

Japan International Cooperation Agency (JICA)

**Directorate General of Land Rehabilitation and Social Forestry,
Ministry of Forestry, the Republic of Indonesia**

**THE STUDY
ON
CRITICAL LAND
AND
PROTECTION FOREST REHABILITATION
AT
TONDANO WATERSHED
IN
THE REPUBLIC OF INDONESIA**

**VOLUME-I
MAIN REPORT**

AUGUST 2001

**Nippon Koei Co., Ltd.
Kokusai Kogyo Co., Ltd.**

AFF

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PREFACE

In response to the request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct the Study on Critical Land and Protection Forest Rehabilitation at Tondano Watershed and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent to the Republic of Indonesia the study team headed by Mr. Hitoshi Shimazaki, Nippon Koei Co., Ltd., three (3) times between February 2000 to May 2001.

The team held discussions with the officials concerned of the Government of the Republic of Indonesia, and conducted field survey and investigation in the study area. After the team returned to Japan, further studies were made and this report was prepared.

I do hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

August 2001



Kunihiro SAITO
The President of
Japan International Cooperation Agency

August 2001

Mr. Kunihiko SAITO
President,
Japan International Cooperation Agency
Tokyo, JAPAN

Letter of Transmittal

Dear Sir,

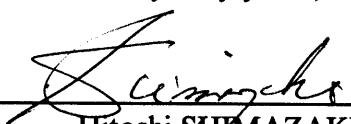
We are pleased to submit to you the report for the Study on Critical Land and Protection Forest Rehabilitation at Tondano Watershed in the Republic of Indonesia. This report presents the results of all work performed in both Indonesia and Japan over a 16 month period from February 2000 to May 2001.

The proposed conservation plan was prepared with the aim of creating sound watershed conditions by applying the basic concept of "Watershed Conservation through Sustainable Land Use". Implementation of the plan will alleviate the risks of hydrological failure, ecological degradation and soil infertility, which would lead to preservation of social functions of Lake Tondano such as generation of electricity, and inland fishery. In consideration of such public benefits, we recommend that the plan be implemented as soon as possible.

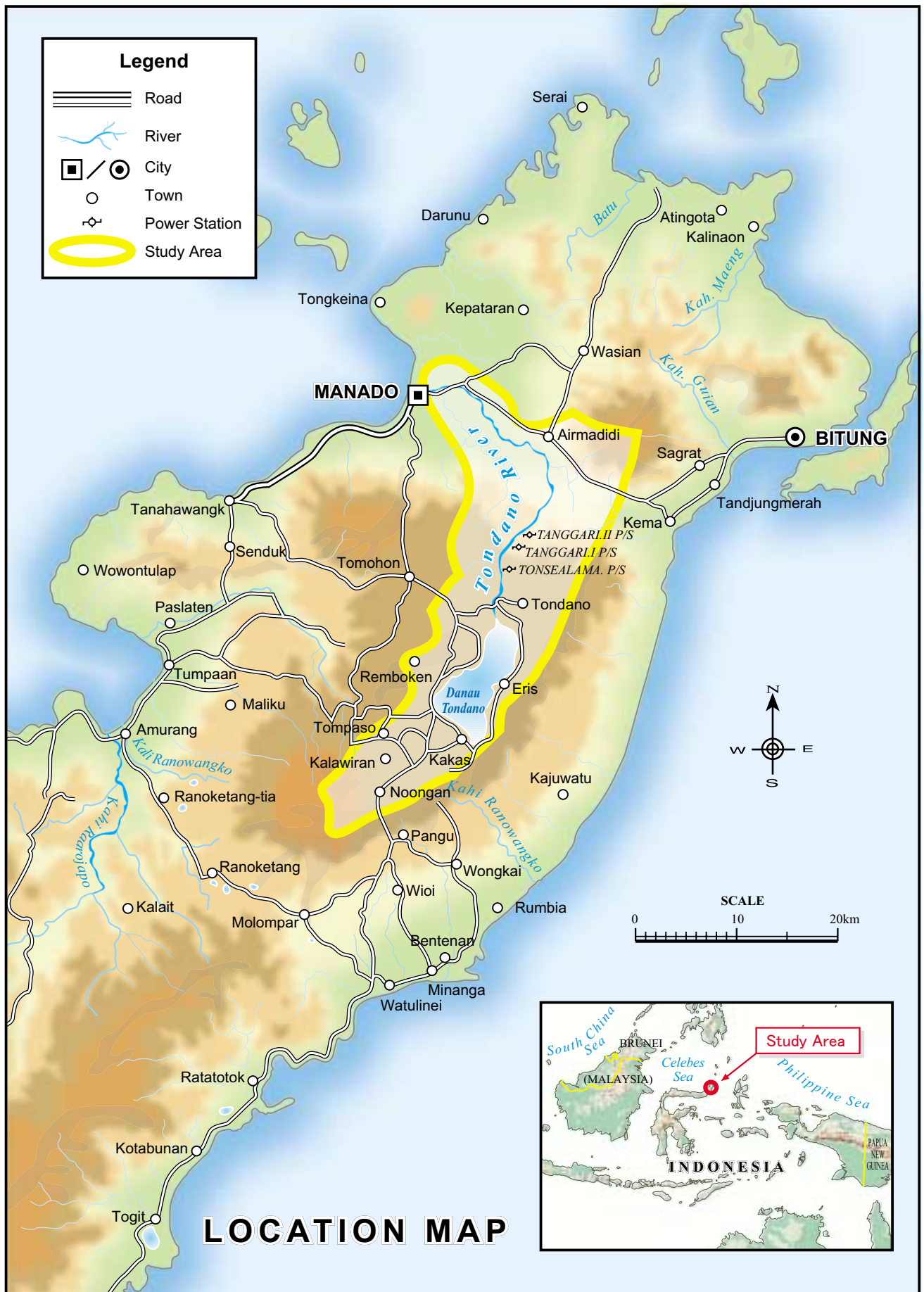
Villagers are engaged in carrying out their livelihoods throughout the watershed. Consequently, watershed conservation will not be sustainable without the participation and empowerment of the community. In the implementation of the plan, the participation and empowerment of community would be regarded as fundamental to the success of the plan and should commence at the earliest possible stage.

We wish to express our deep appreciation and sincere gratitude to the officials concerned of your Agency, the Ministry of Foreign Affairs, and the Ministry of Agriculture, Forestry and Fisheries of the Government of Japan for the courtesies and cooperation kindly extended to our team. We also express our hearty gratitude to the officials concerned from the Indonesian Office of JICA, the Embassy of Japan in Indonesia, the Ministry of Forestry of the Government of Indonesia, the Office of Land Rehabilitation and Soil Conservation, and also local governments for the close cooperation and various forms of assistance extended to our team during field investigations and studies in Indonesia.














Very truly yours,

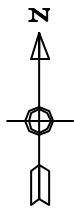

Hitoshi SHIMAZAKI

Team Leader of the Study Team for the
Study on Critical Land and Protection
Forest Rehabilitation at Tondano Watershed



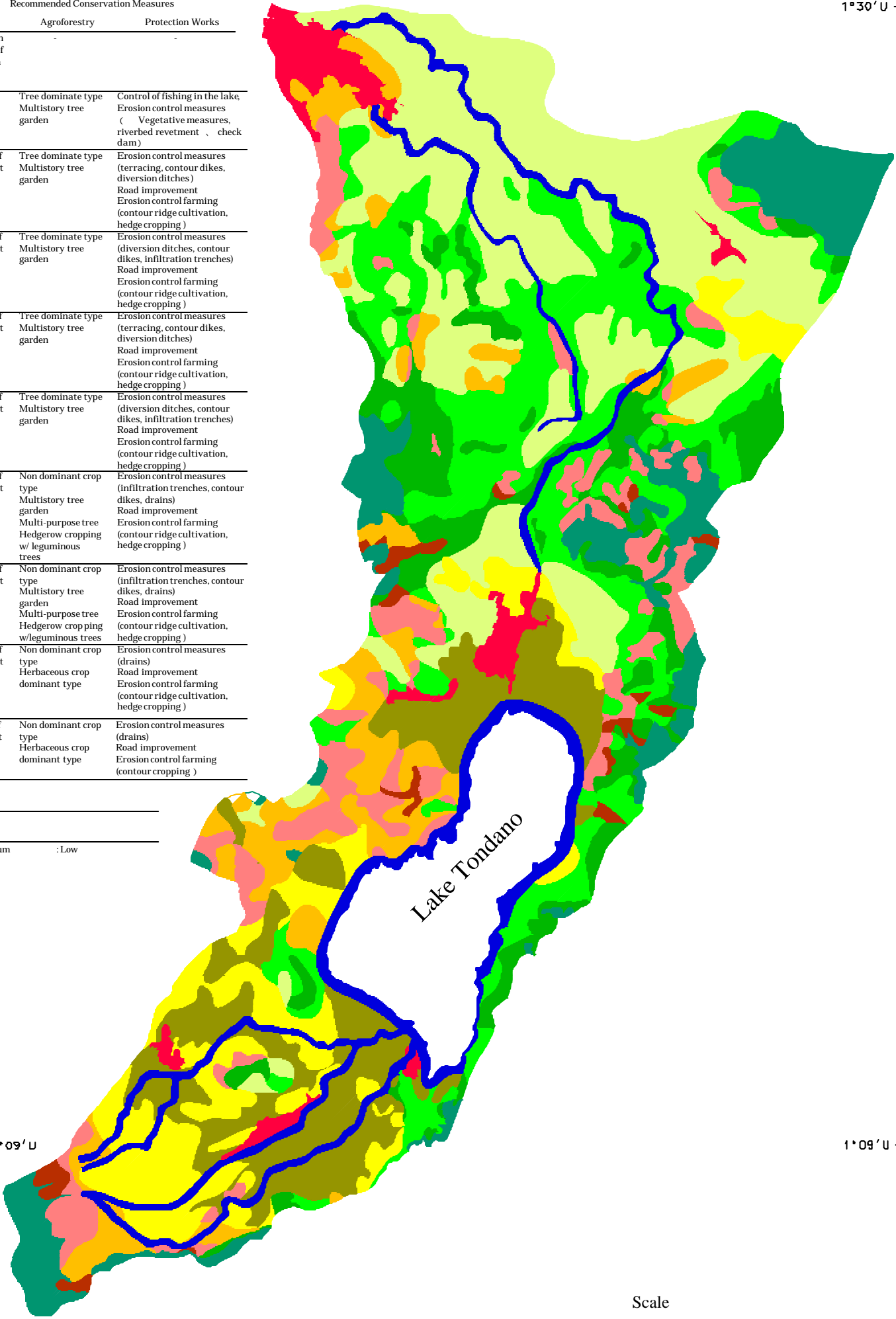
Basic Watershed Conservation Plan

Zones	Land Use	Legend Color	Slope Gradient (%)	Area (ha)	Recommended Conservation Measures			
					Forest	Agroforestry	Protection Works	
P Zone	Forest		> 40	4,361	Reforestation Prevention of reforestation Community forest	-	-	
Bw Zone	Farmlands, forest, wetland		-	3,266	Green belt	Tree dominate type Multistory tree garden	Control of fishing in the lake Erosion control measures (Vegetative measures, riverbed revetment, check dam)	
Bm Zone	Estate		25-40	4,030	Expansion of private forest	Tree dominate type Multistory tree garden	Erosion control measures (terracing, contour dikes, diversion ditches) Road improvement Erosion control farming (contour ridge cultivation, hedge cropping)	
			15-25	7,734	Expansion of private forest	Tree dominate type Multistory tree garden	Erosion control measures (diversion ditches, contour dikes, infiltration trenches) Road improvement Erosion control farming (contour ridge cultivation, hedge cropping)	
	Arable upland		25-40	443	Expansion of private forest	Tree dominate type Multistory tree garden	Erosion control measures (terracing, contour dikes, diversion ditches) Road improvement Erosion control farming (contour ridge cultivation, hedge cropping)	
			15-25	3,825	Expansion of private forest	Tree dominate type Multistory tree garden	Erosion control measures (diversion ditches, contour dikes, infiltration trenches) Road improvement Erosion control farming (contour ridge cultivation, hedge cropping)	
			8-15	3,447	Expansion of private forest	Non dominant crop type Multistory tree garden Multi-purpose tree Hedgerow cropping w/ leguminous trees	Erosion control measures (infiltration trenches, contour dikes, drains) Road improvement Erosion control farming (contour ridge cultivation, hedge cropping)	
			8-15	4,747	Expansion of private forest	Non dominant crop type Multistory tree garden Multi-purpose tree Hedgerow cropping w/leguminous trees	Erosion control measures (infiltration trenches, contour dikes, drains) Road improvement Erosion control farming (contour ridge cultivation, hedge cropping)	
F Zone	Estate		8-15	4,747	Expansion of private forest	Non dominant crop type Multistory tree garden Multi-purpose tree Hedgerow cropping w/leguminous trees	Erosion control measures (infiltration trenches, contour dikes, drains) Road improvement Erosion control farming (contour ridge cultivation, hedge cropping)	
			< 8	5,647	Expansion of private forest	Non dominant crop type Herbaceous crop dominant type	Erosion control measures (drains) Road improvement Erosion control farming (contour ridge cultivation, hedge cropping)	
	Arable upland		< 8	3,782	Expansion of private forest	Non dominant crop type Herbaceous crop dominant type	Erosion control measures (drains) Road improvement Erosion control farming (contour cropping)	
		Paddy Field			6,007			
					2,828			
S Zone								
Note : Priority in Implementation					:High	:Medium	:Low	



1°09'U
124°45'E

1°09'U
125°02'E



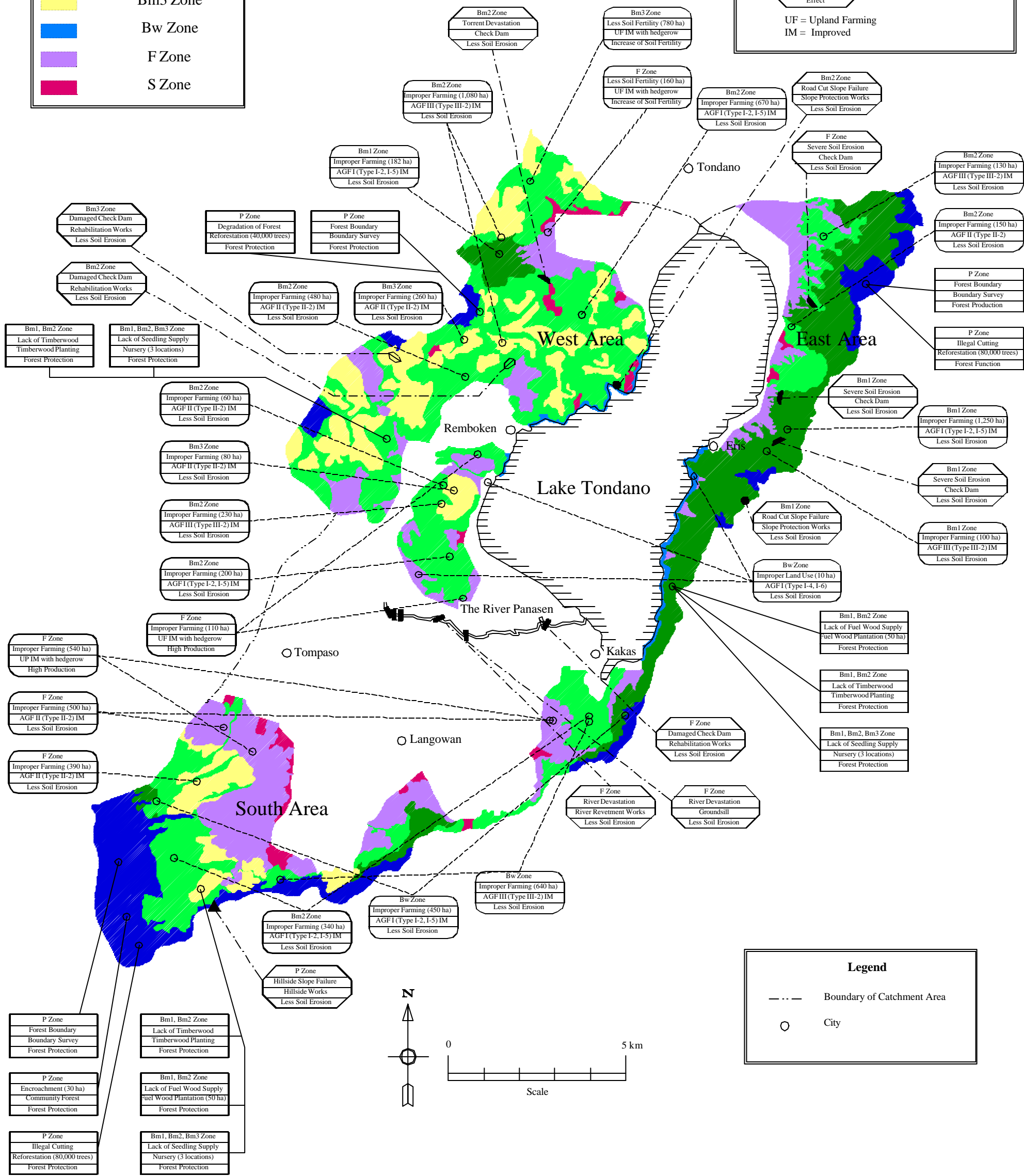
Scale



Basic Watershed Conservation Plan Map
for Study Area

Legend of Zoning	
Color	Zone
	P Zone
	Bm1 Zone
	Bm2 Zone
	Bm3 Zone
	Bw Zone
	F Zone
	S Zone

Legend of Box	
<div>Zone</div> <div>Problem</div> <div>Plan</div> <div>Effect</div>	Forest Conservation
<div>Zone</div> <div>Problem</div> <div>Plan</div> <div>Effect</div>	Agroforestry Development
<div>Zone</div> <div>Problem</div> <div>Plan</div> <div>Effect</div>	Erosion Contol Facility Development
UF = Upland Farming IM = Improved	



Watershed Conservation Plan Map for Intensive Area



General View of Lake Tondano from Eastern Lake Shore Side



Fuel Woods Transportation (Mt. Soputan)



Vegetation of Protection Forest (Mt. Mahawu)



Works in a Nursery (Kawangkoan)



Well Managed Agroforestry (Tondano)



Poor Managed Agroforestry (Airmadidi)



Well Managed Vegetable Field at Steep Slope
(Tomohon)



Clove Estate at Steep Slope (Eris)



Wet Masonry Check Dam (Toulinag Oki)



Cage Fish Culture in Lake Tondano (Eris)



Semi-structured Interview Survey (RRA Survey)
(Tompaso)



Seminar on the Study (Manado)