Support to Building the Inter-American Biodiversity Information Network

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Biodiversity Information for Decision Making – International Experiences

APPENDIX 4

CASE STUDIES: Use of Biodiversity Information in the Decision Making Process in Japan

(Document 2 – Appendix 4)

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CASE STUDIES: Use of Biodiversity Information in the Decision Making Process in Japan

This Appendix accompanies the principal document *Biodiversity Information for Decision Making – International Experiences.* The principal author is Kazuyuki Sato, Nippon Koei, Japan.

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CHAPTER 1 INTRODUCTION

1.1 Background

Various kinds of data gathering activities concerning environmental information are carried out throughout the globe. However it is important to bear in mind that information collected should be linked to and suitable for decision-making. How raw data is transformed into useful and easily understood data for decision makers is the key concept. Chapter 40 of Agenda 21 stresses the importance of the use of information for decision-making. The underlying message is that policy decisions should be based on the information available, preferably scientific knowledge. In order to ensure that approach, it is necessary to store, present and analyse information in a form that is understandable to decision-makers.

In the context of biodiversity, this concept certainly applies. The Convention on Biological Diversity (CBD) proposed the adoption of an ecosystem approach, which means biological diversity should be protected not on a species-by-species basis, but on an ecosystem approach, that is from a holistic point of view. GIS is useful in this regard as it stores spatial information on habitats, together with distributional information, and other related data, in a single coordinate environment.

1.2 Objective

The objective of this report is to illustrate how biodiversity information is used in the decision-making process in Japan. Collected examples provide an opportunity to consider how biodiversity information can contribute to future decision-making.

Chapter 2 reviews the overall decision making structure and approach to networking in Japan, and how connections are made internationally. The following Chapter details a number of Case Studies of the use of biodiversity information in decision making, mainly related to environmental impact assessment and decisions regarding the siting of infrastructure, and policy development for extractive industries.

1.3 Research Method

The case studies are from Japan and from development projects elsewhere in the Far East funded by JICA (Japan International Cooperation Agency). They are:

- HGAP (Hokkaido Gap Analysis Programme);
- Oil Spill Modelling Study;
- JICA Study on Watershed Management in the Philippines; and

- JICA Study on Integrated Mangrove Management through Community Participation in Myanmar.

CHAPTER 2 THE NATIONAL BIODIVERSITY DECISION MAKING PROCESS IN JAPAN

2.1 Overview of National Policy

The central focus of national policy on biodiversity in Japan is the National Strategy on Biodiversity Conservation (NSBC). The strategy was formulated in October 1995, in response to the requirement under the article 6 of the Convention of Biological Diversity (CBD). The strategy was revised in 2002, taking into account social and economic trends, such as the threat of invasive species, human disturbance on the margins of forested areas, and evolving policies of ministries related to biodiversity. Institutional changes were made in the period of 1995-2000 in response to the NSBC, including the establishment of the Ministry of Environment (MOE) in 1999 and amendments to the River Law that incorporated the concept of conservation of riverine environments.

This new strategy was based on five pillars: (a) use of scientific knowledge, (b) integrated approach, (c) information sharing and participation, (d) collaboration with ministries and local governments, and (e) international cooperation.

Adopting an ecosystem approach, the strategy classified national land into ecosystems: (a) untouched forest, (b) rural agricultural land with forests, (c) urban area, (d) rivers, wetlands, and drainage systems, (e) coasts, (f) fishery areas, and (g) national parks and protected areas.

Special foci are on (a) the establishment of a habitat network, (b) restoration of wetlands and coastal lagoons, (c) environmental information, and (d) measures for invasive species. Special considerations are also given to the information management, environmental education, and international cooperation.

2.2 National Institutions

Because biodiversity includes a wide range of issues, the Ministry of Environment (MOE) is co-mandated with other concerned agencies, including: the Ministry of Agriculture, Forestry and Fisheries (MAFF), Ministry of Land, Transport and Infrastructure (MLIT), Ministry of Education, Culture, Sports, Science and Technology (MOECSST), Ministry of Economy, Trade and Industry (METI), and Ministry of Foreign Affairs (MOFA). The Division of Environmental Planning under the Ministry of Environment is responsible as the national secretariat on the CBD, while Centre of Biodiversity in Japan is registered as a national focal point for the CHM.

National institutions are coordinated through an Inter-Ministerial Council chaired by the Prime Minister, and this Council is the ultimate decision maker for the NSBC.

Japan does not have permanent networking mechanisms to involve research, institutions, NGO and the public in the process, but rather uses specific consultation mechanisms, such as ad hoc or temporary commissions. For example, in revising the NSBC a temporary Study Commission was formulated within the MOE. Commission members were mainly selected from university professors specializing in nature conservation. They held six meetings within a six-month period. Following the study group, the Central Environmental Council, an advisory body for the MOE, established a sub-committee on NSBC revision. They held a total of eight meetings, and for example, at the third meeting, NGOs were invited to present their views and opinions. The sub-committee then drafted the revised NSBC, after which public comments were invited (a total of 26 organisations or persons commented).

2.3 Information Networking

The Ministry of Environment has set up the Biodiversity Center of Japan. The intention is to make a single "one-stop shop" for the biological diversity issues. Through the Japan Integrated Biodiversity Information System (JIBIS) the Ministry of Environment has collected a range of datasets resulting from natural environment surveys since the 1970s. During a formulation phase of the NSBC, these data were fully utilized, especially to identify ecosystem changes, through the preparation of many maps. There is no monitoring programme especially aimed at gathering policy relevant information, rather use is made of information gathered in on-going programmes kept at the JIBIS.

The JIBIS only holds information from official government sources, mainly MOE. In order to broaden the base of available information, a pilot project called NORAD (Network of Organisations for Research on Nature Conservation) was launched in 2001. This project aims to share information and knowledge between the governmental and prefectural research institutions. The Biodiversity Centre of Japan, NIES, and 12 research institutions are participating in this pilot project. A national CHM for this central-local government collaboration is expected to be launched in near future.

The JIBIS datasets (many of then GIS based) are the principal reference base for conducting environmental impact assessments, and are frequently used for this purpose, as indicated in the Case Studies. More information on JIBIS can be found in Document 4 - *Standards and Practices for Sharing GIS-based Information.*

The Biodiversity Center of Japan has also established a Japan Biosafety Clearing House that provides:

- Text of the Cartagena Protocol
- Related domestic law
- Information on contact points
- Links to other web-based resources

2.4 International Cooperation

With respect to the international cooperation, the NSBC indicates that the emphasis will be placed on migratory birds, coral reef conservation in Indonesia, and wetland conservation.

The regional focus is on Asian countries, although the NSBC also includes collaboration with DIVERSITAS, GBIF, and the Millennium Ecosystem Assessment.

Japan does not participate in any regional networks equivalent to IABIN, and instead operates bilaterally with a range of neighbouring countries, and actively participates in global and regional environmental conventions and the CBD CHM.

CHAPTER 3 CASE STUDIES IN JAPAN AND ASIAN COUNTRIES

3.1 HGAP (Hokkaido Gap Analysis Programme)

3.1.1 Overview

Hokkaido is located in the northern part of Japan, and is famous for its remaining wilderness and variety of ecosystems. Rapid reclamation since the 1860's has destroyed a large area of old forests and wetlands.

Hokkaido Gap Analysis Programme was launched in 1999, and is operated by a voluntary group of researchers, academics and officials. The activities aim to provide some scientific and technical inputs for the formulation of a Biodiversity Conservation Strategy in the Hokkaido area.

3.1.2 Approach

The Gap analysis approach was adopted for this case study. This analytical method was originally developed by the Biological Resources Division (BRD) of the United States Geological Survey (USGS), and it has been tested throughout the United States.

The key concept is to identify the spatial gap in the area for biodiversity conservation. By overlaying a thematic maps that represent the geographical distribution of species, the type of vegetative cover, and the geographical sphere of the protected area, the 'gap' of protection, is identified. The word 'gap' in this instance means the area where no conservation activities are taking place, irrespective of need, or the area where there are conservation activities, but they are not necessary for conserving it. Figure 3.1 illustrates this approach.

At least three types of spatial data are required: (a) vegetative cover, (b) geographical extent of protected area, and (c) the distribution of target species. With respect to the vegetative cover, satellite images are available for almost all the area of the Globe, and it is relatively easy to obtain the data. However, data on the spatial distribution of species are often limited, so methods of inferring the spatial distribution from the vegetation or habitat have been proposed, such as the wildlife-habitat relation model (WHRM). These methods are based on a coarse-filtering approach, which assumes that that there is a strong correlation between certain types of vegetative cover and the existence of certain species.

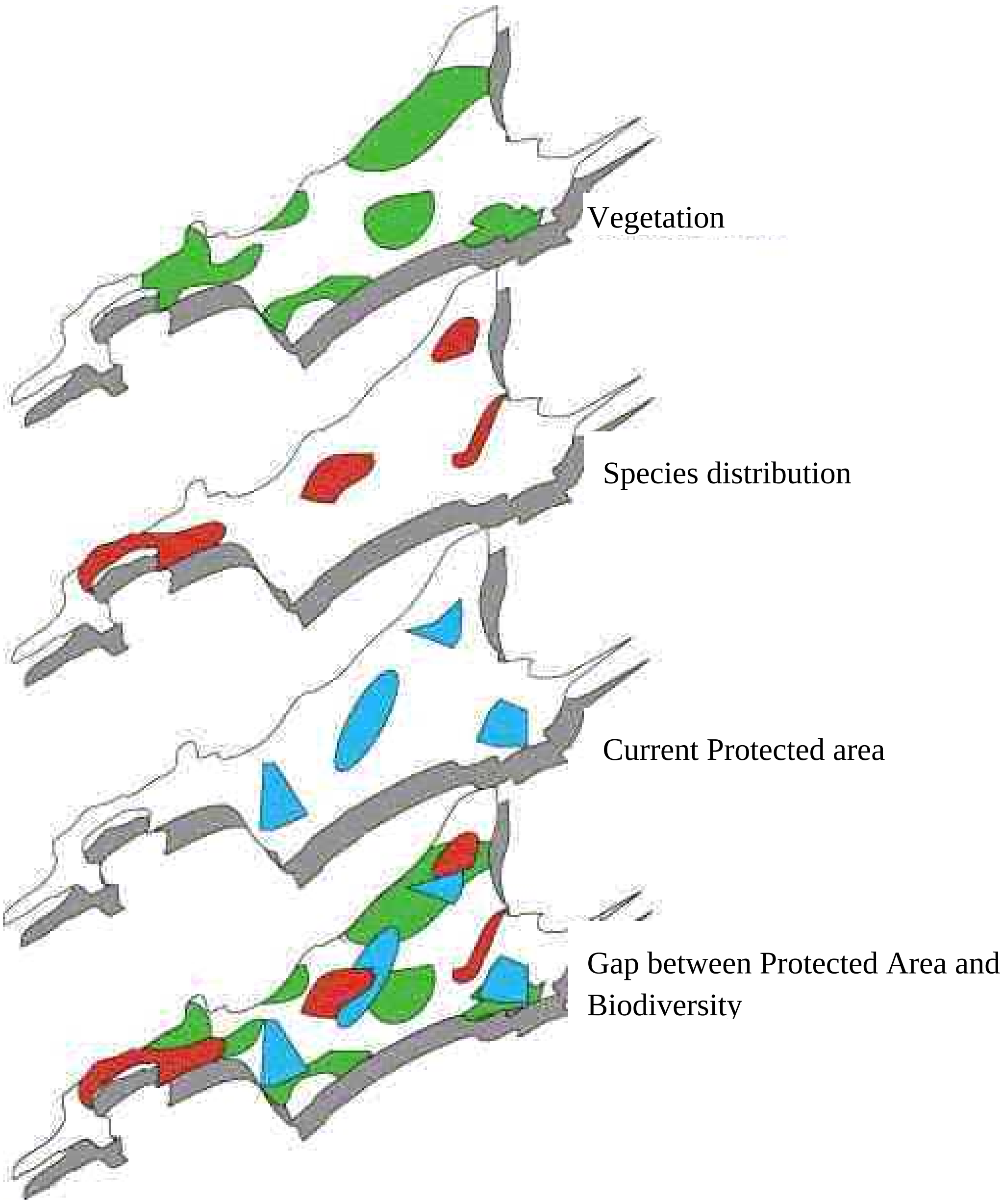


Figure 3.1 The Concept of the Gap Analysis

Source : http://homepage3.nifty.com/hgap/

3.1.3 Research Findings

(1) Species Distribution of Hawks (*Spizaetus nipalensis*)

The conservation of the hawk (*Spizaetus nipalensis*) sometimes triggers controversial issues of habitat conservation when civil engineering works are planned in public developments. The habitat of this species is high coniferous trees in mountainous areas. Several research findings indicate that the existence of this species is limited by two factors: (a) existence of high trees, and (b) the availability of small animals for prey, such as snakes, squirrels and small birds.

This case study is an example that examines the relationship between habitat suitability index and conservation area.

As proxy indicators, eleven variables were originally selected and examined by a step-wise regression analysis. Five representative indicators were selected as a result: (a) relative height, (b) human disturbance, (c) broad leaf trees, (d) elevation, and (e) index of fragmentation.

(2) Data

The whole area of Hokkaido was divided into a grid system with a resolution of 5 kilometres, and several types of data were prepared. These were:

- Digital Elevation Model with a spatial resolution of 50 metres, taken from the Digital National Land Information (DNLI) in Japan;
- Land Cover Map derived from the vegetative map prepared by the JIBIS as well as a topographical-map with a scale of 1:25000;
- Protected Area Boundary taken from the JIBIS.

Eleven indicators that represent the habitat for the hawks were derived from the data sources. The number of these indicators was reduced with a statistical method called discriminate analysis. The Habitat Suitability Index was calculated for each grid cell in the study area, and the potential habitat was mapped out by this Habitat Suitability Index.

Table 3.1 summarises the indicators, and Figures 3.2-3.5 show the Gap Analysis.

3.1.4 Achievement

The fact that the digital data is available from Digital National Land Information (DNLI) and the Japan Integrated Biodiversity Information System (JIBIS), made it easy to carry out this type of study. It also shows the importance of advance preparation, digitisation and storage of data.

3.1.5 Challenges

(1) Voluntary Data Collection Scheme

It is not easy to collect observation data of species from which spatial distribution is estimated. Normally, this kind of data collection requires intensive fieldwork by experts. These types of activity cannot solely be carried out by governmental agencies. Therefore, it is necessary to establish a collaborative relationship with citizens and NGOs. Actually in the case of this analysis, original data on the distribution of observed hawks was collected by a voluntary research group In Japan, a new institutionalised educational curriculum offers the possibility of

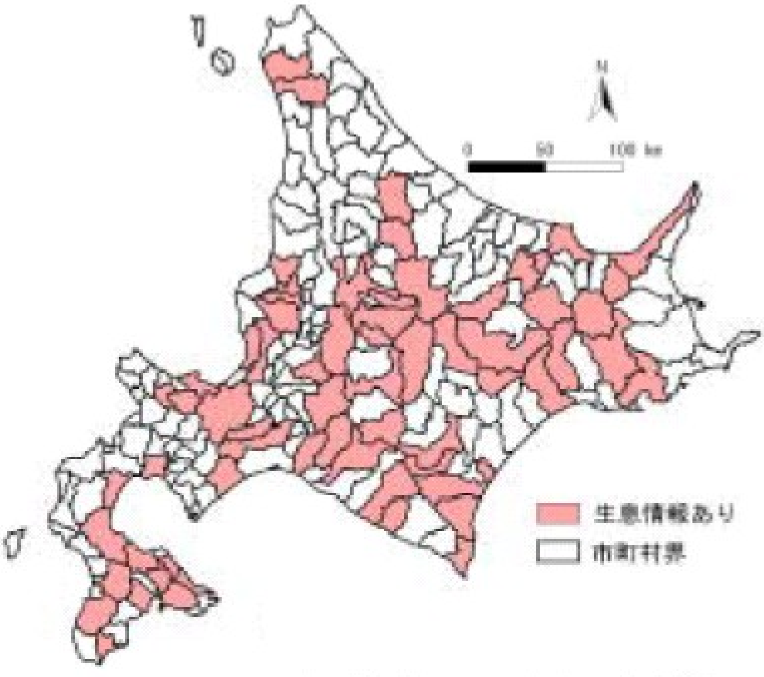


Figure 3.2 The Occurrence of Hawks

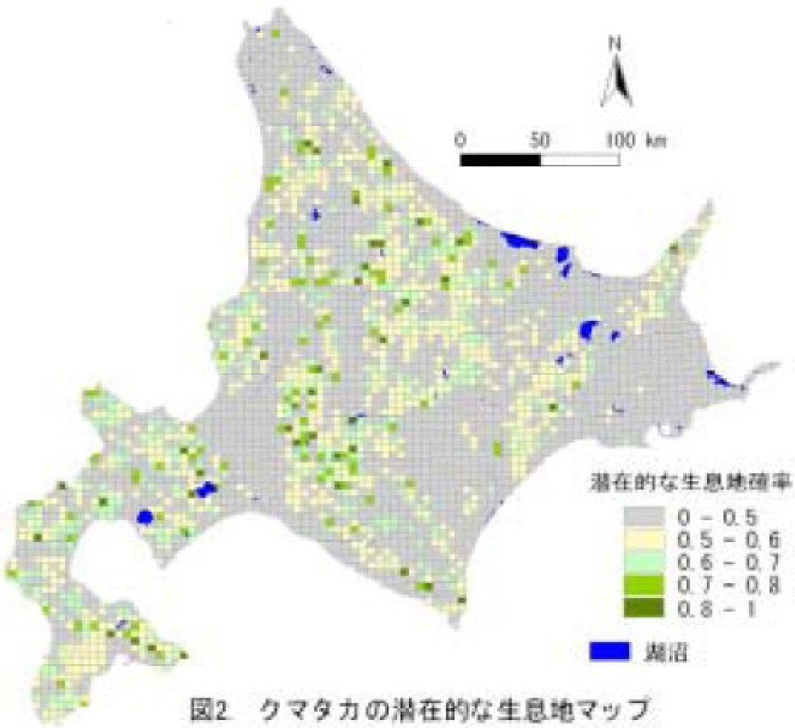


Figure 3.3 Potential Habitat Map

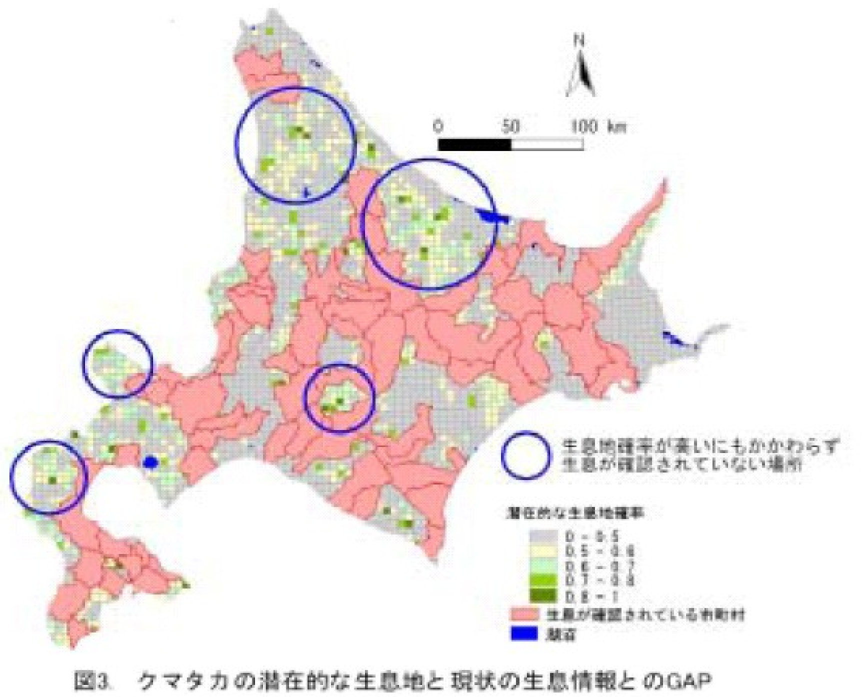


Figure 3.4 Gap between Observed Occurrences and Potential Habitat

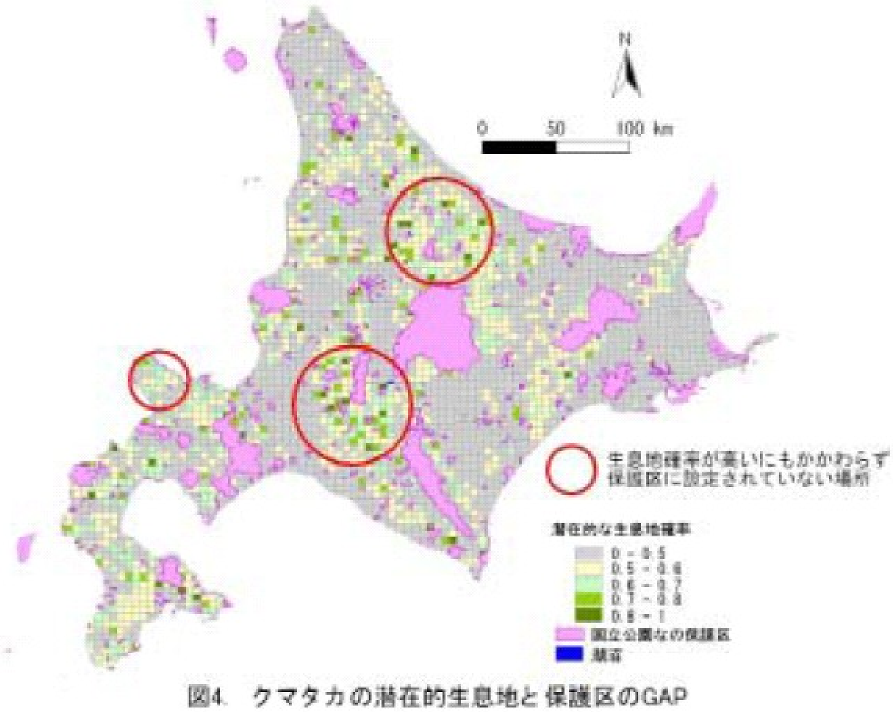


Figure 3.5 Gap between Potential Habitat and Protected Area

Table 3.1 Indicators for Evaluating a Habitat of Hawks

Element	Indicators	Unit	Remarks
Geomorphology			
	average elevation	metre	average elevation within a grid
	average slope	degree	average slope within a grid
	difference in elevation	metre	difference between maximum height and minimum height in a grid
Resources Accumulation			
	broad leaf tree	sq. kilometre	area extent of broad leaf tree forest within a grid
	conifer tree	sq. kilometre	area extent of conifer tree forest within a grid
	mixed forest	sq. kilometre	area extent of mixed forest of broad leaf tree and conifer tree within a grid
	river length	metre	cumulative length of river within a grid
Human Disturbance			
	Alternation Land	sq. kilometre	area extent of alternation land within a grid
Fragmentation of Forest			
	alpha	0-100	index of fragmentation estimated from area extent of patch
	beta	0-100	index of fragmentation estimated from perimeter of patch
	phai	0-100	index of fragmentation estimated from the number of patches within a grid
(Source): Report of HGAP. 2002.			

teaching environmental education. Voluntary monitoring activities might be carried out as part of the curriculum, which is expected to contribute to the data gathering activities, as well as enhancing the interest of the school children in the ecosystem and natural environment.

(2) Specimen Data Collection

A coarse-filtering approach should be supplemented by a fine-filtering. In order to fill up the data-sparse space in the species distribution, voluntary monitoring would be an option. Another alternative is the utilisation of existing information.

Specimen collection would contribute a part of the knowledge to be utilised for estimating species distribution.

If specimen data are stored with information on the location at which the specimen was collected, preferably with co-ordinates of longitude and latitude, it would be a valuable source of input for species distribution.

3.2 Oil Spill Dispersion Modelling in the Sea of Japan

3.2.1 Background

After the WSSD in Johannesburg in 2002, more emphasis has been placed on Sustainable Development, especially in the extractive industries, such as oil, gas and mining companies. Oil, gas and other natural resources are presently essential for our daily lives. They can also bring economic benefits to developing countries. However, their extraction, transport and refinement have environmental risks and are sometimes damaging to the natural ecosystem when an accident occurs.

Since the wreck of the Russian tanker 'Nakhtokha' in the Sea of Japan in 1997, more attention has been placed on emergency action planning for oil spill accidents. Lessons learned from the 'Nakhtokha case' were: (a) action was delayed at the early stage, (b) estimates of time taken for oil to reach coastal areas were poor, and (c) communication among volunteers who participated in oil removal activities was inadequate. These factors brought about both severe environmental pollution to the coastal area of Japan, and inefficient mitigation and remediation activities.

In order to overcome these constraints as well as to ensure timely action for future contingency (i.e. fencing to protect an area of fishery resources or coastal area), the scientists and researchers launched a research project. This study, in addition to evaluating the coastal environment, is focusing on estimating the arrival time of spilled oil in the coastal area with a combination of computer modelling and GIS. This case illustrates the integration of GIS and oil dispersal modelling.

3.2.2 Study Area

The study targeted an area of the Sea of Japan, which is one of the richest fishery areas in the country. There are considerable fears regarding the damage to the area that a large spill could cause. The target area was divided into 5000 grid spacings of 1 degree.

3.2.3 Approach

This example adopts an approach of integrating GIS and oil dispersal modelling. The study utilises a two-dimensional dispersion model developed by the

Association of Petroleum in Japan. This model considers a process of rate and transport of the oil.

Four types of data are required for the model calculation; (a) source of location of oil spill, (b) amount of oil spilled, (c) climatic conditions, such as wind velocity and direction, and (d) current or tidal flow.

Table 3.2 Parameters for Model Input

Element	Indicators	Unit	Remarks
Drift Conditions			
	ocean current	metre	average current
	tidal current	degree	average slope within a grid
			not considered
	Wind		coefficient method : 5%
	river flow	metre	not considered
Climate Conditions			
	wind direction	degree	area extent of broad leaf tree forest within a grid
	wind speed	metre/sec	
	air temperature	degree	
	sea temperature	degree	averaged sea surface temperature in January

(Source): http://www.glocom.ac.jp/eco/esana/resource/goto/

Table 3.3 Simulation Scenario

Conditions	Case1	Case 2	Case 3
Date of oil spill	2-Jan	7-Jan	11-Jan
Location of oil spill	point 1	point 6	point 6
Amount of spilled oil	6000kl	6000kl	6000kl
Spill type	flash spill	flash spill	Flash spill
Simulated period	270hours	270 hours	240 hours

(Source): translated from http://www.glocom.ac.jp/eco/esana/resource/goto/

(Note): Point 1 and 6 are represented by the Figure 3.6

By identifying the location of an oil spill from the satellite image, such as RADARSAT, a simulation study was carried out by changing the point source of the oil spill (Figure 3.6), and estimating the arrival time and location at the coastal area.

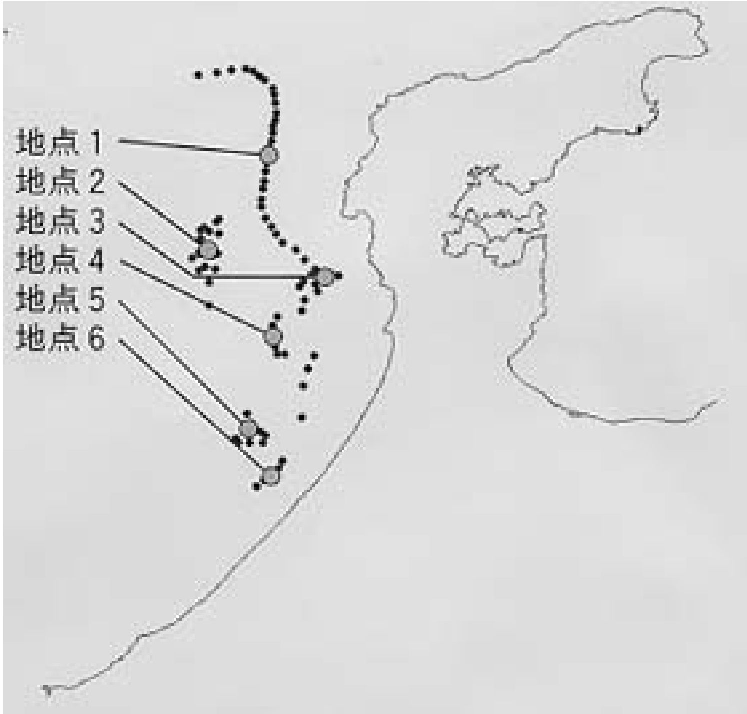


Figure 3.6 Oil Spill Source

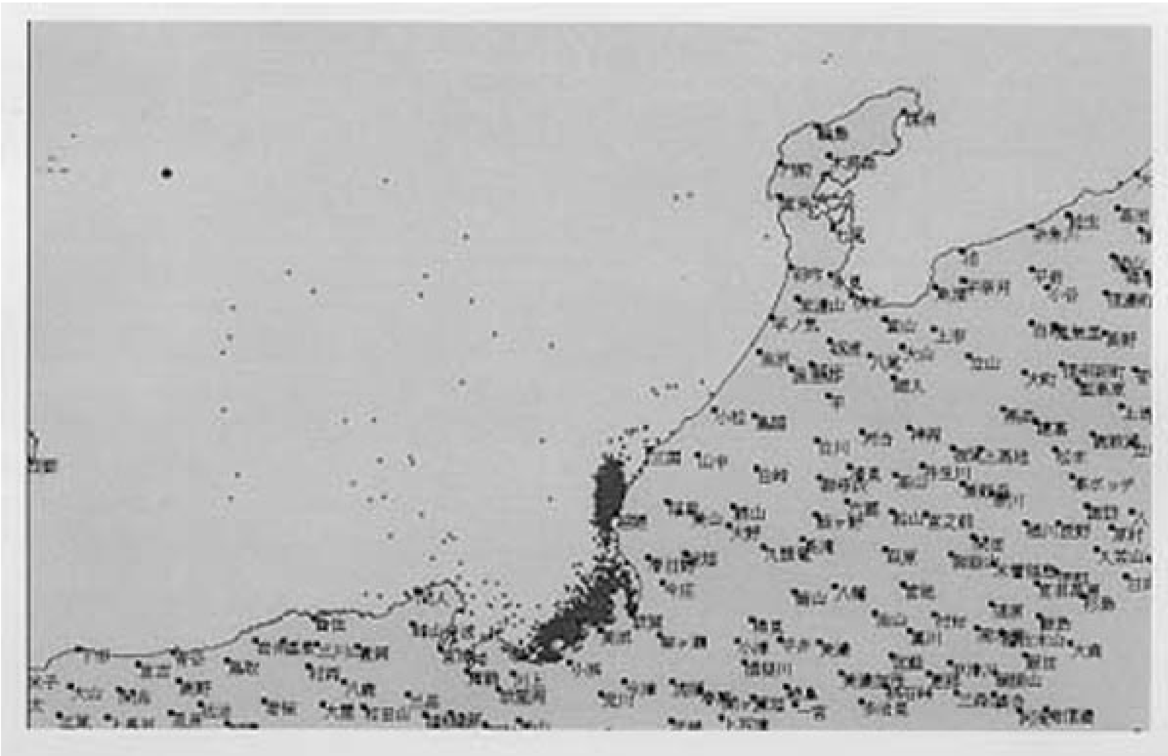


Figure 3.7 Simulated Results (Case 1)

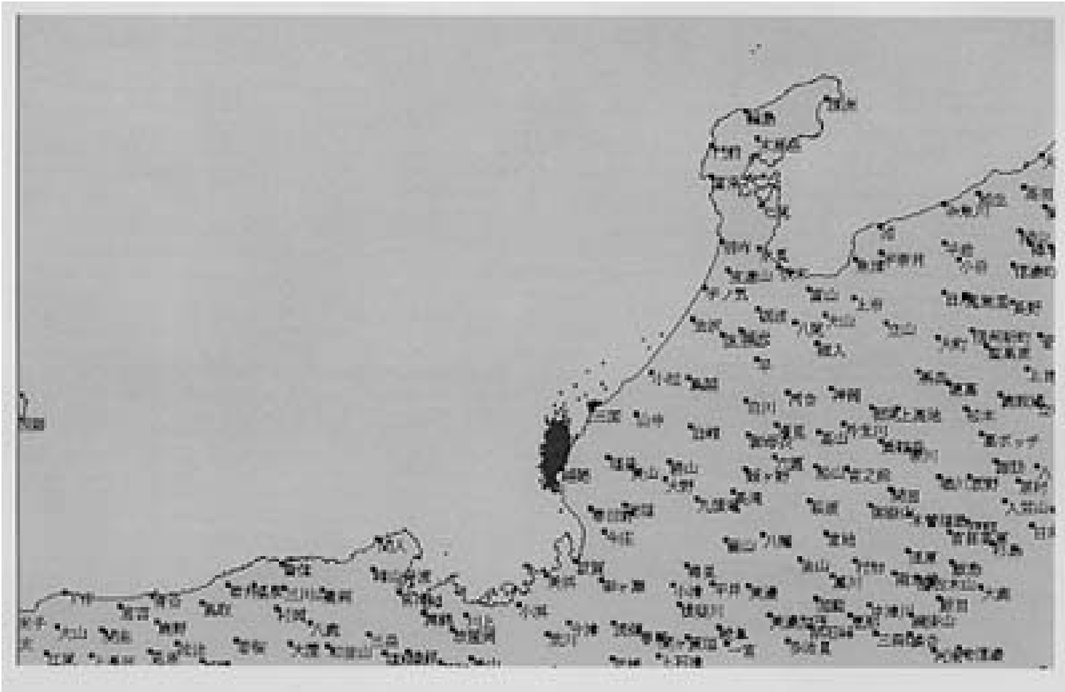


Figure 3.8 Simulated Results (Case 2)

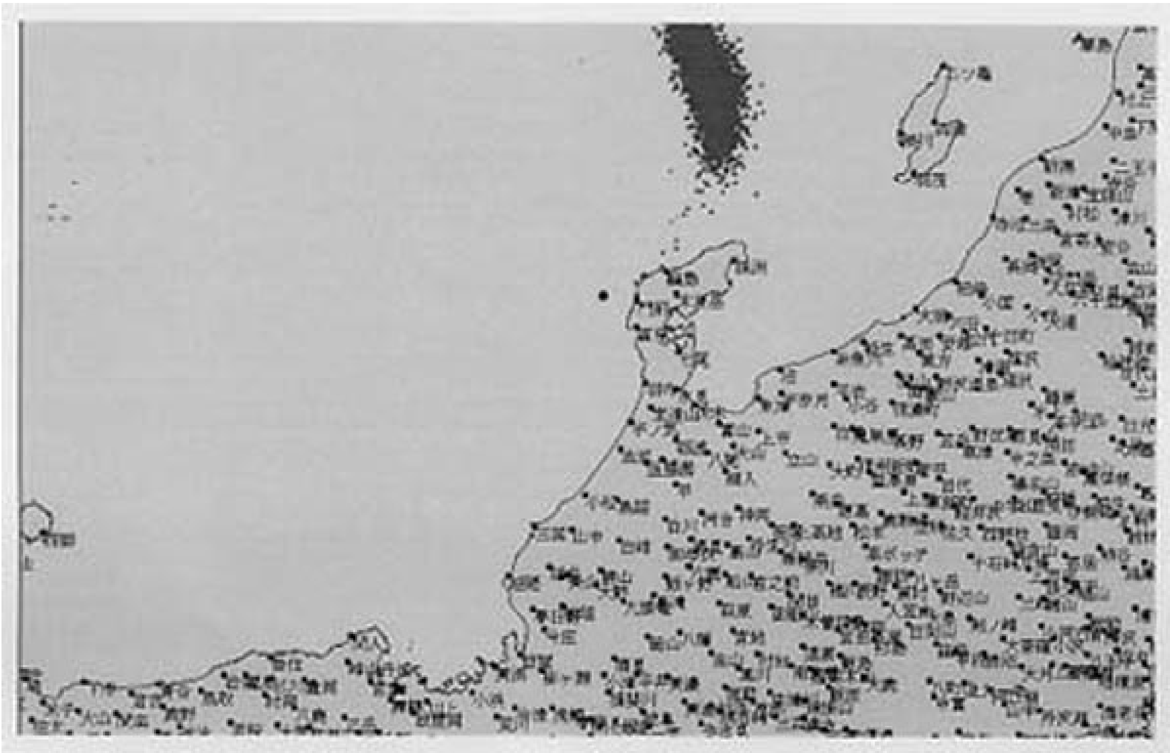


Figure 3.9 Simulated Results (Case 3)

3.2.4 Achievement

(1) Methodology

The methodology is useful for evaluating environmental risk at the development phase of oil development projects in environmentally sensitive marine and coastal areas, where coral reefs or habitats for marine resources are located.

3.2.5 Challenges

(1) Prepare Necessary Database for Model Input

Preparing the database for the inputs to model calculation is necessary for a quick response and hence a quick decision, since the estimation of arrival time should be conducted within a few hours of the oil spill's occurrence to ensure a rapid response to the incident.

(2) Environmental Sensitivity Index

Since time, money and resources are limited, contingency action must be focused on pre-determined areas. By calculating an estimated arrival time of the oil spill, the ESI (Environmental Sensitivity Index) can provide information on the likely impacts of the spill. This should be calculated based on biological surveys, from sources such as data stored in JIBIS.

(3) Evolving to a DSS (Decision Support System)

This case is still a study in its research and development phase. It would be preferable for this concept to evolve into a DSS (Decision Support System) for contingency planning, to be adopted by an agency responsible for coastal management.

(4) Data Dissemination through Web-GIS

If the estimated time of arrival of spilled oil could be provided through Web-GIS, the inhabitants of the coastal area would be able to make their own preparations.

3.3 The Use of Spatial Information for Watershed Management Planning in the Philippines

3.3.1 Background

This case study was taken from the JICA Master Plan Study for Watershed Management in the Upper Magat and Cagayan River Basins.

(1) Geographical Context

The Cagayan River and its tributary the Magat River are the longest rivers in the Philippines and they flow in a northward direction across Luzon Island (Figure

3.10). Due to the heavy logging activities by concessionaires during the 1960's, the upland catchment areas have been converted into barren land. After the termination of logging activities, people encroached into the forestland, employing slash-and-burn techniques in a steep area. As a consequence, the area is affected by severe soil erosion during the rainy season from June to September, together with frequent flooding further downstream due to sedimentation.

To tackle the rehabilitation of the upland mountainous area, as well as to conserve the important ecosystem, the Philippine government launched two policies on land use in upland watershed areas: NIPAS (National Integrated Protected Area System) and CBFM (Community-based Forest Management)

(2) National Integrated Protected Area System (NIPAS)

The NIPAS Act, issued in 1992, aims to integrate previously-defined categories of the national park (game refuge, bird and wildlife sanctuary, wilderness area, nature reserve, mangrove reserve, and virgin forest), into one single category of protected area. The act also aims to secure all native plant and animals and conserve soil and water in critical watersheds by establishing a system of protected areas. In terms of virgin forest, the act defines the criteria for land to be included in this type of protected area. The act defines that virgin forest, including mossy forest and any continuous residual forest of good quality, and the lands above 1,000 metres in elevation and/or with slopes of 50 % or over, should be granted protected area status.

(3) Land Titling Aspect

In the study area, 75.5 percent of the land is owned by the government, while the remainder is owned privately. Under the current land classification scheme, the government-owned land was divided into two categories: (a) Forest Land and (b) National Park. However, there is an overlap of the geographical area of the tenurial rights within the government-owned land. These rights are: (a) the mining area, (b) the area certified by CBFMA (Community-Based Forest Management Agreement), and (c) the area certified by CADC (Certificate of Ancestral Domain Claims).

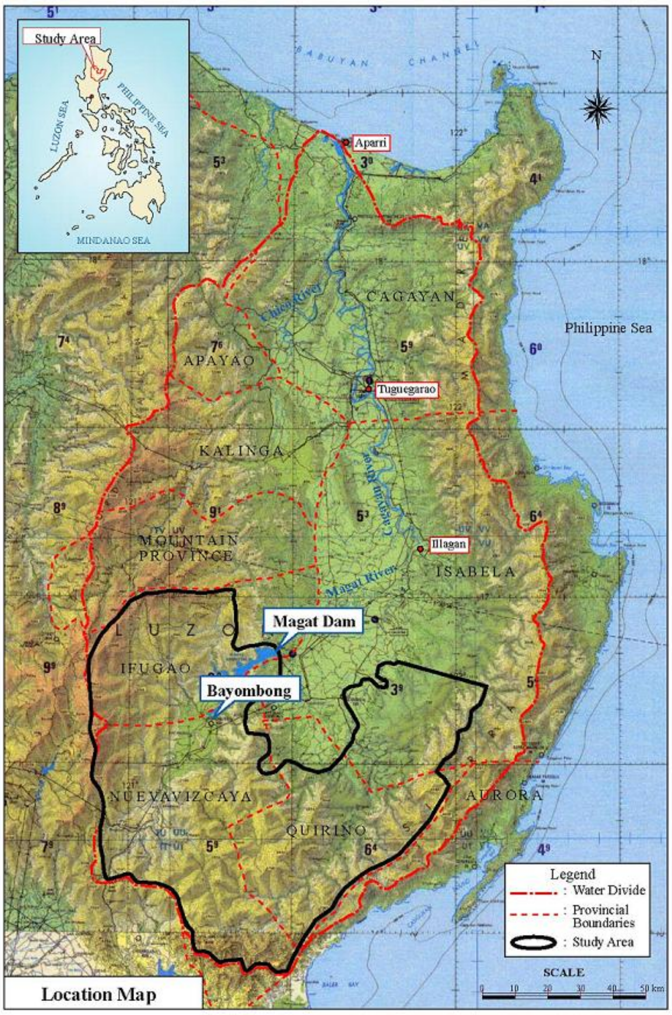
The mining area is certified in accordance with the Philippine Mining Act of 1997, and this should be excluded from protected areas, since mining activities are prohibited within them.

(4) CBFMA

The CBFMA is, in basic terms, a contract between the government and the peoples' organization (PO) over the use of forestland. Based on this agreement, the PO can cultivate the land for 25 years, with a condition that they manage the certified land according to the Resource Use Plan to be prepared by the PO themselves.

(5) CADC

In addition, there is another tenurial instrument called the CADC. This certificate is awarded to Indigenous Communities in compliance with the Indigenous Peoples' Rights Act of 1997. This was formulated in order to ensure the rights of indigenous people to own, manage, develop and conserve their ancestral domains and all natural resources found therein. The act also endows a right of self-governance and self-determination on the use, management and conservation of their domain. The CADC area is fragmented over the region, especially in the forestland. This situation is related to the characteristics of the area where there are several separate minority groups living.



Location of the study area in the Philippines

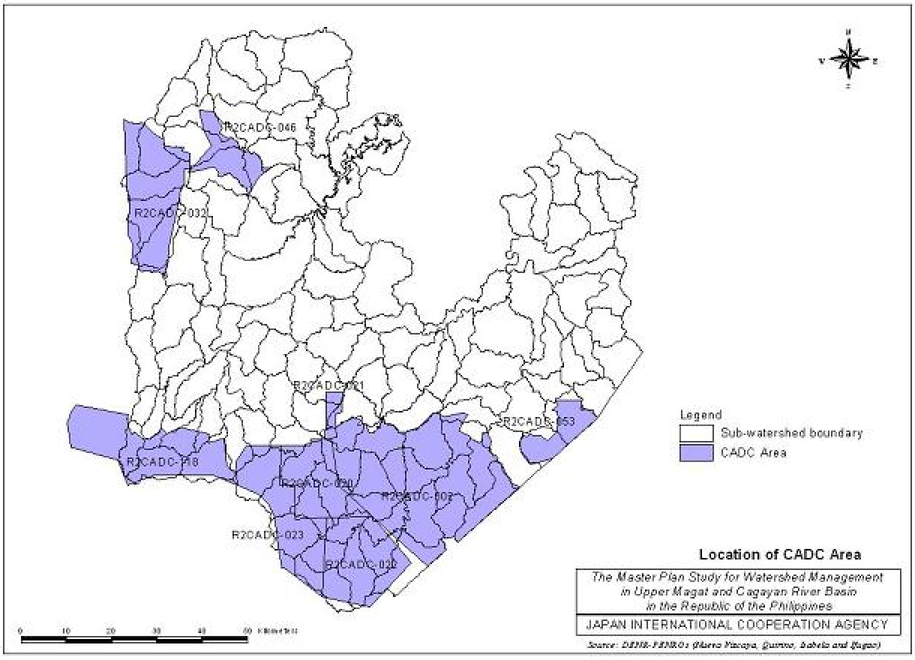


Figure 3.11 Location of CADC Area

3.3.2 Approach

This study targeted an area of 970000 hectares in the Upper Magat and Cagyan River basin. In order to delineate the protected area and to determine the appropriate land use in the watershed, a multiple step approach was employed, consisting of: (1) data preparation, (2) soil erosion estimates, (3) land use zoning, and (4) priority area selection.

(1) Data Preparation

The contour line was manually digitised from the paper format topographical map. A slope map was derived from the contour line by using the GIS functionality. A land use map was prepared from a LANDSAT satellite image. The soil map was prepared as per the contour line, by digitising a paper map. The boundaries of the CADC area, the CBFMA area and the National Park were also prepared by manually digitising a map.

(2) Soil Erosion Estimate

Using the USLE (Universal Soil Loss Equation), the potential amount of soil erosion was calculated on a sub-watershed basis. The results would be an input for prioritising the area of rehabilitation. For this estimation, several geographical layers were utilised, such as slope, vegetative cover, soil erosion risk, as shown in Figures 3.12-3.14.

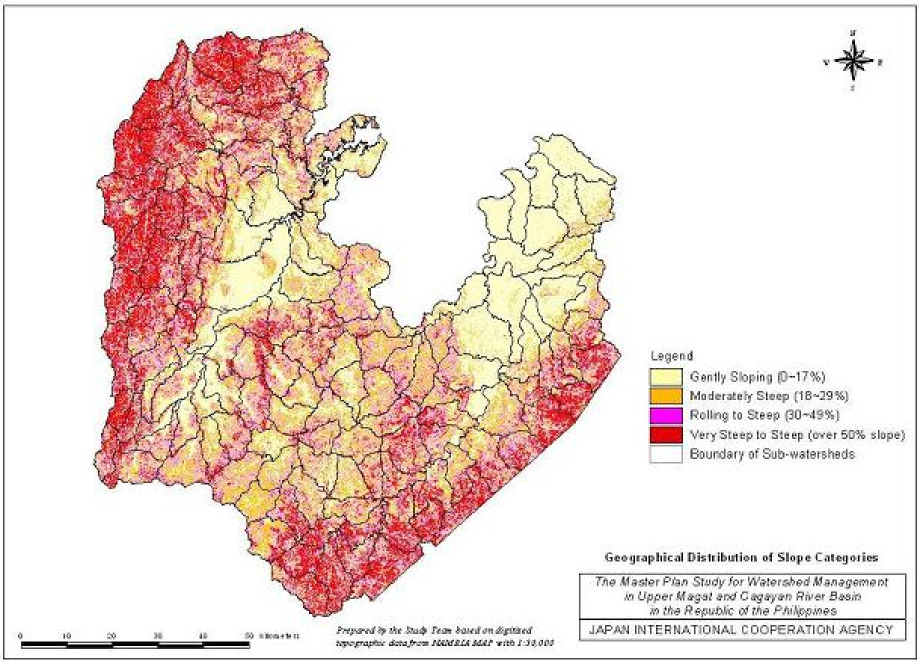


Figure 3.12 Geographical Distribution of Slope Categories

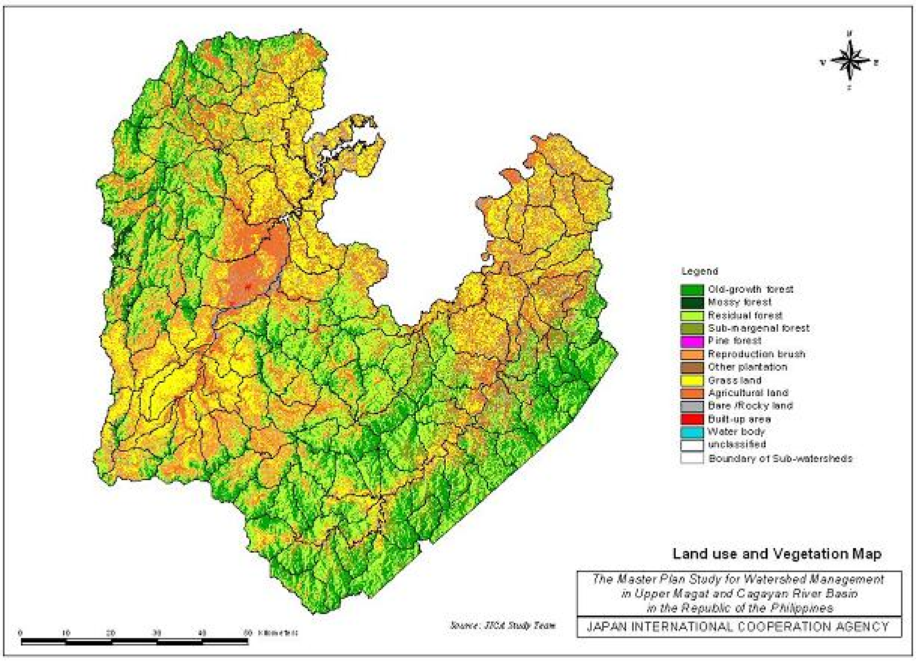


Figure 3.13 Land Use and Vegetation

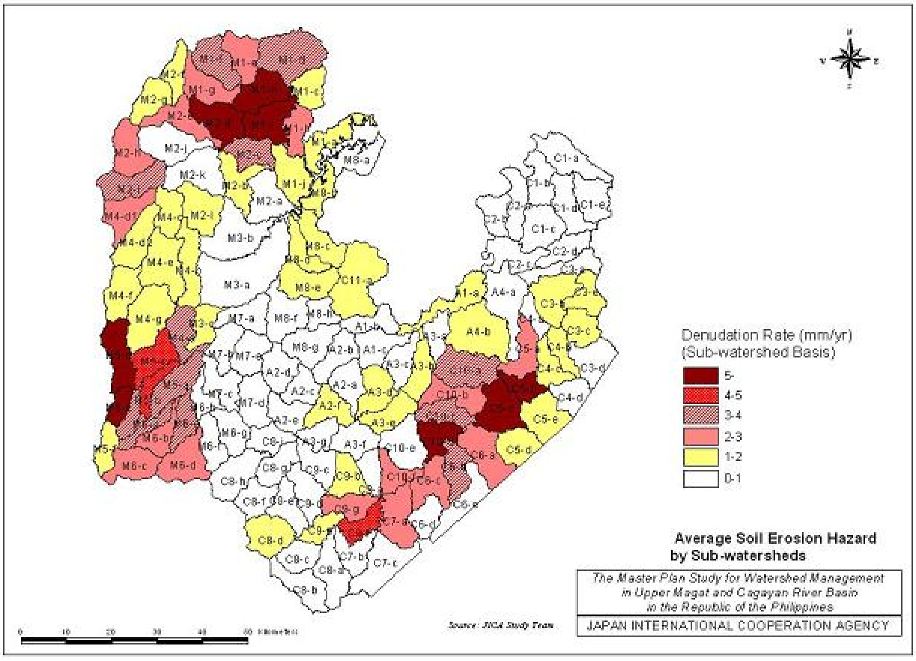


Figure 3.14 Averaged Soil Erosion Hazard by Sub-watershed

(3) Land Use Zoning

Land Use Zoning was carried out using two indicators: (a) slope and (b) current vegetation. Protected areas were defined following established criteria. Table 3.4 shows the classification scheme and proposed land use for the Study area. The study considers the location of the CADC area, which is excluded from the Proposed Protected Area.

Table 3.4 Proposed Land Use in the Study Area

	Slope			
Current Land Use	<18%	18-30%	30-50%	>50%
Old Growth Forest	Old Growth Forest	Old Growth Forest	Old Growth Forest	Old Growth Forest
Mossy Forest	Old Growth Forest	Old Growth Forest	Old Growth Forest	Old Growth Forest
Residual Forest	Old Growth Forest	Old Growth Forest	Old Growth Forest	Old Growth Forest
Sub-marginal Forest	Old Growth Forest	Old Growth Forest	Old Growth Forest	Old Growth Forest
Pine Forest	Old Growth Forest	Old Growth Forest	Old Growth Forest	Old Growth Forest
Reproduction Brush	Agro-forestry	Agro-forestry	Manmade Forest	Manmade Forest
Other Plantation	Other Plantation	Other Plantation	Other Plantation	Other Plantation
Grass Land	Agricultural Land	Agricultural Land	Manmade Forest	Manmade Forest
Agricultural Land	Agricultural Land	Agricultural Land	Manmade Forest	Manmade Forest

(Source): JICA Master plan study for watershed management in upper Magat and Cagayan river basin

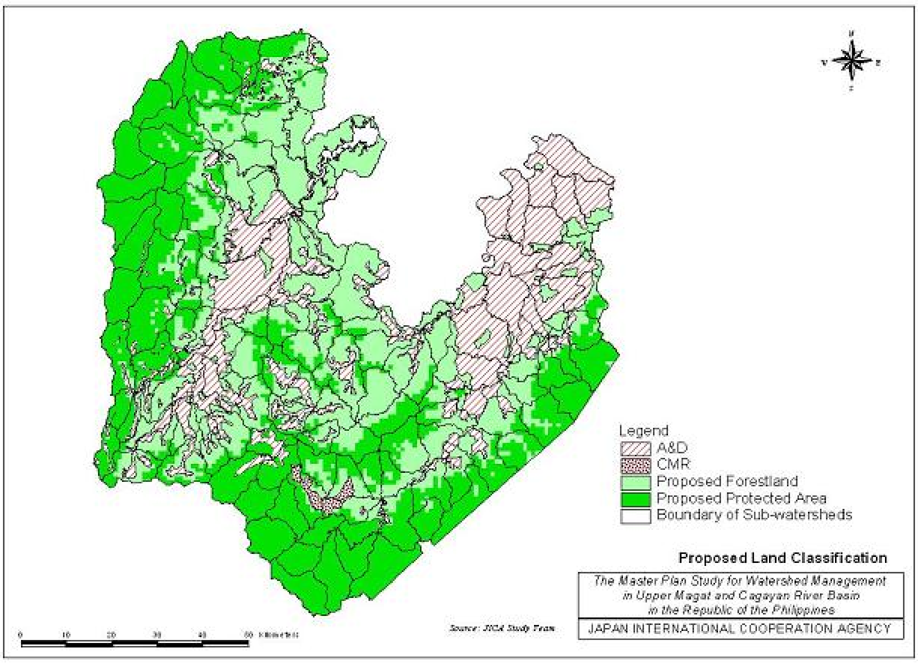


Figure 3.15 Proposed Land Classification

(4) Priority Area Selection

This analysis was conducted with the aim of selecting a prioritised sub-watershed for carrying out a pilot project. The sub-watershed was characterised with respect to both natural and social conditions. For natural conditions, the results of potential soil loss derived from USLE were adopted, and divided into seven categories. With respect to social conditions, two indicators were selected from the following: (a) population, (b) household number, (c) population density, (d) poverty (population under the poverty line), (e) agricultural dependency ratio, and (f) literacy rate. The dependency ratio of upland dwellers on agriculture, and poverty ratio are priority indicators.

Overlaying a priority map of social aspects onto a priority map showing aspects of natural conditions, enables identification of the overall priority area. The social priority map was weighted to 25 %, while the natural priority map was weighted to 75%.

3.3.3 Achievement

(1) Poverty Mapping Approach

One of the advantages of this study is that it considers the social aspects when delineating a protected area. For this purpose, the analysis incorporates a socio-economic map layer prepared using the poverty mapping approach.

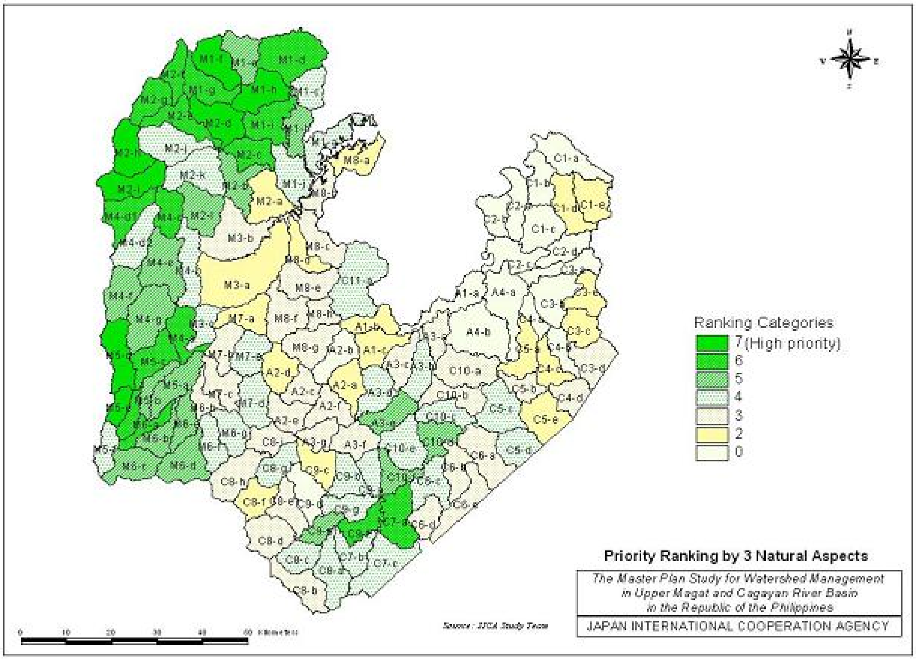


Figure 3.16 Priority Ranking by Three Natural Aspects

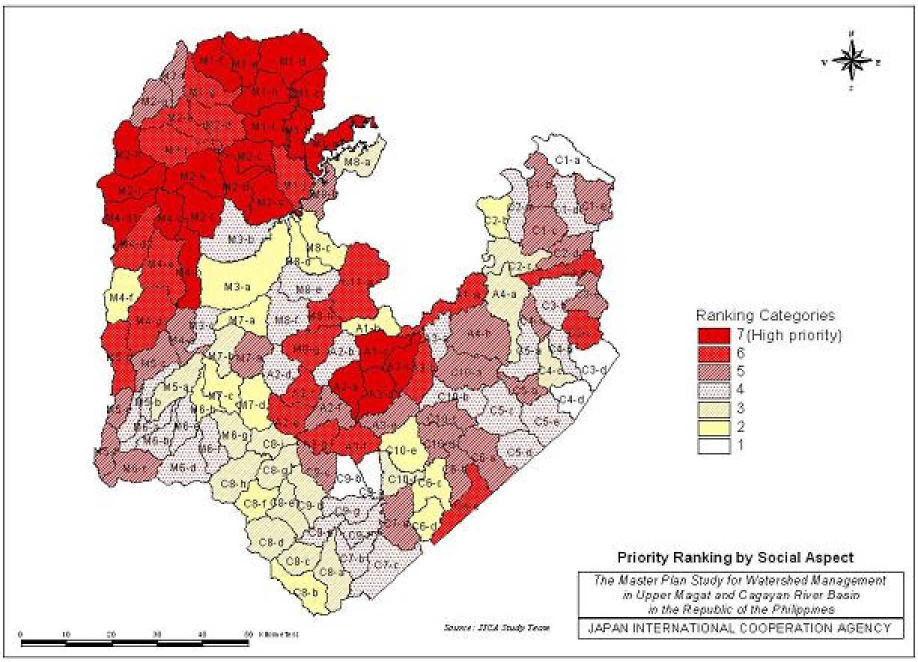


Figure 3.17Priority Ranking by Social Aspect

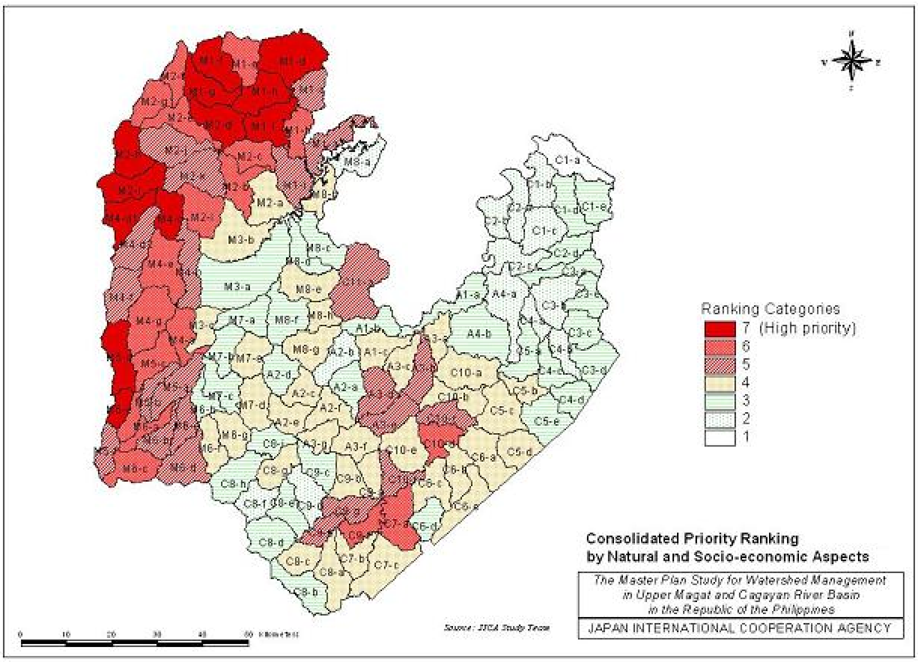


Figure 3.18 Consolidated Priority Ranking by Natural and Socio-economics

(2) Land Titling Aspect

This study also considers a land titling aspect, when delineating the boundary of a protected area.

(3) Multi Data Source Approach

This study focuses on the multiple data source approach, by combining biodiversity information with other socio-economic aspects, together with the land titling aspect or the poverty mapping approach. This approach would be a beneficial to way to balance conservation and development (i.e. the poverty reduction to meet the Millennium Development Goal in 2015).

3.3.4 Challenges

(1) Ready-made Database

Data preparation in a tailor-made way is time consuming. A ready-made database ensures efficient preparatory work for the planning of a protected area, especially for delineating its boundary.

(2) Land titling

In the Philippines, administrative boundaries are sometimes a matter of conflict between the government and citizens. A rigid delineating system is required for deciding on the boundaries of a protected area.

3.4 The Use of Spatial and Biodiversity Information for Mangrove Management Planning in Myanmar

3.4.1 Background

This case study is taken from the JICA Master Plan Study for Integrated Mangrove Management through Community Participation in the Ayeyarwady Delta in Myanmar.

Myanmar is one of the poorest countries in Asia, and this poverty triggers a high rate of deforestation. Ayeyarwardy delta, a coastal area located at the mouth of the Ayeyarwady river, was previously covered by a vast mangrove forest. However, due to the over-exploitation of the mangroves for firewood and charcoal (transported to the capital city of Yangon), and the subsequent conversion of the land to paddy fields, the mangrove forest has been disappearing significantly.

The Mangrove ecosystem is home to various kinds of species, such as shrimp, crocodiles, turtles, dolphins, and water-birds. The Myanmar government tried to tackle the problem of mangrove deforestation, and establish a protected area in the region. Biodiversity conservation is one of the aims of this project, as the marine turtle (*Leidochelys olivacea*, *Chelonia mydas*, *Caretta caretta*) and estuarine crocodiles (*Crocodyleus porosus*) are at risk because they (and their eggs) are the main source of protein for local people.

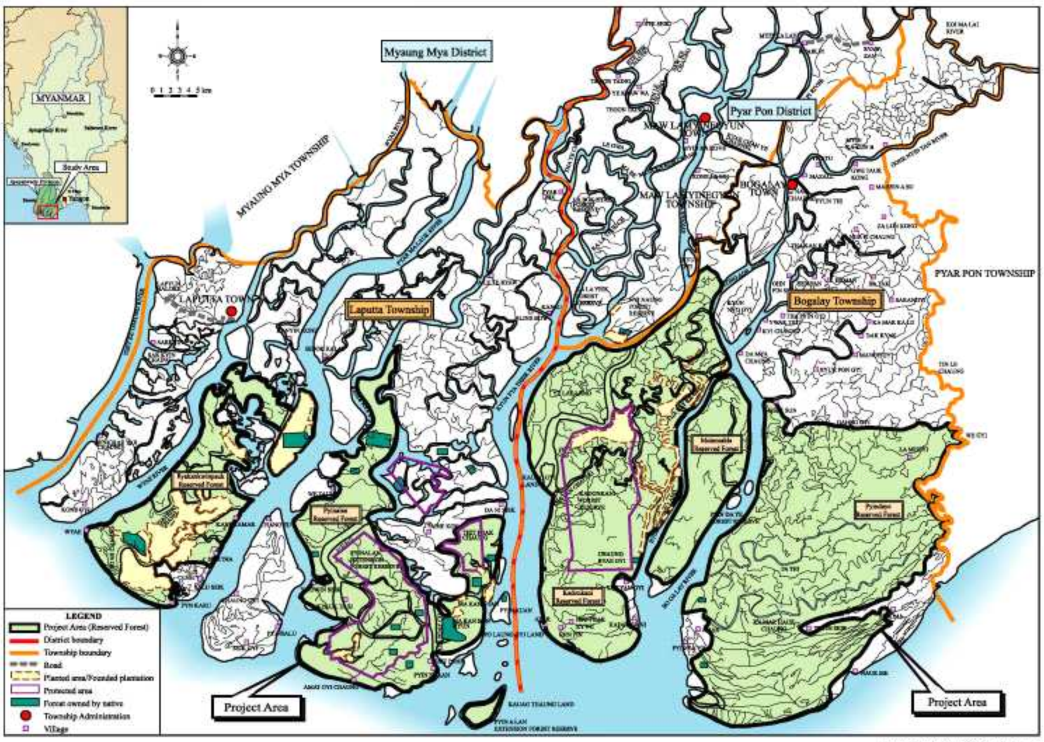
A major threat to the mangrove ecosystem is the human pressure of illegal cutting and the subsequent conversion to agricultural land. Pressure on converting mangrove forest to agricultural land is strong, representing a lowering of productivity triggered by a saline water intrusion to the developed paddy land. As a result of this, developed paddy land is frequently abandoned within a couple of years, leaving behind barren and saline land.

3.4.2 Objective

Introducing community forestry for firewood and agro-forestry that ensures a sustainable livelihood with value-added income-generation is an effective measure for preventing encroachment and for conserving the mangrove. The word 'integrated,' which appears in the research title, means a balance between development and conservation, which leads to the concept of Sustainable Development. The aim of this study is to formulate a master plan for rehabilitating the area, as well as to identify an area for strict conservation. The study is also required to formulate a strategy for the extension or adoption of community forestry. In this regard, it is necessary to prioritise villages for the introduction of community forestry, to achieve the balance of preserving the mangroves whilst maintaining their sustainable use by villagers.

3.4.3 Study Area

The study area covers 223,400 hectares. It is composed of five forest reserves in the Ayeyarwady Delta: (a) Kyakakwnpauk Reserved Forest, (b) Pyinalan Reserved Forest, (c) Kandonkani Reserved Forest, (d) Meinmalha Reserved Forest, and (e) Pyindaye Reserved Forest. Each reserved forest is divided by the forestry department for management purposes. These areas were designated in the 1900s, at the time of the colonial period. Officially inhabitation of these areas is strictly prohibited, but the people are nevertheless encroaching upon them.



Location Map of Study Area

Figure 3.19 Location Map of the Study Area in Myanmar

3.4.4 Approach

A series of analyses were carried out to determine the zoning plan for the area. The JICA Study team carried out a wide range of analyses, both in terms of the natural and social conditions, to characterise the study area. These were: (a) land cover change detection analysis, (b) document review of the endangered list, (c) village profile survey, (d) field investigation survey, (e) map layer preparation, (f) zoning, and (g) priority village selection

(1) Change Detection Analysis.

Vegetative cover change was detected by comparing LANDSAT images of three time periods (1995, 2000 and 2002). The changes in vegetative cover were identified on a forest compartment basis. A historical topographical-map was scanned, geo-referenced, geometrically corrected, and stored into a GIS, to determine the long-term change from the 1920s, at the time when first edition of the topographical map was prepared. Figure 3.20 illustrates the rate of change from 1995-2001, on a forest compartment basis.

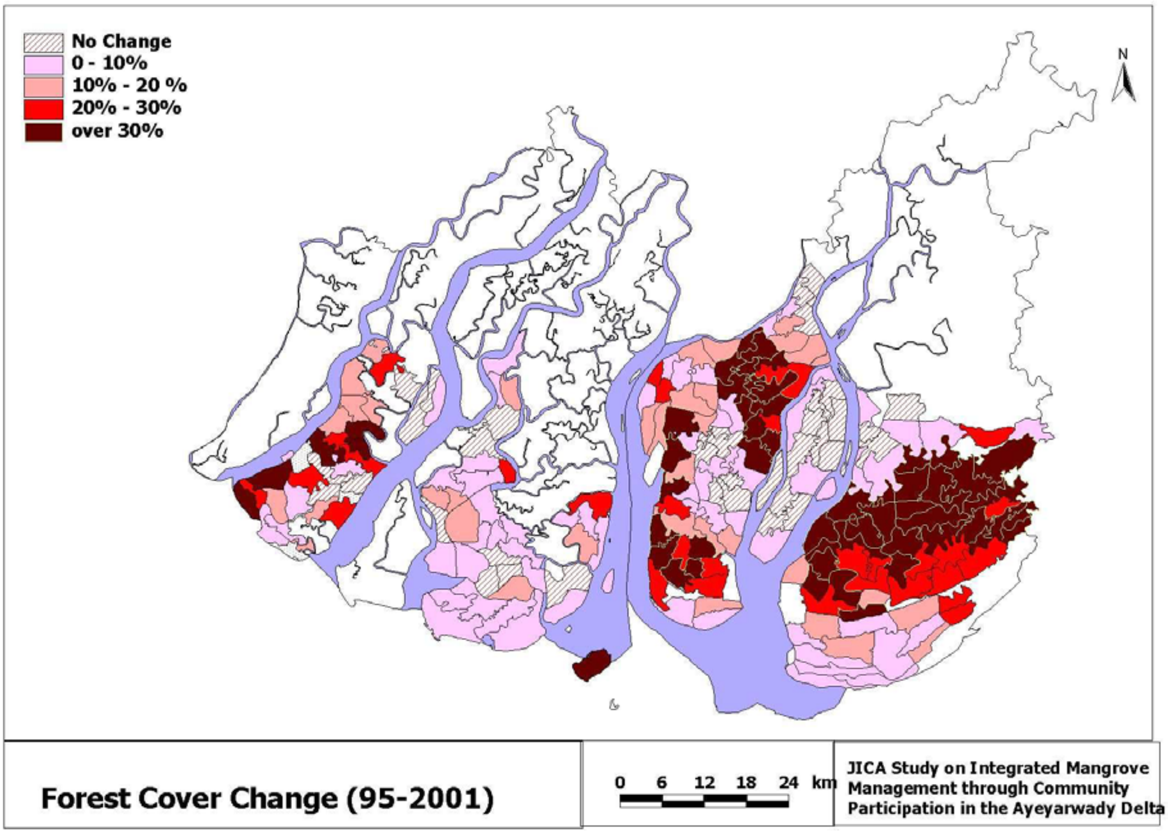


Figure 3.20 Forest Cover Change Map

(2) Document review

Important wildlife species were identified through a review of the Red List prepared by the IUCN, together with a list of protected species and a list of herbal and medicinal plants present in the mangroves. Both of these lists were prepared by the Forest Department in Myanmar. By examining the species list, taxonomic groups such as birds and reptiles were ranked as high priority for conservation. The main species for conservation are: Ayeyarwady Dolphin (*Orcaella brevirostris*), Green Turtle (*Chelonia mydas*), Olive Ridley (*Lepidochelys olivacea*), Loggerhead Turtle (*Caretta caretta*), smooth-coated otter (*Lutra perspicillata*), Asiatic elephants (*Elepaas maximus*), and estuarine crocodiles (*Crocodylus porosus*).

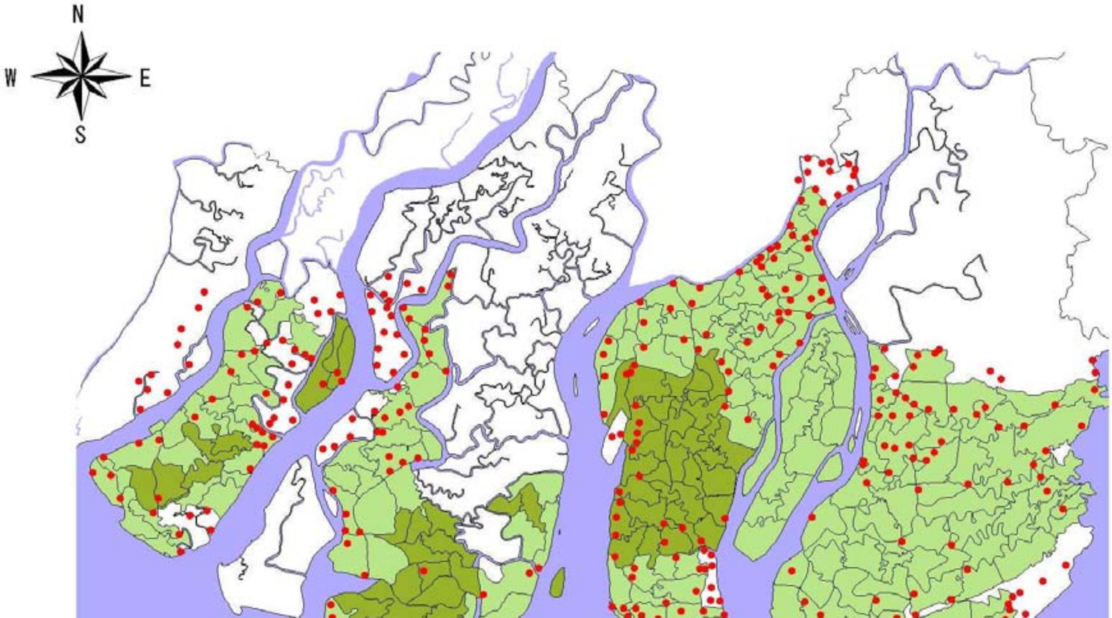
(3) Village Profile Survey (VPS) and Rapid Rural Survey (RRA)

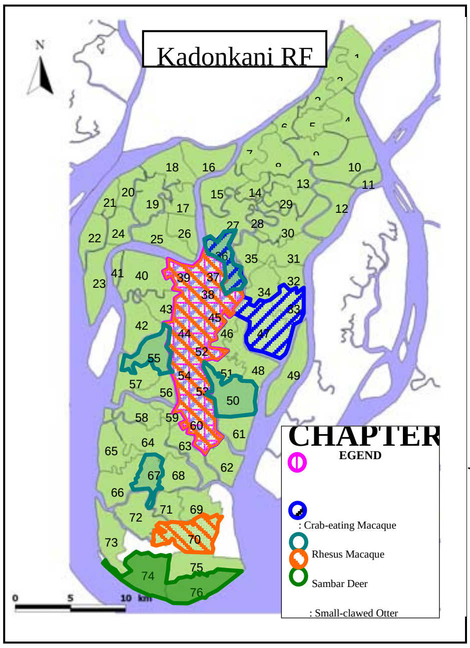
Several types of information were collected from villagers through this survey. These include basic data concerning village profiles, including population, age, ethnicity, income levels, occupations, and the levels of local infrastructure on water, health clinics, and schools. Through RRA, participants are asked to discuss their use of natural resources, including the geographical area in which they collect fuel wood. Surveyors also collect data on the location of the village, by measurements made using GPS. In addition, the surveyors also inquired as to the incidence of certain species that were identified during the document review phase.

Figure 3.20

(4) Field Investigation

In order to identify the species distribution of the mangroves, together with important species in fauna and flora, the mangrove specialist and the fauna and flora specialist of the study team carried out a field investigation to observe the zonal structure of the mangroves, and the species distribution. The information collected regarding the elevation, observed species, and the location measured by GPS receiver, were also stored, as input data for supervised classification of satellite images.

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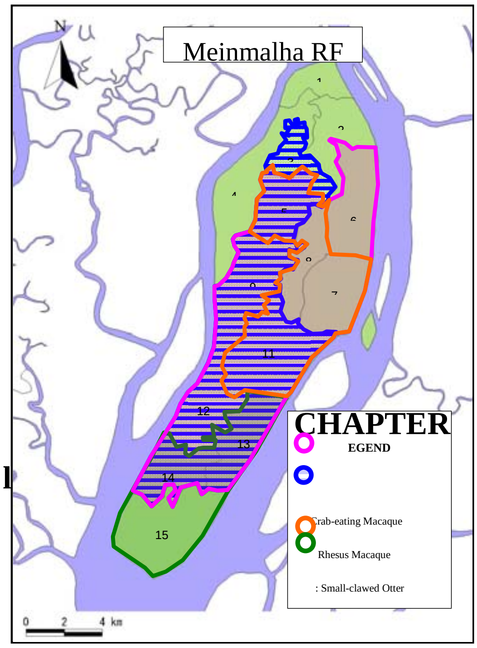
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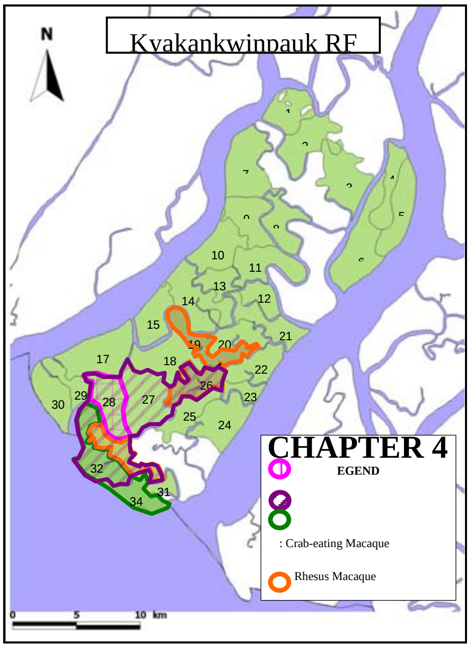
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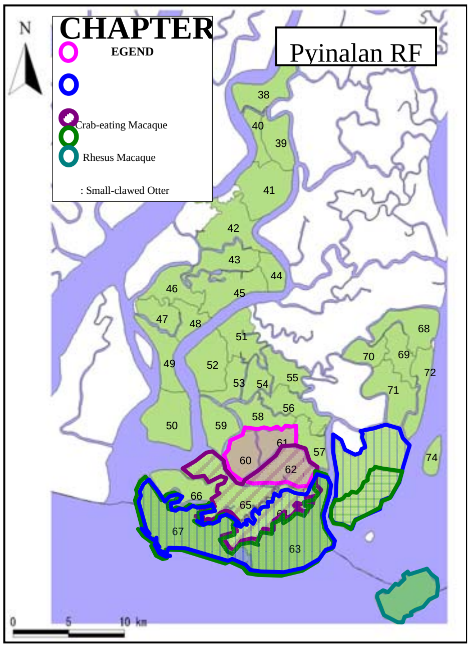
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Figure 3.22 Species Distribution Maps

(5) Map Layer Preparation

A species distribution map was prepared based on the information collected in the field. The species were: (a) the crab-eating macaque, (b) the sambar deer, (c) Asiatic elephants, (d) the olive ridley, (e) the green turtle, and (f) the loggerhead turtle, as shown on Figure 3.22. Thematic maps were also prepared for socio-economic indicators.

(6) Zoning

Map layers were used as the future conservation-zoning plan, which comprises the Protected Area, Buffer Zone, and a Multiple Use Zone. Indicators selected for classifying the area were: (a) percentage of forest cover and (b) the existence of villages. In terms of indicator of forest cover, the following criteria were adopted:

- Category A: Forest with over 60 % of forest cover.
- Category B: Forest with between 30 - 60 % forest cover
- Category C: Forest with less than 30 % forest cover

By combining forest cover with the existence of villages, sub-categories ranging from A1, A2, B1, B2, C1,and C2 were proposed, which correspond to the zoning category in Table 3.5. Figure 3.24 illustrates the land use zoning in the Study area.

Table 3.5 Category and Zoning

Zoning	Category
Protected Area	A1
Special Management Area	A2
Buffer Zone	B1
Multiple Use Area	B2, C1, C2

(Source): Field Report of JICA Mangrove Study

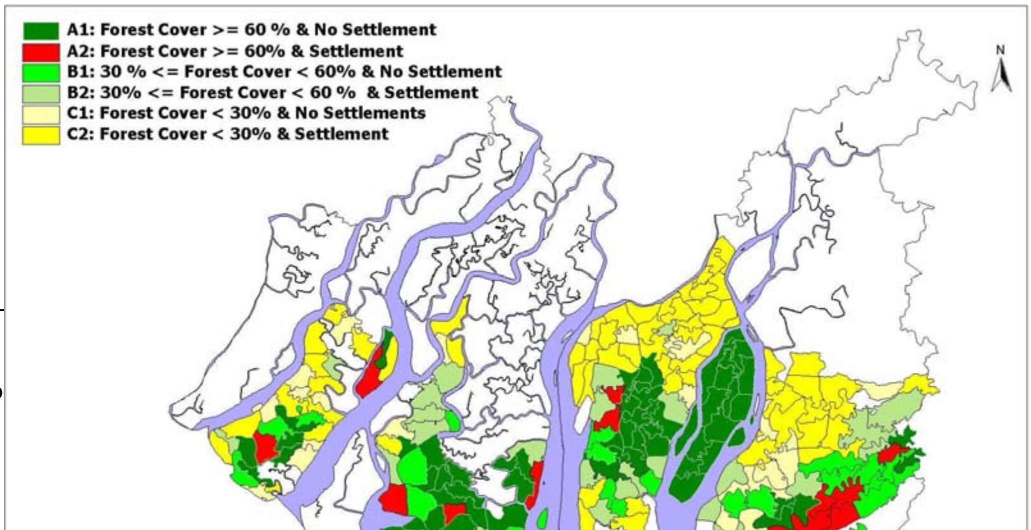

Figure 3.23 Classification Map

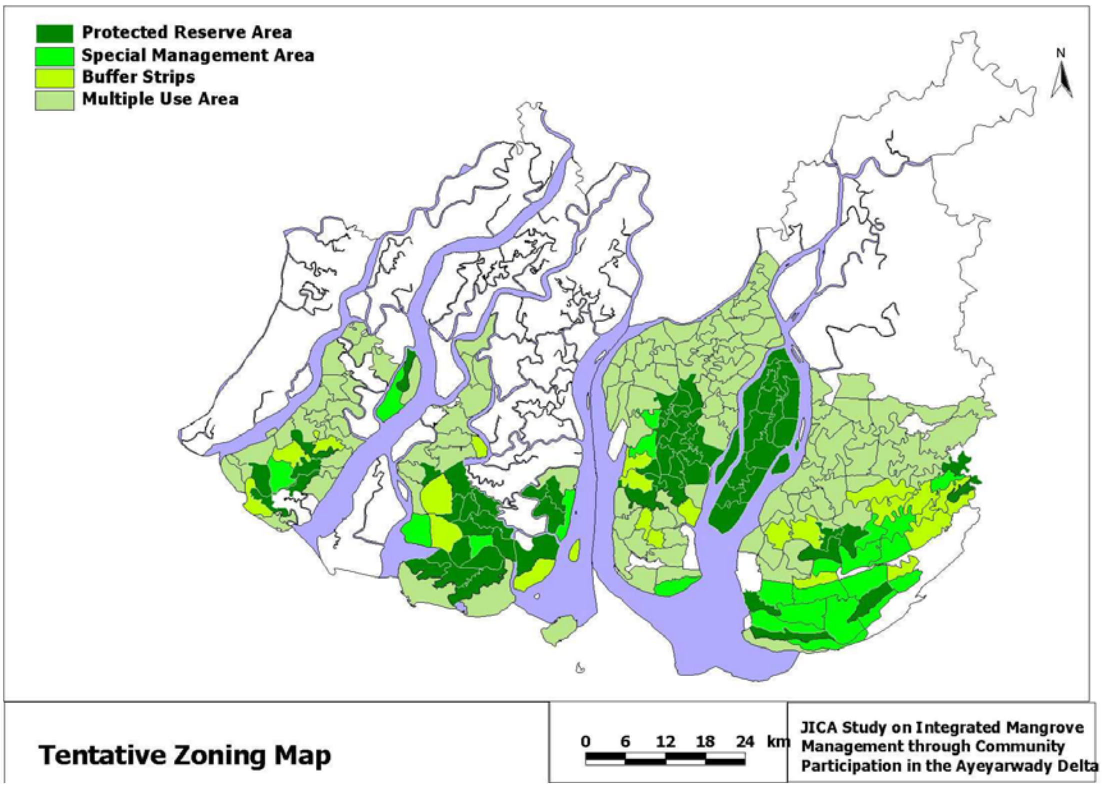

Figure 3.24 Tentative Zoning Map

(7) Priority Selection for Model Villages

By overlaying thematic maps, such as (a) the location of villages (Figure 3.21), (b) fuel wood collecting area for each village (Figure 3.25), and (c) the area of richness in mangrove identified by the satellite images and field observation, suitable model villages were selected

The study focuses on priority villages where the fuelwood collecting area overlaps the area of conservation or the area where government has an intention to protect.

3.4.5 Achievements

(1) Use of historical maps

Historical maps are sometimes a good source of information, particularly when restoring a past environment, and can indicate the long-term change of land cover.

(2) Focus on Local Knowledge

The study attempted to collect the local knowledge of villagers in terms of their use of natural resources, including firewood collection. This is an invaluable tool, both for assisting with the formulation of strategies for mangrove protection in the region, and also for wider etho-botanical issues such as drug discovery and improvements in database nomenclature.

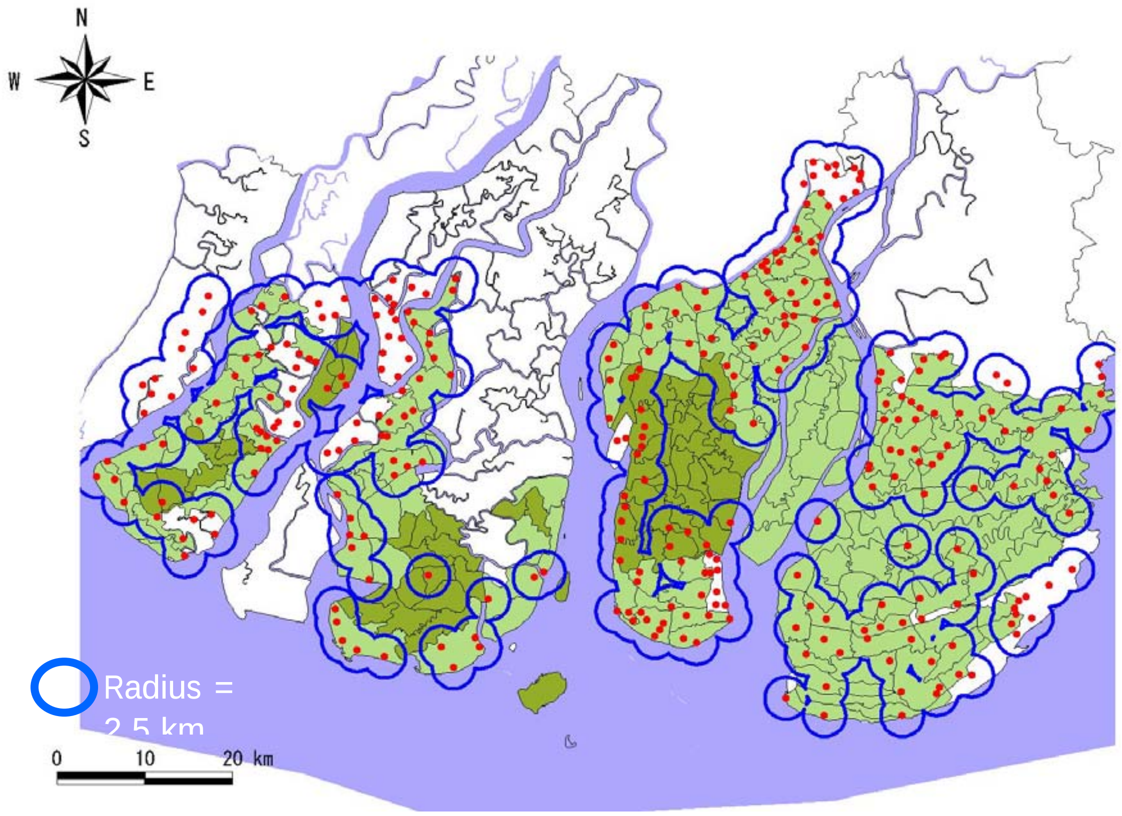

Figure 3.25 Fuelwood Collection Area

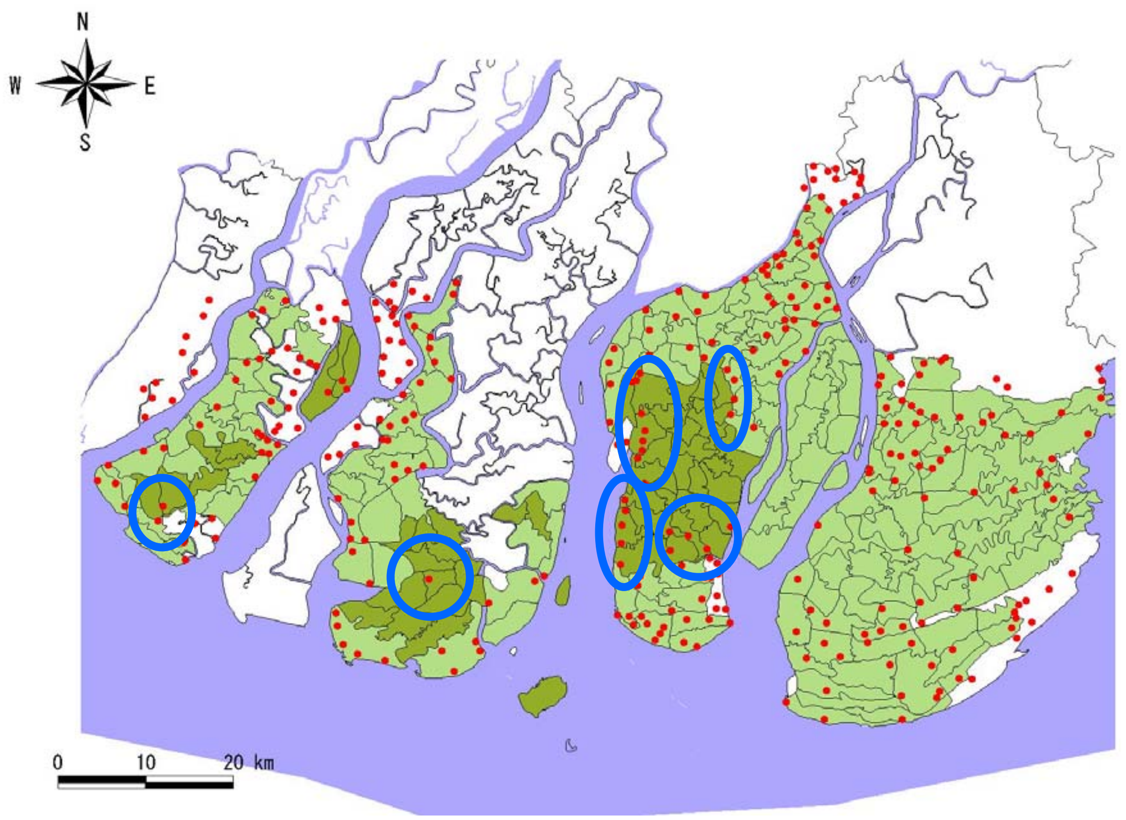

Figure 3.26 Priority Village Map

(3) Hot Spot Identification

This study identified areas where the location of villages and/or the use of natural resources were occurring within or close to protected areas, so this could be a suitable approach for identifying hot-spots of mangrove degradation.

3.4.6 Challenges

(1) Data archiving

It is generally difficult to collect species data on a regular basis in developing countries. Donor-funded research projects can be a good source of biodiversity information, and it is important that any such data is shared effectively, through donor coordination and cooperation.

(2) Incorporating Local Names into Taxonomic Databases

Villagers frequently use local names for their resources and not the international scientific names. The incorporation of local names into a taxonomic database would be beneficial from the ethno-botanical point of view, as described in section 3.4.2 above.

(3) Interviews with Villagers

Interviews with villagers regarding their use of natural resources or the occurrence of species is one of the most valuable research methods in developing countries. However, this is not particularly accurate, since the villagers are not flora and fauna experts, and they are not necessarily acquainted with species identification. Establishing a data collection methodology that ensures accuracy of data and taxonomic identification would be one of the challenges in developing countries.

CHAPTER 4 LESSONS LEARNED AND RECOMMENDATIONS TO IABIN

Through reviewing the case studies, the following points should be raised when considering the use of information for decision-making at a national or regional level, and in foreign development projects.

4.1 National Coordination

Experience in Japan has found that strong high-level coordination is essential to the development of national biodiversity policy, and that this is facilitated by having a central repository for biodiversity information, including GIS based data on a consistent basis.

4.2 Transparency

In the context of the decision making process, it is necessary to make the data or information available to the public due to the controversial issues contained therein. As the Hokkaido case illustrates, there is a lack of information on species distribution. Participatory data gathering, together with environmental education, is one of the solutions to this constraint.

4.3 Land Cadastral Aspect

The Philippine case illustrates that the land cadastral problem is a bottleneck for delineating the boundary of a protected area. It is not a good idea to trigger an involuntary resettlement, when people are living in or around the proposed protected area. The decision supporter should bear in mind social considerations in the context of designating a protected area.

4.4 Use of Historical Documents, Specimens or Maps

To determine the original state of the ecosystem is a first step for biodiversity conservation, especially when evaluating an invasive species. If we incorporate an alien species, it might trigger negative consequences to the ecosystem. However, it is difficult to determine the original state of the ecosystem. Historical documents or species collection is a valuable source of information in this regard. These data sources act as baseline information on the disturbance of the ecosystem. Sometimes these kinds of data are archived in a museum in developed countries. Consequently, co-operation activities between developed countries and developing countries are required in the area of natural history.

4.5 Incorporating Local Names Into Species Databases

As the study in Myanmar demonstrates, local people refer to their natural resources using local names, and not scientific names. To formulate a conservation plan in a participatory manner, non-locals must establish a common knowledge base with local people. It is important therefore to incorporate local knowledge or names of local species into plans and databases. In addition, with this kind of knowledge base established, local communities can provide information on local animal numbers and the medicinal or herbal uses of plants. It is recommended therefore that local names should be incorporated into the species database.

4.6 Digitalising Existing Information

In developing countries, data normally exists in paper or non-electrical form, and is therefore rarely ready to use without further processing. Such data therefore needs to be converted into a digital form.

4.7 Use of GIS

Digitally mapped data on a consistent basis was found to be extremely useful in effective modelling and making policy decisions regarding siting of major projects and defining limits for protected areas and extractive industry restriction.

ANNEX 1 - Literature Cited

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ANNEX 2 - Acronyms and Abbreviations

BRD	Biological Resources Division
CADC	Certificate of Ancestral Domain Claim
CBD	Convention on Biological Diversity
CBFM	Community-Based Forest Management
CBFMA	Community-Based Forest Management Agreement
CHM	Clearing-house Mechanism
DNLI	Digital National Land Information
DSS	Decision Support System
ESI	Environmental Sensitivity Index
GBIF	Global Biodiversity Information Facility
GIS	Geographical Information System
GPS	Global Positioning System
HGAP	Hokkaido Gap Analysis Program
JIBIS	Japan Integrated Biodiversity Information System
JICA	Japan International Cooperation Agency
MAFF	Ministry of Agriculture, Forestry and Fisheries
METI	Ministry of Economy, Trade and Industry
MHLW	Ministry of Health, Labour and Welfare
MLIT	Ministry of Land, Transport and Infrastructure
MOE	Ministry of Environment
MOECSST	Ministry of Education, Culture, Sports, Science and Technology
MOFA	Ministry of Foreign Affairs
NGO	Non Governmental Organisation

NIES	National Institute for Environmental Studies
NIPAS	National Integrated Protected Area System
NORAD	Network of Organisations for Research on Nature Conservation
NSBC	National Strategy on Biodiversity Conservation
PO	Peoples' Organisation
RRA	Rapid Rural Appraisal
USGS	United States Geological Survey
USLE	Universal Soil Loss Equation
VPS	Village Profile Survey
WHRM	Wildlife Habitat Relation Model
WSSD	World Summit of Sustainable Development