∉ Increasing of the understanding for all stakeholders on things that banned to be conducted in Bintuni Bay Natural Reserve area.

STRATEGY 3. MONITORING/ROUTINE PATROL

Targets:

Maintaining the secure of the conservation area from activities that can decline the area quality.

Action Programs:

- ∉ Scheduled Patrol by internal organizer.
- ∉ Training for forest rangers to increase monitoring ability
- ∉ Extension and information on importance of the area existing
- ∉ Provide a monitoring book guidance for the area manager

Indicators:

- ∉ Increasing of the area security from illegal activities
- *e* Improvement of manager capability for monitoring area activity
- ∉ Increasing of community awareness on the existing and function of area as life buffer system.
- ∉ Availability the monitoring book guidance as a reference for manager in doing monitoring activities.

STRATEGY 4. JOINT PATROL AND SECURITY COORDINATION

Target:

Establishment a joint understanding among stakeholders on responsibility and area monitoring

Action Programs:

- *e* Coordination with institution engaged in making an integrated security plan
- ∉ Integrated Patrol involving some related institute





Indicators:

- ∉ Development a collaboration and coordination between manager and related institute in securing the area
- ∉ Decreasing of security disturbing rate of area

STRATEGY 5. INVENTORY AND MAPPING THE EXISTENCE OF FLORA, FAUNA AND ECOSYSTEM OF THE AREA

Targets:

Database of FLORA, FAUNA, AND ECOSYSTEM, which is sufficient to hold up management of Bintuni Bay Natural Reserve area.

Action Programs:

- ∉ Identify ecosystem type and mapping of land covering in Bintuni Bay Natural Reserve
- ∉ Inventory and mapping status of area flora and fauna
- ∉ Research on ecosystem dynamic and population of area flora and fauna
- ∉ Inventory, identify, and mapping special place for breeding, spawning, and hatching in the area
- ∉ Develop permanent plot
- ∉ Gather report studies on flora, fauna and ecosystem that have been done in CATB

Indicators:

- ∉ Availability of data ecosystem type and land covering of Bintuni Bay Natural Reserve area
- ∉ Availability of information and map of area flora and fauna condition
- ∉ Availability information of ecosystem change and population of area flora and fauna
- ∉ There are facilities for research and education purpose
- ∉ Documented results of research and study on ecosystem and flora-fauna from the whole area.

STRATEGY 6. PROTECTION OF FLORA/FAUNA SPESIES AND THEIR HABITAT

Target:

Assuring the existing of flora and fauna and the integrity of their habitat in Bintuni Bay Natural Reserve.

Action Programs:

∉ Collaboration with related institute in efforts to protect flora and fauna species in the area.



- ∉ Set up restriction sign and make poster, brochure, leaflet about endangered and protected species of flora and fauna and also hunting prohibition and its benefit.
- ∉ Research on the existing of rare, protected, threatened flora/fauna in Bintuni Bay Natural Reserve.
- ∉ Observation and development flora and fauna in permanent plot.

Indicators:

- ∉ Collaboration with related institute being well related to support the protection and development program
- ∉ Understanding and knowledge of people about the existing of rare, protected and or threatened extinct flora and fauna in Bintuni Bay Natural Reserve increases.
- ∉ Availability of sufficient information regarding the existing of rare, protected, and or threatened extinct flora/fauna in Bintuni Bay Natural Reserve.
- ∉ Availability of Information about development of certain flora/fauna for research and development purpose.

STRATEGY 7. PREVENTION OF EROSION HAZARD AND SEDIMENTASION AND REHABILITASION OF BINTUNI BAY NATURAL RESERVE AREA

Target:

Restored and maintained of the integrity of ecosystem of Bintuni Bay Natural Reserve area.

Action Programs:

- ∉ Prevention ecosystem damage as a result of human activities
- *e* Rehabilitate the area where being damaged in Bintuni Bay Natural Reserve.
- ∉ Intensive research and study on degradation rate of area ecosystem.

Indicators:

- ∉ Decreasing of degradation rate of area ecosystem affected by human activities.
- ∉ Improvement of ecosystem quality of area
- ∉ Availability of sufficient information about degradation rate of area ecosystem to support management program.

STRATEGY 8. EXTENSION ABOUT THE IMPORTANCE OF THE EXISTING OF BINTUNI BAY NATURAL RESERVE AREA AS A LIFE BUFFER SYSTEM

Target:

Development of an awareness and appreciation of people on the existing of Bintuni Bay Natural Reserve.



Action Programs:

- ∉ Intensive extension and information about the importance of the existing area as life buffer
- ∉ Produce poster, leaflet, and brochure about function of the area for the life of people inside and around the area

Indicators:

- ∉ The awareness and appreciation of people on the importance of the existing of Bintuni Bay Natural Reserve area increases
- ∉ The knowledge of people about the existing of Bintuni Bay Natural Reserve area increases.

STRATEGY 9. TRADITIONAL USE OF NATURAL RESOURCES OF BINTUNI BAY NATURAL RESERVE AREA

Target:

Increasing the condition of social-economy of people living in and around CATB area

Action Program:

- *e* Develop a book guidance of exploitation of natural resources in the area for manager
- *e* Produce a poster about sustainable use of natural resources
- ∉ Research about model of wildlife reproduction, regeneration technique for beneficial plants, life cycles of water territory biota, and species inventory of local agriculture commodity.
- *e* Collaboration with related institute in extension and assistance program
- ∉ Applying catching system of fisheries product that environmental friendly
- ∉ Applying agriculture system that concern sustainable aspect
- ∉ Exploitation of certain wildlife under supervising of manager and collaborating with related agency.
- \notin Making of data system about results of research that connecting with limited use.

Indicators:

- *∉* Availability of book guidance about exploitation for area manager
- ∉ Understanding of people about sustainable use of natural resources exploitation increases.
- ∉ Information about model animal reproduction, regeneration technique for beneficial plants, life cycle of water territory biota, and a species variety of local commodity agriculture that can be used by local people.



- ∉ Good collaboration with related agency is connecting to support area management program
- ∉ Reducing and even no activity at all in catching of fish with practicing technique that not environmental friendly.
- ∉ Reducing pressure on the existing of area ecosystem as a result of the expand of agriculture land
- *e* Development model of exploitation wildlife that care of nature balancing.
- ∉ Data system from results of study that connected with limited use program by people inside and surrounding of the area is available.

STRATEGY 10. INFORMATION SYSTEM AND DATABASE

Target:

Availability of sufficient data to all management activities aspect in order to support plan and development area

Action Program:

- *e* Coordination with related institute in developing SIG technique
- ∉ Acquisition of hard- and soft ware to support information system and database
- *e* Increasing the capability of manager to master on SIG technique and database
- ∉ Collection and maintenance of information media

Indicators:

- ∉ Establishing collaboration in development SIG and database of area
- ∉ Availability an instrument to support SIG program and database
- ∉ Availability a manager staff with adequate capability on SIG and database
- ∉ Availability collection of adequate information media to support programs of research, education, and area development

STRATEGY 11. SUPPORTING FACILITIES AND INFRASTRUCTURE FOR PROGRAM OF AREA MANAGEMEN

Target:

Availability facilities and infrastructure, which are sufficient to support program on management, education, and research.

Action Programs:

∉ Acquisition and maintenance facilities and infrastructure management such as office and working hut





- ∉ Make brochure/leaflet/book and other media about existing and function of Bintuni Bay Natural Reserve.
- ∉ Acquisition and maintaining Communication and Information Center (PUSKOMIN) of area.
- \notin Acquisition and maintaining facilities and infrastructure research such as research hut.

Indicators:

- ∉ Availability and maintaining facilities and infrastructure management such as office building and working hut manager that are sufficient, beside the office building that is already existed
- ∉ Availability of lighting facilities that is adequate for education purpose
- ∉ Availability and maintaining facilities like communication and information center for Bintuni Bay Natural Reserve area.
- ∉ Availability and maintaining research facilities in Bintuni Bay Natural Reserve area.





V. ACTIVITY PLAN

A. GENERAL

Activity plan of Bintuni Bay Nature Reserve management was based on the analysis of existing problems and conditions. SWOT analysis, resulted from existing strengths, weaknesses, opportunities and threats, showed the strategies that must be done.

The strategies then were translated into the activity plan which was focused to some aspects referring to Strategic Plan (Renstra) of Directorate General of Forest Protection and Nature Conservation (PHKA) of 2005-2009 as follow up actions of Law No. 28 of 2004 regarding National Planning System; of Government Regulation No. 20 regarding Government Work Planning; of Government Regulation No. 21 regarding Work Planning and State Ministry/Institutional Budgeting; and Presidential Instruction No. 7 of 1999 regarding performance accountability of government institutional. Some management aspects would be emphasized on *the aspects of area consolidation, of area management effectiveness improvement, of species conservation and biodiversity development, of area preservation and protection, of supporting/institutional and of utilization.* Besides these aspects, the area management activity plan also exclusively includes proposal on *facility (equipment and infrastructure) development for supporting management activities.*

The emphasized aspects in the activity plan proposal would be implemented based on priority scales and will be interpreted for one-year, five-year and 25-year plans. The followings are the priority activity aspects in Area Management Plan for 25 years as presented in Table V.1.

			Activ	ity Implement	tation	
No	Activity Aspects	1 st 5-years	2 nd 5-years	3 rd 5-years	4 th 5-years	5 th 5-year
		2006-2010	2011-2015	2016-2020	2021-2025	2026-2030
1.	Area Consolidation	++++				
2.	Effectiveness area management improvement	++++	++++	++++	++++	++++
3.	Species conservation and biodiversity development	+++++	++++	++++	+++++	+++++
4.	Area preservation and protection	++++	++++	++++	++++	++++
5.	Supporting/institution al	++++		++++	++++	
6.	Utilization	++++	++++	+++++	++++	+++++
7.	Facilities (equipments and infrastructures) for supporting management activities	++++	++++	++++	+++++	++++

Table V.I. Activity Plan Priority of Bintuni Bay Nature Reserve Area Management for 25-years (2006-2030)



B. MANAGEMENT ACTIVITY PLAN

B.1 Area Consolidation

Legal status is very crucial to have good and solid conservation area management. The followings are some activity plan proposed for area consolidation of Bintuni Bay Nature Reserve:

- <u>Area Legal Certainty</u>. Legal certainty hereby is an activity aiming to bring Bintuni Bay Nature Reserve area to clear legal certainty. Currently Bintuni Bay Nature Reserve area still has only a notification not definitive/ permanently established status given by Forestry Minister. Therefore, a legal certainty process for legal status determination of the area is a top priority.
- Formal Legal Recognition of Bintuni Bay Nature Reserve Existence by Regional Government. Legal certainty process of Bintuni Bay Nature Reserve for definitive/permanent status should be followed by formal legal recognition by local government through local government regulation that legalizes the area existence in district and province spatial arrangement.
- 3. <u>Reconstruction of Boundary Marker</u> is a reconstruction work by placing a marker along the area boundaries and should be done through a coordinative and participative work with related parties. This activity would be carried out through the involvement of BAPPEDA, subdistrics and local community. To make sure the previous position of borders, GPS is used by tracking the previous area boundaries. The reconstruction is a must to have the area a clear legal status. The reconstruction does not means placing a marker in a new position but in previous position according to its previous coordinate from point zero till all points covered by. Total distance of boundaries with mainland is approximately 125 km of 250 km total boundary distance.
- **4.** <u>Cooperation</u>. Cooperation means the involvement of stakeholder except the area manager to improve the effectiveness and the efficiency of management activities, especially in the activity of boundary marker reconstruction of the area.

The summary of proposed activity plan for supporting the activities of Bintuni Bay Nature Reserve area consolidation is presented in Table V-2.

No.	Main Activities	Activity Components
1.	Legal Certainty of the Area	Making of ministry decree on definitive area determination
2.	Formal Legal Recognition of Bintuni Bay Nature Reserve Existence by	 Formulating District Head (Bupati) Decree on the existence of Bintuni Bay Nature Reserve
Bay Nature Reserve Existence by Regional Government		 Formulating Regional Regulation on Bintuni Bay Nature Reserve.

Table V-2.	Activity plan of Bintuni Bay Nature Reserve area management for improving the
	effectiveness of area management.





No.	Main Activities	Activity Components
3.	Boundary Marker Reconstruction	1. Boundary marker making/suplies
		2. Boundary marker setting up
4.	Cooperation	Making MOU with related stakeholder for boundary marker reconstruction activities

B.2 Effectiveness Improvement of Area Management

These activities aim to improve the effectiveness of Bintuni Bay Nature Reserve area management in accordance with its functions. Some activities of area management proposed are as fallows:

- 1. <u>Production of Pocket Books/Operation Manuals/Guidelines on Area Management</u> <u>Activities</u>. The guidelines would be used by area managers especially for Forest Rangers (POLHUT) in which contains operation manual on area management activities.
- 2. <u>Area Directive Board/Plank Construction</u>. Area directive boards/planks aim to give signs of area border, area existence and announcement of regulations and restrictions.
- 3. <u>Area Border Maintenance</u>. Borders in the field should be visible and easily be identified, for instance to differ between manmade with natural border markers so that every one would be able to identified easily. Borders and boundary markers need maintenance and protection regularly by officers. Border maintenance would be done since the first year of the area development until the fifth year and further through routine maintenance every two years.
- 4. <u>Studies on Functions and Potency of the Area</u>. To conduct studies concerning on function and potency of the area for planning purposes
- 5. <u>Management Guidance and Area Blocking</u> This activity aims to devide the area into blocks for planning purposes.
- 6. <u>Production of Posters/Leaflets on Area Management Activities</u>. The activity aims to disseminate the information and to improve the knowledge of local community on the existence of Bintuni Bay Nature Reserve and its functions as buffering system for lives.
- 7. <u>Research</u>. Management activity Impacts to the nearby area could be positive impacts such as in economic i.e. improvement on transportation, communication, and the creation of new opportunities for businesses; or negative impacts such as culture from outside influencing on conservation of local culture, area security and stability, and consumerism which might develop within the local community. These all, in turn, may cause resource exploitation in exaggerated way.

To monitor the possibilities of the negative impacts occurrence due to area development, then in Bintuni Bay Nature Reserve management, it is planned to conduct Environmental Impact Monitoring once every year. The results of the study might be of significant inputs for policy making of Bintuni Bay Nature Reserve area and its surrounding development. Monitoring environmental impact could be carried out with participation of other parties such as universities or NGOs.



- 8. **Community Development**. This activity aims to develop local community living inside and surrounding area. The priority target of these activities is especially those living in buffer blocks.
- 9. <u>**Community Involvement**</u>. Community participation on the activities of area management is very important so that work group formations is necessary to be established for helping the manager by giving inputs or solving problems related to area utilization.
- 10. <u>GIS and Database</u>. Geographical Information System (GIS) is a powerful tool for conservation area development plan. To develop GIS, it needs to coordinate with other related institutions. The above mentioned study results could be used for revising thematic information of the area. GIS is also a very useful tool for production of information media and communication materials.

Bintuni Bay Nature Reserve manager could conduct or facilitate studies on ecosystem classification, habitat classification and inventory. Data from the studies would be used as baseline data needed for evaluation of Bintuni Bay Nature Reserve ecosystem development. Due to lack of field worker in Bintuni Bay Nature Reserve, most of the studies would be carried out by researchers from other parties especially from in country universities or/and overseas universities. Bintuni Bay Nature Reserve manager could help and facilitate the research by providing accommodation and permits to build productive conditions to the researchers. The results of the studies would be used for provided good database and GIS which would be developed for Bintuni Bay Nature Reserve.

Database is developed to equip Management Information System (MIS) which is currently installed for conservation areas in Indonesia. Concerning this interest, Bintuni Bay Nature Reserve would collect and maintain collections of information media including: 1) books, magazines and journals; 2) brochures, posters, stickers 3) photo collections, slides, and films; 4) maps (including, topography maps, land use pattern maps, navigation maps, etc.).

The summary of activity plan proposed for effectiveness improvement in Bintuni Bay Nature Reserve Management is presented in Table V-3.

No.	Main Activities	Activity Components
1.	1. Production of Pocket Book/Operation Manuals/Guidelines on Area	 Production of pocket books/manuals on area boundaries maintenance activities
Manageme	Management Activities	 Production of pocket books/manuals, guidelines on area maintenance activities.
		 Production of pocket books/manuals/ guidelines on area potency management activities.
		 Production pocket books/manuals/ guidelines on area preservation and protection activities.
	 Production pocket books/manuals guidelines on researches and area development activities. 	

Table V-3. Activity plan of Bintuni Nature Reserve Area Management for effectiveness Improvement of the Area.





No.	Main Activities	Activity Components
2.	Area Directive Board/Plank Construction	Production and Setting up of announcement and Area Directive boards/planks along the trails and on some islands in the area that is frequently passed by people and as shipping-lane.
3.	Area Border Maintenance	1. Seting up trails in area borders with 2 m wide.
		Seting up boundary marker made from zinc plates on trees found exactly in area borders
		 Upgrading boundary markers that are removed or damaged.
4.	Studies on Functions and Potency of the Area	 Identification and mapping the existing ecosystem types of Bintuni Bay Nature Reserve area.
		Identification and mapping the land covers according to the ecosystems.
5.	Block Structuring and Establishment	Structuring and establishment of directive blocks in the area
6.	Production of Poster/Leaflet Regarding on Area Management	 Production of Posters on sustainable utilization of natural resources
	Activities	Production of Posters on endangered and protected flora/fauna species in the area
		 Production of Posters on ecosystem condition of the area
7.	Community Development	Community development with the target to the people living in buffer blocks regarding to the importance of the area as buffering system for livings
8.	Community Development	Forming of work groups in area management activities
9.	Research	1. Studies on environmental impacts
		 Studies on impacts of planned region development to the nature reserve area
10.	Geographical Information System (GIS) and Database	GIS supply and revising data based on current research results

B.3 Species and Biodiversity Conservation Development

Activities of species conservation and biodiversity development are closely related to the activities of researches, development and other activities that support cultures, especially those that are associated with biodiversity. These activities aim to improve preservation of flora and wild fauna, and to facilitate essential ecosystem management. Some management activities to be proposed are as followings:

 <u>Guideline Books</u>. These pocket books/manuals/guideline books contain guidelines of maintenance activities of flora, fauna and their ecosystem. These guidelines would be used by area manager, especially forest rangers, and contain technical procedures on area management activities.



- 2. <u>Studies on flora, fauna and ecosystem condition of the area.</u> These activities aim to identify flora, fauna and their habitat in the area for supporting species and biodiversity conservation efforts of Bintuni Bay Reserve Area.
- 3. <u>Habitat Supervision</u>. These activities would be emphasized on evaluation of area ecosystem condition in which flora and fauna's habitat presents.
- 4. <u>Control</u>. Descriptions on control efforts, such as exotic species control. These aim to control introduction of new species that have potential as a pest, that have similar roles with native species, etc.

Pest and disease prevention. In the natural forest ecosystem which has a structure consisting of various biota species, uneven aged stands and relatively stabile ecosystem, pest and disease outbreak is rare. Population fluctuation of pest and disease could be controlled by its nature ability to recovery. Bintuni Bay Reserve Area might be give awareness more to the possibility of dangerous pest and diseases occurring in agricultural areas or areas nearby the borders. Pest and disease monitoring should be done periodically by officers or by giving an awareness of community reports regarding pest and disease occurrence. Attention should more be taken to the possibilities of exotic biota invasion into the area. If there are any pest and disease cases which consider dangerous, preventive and repressive efforts as well should be done immediately. In general the activities that might be applied are:

- ∉ Eradication of exotic plant species that have potential to grow expansively in the area.
- ∉ Dissemination of information on restriction of exotic species introduction through extension works and socializing.
- ∉ Conducting inventory, identification and impact studies of the exotic species existing in the Bintuni Bay Nature Preserve Area.

<u>Species Protection</u>. In general, Community and related institutions awareness on the biota status especially endangered and protected biota should be increased. Some protected biota might also have special protection measures. The activities could be done for species protection, i.e.:

- ∉ Detail studies on breeding period of hunted animals for allowable hunting period determination
- ∉ Construction of directive/sign boards/plank on protected animal hunting restriction.
- ∉ Production of broschures, leaflets dan posters on restriction to endangered and protected animal hunting.
- 5. <u>Rehabilitation</u>. Rehabilitation is activities that are related to the effort to rehabilitate any damages and changes of landscape of Bintuni Bay Nature Reserve Area. To be able to handle any damages and changes of the landscape, Bintuni Bay Nature Reserve Area manager should coordinate with related institutions. Damages and preventive efforts in rehabilitation activity plan are classified as fallows:



Prevention of Erosion-abrasion and sedimentation. Bintuni Bay Nature Reserve Area has not yet had any information regarding affected locations by erosion-abrasion and sediment accumulation. However, there is an indication that in some locations, effects of abrasion-erosion and rivers is less significant. It is clearly be seen by the formation of many new small islands in estuaries. Management should be focused on the locations susceptible to abrasion-erosion that usually occur in the locations at which are directly affected by big waves. Meanwhile, sediment management is closely connected to the effort of Forestry Affair Office to establish sustainable forest management in HPH areas and community forest. To support this activity, it is necessary to form coordination forum by involving related institutions.

Rehabilitation of Bintuni Bay Nature Reserve Area. Today local community traditionally have been utilizing the area for fishing and cultivation. In some locations land clearing has been done for log-yard area by community forestry businesses. All these activities strongly influence the compactness of the ecosystem of the area and in turn, these would impact to important flora and fauna in the area. Therefore, it is urgent to carry out some activities as follows:

∉ Preparing technical plan of damaged area rehabilitation.

Technical plan should firstly be prepared for achieving efficiency and effectiveness of rehabilitation activities. These activities would be carried out by participation of related work partners, such as universities, LIPI and NGO.

- ∉ Area rehabilitation using native plant species. Targeted locations for rehabilitations are mainly of abandoned HPH and Kopermas logyards, i.e. logyards in Tirasai, Sumberi, Awarapi River S.P. V, Ausoi River S.P.IV. For this activities therefore it is needed:
 - ∉ Seeds and seedlings of native plant species supply which are adapted to the area ecosystem being rehabilitated.
 - ∉ Planting the plants for rehabilitation through community participation and the support of the third parties.
 - ∉ Plantation maintenance.
- ∉ Studies related to the efforts of rehabilitation that could be carried out are:
 - ∉ Studies on sedimentation rates in main rivers in the area
 - ∉ Studies on ecosystem damages in the Bintuni Nature Reserve area and their causes
- 6. **Database Development**. This aims to revise the information on flora and fauna condition and their habitat as well for supporting management activities of Bintuni Bay Preserve Area.
- <u>Cooperation</u>. To formulate Memorandum of understanding (MOU) between Natural Resource Conservation Agency (BKSDA) Region II Sorong (for intention to Resort Bintuni Bay) and local, regional or international universities/NGO.



The summary of activity plan proposed for developing species conservation and biodiversity in Bintuni Bay Reserve Area is presented in Table V-4.

Table V-4. Activity Plan of Bintuni Bay Nature Reserve Area Management for developing species and biodiversity conservation.

No.	Main Activities	Activity Components						
1.	Manuals	1. Production of manuals on flora/fauna and area ecosystem maintenance						
		2. Production of manuals on flora/fauna and area ecosystem control						
		3. Production of manuals on area rehabilitation						
2.	Studies on flora and fauna condition in the area	 Inventory and mapping of flora and fauna status in Bintuni Bay Nature Reserve area 						
		2. Studies on flora and fauna population dynamics in Bintuni Bay Nature Reserve Area						
		3. Inventory and identification of valuable and endangered plant species in Bintuni Bay Nature Reserve area						
		 Inventory and identification of exotic flora and fauna in Bintuni Bay Nature Reserve area 						
		 Negative impact of the exotic species presence in Bintuni Bay Nature Reserve area 						
		 Development of the use of native species widely in agriculture practices 						
3.	Habitat Supervision	 Inventory and mapping of particular sites for spawning ground in Bintuni Bay Nature Reserve area 						
		2. Studies on ecosystem dynamics in Bintuni Bay Nature Reserve area						
		3. Permanent plot setting up						
		4. Trails making for education and research purposes						
4.	Pest and Disease Control							
	a. Pest and Disease Prevention	1. Eradication of expansive plant species (exotic plants).						
		 Dissemination of restriction information on exotic species introduction into the area through extension works and socializing. 						
		 Inventory and identification studies on the impact of exotic species occurring in Bintuni Bay Nature Reserve area. 						
	b. Species Protection	1. Detail studies on breeding period of hunted animals to determine hunting times						
		2. Making of restriction boards/planks for hunting protected animals						
		3. Production of brochures, leaflets and poster for hunting restriction of endangered and protected animals						
5.	Rehabilitation							
	a. Erosion-abrasion and sedimentation Prevention	Formation of Coordination Forum with the participation of related institutions.						
	b. Rehabilitation of Bintuni Bay Nature Reserve Area	1. Preparation of technical plan for rehabilitation of damaged area.						
		2. Area Rehabilitation						





No.	Main Activities	Activity Components				
		 ∉ Seeds and seedlings of indigenous plant species suitable to the area ecosystem being rehabilitated ∉ Planting or rehabilitating the area through community participation and with the support of the third parties ∉ Plantation maintenance. 				
c. Studies related to the efforts of	1. Studies on sedimentation rates in main rivers of the area.					
	rehabilitation that could be carried out	 Studies on ecosystem deteriotation rate in Bintuni Bay Nature Reserve Area and its causes. 				
6.	Database System Development	 Biodiversity (flora/fauna) potency in Bintuni Bay Nature Reserve Area 				
		Social, economic and culture data of the community in the area and its suroundings				
		 Compilation of study results and information regarding the area development in the past 				
7.	Cooperation	Making of MOU to support the activities for species conservation and biodiversity development.				

B.4 Area Conservation and Protection

The activities of Area Conservation and Protection aim to improve forest protection and to build law enforcement in Bintuni Bay Nature Reserve Area. Area Conservation and protection activities here includes protection to the utilization of natural resources, area boundary violation by inhabitant and shifting cultivation, illegal logging, forest product gathering, animal herding, etc.

General efforts of protection that we mean here are every activities aiming to protect and monitor any disturbances to the compactness of the area. To support these efforts, therefore some activities are needed as follows:

 <u>Routine Protection (Patrol)</u>. In accordance to the principle of efficient and cost-effective management, habitat damage prevention due to utilization activities could be done by its own user.

Routine activities of area conservation and protection could be done by area manager (forest rangers), community based observer or voluntary forest keepers under direction of Bintuni Bay Nature Reserve manager, and collective patrol that involves other related institutions.

Collective patrol with the involvement of other related institutions should be carried out et least twice a year. While participatory protection might depend on local community reports and carry out sporadically. Patrol operation would be executed if the safety measures really need supporting from other security components such as Polri, TNI and regional government. If the situation relatively secure, so the intensity of collective patrol operation could be reduced or even abolished.

Protection of Bintuni Bay Nature Reserve Area needs good coordination not only with related institution but also with informal leaders. This coordination should be done every time at least at every collective patrol operation, before and after execution.



Every activity in protection program must be planned and if necessary, prior to the patrol, patrol routes could be programmed and loaded in GPS. In addition, patrol system should be sporadic so that could be predicted by violators such as in routine patrol. Every officer must know exactly area boundaries, the regulations, and the area components to be protected. Every officer also requires to learn and to understand life pattern and activities of the local community so that strangers would easily be identified. Every officer must ready to take action based on the information coming from the local community. The reason is that local people know well the area and they could be efficiently used as overseers because they live everyday in the area.

- Law Enforcement. Law enforcement in Bintuni Bay Nature Reserve Area should be conducted as inter-institutional/joint works that involves the manager authority of Bintuni Bay Nature Reserve Area, Police, Fishery Office, TNI and local community. To support the activities for law enforcement, some supporting activities are proposed, i.e:
 - ∉ Formulating Simple and Understandable Regulation and Restriction

Existing regulations need to be evaluated to ensure their relevancy and effectiveness in protecting Bintuni Bay Nature Reserve Area. Efforts to make regulation clear, understandable, accordance with conservation purposes, and sustainable utilization are necessary to do.

∉ Regulation Socialization

Regulation must be socialized and the roles of every stakeholde should also be clear stated so that ambiguous meanings could be eliminated. It is also a need to have special regulations that are agreed by all parties, especially regulations on the restriction of all extractive activities that are destructive to the area. Restriction to the uses of trawl, poison chemicals, boom, and restriction to forest logging for forestry, fishery, and plantation businesses should be formulated and implemented. Particular regulations for customary community also need to formulate to accommodate exclusive rights to utilize resources in the area in certain requirements and in the context of sustainable utilization.

3. Production of Manuals on Area Conservation and Protection.

Activity plan for Bintuni Bay Nature Reserve area conservation and protection is summarized in Table V.5.

Table V-5. Activity Plan of Bintuni Bay Nature Reserve Area Management for AreaConservation and Protection Programs.

No.	Main Activities	Activity Components
1.	Routine Protection (Patrol)	1. Routine patrol by the area manager
		2. Collective patrol
		 Routine patrol by community or private parties (volunteers).





No.	Main Activities	Activity Components
2. Law enforcement	 Formulating special regulations on restriction and punishment for hunting and utilizing protected flora and fauna 	
	 Making of simple/understandable regulations on the exclusive rights to Customary (adat) community in utilizing resources with certain requirements and in the context of sustainable utilization 	
		 Socializing regulations on restrictions and punishment for illegal activities in the area to all stakeholder
3.	Manuals	Making of manuals (guidelines) on Conservation and Protection of Bintuni Bay Nature Reserve Area

B.5 Supporting Activities/Institutional

Supporting activities/Institutional aim to reinforce area manager institutional and to bring about capable human resources in supporting Bintuni Bay Nature Reserve Area Management.

- 1. <u>Improving the manager capacity</u>. Pressure to Bintuni Bay Reserve Area in the future would be much more intense. In such situation, more capable human resources especially forest rangers (POLHUT) are needed and could be achieved through trainings.
- 2. <u>Manager Personnel Number Addition</u>. Currently Resort Bintuni Bay only has 2 staffs while one forest ranger, theoretically, is only able to handle area up to 10000 ha. This means that 10-12 forest rangers (POLHUT) are needed for covering up all Bintuni Bay Nature Reserve Area. It is planed to employ 10 field officers and 5 among them would always maintain coordination and communication with user groups in the field.

Activity plan that are proposed for Supporting Activities/Institutional programs is summarized in Table V.6.

Table V-6.	Activity plan that are proposed for Supporting Activities/Institutional in Bintuni Bay
	Nature Reserve Area Management

No.	Main Activities	Activity Components
1.	Manager Capacity Improvement	1. Voluntary forest keeper (jagawana) trainings
		2. Forest ranger (POLHUT) trainings
2.	Management personnel	Management personnel addition with emphasizing on forest ranger (POLHUT) personnel addition

B.6 Utilization

Utilization activities which are meant here is more emphasized on natural resources utilization activities by the community in the area and nearby. Based on the survey and the meeting with



the local community to discuss area management plan, It is revealed that local community livings in the area and surroundings are very largely dependent on the existing of Bintuni Bay Nature Reserve for everyday lives. Utilization of natural resources in the area is old practice since their ancestors live here prior to the establishment of conservation area. However, the local community whose own customary (adat) rights of the area has given a commitment to protect the existence of Bintuni Bay Nature Reserve. An agreement on what can and cannot be done in Bintuni Bay Nature Reserve Area that related to utilization of natural resources should be established, such as discussed in Chapter V.

- 1. <u>Manuals</u>. These could be as pocket books, technical guidelines or manuals on natural resource utilization in the area, and would be used by area managers especially forest rangers (POLHUT) and group of user (community)..
- 2. <u>Utilization of fishery Products</u>. People whose have customary (adat) rights and live in the area or surroundings would be allowed to utilize traditionally of fishery products from the area. Development and monitoring on local product utilization would be carried out by Conservation Natural Resource Agency (Balai KSDA) (with the intention to Ressot Bintuni Bay Reserve Area Manager) cooperating with local customary rights (adat) owners based on the collective agreement. This agreement also includes the utilization of the natural resources by non customary (adat) rights owners which live in the area and nearby area

Traditional utilization fishery resources should be organized by the community whose have customary rights living in the area and nearby, under Conservation Natural Resource Agency (Balai KSDA) supervision. Consequently, Bintuni Bay Natural Reserve Area managers should build understanding the importance of local knowledge and wisdom. Local knowledge and wisdom should be developed and disseminated to others.

Development of fishery business in the area is allowed only to the owners of customary (adat) rights living in the area and surroundings. Proposal to develop fishery, for instance fish culture in rivers by using keramba (woven basket for raising fish) should be submitted to Bintuni Bay Nature Reserve Area manager. Technical supervision on fish culture would be handled through the cooperation with other related institution (Fishery and Marine Affair Office) and Coastal Partnership (Mitra Pesisir).

Some activities could be carried out, i.e:

- ∉ Extension works regarding to the benefit of mangrove area preservation for fishery
- ∉ Community development on the utilization of fishery product in the area by environmental sound manners with the cooperation of Fishery and Marine Affair Office and Coastal Partner (Mitra Pesisir), i.e.:
 - o Trainings on fish culture using floating keramba in rivers
 - Introduction to "sasi" system for giving recovery opportunity to the utilized natural resources
 - Trainings on fishing net production and repair, through cooperation with Fishery and Marine Affair Office
- ∉ Socializing restriction in using chemicals in the area



3. <u>Utilization of Agriculture and Animal Hunted Products.</u> Agriculture and plantation practices in the area such as the use of pesticides, herbicides, inorganic fertilizers and destructive land clearing and preparation could be regarded as main threat to the existence of Bintuni Bay Nature Reserve Area. Bintuni Bay Nature Area manager would cooperate with Agriculture Affair Office in facilitating the community to have an access for developing more efficient agriculture and plantation pattern. By developing more efficient agriculture and plantation pattern for agriculture and plantation pattern purposes in the area could be prevented, but also farmer income might be increased as well:

Agriculture practices in the area is possible as long as only for daily consumption. All agriculture practices in the area should be mapped to monitor and to prevent agriculture land expansion. Developing large scale of plantations in the area is prohibited. Otherwise developing plantation outside the area should be coordinated with Conservation Natural Resource Agency (Balai KSDA) to avoid area overlapping. Based on the field observation and interview to the community, there are some activities possible to be carried out, i.e

- ∉ Extension works on the importance of sustainable agriculture system
- ∉ Implementation of sustainable agriculture system
 - o Introducing agroforestry system to the community in the area
 - o Trainings on permanent agriculture practices, limited only in settlement area
 - Local plant seedling and seed supply for growing.
- ∉ Limited Utilization of Wild Animals
 - Developing and supervising on raising crocodile in Naramasa, Yensei, Yakati and Mamuru villages
 - o Setting and supervising hunting period based on the result of the studies
 - Trainings and technical supervision on the production of handicraft made from crocodile leather in Naramasa, Yensei and Yakati villages
 - Trainings and technical supervision on the production sweet dried jerked meat (*dendeng*) and fried meat reduced to fibers (*abon*) of pig and deer, through the cooperation with District Industrial Affair Office
- ∉ Extension works and socialization on appropriate hunting period based on the results of the studies.
- 4. **Researches.** Research activities would be emphasized on studies in order to support sustainable utilization by the community.
- 5. **Cooperation.** Cooperation aims to build common understanding with related stakeholders such as Marine and Fishery Affair Office, Agriculture Sffair Office, and Forestry Affair Office of Bintuni Bay District in supporting utilization activities, especially in term of sustainable utilization concept.



6. **Database system development.** These activities aim to revise information regarding natural resource utilization in the area based on current related studies.

Activity plan proposed for natural resource utilization in Bintuni Bay Nature Reserve Area is summarized and presented in Table V-7.

Table V-7.	Management	activity	plan	of	natural	resource	utilization	in	Bintuni	Bay	Nature
	Reserve Area.										

No.	Main Activities	Activity Components	
1.	Manuals	Production of manuals on natural resource utilization in the area	
2.	Utilization of fishery products	1. Joint extension works with Fishery and Marine Office on the benefit of mangrove preservation for fishery production	
		2. Socialization regarding to the restriction on the use of chemical in the area	
		3. Trainings to introduce "Sasi" system".	
		4. Trainings and supervision on floating keramba construction in river	
		5. Training and supervision on fishing net making and repair	
3.	Utilization of agriculture and wild animal hunted product	1. Joint extension work with Agriculture Affair Office on the importance of sustainable agriculture system	
		2. Introduction to agroforestry.	
		3. Trainings on permanent agriculture practices limited only in settlement (villages) located in the area	
		4. Trainings on raising young crocodile	
		5. Trainings or technical supervision on making handicraft made from crocodile leather	
		6. Training/technical supervision on production of sweet <i>dendeng</i> and <i>abon</i> made from deer and pig meat	
		 Introduction to appropriate hunting techniques of wild animal by considering breeding periods of the animals 	
4.	Researches	 Studies on animal reproduction pattern and hunting sites Bintuni Bay Nature Reserve area 	
		 Studies on plant propagation techniques, especially for valuable plant found in Bintuni Bay Nature Reserve area 	
		3. Studies on life cycle patterns of certain marine biota found in the area, such as fish, shrimp, and crab in Bintuni Bay Nature Reserve Area	
		4. Inventory of local agriculture commodities	
5.	Cooperation	Making of MOU related stakeholder to support utilization activities in Bintuni Bay Nature Reserve Area	
6.	Database system development	1. Potency of valuable biological natural (flora/fauna) resource of Bintuni Bay Nature Reserve Area	
		2. Flora and flora reproduction seasons in Bintuni Bay Nature Reserve Area	


C. EQUIPMENTS AND INFRASTRUCTURES

Equipment and infrastructure development planning is formatted by concerning development phase priority. Some considerations which should be given to management importance are:

C.1. Management Facilities:

a. Office Buildings

Concerning that Bintuni Bay Nature Reserve Area is located at rapid developing residency, office buildings are urgently needed for management activity center and information center as well. Equipments and infrastructure needed are:

∉	Land	:	500 m ²
∉	Office Buildings	:	1 unit, flooring area = 90 m^2 .
∉	Forest Ranger (POLHUT) Barrac	k:	1 unit, for 6 families (flooring area = 108 m^2)
∉	Electricity Equipments	:	1 unit 3 KW generator
∉	Drinking Water Instalation :		drilled well, water pump, and
			watersupply tower
∉	Communication Equipments	:	1 unit SSB radio, 7 units handy talky and
			SSB radio tower
∉	Transportations Facilities	:	2 units motorcycles,
			1 unit 80 hp speedboat
			1 unit 40 hp longboat
∉	Office Facilities	:	3 units komputer, printer, office appliances
			7 units GPS
			7 units compass (Suunto branded)

b. Patrol roads

There must be patrol roads as an access to the entire area of Bintuni Bay Nature Reserve so that patrol is possible and easy to carry out. River and sea transportation might be used because these are regarded as the most important transportation in the area. However patrol roads on the area border that have a boundary with lowland forest could be constructed along with border trails for efficiency (related to area border maintenance)

c. Temporary Worker Houses

These buildings would be occupied by the smallest unit of area manager and would equipped with reasonable facilities for supporting the activities in the location. 4 (four) temporary worker houses are planned to build in Banjar Ausoy, Naramasa, Mamuranu and Tirasai villages. Equipments and infrastructure needed are:

- \notin Land : 3 units, 100 m² in size each location
- ∉ Temporary worker house buildings : 3 units, 48m2 each building





∉	Electricity Generator	: 3 units, capacity 2.5 KW
∉	Dringking water instalation	: 3 unit drilled wells, water pumps and
		tower
∉	Communication equipments	: 3 unit SSB radios, 3 unit Handy talky
∉	Working tools and equipments	: 3 unit typewriters 80 cm
		3 unit GPS

d. Patrol House and Monitoring Tower

These facilities are very important for wild animal and forest fire monitoring. For tourism purposes, these could be used for view seeing. Monitoring tower would be built in Awerepi, Simeri, Modan Island and Bore Island.

C.2. Education Facilities

a. Information Center

The office of Bintuni Bay Nature Reserve Area Management could be functioned as well as Information Center.

b. Directive Boards/Planks

These facilities consisting of announcement boards, restriction boards and warning signs must be built at strategic and visible sites.

∉	Name boards of the area	: 50 units
∉	Restriction and Information boards	: 100 units, mainly build at border tracts
		nearby settlements (villages).

c. Trails

These facilities might be used for patrol and education purposes as well. Access to the entire sites in the area also could be easily gained, meaning that patrol and touring for sight seeing are possible to carried out. Permanent trails in mangrove area would be built only at which monitoring towers and permanent plots would be established.

C.3. Research Facilities

a. Information Center and Research Facilities

These buildings could be developed in the area depending on the importance. Information and Data Base Center could be established together with the office in one building. In addition, some facilities also necessary being built in thearea are :

∉ Weather and Climate Station Establishment

Current climate and weather in the area have not been known well, on the other hand climate and weather data is very importance for area management



planning. For this reason, it is urgently needed to establish weather and climate station in the area.

∉ AWRL Station (AWLR : automatic water level recording) Establishment

AWLR station would be very helpful for Bintuni Bay Nature Reserve Area Manager to monitor the impact created by the change of landuse at upstream to the area. Proposed location for AWRL Station establishment is of Muturi river

∉ Floating house for Research Activities

Floating house for research activities should not be established in many locations, but should be developed in certain way so that the house could be moved to other locations at where research activities would be carried out. By such way, time efficiency in mobility could be improved. Moving this floating house might be done by using longboat.

b. Trails for Field Study

Trail construction must be simple and dependence on the importance

c. Field Laboratory (in study sites)

Studi site setting would be depended on the regulations. Permanen plot could be established in the area. Observation sites or field laboratories would be largely depended on the flora-fauna mapping studies in Bintuni Bay Nature Reserve Area.

d. Guest House for Researchers

Guest house for researchers would be build side by side with Bintuni Bay Nature Reserve Area Manager Office.

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VI. FUNDING

A. FUND RESOURCE

Funding for Bintuni Bay Nature Reserve Management and Development could be obtained from APBN and non-APBN funds or from other resources (domestic and foreign aids). Fund collecting from private companies operated in Bintuni Regency could be done with the knowledge of the Head of KSDA Agency Papua II Sorong. Aids and supporting should not always be in the form of money but could be in the form of goods, facilities or services, for instances: communication equipments, buildings or participation in patrol. Fund may also be collected by NGO or other organizations. Likewise the implementation of the development could be also carried out by the third parties pointed by fund provider or collector with the concent of BKSDA Papua II Sorong. All facilities built in the area for supporting Bintuni Bay Nature Reserve Area Management will be considered as Bintuni Bay Nature Reserve or Indonesia government assets.

Activity Support Proposal Prosedures and Responsible Party for the Implementation are presented in Figure VI-1.



Figure VI-1. Flow Chart of Activity Support Proposal Prosedures and Responsible Party for Implementation

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B. COST DESCRIPTION

Cost description for management activities is presented in Table VI-1 dan Table VI-2, while that for supporting facilities of management activities is presented Table VI-3. dan Table VI-4.

Table VI-1. Cost alocation plan for short-term (yearly) management of Bintuni Bay Nature Reserve Area in the first 5-years period (2006-2010).

_	_	-		1		r	r	r	1	1				
Total 5	years (x'000)		'	•	•	112,500	1,114	3,100	'			1,200	1,200	1,200
(000)	2010					22,500								
eriod of (x	2009					22,500								
n Year Pe	2008					22,500								
ing Plan o	2007					22,500								
Fundi	2006					22,500	1,114	3,100				1,200	1,200	1,200
Price Unit	(Rp)				ı	900'006	1,114,000	3,100,000				30,000	30,000	30,000
	Unit				I	Km	Package	Package				Unit	Unit	Unit
	Volume				ı	125	-	-				20	20	20
	Component		Definitive status decree making	1. Regency Head (Bupati) Decree Making	2. Regional Regulations on Nature Reserve	1. Trails and tracks making (km)	 Boundary Marker Making Made from Pole 	 Boundary Marker Making made from zinc plate 	MOU making with stakeholder on boundary marker reconstruction		ment	 Supply of manuals/pocket books on area boundary maintenaces 	 Supply of manuals/pocket books on /technical guidance on the activities of area potency management. 	3. Supply of manuals/pocket books/technical guidance on Area
	Activity	Area Consolidation	a. Area Legal Certainty	b. Formal Legal Recognition of Bintuni	Bay Nature Reserve Area by Regional Government	c. Reconstructio of Boundary Marker	1	1	d. Cooperation		Effectiveness Area Management Improven	 a. Supply of manuals/pocket books /technical guidance on areal management 		
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	Activity	Component	Volumo	1 min	Price Unit	Fund	ing Plan c	n Year Pe	sriod of (x	(000)	l otal 5
	ACIIVITY	Component	volume		(Rp)	2006	2007	2008	2009	2010	years (x'000)
	b. Area Directive Boards	Announcement board dan Area Directive Board Making	50	Package	1,650,000		41,250		41,250		82,500
	c. Area Border Maintenance	1. Trail and track maintenace (km)	50	Km	900'006				22,500	22,500	45,000
		 Damaged boundary marker pole replacement 	-	Package	1,114,000			ı		1,114	1,114
		3.Making Boundary Marker made from zinc plate	-	Package	3,100,000					3,100	3,100
	d. Study on Area function and Potency	 Identification of ecosystem type and mapping of area cover in CATB 	ı	'		-	ı	ı		I	
		Mapping of land cover according to the ecosystem in the area for planning	ı	ľ			-	ı	ı		
	e. Poster/Leaftlet Production	 Supply of Posters on sustainable utilization 	150	Package	22,500	3,375	I	ı	-	-	3,375
		 Suplpy of Posters on protected and endangered Flora/Fauna species of the area 	150	Package	22,500	ı	3,375	ı	ı	3,375	3,375
		Supply of Posters on ecosystem condition of the area	150	Package	22,500	ı	ı	ı	·	3,375	3,375
	g. Community Development	Community development with the target of the people living in buffer blocks regarding to the importance of the area as buffering system for livings	5	Package	9,900,000	9,900	6,900	9,900	9,900	6,900	49,500
	h. Community Involvement in Area Management Activities	Work group formation	1	Package	10,450,000	10,450	I	I	ı	I	ı
	i. Research	Environmental Impact study	1	Package	37,500,000				37,500		37,500
		Study on the planned region development impact to the nature reserve area	1	Package	37,500,000	-	I	37,500	ı	ı	37,500
	Geographical Information System (GIS) and. Database	Geographical Information System (GIS) Suplí and Data Revision based on study results	-	Package	37,500,000	·	ı	ı	ı	37,500	37,500
	-							ſ			
e	Species and Biodiversity Conservation D	evelopment									
	a. Manuals	1. Production of Manuals on flora/fauna and area ecosystem Maintenance	-	Package	10,000,000		10,000				10,000

Funding





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	Activity	Componet	Volumo	1 nit	Price Unit	Fund	ing Plan c	n Year Pe	sriod of (x	(000)	l otal 5
DN ON	ACTIVITY	CONTROLLER	volume		(Rp)	2006	2007	2008	2009	2010	years (x'000)
		 Production of manuals on flora/fauna and area ecosystem control 	L	Package	10,000,000	ı	ı	ı	10,000	ı	10,000
	 b. Studies on flora and fauna condition of the area 	 Inventory and mapping of flora and Fauna species of the area 	Ţ	Package	37,500,000	37,500					37,500
		Study on Flora and fauna dinamics in the area	٢	Package	37,500,000		37,500				37,500
		Inventory and identification of valuable and endangerd plant species dan in the area	5	Package	37,500,000			37,500			37,500
		 Inventarisasi dan identifikasi jenis-jenis flora dan fauna eksostik di kawasan Cagar Alam Teluk Bintuni 	L.	Package	37,500,000	37,500					37,500
		5. Negative exoctic species presence impact to Bintuni Nature Reserve Area		Package	37,500,000		37,500				37,500
		Development of the use of local species widely in agriculture practices	L	Package	37,500,000			37,500			37,500
	c. Habitat Supervision	 Inventory and mapping of particular sites spawning ground in Bintuni Bay Nature Reserve area 	3	Package	37,500,000		37,500				37,500
		2. Study on ecosystem dynamics of Bintuni Bay Nature Reserve Area	2	Package	37,500,000			37,500			37,500
		Making of permanent plots	٦	Package	16,950,000				16,950		16,950
		 Making of trails for research and education purposes 	L	Km	65,000				65,000		65,000
	d. Control										
	a. Pest and Disease Prevention	 Eradication of expansive or exoctic species existing in the area. 	1	Package	9,900,000		9,900				
		 Extension and socialization on introduction of exoctic species restriction to Bintuni Bay Nature Reserve Area. 	2	Package	9,900,000			9,900			9,900
	b. Species Protection	 Conducting detail study on breeding period of hunted animal for determining hunting period for the people 									

Funding





						Fundi	ing Plan c	n Year Pe	eriod of (x	(000,	Total 5
Ŷ	Activity	Component	Volume	Unit	(Rp)	2006	2007	2008	2009	2010	years (x'000)
		 Making of restriction boards/planks for hunting protected animals 	10	Package	16,500,000		16,500				16,500
		 Making of broschures, leaflets and posters on restriction of protected or endangered animals 									
	e. Rehabilitation										
	a. Erosion-abrasion and sedimentation Prevention	Formation of Coordination Forum involving related institutions.									
	b. Rehabilitation of Bintuni Bay Nature Reserve Area	 Preparation of technical plan for damaged area rehabilitation 	1	Package	9,900,000					9,900	9,900
		2. Area Rehabilitation									
	c. Research	 Study on sedimentation rates in some rivers of the area 	1	Package	37,500,000		37,500				37,500
		 Study on ecosystem deteriotation rate and its causes in Bintuni Bay Nature Reverse Area 	1	Package	37,500,000			37,500			37,500
	f. Data base system development	 Biological resource (flora/fauna) potency in Bintuni Bay Nature Reserve Area 	2	Package	10.000.000	10.000			10.000		20.000
		Social, economic and cultural data of the community in the area and its surroundings	2	Package	10.000.000	10.000			10.000		20.000
		 Compilation of study results and area development being conducted in the past 	5	Package	5,000,000	5,000	5,000	5,000	5,000	5,000	25,000
	e. Cooperation	Making of MOU to support activities for species and biodiversity conservation development	۲	Package	5,000,000	5,000					5,000

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						Eind	o neld on	n Vaar De	rind of (v)		Total 5
ž	Activity	Component	Volume	l Init	Price Unit					(2000	Vears
					(Rp)	2006	2007	2008	2009	2010	ycai s (x'000)
4	Area Conservation and Protection										
	a. Routine patrol	1. Routine patrol by the area manager	240	Package	120,000	5,760	5,760	5,760	5,760	5,760	28,800
		2. Collective Patrol	2	Package	9,500,000	9,500	9,500	9,500	6,500	9,500	47,500
		 Routine Patroli by the local community and private parties (volunteer) 	5	Package	I						Voluntir
	e. Law enforcement	 formulating special regulations on restriction and punishment for hunting and utilizing protected flora/fauna 	ı	Unit	ı						1
		 Formulating simple and understandable regulations on exclusive right for Customary (adat) communty in utilizing natural resources in the area with certain requirements and in the context of sustainable utilization 		Unit							
		 Socializating regulations restriction and punishment on illegal activities in the area to all stakeholders 									
	d. Making of manuals	Manuals on conservation and protection of CATB Area									
5.	Supporting facilities/Institutionals										
	a. Management personeel	Area manager personeel addition									PHKA
	b. Trainings	 volunteer forest keepers (jagawana) trainings 	9	Package	7.500.000	15.000	7.500	7.500	7.500	7.500	45.000
		2 Forest rangers (Polhut) Trainings	5	Package	10.000.000	20.000	10.000	10.000	10.000		50.000
•											
.	Utilization										
	a. Manuals	Suply of manuals on natural resource utilization	2		I						
	B. Fishery product utilization	 Joint extension works with Fishery and Marine Office on the importance of magrove conservation for fishery production 	5	Package	20,900,000		20,900		20,900		41,800

Funding

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	A	Common of the second	Velume	1 mit	Price Unit	Funo	ling Plan o	on Year P	eriod of ()	(000)	Total 5
0Z	AGUVILY	Component	volume	UNIT	(Rp)	2006	2007	2008	2009	2010	years (x'000)
		Sosializing restriction on chemical using in the nature reserve area	1	Package	20,900,000		20,900				20,900
		3. Trainings on "Sasi" system introduction.	-	Package	20,900,000		20,900				20,900
		 Trainings and supervision on making of and seting up floating keramba in the river 	1	Package	20,900,000		20,900				20,900
		Trainings on making of fish net and repairing	1	Package	20,900,000		20,900				20,900
	c. Utilization of agriculture and hunted animal products	 Joint extention works with Agriculture Office on the importance of sustainable agriculture system 	2	Package	20,900,000		20,900		20,900		41,800
		2. Introduction to agroforestry system.	1	Package	20,900,000		20,900				20,900
		 Trainings on permanent agriculture practices mainly in the villages located in the area 	1	Package	20,900,000		20,900				20,900
		 Development of the use of local species widely in agriculture practices. 	1	Package	37,500,000			37,500			37,500
		5. Trainings on young crocodile raising	1	Package	20,900,000			20,900			20,900
		 Trainings/technical supervision on making of handicraft made from crocodile leather 	1	Package	20,900,000			20,900			20,900
		7. Trainings/technical supervision on making of sweet <i>dendeng</i> and <i>abon</i> made from deer meat	1	Package	20,900,000			20,900			20,900
		 Introduction to appropriate wild animal hunting techniques by considering breeding periods of the animals 	1	Package	20,900,000		20,900				20,900
	d. Research	1. Study on reproduction pattern of the wild animals and hunting sites	2	Package	37,500,000			37,500		37,500	75,000
		 Study on plant propagation techniques especially for valuable plant occuring in the nature reserve area 			ı						ı
		3. Study on life cycle patterns of certain marine biota such as fish, shrimp, and	2	Package	37,500,000			37,500		37,500	75,000

Funding

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					Fund	ing Plan	on Year P	eriod of (x	(000)	Total 5
Activity	Component	Volume	Unit	(Rp)	2006	2007	2008	2009	2010	years (x'000)
	crabs in the nature reserve area									
	4. Inventory of local agriculture comoditiest	٢	Package	10,000,000	10,000					10,000
Ч	Making of MOU with related stakeholder to support utilization activities	2	Package	2,500,000	2,500		2,500			ı
system development	 Valuable biological resource (flora/fauna) potency of Bintuni Bay Nature Reserve Area 	1	Package	10,000,000					10,000	10,000
	2. Flora and fauna reproduction seasons in Bintuni Bay Nature Reserve Area	١	Package	10,000,000					10,000	10,000





Table VI-2. Cost alocation plan for long-term (about 5-years) management of Bintuni Bay Nature Reserve Area in the first 25-years period (2006-2030).

						Fund	ing Plan o	n Year Pei	riod of (x)	(00)	Total 25
ŝ	Activity	Component	Volume	Unit	Price Unit (Rp)	2006- 2010	2011- 2015	2016- 2020	2021- 2025	2025- 2030	tahun (x'000)
-	Area Consolidation										
	a. Area Legal Certainty	Definitive status decree making									•
	b. Formal Legal Recoqnition of Bintuni Bay Nature Reserve Area by Regional	1. Regency Head (Bupati) Decree Making									•
	Government	 Regional Regulations on Nature Reserve 									
	c. Reconstructio of Boundary Marker	4. Trails and tracks making (km)	125	Km	006	112500					112,500
		 Boundary Marker Making Made from Pole 	L	Package	1.114	1,114					1,114
		Boundary Marker Making made from zinc plate	L	Package	3.100	3,100					3,100
	d. Cooperation	MOU making with stakeholder on boundary marker reconstruction		I							
2	Effectiveness Area Management Improve	ment									
	 a. Supply of manuals/pocket books /technical guidance on areal management 	1. Supply of manuals/pocket books on area boundary maintenaces	20	Unit	30.000	1,200					1.200
		 Supply of manuals/pocket books on /technical guidance on the activities of area potency management. 	20	Unit	30,000	1,200					1.200
		 Supply of manuals/pocket books/technical guidance on Area Conservation and Protection. 	20	Unit	30,000	1,200					1.200
	b. Area Directive Boards	Announcement board dan Area Directive Board Making	50	Package	1,650	82.500		82.500		82.500	247.500
	c. Area Border Maintenance	1. Trail and track maintenace (km)	50	Km	006	45.000	45.000		45.000		135.000
		2. Damaged boundary marker pole replacement	2	Package	1,114	1.114	1.114	1.114	1.114	1.114	5.570

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Funding





					Drino	Fund	ing Plan o	n Year Per	riod of (x`0	(00	Total 25
۶	Activity	Component	Volume	Unit	Unit (Rp)	2006- 2010	2011- 2015	2016- 2020	2021- 2025	2025- 2030	tahun (x'000)
		3.Making Boundary Marker made from zinc plate	с	Package	3.100	3.100		3.100		3,100	9.300
	d. Study on Area function and Potency	Identification of ecosystem type and mapping of area cover in CATB	3	Package	37.500		37.500	37.500	37.500	ı	112.500
		 Mapping of land cover according to the ecosystem in the area for planning 	ę	Package	37.500		37.500	ı	37.500	37.500	37.500
	e. Poster/Leaftlet Production	1. Supply of Posters on sustainable utilization	450	Package	22.5	3.375	3.375	3.375			10.125
		 Suplpy of Posters on protected and endangered Flora/Fauna species of the area 	450	Package	22,5	3.375	3.375	3.375	I	ı	10.125
		Supply of Posters on ecosystem condition of the area	450	Package	22,5	3.375	3.375	3.375			10.125
	g. Community Development	Community development with the target of the people living in buffer blocks regarding to the importance of the area as buffering system for livings	20	Package	9,900	49.500	49.500	49.500	49.500		198.000
	h. Community Involvement in Area Management Activities	Work group formation	1	Package	10.450	10.450		ı		ı	10.450
	i. Research	Environmental Impact study	2	Package	37.500	•	37.500	•	37.500	•	75.000
		Study on the planned region development impact to the nature reserve area	1	Package	37.500	37.500	I		I	ı	37,500
	Geographical Information System (GIS) and. Database	Geographical Information System (GIS) Supli and Data Revision based on study results	5	Package	37.500	37.500	37.500	37.500	37.500	37.500	187.500
e	Species and Biodiversity Conservation D	svelopment									
	a. Manuals	 Production of Manuals on flora/fauna and area ecosystem Maintenance 	1	Package	10.000	10.000				ı	10.000
		 Production of manuals on flora/fauna and area ecosystem control 	1	Package	10.000	10.000					10.000
	b. Studies on flora and fauna condition of the area	 Inventory and mapping of flora and Fauna species of the area 	ო	Package	37.500	37.500	37.500		37.500		112.500

Funding





						Fund	ing Plan o	n Year Pei	riod of (x`((00	Total 25
Ŷ	Activity	Component	Volume	Unit	Price Unit (Rp)	2006- 2010	2011- 2015	2016- 2020	2021- 2025	2025- 2030	tahun (x'000)
		Study on Flora and fauna dinamics in the area	2	Package	37.500	37.500			37.500		65.000
		 Inventory and identification of valuable and endangerd plant species dan in the area 	Э	Package	37.500	37.500	37.500	37.500			112.500
		 Inventarisasi dan identifikasi jenis-jenis flora dan fauna eksostik di kawasan Cagar Alam Teluk Bintuni 	-	Package	37.500	37.500					37.500
		5. Negative exoctic species presence impact to Bintuni Nature Reserve Area	2	Package	37.500	37.500			37.500		65.000
		 Development of the use of local species widely in agriculture practices 	3	Package	37.500	37.500	37.500	37.500			112.500
	c. Habitat Supervision	 Inventory and mapping of particular sites spawning ground in Bintuni Bay Nature Reserve area 	З	Package	37.500	37.500	37.500		37.500		112.500
		2. Study on ecosystem dynamics of Bintuni Bay Nature Reserve Area	5	Package	37.500	37.500	37.500	37.500	37.500	37.500	187.500
		3. Making of permanent plots	3	Package	16.950	16.950	16.950	16.950			50850
		 Making of trails for research and education purposes 	5	Km	50.000	50.000	50.000	50.000	50.000	50.000	250.000
	d. Control										
	a. Pest and Disease Prevention	 Eradication of expansive or exoctic species existing in the area. 	1	Package	9.900	9.900					9.900
		 Extension and socialization on introduction of exoctic species restriction to Bintuni Bay Nature Reserve Area. 	2	Package	9.900	006.6	006.6				19.800
	b. Species Protection	 Conducting detail study on breeding period of hunted animal for determining hunting period for the people 	3	Package	37.500	37.500	37.500		37.500		112.500
		 Making of restriction boards/planks for hunting protected animals 	5	Package	16.500	16.500	16.500	16.500	16.500	16.500	82500
		3. Making of broschures, leaflets and	450	Package	22.5	3.375	3.375	3.375	-	'	10.125

Funding





					Drico	Fund	ing Plan o	n Year Pe	riod of (x`((00)	Total 25
Ŷ	Activity	Component	Volume	Unit	Unit (Rp)	2006- 2010	2011- 2015	2016- 2020	2021- 2025	2025- 2030	tahun (x'000)
		posters on restriction of protected or endangered animals									
	e. Rehabilitation										
	a. Erosion-abrasion and sedimentation Prevention	Formation of Coordination Forum involving related institutions.	1								
	b. Rehabilitation of Bintuni Bay Nature Reserve Area	 Preparation of technical plan for damaged area rehabilitation 	L	Package	006'6	006'6					9.900
		2. Area Rehabilitation									
			3	Package	20.000	50.000	50.000	50.000			150.000
			£	Package	20.000	20.000	50.000	50.000			150.000
	c. Research	1. Study on sedimentation rates in some rivers of the area	3	Package	20.000	20.000	50.000	50.000			150.000
		 Study on ecosystem deteriotation rate and its causes in Bintuni Bay Nature Reverse Area 	£	Package	37.500	37.500	37.500	37.500			112.500
	f. Data base system development	 Biological resource (flora/fauna) potency in Bintuni Bay Nature Reserve Area 	2	Package	10.000	10.000		10.000			20.000
		Social, economic and cultural data of the community in the area and its surroundings	2	Package	10.000	10.000			10.000		20.000
		 Compilation of study results and area development being conducted in the past 	5	Package	2.000	2.000	5.000	5.000	5.000	5.000	25.000
	e. Kerjasama	Pembuatan MOU dalam menunjang kegiatan Pengembangan Konservasi Jenis dan Keanekaragaman Hayati	1	Package	5.000	5.000					5.000
4.	Area Conservation and Protection										
	a. Routine patrol	1. Routine patrol by the area manager	1240	Package	120	28.800	28.800	28.800	28.800	28.800	144.000

Funding

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						Fund	ing Plan o	n Year Pei	riod of (x`0	(00)	Total 25
°N N	Activity	Component	Volume	Unit	Price Unit (Rp)	2006- 2010	2011- 2015	2016- 2020	2021- 2025	2025- 2030	tahun (x'000)
		2. Collective Patrol	25	Package	9.500	47.500	47.500	47.500	47.500	47.500	237.500
		 Routine Patroli by the local community and private parties (volunteer) 	25	Package	1.500	7.500	7.500	7.500	7.500	7.500	37.500
	e. Law enforcement	1. Formulating special regulations on restriction and punishment for hunting and utilizing protected flora/fauna	2	Package	7.500	7.500	7.500	7.500	7.500	7.500	37.500
		 Making of simple and understandable regulations on exclusive right for Customary (adat) communty in utilizing natural resources in the area with certain requirements and in the context of sustainable utilization 	5	Package	7.500	7.500	7.500	7.500	7.500	7.500	37.500
		 Socializating regulations restriction and punishment on illegal activities in the area to all stakeholders 	2	Package	15.000	15.000	15.000	15.000	15.000	15.000	75.000
	d. Making of manuals	Manuals on conservation and protection of CATB Area	2	Package	7.500	7.500	7.500				15.000
5.	Supporting facilities/Institutionals										
	a. Management personeel	Area manager personeel addition	3	Package							PHKA
	b. Trainings	1. volunteer forest keepers (jagawana) trainings	15	Package	7.500	45.000	22.500	22.500	22.500		112.500
		2 Forest rangers (Polhut) Trainings	15	Package	10.000	50.000		50.000	50.000		150.000
			-					-	-		
0	Utilization										-
	a. Manuals	Suply of manuals on natural resource utilization	2	Package	7.500	7.500	7.500				15.000
	B. Fishery product utilization	 Joint extension works with Fishery and Marine Office on the importance of magrove conservation for fishery production 	10	Package	20.900	41.800	41.800	41.800	41.800	41.800	209.800
		2. Sosializing restriction on chemical	4	Package	9.900	9.900	9.900	9.900	9.900		39.600

Funding





						Fund	ing Plan o	n Year Pei	riod of (x`((00	Total 25
Ŷ	Activity	Component	Volume	Unit	Price Unit (Rp)	2006- 2010	2011- 2015	2016- 2020	2021- 2025	2025- 2030	tahun (x'000)
		using in the nature reserve area									
_		3. Trainings on "Sasi" system introduction.	2	Package	20.900	20.900	20.900	20.900	20.900	20.900	104.500
		 Trainings and supervision on making of and seting up floating keramba in the river 	3	Package	20.900	20.900	20.900	20.900			62.700
		 Trainings on making of fish net and repairing 	3	Package	20.900	20.900	20.900	20.900			62.700
	 C. Utilization of agriculture and hunted animal products Pemanfaatan Hasil Pertanian dan Perburuan 	 Joint extention works with Agriculture Office on the importance of sustainable agriculture system 	10	Package	20,900	41.800	41.800	41.800	41.800	41.800	209.000
_		2. Introduction to agroforestry system.	3	Package	20.900	20.900	20.900	20.900			62.700
		 Trainings on permanent agriculture practices mainly in the villages located in the area 	3	Package	20,900	20.900	20.900	20.900			62.700
		 Development of the use of local species widely in agriculture practices. 	2	Package	37.500	37.500		37.500			65.000
_		5. Trainings on young crocodile raising	3	Package	20.900	20.900	20.900	20.900			62.700
		 Trainings/technical supervision on making of handicraft made from crocodile leather 	3	Package	20.900	20.900	20.900	20.900			62.700
		7. Trainings/technical supervision on making of sweet <i>dendeng</i> and <i>abon</i> made from deer meat	3	Package	20.900	20.900	20.900	20.900			62.700
		 Introduction to appropriate wild animal hunting techniques by considering breeding periods of the animals 	3	Package	20.900	20.900	20.900	20.900			62.700
	d. Research	1. Study on reproduction pattern of the wild animals and hunting sites	10	Package	37,500	75.000	75.000	75.000	75.000	75.000	375,000
		 Study on plant propagation techniques especially for valuable plant occuring in the nature reserve area 	3	Package	20.900	20.900	20.900	20.900			62.700
		 Study on life cycle patterns of certain marine biota such as fish, shrimp, and crabs in the area 	10	Package	37,500	75.000	75.000	75.000	75.000	75.000	375,000

Funding



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Bintuni Bay Nature Reserve Management Plan

					Drico	Fund	ing Plan oi	n Year Per	riod of (x`((000	Total 25
Ŷ	Activity	Component	Volume	Unit	Unit (Rp)	2006- 2010	2011- 2015	2016- 2020	2021- 2025	2025- 2030	tahun (x'000)
		 Inventory of local agriculture comoditiest 	7	Package	10.000	10.000	10.000				20.000
	e. Cooperation	Making of MOU with related stakeholder to support utilization activities	3	Package	5.000	5.000	5.000	5.000			15.000-
	f. Data base system development	 Valuable biological resource (flora/fauna) potency of Bintuni Bay Nature Reserve Area 	3	Package	10.000	10.000		10.000		10.000	30.000
		 Flora and fauna reproduction seasons in Bintuni Bay Nature Reserve Area 	З	Package	10.000	10.000		10.000		10.000	30.000





Table VI-3. Cost alocation plan for short-term (yearly) equipment and infratructure development of Bintuni Bay Nature Reserve Area in the first 5-year period (2006-2010)

	A letivitan (V aniatan	Vonnend	Volumo	Coting	Harga		Total Biaya	Periode Tahı	(000, x) ay ur		Total 5
	Akiivitas/Negiatali		Allinio	oatuali	Satuan	-	2	e	4	5	x 000.000 x
-	Management facilities										
	Office										
	Office building/tomporativ	Land for office	500		150,000	75,000					
	building/terripolary house construction (KPPN.066/33.51)	Office building (m)	06	L	1,750,000	157,500					157,500
		Forest Ranger (Polhut) Barack (for 6 men or fam.)	162		1,500,000		243,000				243,000
		Generator (4.5 KW)	1	L .	7,500,000						
		Computerr P IV	2	unit	10,000,000	10,000				10,000	20,000
		Printer A3 (HP 1180C)+ USB Conector	-	unit	4,000,000	4,000					4,000
		Office appliances	3	paket	7,500,000	7,500		7,500		7,500	22,500
		Facsimile	-	unit	1,500,000	1,500					1,500
		Telephone facilities	-	unit	250,000	250					250
		SSB Radio	1		25,000,000	25,000					25,000
		GPS	7		3,500,000	10,500	7,000	7,000			24,500
		compass (Suunto)	7		1,000,000	3,000	2,000	2,000			7,000
		Speed boat for patrol 40 hp	-		75,000,000				75,000		75,000
		Longboat for patrol 40 hp	1		30,000,000			30,000			30,000
		Handy talky	7		5,000,000	10,000	10,000	10,000	5,000		35,000
		motorcycles	-	unit	20,000,000				20,000		20,000
		Dringking water instalation	-		15,000,000	15,000					15,000
	Office maintenance	Office building (m) + barack	252	1	35,000			8,820		8,820	17,640
	(KPPN.066/33.51)	Office yard and garden	500		5,000	2,500	2,500	2,500	2,500	2,500	12,500
		computer dan printer	4	unit	500,000		2,000	2,000	2,000	2,000	8,000

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Antivitas/Negiatali			oatuali	Satuan	1	2	3	4	5	x 000.000
	Office appliances			2,500,000	2,500					2,500
	SSB Radio	1	unit	900,000	006	900	900	006	006	4,500
	Handy talky	7	unit	250,000	500	1,000	1,500	1,750	1,750	6,500
	Speed boat for patrol (operational)	-		6,000,000				6,000	6,000	12,000
	Longboat patrol (operational)	2		3,500,000			3,500	3,500	3,500	10,500
	Motorcycles	~		1,550,000				1,550	1,550	3,100
	Generator operational (liter fuel)	-	tahun	9,000,000	9,000	9,000	9,000	9,000	9,000	45,000
	Telephone operational (cost)	-		1,200,000	1,200	1,200	1,200	1,200	1,200	
 Temporary worker										·
 Temporary worker	Temporary worker house (m)	48	3 unit	1,750,000		84,000	84,000	84,000		- 252,000
 (KPPN.066/33.51)	Land (m)	100	3 compartments	50,000		5,000	5,000	5,000		15,000
	Generator, 1,5KW	e	unit	2,500,000		2,500	2,500	2,500		7,500
	Typewriter 60 cm	ę		1,000,000		1,000	1,000	1,000		3,000
	SSB Radio	с		25,000,000		25,000	25,000	25,000		75,000
	GPS	З		3,500,000		3,500	3,500	3,500		10,500
	Handy talky	ю		5,000,000		5,000	5,000	5,000		15,000
	Longboat for patrol, 25 pk	ю		20,000,000		20,000	20,000	20,000		60,000
	remporary worker nouse appliances	ю		7,500,000		7,500	7,500	7,500		22,500
	Dringking water instalation	ю		5,000,000		5,000	5,000	5,000		15,000
										·
 Maintenancen (KPPN.066/33.51)	Pond Temporary worker house (m)	48	С	35,000			1,680	3,360	5,040	10,080
	Generato Operasional	ю		7,500,000		7,500	15,000	22,500	22,500	67,500
	Longboat Operasional	Э		15,000,000		15,000	30,000	45,000	45,000	135,000
	Typewriter 60 cm	З		50,000		50	100	150	150	450
	SSB Radio	e		900'006		006	1,800	2,700	2,700	8,100
	Handy talky	С		250,000		250	500	750	750	2,250

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	Animiasi neglatali			oatuali	Satuan	1	2	3	4	5	x 000.000
		Longboat for patrol	Ю		3,500,000		3,500	7,000	10,500	10,500	31,500
		appliances	ю		2,500,000		2,500	5,000	7,500	7,500	22,500
2	Education Facilities	Brochure/leaflet/comic book regarding to the nature reserve									
		Data and information Center									ı
ი	Research Facilities Guest house for										·
	resarcher (KPPN.066/33.51)	Guest house for resarcher (in office area)	48	E	1,750,000	84,000	I	ı	ı	ı	84,000
		Weather and Climate Station	ю	unit	15,000,000	15,000		15,000	ı	15,000	45,000
		AWRL Station	-	unit	75,000,000	I	ı	75,000	I	ı	75,000
		Floating nouse for research activities (m)	48		2,000,000	ı	96,000		ı		96,000
		congooat for research activities (40 hp)	-	unit	30,000,000	I	30,000	ı	ı	ı	30,000
			0		000		000	000		000 1	- ⁰⁰
	INIAIITIETIATICE		• •		000'ec		1,000	1,000	1,000	1,000	0,120
		Weather and Climate Station	~		600,000		600	600	600	600	2,400
		AWRL Station Eloating house for research	-		1,200,000	I			1,200	1,200	2,400
		activities (m)	48		35,000	I	I	1,680	1,680	1,680	5,040
		Luigboar iui researcii aciiviiles (40 hp)				ı	ı	ı	ı	·	ı

Funding

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Table VI-4. Cost alocation plan for long-term (about 5-years) equipment and infratructure development of Bintuni Bay Nature Reserve Area in the first 25-year period (2006-2030)

					Harda		Total Biaya I	Periode Tahui	ו ke (x '000)		Total 25
° N	Aktivitas/Kegiatan	Komponen	Volume	Satuan	Satuan	2006-2010	2011-2015	2016-2020	2021-2025	2026-2030	tahun x 000.000
-	Management facilities Office										
	Office building/temporary house construction	Land for office	500		150,000	75,000					75,000
	(KPPN.066/33.51)	Office building (m)	06	-	1,750,000	157,500					157,500
		Forest Ranger (Polhut) Barack (for 6									
		men or fam.)	162		1,500,000	243,000					243,000
		Generator (4.5 KW)	~	-	7,500,000	•					ı
		computer P IV Printer A3 (HP	ი	unit	10,000,000	20,000	10,000	20,000	10,000		60,000
		1180C)+ USB									
		Conector	-	unit	4,000,000	4,000		4,000			8,000
		Office appliances	ო	paket	7,500,000	22,500					22,500
		Facsimile	-	unit	1,500,000	1,500	ı	ı	ı		1,500
		Telephone facilities	~	unit	250,000	250					250
		SSB Radio	-		25,000,000	25,000	·	ı	ı		25,000
		GPS	7		3,500,000	24,500		ı		·	24,500
		compass (Suunto)	7		1,000,000	7,000	ı		ı		7,000
		Speed boat for patrol									
		40 hp	-		75,000,000	75,000	I	I	I	ı	75,000
		Longboat for patrol 40	0								
		hp Heady follow	~ ~		30,000,000	30,000	30,000	ı	ı		60,000 25,000
		mariuy taiky	~ ~	tion	000,000,000	20,000	- 000			-	000,000
		Dringking water	4	nuir	zu,uuu,uuu	20,000	20,000	ı	20,000	20,000	00,000
		instalation	-		15,000,000	15,000	ı	ı	ı	I	15,000
		Office building (m) +									
		barack	252	-	35,000	17,640	17,640	17,640	17,640	17,640	88,200
		Office yard and	200		5 000	12 500	12 500	12 500	12 500	12 500	62 END
		garden computer dan printer	9 4	unit	500.000	8.000	8,000	8,000	8.000	8.000	40.000
		Office appliances			2,500,000	12,500	12,500	12,500	12,500	12,500	62,500
		SSB Radio	-	unit	900,000	4,500	5,175	5,400	5,625	5,850	26,550
		Handy talky	7	unit	250,000	6,500	7,475	7,280	8,125	8,450	37,830
		Speed boat for patrol	-		6,000,000	12,000	30,000	30,000	30,000	30,000	132,000
		Longboat for patrol	2		3,500,000	10,500	21,000	21,000	21,000	21,000	94,500

VI - 19

Funding





							Total Biava	Inde Tabu	(UUU, ^ / VI		Total 25
	A litinitac/IV calater	Kemnonen	Volumo	Cotiton	Harga		готаг втауа		I NE (Y MAN)		10141 23
	Akiivitas/neglatati		Allinio	oatuali	Satuan	2006-2010	2011-2015	2016-2020	2021-2025	2026-2030	x 000.000
		Motorcycles	ε		1,550,000	3,100	6,200	6,200	9,300	12,400	37,200
		(liter fuel) Toloshooo	-	tahun	9,000,000	45,000	45,000	45,000	45,000	45,000	225,000
		releprione operational (cost)	£		1,200,000	1,200	1,200	1,200	1,200	1,200	
	Temporary worker house										
	Tomporary worker house	Temporary worker	91	+ <u>in</u>	1 750 000	252 000		1	1	1	752 000
	(KPPN.066/33.51)	nouse (m) Land (m)	100	3 compatments	50.000	15.000					15,000
		Generator, 1,5KW	e	unit	2,500,000	7,500	'		ı	ı	7,500
		Typewriter 60 cm	ი ი		1,000,000	3,000	'	I	I		3,000
		GPS	ი ო		3.500.000	10.500					10.500
		Handy talky			5,000,000	15,000	'		ı	ı	15,000
		Longboat for patrol, 25 hp	en en		20.000.000	60.000	'				60.000
		Temporary worker	,								
		house appliances	n		7,500,000	22,500	'				22,500
		Dringking water instalation	~		5 000 000	15 000	'				15,000
		Temporary worker			000.000.0	000					000.0
	Maintenance	house (m)	48	ę	35,000	10,080	25,200	25,200	25,200	25,200	110,880
	(KPPN.066/33.51)	Generator operational	ი ი ი		7,500,000	67,500	112,500	112,500	112,500	112,500	517,500
		Longboat Operational	ოი		15,000,000	135,000	225,000	258,750 540	310,500	281,250	1,210,500
		Lypewriter ou cm SSR Radio	თ. ო			450 8 100	0.318 0.315	040 0 720	503 10 125	585 10 530	2007 Z47 790
		Handy talky	- 		250,000	2,250	2,588	2,700	2,813	2,925	13.275
		Longboat for patrol			3,500,000	31,500	52,500	52,500	52,500	52,500	241,500
		Temporary worker	_								
		house appliances	ς Γ		2,500,000	22,500	25,875	27,000	28,125	29,250	132,750 -
2	Education Facilities										1
		Brochure/leaflet/comic book regarding to the									
		nature reserve	2	pakage	5,000,000						·
		Data and information									
ю	Research Facilities	Celliei	-								
	Guet house for recorder	Guest house for									
	(KPPN.066/33.51)	area)	48	E	1,750,000	84,000	1			-	84,000

Funding





					Harca		Total Biaya	Periode Tahu	n ke (x '000)		Total 25
Ŷ	Aktivitas/Kegiatan	Komponen	Volume	Satuan	Satuan	2006-2010	2011-2015	2016-2020	2021-2025	2026-2030	tahun x 000.000
		Weather and Climate									
		Station	ო	unit	15,000,000	15,000		15,000	ı	15,000	45,000
		AWRL Station	-	unit	75,000,000			75,000		ı	75,000
		Floating house for									
		research activities (m)	48		2,000,000		96,000		ı	ı	96,000
		Longboat for research									
		activities (40 hp)	-	unit	30,000,000	I	30,000			I	30,000
											•
		Guest house for									
2	Aaintenance	resarcher	48		35,000	ı	1,680	1,680	1,680	1,680	6,720
		Weather and Climate									
		Station	-		600,000		600	600	600	600	2,400
		AWRL Station	-		1,200,000				1,200	1,200	2,400
		Floating house for									
		research activities (m)	48		35,000		ı	1,680	1,680	1,680	5,040
		Longboat for research									
		activities (40 hp)	1	1	7,500,000	ı	37,500	37,500	37,500	37,500	150,000



VII. ORGANIZATION

A. HUMAN RESOURCE, INSTITUTIONAL AND COORDINATION SUPERVISION

A.1. Organization and Human Resource Development

Bintuni Bay Nature Reserve Management implementation would be carried out by BKSDA Papua II (for the intention to Resort Bintuni Bay). The Bintuni Bay Nature Reserve Manamement implementation principle is partisipative and intergrated. Therefore, it is needed a logic framework for efficient and dinamic management, based on communication strategy, coordination, multistakeholders and education. As Bintuni Bay Nature Reserve Manager, BKSDA should have the capability to comunicate and coordinate with all parties. If so the area management would be going along smoothly and intergrated with its surroundings development. Structurally, some full functional positions in the area management organization are proposed for optimal management achievement.

Resort KSDA Bintuni Bay directly manages Bintuni Bay Nature Reserve under supervision of BKSDA Papua II. Adminitratively, BKSDA Papua II would coordinate and take responsibility to Forestry Department. To create efficient and dinamic management, a small unit of operational management is needed. Resort head of Bintuni Bay Nature Reserve should be more functional, thus able to optimalize coordinative and partisipative management pattern by maintaining coordination with Distric Goverment of Bintuni.Bay Therefore, human resource development programs such as trainings within the scoupe of forestry, marine and fisheries, environment and other sectors are urgently needed. A need of trainings is very dinamic depending on the technology progress and general management principles.

The number of personeel in Resort of Bintuni Bay Nature Reserve would be adjusted to monitoring post establishement proposed. Every monitoring post would be occupied up to 2 forest rangers. Each personeel is required to optimalize their technical skill in management processes. This aims to achieve effcient personal budget, and on the other hand to optimalize operational and management of inventory facilities of Bintuni Bay Nature Reserve Ressort.

Implementation of development programs demand the participation of the local community and private enterprises operated nearby the area. The cost for implementation of volunteer forest ranger in the area could be shouldered by private enterprises which intend to help. However, command line of forest ranger organization is taken by the Resort Head, while the privates enterprises are only regarded as supporting parties for supplying.facilities

Some activities could carried out, among others:

- ∉ To develop the management status of conservation area in Bintuni Bay becoming KSDA section, concerning that in this region there are 2 nature reserve areas i.e. Bintuni Bay and Wagura Kote Nature Reserves.
- ∉ To add forest ranger number so that every controling areas could be occupied by forest rangers responsibe to the area.



- ∉ To train forest rangers on forest guarding, community empowerment and communication.
- ∉ To cooperate with the third parties on giving volunteer forest ranger supervision for controling the area.

A.2. Management Policy

All management activities in the nature reserve management are interconnected. Activities of control could give data and information for maintenance interests and furthermore for planning interests. On the other hand, the implementation of research and development could supplement the information for maintenance, utilization, control, and rehabilitation purposes in Bintuni Bay Nature Reserve Area (Figure VII-1).



Figure VII-1. Information Structure Flow of Management Implementation Steps

Organization structure and human resources need to evaluate regularly through an analysis of workload and human resource demands so that the achievement would be more efficiently and effectively and able to anticipate workload being faced and planned.

To anticipate continuously increasing of workload, thus based on the analysis it is needed fulfillment of the demand in various skills of employees. The human resource addition would accomplish gradually depending on the vacancy and available cost. To support management implementation, law certainty of the area should also considered in order to realize that the nature reserve existence is under responsibility of all parties, and it is expected that the existence of the area would be very useful for the community living in the area and its surroundings. The implementing activities are as follows:

∉ To form a Communication Forum and Community Groups

This forum aims to promote sustainable nature reserve management. This is of multistakeholder forum to discuss all activities which would be carried out in the nature reserve. In the implementation, this forum could be acted as an arm or information source of Monitoring Agency.



On the other sides, Groups of community who are depending on the Bintuni Bay Nature Reserve Area for their livelihood should be organized. The purpose is to facilitate control and coordination all together becoming a control link to the whole nature reserve area.

∉ Helping the regional government to formulate special regional regulation on the existence of the nature reserve area in district spatial plan.

A.3. Coordination within Bintuni Bay Nature Reserve Manager Scope

In general, management coordination would be done between the Bintuni Nature Reserve manager and upper institutions, i.e. BKSDA Papua II Sorong. Coordination, mainly, is needed to reach other parties in District, Provincial and Central Government, NGO, mass media and private enterprises.

A.4. Coordination with Other Institutions

In general, management coordination would be done by the Nature Reserve Manager (Resort BKSDA) with other related institutions in the District optimally so that this would create a cooperation opportunity in activities of Bintuni Bay Nature Reserve Management. Special coordination with Provincial and Central Government, Education and Research Institutions, community, NGO, mass media and private enterprises would be done by BKSDA or Resort and under the knowledge of BKSDA Papua II Sorong.

1. The Scope of District Government

In order that the strategy and program of Bintuni Bay Nature Reserve Area management could be carried out in the same direction and integrated with those of Teluk Bintuni District development, thus Bintuni Bay Nature Reserve Area manager should coordinate with the institution under the scope of District (Kabupaten) Government, as follows: 1) Fishery and Marine Affair Office, 2) Tourism Affair Office, 3) Forestry Affair Office, 4) Plant Crop Affair Office, 5) Transportation Affair Office, 6) Regional Environmental Impact Management Agency (BAPEDALDA), 7) Regional Development Planning Agency (BAPPEDA), 8) Industry and Trade Affair Office, 11) Police (POLRI) and Army (TNI). Coordination meant here could be in the form of reports, information, joint activities and consultation.

2. The Scope of Provincial and Central Government

BKSDA of Bintuni Bay Nature Reserve Resort must coordinate with Provincial Government of Irian Jaya Barat, Regional Government of District Teluk Bintuni and other technical institutions. Coordination could be in the form of reports, information and joint activities.

3. Research and Education Intitutions

Coordination in education and research activities in order to develop human resources related to community participation and to improve the community knowledge of value and



the importance of Bintuni Bay Nature Reserve is very important to do. The mentioned coordination includes: 1) Basic and Secondary Education Agencies in District (Kabupaten) of Teluk Bintuni and 2) Universities. In this context, coordination meant is of joint activities and consultation. Research activities by international agencies in operational level would be organized fully by Directorate General PHPK and BKSDA Papua II Sorong.

4. Local Community

To optimize the area management to be more efficient and in term of participative management, thus coordination with local community is very urgent. Coordination with the local community, could be listed with: 1) village officials, 2) Village Representative Agency or Customary Community Agency (LMA); and 3) informal leaders.

Coordination meant here is of reports, joint activities, and consultation. All coordinative activities with local community must be reported BKSDA Papua II Sorong and Bappeda District of Teluk Bintuni.

5. Non Government Organization (LGO)

NGO has an important role i.e.: as facilitator, giving assistance to the local community or generating input of alternative strategy and policy of Bintuni Bay Nature Reserve Management. Therefore, coordination between Resort of Bintuni Bay Nature Reserve and NGO in the area and its surroundings and out side of the bay as well is largely needed. This coordination includes with:

- 1) International NGO: The Nature Conservancy (TNC), WWF, Conservation International (CI) and others.
- 2) Regional NGO: Yayasan Kehati, Walhi, and others
- 3) Local NGO

Coordination in this context could be in the form of reports, joint activities and consultation. All coordinative activities (with NGO) must be reported to BKSDA Papua II Sorong and Bappeda of District of Teluk Bintuni.

6. Mass Media

The effort to improve the awareness and community participation in Bintuni Bay Nature Reserve would be difficult to achieve, if the communication and information dissemination carried out only by Resort Head of Bintuni Bay Nature Reserve or BKSDA Papua II Sorong. Mass media supporting for communication strategy and information management would affect widely, not only to the community around the area but also to national and international level. Mass media mentioned here includes printed media, electronic media, and alternative media.

7. Private Enterprise

Coordination with private enterprises is also important, especially with big private enterprises that operate in District of Teluk Bintuni. These private enterprises could take a



role actively together with the Resort for monitoring and protecting the nature reserve area. They could also participate in facilitating volunteer forest rangers to take a part in the monitoring activities.

In General, all actors which have an interest in the nature reserve management need to know what a role they may take part. The Community (as a stakeholder) could take a role as volunteer forest ranger to help monitoring process and also as service user of the nature reserve. The community also could participate as an arm of the head of forest ranger to collect useful information for management purposes.

Moreover, the community could also have the same role to the Monitoring Agency such as mentioned above to the technical implementer (the head of forest ranger). By such way, the technical implementer would be monitored comprehensively by the community and Monitoring Agency as well. However, the community must coordinate with the nature reserve area manager in taking up their roles.

Monitoring Agency does not include in internal organization structure of BKSDA or technical implementer of the nature reserve. By such organization structure, this makes the agency more independent to do its responsibility to monitor the implementation of the management, however this agency is still bound by the area management plan. Membership of this agency that is quite diverse will create synchronization of activities with related institutions in the scope of District of Teluk Bintuni so that all activities could be implemented well (Figure VII-2).



Figure VII-2. Structure of Nature Reserve Area Management System

B. ADMINISTRATION AND RESPONSIBILITY

Administratively, the implementation of Bintuni Bay Nature Reserve management is under the responsibility BKSDA Papua II Sorong. In scope of technical implementer, the head of Resort would be fully responsible to how the area management would be implemented. In real implementation of the area management, there would be developed Monitoring Agency role in



monitoring of the area management that has been planned. This agency would give inputs to the Resort and BKSDA as responsible agencies.

Bintuni Bay Nature Reserve is suggested to have enough staff number to manage its quite vast area. Therefore, it is planned to increase staff number and to establish organization structure for Area Co worker Office (Kantor Wilayah Pembantu) in some area in the region such as Naramasa, Mamuranu, and Tirasai. Every Area Co worker Office would be responsible to the head of the Resort. Every Area Co worker Office would also be equipped with forest rangers (**Figure VII-3**).



Figure VII-3. Organization Structure of Bintuni Bay Nature Reserve Management

Responsibility and Function:

The Head of Forest Ranger

The Nature Conservancy

- 1. Being responsible to the implementation of management plan.
- 2. Coordinating forest rangers in Bintuni Bay Nature Reserve in activity implementation of area management.
- 3. Being responsible to coordinate with other institutions in District of Teluk Bintuni
- 4. Establishing cooperation with private institutions in District of Teluk Bintuni for the nature reserve management and reporting this to the head of BKSDA
- 5. Establishing monthly monitoring and evaluation of the implementation of management plan
- 6. Submitting a report regarding to the implementation of the nature reserve management to the head of BKSDA Papua II Sorong

Forest Ranger



- 1. being responsible to carry out Forest ranger's jobs
- 2. Helping the head of forest ranger in the nature reserve management
- 3. Submitting a report regarding to job evaluation every month to the head of forest ranger

Administration

- 1. Being responsible to carry out administrative jobs of the resort office
- 2. Being responsible to resort activity documentation
- 3. Helping the head of forest ranger in research document archiving and planning
- 4. Helping the head of forest ranger in data base management of the area
- 5. Helping the head of forest ranger in research activities in the area

C. STAFF MANAGEMENT

Staff for Bintuni Bay Nature Reserve management should be improved in term of quantity and quality. Bintuni Bay Nature Reserve with the area of 124.000 Ha needs the addition of forest rangers. They should be able to carry out monitoring, extension and community development works. To achieve efficient and effective management of Bintuni Bay Nature Reserve, staff addition demand does not only consider in increasing the quantity but also sufficient qualification. However staff quality might be improved through trainings.

Forest Ranger Head/Manager Bintuni Bay Nature Reserve Head/Resort Head Qualifications:

- ∉ Bachelor (Sarjana)/D3 (3-year professional education) degree in forestry with working period of 3-5 years, or high school (SMA) graduation with working period more than 15 years working as Forest Ranger in the Nature Reserve.
- ∉ Used to take Civil Servant Investigator Education (PPNS), Technical Forestry Grader (PTK), and training on program planning, community development, extension work and participative planning.

Head of Area (Responsible to the Area) Qualifications:

- ∉ D3 (3-year professional education) degree in forestry with working period of 1-3 years, or high school (SMA) graduation with working period of 5-10 years working as Forest Ranger in the Nature Reserve
- ∉ Used to take extension work and community development trainings

Forest Ranger (Polhut) Qualifications:

1. Passing Forest Ranger education

Computer and Administrative Staff Qualifications:

2. D3 degree in Computer/administration with working period of 1-3 years, or high school (SMA) graduation with working period of 5-7 years



Staff number addition for the nature reserve management would be accomplished up to the period of 2020 and the capacity of the staff might be improved through trainings and courses. If the demanded qualification for staff could not be achieved, in the region, at least minimal qualification must be fulfilled while their required skills could be achieved through trainings (Table VII-1). Cost allocation based on cost standard of 2005 for staff number addition and trainings is presented in (Table VII-2)

			Staff Demand	5	Qualification		Ach	nieveme	ent	
No	Activity	Evipting	Domond	Difforence	Quanneation	2006-	2011-	2016-	2021-	2026-
		Existing	Demanu	Difference		2010	2015	2020	2025	2030
Α	Staff									
1	Senior Forest Ranger/Resort Head	1	1	0	Sarjana/ D3	0				
2	Forest Ranger (polhut)									
	∉Junior Implementer Forest Ranger (Polhut Pelaksana Pemula)	0	6	6	D3/ SLTA	3	2	1		
	∉Implementer Forest Ranger (Polhut Pelaksana)	1	6	5	D3/ SLTA	2	3			
3	Administrative staff									
	Computer and Administrative Staff	0	1	1	D3/ SLTA	1				
в	Trainings									
	∉Trainings on species Determination and Identification	-	ć			3	1	1	1	1
	∉Trainings on Community Empowerment	-	ć			3	2	1	1	1
	∉Trainings on Program Planning	-	ć			3	1	1	1	1
	∉Trainings on Extension Work	-	ć			3	2	1	1	1
	∉Trainings on Data Base Management	-	ć			2		1		
	∉Trainings on GIS	-	ż			1	1	1	1	1
	∉Training on	-	ć			1	1	1	1	1

Table VII-1. The Nature Reserve Management Staff Condition, Planned Staff Number Achievement and Trainings





Table VII-2. Cost Allocation for Staff Number Addition and Trainings Program in Bintuni Bay Nature Reserve

			Planne	ed Cost (Rp.)	X 000)		
No	Activity	2006- 2010	2011- 2015	2016- 2020	2021- 2025	2026- 2030	Cost Resource
Α	Staff						APBN
1	Senior Forest Ranger/ Resort Head	96,000,					
2	∉Forest Ranger (Polisi Hutan)						
	∉Junior Implementer Forest Ranger (Polhut Pelaksana Pemula)	396,000					
	∉Implementer Forest Ranger (Polhut Pelaksana)	468,000					
3	∉Administrative staff						
		60,000					
В	Trainings						APBN,
	∉Trainings on species Determination and Identification	15,000	6,500	7,150	7,865	8,651	Private Enterprises
	∉Trainings on Community Empowerment	12,000	8,800	4,400	4,400	4,400	
	∉Trainings on Program Planning	15,000	5,000	5,000	5,000	5,000	
	∉Trainings on Extension Work	12,000	8,800	4,400	4,400	4,400	
	∉Trainings on Data Base Management	6,000		3,000			
	∉Trainings on GIS	5,000	5,000	5,000	5,000	5,000	
	∉Training on participatory planning	4,000	4,000	4,000	4,000	4,000	


VIII. MONITORING DAN EVALUATION

Bintuni Bay Nature Reserve Area Management is a continuous process, thus evaluation and monitoring activities is very important to do so that the whole implemented activities would be accordance with the goals and targeted achievement of the area management. On the way, henceforth, new area management issues would appear and some certain strategies could be not relevant anymore. Therefore, activity priority must be evaluate and modify from times to times.

In general, to do monitoring activities, it means that we do to things, i.e. firstly, monitoring to the plan, and secondly comparing performance achievement by using a certain measures, deciding what aspect of management plan should be adjusted and then formulating modifications. But, in conservation management system, this terminology is modified to know the differences between natural phenomenon, survey, monitoring, observation and research. While, evaluation means to identify what have been and which have not been achieved, and also what should have done in the future by involving or taking feedback from key stakeholders and the manager.

A. IMPLEMENTATION OF ACTIVITIES

Activity monitoring that is continued with evaluation of area management implementation is suggested being carried out by internal manager of Bintuni Bay Nature Reserve and also by independent Communication Forum.

A.1. Internal Manager of Bintuni Bay Nature Reserve

Monitoring and evaluation is a routine activity of area manager to evaluate members of area manager. Monitoring and evaluation by internal element could be in the form of built-in control by immediate superior in the office, as well as in the field. Such monitoring could be translated into reality in the form of regular supervisions to the locations or of incidental or unexpected visits/inspections.

Other methods in monitoring and evaluation of activities are by sending periodic reports and special report from the lower to the upper level (for instances from area officer to the head of resort). In addition, routine meeting should be attended by the whole elements of structural and functional leaderships, while periodic meeting should be attended by all staff of Resort KSDA Teluk Bintuni. In such way, monitoring and evaluation to the management activities connected to the activity progress and as well as the faced problem could be more effective and problem solving could be quickly handled comparing to that by letter communication or reports.

A.2. Independent Communication Forum

Besides monitoring and evaluation of Bintuni Bay Nature Reserve management by the area manager, independent Communication Forum is also urgently needed. This forum is



expected not only to evaluate performance of work programs but also to control the implementation of area management activities.

A.2.1 Communication Forum Composition

To monitoring and evaluation implementation of management activity purposes, Composition of Communication Forum should take into consideration not only to the personnel capacity but also to the representativeness factor of stakeholders in the area management activities. The followings are composition of Communication Forum would be proposed by concerning the aspect of implementer capacity and representativeness of stakeholders in the area management:

1. The State University of Papua

This educational institution is necessary to given into a consideration as activity implementer in monitoring and evaluation management programs. Unquestionably, this institution has qualified human resource and experiences in conducting monitoring and evaluation of management activity implementation in conservation area, and in other forestry activities. In addition, currently this institution also has GIS Laboratory equipped with adequate facilities, among them hardware and as well as software to support this activity. The laboratory is managed by laboratory head whose has adequate qualification to monitor conservation area dynamics. The followings are equipment condition and supporting personnel in GIS Laboratory of Forestry Faculty, The State University of Papua as presented in **Table VIII-1. and VIII-2.**





Table VIII-1. Supporting facility condition of GIS laboratory, Faculty of Forestry, Unipa

No.	Items	Specification/ Brand	Unit	Resource	Year	Status	Notes
1.	Computer Hardware	Pentium I, 256 MHz, 16 M, 40 G	1 Unit	-	-	Inventory	Good
		Pentium II, 256 MHz, 32 M, 2 G	1 Unit	P2T, Faperta Uncen	2000	Inventory	Good
		Pentium IV, 1,7 GHz, 600 Mb, 20 G	1 Unit	Semi Que IV For. Dept.	2002	Inventory	Good
		Pentium IV, 3.0 GHz, 1.0 Gb, 20 G	1 Unit	Diploma MHAP Faculty Of For. Unipa	2003	Inventory	Good
		Pentium IV, 2.26 GHz, 261 Mb, 40 G	5 Unit	Diploma MHAP Faculty Of For. Unipa	2004	Inventory	Good
2.	Computer Software	ILWIS 3.1, Lisenced	1 Unit		2000	Inventory	Good
		ArcView 3.3 Lisenced	1 Unit	TNC	2003	Inventory	Good
	Citra Landsat 7 ETM, Teluk Bintuni	5 Scene	TNC	2002	Inventory	Good	
		Citra Landsat 7 ETM. Sarmi	5 Scene	Coastal Resource Map Project	2002	Inventory	
3.	Portable Digitizer		1 Unit	Semi Que IV For. Dept.	2002		Good
4.	Rolled Digitizer		1 Unit	Bappeda.of Irian Jaya Province	1999	Borrowed	Good
5.	Plotter	A1, Epson Stylus pro 7500	1 Unit	P2T Faperta Uncen	2000	Inventory	Good
6.	Plotter	Calcom	1 Unit	Bappeda of Irian Jaya Province.	2000	Borrowed	Good
7.	Scanner		1 Unit	P2T Faperta Uncen	2000	Inventory	Out of order
8.	D-Link	10/100 Fast Ethernet Switch DES-1008D, 8 link	1 Unit	TNC	2003	Inventory	Good
9.	Digital Camera	Kodak Easy Share	1 Unit	P2T Faperta Uncen	2000	Inventory	Good
10.	UPS	Pro Link Pro 2100, 1000 W	1 Unit	Semi Que IV For. Dept.	2003	Inventory	Good
11.	Stabilizer	UNION 50/60 Hz, 500 VA	1 Unit	Semi Que IV For. Dept.	2002	Inventory	Good
12.	Electrical Kids	-	-	Biometrics and GIS Lab	2002/ 2005	Inventory	Good





Tabel VIII.2. Supporting personnel of GIS Laboratory, Faculty of Forestry, Unipa

No.	Personnel Name	Qualification	GIS Training Attended	Sponsor- ship
1.	Yosias Gandhi	Masteral Degree	 Training on GIS Introduction for Nature Reserve Area Management, 2001, Unipa Manokwari. 	TNC & UNIPA
			 Training on Mangrove Vegetation Identification in Bintuni Bay, 2001, Unipa Manokwari 	TNC
			 Presentation of GIS Training Results in Bintuni Bay Nature Reserve, Presented in Biology Conference IV, 2002, Goroka, PNG. 	TNC
			 Remote Sensing and GIS for Coastal Zone Management, 2003, BIOTROP, Bogor 	TNC
2.	Julius D. Nugroho	Masteral Degree	 Training on GIS Introduction for Nature Reserve Area Management, 2001, Unipa Manokwari. 	TNC & UNIPA
			 Training on Mangrove Vegetation Identification in Bintuni Bay, 2001, Unipa Manokwari 	TNC
			 Remote Sensing and GIS for Coastal Zone Management, 2003, BIOTROP, Bogor 	TNC
3.	Yoseph Rahawarin	Sarjana (Bachelor Degree)	 Training on GIS Introduction for Nature Reserve Area Management, 2001, Unipa, Manokwari. 	TNC & UNIPA
			 Training on Mangrove Vegetation Identification in Bintuni Bay, 2001, Unipa, Manokwari 	TNC
4.	Christian Imburi	Sarjana (Bachelor Degree)	Training on GIS for Beginners. 2004, BITROP, Bogor.	Unipa
5.	Fransina Kesaulija	Sarjana (Bachelor Degree)	Training on GIS Introduction for Nature Reserve Area Management , 2001, Unipa Manokwari.	TNC & UNIPA

In addition, The University has conducted joint researches many times with some NGOs and Regional Government in the Bintuni Bay region, including Bintuni Bay Nature Reserve. Contributions given by this institution in monitoring and evaluation activities are more emphasized on monitoring and evaluation of activity achievement, helping in problem identification and facilitating problem solving, especially those related to the knowledge aspects faced by the manager.

2. Natural Resource Agency (BKSDA) Papua II (For Attention to Resort KSDA Bintuni)

Besides as institutional manager that carry out internal monitoring and evaluation, this institution as managerial controller for the area management, is also expected to take a role in external monitoring and evaluation activities. Accordance with its role and function, this



institution would know more about problem and constrain types appeared during implementing management activities in the field. Therefore, it is expected that in evaluation activity of management activities by Communication Forum, this institution should play a role more in communicating the problems and constrains to other stakeholders in the Forum.

3. Customary Community Represented By Customary Consultative Agency of Bintuni Bay.

Based on the field observations, the success of Bintuni Bay Nature Reserve Area Management requires the involvement of components of customary community living in the area and its surroundings. Besides direct participation of the community in management planning activities, the role of customary community represented by Customary Consultative Agency of Bintuni (LMA MTB) and Lemasom (*Lembaga Musyarawarah Adat Sough-Moskona*) in the activities of monitoring and evaluation in management activities is urgent. The role of customary community in monitoring and evaluation is more emphasized in studying and monitoring on occurrences which is predicted giving an important impact to the area's values and functions.

This activity, generally, are of an activity coordination in the form of consultation, briefing and cooperation with various targeted groups, according to group types of users and impact types. Coordination to monitoring and evaluation of management activities includes Coordination Forum and Participation Coordinating Association. Coordination is also needed to do with local community, and as well as other users of area potency. Through coordination and community participation, efficient management, especially in monitoring and evaluation, could be achieved.

4. Regional Development Planning Board (BAPPEDA) of Bintuni Bay District

As institutional planner in Bintuni Bay District, Regional Development Planning Board (BAPPEDA) of Bintuni Bay District is expected to play a role more in supporting activities of Bintuni Bay Nature Reserve area management. This board is relatively new accordance with newly developing district of Bintuni Bay, however this board capacity, undoubtedly, would be able to support monitoring and evaluation activities. BAPPEDA of Bintuni Bay District is currently equipped with Monitoring and Evaluation Sub Section in its organization structure. The roles that could be played by this board in supporting the activities of monitoring and evaluation are to facilitate problem solving related to the region development by regional (district) government.

5. Related Offices in the District Such as Forestry Affair Office and Fishery and Marine Affair Office.

Beside BAPPEDA of Bintuni Bay District, The offices relevant to the area management activities are necessary taken into consideration becoming a member of Communication Forum. The offices directly related and considered as manager counterpart are Forestry Affair Office and Fishery and Marine Affair Office. The Nature Reserve with the area of (±124.850



ha, mostly consists of mangrove ecosystem and lowland forest. Certain parts of the area are bordered by production forest and protected forest. This situation makes fishery and forestry activities unavoidable, and these two stakeholder roles are absolutely needed for management activities and as well as monitoring and evaluation. The important roles which could be taken by the two are to facilitate managerial problem solving, especially those related to the community as users of natural resource in the area and its surroundings.

Communication Forum which would be proposed should be strengthened its existence in the law structure of Regional Government with District Head (Bupati) Decree. It is proposed that this independent forum is under UNIPA coordination, although it could also be possible at some time in the future, other stakeholders such as BAPPEDA of Bintuni Bay District might be as a coordinator.

A.2.2 Task and Responsibility

Main tasks of Communication Forum, among them are:

- 1. Monitoring management plan implementation carried out by BKSDA Papua II Sorong and Resort Bintuni Bay
- 2. Carrying out evaluation to the activity implementation accordance with management plan that has been enacted.
- 3. Helping the manager to facilitate in management problem solving, especially those related to the community.
- 4. Giving inputs to the manager if the result of the evaluation indicates the things that are not accordance with the established management plan.
- 5. Making a report on evaluation of activity implementation and submitted to the manager and Regional Government of District Bintuni Bay

In the implementation of monitoring and evaluation, this independent forum should always have coordination with Natural Resource Agency (BKSDA) Papua II and the head of Resort KSDA Bintuni which acts as main authorized institutions to handle the area manager and the community (Volunteer Forest Keeper, Communication Forum and User Group) in the area and its surroundings (**Figure VII-1**). If necessary, this forum could conduct site visits for directly checking the real condition of the field.

A.2.3 Supporting Resource

For improving the performance, the proposed forum should be equipped with supporting facilities. Supporting facilities owned by GIS Laboratory of Unipa although is quite sufficient, but some software such as satellite imagery and digital data analysis equipments is needed being supplied.

In addition, It is needed a kind of popular guidance for field monitoring. By such popular guidance, gap between technical conservation activities and information disseminated widely



in the community would eliminate. It is important to do because, by such way the community knowledge on value and function of Bintuni Bay Nature Reserve area would also improve.

Besides supported by sufficient equipments, the Communication Forum needs to be supported by qualified personnel. One strategy in facilitating capacity building improvement of the personnel is by programmed trainings. Trainings and courses which are proposed for supporting the activities of the Forum, among them are:

- 1. Training on Geographic Information System (GIS), facilitated by GIS Laboratory of UNIPA in Manokwari, cooperating with international NGOs such as The Nature Conservancy (TNC).
- 2. Training on Project monitoring and evaluation system, facilitated by UNIPA and BAPPEDA of Bintuni Bay District.
- 3. Training which is proposed especially for the community represented by Customary Consultative Agency (LMA) are of training on field monitoring guidance use, facilitated by the area manager coordinating with NGOs.

B. MONITORING AND EVALUATION TIME PLAN

The Nature Conservancy

In the implementation, Strategies on Bintuni Bay Nature Reserve management should be monitored and evaluated for every period of implementation time by internal area manager and as well as by independent communication.

B.1. Internal Manager of Bintuni Bay Nature Reserve

In monitoring and evaluation by internal area manager elements, the head of resort as implementer agent in Bintuni Bay Nature Reserve area should conduct scheduled monitoring and evaluation internally to all implementations of area management activity plan (Chapter 5), such being explained further on **Table VIII-3**.

 Table VIII-3.
 Plan of monitoring and evaluation of Bintuni Bay Nature Reserve Management activity by internal area manager element

No	Implementation	Form	of activity
NO.	Time	Monitoring	Evaluation
1.	Monthly	 Monitoring all management activities for a month includes: ✓ Target and Realization of the activities, and its Cost. ✓ Problems and constraints found in the field ✓ Personnel performance during implementation of the activities. 	Evaluating all activities for a month, embodied in a monthly report and submitted to BKSDA Papua II
2.	Quarterly	Monitoring all management activities for the last of tree months, emphasized on the matter such as mentioned in monthly monitoring	 Meeting to evaluate implementation of management activities, attended by all leadership elements of structural and functional area manager Submitted routine report to BKSDA Papua II.





No	Implementation	Form	of activity				
NO.	Time	Monitoring	Evaluation				
3.	Semi-annual	Monitoring all management activities for the last of six months, emphasized on the matter such as mentioned in monthly monitoring.	 Meeting to evaluate implementation of management activities, attended by all leadership elements of structural and functional area manager. Submitted routine report to BKSDA Papua II. 				
4.	Yearly	Monitoring all management activities for a year.	 Periodic meeting to evaluate comprehensively the whole management activity implementation, attended by all area managers. Submitted monthly report to BKSDA Papua II. 				

B.2. Independent Communication Forum

B.2.1 Activity Scope of Independent Communication Forum

Monitoring activities by independent Communication Forum to the implementation of management plan could be divided into three categories, i.e.:

- 1. Monitoring and evaluation comprehensively to all area management plans and goals which have been determined would be carried out once every 5-years.
- 2. All aspect of activities in management plan which have been conducted would be evaluated yearly.
- 3. If necessary, monitoring and evaluation could be conducted any time and it is a of an incidental activity.

As a guidance, monitoring and evaluation process to implemented strategies always refers to management activity plan (**Chapter V**) and funding (**Chapter VI**).

B.2.2 Working Mechanism of Independent Communication Forum

Based on working scope as mentioned before, this forum would work following the scenario as presented in the flow chart in **Figure VII-1**.

Figure VII-1 explains working mechanism of independent Communication Forum as follow:

- 1. This forum would conduct monitoring and evaluation of management activity implementation yearly.
- 2. If there are problems, constraints and something that is not accordance with the activity plan, so this forum should give suggestions, solutions and or program revision to the area manager.
- 3. If there are no problems, constraints and everything is going well and accordance with the activity plan, so implementation of management activity plan would be accepted and followed up in the form of written report and furthermore it would be continued with monitoring and evaluation activities for 5-years.
- 4. If in monitoring and evaluation activities for 5-years there are problems, constraints and something that is not accordance with the activity plan, so this



forum should give suggestions, solutions and or program revision to the area manager. If necessary, management plan reviews or changes could be done.

5. If in monitoring and evaluation activities for 5-years, there are no problems, constraints and everything is going well and accordance with the activity plan, so implementation of management activity plan would be accepted and followed up in the form of written report.



Figure VII-1. Working mechanism of Independent Communication Forum



IX. CLOSING

Bintuni Bay Nature Reserve plan is not a tough plan which must be used to manage an area in which has a complicated ecological process. Bintuni Bay Nature Reserve ecosystem consists of small island coastal ecosystem, mangrove ecosystem, and marine ecosystem. Because of this, in its management, it is needed dynamic devices. The commitment of the area manager to related groups is an important basis for a dynamic management. Main framework in dynamic management is of cooperation and crossed-institutional coordination of all stakeholders in Bintuni Bay Nature Reserve.

Bintuni Bay Nature Reserve plan is a document in which contains accommodative value, participation and high transparency because this document is formulated based on the result of a set of processes by involving all stakeholders including customary community. This document will be as guidance for the government and stakeholders in implementing the activities of Bintuni Bay Nature Reserve management for period of 25 years and furthers. This document also may function as controlling tools and coordination of various institutions so that the implementation of every planned activity would be synergic.

In the implementation, this document is expected being legalized through Decree of Bintuni Bay District Head (Bupati), so it will has a law certainty. Some formulated programs have been adjusted with main job and function of related technical institutions in the scope of regional government of Bintuni Bay District and also have accommodated a number of stakeholder interests. However, the programs still take community economic development into consideration. This consideration becomes very strategic, because in program funding, it must fallow funding scheme of related technical institutions for the program which is in accordance with their main jobs and functions. Other funding sources could be attempted from private enterprises or other legal grants.

Forestry Department, in this context, Directorate General of Forest Protection and Nature Conservation (PHKA) as an institutional implementer of management activity plan has many limitation in resources. Because of this reason, The involvement of other parties such as private enterprises/investors, local and international NGOs, Regional Government, and as well as other interested person in environment, is extremely expected in the implementation of activity plan of Bintuni Bay Nature Reserve Area in the field.

By publishing this management plan document, hopefully, Bintuni Bay Nature Reserve Area could be managed optimal and sustainable in accordance with its functions.



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APPENDICES

Apendices





Appendix 1. Terminologis and abbreviations mentioned in the document

Abrassion

Disappearance of rock and land is due to water, ice or wind actions.

Agro-Ecosystem

Agricultural system based on reciprocal relationships between a group of people and its physical environment for live continuity possibility of that group of people.

Agroforestry

Landuse systems and technology in which long-lived trees (including bush, palm, bamboo and woody vegetation, etc) and food crops and/or forages are grown together in a space and time arrangement.

Arboretum

A land on where collected-various species of trees are grown for research and education purposes.

AWB

Asian Wetland Bureau

BAPEDALDA

Badan Pengendalian Dampak Lingkungan Daerah, Regional Environmental Impact Management Agency

BAPPEDA

Badan Perencana Pembangunan Daerah, Regional Development Planning Agency

BAPPENAS

Badan Perencanaan Pembangunan Nasional, Nacional Development Planning Agency

BAPI

The Biodiversity Action Plan for Indonesia

BKSDA

Balai Konservasi Sumberdaya Alam, Natural Resource Conservation Agency

Biodiversity

Biodiversity is a term used for illustrating life form diversity on earth, interaction form amongst organisms and their environments. Biodiversity consists of three things, i.e. ecosystem, species and genetic and covers terrestrial, waters, coastal and marine region.

Biogeography

Is geographical distribution of vegetation and animals, on earth.

Biopiracy

Is exploration and Utilization of local knowledges and genetic resources without any knowledge or agreement of the owner/local community.

Bioprospecting

Is an appraisal on genetic resource and biological resource. In practices, this activity is followed by issues on intellectual right owner, evenly and fairly profit distribution, and negative impacts of genetic engineering product utilization.





Bioregion

Physical area/environment which its management is not determined by political and administrative definition, but by geographic, human community and as well as ecology system definition. Therefore, bioregion also has the same meaning with ecoregion, i.e. area management based on local ecosystem and natural habitat priority.

Biotechnologi

Application of technology with the basis of biology principles in living organism uses for people needs.

Nature Reserve

Because its nature condition with specific flora, fauna and ecosystem or particular ecosystem, this area requires protection and is continually and naturally developed

Biosphere Reserve

An area within a country that receives a special status from the countries joining the program of The Man and The Biosphere (MAP) under UNNESCO, as special conservation area with economic, ecology and social functions.

World Heritage Site

According World Heritage Convention declared by UNESCO, There are two things, i.e.:

- "Cultural World Heritage" refers to monumens, architecture work, carving and painting, archeologic element or structure, commemorative buildings, occupied caves and the combination of all mentioned elements which universally all have high value in term of history, arts and knowledge.
- 2. "Natural World Heritage" refers to ecosystem, habitat or group of geological and physiographic formation, as well as threatened flora and fauna species

CITES

Convention on International Trade of Endangered Species

Endemic Bird Site

A natural grouping Site for bird having a limited range of live.

Debt for Nature Swap

Fund for natural conservation is defined as abolished foreign debt by exchanging with domestic natural resource mobilization for natural conservation.

Deforestation

Forested land changes its functions due to forest stripping for example into agriculture land, plantation or other uses.

Ecoregion

An area conservation management approach using region division based on ecosystem difference condition (see bioregion).

Ecosystem

Biotic dan abiotic component in an ecosystem interact each other resulting energy flow and nutrient cycling.





Equator

Imaginary lines encircling the globe with its diagonal of zero degree (dividing the globe into two parts: north and south parts)

Endemic, Endemism

Plant or animal spesies occurring only in a particular area and is frequently unique for that area.

Ephypite

Plants growing wholly above ground surface, on other plant but is not detrimental to their host.

Eutrophication

Nutrient enrichment occurring in waters so that triggering water plant growth explotion and causing oxygen content limitation in waters.

El Nino Phenomenon

Natural phenomenon causes extremely long dry season

Habitat Fragmentation

Is a process causing previously a compact primary forest area becoming fragmented and forming several compartments separated and dispersedly.

Habitat

Is natural-living site of flora and fauna.

Herpetofauna

A group of animals includes in amphibian (frogs) and reptile (crocodile, turtle, snack, lizards)

Dipterocarp Forest

Is forest dominated by family of dipterocarpacea, such as various species of meranti, kruing and kapur.

'Ever Green Rain Lowland Forest

Is forest containing ever green woody plant and occurs in tropical low land area with rainfall of 2.500 mm/year.

"Kerangas" Forest

A forest occuring on podsolic soils, highly-leached Soils with high silica content formed on sandy quarsa terraces, or rocky hills. The soils are very acid and infertile in which iron and humus occumulated under upper layer of white sands.

Protected Forest

Law No.41 explains that conservation forest includes nature preservation forest nature conservation forest and hunting forest

Primary Forest

Is a virgin forest or natural forest never being touched and being utilized by man.

Secondary Forest

Is natural forest ever being utilized by man.

IBOY

Is abbreviation of International Biodiversity Observation Year which has been conducted in 2001 dan 2002, as a window for scientists and educator in the world, cooperatively to improve communication in important knowledge which have biodiversity basis.





IBSAP

Indonesian Biodiversity Strategy and Action Plan

Species Diversity Index

Is an index used to compare species diversity in a particular area based on flora and fauna species number and abundancy

IUCN International Union for the Conservation of Nature and Natural Resources

Karamba

Woven bamboo basket floats on rivers for fish or shrimp culture

Carnivora

Meat-eater organisms

Intertidal/litoral Area

An area lies between the highest-tidal area and the lowest-tidal area

Conservation Area

Areas which are classified as nature conservation area are of national park, national recreation park, great-forested park (taman hutan raya), and nature reserve including nature sanctuary, wildlife reserve, protected forest and hunting park. Conservation terminology is not recognized in Law No.5 of 1990. While, in Law No.41 of 1999, it is mentioned regarding forest classification based on its fuctions, i.e. conservation forest, protected forest, and production forest. Furthermore, conservation forest is classified into nature preservation forest, nature conservation forest and hunting park.

Supporting Activity for Culture (of Plants and Animals) In Nature Reserve Area

Is an allowed activity carried out in nature reserve area in the form of germplasm taking, transporting and using for species improvement and captive breeding operation

Conservation

Protection attempts on buffering-live ecosystem, germplasm conservation and biodiversity utilization based on sustainable principles.

Ex-situ Conservation

Attemps to protect, to utilize and to conserve species occurring outside its natural habitat based on sustainable perinciples.

In-Situ Conservation

Attemps to protect, to utilize and to conserve species occurring in its natural habitat based on sustainable principles.

Biodiversity Convention

Convention signed by 150 countries in High Level Confference of United Nations regarding Environment and Development, conducted in Rio de Jeneiro, in 1992

Corridor

Protected lands function as paths connecting one conservation area to the other ones. It is known as conservation corridor or movement corridor by which animals and plants being possible to spred, so that gen flow, as well as site colonization could be happened appropriately. Corridor might be functioned to help protected animals to migrate seasonally amongst different habitat chains to find food.



Ramsar Criteria

Criteria is used, under Ramsar Convention, to asses the quality of wet land area based on biodiversity assets and ecosystem uniqueness, so that it is qualified to be given a status as important area on earth. These criteria include the uniqueness of wet land type, animal and plant communities found, and specific criteria as habitat for unique birds and fishes.

Flora and Fauna Criteria according to IUCN:

- Critically endangered: if the species in its nature is extremely threathened to extinction for very short period of time. Population declines at least 80% for the last 10-years, with the area predicted less than 100 km², and population has less than 250 adult individuals. Number of population member is predicted having less than 50 adult individuals and possibly distinct at least 50% in 10-years.
- 2. Endangered: If the species does not include critical endangered criteria but it undergoes high distinction risk in its nature for a short periode of time. Population declines at least 50% for the last 10-years, with the area predicted less than 5000 km², and population has less than 2500 adult individuals. Number of population member is predicted less than 250 adult individuals and possibly distinct at least 20% in 20-years.
- 3. Vulnerable: If the species does not include endangered criteria, but it undergoes high distinction risk in its nature for a short periode of time. Population declines at least 20% for the last 10-years, with the area predicted less than 2000 km², and population has less than 10000 adult individuals. Number of population member is predicted less than 250 adult individuals and possibly distinct at least 10% in 100-years (detailed categories see in Mogea *et al.* 2001)

MAB

is abbreviation of the Man And the Biosphere. It is a UNESCO program, started in 1971 for sustainable utilization and biodiversity conservation by developing natural and social science basis. It also aims to improve relationship being harmony between community and its global environment.

Megadiversity Country

Is a term used to figure out a country with high cultural and biodiversity Indonesia is to be a second rank after Brazilia.

Moratorium

Temporary cessation.

Omitology Value

Values consist of species diversity, number, distribution and bird life.

Nokturnal

Animals behave to be active, to move and to look for food during nights.

Sustainable Development

Development pattern which is able to satisfy today generation needs without weakens development ability to fulfil future generation.



Nature Reserve Area Management

Is a collective attempt to manage, to maintain, to utilize, to control, to supervise, to protect and to develop a nature reserve area.

Carbon Trade

An internationally-developing mechanism for countries having adequately large forested area (functioning to absorb carbon emission from fossil fuel burning) to get a international compensation in form of funding for conservation activities which are connected to carbon emission.

Nucleus Plasm Pattern

Agriculture system which connects agriculture with agroindustry in which primer products (annual plants or plantations, animals, milk, poultry, eggs, fishes, shrips, etc) is not centralized in big capital product units (or social) but in the hand of small famers, institutionalized correlated through contract with bigger nucleus enterprises which handle one or more downstream and upstream activities, such as production facilities, processing, and product marketing.

Germ plasm

A substance as genetic source found in every group of organism which could be utilized and developed to get an improved species or new cultivar.

Potassium Sianida

A poisonous chemical used for catching fish

PRA

Is abbreviation of Participatory Rural Appraisal. PRA method is a media for communicate through dialog between planner-administrative implementer and their partners (communities) for solving problems and for improving skill to solve occurred problems.

Alluvial Swamp

Swamp on clayed soils which is deposited by water run.

Herbaceous Swamp

Swamp on which small plants such as grasses and non-woody plants grown.

Genetic Engineering

Technology used to change genetic materials of living cells through man manipulation in order the cells to produce desired substances or to have different functions with other cells not being manipulated.

Nature Reserve Area Management Plan

Is a collective attempt to produce a document regarding the strategies in managing, , maintaining, utilizing, controlling, supervising, protecting and developing a nature reserve area.

Resine

Plant secretion products are characterized by having very complex chemical structures, solid, and transparent.

Restocking

Activity aims to increase wild species of flora na d fauna in their native nature habitat. Blue Revolution





Fishery product change process (particularly land, fresh water and brackish water fishery) from traditional methods switching to intensification for increasing product

RSA

Is abbreviation of Rapid Social Assessment. RSA method is a media for collecting data and information through communication and dialog methods between researcher and the community.

Savana

A grass land area with a small groups of trees alternately

Silviculture

Forest tending and supervision or forest vegetation manipulation for particular purposes, such as to control forest structure and composition, and tree growth.

Common Transmigration

Population movement from one densely-populated area to other sparcely-populated area, routinely conducted and organized by the government.

"Swakarsa" Transmigration

Spontaneous transmigration organized independently by the transmigrants.

Trawl

Is an equipment (net) to catch shrimp, and frequent being called as "pukat harimau".

Invansive Plant

Plant species, generally not native species in particular habitat, grown purposively or unpurposely due to natural dissemination, but because of its ability to reproduce massively, the species would dominated grown area of other plant communities

UNDP United Nations Development Program is a UN agency for development

USAID

United State Aid, an aid board from United States of America for development in developing countries

Economic Valuation

Valuation method of natural resource economic by determining or measuring natural resource values in monetary term.

WWF

World Wide Fund for Nature or more popular with World Wildlife Fund, Lembaga international agency for natural resource conservation



Voor					Ai	r Tempe	rature (,C)				
leal	Jan	Feb	Mar	Apr	Мау	June	July	Aug	Sept	Oct	Nov	Dec
1997 maximum	-	-		35.42	34.73	34.88	33.02	32.99	32.98	33.78	34.88	33.05
1997 means	-		-	26.92	26.89	26.4	25.43	25.34	25.93	27.11	27.17	27.48
1997 minimum	-	-	-	22	22.74	21.4	20.83	20.02	20.76	22.84	22.2	22.88
1998 maximum	36.31	36.15	36.21	36.92	37.26	34.19	34.6	34.19	35.59	37.02	36.12	33.53
1998 means	27.83	27.28	27.88	27.86	28.17	26.91	26.42	26.44	26.75	27.31	27.61	27.29
1998 minimum	22.72	23.05	23.14	23.51	23.45	23.26	21.36	22.62	22.82	23.11	23.19	22.11
1999 maximum	36.35	35.09	35.81	35.56	35.37	35.6	34.59	34.58	35.13	36.36	33.08	33.55
1999 means	27.7	27.22	27.26	27.26	26.85	26.4	25.69	25.44	26.13	26.96	26.94	27.19
1999 minimum	22.93	22.2	22.7	22.79	22.99	22.45	21.2	21.87	21.96	22.99	22.91	22.71
2000 maximum	35.87	34.9	37.07	35.64	-	-	-	-	-	-	-	-
2000 means	26.96	27.14	27.27	27.25	-	-	-	-	-	-	-	-
2000 minimum	22.85	22.45	22.03	22.71	-	-	-	-	-	-	-	-

Appendix 2. Ambient air temperature (0 C) data for three years (1997 – 2000) recorded by PT. Calmarine, in Weather Observation Station of Tanah Merah, Babo.

Sourcer: BP Pertamina (2002)

Appendix 3. Ambient relative air moisture (%) during	for three years (1997 - 2000) recorded
by PT Calmarine, in Weather Observation Station of T	anah Merah, Babo.

					Relat	tive Air I	Noisture	e (%)				
Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1997 maximum	-	-	-	100	100	100	100	100	100	100	100	100
1997 means	-	-	-	86.5	86.9	83.7	88.8	83.1	85.7	85.2	86.5	87.4
1997 minimum	-	-	-	43.4	54.4	49.8	53.2	46.9	53.8	52.7	39.4	61
1998 maximum	100	100	100	100	100	100	100	100	100	100	100	100
1998 means	85.7	89.2	86.6	89.2	89	93.4	93.6	93	92.6	91.7	91.4	91.7
1998 minimum	48.5	51	45.6	SO.1	55.2	65.3	60.6	56.4	57.2	50.3	54.7	62.4
1999 maximum	100	100	100	100	100	100	100	100	100	100	100	100
1999 means	90.1	90.7	91.3	91.9	93.1	93.1	93.5	94.4	93.2	92.2	93	93.3
1999 minimum	50.5	53.5	58.4	55.7	59.5	57.6	57.8	59.1	54.9	51	60.8	63.2
2000 maximum	100	100	100	100	-	-	-	-	-	-	-	-
2000 means	93.2	91.3	90.9	91.9	-	-	-	-	-	-	-	-
2000 maximum	56.6	55.2	48.8	61	-	-	-	-	-	-	-	-

Source: BP Pertamina (2002)





Appendix 4. Species, Family, Density (N/Ha), Frequency (F), and Important Index Value (IIV) of vegetation in seedling and stick stages in the Plot of Kaboi Island (In the front of Muara Tirasai), in Bintuni Bay Nature Reserve

Species	Family	:	Seedling Stage	e	Stick Stage			
		N/Ha	F	IIV	N/Ha	F	IIV	
B. gymnorrhiza	Rhizophoraceae	2500	-	58	-	-	-	
B. parviflora	Rhizophoraceae	-	-	-	262	-	92	
Ceriops tagal	Rhizophoraceae	2500	-	58	63	-	33	
R. mucronata	Rhizophoraceae	-	-	-	-	-	-	
R. apiculata	Rhizophoraceae	5000	-	84	363	-	175	

Source: Survey Results by TIM TNC, 2005.

Appendix 5. Species, Family, Density (N/Ha), Frequency (F), and Important Index Value (IIV) of Vegetation in Pole and Tree Stages in the Plot of Kaboi Island (In the front of Muara Tirasai), in Bintuni Bay Nature Reserve

Ionia	Famili		Pole Stage		Tree Stage			
Jenis		N/Ha	F	IIV	N/Ha	F	IIV	
B. gymnorrhiza	Rhizophoraceae	-	-	-	87	-	62	
B. parviflora	Rhizophoraceae	-	-	-	150	-	51	
Ceriops tagal	Rhizophoraceae	-	-	-	26	-	19	
R. mucronata	Rhizophoraceae	-	-	-	150	-	11	
R. apiculata	Rhizophoraceae	-	-	-	162	-	157	

Source: Survey Results by TIM TNC, 2005.

Lampiran 6. Species, Family, Density (N/Ha), Frequency (F), and Important Index Value (IIV) of vegetation in seedling and stick stages in the Plot of Mangrove Area of Simeri River, in Bintuni Bay Nature Reserve.

Species	Family	<u>s</u>	Seedling Stage	e	Stick Stage			
Species		N/Ha	F	IIV	N/Ha	F	IIV	
R. mucronata	Rhizophoraceae	7000	-	68	770	-	178	
X. moluccensis	Meliaceae	6000	-	56	30	-	55	
B. gymnorrhiza	Rhizophoraceae	5000	-	44	160	-	41	
Ae. corniculatum	Myrsinaceae	4000	-	32	10	-	9	
B. sexangula	Rhizophoraceae	-	-	-	130	-	11	
X. granatum	Meliaceae	-	_	_	20	-	7	

Source: Survey Results by TIM TNC, 2005.





Appendix 7. Species, Family, Density (N/Ha), Frequency (F), and Important Index Value (IIV) of Vegetation in Pole and Tree Stages in the Plot of Mangrove Area of Simeri River, in Bintuni Bay Nature Reserve

Secolog	F 1		Pole Stage		Tree Stage			
Species	Failiny	N/Ha	F	INP	N/Ha	F	INP	
R. mucronata	Rhizophoraceae	-	-	-	160	-	180	
X. moluccensis	Meliaceae	-	-	-	-	-	-	
B. gymnorrhiza	Rhizophoraceae	-	-	-	80	-	102	
Ae. corniculatum	Myrsinaceae	-	-	-	-	-	-	
B. sexangula	Rhizophoraceae	-	-	-	40	-	18	
X. granatum	Meliaceae	-	-	-	-	-	-	

Sourcer: Survey Results by TIM TNC, 2005.

Appendix 8. Species, Family, Density (N/Ha), Frequency (F), and Important Index Value (IIV) of vegetation in seedling and stick stages in the Plot of Mania Island (Tanjung Pitaboni), in Bintuni Bay Nature Reserve

Species	Family	1	Seedling Stage	e	Stick Stage			
Species	Failing	N/Ha	F	IIV	N/Ha	F	IIV	
Ae. corniculatum	Myrsinaceae	1458	0.42	24.28	500	0.42	64.70	
Avicennia alba	Avicenniaceae	833	0.17	10.81	67	0.08	10.53	
B. gymnorrhiza	Rhizophoraceae	625	0.08	6.32	133	0.08	15.18	
B. parviflora	Rhizophoraceae	625	0.17	9.90	133	0.25	26.95	
B. sexangula	Rhizophoraceae	1250	0.17	12.65	-	-	-	
Ceriops decandra	Rhizophoraceae	1250	0.08	9.08	67	0.17	16.42	
R. mucronata	Rhizophoraceae	11875	0.75	84.44	33	0.08	8.21	
R. apiculata	Rhizophoraceae	4792	0.50	42.53	500	0.33	58.41	

Sourcer: Survey Results by TIM TNC, 2005.

Appendix 9. Species, Family, Density (N/Ha), Frequency (F), and Important Index Value (IIV) of Vegetation in Poles and Trees Stages, in the Plot of Maniai Island (Pitaboni Cape), in Bintuni Bay Nature Reserve

Emocios	Family		Pole Stage		Tree Stage			
species	гапшу	N/Ha	F	IIV	N/Ha	F	IIV	
A. corniculatum	Rhizophoraceae	-	-	-	2.08	0.08	3.98	
Avicennia alba	Avicenniaceae	108	0.17	88.81	2.92	0.50	59.98	
A. marina	Rhizophoraceae	-	-	-	4.17	0.08	5.56	
B. gymnorrhiza	Rhizophoraceae	-	-	-	12.50	0.08	10.86	
B. parviflora	Rhizophoraceae	25	0.08	19.78	37.50	0.42	43.33	
B. sexangula	Rhizophoraceae	-	-	-	14.58	0.17	15.87	
C. decandra	Rhizophoraceae	8	0.08	12.85	2.08	0.08	4.21	
R. mucronata	Rhizophoraceae	25	0.25	37.41	60.42	0.50	54.80	
R. apiculata	Rhizophoraceae	150	0.58	140.85	104.17	0.75	96.48	
S. alba	Sonneratiaceae	-	-	-	4.17	0.08	5.04	

Source: Survey Results by TIM TNC, 2005.





Appendix 10. Mangrove potency (m3/ha) measured in stage of Vegetation of Pole and Tree in mangrofe forest block of Maniai Island (Pitaboni Cape) (20 m x 230 m = 0.46 ha), in Bintuni Bay Nature Reserve.

	Family	Pole					Tree					Overall mean
Species		Diameter	Height	N/ha	Potency/tree (M3/tress)	Potency/ha (M3/ha)	Diameter	Height	N/ha	Potency/tree (M3/tress)	Potency/ha (M3/ha)	potency /ha (m3/ha)
R. apiculata	Rhizophoraceae	14.7	11.8	150	0.2	13.81	21.34	14	2.08	0.5	0.48	14.29
D. spathacea	Bignoniaceae						28.79	16.9	2.92	1.1	1.48	1.48
B. gymnorrhiza	Rhizophoraceae						30.57	16.5	4.17	1.2	2.32	2.32
B. sexangula	Rhizophoraceae						29.88	14.3	12.5	1.0	5.76	5.76
X. granatum	Meliaceae						36.43	14.8	37.5	1.5	26.60	26.60
C. decandra	Rhizophoraceae	16.88	12	8	0.3	0.99	35.59	16.4	14.58	1.6	10.94	11.92
R. mucronata	Rhizophoraceae	16.03	12.3	25	0.2	2.85	28.66	18	2.08	1.2	1.11	3.96
X. moluccensis	Meliaceae						30.15	14.8	60.42	1.1	29.35	29.35
A. alba	Avicenniaceae	16.73	12.2	108	0.3	13.32	29.61	15.8	104.17	1.1	52.11	65.42
S. alba	Sonneratiaceae						23.25	15	4.17	0.6	1.22	1.22
B. parviflora	Rhizophoraceae	11.89	13.3	25	0.1	1.70						
Total				316	1.0	32.7			244.59	10.9	131.4	164.03
Means				63.20	0.20				24.459	1.09		

Appendix 11. Species, Family, Dencity (N/Ha), Frequensi, and Important Value Index of Vegetation in Seedling and Stick Stage, in Plot of Sumberi River, in Bintuni Bay Nature Reserve

Encoing	Family	5	Seedling Stag	e	Stick Stage			
Species	гатпу	N/Ha	F	IIV	N/Ha	F	IIV	
Ac. speciosum	c. speciosum Pteridaceae		0.33	62.94	600	0.33	100.00	
R. apiculata	Rhizophoraceae	2917	0.33	27.49	-	-	-	
Ae. corniculatum Myrsinaceae		2500	0.33	25.61	-	-	-	
B. gymnorrhiza Rhizophoraceae		3750	0.33	31.27	-	-	-	
X. granatum	Meliaceae	1667	0.33	21.83	267	0.17	47.22	
C. decandra	Rhizophoraceae	1250	0.17	12.80	-	-	-	
C. tagal	Rhizophoraceae	417	0.17	9.03	-	-	-	
R. mucronata Rhizophoraceae		417	0.17	9.03	-	-	-	
D. spathacea	Bignoniaceae	-	-	-	333	0,17	52,78	

Source: Survey Results by TIM TNC, 2005.





Appendix 12. Species, Family, Dencity (N/Ha), Frequensi, and Important Value Index of Vegetation in Pole and Seedling Stages in mangrove forest block of Sumberi River, Bintuni Bay Nature Reserve

Emocios	Family		Pole Stage		Tree Stage			
Species	ганшу	N/Ha	F	IIV	N/Ha	F	IIV	
R. apiculata	Rhizophoraceae	50	0.33	86.50	100.00	0.83	113.18	
D. spathacea	Bignoniaceae	17	0.17	30.74	45.83	0.17	35.51	
B. gymnorrhiza	Rhizophoraceae	-	-	-	29.17	0.33	37.00	
B. sexangula	Rhizophoraceae	33	0.33	53.38	20.83	0.33	23.97	
X. granatum	Meliaceae	33	0.17	47.62	16.67	0.33	20.62	
C. decandra	Rhizophoraceae	17	0.17	26.88	8.33	0.17	12.44	
R. mucronata	Rhizophoraceae	-	-	-	12.50	0.33	22.77	
X. moluccensis	Meliaceae	-	-	-	8.33	0.17	10.01	
A. alba	Aviceniaceae	-	-	-	4.17	0.17	8.71	
S. alba	Soneratiaceae	-	-	-	4.17	0.17	8.49	
C. tagal	Rhizophoraceae	33	0.33	54.88	-	-	-	

Sourcer: Survey Results by TIM TNC, 2005.

Appendix 13. Mangrove potency (m3/ha) measured in stage of Vegetation of Pole and Tree in mangrofe forest block of Sumberi Rivers (20 m x 230 m = 0.46 ha), in Bintuni Bay Nature Reserve

		Pole					Tree					Overall
Species	Family	Diameter	Height	N/ha	Potency/tree (M3/tress)	Potency/ha (M3/ha)	Diameter	Height	N/ha	Potency/tree (M3/tress)	Potency/ha (M3/ha)	mean potency /ha (m3/ha)
R. apiculata	Rhizophoraceae	19.3	12	50	0.4	4.91	35.5	14.4	100	1.4	39.89	44.80
D. spathacea	Bignoniaceae	17.2	10	17	0.2	1.11	27.4	12.8	45.83	0.8	9.68	10.79
B. gymnorrhiza	Rhizophoraceae						36.3	15.1	29.17	1.6	12.76	12.76
B. sexangula	Rhizophoraceae	12.9	6.5	33	0.1	0.78	26.9	13	20.83	0.7	4.31	5.09
X. granatum	Meliaceae	15.9	10	33	0.2	1.83	24.7	10.8	16.67	0.5	2.41	4.25
C. decandra	Rhizophoraceae	13.9	7.5	33	0.2	2.15	30.3	10.7	8.33	0.8	1.80	3.94
R. mucronata	Rhizophoraceae						38.4	11	12.5	1.3	4.46	4.46
X. moluccensis	Meliaceae						22.6	7.5	8.33	0.3	0.70	0.70
A. alba	Avicenniaceae						35.7	15	4.17	1.5	1.75	1.75
S. alba	Sonneratiaceae						33.4	25	4.17	2.2	2.56	2.56
C. decandra	Rhizophoraceae	13.7	7	17	0.1	0.49						
Total				183.00	1.20	11.27			250	11.0	39.40	50.67
Means				30.5	0.20	1.88			25	1.1	7.72	





Appendix 14. Personal Data of Autors of Bintuni Bay Nature Reserve Plan 2005



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Bintuni Bay Nature Reserve Management Plan





Appendix 15. Working Map of Bintuni Bay Nature Reserve Management Plan 2006-2030





What they say

Drs. J. Paiki – Acting Head of Bintuni Bay Regency Management plant reveals a commitment of all stake holders to keep environment sustainability. Hopefully its implementation would make the nature reserve protected and the local community could take the benefit from it

Bintuni Bay Natur community and the

Prof. Dr. Frans Wanggai – Rector of Papua Universitas re Reserve management is under all party's responsibility including the government. The implementation of this plan must be able to protect natural resource which is as God's blessing

Ir. Petrus Kasihiw, MT – Head of Bappeda of Bintuni Bay Regency management plan would help us to do more along with the nature reserve management for the improvement of Bintuni Bay Regency Development

Ir. Fransisco Moga, MP – Head of BKSDA Papua II – Sorong

This management plan is a real proof of "adat" community, NGO and Regional Government participation. Its implementation still needs the support of all stakeholders to achieve sustainable environment and prosperous community

Abraham Wekaburi (Coordinator of 7-tribes in Bintuni)

The nature reserve is our property, in which our life is depended to. We want to cooperate for protecting this nature reserve. We wish, the nature reserve management would make our community prosperous

Adrian Tatiri – Head of Yakati Kampong

We want this reserve nature sustainable, we could take fish, shrimp, crab and crocodile from the mangrove. This reserve nature is our (bintuni community's) property. Hopefully, the nature reserve management could cooperate with the community to protect Bintuni Bay Nature Reserve

Otto Manibuy – "Adat" Wamesa Leader

Bintuni Bay Nature Reserve is ours. All community is allowed to look for food there, but they must follow our rules. We want our mangroves being protected and we could take sea products from the Reserve Nature's natural resources











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