

SECTOR D

NATURAL

ENVIRONMENT

**THE STUDY ON COMPREHENSIVE WATER MANAGEMENT
OF MUSI RIVER BASIN IN THE REPUBLIC OF INDONESIA**

FINAL REPORT

SECTOR D

NATURAL ENVIRONMENT

TABLE OF CONTENTS

1.	NATURAL ECOSYSTEMS AND HUMAN IMPACTS.....	D-1
1.1	Ecosystems of South Sumatra	D-1
1.2	Sumateran Lowland Rain Forest	D-3
1.3	Sumateran Freshwater Swamp Forest	D-4
1.4	Sumateran Peat Swamp Forest	D-5
1.5	Sunda Shelf Mangroves.....	D-7
1.6	Sumateran Montane Rain Forest	D-8
1.7	River and Lake Ecosystems.....	D-9
1.7.1	Rivers	D-9
1.7.2	Lake Ranau	D-9
2.	URBAN AND INDUSTRIAL ENVIRONMENT.....	D-10
2.1	Urban Environment	D-10
2.2	Industrial Environment.....	D-11
3.	LAWS AND INSTITUTIONS FOR ENVIRONMENTAL MANAGEMENT	D-12
3.1	General Land Use Plan	D-12
3.2	Conservation of Natural Environment.....	D-12
3.2.1	International Condition	D-12
3.2.2	National Condition.....	D-13
3.2.3	Provincial Condition	D-15
3.3	Forestry, Agriculture, and Estate Development	D-21
3.3.1	Forestry	D-22
3.4	Environmental Impact Assessment (AMDAL Process).....	D-26
4.	EXISTING AND POTENTIAL ENVIRONMENTAL ISSUES.....	D-28
4.1	Goals and Current Issues	D-28
4.2	Existing Threat from Activities in Forestry, Estate, and Agriculture.....	D-28

4.2.1	Expansion of Wasted Land and Erosion	D-28
4.2.2	Poor Species Diversity in Forestry, Estate, and Agriculture.....	D-31
4.2.3	Forest Fire and Haze	D-31
4.3	Existing and Potential Impact From Water Development	D-32
4.4	Needs for Strong and Coordinated Conservation Policy	D-32
4.4.1	Placing Musi Watershed in National Priority List	D-33
4.4.2	Review and Update of Protected Areas.....	D-33
4.4.3	Peat Wetland and Mangrove Need More Attention	D-34
4.4.4	Improvement of Guidelines.....	D-35
4.4.5	Transparent Civil Management.....	D-36
4.4.6	Allocation of Budget for Training.....	D-36
4.5	Potential Degradation of Urban and Industrial Environment	D-36
4.6	Needs for Careful Research and Planning for Future Tourism Development	D-37
4.7	Environmental Research, Education, and Public Participation.....	D-37
4.7.1	Monitoring.....	D-37
4.7.2	Recording of Traditional Technology	D-37
4.7.3	Consulting for Integrated Land Management	D-38
4.7.4	Education, Training, Communication, Employment	D-38
4.7.5	Desirable Capacity of Extension Office.....	D-39
5.	GOALS AND OBJECTIVES OF WATERSHED REHABILITATION AND CONSERVATION (MASTER PLAN COMPONENT 3).....	D-40
5.1	Goals and Objectives	D-40
5.2	Relationship with Other Sectors	D-42
6.	PROGRAM FOR WATERSHED REHABILITATION AND CONSERVATION (MASTER PLAN COMPONENT 3)	D-43
6.1	Soil Erosion Prevention	D-43
6.1.1	Reforestation on Land with Major Constraints	D-43
6.1.2	Law Enforcement against Destruction of Forest.....	D-49
6.1.3	Inner- and Inter-Basin Coordination (Program 3-6)	D-54
6.2	Rehabilitation and Conservation of Natural Environment.....	D-57
6.2.1	Expansion of Forest Area.....	D-57
6.2.2	Management of River Environment (Program 3-9)	D-64
6.2.3	Conservation of Swamp and Mangrove Forests	D-66

7.	SELECTION OF PRIORITY PROGRAMS	D-72
8.	COST ESTIMATION AND IMPLEMENTATION PROGRAM OF THE PRIORITY PROGRAMS	D-74
8.1	Soil Erosion Prevention	D-74
8.1.1	Application of Agroforestry on Land with Major Constraints (Program 3-1).....	D-74
8.1.2	Strengthening of Agriculture/Estate/Forestry Extensions (Program 3-3).....	D-77
8.1.3	Reforestation of Production Forests / Forest Estates (Program 3-4)	D-78
8.1.4	Inner- and Inter-Basin Coordination (Program 3-6).....	D-80
8.2	Rehabilitation and Conservation of Natural Environment	D-82
8.2.1	Rehabilitation of Existing Protected Forests (Program 3-7).....	D-82
9.	PROGRAM EVALUATION	D-85
9.1	Application of Agroforestry on Land with Major Constraints (Program 3-1)	D-85
9.1.1	Social Evaluation	D-85
9.1.2	Economic Evaluation	D-85
9.1.3	Financial Evaluation	D-85
9.1.4	Technical Evaluation	D-86
9.1.5	Environmental Evaluation	D-86
9.2	Strengthening of Agriculture/Estate/Forestry Extensions (Program 3-3) ..	D-86
9.2.1	Social Evaluation	D-86
9.2.2	Economic Evaluation	D-86
9.2.3	Financial Evaluation	D-87
9.2.4	Technical Evaluation	D-87
9.2.5	Environmental Evaluation	D-87
9.3	Reforestation of Production Forests / Forest Estates (Program 3-4).....	D-87
9.3.1	Social Evaluation	D-87
9.3.2	Economic Evaluation	D-88
9.3.3	Financial Evaluation	D-88
9.3.4	Technical Evaluation	D-88
9.3.5	Environmental Evaluation	D-89
9.4	Inner- and Inter-Basin Coordination (Program 3-6).....	D-89
9.4.1	Social Evaluation	D-89
9.4.2	Economic Evaluation	D-89
9.4.3	Financial Evaluation	D-89
9.4.4	Technical Evaluation	D-89
9.4.5	Environmental Evaluation	D-89

9.5	Rehabilitation of Existing Protected Forests (Program 3-7)	D-90
9.5.1	Social Evaluation.....	D-90
9.5.2	Economic Evaluation	D-90
9.5.3	Financial Evaluation.....	D-90
9.5.4	Technical Evaluation.....	D-90
9.5.5	Environmental Evaluation.....	D-90

LIST OF TABLES

Table D1.1.1	Applicable Ecoregions by Regencies and Municipalities	D-3
Table D2.2.1	Mineral Resources in South Sumatra (under development / under survey).....	D-11
Table D3.2.1	IUCN Red Data Animals for southern Sumatra	D-14
Table D3.2.2	Laws and Regulations Related to Environmental Conservation in Indonesia	D-15
Table D3.2.3	Coordination of Offices	D-16
Table D3.2.4	Definition of Forest Areas in South Sumatra	D-17
Table D3.2.5	Designated Forest Area in South Sumatra.....	D-17
Table D3.2.6	Protected Areas in South Sumatra	D-17
Table D3.2.7	Areas of Eco-Regions and Ratio of Protected Forests	D-18
Table D3.2.8	Number of Staff at Conservation Forest (SM, HSA, TWA)	D-18
Table D3.2.9	Protected Areas of South Sumatra.....	D-19
Table D3.2.10	Protected Species of South Sumatra.....	D-20
Table D3.3.1	Coordination of Provincial Departments.....	D-21
Table D3.3.2	Number of Office and Staff of Agriculture Extension by Regency Year 2000	D-21
Table D3.3.3	Forest Area Decrease 1995-2000 (ha)	D-22
Table D3.3.4	Forest Production in South Sumatra.....	D-24
Table D3.4.1	Water-related projects that are subject to environmental impact assessment.....	D-26
Table D6.1.1	Land Area that has Major Constraints by Sub-Basin	D-44
Table D6.1.2	Target Land Use Types for Erosion Prevention	D-45
Table D6.1.3	Number of Office and Staff of Agriculture Extension by Regency Year 2000	D-48
Table D6.1.4	Production Forests in South Sumatra Province	D-49
Table D6.1.5	Priority Sites for Investigation for Reforestation	D-51
Table D6.1.6	Actions for Reforestation of Production Forests	D-52
Table D6.1.7	Types of Illegal Logging	D-52
Table D6.1.8	Actions for Reforestation of Production Forests	D-54
Table D6.1.9	Examples of Counter Measures against Illegal Logging.....	D-54
Table D6.1.10	Sub-Basins and Shared Concerns	D-55
Table D6.1.11	Kabupatens and Sub-Basins	D-56

Table D6.2.1	Area of Sub-Basins and Ratio of Protected Forests.....	D-59
Table D6.2.2	Project Components for Rehabilitation of Protected Forest	D-60
Table D6.2.3	Number of Staff at Conservation Forest 2001	D-60
Table D6.2.4	Priority Area for New Designation of Protected Forest.....	D-61
Table D6.2.5	Area of Eco-Regions and Ratio of Protected Forests	D-62
Table D6.2.6	Land with Major Constraints by Sub-Basin.....	D-62
Table D6.2.7	Area of Sub-Basins and Ratio of Protected Forests.....	D-62
Table D6.2.8	Project Components for New Designation of Protected Forests	D-64
Table D6.2.9	Example of River Sections under Significant Human Influences	D-65
Table D6.2.10	Priority Areas for Conservation of Tidal Swamp Forest	D-67
Table D6.2.11	Project Components for Tidal Swamp Forest Conservation.....	D-68
Table D6.2.12	Scope of Study for Existing Condition at Tanjung Api Api	D-69
Table D7.1.1	Evaluation of Priorities for Each Proposed Programs	D-73
Table D8.1.1	Landuse on the Land with Major Constraints	D-74
Table D8.1.2	Program Cost for Agroforestry Projects in Farmer's Plantation (Program 3-1).....	D-76
Table D8.1.3	Program Cost for Strengthening of Agriculture/Estate/ Forestry Extension (Program 3-3).....	D-78
Table D8.1.4	Priority 21 Sites for Reforestation	D-79
Table D8.1.5	Program Cost for Reforestation of Production Forest/ Forest Estate (Program 3-4)	D-80
Table D8.1.6	Sub-Basins and Shared Concerns	D-81
Table D8.1.7	Kabupatens and Sub-Basins for Groups of Sub-Basins.....	D-81
Table D8.2.1	Landuse Other Than Forest Cover within the Protected Forests in All Protected Forests	D-82
Table D8.2.2	Target Area for Forest Rehabilitation Program in All Protected Forests	D-83
Table D8.2.3	Program Cost for Rehabilitation of Existing Protected Forests (Program 3-7).....	D-84
Table D9.1.1	Comparison of Program Cost and Development Expenditure (Program 3-1).....	D-85
Table D9.2.1	Comparison of Program Cost and Development Expenditure (Program 3-3).....	D-87
Table D9.3.1	Comparison of Program Cost and Development Expenditure (Program 3-4).....	D-88

Table D9.3.2	ITTO Guidelines on Tropical Production Forests	D-89
Table D9.5.1	ITTO Guidelines on Tropical Forest Conservation.....	D-90

LIST OF FIGURES

Figure D1.1.1	Ecoregions of southern Sumatra.....	D-2
Figure D1.2.1	Major Human Impacts on Sumateran Lowland Forests.....	D-4
Figure D1.3.1	Major Human Impacts on Sumateran Freshwater Swamp Forests.....	D-5
Figure D1.4.1	Major Human Impacts on Sumateran Peat Swamp Forest.....	D-7
Figure D1.5.1	Major Human Impacts on Sunda Shelf Mangroves.....	D-8
Figure D1.6.1	Major Human Impacts on Montane Rain Forest	D-9
Figure D3.3.1	Selective Cutting and Secondary Growth of Production Forest	D-22
Figure D3.3.2	Production Forest with Acacia Plantation and Forest Converted to Estate.....	D-23
Figure D3.3.3	Possible Conflict Between Forest Conservation and Increase of Land Clearance.....	D-24
Figure D4.1.1	Land Use Transformation in South Sumatra	D-29
Figure D5.1.1	Conceptual Map of Target Areas.....	D-40
Figure D5.1.2	Overall Scheme for Rehabilitation and Conservation of the River Basin.	D-41
Figure D6.1.1	Introduction of Agroforestry on Land with Major Constraints ..	D-43
Figure D6.1.2	Land with Major Constraints (Not Suitable for Agricultural Use).....	D-44
Figure D6.1.3	Land Use Types within the Constraints Area.....	D-45
Figure D6.1.4	Land Use Types within the Constraints Area by Sub-Basin	D-45
Figure D6.1.5	Conceptual Relationship of Road, River, Village and Farmer's Plantations	D-46
Figure D6.1.6	Land Use Regulation on the Land with Major Constraints	D-47
Figure D6.1.7	Expected Function and Necessary Input for Agriculture/ Estate/Forestry Extensions	D-48
Figure D6.1.8	Image of Coordination within Inter- and Inner-Basin Organization	D-56
Figure D6.1.9	Actions Expected for Inter- and Inner-Basin Organization.....	D-57
Figure D6.2.1	Designated Protected Forest and Forest Land Use.....	D-58
Figure D6.2.2	Land Use in Protected Forests	D-58

Figure D6.2.3	Five Steps for Designation of New Protected Forest.....	D-63
Figure D6.2.4	Project Schedule for Management of River Environment.....	D-66
Figure D6.2.5	Project Schedule for Tidal Swamp Forest Conservation	D-68
Figure D6.2.6	Project Schedule for Freshwater Swamp Conservation.....	D-71
Figure D8.1.1	Six Target Regions for Promotion of Agroforestry Technology.....	D-75
Figure D8.1.2	Project Image Chart for First Phase Agroforestry Program	D-75
Figure D8.1.3	Implementation Schedule for Agroforestry on Land with Major Constraints (Program 3-1).....	D-77
Figure D8.1.4	Implementation Schedule for Strengthening of Agriculture/ Estae/Forestry Extension (Program 3-3).....	D-78
Figure D8.1.5	Implementation Schedule for Reforestation of Production Forest/ Forest Estate (Program 3-4).....	D-80
Figure D8.2.1	Implementation Schedule for Rehabilitation of Existing Protected Forests (Program 3-7)	D-83

LIST OF ANNEXES

Annex D1.1.1	Descriptions of Ecoregions in South Sumatra	DA-1
Annex D3.1.1	Ministerial Priority List of Watershed for Rehabilitation of Rehabilitation of Forest and Land	DA-6
Annex D3.1.2	Suggested Priority List for Rehabilitation and Sedimentation Prevention (Tentative)	DA-6
Annex D6.1.1	Land Systems That Has Major Constraints for Agriculture Use	DA-7
Annex D6.1.2	Land Use Types within the Constraints Area by Sub-Basin.....	DA-7
Annex D6.1.3	Logging Concession (HPH) and Mining Activities as of 2001.....	DA-8
Annex D6.2.1	Definition of Designated Forest Area, Forest Land Use, and Non-Forest Land Use	DA-9