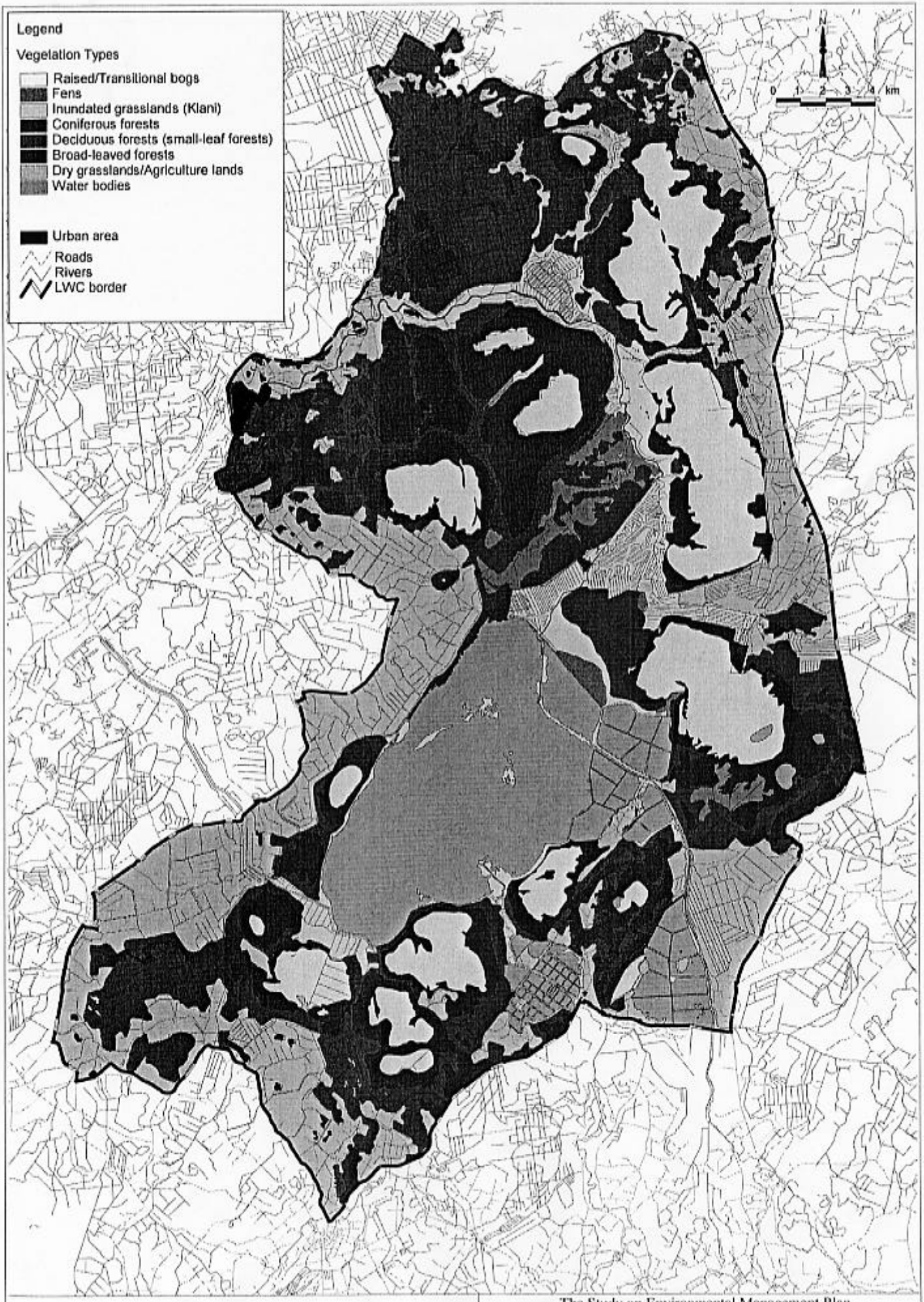
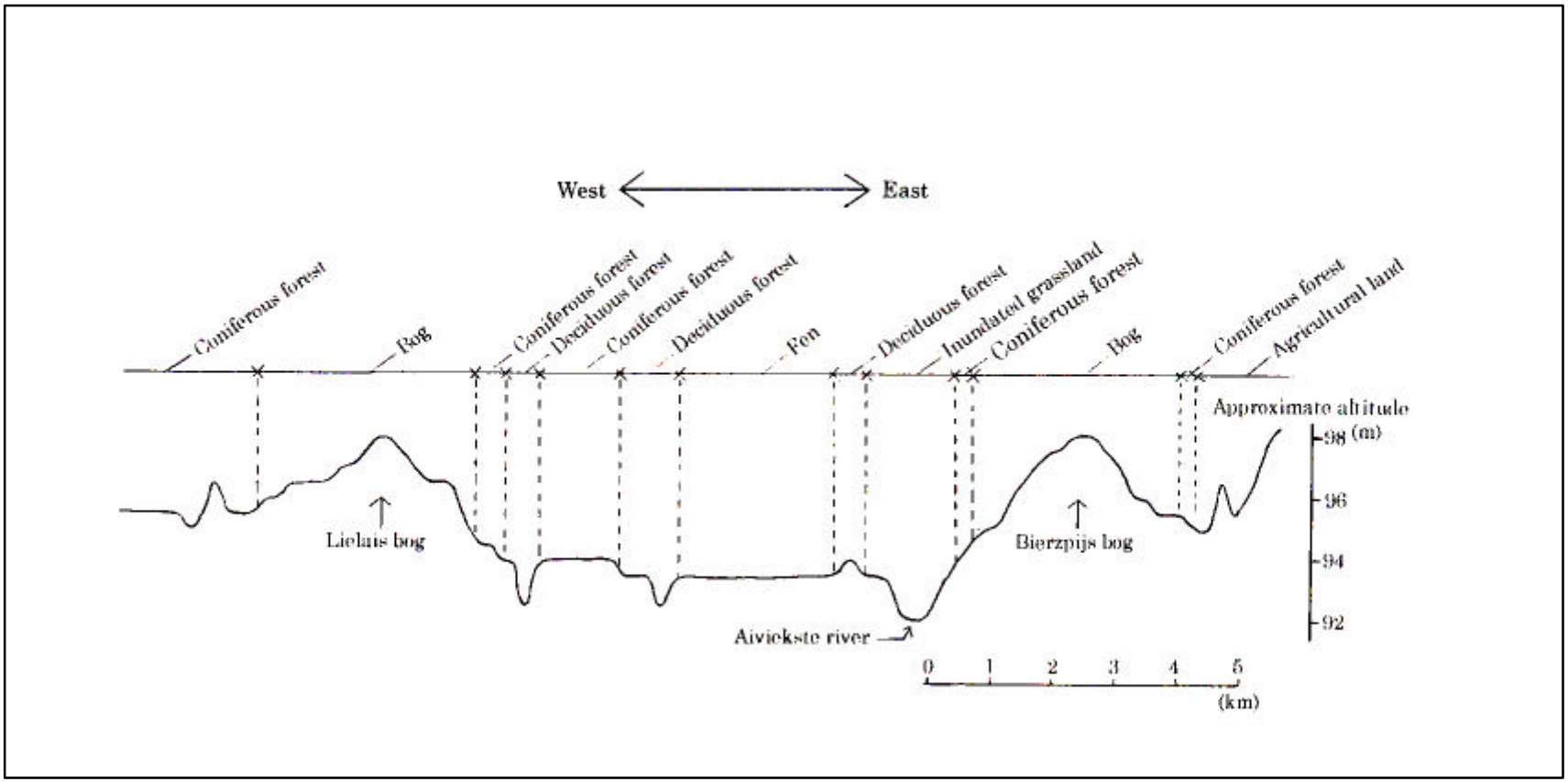


Figure 3.3.1 Vegetation Map

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

JAPAN INTERNATIONAL COOPERATION AGENCY



Note: Location of this cross section is shown in Figure 3.3.3.

Figure 3.3.2 Typical Cross Section of LWC

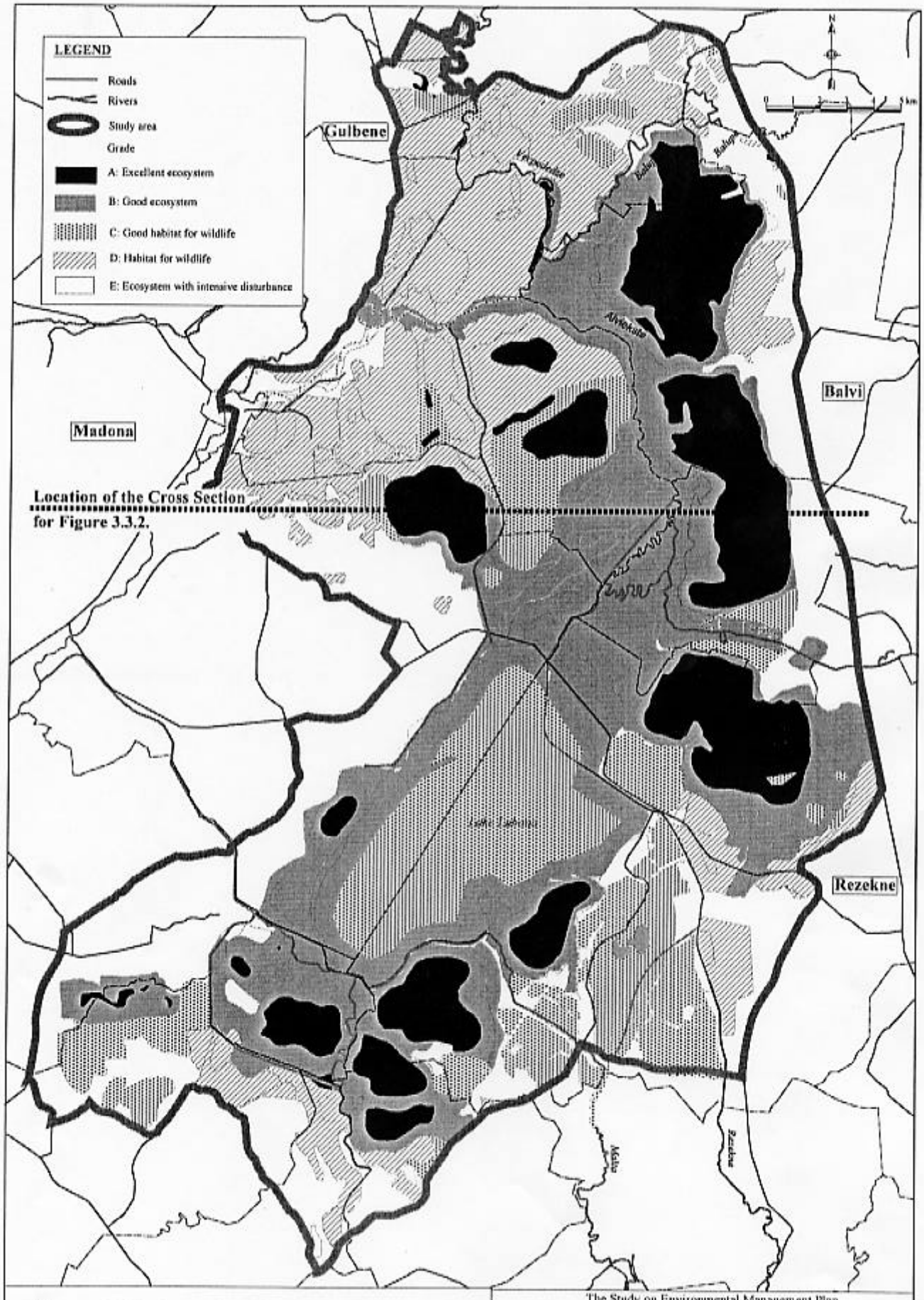


Figure 3.3.3 Secondary Evaluation Map

The Study on Environmental Management Plan
for Lubana Wetland Complex in the Republic of Latvia
JAPAN INTERNATIONAL COOPERATION AGENCY

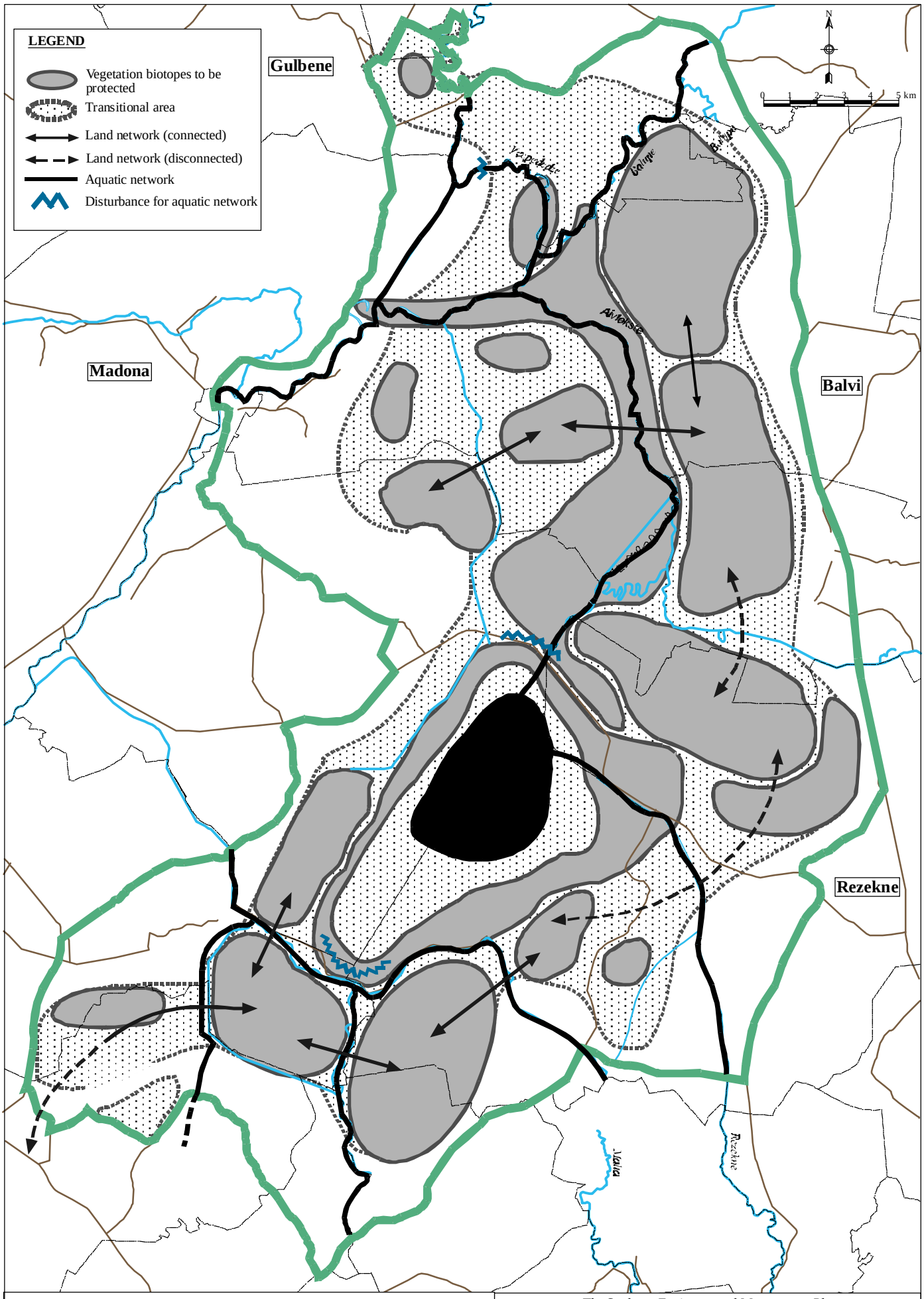


Figure 3.3.4 Delineation of LWC for Vegetation Biotope

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

JAPAN INTERNATIONAL COOPERATION AGENCY

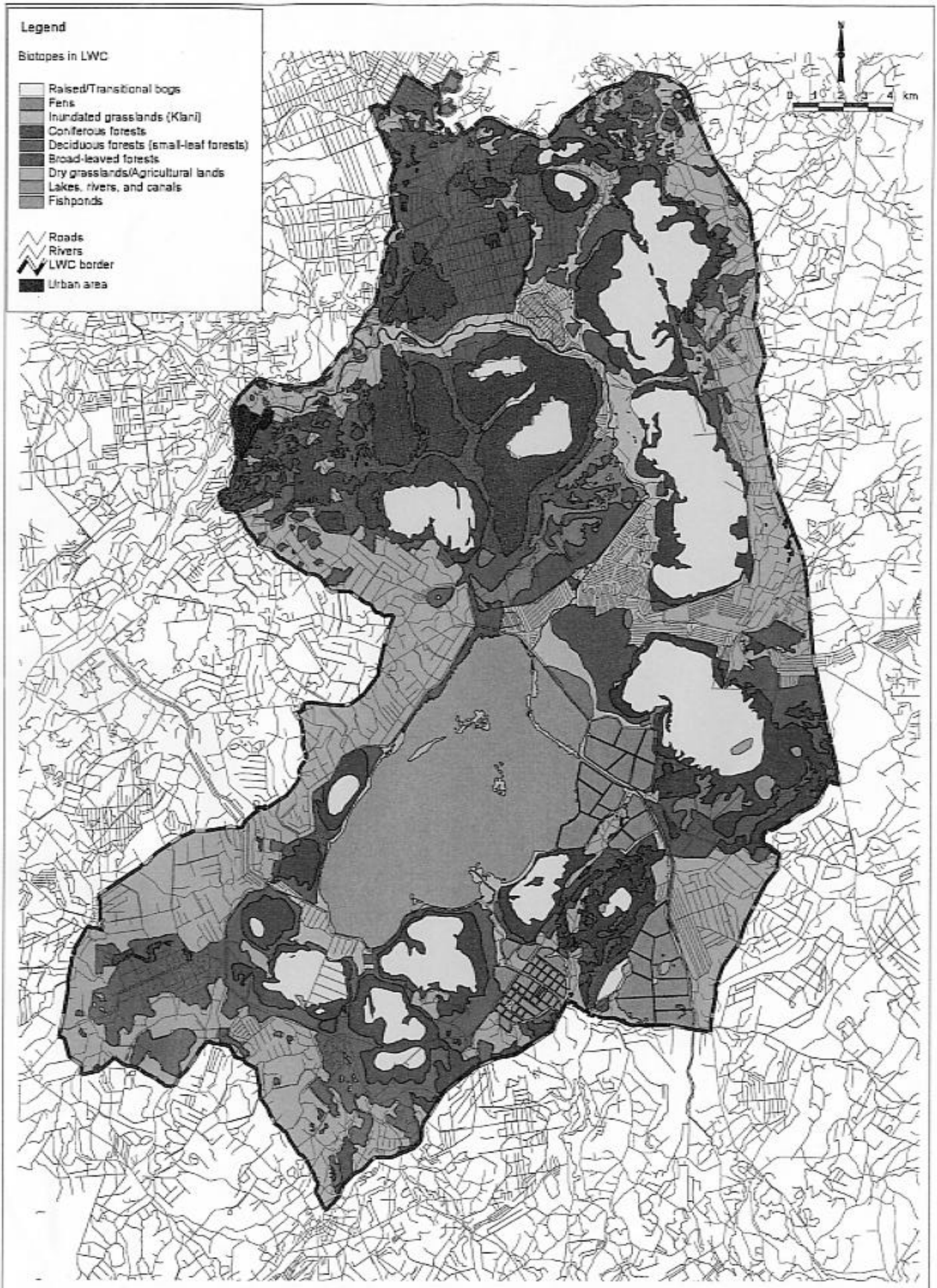


Figure 3.4.1 Biotope Map in LWC

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

JAPAN INTERNATIONAL COOPERATION AGENCY

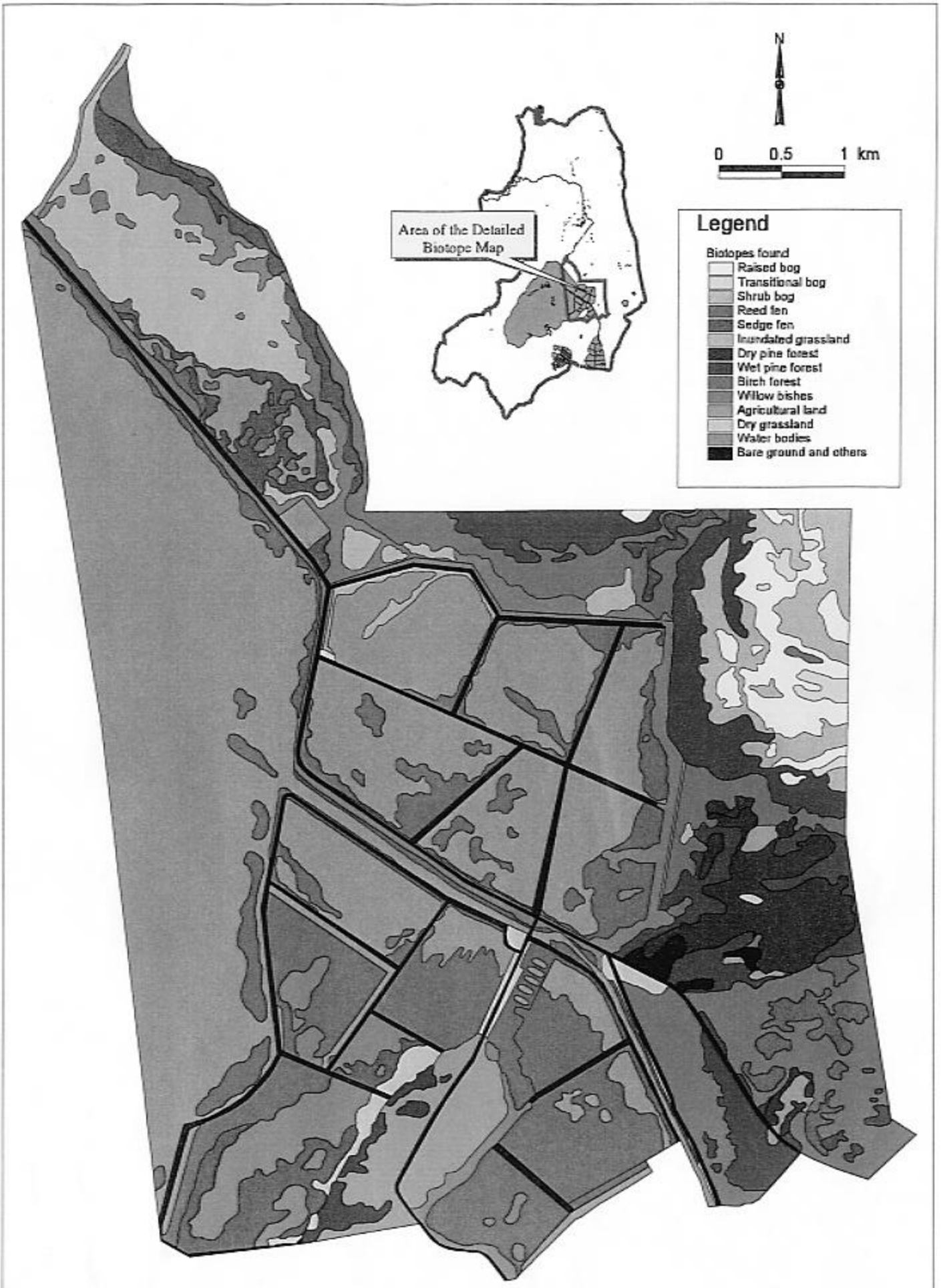


Figure 3.4.2 Detailed Biotope Map in LWC

CHAPTER 4

PART II REGIONAL DEVELOPMENT AND LAND USE

CHAPTER 4 GUIDELINE FOR REGIONAL DEVELOPMENT

4.1 Future Socioeconomic Frame

On the basis of the medium term economic strategy and other documents of the government, the Ministry of Economy (MOE) in cooperation with the University of Latvia and the Riga Technical University is developing a long term strategy of economic development of Latvia. Its time perspective is development of national economy until the year 2025. Its main task is to analyze and forecast long term growth factors, connect theoretical conclusions with practical steps of their implementation in economic policy to achieve growth which will be friendly to environment and resources, stable, comprehensive, diversified and balanced from the viewpoint of the development of national economy.

4.1.1 Long Term Economic Growth Prospects of Latvia

Since finalization of the long term strategy of economic development is scheduled in September 2000, an authorized long-term national socioeconomic prediction has been available only in the Report on Economic Development of Latvia (MOE, December 1998). In this report, the basic scenario (BS) and accelerated scenario (AS) of the Latvian economy were modeled for the period until 2025 on the basis of analysis of growth factors. The summary of both scenarios is presented in the next table. Taking into account the changeable and unstable economic situation, BS is more realistic than AS which demands perfect achievement of the internal growth factors and favorable external market conditions.

National Economic Growth Data in the Long Term

(Unit : % / year)

Years	1996~2000		2001~2005		2006~2010		2011~2015		2016~2020		2021~2025	
Scenarios	BS	AS	BS	AS	BS	AS	BS	AS	BS	AS	BS	AS
GDP Growth Rate	4.0	4.5	5.0	6.3	4.8	6.6	4.4	5.9	4.1	5.2	4.0	5.0
Unemployment Rate	15.7	15.7	14.3	13.4	10.8	7.9	5.9	5.0	5.0	5.0	5.0	5.0
Capital Growth Rate	3.3	4.1	4.4	5.3	4.5	4.8	4.3	5.3	4.4	5.2	4.8	5.0
Industrial Growth Rate	5.1	5.7	5.5	6.8	4.1	5.9	3.6	5.1	3.3	4.4	3.3	4.2

Source: Report on Economic Development of Latvia (MOE, December 1998)

BS reflects economic development assuming that in the starting period until 2003 the medium term economic strategy in the context of accession to EU (accepted by the Latvian Government in March 1998) has been implemented and after this period (2003~2025) the tendencies declared in the strategy will be maintained. It foresees less investments and does not rely much on the favorable external economy during the whole period.

The GDP growth is supported by changes in the number of employed persons and labor productivity. It is foreseen that the Latvian GDP can increase by reducing its unemployment rate, because the population of Latvia is going down every year. Secondly, there is a large economically active population, 88 % of all people at work-capable age. Therefore, the number of employees as a positive GDP growth factor will function, and the natural level of unemployment (5 % of economically active population) will be reached after 2016.

The labor productivity growth as another GDP growth contributor is secured by increased capital and technological innovation. It is forecasted that at the beginning of the period technological changes can ensure higher increase of GDP, which will get smaller in the following years. Increase of capital secures the GDP growth by 3.5 % every year on the average. Such growth of capital requires that investments in the fixed capital constitute 19~20 % of GDP.

4.1.2 Future Socioeconomic Frame for LWC

As there has been no prediction on the future social and economic situation for LWC, its socioeconomic frame is established here by estimating the future figures for the socioeconomic indicators available around LWC (Table 4.1.1) based on the above mentioned national prediction for economic growth rates under BS. The socioeconomic indicators and their 1998 levels, which are almost the same as the national economic growth data, are selected from the set of multiple indicators on socioeconomic development as shown in the next table. They have been adapted by the Latvian Government since July of 1997 to evaluate development status on the city/district basis. This evaluation is based on the Law on Specially Supported Regions approved in May, 1997.

Socioeconomic Levels of the Four Districts in 1998

Indicators	Rezekne	Balvi	Madona	Gulbene	Average in four	National median
a. Industrial output (LVL/person)	93	176	280	246	199	434
b. Capital investments (LVL/person)	62	91	227	257	159	196
c. Unemployment rate (%)	28	22	13	10	18	11
d. Monthly gross wage (LVL)	80	92	92	92	89	104

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

Considering the low level of economic activities within LWC, it is assumed that the present situation of LWC is the same as or worse than that of Rezekne district which is in the worst economic situation among the four districts concerned. Therefore, the future socioeconomic frame for LWC is set up based on the present figures of Rezekne district applying the national economic growth rates of the basic scenario above mentioned, together with population and tourists prediction utilizing the past or assumed growth rates. The next table shows the calculated future socioeconomic frame for LWC up to 2010 as the target year of EMP.

Future Socioeconomic Frame for LWC

Socioeconomic Factor	Unit	1998/99	2000	2005	2010
a. Industrial output	LVL/person	93	103	134	164
b. Capital investment	LVL/person	62	66	82	102
c. Unemployment rate	%	28.0	15.7	14.3	10.8
d. Monthly gross wage	LVL/worker/month	80	87	110	140
e. Population	Persons	6,500	6,400	6,000	5,600
f. Potential tourists	Visitors	-	400	640	850

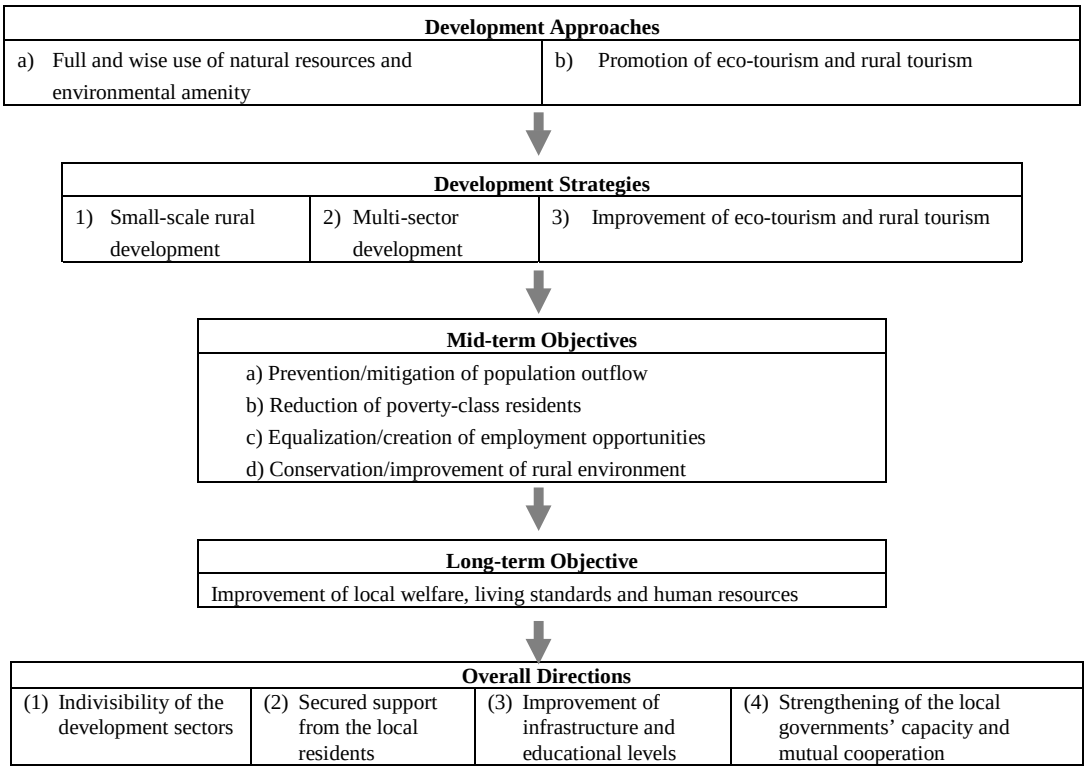
Note : 2005 figures of "Potential tourists" are averages between 2000 and 2010.

As for the monthly gross wage, it is assumed that it well connects with GDP so that the wage level growth rate is quite similar to that of GDP. Average annual growth rates of local population between 1996 and 1999 calculated with actual data (Table 4.1.2) are applied for the population projection. Potential eco-tourists to LWC are assumed to be more than 400 at present and 700~1,000 (850 on the average) within the future ten years. About 28 % are foreigners.

As there exists no socioeconomic growth prediction at the local level, the future socioeconomic frame for LWC is established assuming that the national growth rates can be applied everywhere in Latvia including the LWC area. In order to realize the expected economic growth, local environmental resources should be actively utilized in a wise-use manner for sustainable development. Indeed, eco-tourism and fishery rehabilitation projects are proposed in EMP, and they will contribute to economic growth in LWC. However, the future economic growth figures for LWC as established above might not be fully achieved because EMP does not include development projects of more profitable industrial sectors, potential of which has been unforeseeable at present.

4.2 Guideline for Regional Development

The development guideline includes development approaches, objectives, strategies, and directions, which are schematically expressed in the next flow chart. Development approach is a perspective of local people's interests. Development strategy is a body of coordinated priorities and actions. Strategy is thus for achievement of the objectives defined under the approaches using the existing resources and other advantages and strong sides of LWC.



Schematic Chart of Socioeconomic Frame for LWC

4.2.1 Approach and Strategy

(1) Development approaches and objectives

Fully considering the above-mentioned EU level, national and local development frameworks as well as environmental importance of LWC, development approaches and objectives are set out for LWC as follows:

Development approaches

a) Full and wise use of natural resources and environmental amenity in and around Lake Lubana as local heritages, to activate economic activities in LWC; and

b) Promotion of eco-tourism and rural tourism based on the existing agricultural, forestry and fishery industries, focusing on natural environment as well as rural landscapes in LWC.

Long-term objective

Improvement of local welfare, living standards and human resources by means of sustainable rural development in LWC

Mid-term objectives

- to prevent or mitigate population outflow phenomenon,
- to reduce number of the local residents in the poverty class,

- to equalize or create employment opportunities, and
- to conserve and improve the rural environment goods and services.

(2) Development strategies

LWC is located within the purely rural area mainly based on traditional agriculture, forestry and inland fishery. The area suffered from economic disturbance of these primary industries due to population outflow to urban areas, negative impacts from the nation-wide economic depression after independence from Russia in 1991. Under such circumstances, the local residents have been seeking stabilization of economic foundation as well as activation of local societies.

However, in LWC where conservation of the wetland ecology is another important theme, drastic conversion of the existing industrial structure necessitating land use change in a large scale is not an appropriate development direction. Besides, large-scale industrialization is not acceptable in LWC, taking into account its unreality and foreseen adverse impacts on the natural environment.

Therefore, the following three strategies are proposed for development in LWC, which are in compliance with the existing land use and the development approaches above mentioned:

1) The image of development is to be **a small scale rural development**, which should be mainly based on the existing agricultural, forestry and fishery activities;
2) **Multi sector development** should be directed by expanding or extending all the existing industries, not by focusing only on a certain sector such as agriculture, forestry, fishery or others selected out of them; and
3) **Eco-tourism and rural tourism** should be actively promoted, by wisely using natural resources, wetland and rural landscapes, as well as products and facilities of the existing primary industries.

4.2.2 Overall Directions

Based on the development approaches, objectives, and strategies proposed in the previous sections, the development in LWC can be envisaged to generally go toward the following directions.

(1) Indivisibility of the development sectors

Development in LWC will include different sector development that are inter-connected each other. Identification and definition of problems within multiple sectors should be carried out with expertise.

(2) Secured support from the local residents

In order to achieve the development objectives, they have to be supported by the local residents through the local society's collaboration and publicity of the local governments' activities.

(3) Improvement of infrastructure and educational levels

To obtain even small or middle sized business support, minimum infrastructure conditions for entrepreneurship should be established. Involvement of foreign investment and modern technology requires experts of high qualification. So professional training and high-level education should be provided for the development.

(4) Strengthening of the local governments' capacity and mutual cooperation

LWC covers multiple districts and townships/town requiring territorial cooperation and coordination among these municipalities. In particular, they are essential to carry out an integrated management of Lake Lubana and the surrounding environment, and to reconstruct a water control system. In order to realize these in implementing the development activities, quality and effectiveness of the local governments' capacity for development planning, project implementation and consultancy should be improved. It will also contribute to formation of development institutions such as business development and support centers, and regional development agencies.

4.2.3 Necessary Actions for Regional Development in LWC

In order to achieve the development objectives in LWC, systematic and simultaneous actions are needed. For the future improvement of the socioeconomic level of LWC, it is essential to fully and wisely use natural resources and environmental amenity in line with the proposed three development strategies. Based on the analysis results on the existing resources and potential markets, future development can be guided by the following actions that should be taken for the existing or potential industries in LWC.

(1) Agriculture

As for the traditional production, effective rotations should be applied for the cultivation of cereal crops, peas and potatoes, aiming at sustainable soil fertility and mitigation of soil structure depletion. Application of humus content will also consolidate soil fertility of the agricultural lands in LWC. Traditional livestock farming is to be continuously a main economic activity taking advantage of vast area of meadows and pastures surrounding Lake Lubana, since it provides employment opportunities and basic food supply for local residents. Further promotion of the on-farm processing of dairy products is recommendable in addition to the usual livestock products. As non-traditional income sources, mushroom cultivation as well as apple wine/cider production can be considered. Prospective mushroom species are champignon de Paris (*Agaricus bisporus*), shiitake (*Lentinus edodes*), and oyster mushroom (*Pleurotus species*). Although apples are produced in the small-scale orchards around LWC, it is needed for farmers to increase apple productivity and improve quality for promotion of wine/cider production.

Financial support is inevitable for the agricultural development, making a full use of and strengthening the existing financial systems for the public subsidies and saving-and-loan banks. Besides, technical and scientific backup is important to adopt the best cultivation

and processing technologies from economical and environmental viewpoints so that quality of agricultural products and cultivation methods is in line with the EU requirements. It is therefore recommendable to establish pilot farms for demonstration of the non-traditional agriculture, which can be the base for training and testing of new technologies to adjust them to the local conditions. In order to effectively promote agricultural development in LWC together with these financial and technical supports, close cooperation among the local farmers by means of establishment of agricultural cooperatives or other types of collective organization is recommendable because such an organization can make use of scale merit and secure the local farmers with necessary seed material and market information.

(2) Forestry

Forestry is the most active sector in LWC at present, and should continue to be a key industry in the future as income sources for local residents. Additionally, afforestation on the abandoned or unutilized agricultural land can be proposed, as it is one of the major national forestry policies for creating additional income source in a long term. Planting of pine, spruce, birch, and aspen is recommendable for the commercial purpose. If idle land is privately owned by local residents, they should be partially supported for afforestation through the existing financial systems such as the state subsidy program. Guarantees of long-term credits must be elaborated for private owners to regenerate and plant their forests. Technical training and consultation system on the local level must be consolidated for such land owners to grow trees and rationally use wood resources, as well. This system should have functions to improve wooden and non-wooden forest products toward international and EU quality requirements.

For sustainable and effective development in the future, environmental consideration and wood waste usage are important. Monitoring on forests in LWC is required to obtain objective information on the conditions of newly planted forests and their impacts on the local ecosystem. Legislative and institutional system should be therefore improved for supervision and management of state and private forests in LWC. It will also prevent wood stealing cases. Wood working activities using the wood waste such as furniture and handicraft making should be considered, as they will create further marketing possibilities for the local residents and tourists and can be conducted even during winter season as an additional income source.

(3) Fishery

Considering the national fishery policies and potential markets as well as the present inland fishery conditions in Lake Lubana and the fishponds, an important species of fishery development in LWC has been identified by the current study to be pike, which might be regarded as symbolic fish species to be produced and conserved in the future. Pike can be caught both commercially and recreationally for anglers, and is a target species of the National Board of Fishery (NBF) for artificial seed production aiming at restocking.

This selection of pike as prospective fishery species is also based on the comparative analysis on marketable features between Lake Lubana where eco-tourism/rural tourism is proposed and Lake Razna already known nationwide as the center of eel production. Pikeperch is another target species due to its high market price and recreational demand, propagation of which should be done for fishery development in LWC.

Fish processing plants should be also promoted in order to add market values to fresh fish which does not have a market demand or gets spoiled fast. Such processed goods as smoked or dried fish can be marketed outside LWC and sold to the tourists to Lake Lubana. Cooperatives such as a fishing club or union should be established to analyze potential markets, to improve fishing techniques, and to provide private fishermen and companies with other attractive supporting means. Rehabilitation of the old fishponds as well as market development including tourists can be also implemented effectively with mutual cooperation through such bodies.

(4) Tourism

For LWC with rich natural environment and rural atmosphere, eco-tourism and rural-tourism are prospective tourism forms. All the existing natural resources and products from agriculture, forestry and fishery can well serve tourists visiting LWC. In order to promote these two types of tourism, positive image of LWC with local interesting objects should be created by means of advertisement to potential tourists, developing tourism data base and information system, and printing the information brochure about possible recreational and environmental activities. Tourism cooperation with foreign countries such as Lithuania, Finland, Germany, Austria, Poland, and Russia is recommendable, especially taking advantage of the LWC's location close to the international roads connecting Riga and Moscow as well as St. Petersburg and Warsaw. At the same time, training of the manpower involved in the tourism services including foreign languages training is of crucial importance. Especially for rural-tourism, service training and accommodation facilities should be arranged for local residents who can offer their farms for tourists' needs.

Proposed eco-tourism in LWC include various types of environmental and recreational activities, and rural tourism activities will additionally include farming and forestry experience. These activities necessitate building of facilities specific to eco-tourism and rural tourism in addition to basic infrastructure for telecommunication and transportation. In particular, angling facilities at Lake Lubana and the fishponds are essential. Release of popular angling species such as pikeperch will contribute to increase the number of anglers visiting LWC. Financial and institutional support is needed for tourism development including establishment of these facilities. Special financial backup must be provided to local residents and farmers who are involved in rural tourism, making use of the existing financial supporting system such as the Special Action for Pre-accession in Agriculture and Rural Development (SAPARD) Program, because they are supposed to manage landscape beauty of their pastures and old orchards in addition to provision of services and

good-quality accommodation to tourists at their farm lands. Considering that important factors attracting rural tourism are waterfront siting and basic infrastructure, Nagli or Idena areas have a high potential to be bases for rural tourism in LWC.

4.2.4 Implication with the Environmental Management Plan

Summarizing the contents of the development guideline, the following are important factors from the development side to be considered for implementation of EMP.

(1) Full and wise use of natural and environmental resources in LWC

It is essential to make use of any resources in LWC to improve the living standard of the local people. For example, idle arable land should be used for development such as afforestation for forestry activities, eco-tourism and rural tourism should be actively introduced targeting the LWC naturalness and the existing primary industries. But this direction is in accordance with sustainable development concept ignoring adverse impacts on environment.

(2) Multi-sector development based on the existing industries

The primary industries with a long history such as agriculture, forestry and fishery should be continued simultaneously, neither terminating all these activities nor specializing a specific industry. This implies that the present land use for these industries will not change in principle to expand the natural area. On the other hand, it is not intended to introduce exotic industry such as heavy industry and mass tourism. The area should aim at small-scale rural development based on the land and environment.

(3) Improvement of local welfare and living standard

Socioeconomic level represented by employment rate, wage and education level in LWC should reach the national average. For this purpose, the development side will require local manpower, expertise, budget and institutional privileges in introducing non-traditional primary goods or processing methods, and in training local residents for eco-tourism and new productive technology. This requisite has a possibility to bring about financial or institutional conflicts with implementation of the proposed conservation projects. However, it is also a fact that financially rich communities can easily promote environmental conservation in contrast.

4.3 Fishery Development Plan

The guideline for regional development as described above are neither detailed development plans nor concrete projects. But, in addition to the eco-tourism development plan, a fishery development plan among the other primary industries is prepared because of the following reasons:

(1) Related local townships and people are all curious at the future fishery development, expecting the fishery development directions in more detail.

(2) Inland fishery in lakes and fishponds are relatively peculiar to LWC which has the nationally largest lake, Lake Lubana. In this context, inland fishery technology to be domestically introduced has been limited in comparison with agriculture and forestry which are common nationwide.

(3) Fish productivity in LWC is important not only for commercial fishery, but also for birds and eco-tourism which are a major target area in EMP. Fishery resources are therefore the key factor for both environmental conservation and development in LWC.

4.3.1 Concept on Fishery Development

Substantial national policy on commercial fishery is to conform fishing capacity to fish resources available, to ensure sustainable management and use of fish resources, to attain competitive fish products for local and international market, and to secure integration of the Latvian fisheries into the EU Common Fishery Policy. In accordance with the national policy, five strategies are introduced by the Government, namely 1) to manage fish resources and fisheries effectively, 2) to promote competitive fish products in domestic and international market, 3) to develop new international market, 4) to conduct fish restocking and aquaculture program, and 5) to establish education and research system on fishery. In addition, the angling or recreational fishing is also recognized as an important part of fishery sector in Latvia, though it is under the researching phase of new development forms.

In line with the national policy mentioned above, it is recommended to set a site specific concept on fishery in LWC, and it is presumed "**Lake of Pike**". This concept is induced from the viewpoint of relative publicity of Lake Lubana in contrast to Lake Razna known by eel production. Pike and pikeperch must be the most important and symbolic fish species to be produced and conserved in LWC. Since they are the highest trophic level endemic predator and caught by both commercial and recreational fishery with high economic value, their proper resource management surely contributes to conservation of other fish species and natural environment of LWC. Moreover, pike is a target species of NBF for artificial seed production aiming at restocking. Hence this concept should be taken into consideration in relevant development and conservation activities, particularly for eco-tourism development.

4.3.2 Direction of Fishery Development

(1) Prospect of commercial and recreational fishing

Although LWC is one of the important freshwater fish production areas, the production amount is negligibly small compared with the national fishery production. Moreover,

considering people‘s general preference, demand of ordinary freshwater fishes like carp species seems not to increase in near future. Therefore, following the LWC’s concept on fishery, development direction of commercial and recreational fishery must be set forth for maximum and sustainable exploitation of pike, pikeperch and some other valuable fishes, such as perch, tench and ide.

According to the study of LFRI, the annual potential fish catch of Lake Lubana is indicated to be 15 kg/ha or 120 tons, amongst which pike 40 tons, breams 30 tons, roach 10 tons, and other fishes 40 tons. The present fishery production of the lake, approximately 60 tons/year could be duplicated by proper resource exploitation. About pike, present production level of about 27 tons can be increased to about 1.5 times without artificial propagation measures, though more examinations are required to estimate catch of anglers and effect of fry restocking activities. An establishment of organization of fishermen and anglers with local-specific regulations is strongly recommended in order to solve various inter and inner problems effectively and rationally, because these fishing subsectors intend to use the same resources.

(2) Prospect of aquaculture

Governed by competitive relations under market economy, traditional carp culture at the Nagli fish farm seems difficult to continue its operation. One of the national aquaculture development strategies is to introduce competitive culture species such as crayfish and eel. However, it has appeared that culture of crayfish is not suitable for LWC because of the nature of bottom soil, being acid and inclusive of peat. Aquaculture of eel could be in a similar situation as crayfish, meaning that it is possible to grow-out technically but competitiveness to other locality is a great question.

On the other hand, seed production of pike and pikeperch could have significant potential in LWC. Availability of their wild broodstock is a given heritage in this locality. Fry of those species is demanded not only from Lake Lubana but also from other lakes in the Latgale region and other parts of the country for restocking purposes. Other endemic fishes like tench are also possible to reproduce for restocking. Development direction of aquaculture should not be for increase of market-size carp production, but for seed production of pike, pikeperch, and some other potential species. This would be maximized when demand from recreational fishing is increased. Present carp culture ponds particularly for the Oreniesi-drabaki ponds can be used as charged angling ponds in future.

(3) Strengthening of fishery resource management activity

Basic information required for proper fishery resource management such as aquatic environment, fish ecology and fishery activities, is substantially lacked in LWC at present. LFRI conducted a productivity and control fishing survey for quick resource assessment in 1997, but LFRI has no plan to carry out additional study for Lake Lubana. Several numbers of fish inspection officers are appointment in Rezekne and Madona REBs, but they are not mandated for field investigation nor fishery development activities. It is necessary to

establish a new institutional set-up that is responsible for monitoring of aquatic environment and for fishery resource management of LWC.

(4) Promotion of fish fry restocking activity

LFRI is not recommended fish fry restocking activity for Lake Lubana because of its relatively good conditions of fish reproduction. However, considering that fishing pressure is going to be increased for particular target species such as pike and pikeperch in order to meet with market demand, fry restocking activity will play an important role for effective use of the lake. Moreover, fry restocking activities could promote fishermen‘s participation to resource management and enhance awareness of the local people. Thus, it is recommended to implement fish fry restocking program as a resource propagation measure associated with other conventional legislative measures.

(5) Promotion of recreational fishing

There is a promising demand for fishing of pike and pikeperch from anglers of Latvia as well as overseas. Although LWC embraces rich natural resources, there are few service facilities and promotion activities. In addition to these dynamic fishing activities, Lake Lubana is known as a winter fishing place. For the benefits of anglers, a series of attractive facilities should be constructed. The facilities need to include angler‘s huts providing various services, fishponds for charged angling, and place for renting fishing boats. Development of souvenirs based on the concept of “Lake of Pike” also will support acceptance of anglers and other visitors.

(6) Promotion of eco-tourism

Eco-tourism must be developed based on accurate knowledge on fish and aquatic ecology. A series of fishery related activities in LWC such as fish unloading, artificial fry production and restocking or fish processing can provide informative knowledge to eco-tourists. Facilities for exhibition and explanatory purposes should be established in order to improve fishery related knowledge as well as aquatic ecology for eco-tourists. Facilities like educational aquarium, fish hatchery and fish processing would meet the objectives of eco-tourism from fishery sector.

(7) Improvement of post-harvest activity and promotion of processing

In order to improve present non-systematic post-harvest and marketing activities of local fishermen, a series of supportive facilities should be installed around the lake including access roads to fish unloading places. These facilities should be maintained and managed by fishermen‘s groups or cooperatives. Fish processing activities should be promoted in order to produce competitive fish products. Pike and pikeperch have high demand in a form of filet. A series of conventional processing methods, smoke, dry, canning can be applicable for carp species. These products could be sold strategically by a single organization which have a specific marketing brand, “Lake of Pike”.

(8) Encouragement of fish control activity

Present fish control activities by Rezekne and Madona REBs seem not enough to restrict expansion of recent illegal fishing. In order to support the activity of fish inspectors, necessary equipment for routine patrol such as vehicle, boat, and snowmobile should be deployed specifically in LWC.

4.3.3 Proposed Projects for Fishery Development

For the fishery development in LWC, the fish hatchery development project" and the angling promotion project are proposed as below. Table 4.3.1 shows facilities and equipment with their initial costs required for implementation of these fishery development projects in LWC. The total cost for these facilities and equipment is estimated at about 414,000 LVL without any contingency.

(1) Fish hatchery development project

A construction of new hatchery complex is required in LWC for production of fish fry for restocking to natural waters and for release to fish angling ponds. Besides, a hatchery educational aquarium and some demonstration facilities about fish reproduction are necessary for eco-tourism development. A series of earthen ponds for brood-stock and juveniles are also included in this hatchery complex. A possible site of the fish hatchery complex is the wintering pond area of the Nagli fish farm. The target production scale of the hatchery is preliminary given as follows.

Target Production Scale of the Hatchery

Fish species	Target production	
	Swim-up larvae or eggs	5-10 g size juveniles (no.)
Pike	5 mil.	250,000
Pikeperch	3 mil.	150,000
Other species	2 mil.	100,000
Total	10 mil.	500,000

(2) Angling promotion project

Angling is considered to be a substantial and important core of future regional development of LWC from viewpoint of wise use of natural resources. Considering current management situation of fishponds, several angling ponds should be opened by rehabilitation of a part of present aquaculture ponds of the Nagli fish farm. For promotion of angling activities in LWC, supporting facilities such as angler's huts available for car park, watching tower, fishing lots, and rental boats will be required around the lake from fishing management viewpoint.

4.4 Recommendations

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. For example, further development in LWC can be carried out within the framework of the development plan for Latgale region prepared recently. Development directions in the plan such as rural tourism and information technology are to be expanded to LWC.

The guideline on regional development for LWC is proposed also as a major component of EMP, which aims at integration between wetland conservation and local development of LWC. So the proposed conservation projects and development directions should continue to be fed to back each other to improve EMP. In this sense, contents of the development guideline will be further revised if necessary, based on the future findings from the environmental conservation side as well as inevitable requisites for the water level management.

Because of the importance of wetland ecology and eco-tourism potentials in LWC, it is allowed within the development guideline neither to construct industrial enterprises that pollute atmosphere, waters, groundwater and soil, nor to apply production and land use methods which damage the surrounding ecosystems. Although these adverse impacts will not be anticipated as far as the proposed development approaches and strategies such as “small-sized rural development” are taken, the following environmental measures have to be considered jointly with tourism infrastructure projects and environmental projects proposed under the EMP framework:

1) Improvement of wastewater treatment facilities and sewage system to protect Lake Lubana and rivers in LWC from further water pollution and eutrophication;
2) Prevention of over-capacity visitors damaging tourism objects, biological variety, protected forest and rural landscapes;
3) Establishment of collection and treatment system of domestic, tourist and industrial solid wastes in LWC; and
4) Restriction on vehicle usage and promotion of horse-riding and bicycle services to prevent noise and air pollution.

Table 4.1.1 Socioeconomic Indicators to Identify Special Support (in 1997 and 1998)

Indicators	Source	Date/Year	Unit	Riga City	Daugavpils City	Rezekne City	Rezekne Distruct	Balvi District	Madona District	Gulbene District
a. Resident Population	(1)	Jan.1/1998	persons	805,997	116,530	41,069	41,962	31,529	47,600	29,197
	(2)	Jan.1/1999		796,732	115,450	40,557	41,485	31,036	47,423	28,998
Production Indicators										
b. Industrial Output	(1)	1997	1,000 Ls	955,784	92,363	41,937	4,018	5,258	11,534	6,954
	(2)	1998		1,046,413	95,238	35,018	3,874	5,455	13,301	7,139
c. Industrial Output per capita (= b/a x 1,000)	(1)	1997	Ls	1,186	793	1,021	96	167	242	238
	(2)	1998		1,313	825	863	93	176	280	246
d. Score of c (= ranking No. x weight 1.0) *	(1)	1997	points	1	7	4	32	28	24	25
	(2)	1998		2	6	5	32	27	22	24
e. Capital Investment	(1)	1997	1,000 Ls	298,727	15,617	3,715	1,121	1,196	4,130	2,907
	(2)	1998		532,576	29,296	7,589	2,590	2,830	10,772	7,443
f. Capital Investment per capita (= e/a x 1,000)	(1)	1997	Ls	371	134	90	27	38	87	100
	(2)	1998		668	254	187	62	91	227	257
g. Score of f (= ranking No. x weight 1.0) *	(1)	1997	points	2	10	18	33	32	22	16
	(2)	1998		2	8	20	33	31	13	7
h. Active Enterprises **	(1)	Jan.1/1998	enterprises	31,017	1,640	612	247	235	490	360
	(2)	Jan.1/1999		28,347	1,673	679	232	230	489	358
i. Active Enterprizes per 1,000 inhabitants	(1)	1997	enterprises	38	14	15	6	7	10	12
(= h/a/1,000)	(2)	1998		36	14	17	6	7	10	12
j. Score of i (= ranking No. x weight 1.0) *	(1)	1997	points	1	10	9	32	30	22	16
	(2)	1998		1	10	7	32	30	23	16
k. Total Scores of Production Indicators (=d+g+j)	(1)	1997	points	4	27	31	97	90	68	57
	(2)	1998		5	24	32	97	88	58	47
Social and Demographic Indicators										
l. Umemployment Rate ***	(1)	Jan.1/1998	%	3.1	7.7	11.8	29.0	21.6	13.1	9.9
	(2)	Jan.1/1999		4.8	10.6	15.7	28.2	22.1	12.5	10.2
m. Score of l (= ranking No. x weight 2.0) *	(1)	1997	points	2	30	50	66	60	52	40
	(2)	1998		2	34	54	66	60	44	30
n. Personal Income Tax	(1)	1997	1,000 Ls	60,049,746	8,113,561	2,287,202	787,863	853,495	1,591,087	1,115,270
	(2)	1998		72,098,760	7,911,074	2,597,238	845,661	920,799	1,711,878	1,202,745
o. Personal Income Tax per capita (= n/a x 1,000)	(1)	1997	Ls	75	70	56	19	27	33	38
	(2)	1998		90	69	64	20	30	36	41
p. Score of o (= ranking No. x weight 2.0) *	(1)	1997	points	4	6	14	66	58	50	38
	(2)	1998		4	10	14	66	58	50	38
q. Demographic Burden ****	(1)	Jan.1/1998	persons	668	638	642	951	877	887	791
	(2)	Jan.1/1999		640	612	615	913	839	846	747
r. Score of q (= ranking No. x weight 1.0) *	(1)	1997	points	5	3	4	33	29	31	18
	(2)	1998		5	3	4	33	28	30	17
s. Persons with Education per 1,000 inhabitants *****	(1)	1989	persons	769	670	659	428	451	507	524
t. Score of s (= ranking No. x weight 1.0) *	(1)	1997	points	1	5	6	32	30	20	17
u. Monthly Average Wages and Salaries	(1)	1997	Ls	137.7	99.5	98.3	74.3	82.3	83.3	84.3
	(2)	1998		154.0	106.0	106.0	80.0	92.0	92.0	92.0
v. Score of u (= ranking No. x weight 1.0) *	(1)	1997	points	2	9	12	33	28	27	25
	(2)	1998		2	15	16	33	27	26	25
w. Inhabitants per km^2	(2)	Jan.1/1999	persons	2,595	1,604	2,386	16	13	14	15
x. Score of w (= ranking No. x weight 1.0) *	(2)	1998	points	1	3	2	24	31	29	25
y. Total Scores of Social and (=m+p+r+t+v)	(1)	1997	points	14	53	86	230	205	180	138
Demographic Indicators (=m+p+r+v+x)	(2)	1998		14	65	90	222	204	179	135
z. **Grand Total Scores** (=k+y)	(1)	1997	points	18	80	117	327	295	248	195
	(2)	1998		19	89	122	319	292	237	182
Overall Ranking of z ******	(1)	1997	—	1	7	9	33	31	26	21
	(2)	1998		1	6	10	33	31	25	21

Notes : * For the indicator concerned, 7 cities and 26 districts forming the whole Latvia were ranked in better order from No.1 to No.33.

** Active enterprises were counted also besed on information about activity cessation.

*** It is a ratio of unemployed persons to economically active population, who offer thir work for the production of goods and services.

**** Population under and over working age per 1,000 population of working age.

***** They are persons with higher and secondary education per 1,000 inhabitants at age of 18 and older.

****** This ranking shows overall socioeconomic levels, indicating that cities or districts with the higher No. need more special support for their develop

Source : (1)Administrative Districts and Major Cities of Latvia : statistical yearbook (CSB, 1998)

(2)Administrative Districts and Major Cities of Latvia : statistical yearbook (CSB, 1999)

Table 4.1.2 Estimated or Projected Future Population in LWC

Town-ship/ Town	Actual Population in Whole Townships/Town				Annual Growth Rate (%)	Projected Population in Whole Townships/Town						Whole Area	Actual/Projected Population Density in Whole Townships/ Town (/km²)				Study Area	Estimated/Projected Population in LWC			
	1996	Share	1999	Share	1996-99	2000	Share	2005	Share	2010	Share	(km²)	1999	2000	2005	2010	(km²)	1999	2000	2005	2010
Total	18,044	100%	17,320	100%	-1.36	17,088	100%	15,993	100%	14,996	100%	2,272	7.6	7.5	7.0	6.6	814	6,554	6,465	6,046	5,665
Rezekne District																					
1 Gaigalava	1,247	6.9%	1,213	7.0%	-0.92	1,202	7.0%	1,148	7.2%	1,096	7.3%	193	6.3	6.2	5.9	5.7	94	591	585	559	534
2 Nagli	700	3.9%	687	4.0%	-0.62	683	4.0%	662	4.1%	641	4.3%	138	5.0	4.9	4.8	4.6	133	662	658	638	618
3 Deksare	998	5.5%	976	5.6%	-0.74	969	5.7%	933	5.8%	899	6.0%	103	9.5	9.4	9.1	8.7	21	199	198	190	183
Balvi District																					
4 Ragaju	1,968	10.9%	1,872	10.8%	-1.65	1,841	10.8%	1,694	10.6%	1,558	10.4%	318	5.9	5.8	5.3	4.9	50	294	289	266	245
5 Lazdukalns	1,328	7.4%	1,225	7.1%	-2.66	1,192	7.0%	1,042	6.5%	911	6.1%	195	6.3	6.1	5.3	4.7	80	503	489	428	374
6 Berzpils	1,246	6.9%	1,107	6.4%	-3.87	1,064	6.2%	874	5.5%	717	4.8%	128	8.6	8.3	6.8	5.6	59	510	491	403	331
Madona District																					
7 Lubana Town	2,197	12.2%	2,131	12.3%	-1.01	2,109	12.3%	2,005	12.5%	1,906	12.7%	3	710.3	703.1	668.3	635.2	2	1,421	1,406	1,337	1,270
8 Varaklani	1,080	6.0%	1,046	6.0%	-1.06	1,035	6.1%	981	6.1%	930	6.2%	99	10.6	10.5	9.9	9.4	12	127	125	119	113
9 Indrani	1,240	6.9%	1,222	7.1%	-0.49	1,216	7.1%	1,187	7.4%	1,158	7.7%	343	3.6	3.5	3.5	3.4	125	445	443	433	422
10 Ospe	1,657	9.2%	1,604	9.3%	-1.08	1,587	9.3%	1,503	9.4%	1,424	9.5%	224	7.2	7.1	6.7	6.4	134	960	949	899	852
11 Barkava	1,901	10.5%	1,798	10.4%	-1.84	1,765	10.3%	1,608	10.1%	1,466	9.8%	188	9.6	9.4	8.6	7.8	54	516	507	462	421
12 Murmastiene	1,052	5.8%	1,027	5.9%	-0.80	1,019	6.0%	979	6.1%	940	6.3%	175	5.9	5.8	5.6	5.4	38	223	221	213	204
Gulbene District																					
13 Dauksti	1,430	7.9%	1,412	8.2%	-0.42	1,406	8.2%	1,377	8.6%	1,348	9.0%	165	8.6	8.5	8.3	8.2	12	103	102	100	98

Sources : Towns and Civil Parishes in the Administrative Districts of Latvia:
A Collection of Statistical Data, Parts 1 & 2 (CSB, 1998); and Number of Inhabitants in Regions,
Towns and Townships of Latvia: Statistical Bulletin (CSB, 1999)
Note : The estimated figures, especially total figures, in the teble are not always equal to the calculated ones due to round-off processing.

Table 4.3.1 List of Facility and Equipment for Fishery Development

Project	Specification	Unit	Cost (LVL)	Type
(1) Fish Hatchery Complex of the Nagli Fish Farm Area			314,700	
1) Hatchery complex			209,900	
a) Hatchery building	1 story, RC	m2	120,000	B
b) Incubator	100-l.	set	5,000	E
c) Tanks for larvae	FRC 500-l.	set	20,000	E
d) Tanks for juveniles	FRC 3 m3	set	35,000	E
e) Water intake pump	1 m3/min	set	5,000	E
f) Heating unit	Water heater	set	8,500	E
g) Elevated tank	5 m3	set	3,500	E
h) Water checker	portable type	set	1,700	E
i) Rearing equipment	Net, filter, grass equipment, etc.	set	6,700	E
j) Aerator		set	4,500	
2) Educational aquarium with demonstration area			60,000	
a) Educational aquarium with demonstration	1 story, RC	m2	40,000	B
b) Glass tanks	500-l. for exhibition	set	15,000	E
c) AV equipment	Video, TV monitor	set	5,000	E
3) Outdoor ponds			44,800	
a) For broodstock	WD 2.5 m, 1 ha. (pond rehabil'n)	set	16,800	C
b) For juveniles	WD 1.5 m 0.5 ha (pond rehabil'n)	set	28,000	C
(2) Angling Supportive Facility and Equipment of the Lake and River			99,200	
1) Rehabilitation of ponds			14,200	
b) Rehabilitation of pond and facilities		set	10,000	C
c) Fishing wharf	Wooden	set	2,200	B
d) Watching tower	Wooden with light	set	2,000	B
2) Facility for Anglers			85,000	
a) Angler's hut	1 story, 1 place	m2	20,000	B
b) Wooden pier	Wooden piar, 20 m	set	10,000	B
c) Boat for rent	Wooden without engine	set	30,000	E
d) Fishing rot for rent	Rot and reel	set	15,000	E
e) Parking lot	Gravel, 200 m2 x 5 places	m2	10,000	C
Grand Total			413,900	

Note: B: building work, C: civil work, E: equipment

CHAPTER 5

CHAPTER 5 DIRECTIONS OF LAND USE PLANNING

5.1 Overall Frame

A schematic chart summarizing the overall frame of land use planning for LWC is shown in Figure 5.1.1. According to this chart, the following sections describe the frame components including approaches, strategies, and legal and institutional aspects as well as links among them.

5.1.1 Approach and Strategy

(1) Approach for land use planning

The goal of the National Spatial Plan, which is now under preparation for more detail, is to promote sustainable social and economic development of the state, to facilitate coordinated regional policy, to ensure environmental protection, to make a rational use of lands and natural resources, and to manage and protect cultural and historic heritage, creating preconditions for formation of effective network of settlements and infrastructure. The plan should be prepared with basic directions of environmental policy of Latvia. The plan could not contradict the Directives of the European Union concerning spatial planning, including the EU Directive on Environmental Impact of Certain Private & Public Objects (85/337/EEC) as well as the Economic Development Strategy of Latvia and other legislation documents. In making the plan, the following basic principles are supposed to be observed:

Publicity: The planning process promotes participation of society and politicians and their initiative at the earliest possible stage, ensuring openness of information.
Comprehensiveness: The plan takes into consideration and coordinates different spheres of public life, promotes its development, and ensures a comprehensive approach to problem solving.
Functionalism: The plan takes into consideration the existing functional connections between sectors and regions without disturbing or disarranging them.

Moreover, the plan should fit into a united planning system that specifies distribution of responsibility between the state and municipalities toward decentaralization. The state is responsible for basic issues of environment and health protection, and for guidelines on improvement of land use planning of municipalities. In land use planning, local municipalities including towns and townships are responsible for local environment and their administrative area, and balance private and public interests at the area. Duly observing the goal and basic directions on the national-level land use planning, the following approaches for land use planning in LWC are proposed:

1) Planning for local people's welfare:

The local farmers, lumbermen, fishermen, and other land users that depend on the land are major focuses of land use planning. Local acceptability is most likely to be achieved by "bottom-up planning", where problems are identified and initiatives arise at a township level. However, the support of key people who can lend political credibility and agencies that have the resources to implement the plan is equally essential.

2) Protection against adverse impacts of introduced technology:

Land use planning is a means of introducing new technology such as agronomy, sylviculture, livestock husbandry, agro-forestry, and other means by which land is used. This, in turn, may have social and environmental impacts that must be assessed and mitigated in the planning process, as early as possible.

3) Planning with an integrated manner:

Land that is suitable for farming is usually suitable for many other competing uses. So land use planning has to integrate information about the suitability of the land, the demands for alternative products or users, and the opportunities for satisfying those demands on other land available at present and in the future. And land use planning has to integrate with the established legal and institutional framework.

4) Planning based on land resource information:

Capital, labor, management skill and technology can move to where they are needed. On the other hand, land resources are fixed, and different areas present different opportunities and different management problems. Land use plans define the distribution of land selected for the specified objectives. Accurate information about land resources is, therefore, essential to land use planning.

(2) Strategies of future land use

Considering the future land use in LWC, it is essential to observe the existing national and regional goals together with the above-mentioned approaches. The national goals stress rational use of nature resources, and management and protection of nature, which are quite suitable to the land use in environmentally important lands like LWC. LWC has unique and important wetland ecosystems, but with different issues related to local economic activities and environmental protection that should be regarded as one whole problem. Therefore, the area deserves a special attention within the frames of local land use. While determining the land use, there are important aspects not to be forgot. One is the proportion of the determined form of land use to the total area, while another is lands with special conditions or location that should be reserved for specific goals. The second aspect should be emphasized in planning the future land use for LWC, because of its specific necessity of ecological conservation. Taking into account these key factors for land use planning for LWC, the following 5 land use strategies with implication on its regional development and wetland conservation are established:

1) Restriction on change of the existing land use pattern:

If the existing land use pattern is changed in such ways as conversion of forests, swamps or water bodies into agricultural land and other artificial usage, the whole ecosystem of LWC has to be basically affected because of spatially and physically close connection among the existing land uses. Therefore, land use change of a large scale should not be permitted in LWC in principle. Especially, any land use conversion of the proposed protected area are not allowed at all. In the same context, the existing marshes and bogs should remain for the future opportunity of potential profitable usage, because these have been formulated in a long ecological history and have kept naturalness attractive to visitors.

2) Flexible and small scale conversion of the idle arable lands into forests:

Some parts of area categorized as agricultural lands are not under active cultivation due to lack of product market, no profit in production, low level of soil fertility, poor drainage system or little cultivation manpower. The idle arable land is depicted as in Figure 5.1.2. These idle lands should be used not only for agriculture but also forestry, depending on the economic situation. An extent of conversion between agricultural land and forest can be determined comparing a mid-term profitability of the both sectors. When forestry products become much less profitable than agro-products in the future, some afforested area might be returned to farm lands.

3) Harmonization of productive and recreational usage of water bodies:

The water bodies such as Lake Lubana and the existing fish ponds are fishery production area, at the same time important potential area for recreational usage in eco-tourism and rural tourism development in LWC. Therefore, parts exclusively for fishery products or recreational usage and for multi-usage of the both should be demarcated harmoniously taking due consideration of the fishery profitability, tourists' interest and demand size, as well as impacts on water-front scenery and fish breeding. Thus, this harmonization must be also flexible depending on the potential markets of fishery products and tourism.

4) Building of small scale factories, facilities, and infrastructure:

For the economic development for the local society's well-being as well as for financial ground for natural conservation, agriculture-, forestry- or fishery-based processing factories will be profitable. These also have a possibility to offer processed goods as food and souvenirs to potential tourists. For promotion of eco-tourism and rural tourism, tourist facilities and minimum infrastructure have to be constructed or improved. Besides, water control facilities such as sluices, pumping stations, drainage canals have to be rehabilitated or constructed. But all of these should be in a small scale only needing limited area, using the existing facilities as much as possible. In particular, additional construction of inundation control facilities should be implemented only in the Development Zone (DZ).

5) Application of land use technologies friendly to local environment:

Whether the products of each primary industry are traditional or non-traditional, environmental technologies including mixed or rotational cultivation, anti-erosion farming, agro-forestry, organic farming, sustainable and managed feeding in fishery are strongly recommended to be actively applied to productive land use fields. It is because such environment-oriented products can be a feature of LWC to develop new markets, and because the Active Management Zone (AMZ) surrounding the Nature Preservation Zone (NPZ) has a buffering function to ensure the wetland ecology in LWC.

5.1.2 Evaluation of Land Capability

LWC has been reported to be generally suitable for agriculture from both topographical and soil fertile points of view. And the existing forest land in the area has become appropriate for intensive forestry activities because of the past soil rehabilitation and work road construction. Here, land capability of LWC is reviewed especially for agricultural sector as it is spatially influential to the future development land use in LWC. Slope and soil depth are used to review land capability of LWC, applying them to the international standard classification as below.

Land Capability Classification for Agriculture

Soil Depth / Slope	Deep (>90 cm)	Moderately Deep (50~90 cm)	Shallow (20~50 cm)	Very Shallow (<20 cm)
Gently Sloping (<7^0)	C1	C1	C1	C1/P
Moderately Sloping (7^0~15^0)	C2	C2	C2/P	P

Notes: C1=Cultivated land requiring no or few intensive conservation measures such as contour cultivation, strip cropping, vegetative barriers, rock barriers and, in larger farms, broadbase terraces;
C2=Cultivated land needing more intensive conservation such as bench terracing, hexagon, convertible terracing for the convenience of four-wheel tractor farming. The conservation treatments can be done by medium-sized machines; and
P =Pasture. When the land is too wet, zero grazing should be practiced. Rotational grazing is recommended for all kinds of slopes.
Source: Watershed Management Field Manual : Watershed Survey and Planning, FAO, 1990

In LWC, Glacigenos moraine loam and sandy loam deposits lying below are irregularly covered by limnoglacial deposits (sand, aleirit, clay), as much as by augshpleistocena and holocena deposits and peat. Its thickness is 1~4 m, maximum is 8 m. Relief of the plain is flat (mostly less than 1^o), and in some places is crossed by gently sloping hills and continental sandhills. Therefore, the area can be mostly classified into C1 where land is suitable for agricultural cultivation even without conservation measures such as soil erosion controls.

On the other hand, only 50~60 % of the arable land is now under actual agricultural activities in the four districts surrounding LWC. This high proportion of idle land results partially from the fact that there are large areas of low-quality boggy and marshy soils with peat. The poor soils had been forced into production before independence and parts have never come back into agricultural production. The share of acid soils requiring liming has increased, and some soils also contain insufficient natural phosphorus. The improvement of soil requires big investments. In addition, improvement of drainage situation is

necessary for some arable lands. For instance of Balvi district with the drained land occupying 66% of the total district area, ratios of the drained lands in a good technical condition, on average and unsatisfactory are 68 %, 15%, and 17%, respectively.

5.1.3 Legal and Institutional Framework

There may well be a long time gap between land use planning and actual implementation for financial, bureaucratic and political reasons beyond the control of the planner. The responsibility for putting the plan into effect rests with the decision-maker, implementing agencies and the local people of LWC. Common pitfalls in institutional aspects of land use planning are:

- Underestimation of the time and amount of information needed to ensure the comprehension, participation and satisfaction of both the people and the local municipalities, especially in the cases of more socially-oriented activities like cooperatives and credit for small farmers,
- Starting new investment-oriented projects (roads, soil conservation works, tree planting) without building support institutions and following up earlier projects and programs, and
- Attempting to conserve land by taking out of production farmland or under grazing without making a compensatory increase in employment in other sectors.

In order to prevent these pitfalls and to implement smoothly the land use plan for LWC, the following legal and institutional framework should be duly considered.

(1) Policies to provide implementation incentives for land use

When a financial analysis from the farmer's point of view shows the land use to be privately advantageous, the use is likely to continue but socially damaging sometimes. Policy changes and incentives will be needed to make a socially desirable kind of land use, such as conservation farming, equally advantageous to the farmer. Similarly, a financial analysis may demonstrate that farmers do not have an incentive to produce a surplus for sale. If the government requires increased production, a change of pricing policy may be an effective way to provide incentives to achieve it.

The central or local governments may use incentives like grants, subsidies, food-for-work programs, tax benefits and public recognition, and may introduce regulations that require compliance. Where the incentive of ownership is not available, subsidies and/or legal coercion could be used to close the incentive gap.

(2) Legal and financial background for land use planning

According to the Law on Spatial Development Planning of Latvia, which was adopted in October 1998, land use planning in Latvia is to be carried out, as such:

- Local governments of districts, state cities, towns and townships shall prepare land use plans of their administrative areas,
- Central or regional land use programs of higher level shall be observed when producing local land use plans of lower levels, and
- Land use plans of central, regional and local levels shall be prepared in accordance with the relevant development programs.

And the financial arrangement for land use planning is to follow the procedures as below:

- Financing for land use planning being the necessary expenses of the local municipalities shall be allocated in their budgets,
- For facilities of land use planning in the annual state budget, a state target grant is envisaged for co-financing of local municipality land use planning, and
- The Cabinet of Ministries determines the allocation procedure of the state target grants for preparation of local municipality land use plans.

(3) Legal background for ownership of protected areas

LWC includes nature protection areas designated in accordance with the Law on Specially Protected Nature Territories issued in 1993. The legal powers for control of land owners and users are regulated in the Environmental Protection Law. A special form of sanction is connected with private property rights to land within the reserve. In case of violation of the protection rules, the right to use land may be suspended and private land expropriated. The state or local governments own land in LWC, while some parts are also privately owned by physical persons or legal entities. An important issue is the right for land owner and user, but also for state and local authorities responsible for carrying out conservation according to the laws and international obligations.

In accordance with the Law on Land Use & Survey (1991) and the Law on Specially Protected Nature Territories, private land owners have the right to demand for compensation from the local government for financial losses resulting from the legal restrictions and obligations concerning the private land. Tax exemption is one form of compensation available. If no agreement can be reached, the owner or user may bring the matter to court. However, the legal problem is the lack of legal principles for compensation and how to consider private interests, when establishing a protected area and determining restrictions and other requirements. The state has first refusal rights to purchase private land within a protected area. On the other hand, state land within a protected area may be transferred to private ownership in connection with the land reform, but only if the person will agree to observe the rules on the protection and use of the protected area and the plan on nature protection. In other words, the land reform should not weaken existing protected areas.

(4) Institutional coordination of different sectors

Land use planning is non-sectoral. But a land use plan has to be implemented by different sectoral agencies related to agriculture, transportation, tourism, land reclamation, and the extension services, and by private organizations and individuals. There is no clear boundary between land use planning and other aspects of rural development. For example, a desirable change in land use may be the introduction of a cash crop. Successful management may require the use of fertilizer. This cannot be done unless there are local centers for fertilizer distribution, effective advice on its use, and a system of credit for its purchase. Local services will be of no use without an adequate national system of fertilizer distribution, and sufficient manufacture or allocation of foreign currency for imports. Construction of a fertilizer factory and organization of national distribution are certainly not land use planning but they may be essential for the success of planned land use.

5.2 Directions of Land Use Planning

5.2.1 Proposed Future Land Use of the Study Area

(1) Future land use map for LWC

Figure 5.2.1 presents a land use map proposed for the future land use in LWC. It is based on the present land use pattern, reflecting the above-mentioned land use strategies for LWC. The land use here has been proposed based on the analytical results of development potentials in the future, taking account of and harmonizing with proposals on land use appropriate for environmental conservation of LWC. In the course, the output of the environmental zoning has been also fed back. The depicted land use categories are classified into 4 areas such as forest land, agricultural land, urban area, and retardation basin, in addition to the Nature Preservation Zone (NPZ) and the Active Management Zone (AMZ).

1) NPZ and AMZ

NPZ and AMZ are absolutely identical with those of the environmental zoning. Land use for development activities is strictly prohibited in NPZ, while the present land use will be maintained in AMZ with environmental consideration. AMZ includes Lake Lubana and fishponds because they provide not only fishery resources but also valuable aquatic ecosystem to be conserved for flora and fauna as well as eco-tourism activities.

2) Forest land

It includes the existing state and private forests, and its major part covers commercial cutting forests planned by the state-shared forestry company “Latvijas Valsts Mezi”. And all the identified idle arable land is also proposed for forestry development. But wet idle land along the northwestern shore of Lake Lubana necessitates rehabilitation of the existing drainage system in a large scale even for forestry rather than agriculture. Costly drainage rehabilitation works during the period up to 2010 are not recommendable since the economic effectiveness of forestry at present is very low under LWC’s and Latvian

economic situation. Ensuring timing to produce revenues enough to recover the costs including drainage rehabilitation expenditures, forestry activities there should be commenced in a long term. Similarly, the idle state farmland located in the right bank of the Rezekne river is inundated so that the existing drainage pumping facilities must be rehabilitated to make it usable. Conversion to forests there must be considered in a long run beyond 2010, because it can be a potential site for depositing soil dredged from Lake Lubana or for establishing tourism facilities such as horse riding ground upon possible activation of eco-tourism/rural tourism in the future.

3) Agricultural land

This area mostly includes the existing agricultural land consisting of non-irrigated arable land, pastures, complex cultivation patterns, and land principally occupied by agriculture with natural vegetation. Within the area, kinds of agricultural products, cropping patterns and cultivation methods can be modified as far as neither NPZ nor AMZ are environmentally affected. A part of the farmland at Licagala is subject to the spring flood, needing expensive construction of 6-km dike along the Aiviekste river. It is proposed that such dike construction should be considered in a long term, taking into account actual economic merits to agricultural activities as well as hydrological impacts on the whole Aiviekste river basin.

4) Retardation Basin

This area is in the biotope map categorized as inundated grassland with little possibility of any development. Instead, it has played an important role to retain excessive water flow of the rivers, especially during the flooding season. Therefore, its land use is to continue this hydrological function. In the future, development activities can be established even there which is located outside of NPZ or AMZ. However, it is essential to replace the hydrological function lost by the development activities in the other ways, in order to prevent adverse impacts toward downstream.

(2) Change between the present land use and the proposed land use

LWC is divided into three kinds of the environmental zones, such as NPZ, AMZ and the Development Zone (DZ). The next table shows areas in km^2 by the five land use categories for the present based on at the 1998 map as well as for the proposed toward 2010 calculated from Figure 5.2.1.

Since NPZ is strictly preserved and the present land use pattern in AMZ will not be changed in principle, there will be no land use difference between the present and the future. On the other hand, the land use pattern within DZ is proposed to change in the future. As recognized well with the graph below, a major change will be for forest land and agricultural land. The forest area in DZ will increase from 159 km^2 to 190 km^2 (20 % increase), while the agricultural area will decrease from 204 km^2 to 164 km^2 (20 % decrease). This is mainly because of conversion of idle agricultural land to forestry development area. In 2010, the land use ratio of DZ will be 52 % for forest land, 44 % for

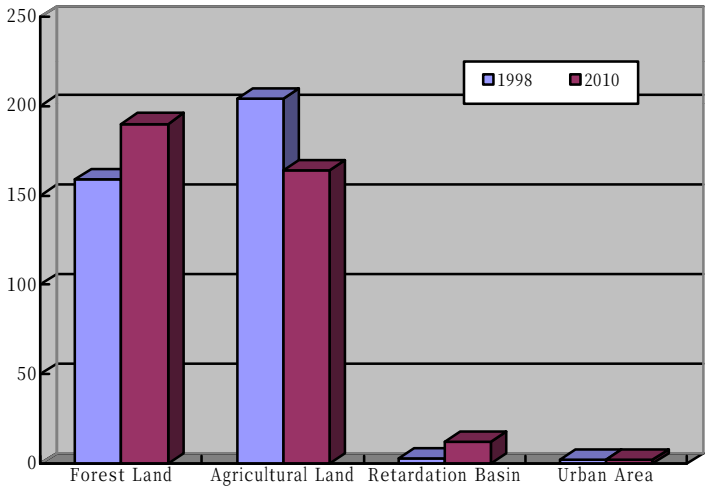
agricultural land, and the remaining 4 % for the other usage. Majority land use of agriculture in 1998 is switched with forestry in 2010.

Area Comparison of the Proposed Land Use (2010) with the Present Land Use (1998)

Land Use Legend	Year	NPZ		AMZ		DZ		Total by Land Use	
		Area (km^2)	%	Area (km^2)	%	Area (km^2)	%	Area (km^2)	%
Forest Land	1998	108	58	112	43	159	43	379	47
	2010	108	58	112	43	190	52	410	50
Agricultural Land	1998	0	0	27	10	204	55	231	28
	2010	0	0	27	10	164	44	191	24
Water Bodies	1998	1	1	93	36	0	0	94	12
	2010	1	1	93	36	0	0	94	12
Retardation Basin or Wetlands	1998	77	41	28	11	3	1	108	13
	2010	77	41	28	11	12	3	117	14
Urban Area	1998	0	0	0	0	2	1	2	0
	2010	0	0	0	0	2	1	2	0
Total by Zone		186	100	260	100	368	100	814	100

Notes: Forest Land includes broad-leaved forest, coniferous forest, mixed forest, natural grassland, transitional woodland & scrub, and sparsely vegetated area; Retardation Basin is inundated grassland, and Wetlands additionally include inland marshes and peat bogs; Water Bodies include lakes, and fish ponds; and Agricultural Land includes non-irrigated arable land, pastures, complex cultivation patterns, and land principally occupied by agriculture with natural vegetation.

Sources: Satellite "SPOT" data in 1998, and 1:50,000 Topographical Maps



Land Use within DZ in 1998 and 2010 (Unit : km^2)

5.2.2 Implication with EMP

The strategies for land use planning and the future land use map proposed in the previous sections are an essential component of EMP for LWC. The strategies and future land use are based on the basic concept mentioned in the guideline on regional development as well as the present land use condition of LWC. Therefore, they are to be altered when the development guideline is revised in the future.

(1) Democratic coordination of different landowners

Land in LWC is owned by different stakeholders such as private persons, private enterprises, the state and local municipalities. The ratio of private land is increasing also in the study area according to the national privatization policies. Especially, a major part of agricultural area is owned by individuals. It is a sensitive matter for private owners to alter the present land use pattern, since it directly affects their living conditions. In particular, due agreement and compensation should be required where private land is planned to be converted to the strict nature 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 democratically by providing local people with opportunities to participate in planning the concrete land use for LWC under the EMP framework.

(2) Maintenance of the existing land use pattern

The already established land use situation should not be changed as much as possible, also ignoring 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. It means that that spatial extension of conservation area except for the proposed strict nature protection area is not favorable from the land use's standpoint. Maintenance of the present land use pattern implies that a large part of LWC continues to be utilized for agriculture, forestry and fishery in the future. Instead of expansion of the land for such primary industries, production should be improved by intensively inputting production resources, although application of land use technologies friendly to environment is recommended as a land use direction. EMP is to take these into account in environmental zoning.

(3) Flexible and multiple usage of the development land

In the land use map in Figure 5.2.1, both the agricultural and forest lands are proposed. In these lands, idle arable land is recommended to be flexibly converted between cultivated land and forest depending on economic profitability of the both industries. The agricultural and forest lands will be used not only purely for agricultural and forestry activities but also for rural tourism development based on the existing natural resources. 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. Water level management plan under EMP should propose water level criteria to harmonize these two purposes.

5.2.3 Recommendations

(1) Detailed assessment on land capabilities of LWC

Land capabilities are described by the land qualities needed for sustained production. The next table lists typical land qualities. For LWC, the choice of land characteristics is limited to those for which information is already available or can be gathered quickly. More detailed assessment on land capabilities thus necessitates data collection about critical land qualities through further researches.

Land Qualities for Agriculture

Land Qualities	Land characteristics that may be used to measure the quality
(a) Sufficiency of energy	Sunshine hours in growing season, temperature regime
(b) Sufficiency of water	Evaporative demand set against rainfall, soil water storage and rooting conditions
(c) Conditions for ripening	Period of successive dry days with specified sunshine and temperature
(d) Climatic hazards	Frequency of damaging frost, hail or winds during growing period
(e) Sufficiency of oxygen in the root zone	Soil drainage class, depth to water table
(f) Sufficiency of nutrients	Soil nutrient levels, pH, organic matter content
(g) Erosion hazard	Rainfall and wind erosivity, set against soil cover, slope angle and length, and soil permeability; calculated soil loss in tonnes/ha/year; or loss of nutrients in kg/ha/year
(h) Toxicity	Soluble Al, Fe; pH

Source : Guidelines for Land Use Planning, FAO, 1989

(2) Establishment of an independent land use planning unit

An independent land use planning unit is recommended to be established for LWC. This will need a range of expertise, access to sufficient authority and the ability to make quick decisions. If it is yet another sectoral body, it will merely compete with other agencies and will not be in a strong position either to influence their programs or to implement plans of its own. The most effective situation for the land use planning unit is as a direct support to the executive. At the highest level, land use planning might be dealt with by a small committee of permanent members drawn from the local municipalities and agencies concerned with LWC. The land use committee should make recommendations on priorities, the creation and allocation of resources, and the establishment, approval and co-ordination of land development programs. Alternatively, these functions could be added to the Environmental Management Center and its Implementation Committee.

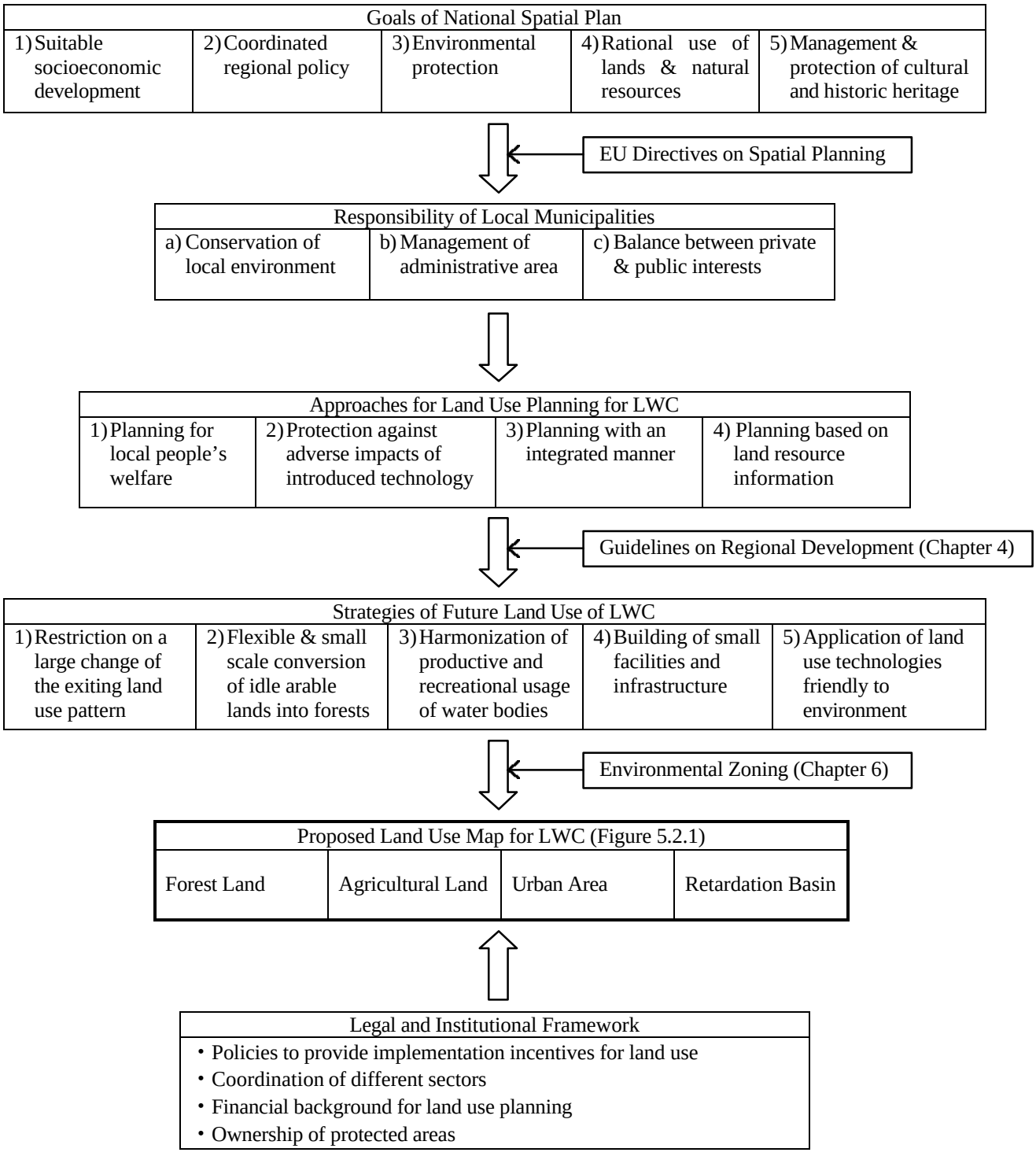


Figure 5.1.1 Schematic Chart of Land Use Frame for LWC

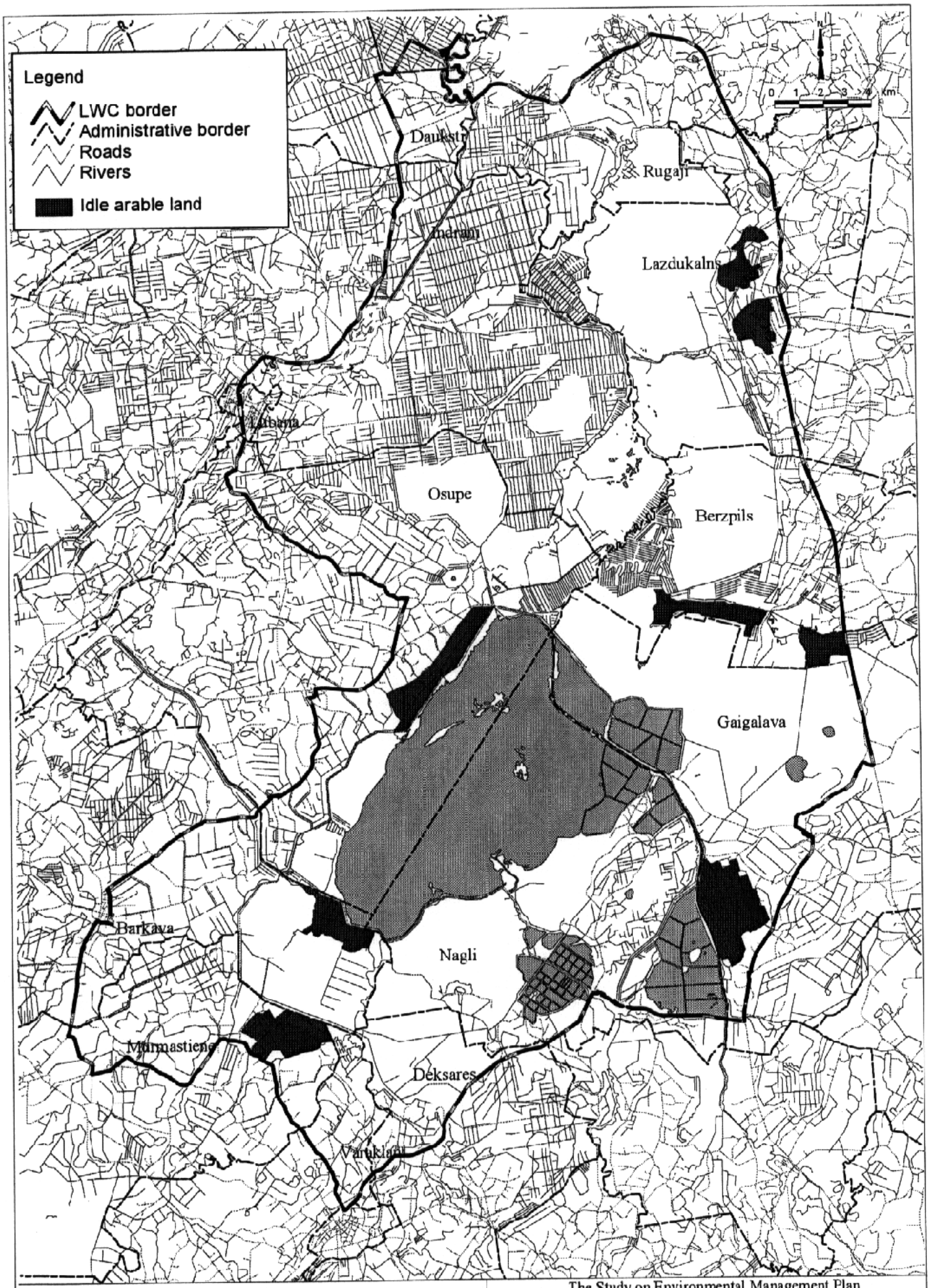


Figure 5.1.2 Idle Arable Land

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

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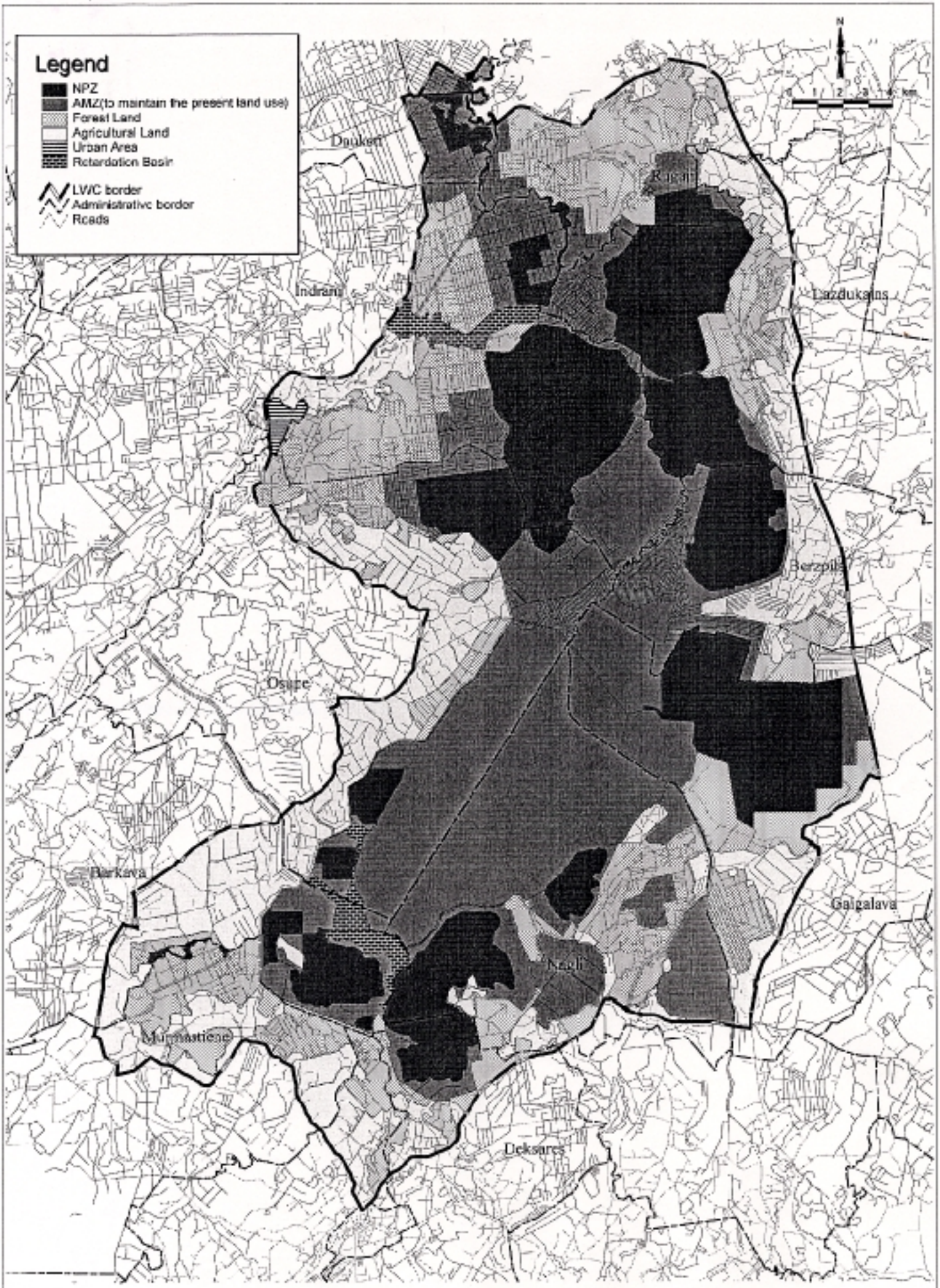

Figure 5.2.1 Proposed Land Use Map

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

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