

JAPAN INTERNATIONAL COOPERATION AGENCY

**MINISTRY OF ENVIRONMENTAL PROTECTION AND REGIONAL DEVELOPMENT
REZEKNE REGIONAL ENVIRONMENTAL BOARD
REZEKNE DISTRICT COUNCIL
THE REPUBLIC OF LATVIA**

**THE STUDY
ON
ENVIRONMENTAL MANAGEMENT PLAN
FOR
LUBANA WETLAND COMPLEX**

FINAL REPORT

**VOLUME I
EXECUTIVE SUMMARY**

DECEMBER 2000

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LIST OF VOLUMES

Volume I	Executive Summary
Volume II	Main Report
Volume III	Supporting Report
Volume IV	Data Book

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PREFACE

In response to a request from the Government of the Republic of Latvia, the Government of Japan decided to conduct a master plan study on Environmental Management Plan for Lubana Wetland Complex and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Yoichi Iwai of Nippon Koei Co., Ltd. and consisting of Nippon Koei Co., Ltd. and Kokusai Kogyo Co., Ltd. to Latvia, three times between August 1999 and October 2000. In addition, JICA set up an advisory committee headed by Mr. Masahiro Ota, JICA Development Specialist between July 1999 and December 2000, which examined the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of Latvia and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

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

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Latvia for their close cooperation extended to the Team.

December 2000



Kunihiko Saito
President
Japan International Cooperation Agency

December 2000

Mr. Kunihiko Saito
President
Japan International Cooperation Agency
Tokyo, Japan

Dear Sir,

LETTER OF TRANSMITTAL

We are pleased to submit to you the Final Report on the Study on Environmental Management Plan for Lubana Wetland Complex in the Republic of Latvia. This report presents the results of all works conducted in both Latvia and Japan during a total period of 17 months from August 1999 through December 2000.

This is an environmental management plan to achieve sustainable development in the Lubana Wetland Complex area for the target year 2010. This management plan includes the wetland conservation projects, the water level management projects, and the development projects for eco-tourism and fishery.

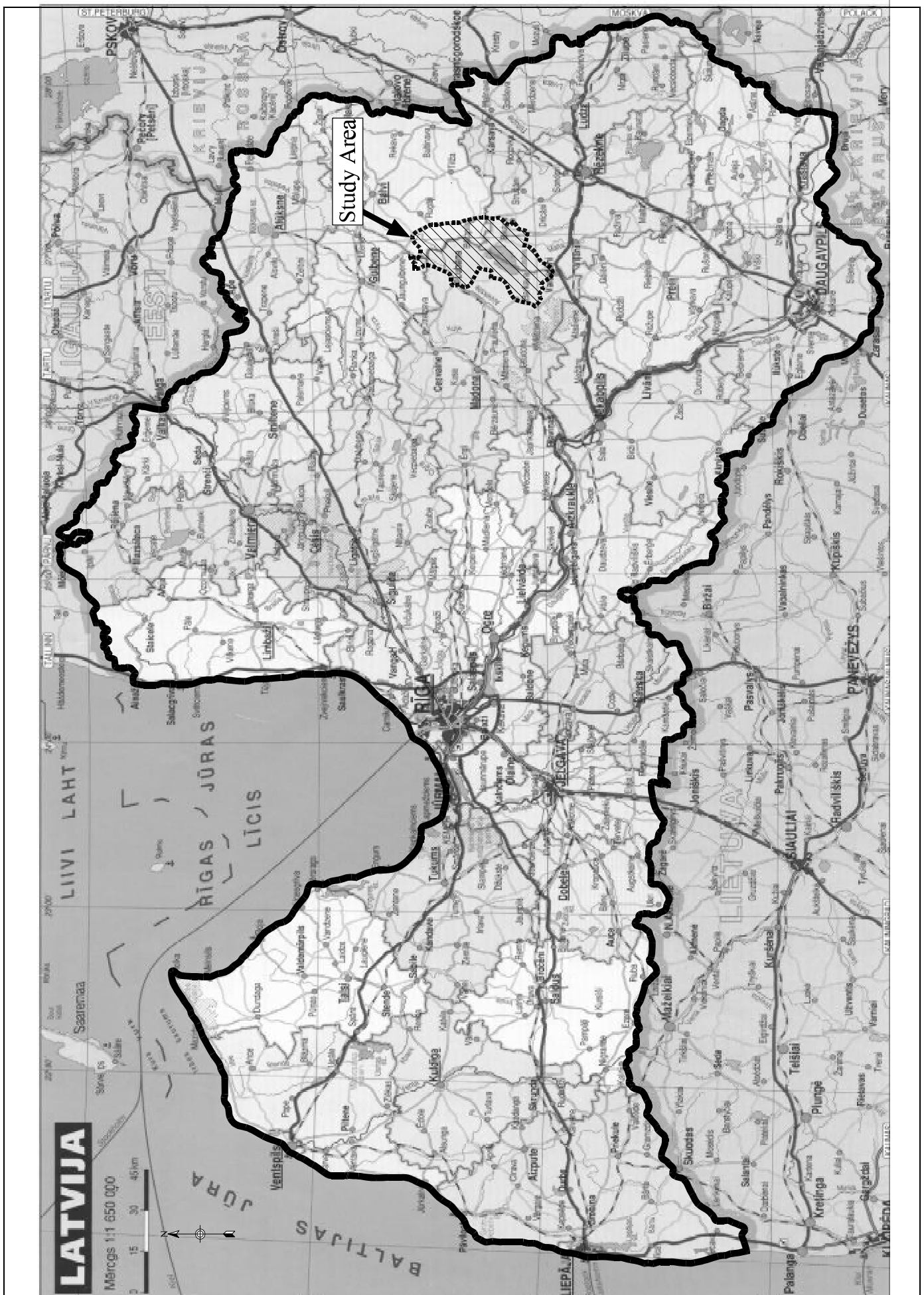
These projects will preserve the internationally important wetland ecosystem, and contribute to regional development in and around the study area. We are confident that the projects, once implemented, will greatly help conserve the environment and improve the socioeconomic development in the Lubana Wetland Complex area. Hence, we recommend to implement the projects as early as possible.

We wish to express our deep appreciation and sincere gratitude to your Agency, the Advisory Committee, the Ministry of Foreign Affairs, and the Environmental Agency of Japan for the courtesies and cooperation kindly extended to our team. We also wish to express our hearty appreciation and gratitude to the Government of the Republic of Latvia and the Embassy of Japan in Latvia for close cooperation and assistance extended to us during our field investigation and study in Latvia.

Very truly yours,



Yoichi Iwai
Team Leader
The Study on Environmental Management
Plan for Lubana Wetland Complex



Location of Study Area

OUTLINE OF THE STUDY

1. Objectives

The objectives of the Study on the Environmental Management Plan for Lubana Wetland Complex (LWC) in the Republic of Latvia (the Study) are:

- a) To formulate an Environmental Management Plan (EMP) for conservation of environmental assets and sustainable use of natural resources in the study area with the target year of 2010, and
- b) To transfer technology on the formulation of EMP to the Latvian counterparts.

2. Framework of the Environmental Management Plan (EMP)

(1) Overall concept

The fundamental vision of the EMP for LWC is set as:

“ Wise Use of the Lubana Wetland Complex”.

The goals to attain this vision are 1) Conservation of Natural Environment and 2) Sustainable Use of Natural Resources. The target area is the whole LWC (about 810 km²) including Lake Lubana, and the target year is set at 2010.

(2) Environmental zoning

The EMP area should be divided into 3 zones, namely Nature Preservation Zone (NPZ), Active Management Zone (AMZ), and Development Zone (DZ). The areas of each zone are 186 km² (23% of the total LWC area) for NPZ, 261 km² (32%) for AMZ, and 367 km² (45%) for DZ respectively.

(3) Organization for EMP

The establishment of the Implementation Committee (IC) and the Environmental Management Center (EMC) is proposed for actual implementation of EMP. The IC is a management authority of EMP which deliberates, authorizes, and coordinates substantial matters related to EMP, and EMC is a site specific organization for actual implementation of EMP. These two organizations should be established before implementation of EMP because they will be required a lot of preparatory works including application of available soft (low interest rate) loan.

In order to effectively and steadily implement the projects and programs proposed under EMP, the following 5 major institutional roles should be set up to realize wise and sustainable use of LWC and to manage the existing institutional difficulties.

- Initiative role for local people's participation,
- Coordination role between environmental side and development sector,
- Enforcement and technical role on implementation,

- Environmental monitoring role for LWC, and
- Environmental education role for residents and visitors.

3. Wetland Conservation Plan

The main strategies are a) to emphasize the biodiversity in rivers and lake, b) to preserve and conserve the wetland vegetation, c) to strengthen the function of forests, d) to manage game animals and birds through hunting, e) to promote eco-tourism for nature protection, and f) to focus on environmental education and public awareness.

In addition to the regulations of protected areas, biodiversity of LWC is protected by the following active measures as a potential Ramsar site.

- Environmental management center construction project
- Biotope conservation program
- Environmental research and monitoring program
- Environmental education and public awareness promotion program

The total cost for WCP is indicatively estimated about 2.3 million LVL including O/M costs up to 2010. The cost for the EMC construction project is about 375,000 LVL including necessary indoor and outdoor facilities.

4. Eco-tourism Development Plan

The eco-tourism is defined as “the promotion of environmentally sensitive tourism and the provision of facilities and environmental education so that tourist will visit, understand, appreciate and enjoy natural and cultural areas without causing unacceptable impacts or damage to their ecosystem or to local culture”. Considering the current socioeconomic and natural conditions of LWC, an introduction of eco-tourism is indispensable for conservation of precious wetland ecosystem and its wise use. Moreover, a promotion of rural tourism focusing on aggressive use of natural resources is emphasized in a development direction of the Latgale region. The strategies of eco-tourism development are set as follows considering possibilities of rural tourism development.

- sustainable natural resources management,
- local community driven development process,
- entrepreneurship promotion,
- full support by local government and public institutions,
- collaboration between public and private sectors,
- small scale eco-tourism and long-term benefits,
- supply-oriented management,
- differentiation and diversification of eco-tourism, and
- focusing on the most potential areas.

Taking the locations and characteristics of eco-tourism resources into account, the Indrani and Lubana eco-tourism development project and the Nagli and Gaigalava eco-tourism development project are proposed. Building facilities should take a consistent strategy to differentiate the eco-tourism in LWC from others. Local-style, small, and nature-contained facilities should be obtained in LWC. The total initial cost for the eco-tourism projects is about 521,000 LVL. Simultaneous promotion of the proposed fish hatchery development and angling promotion projects is recommended for more effective implementation of the eco-tourism development.

5. Fishery Development Plan

Considering the national fishery policies and potential markets as well as the present inland fishery conditions in Lake Lubana, important species of fishery development in LWC are to be pike and pikeperch, which might be regarded as symbolic fish species to be produced and conserved in the future. Thus, the fish hatchery development project” and the angling promotion project are proposed for the fishery development in LWC. The total cost for these facilities and equipment is estimated at about 414,000 LVL without any contingency.

6. Water Level Management Plan

The principal purposes of the water level management plan are to sustain the current ecosystem, to maintain suitable water level for the activities of agriculture, fishery, and forestry, and to protect towns and villages against floods. Thus, the following measures are proposed in line with the water level management plan. In addition, a revised manual is prepared taking note of the required water level and the current operation rule.

- Countermeasures for dryness problem of bog, inundated grassland and fen,
- Wintering place preparation of fish,
- Water quality improvement in the southern part of the lake,
- Rehabilitation of the Aiviekste and Kalnagala sluices, and
- Establishment of the hydrological stations.

Since the cost of measures for dryness problem, wintering place preparation, and water quality improvement is included in the wet land conservation plan, the total cost of water level management plan is about 293,000 LVL only for the rehabilitation of sluices and the establishment of hydrological stations.

7. Economic Evaluation and Financial Analysis

The 11 projects and programs (EMP Projects) are selected for EMP. The total cost including the initial cost, operation and maintenance (O/M) cost, and physical contingency (15% of the initial cost) up to 2010 is estimated at 4.6 million LVL, indicatively.

Proposed Projects and Programs for EMP

(Unit: 1,000 LVL)

Name of Projects and Programs	Initial Cost	O/M Cost	Total Cost
<i>I. Wetland Conservation Plan</i>	<u>1,444</u>	<u>879</u>	<u>2,323</u>
1. Environmental Management Center Construction Project	375	105	480
2. Biotope Conservation Program	796	78	874
3. Environmental Research and Monitoring Program	166	248	414
4. Environmental Education and Public Awareness Program	107	448	555
<i>II. Eco-tourism Development Plan</i>	<u>521</u>	<u>393</u>	<u>914</u>
5. Indrani and Lubana Eco-tourism Development Project	242	171	413
6. Nagli and Gaigalava Eco-tourism Development Project	279	222	501
<i>III. Fishery Development Plan</i>	<u>414</u>	<u>227</u>	<u>641</u>
7. Fish Hatchery Development Project	315	156	471
8. Angling Promotion Project	99	71	170
<i>IV. Water Level Management Plan</i>	<u>293</u>	<u>9</u>	<u>302</u>
9. Aiviekste Sluice Rehabilitation Project	138	6	144
10. Kalnagala Sluice Rehabilitation Project	145	1	146
11. Hydrological Station Construction Project	10	2	12
<i>Physical Contingency (15 %)</i>	<u>401</u>	-	<u>401</u>
<i>Grand Total</i>	<u>3,073</u>	<u>1,508</u>	<u>4,581</u>

(1) Result of cost-benefit and financial analysis

The Economical Internal Rate of Return (EIRR) of the EMP Projects with 40 years project period shows about 30 %. The result means that the EMP Projects are viable economically.

The EMP Projects are interdependent and the benefits of EMP are brought about by overall implementation of the EMP Projects. Therefore, cost recovery mechanism should be considered within EMP framework, not by each project and program. The projects on eco-tourism and angling could collect certain amount of fee for cost recovery, but the projects on wetland conservation and water level management plan do not recover the expenses by themselves. Only the projects on eco-tourism and angling can not cover the required revenue of EMP. Thus, the following financial sources should be additionally sought by the Latvian government due considering the importance of conservation of the precious wetland.

- a) Governmental subsidy for Ramsar site, and
- b) Special assistance for environmental program.

(2) Implementation schedule

The three phased plan, Phase I (year 2001 to 2003), Phase II (year 2004 to 2007), and Phase III (year 2008 to 2010), is proposed for implementation of the EMP Projects, and its schedule of is prepared in the table below.

Implementation Schedule of the EMP Projects

Type	Name of Projects and Programs	Phase I			Phase II				Phase III		
		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
I. Wetland Conservation Plan											
1	Environmental Management Center Construction Project	█	█	█	█	█	█	█	█	█	█
2	Biotope Conservation Program										
2-a	Bird conservation sub-program	█	█	█	█	█	█	█	█	█	█
2-b	Mammal conservation sub-program		█	█	█	█	█	█	█	█	█
2-c	Bog and inundated grassland conservation sub-program	█	█	█	█	█	█	█	█	█	█
2-d	Fish conservation sub-program		█	█	█	█	█	█	█	█	█
3	Environmental Research and Monitoring Program		█	█	█	█	█	█	█	█	█
4	Environmental Education and Public Awareness Program										
4-a	EIMS sub-program		█	█	█	█	█	█	█	█	█
4-b	Environmental Education sub-program		█	█	█	█	█	█	█	█	█
II. Eco-tourism Development Plan											
5	Indrani and Lubana Eco-tourism Development Project			█	█	█	█	█	█	█	█
6	Nagli and Gaigalava Eco-tourism Development Project	█	█	█	█	█	█	█	█	█	█
III. Fishery Development Plan											
7	Fish Hatchery Development Project				█	█	█	█	█	█	█
8	Angling Promotion Project		█	█	█	█	█	█	█	█	█
IV. Water Level Management Plan											
9	Aiviekste Sluice Rehabilitation Project		█	█	█	█	█	█	█	█	█
10	Kalnagala Sluice Rehabilitation Project					█	█	█	█	█	█
11	Hydrological Station Construction Project	█	█	█	█	█	█	█	█	█	█

Note: █ : Design, Equipment Procurement, Construction or Civil Works █ : Operation and Maintenance (O&M) or Training

8. Recommendations

(1) Regional development and land use

Three strategies are recommended for development in LWC, 1) small scale rural development, 2) multi sector development, and 3) eco-tourism and rural tourism promotion. Under these strategies, it is essential to make use of any resources in LWC to improve the living standard of the local people. Socioeconomic levels represented by employment rate, wage and education level in LWC should reach the national average. In order to reach the economic growth with the nationally predicted rate in LWC, it is recommended to consider development projects at the regional or district level, regarding LWC as part of a larger project area.

The recommended five land use strategies are 1) restriction on change of the existing land use pattern, 2) flexible and small scale conversion of the idle arable lands into forests, 3) harmonization of productive and recreational usage of water bodies, 4) building of small scale factories, facilities, and infrastructure, and 5) application of land use technologies friendly to local environment. The future land use planning of LWC should follow the proposed land use map, which is based on development potentials in the future as well as proposed land use appropriate for environmental conservation.

The already established land use situation should not be changed as much as possible, also preventing additional construction of large-scale facilities and infrastructure. It is not only

to prevent damages to the wetland ecosystem of LWC, but also to guarantee the productive land resource to the owners. Idle arable land is to be flexibly converted between cultivated land and forest depending on economic profitability of the both industries. In addition, water bodies such as Lake Lubana and fishponds should be managed so that they contribute to both commercial fishery and waterfowl preservation as eco-tourism object.

Since land in LWC is owned by different stakeholders, due agreement and compensation should be required where private land is planned to be converted to the protection area and even to different productive land, for instance from potentially arable land to forest. Therefore, the different stakeholders' interests on land use must be coordinated by providing local people with opportunities to participate in planning the concrete land use for LWC under the EMP framework. An independent land use planning unit is recommended to be established for LWC. At the highest level, land use planning must be dealt with by a small committee of permanent members drawn from the local municipalities and agencies concerned with LWC.

(2) Fishery development

It is recommended to set a site specific concept on fishery in LWC as Lake of Pike. Pike and pikeperch must be the most important and symbolic fish species to be produced and conserved in LWC, because demand of ordinary freshwater fishes like carp species seems not to increase in near future considering people's general preference. This concept should be taken into consideration in relevant development and conservation activities, particularly for eco-tourism development. For the fishery development in LWC, the fish hatchery development project and the angling promotion project are proposed. The total cost for these projects up to 2010 is estimated at about 641,000 LVL including necessary facilities and equipment.

(3) Wetland conservation

The recommended strategies taken for wetland conservation of LWC are to emphasize the biodiversity, to preserve and conserve the wetland vegetation, to strengthen the function of forests, to manage game animals and birds through hunting, to promote eco-tourism for nature protection, and to focus on environmental education and public awareness. The total cost for the wetland conservation plan (WCP) is indicatively estimated at about 2.3 million LVL including O/M costs up to 2010.

As a project, the construction of the Environmental Management Center (EMC) at Idena is recommended to establish a base for actual implementation of the proposed programs. The biotope conservation program consists of four conservation subprograms for bird, mammal, bog & inundated grassland, and fish. The environmental research and monitoring program is also recommended for management purpose, especially for early warning and monitoring of natural environment as well as socioeconomic activities.

Since LWC fulfills the Ramsar convention criteria, it is recommended to register important biotopes of LWC collectively as a Ramsar site at the commencement point of EMP.

(4) Environmental Information Management and Education (EIMS)

Establishment of EIMS is recommended to accelerate decision-making, monitoring, environmental education, public awareness, and science promotion. The institutional framework for EIMS must be under the jurisdiction of EMC. The grand total for the hardware and software is about 74,000 LVL. In addition, the Environmental Education and Training (EE&T) Plan should be implemented in accordance with the directives and principles stipulated in the national policies on environmental education.

(5) Eco-tourism development

In order to attract the potential eco-tourists, LWC should be well improved in terms of information, advertisement, access, facility, and management. The strategies of eco-tourism development are recommended to be 1) sustainable natural resources management, 2) local community driven development process, 3) entrepreneurship promotion, 4) full support by local government and public institutions, 5) collaboration between public and private sectors, 6) small scale eco-tourism and long-term benefits, 7) supply-oriented management, 8) differentiation and diversification of eco-tourism, and 9) focusing on the most potential areas.

Taking the locations and characteristics of eco-tourism resources into account, the Indrani and Lubana Eco-tourism Development Project and the Nagli and Gaigalava Eco-tourism Development Project are recommended. The total initial cost for the eco-tourism project in Gaigalava and Nagli is about 242,000 LVL, while that for Indrani and Lubana is 279,000 LVL. For the purpose of materializing the two eco-tourism development projects, it is proposed to form the LWC Eco-tourism Association (LETA) consisting of interested local governments, interested local people groups supported by academic institutes.

Eco-tourism activities and services should be regularly improved by the systematic evaluation and feedback system to attract more visitors and prevent inappropriate activities for nature protection. As an administrative organization, EMC needs to monitor eco-tourism activities if they meet the regulations. Governments should facilitate economically viable entrepreneurship providing financial, technical, regulatory, institutional, and physical supports for the private sector. The public sector investment is indispensable in the first phase, and then its operation and management should be gradually handed over to the private sector.

(6) Water level management

For fish habitat conservation, a diversion of river flow to the old Pededze river and an excavation of fish channel for ensuring wintering place are recommended. The cost is included in the proposed wetland conservation plan.

The actual operation of the current water level management facilities should follow the proposed operation manual which is prepared taking note of the required water level and the current operation rule.

Establishment of four hydrological stations are recommended to estimate the flood water volume in the Balupe, Ica, Malta, and Rezekne rivers. The indicative cost for establishment of the hydrological stations is about 10,000 LVL. As for the Aiviekste and Kalnagala sluices, the whole structure should be replaced. The total cost of rehabilitation of the Aiviekste and Kalnagala sluices are 138,000 LVL and 145,000 LVL, respectively.

(7) Environmental management plan

The fundamental vision of the EMP for LWC is recommended to be **Wise Use of the Lubana Wetland Complex**, with such goals to attain this vision as conservation of natural environment and sustainable use of natural resources. The EMP area is recommended to be divided into three zones, namely NPZ, AMZ, and DZ. The environmental zone shows the direction and intensity of actual measures of the wetland conservation plan. "Preservation" should be a principal direction in NPZ, "Protection" and "Conservation" is in AMZ, and "Restoration" mainly in DZ.

Establishment of the Implementation Committee (IC) and the Environmental Management Center (EMC) is proposed for actual implementation of EMP for LWC. IC should be a management authority of EMP which deliberates, authorizes, and coordinates substantial matters related to EMP, and EMC is recommended as a site specific organization for actual implementation of EMP. These two organizations should be established before implementation of EMP because it will require a lot of preparatory works.

Initial cost of the EMP Projects consisting of those for design, construction, equipment procurement, and physical contingency is estimated at about 3.1 million LVL. The O/M cost of them including training cost for staff from year 2001 to 2010 are estimated at about 1.5 million LVL. Total cost up to year 2010 is about 4.6 million LVL. The financial arrangement for initial cost of the EMP Projects is recommendable to be made with combination of the loan and grant scheme from potential international donors. It is recommended that the grant scheme is applied to the Environmental Research & Monitoring Program and the EIMS subprogram which provide only equipment, and other projects and programs apply for the soft loan, which is low interest rate and long repayment period loan scheme. The O/M cost should be basically born by domestic budget.

The total Latvian expenditure for the EMP Projects must consist of the O/M cost and repayment of soft loan. Annual expenditure ranges from about 21,000 LVL/year to 445,000 LVL/year between 2001 and 2010, and 172,000 LVL/year on average. After the year 2011, annual expenditure ranges from about 220,000 LVL/year to 725,000 LVL/year and 361,000 LVL/year on average. Considering affordability of the expenditure for the EMP Projects, domestic annual revenue same as the annual expenditures should be at least required.

The Wetland Conservation Plan, the Eco-tourism Development Plan, and the Hydrological Station Construction Project could be priority projects among the proposed 11 EMP Projects considering their quick effect and urgency. It is recommended that the Fishery Development Project should be implemented in line with the overall development of the Latgale region, and the Aiviekste and Kalnagala Sluice Rehabilitation Projects be designed taking the basin's flood control plan into account.

9. Conclusion

The development of a comprehensive EMP for LWC is acutely needed, and it is justified by its ecological importance, the political and problematic background of LWC, and the strong intention of Latvian people concerned. LWC has been known as an important habitat for migrating birds including rare species, and the International Council for Bird Reservation identified LWC as an important bird area in Europe and recommended its conservation in early 1990s. It is natural that a movement to apply LWC for a Ramsar site arose among the concerned people.

The EIRR of the EMP Projects shows about 30 %. Compared to interest rates ranging from 10 % to 15 % in the conventional economic analysis, the result means that implementation of EMP is economically viable.

As an overall conclusion, the proposed EMP could be justified in terms of social necessity and urgency, and the recommended projects and programs would be feasible and viable from technical and economic standpoints. So the projects and programs within the EMP framework should be implemented as quick as possible before the important wetland ecosystem in LWC is further degraded.

**THE STUDY
ON
ENVIRONMENTAL MANAGEMENT PLAN FOR
LUBANA WETLAND COMPLEX IN
THE REPUBLIC OF LATVIA**

FINAL REPORT

Volume I Executive Summary

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ABBREVIATIONS

<Places>

LWC Lubana Wetland Complex

<Organizations>

ALRSA Aiviekste Land Reclamation System Administration
DC District Council
DPU Daugavpils Pedagogical University
EU European Union
JICA Japan International Cooperation Agency
LFN Latvian Fund for Nature
LOS Latvian Ornithological Society
LRDA Latgale Regional Development Agency
MEPRD Ministry of Environmental Protection and Regional Development
MOA Ministry of Agriculture
MOE Ministry of Economy
MREB Madona Regional Environmental Board
NBF National Board of Fishery
NGO Non-governmental organizations
RDC Rezekne District Council
REB Regional Environmental Board
RREB Rezekne Regional Environmental Board
SHMA State Hydro-meteorological Agency
TNR Teici Nature Reserve

<Plan, Policy, and Project>

NEPP National Environmental Policy Plan
NEAP National Environmental Action Plan
NPBD National Program on Biological Diversity
WCP Wetland Conservation Plan
WQCP Water Quality Conservation Plan

<EMP terms>

AMZ Active Management Zone
DZ Development Zone
EE&T Environmental Education and Training
EMC Environmental Management Center
EIMS Environmental Information Management System
EMP Environmental Management Plan
IC Implementation Committee
NPZ Nature Preservation Zone

<Eco- tourism terms>

EDP	Eco-tourism Development Plan
LETA	Lubana Wetland Complex Eco-tourism Association
TIC	Tourism Information Center

<Economic and Financial terms>

EIRR	Economic Internal Rate of Return
FIRR	Financial Internal Rate of Return
LVL	Latvian Lat(s)
SAPARD	Special Accession Program for Agriculture and Rural Development

<Information terms>

EIMS	Environmental Information Management System
GIS	Geographical Information System
IT	Information Technology

<Chemical terms>

BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
PCB	Polychlorinated Biphenyl
SS	Suspended Solid
T-N	Total Nitrogen
T-P	Total Phosphorus

<Others>

CP/T	Counterpart Team
DF/R	Draft Final Report
F/R	Final Report
It/R	Interim Report
O/M	Operation and Maintenance
P/R	Progress Report
S/C	Steering Committee
S/W	Scope of Work
WWTP	Waste Water Treatment Plant

CHAPTER 1 GENERAL

1.1 Scope of the Study

(1) Objectives

The objectives of the Study on the Environmental Management Plan for Lubana Wetland Complex in the Republic of Latvia (the Study) are:

- a) To formulate an Environmental Management Plan (EMP) for conservation of environmental assets and sustainable use of natural resources in the study area with the target year of 2010, and
- b) To transfer technology on the formulation of the EMP to the Latvian counterparts.

(2) Framework of the Study

In accordance with the agreement between the Ministry of Environmental Protection and Regional Development (MEPRD) and the Japan International Cooperation Agency (JICA) on March 18, 1999, the following Scope of Work is set for the Study. The study area covers the whole Lubana Wetland Complex (LWC) with about 81,000 ha as shown in Figure 1.1.1.

Phase I: Basic Study

- a) Collection and analysis of data and information concerned with environmental and socio-economic aspects of the Study area in order to grasp actual situations and issues,
- b) Consideration of the future economic development, land use and water management in the study area, and
- c) Field surveys to obtain additional data and information for supporting the above work.

Phase II: Plan Conceptualization

- a) Analysis on the rich and diverse ecosystem in the study area,
- b) Assessment of the past impacts of human activities on the ecosystem, and
- c) Conceptualization of the conservation strategies and development framework.

Phase III: Formulation of the EMP

- a) Review and finalization of the study results of Phases I and II,
- b) Formulation of the EMP, and
- c) Evaluation of the plans/programs and development of the implementation schedule.

MEPRD is the national level counterpart to back up the implementation of the Study, and coordinates the Steering Committee (S/C). While, the regional level counterpart team (CP/T) was set up for actual implementation of the Study.

1.2 Socioeconomic and Financial Conditions

1.2.1 Population and Social Conditions

Population in the concerned 4 districts has decreased following the national demographic tendency. The total population of the districts amounted to 150,000 residents in 1998, which means about 4 % decrease compared with the 1991's figure. The population in LWC is approximately 6,500, which can be regarded as a maximum level considering the high occupation rate of water bodies in the area. This decreasing tendency can be explained not only with the residents' low birth rates but also residents' leaving the area to other economically more favorable places to live.

Due to small farms, unsuitable household buildings and facilities, absence of information about possibilities to sell products as well as high production cost, the income is low and economic activity is unprofitable in rural area. Therefore, agricultural activity is carried out mainly in order to supply needs of one's own family. Lack of possibilities for employment has motivated educated and young people to leave the rural area. Economic activity in LWC consisting of the primary industries has the conditions same as or more severe than the above mentioned situations.

Based on the statistics for the four districts concerned, it is supposed that situation of LWC is worse than the district averages because a considerable part of residents are involved in agricultural, forestry, and fishery sectors. The origin of the unemployment is the state-owned industrial companies which have discontinued their activity or limited their production, and jobless people who do not possess their own farm after the re-organization of the collective farms.

Registered Unemployment Rates and Wages in the four Districts

District	Year	Rezekne	Balvi	Madona	Gulbene
Unemployment rate (%)	1997	29.0	21.6	13.1	9.9
	1998	28.2	22.1	12.5	10.2
Average gross wage (LVL/month)	1997	74	82	83	84
	1998	80	92	92	92

Source: Administrative Districts and Major Cities of Latvia : Statistical Yearbook (CSB, 1998 and 1999)

1.2.2 Land Use

The greatest treasure in LWC is its natural resources. Forests cover 47 % of the area, which is higher than the national forest ratio of 44.6 % figured out by MEPRD in 1998. Wetlands and water bodies (Lake Lubana and fishponds) account for 13 % and 12 % respectively. The water surface of Lake Lubana belongs more to Rezekne district than to Madona district. The rest (28 %) of the area is mainly agricultural land that is regarded as a kind of semi-natural resources. This land use structure dominated by such natural resources provides local people with environmental goods and services, while LWC carries the agrarian characteristics and landscapes because of the agricultural areas. Turf bog and marsh soils prevail in the lowlands.

The Law on Spatial Development Planning of Latvia was adopted in October 1998. According to this new law, land use planning in Latvia is to be carried out, as such:

- 1) Local governments of districts, state cities, towns, and townships should prepare land use plans of their administrative areas;
- 2) Land use plans of higher level should be observed when producing the plans of lower levels; and
- 3) Land use plans of regional and local municipal levels should be prepared in accordance with the relevant development plans.

Land use plans for LWC, therefore, has to observe and coordinate with the directions and strategies mentioned in the existing national-level, regional-level district-level and township-level plans. There is no land use plan exclusively for LWC, while land use concept of Latgale region and land use plans of Osupe and Murmastiene townships have been drafted.

1.2.3 Current and Potential Regional Development

(1) Agriculture

Agricultural land constitutes more than 30% of the area of most townships except Nagli where agricultural land constitutes only 11% of the total area. Production of cereals such as rye, winter wheat, barley, spring wheat, and oat has been the main agricultural activities in LWC. Crops produced have been used for both human consumption and animal feed. Dairy farming including milk and meat production has long been conducted in LWC. In addition, potatoes, legumes, and vegetable cultivation and tree crops such as apples and pears have also been conducted. Supplementary agricultural activities include bee keeping, and berries picking.

Promotion of mushroom cultivation will to give good opportunity for rural people to get additional income in future. Flax production level dropped sharply after 1990 due to high cost of production inputs, lack of specialized machinery, and unattractive producer prices. On-farm production of dairy products has potential to be promoted for additional income for rural population.

(2) Forestry

LWC is endowed with forest resources. There are approximately 380 km² of forest land in LWC. On the assumption that the tree volumes cut in a year are equivalent to the removal of 1.6 m³/ha, round logs production from the forests in LWC is estimated to be about 45,000 m³/year. The chief forester offices of MOA have responsibilities in the field of forest management towards the new private forest owners, e.g. restriction of illegal activities and offering consulting services. The offices sell felling rights to these forests, negotiate long and short term logging contracts and organize timber auctions.

Coniferous species such as pine and spruce have a good marketability for domestic as well as foreign market. Sawn timber from pine and spruce are exported to Britain, Germany, and Nordic countries. Afforestation of abandoned or unutilized agricultural land is one of the major goals of national forestry policy. It is suitable to plant conifers (e.g. pine and

spruce) and such deciduous trees as birches and fast growing aspens to obtain input for wood processing industries, pulp, and energy.

(3) Fishery

Fishery and fish processing industry have a potential profit around Lake Lubana, as far as a large investment for reconstruction of equipment is provided. Fish letting into the lake is not necessary, because there are rather good conditions for fish reproduction. Hydro technical buildings exploitation for the increase of fish resources should be made to provide fish spawning time and wintering with good conditions. Fish can use the whole lake territory for the spawning practically.

On the other hand, fishery development perspectives are connected with an overall rural development of the national level, especially considering development possibilities of angling both in public and private water-bodies. It will depend on development of service sector connected with angling in the countryside, such as establishment of network of private hotels near rivers and lakes, rent of boats and fishing tackle, informative and guide services, as well as cooking facilities for the caught fish.

(4) Tourism

Among bird species, tourists usually can expect to see beautiful corncrakes, thousands of swans, black storks and white storks, geese, wild ducks, cranes, and birds of prey. This situation itself can be a potential resource of eco-tourism, since white storks are becoming rare in the other part of Europe. It is not easy for usual tourists to see mammals directly, but beaver, otter, elk, and doe can be expected to be observed. The species of fish in LWC are not rare species, but can be utilized for angling which is a potential product of tourism. There are several fishponds in LWC, and the way of catching fishes in a pond is dynamic such as catching of all fishes by draining water from a fishpond. This can be a potential attraction for tourism. There are extended raised bogs that should be carefully preserved. These sites should not be open to mass tourists, but can be used as a board walk area.

Various landscapes in LWC can be characterized by land use and wetland vegetation. On the whole, distinctive landscape in LWC has potential to attract tourism development. Wide agricultural field and meadow with studded farmhouses on the flat topographic condition can be seen in and around LWC as a peaceful rural landscape. Natural and afforested forest are mixed and extended in LWC. Deciduous forest makes beautiful scenery in fall. Many abandoned fishponds and their facilities are located on the southern part of Lake Lubana, while some fishponds are being operated. Many waterbirds are observed in these fishponds as well as Lake Lubana. People enjoy angling in riverside of the Aiviekste river and other small streams with calm flow.

1.3 Conditions of Natural Environment

1.3.1 Water Quality

(1) Current Water Quality

Lake Lubana belongs to the category of shallow lakes where ammonia (N/NH₄) and phosphate (P/PO₄) should be kept less than 0.5 and 0.04 mg/l, respectively. In October 1999, N/NH₄ was 0.5 mg/l and P/PO₄ was 0.09 mg/l. Lake Lubana and most fishponds still belong to alpha- or beta-mesosaprobic conditions indicating moderate eutrophication levels and progress of organic oxidation and decay. While the Rezekne river did not meet the requirements for good water quality according to the Latvian ambient water quality standards: the respective T-P concentrations of 0.23-0.50 mg/l, and N/NH₄ of 1.18 mg/l and N/NO₂ of 0.14 mg/l at the right downstream from the Rezekne wastewater treatment plant (WWTP). The levels of PCB, Cr⁺⁶, Pb, Cd, As, and Hg did not indicate significant threats on the human health at all survey points.

(2) Direction for water quality conservation

In response to the National Environmental Policy Plan for Latvia (NEPP), MEPRD commenced the project "800+" in 1995 to reconstruct or establish more than 800 WWTPs in small and medium-sized towns including Rezekne city, Vilani town, and Malta township. In addition, there are two projects related to the rehabilitation of wastewater treatment plants (WWTPs) in Stolerova and Sokolku townships.

With the unsatisfactory water quality in Lake Lubana, the formulation of a water quality conservation plan (WQCP) is highly recommended to integrate the water quality management in the Lake Lubana catchment area and to promote eco-tourism development for LWC. As waters flow across wetlands, chemicals that otherwise would contaminate waterways are removed through natural processes that assimilate pollution. The WQCP for LWC should be closely linked to the fundamental vision of EMP, "Wise use of LWC". As wetlands themselves have a great potential of water purification, the maximum utilization of this ability becomes the fundamental strategy for LWC with the help of the upstream water quality management.

The upstream water pollution abatement measures are preconditioned to formulate WQCP, and the following directions are to be set for LWC:

- to make the effluent N and P concentrations from the upstream point sources abide by the requirements of the EU directive (15 mg/l T-N and 2 mg/l T-P for municipal WWTP) by the year 2010,
- to reduce upstream N and P emissions from non-point sources as much as possible, and
- to restore and strengthen the self-purification ability of aquatic ecosystems in and around Lake Lubana.

1.3.2 Birds and Wildlife

Over the period 1974-1999, 224 bird species (7 orders and 48 families) were recorded in LWC. The numbers of water birds points out that the study area fully complies with the criteria of the Ramsar Convention. As for mammals, 23 species (5 orders and 12 families) are recorded and now being prepared to include the numbers of hunted mammals. There are 42 fish and 3 lamprey species in inland waters of Latvia, of which 24 fish species are found in LWC.

About 33 bird species including Redshank, Wood sandpiper, Little gull, Whiskered tern, Black tern, and Nightjar, and 7 animal species such as beaver, wolf, brown bear, lynx, otter, stoat, weasel, and brown bear are the important species within the study area based on the Red Data Book of Latvia and the European Threat Status. There are no endangered fish species for strict conservation in LWC.

Lake Lubana and the surrounding mires, forming LWC, are ecologically united and unique in view of biodiversity. The study area has been attracting much attention from scientists and environmental protectionists. As a result of biological investigations, 11 areas (35,600 ha in total) are proposed to be protected to the Cabinet of Ministers of the Republic of Latvia and it was adopted on June 15, 1999 (Regulations No. 212/199).

1.3.3 Wetland Vegetation

In LWC, wet types of vegetation such as bogs and fens have been well developed. It is assumed that at the early stage of succession inflow water carried soil and debris into an ancient lake and the accumulation of them made the lake shallower. When the lake became shallow enough, aquatic plant species intruded and aquatic plant communities were developed. Dead body of plants accumulated on the lake bed little by little developing a peat layer under cool temperature. As a result, fens and bogs have been developed finally as they are today. Although there is little literature mentioned about a concrete list of flora in LWC, all available data are summed up to 34 rare and protected species found in LWC.

The most remarkable hydrological event of LWC is annual flood in spring caused by snow melting. Then the vegetation is basically established under the influence of flood and its distribution reflects the intensity of inundation. The duration period of inundation differs from place to place determined by topography, elevation, and location.

It is clear that most bogs are free from annual flood. Since the dike was constructed in 1982, one bog at the west coast of Lubana Lake seems to be affected by the flood with once per 10 years possibility. Some fens are not inundated annually. Fens are adapted to an annual flood but not necessarily required, they are located in depression areas assuming to be nursed by inflow surface water or groundwater during a year. Most part of inundated grasslands is submerged once every two years. Some forest areas are also inundated. Long inundation is not desirable for tree growth, but tree species in these forests have adapted and are tolerable to periodical inundation.

1.3.4 Biotope Map of the Study Area

(1) Distribution of biotopes in LWC

LWC is divided into 9 biotope types. Since distributions of most animal species are bound by vegetation types, terrestrial biotopes of LWC is delineated by modifying vegetation map from the viewpoint of animal distributions. Aquatic biotopes were classified based on values as fish habitat. The distribution of biotopes in LWC is shown in the biotope map of Figure 1.3.1.

(2) Detailed biotope map of the model area

The detailed biotope map is prepared to use as a) decision-making tool to formulate conservation measures, b) standardization of ecological monitoring procedures, c) specification of educational and eco-tourism resources, and d) formulation of biotope mapping process.

The detailed biotope map consists of 14 biotopes as shown in Figure 1.3.2. Raised and transitional bogs can be found in the northeastern part of the model area, at the edge of Sala bog. Shrub bogs tend to be rather dry comparing with the raised and transitional bogs, so sporadic pine shrub of 3-6 m high can be observed. Meanwhile, reed and sedge fens are found in Gomelis, Idena and Kvapani fishponds. The area of fens in Idena fishponds is much larger than that of Kvapani fishponds. Inundated grasslands are found mostly in Gomelis, which being affected by spring flood. Dry pine, wet pine, and birch forests are observed between bogs and fishponds. Willow bushes are located in border areas between forests and fens near the fishponds. Agricultural land and dry grassland are found around Idena township. Rye are mainly cultivated in agricultural lands, and the dry grassland are covered with herbaceous species on dry soil.

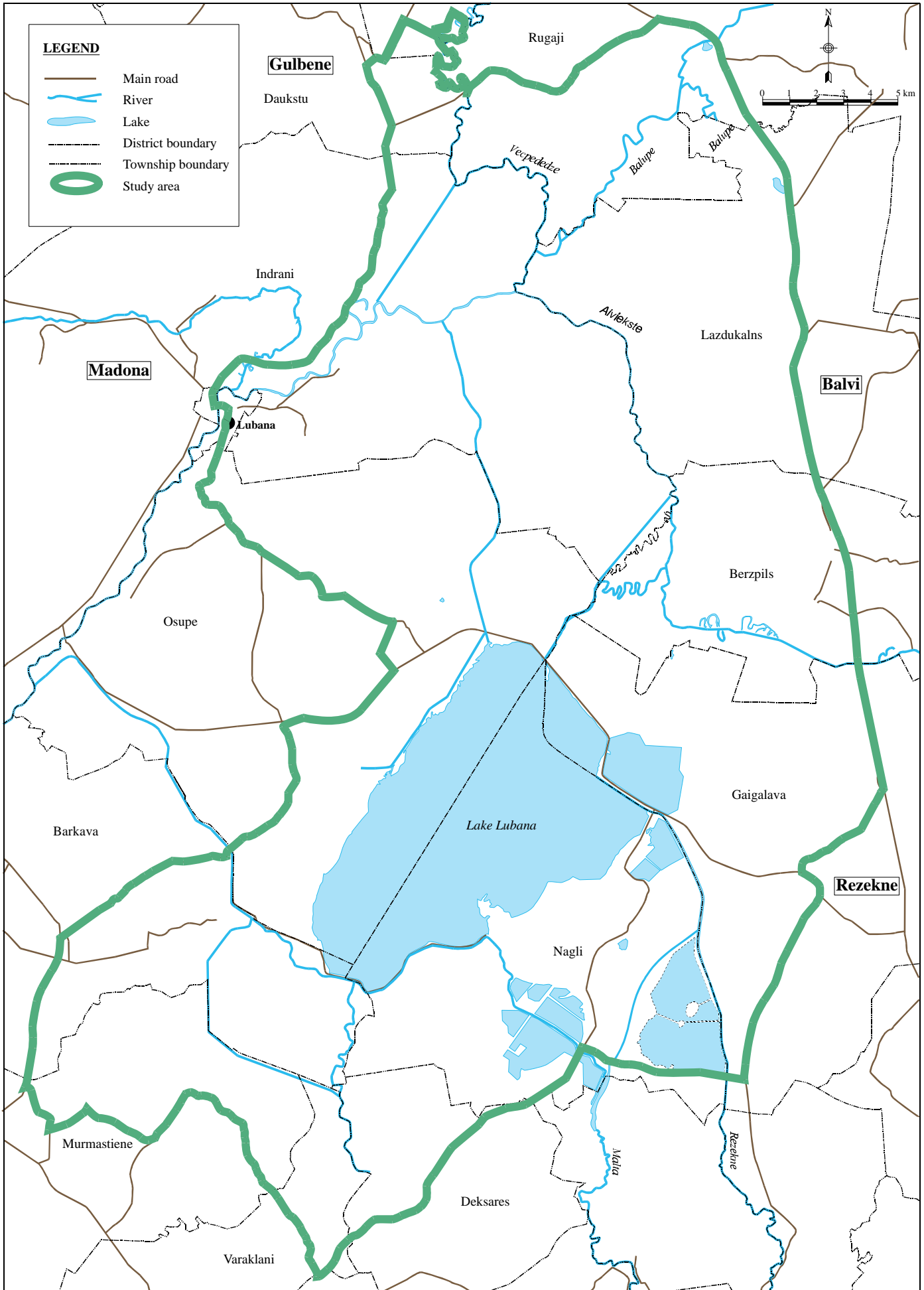


Figure 1.1.1 Location of the Study Area

The Study on Environmental Management Plan
for Lubana Wetland Complex in the Republic of Latvia

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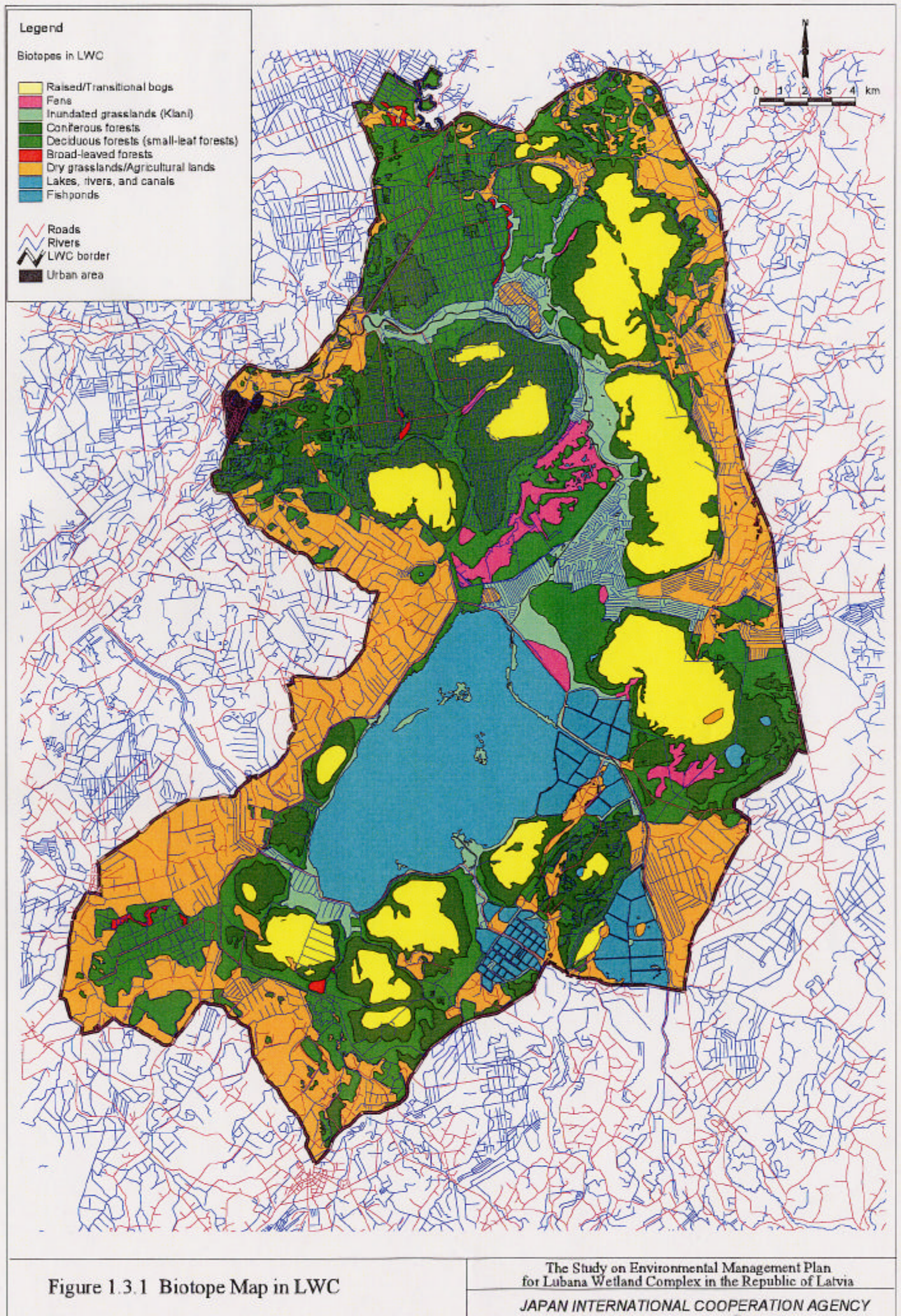


Figure 1.3.1 Biotope Map in LWC

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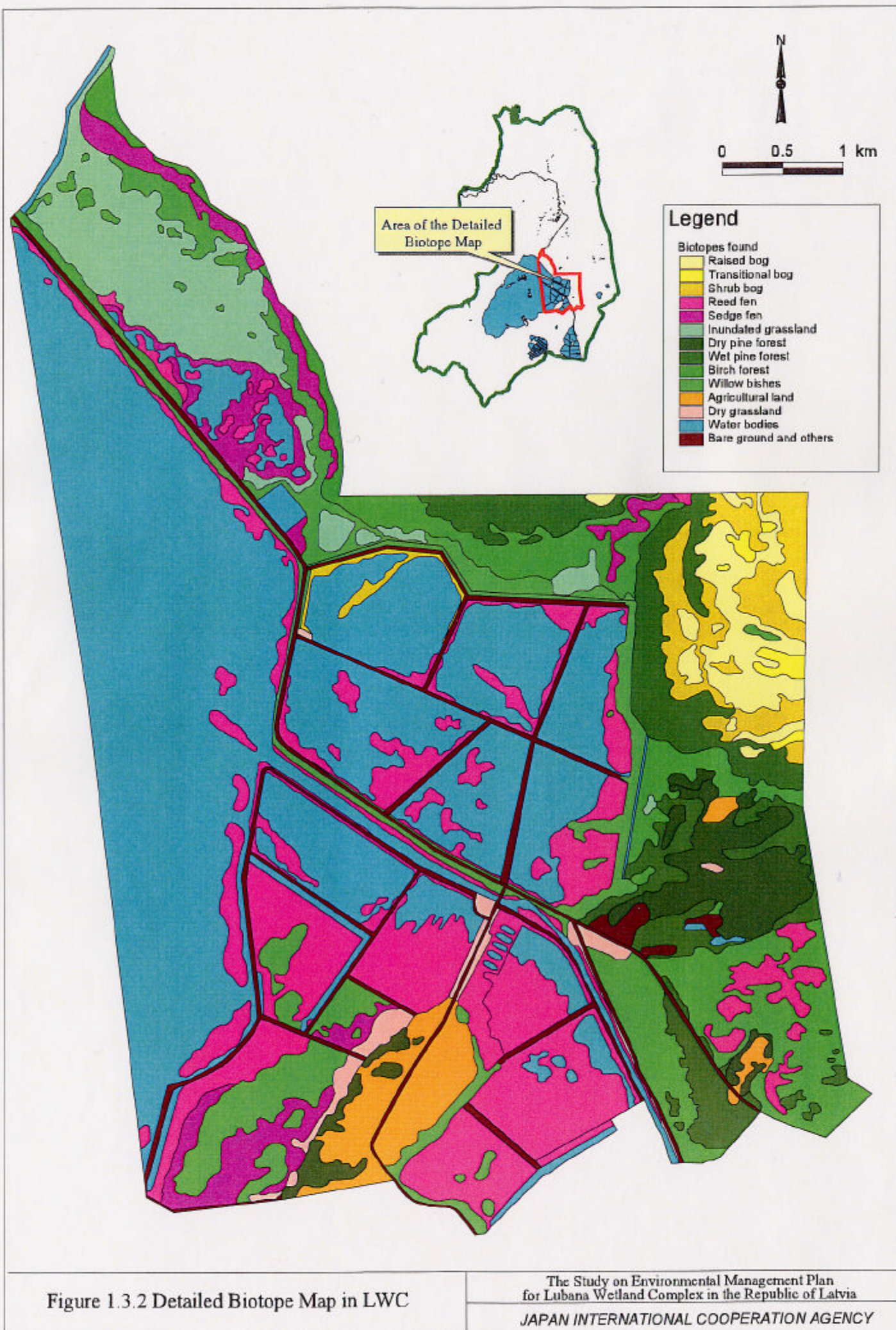


Figure 1.3.2 Detailed Biotope Map in LWC

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