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**COMMITTEE FOR THE ACTIVITIES OF THE COUNCIL OF EUROPE
IN THE FIELD OF BIOLOGICAL AND LANDSCAPE DIVERSITY**

(CO-DBP)

Group of Specialists– European Diploma for Protected Areas

28-29 January 2002
Room 15, Palais de l'Europe, Strasbourg

**Matsalu Nature Reserve
(Estonia)**

**APPLICATION
for the European Diploma for Protected Areas**

*Document established by
the Directorate of Culture and Cultural and Natural Heritage*

**INFORMATION FORM FOR NEW APPLICATION
FOR THE EUROPEAN DIPLOMA OF PROTECTED AREAS**

Logo
European Diploma

Council of Europe

European Diploma

**Information form
for Candidate Sites**

This form is also available on diskette

Site Code (to be given by the Council of Europe)								
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1. SITE IDENTIFICATION

1.1. SITE NAME

Matsalu Looduskaitseala (Matsalu Nature Reserve)

1.2. COUNTRY	Eesti (Estonia)							
1.3. DATE CANDIDATURE	2	0	0	1	1	2	0	9
1.4. SITE INFORMATION COMPILATION DATE	2	0	0	2	1	1	0	9
	Y	Y	Y	Y	M	M	D	D

1.5. ADDRESSES: Administrative Authorities

National Authority	Regional Authority	Local Authority
Name: Ministry of Environment Address: Toompuiestee 24, Tallinn	Name: Address:	Name: Matsalu Nature Reserve Administration Address: Penijõe, Lihula vald, Läänemaa
Tel. Fax. E-mail: Hanno.Zingel@ekm.envir.ee	Tel. Fax. E-mail.....	Tel.+3724724222 Fax.+37224235 E-mail: matsalu@matsalu.ee.....

1.6. ADDRESSES: Site Authorities

Site Manager	Site Information Centre	Council of Europe Contact
Name: Matsalu Nature Reserve Administration Address: Penijõe, Lihula vald, Läänemaa Tel.3724724222..... Fax.372424235 E-mail:matsalu@matsalu.ee	Name: Matsalu Nature Reserve Administration Address: Penijõe, Lihula vald, Läänemaa Tel.37224236 Fax.372424235 E-mail: muuseum@matsalu.ee	Name: Address: Tel. Fax. E-mail.....

1.7 SUMMARY DESCRIPTION

Matsalu wetland constitutes a very valuable natural heritage. Thousands of waterfowl and waders migrate through the area, nest, rest or moult here, it is home for the seals and nursery for the fish. It is a protected area, a wetland of international importance and important bird area. Biodiversity here is closely connected to the historical land-use, especially mowing and grazing that has created semi-natural meadow communities characteristic to the area. Therefore both land-use intensification and abandonment cause problems here and nature conservation is inseparably connected to resource use management. Management of the site is therefore concentrated on co-operative efforts with the farmers, like mowing and grazing contracts, support for investment and capacity building related to wetland resources' wise use.

1.8. EUROPEAN INTEREST JUSTIFYING THE CANDIDATURE

1. Valuable fauna and flora

The region is extremely important for migrating, moulting and nesting birds. This has been recognised by designating as IBA. Significant part of the global populations of barnacle geese and globally threatened lesser white-fronted geese migrate through the area. Area is also very important for waders both on migration and during nesting time.

Of mammals populations of grey and ringed seals, otters and beavers are important. Area is rich in reptiles and amphibians, most important of who is the endangered Natterjack toad. The fish resource is also considerable.

Flora and vegetation are also remarkable. Due to high species richness the area is significant as representative set of typical habitats for Estonia, that are now rare in the Baltic region. Especially important are alluvial and coastal meadows, alvars and wooded meadows.

It is obvious that landscape, vegetation and fauna are closely interconnected.

2. Valuable ecosystems

Due to above-mentioned reasons it is necessary to review the ecosystems in the area. The development is sustainable only if it does not cause decline in the ecosystem quality.

2.1. **Väinameri sea.** Väinameri, especially its shallow parts is important stop-over and moulting site of long-tailed ducks, scoters, goldeneyes and other waterfowl. It is important fishing area for humans, seals and cormorants. Rare bottom-plant communities are present. Parts of the area are important for tourism and this importance is increasing.

2.2. **Bays, lagoons and reed-beds.** Thousands of migrating whooper and Bewick's swans, geese and dabbling ducks stop here. White-tailed eagles and other birds catch fish. Important fish spawning areas, partly also important for fishing. Reed is important thatching material and potentially important source of renewable energy. Of mammals otter is important. Most important is Matsalu bay but other bays and lagoons are also important.

2.3. **Rivers and ditches.** Most of the rivers and creeks have been dredged thus reducing their natural diversity and value. In addition the rivers and streams have transported significant pollution load for years. However they still have importance as inflows of bays and lagoons, fish migration corridors and spawning sites, feeding sites of birds, otter and beaver habitats, popular sport fishing sites. Their value is enhanced by decrease in pollution load that has happened during this decade. Most important is Kasari river system. Restoration of more natural flow patterns could further improve the value of the rivers and streams, and bays and lagoons they flow into.

- 2.4. **Grasslands (coastal, alvar, alluvial or marshy)** are important sites for many rare and endangered plant species, nesting and migrating waders like dunlins, ruffs, black-tailed godwits, redshanks, migrating barnacle geese and other geese species including lesser white-fronted goose. They have been important pastures and hay-meadows for millennia. Most important coastal meadows in Estonia are located on the coasts of Matsalu bay. Most important alluvial meadow lies in Kasari delta.
- 2.5. **Woodlands.** Most valuable are those wooded meadows that are regularly mowed but wood-pastures and other old forests are also valuable. Characteristic to the woods is high plant diversity including abundance of orchids, fungi connected to old trees, bird richness.
- 2.6. **Islets.** Uninhabited islets form compact systems of the above-listed communities.

1.9. SELECTION METHODOLOGY

The area was selected as proposed site in Estonia because of its high natural value – including habitats and species that must be protected in the framework of Natura 2000 - and clear need to integrate nature conservation with other sectors, as well as progress achieved in this field by the nature reserve administration.

1.10. MAIN AIM OR MOTIVATION

The main aim is to conserve biodiversity, especially the bird richness and the semi-natural habitats connected to the wetland, but also to contribute to balanced and sustainable development of the area by means of cross-sector integration.

1.11. DATES (to be filled in by the Council of Europe)

DATE OF FIRST EXAMINATION

Y	Y	Y	Y	M	M	D	D

DATE OF EXPERT VISIT

Y	Y	Y	Y	M	M	D	D

DATE OF SECOND EXAMINATION

Y	Y	Y	Y	M	M	D	D

DATE OF AWARD

Y	Y	Y	Y	M	M	D	D

2. SITE LOCATION

2.1. SITE CENTRE LOCATION

LONGITUDE

0	E	2	3	°	3	8	′	5	5	″
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W/E (Greenwich)

LATITUDE

N	5	8	°	3	3	′	6	6	″
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2.2. AREA (ha)

Total Area	4	8	6	1	0	,		
Core						,		
Buffer						,		
Transition						,		

2.3. SITE LENGTH (km)

				,			
--	--	--	--	---	--	--	--

2.4. ALTITUDE (m)

MINIMUM			
			0

MAXIMUM			
		3	3

MEAN			
			4

2.5. ADMINISTRATIVE REGION

REGION NAME	% COVER
Lääne County	1 0 0
Marine area not covered by the terrestrial part	

3. NATURAL HERITAGE

3.1 GENERAL ABIOTIC DESCRIPTION (Geomorphology, geology and hydrogeology)

Crystalline layer is located below 100-400 metres and is inclined southwards 2-4 metres per kilometre. It is covered by upper Ordovician and lower Silurian limestone and dolomites that are also inclined southwards. The latter are mostly sedimentary but some of them like Salevere Salumägi, Kirbla clint, Mihkli Salumägi, Huitberg and others are biohermal rocks made up of ancient corals.

Glaciers have eroded area so that stronger biohermal rocks are now higher than surroundings. Glaciers have also brought moraine and boulders to the area. Thickness of glacial and post-glacial sediments varies from zero on hillocks to above ten metres in depressions. Due to geological structure of the area the ground-water is mostly connected to Silurian and Ordovician lime-stones. Best conditions both for ground-water formation and higher pollution risks are on uplands with exposed bedrock. Most of the settlements in the area use Silurian-Ordovician water.

3.2. HABITATS

Following habitat types from Annex 1 of the Habitat directive are well represented

- 1110 sandbanks slightly covered by water
- 1130 estuaries
- 1140 mudflats and sandflats not covered by water at low tide
- 1150 coastal lagoons
- 1160 shallow inlets and bays
- 1170 reefs
- 1210 annual vegetation on drift lines
- 1220 perennial vegetation on stony banks
- 1310 Salicornia and other annuals colonising mud and sand
- 1620 Boreal Baltic islets and small islands
- 1630 Boreal Baltic coastal meadows
- 3260 water courses with Ranunculion fluitans and Callitriche-Batrachion
- 5130 juniper formations on heaths and calcareous meadows
- 6210 semi-natural dry grasslands on calcareous substrate
- 6270 lowland species-rich grasslands
- 6280 Nordic alvars
- 6410 Molinia meadows
- 6430 Hydrophilous tall herb fringe communities
- 6450 boreal alluvial meadows
- 6510 lowland hay meadows
- 6530 wooded meadows
- 7230 alkaline fens
- 9020 hemiboreal old broadleaved forests
- 9070 wooded pastures

3.3. FLORA

Over 900 species of vascular plants have been recorded in the area, about half of these belong to the Red Data Book of the Baltic Sea Region but much smaller amount is rare in Estonia. Plant species richness is connected to alkaline soils and landscape diversity. Most typical plant communities are reed-beds, marshes, coastal meadows, alluvial meadows, alvars, wooded meadows and wood-pastures, and woodlands that have developed as the result of the over-growth of the above-listed communities.

The vegetation of the area is the long-term human impact: land-use started immediately after the land had emerged from the sea. As the result most of the coast was open, and most of the forests were used as wooded meadows or wood-pastures.

Species of international or national nature conservation interest include:

Cypripedium calceolus
Dianthus arenarius
Ostericum palustre
Sisymbrium supinum
Thesium ebracteatum
Aspenium ruta - muraria
Coeloglossum viride
Dactylorhiza baltica
Dactylorhiza cruenta
Dactylorhiza fuchsii
Dactylorhiza incarnata
Dactylorhiza maculata
Daphne mezereum
Epipactis palustris
Gymnadenia conopsea
Herminium monorchis
Listera ovata
Lunaria rediviva
Nymphaea candida
Neottia nidus - avis
Nymphaea alba
Ophrys insectifera
Orchis mascula
Orchis militaris
Platanthera bifolia
Platanthera chlorantha
Potentilla fruticosa
Tetragonolobus maritimus
Ulmus laevis
Viola elatior
Viola uliginosa
Prunus spinosa

3.4. FAUNA

Fish species listed in Annex 2 of Habitat directive are:

Cobitis taenia
Cottus gobio
Misgurnus fossilis
Lampetra fluviatilis

Birds listed in Annex 1 of Bird directive include:

Anser erythropus
Botaurus stellaris
Branta leucopsis
Ciconia ciconia
Circus aeruginosus
Circus cyaneus
Circus pygargus

Crex crex
 Cygnus columbianus bewickii
 Cygnus cygnus
 Gallinago media
 Grus grus
 Haliaetus albicilla
 Limosa lapponica
 Mergus albellus
 Phalaropus lobatus
 Philomachus pugnax
 Pluvialis apricaria
 Podiceps auritus
 Porzana porzana
 Recurvirostra avosetta
 Sterna albifrons
 Tetrao tetrix
 Tringa glareola

3.5. LANDSCAPE

Due to the bedrock and geological history the landscape is relatively flat. After the retreat of the glaciers the land-lift of 2-3 mm per year started and is still going on. During first stages of the Baltic sea development the area was under water. Higher parts of the area like limestone cliffs appeared first from the sea. Under the water thick layer of clay developed in big parts of the area. On other parts moraine dominates. Area is included into the landscape region of West-Estonian lowland.

Significant areas of dry land started to appear about 4000 years ago. Islets appeared, grew, joined each other and the mainland, and the whole coastline shifted towards the sea. Accumulation of sediment, especially in Kasari delta increased the impact of land-lift. Due to flat relief the coastline changes quickly in such circumstances. Saastna peninsula was a separate islet in 17th century, Sassi as late as last century. This change is taking place nowadays as well.

There are over 40 islets in the Väinameri, the precise number depends on the minimum size of an islet to be counted. With several smaller ones it depends on the water level if they reach at all out of water. Tens of islets are also located in Matsalu and Haapsalu bays and Käina lagoon. Due to the flat relief the flooded area forms significant part of the islets. Larger and higher islets stay mostly out of water even during strong storms. The islets are vary diverse, varying from higher stony ones to low-lying coastal islets.

Flooded area is large also on the mainland, being in some cases several hundred metres wide. Large coastal lowlands (ca 3000 ha) are located around Matsalu bay. Kasari delta (4000 ha) is the largest freshwater floodplain in the area. Flat relief and heavy soils favour wetland development.

4. CULTURAL HERITAGE AND SOCIO-ECONOMIC CONTEXT

4.1 CULTURAL HERITAGE

Valuable cultural heritage includes traditions of wise use of the wetland ecosystems, local architecture, handicraft etc. that can be used as the base for future development. Stone walls, old buildings and ruins as well as ancient trees with wide canopies are quiet witnesses of the long history of human land-use.

4.2 SOCIO-ECONOMIC CONTEXT

Socio-economically it is a typical Estonian rural area with problems like unemployment, insufficiently developed infrastructure *etc.* However these are not very acute and there has been moderate success in tackling them. Area is relatively rich in renewable resources that provide an important development opportunity. Important or potentially important sectors of economy are agriculture, fisheries, reed-harvest, tourism. Wetland management in the form of contracts with the farmers has also significantly contributed to local economy and helps to avoid rural depopulation.

5. EDUCATIONAL AND SCIENTIFIC INTEREST

Education. Network of schools is currently satisfactory but its continued functioning can become problematic due to financial constraints and decreasing number of school-children. Local nature is actively used by schools for purposes of environmental education. Due to diversity of nature the area has national and also international significance for environmental education. International schoolchildren projects are coordinated by administration (Baltic Sea Project-UNESCO – Birds Ecology and Naturewatch (WWF)).

Visitor Centre. The visitor centre is situated in a new renovated manor house. There are about 6000-7000 visitors every year. 8 educated guides are providing excursions in tourism season. Boat trips and canoing are arranged for visitors. In the nature class the special courses as "Life in the water" and "Life in the air" are arranged for local schools. Different meetings for farmers and local village groups are arranged for better management of the area.

Science. Biodiversity of the area makes it a very appealing study site. Scientific research – especially ornithology - has a long tradition. Cooperation work with Tartu University, Tartu Agricultural University, Tallinn Technic University, University of Gotland etc. Good quality of the applied research can in turn contribute to the effectiveness of management.

6. SITE DESCRIPTION

6.1. VULNERABILITY

Biodiversity here is closely connected to the historical land-use, especially mowing and grazing that has created semi-natural meadow communities characteristic to the area. That can harbour very high biodiversity (in Allika wooded meadow there are 62 vascular plant species per square meter). Therefore both land-use intensification and abandonment cause problems here and nature conservation is inseparably connected to resource use management. Shallow bay with islets, bird-rich coastal meadows, wooded meadows with rich flora and huge open floodplain are the main values that must be actively managed to maintain their biodiversity.

6.2. PROTECTION STATUS

Nature Reserve, 1957
Wetland of International Importance (Ramsar Site) from 1976
HELCOM PMPA 1994

6.3. OWNERSHIP

Mixed: 75% national, 25% private

6.4. DOCUMENTATION

Erm, V., Järv, L., Lepik, I., Lotman A., 1998, Matsalu kalad, kahepaiksed ja imetajad. Fishes, amphibians, reptiles and mammals of Matsalu, Tallinn

Järvekülg, A., 1984. Matsalu lahe põhjaloomastik aastail 1977-1981. Loodusvaatlusi 1981, I, Lihula, lk. 121-130

Kalamees, A. (ed.) 2000. Important Bird Areas in Estonia. Eesti Loodusfoto, Tartu, 114 pp.

Kaljuste, T. 2001, Matsalu taimed. Plants of Matsalu, Tallinn

Lotman, A., 1998. Integrated Coastal Zone Management – combining biodiversity conservation and sustainable resource utilisation, a case study from Matsalu Reserve, Estonia. In: Armin Wolf and Ruuben Post, eds. Proceedings of the seminar on an Integrated Management Approach, Europarc Federation

Lotman, A., 2001. On habitat management for geese in Matsalu nature reserve. In: 6th Annual Meeting of the Goose Specialist Group of Wetlands International, Abstracts, Wetlands International

Luhamaa, H., Ilkonene, I., Kukk, T. 2001 Läänemaa pärandkooslused. Seminatural communities of Läänemaa County, Estonia. Pärandkoosluste Kaitse Ühing, Tartu-Turku, 96 pp.

Mägi, E., 1993, Composition of nesting avifauna in Kasari alluvial meadow. Loodusvaatlusi 1993, I 41-63 p.

Mägi, E., Kastepõld, T., 1996, Matsalu lindude nimestik. Birds of Matsalu, Tallinn

Mägi, E., Kastepõld, T., Lotman, A., 1997, Conserving bird richness of Matsalu wetland. In: The IX Finnish-Estonian Ornithological Congress, Abstracts, Lammi 1997

Paal,J., Ilomets, Fremstad, E., Moen A.,Borset, E., Kuusemets, V., Truus,L., Leibak, E., 1998. Estonian Wetlands Inventory 1997. Publication of the Project "Estonian Wetlands Conservation and Management". Eesti Loodusfoto, Tartu, 166 pp.
 Truus, L., Sassian, K., 1999, Kasari jõe hüdroloogilise režiimi muutumine vooluteede reguleerimise ja luha kuivendamise tagajärjel ning selle mõju Kasari luha taimkattele. On changing hydrological regime of Kasari river as the result of river dredging and draining of meadows, and its influence on the vegetation of kasari alluvial meadow. Summary. Loodusvaatlusi 1997-1999, Lihula, 111-119

7. SITE MANAGEMENT

7.1. MANAGEMENT PLANS

Management plan for Matsalu wetland was endorsed by Minister of Environment in 1994 (Management Plan for Matsalu Nature Reserve 1993-1996).
 It was later updated by integrated coastal management plans from 1996 (Integrated Coastal Zone Management Plan for Matsalu Wetland Catchment Area 1996 -1999) and 1999 (Integrated Coastal Management Plan for Coastal Area of Väinameri 1999-2003).
 New arrangement of Matsalu Nature Reserve Management Plan for 2003-2008 is in progress.
 In a recent year 2700 ha of floodplain has been mowed, 1200 ha of coastal meadows and pastures are grazed and about 100 ha of wooded meadows are cleaned according to the management plans.

7.2. BUDGET AND PERSONNEL

The budget of Matsalu Nature Reserve Administration in a year 2001 was 6,497 milj.EEK, of what directly for management of meadows was 4,250 milj. EEK.
 21 personas were imploied of whom 4 are rangers, 10 are monitoring specialists, 4 connected to tourism or nature education.

8. MAP OF THE SITE

• Physical map:

NATIONAL MAP NUMBER

SCALE

PROJECTION

1:10000

Lambert-conic
EurefEst92

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITISED FORM

EELIS (Estonian Nature Information System)
2405
Matsalu looduskaitseala LKA00445

• Map of designated sites described in 6.2.

Provide this information on a map with the same characteristics as above.

• Aerial photograph(s) included:

YES

NO

NUMBER	AREA	SUBJECT	COPYRIGHT	DATE

9. SLIDES

NUMBER	PLACE	SUBJECT	COPYRIGHT	DATE
1	Matsalu Bay (coast.jpg)	Haeska coastal meadow	Tiit Kaljuste	May 2000
2	Matsalu wetland (floodplain.jpg)	Kasari river and floodplain	Tiit Kaljuste	Aug 2000
3	Matsalu wetland (floodplain2.jpg)	Coastal floodplain by Suitsu river	Tiit Kaljuste	Sept 1999
4	Matsalu wetland (gees.jpg)	A flock of barnacle-gees on Salmi coastal meadow	Tiit Kaljuste	May 2000
5	Matsalu wetland	Boat trip along Suitsu river	Tiit Kaljuste	Sept 2001
6	Matsalu wetland (lwf1 804.jpg)	Lesser white-fronted geese feeding on coastal meadow of Haeska	Maire Toming	May 2001
7	Matsalu wetland (reedbed1.jpg)	Reedbeds in Matsalu Bay	Tiit Kaljuste	Aug 2001
8	Penijoe (centre.jpg)	New Centre of Matsalu Nature Reserve	Tiit Kaljuste	Jun 2001

please continue on separate page if necessary

Väinameri and its coast *Towards Integrated Coastal Management*

Introduction

Why coastal zone of Väinameri?

Väinameri and its coastal areas (map 1) constitute a very valuable natural heritage. Thousands of waterfowl and waders migrate through the area, nest, rest or moult here, it is home for the seals and nursery for the fish. Several protected areas, wetlands of international importance and important bird areas are located in the area that also has long history of hunting and fishing, reed-harvest and farming. Biodiversity here is closely connected to the historical land-use, especially mowing and grazing that has created semi-natural meadow communities characteristic to the area. Therefore both land-use intensification and abandonment cause problems here and nature conservation is inseparably connected to resource use management.

Social-economical situation

Social-economically it is a typical Estonian rural area with problems like unemployment, insufficiently developed infrastructure *etc.* However these are not very acute and there has been moderate success in tackling them. Area is relatively rich in renewable resources that provide an important development opportunity. Important or potentially important sectors of economy are agriculture, fisheries, reed-harvest, tourism. Proximity to the border means also some importance from national security point of view. This far co-ordination of different activities has not been sufficient in the area.

The objective of the plan

The area was chosen as pilot site for integrated coastal management in Estonia because of its high natural value and clear need to integrate nature conservation with other sectors. *The objective of this plan is to contribute to balanced and sustainable development of the area by means of cross-sector integration, in order to improve livelihood of the local communities, use natural and economic resources more efficiently, and conserve biodiversity.*

The plan is neither a scientific paper nor an encyclopaedia, but a document oriented towards practical implementation. Therefore the description of the area is as brief as possible, providing only the necessary information. In order to simplify reading no references are presented in the text.

Institutional framework

The plan was created in the framework of HELCOM PITF MLW. HELCOM is the Helsinki Commission for Baltic Sea Environment Protection. The first Helsinki Convention for the Baltic Environment Protection was signed in 1974 by the coastal states of the Baltic Sea that existed *de facto* at that time. In 1992 new convention was signed by all countries bordering the Baltic Sea and EU. HELCOM is the governing body of the Conventions. The HELCOM Programme Implementation Task Force (PITF) coordinates the implementation of the Baltic Sea Joint Comprehensive Environmental Action Programme (JCP) approved in 1992. Management of coastal lagoons and wetlands is part of JCP.

Working Group on Management of Coastal Lagoons and Wetlands (MLW) was established within the framework of HELCOM PITF in 1993. World Wide Fund for Nature WWF is acting as the lead party and secretariat to MLW. The main objective of the HELCOM PITF MLW is development of Integrated Coastal Zone Management (ICZM) plans for the priority wetland areas identified in the JCP. Phase 1 of MLW started in 1995.

Within 2 year period ICZM plans were developed for Matsalu and Kaina Bay areas in Estonia, and for the Oder/Odra Lagoon (Germany and Poland), Vistula lagoon (Poland and Russia), Curonian lagoon (Russia and Lithuania), Engure/Kemeri (Latvia). For each area Area Task Teams (ATT-s) responsible for the development of ICZM Plans were established, with the projects being funded by EU-LIFE and Sweden.

Analysis of the ICZM plans prepared during Phase 1 resulted in decision to start so called Phase 1b, in order to make the plans more operational. Denmark (DANCEE) and Sweden (SEPA) agreed to finance this task. By that time plans for Matsalu and Käina bay areas had partly been implemented and significant similarities between the areas had become very clear. Therefore decision was taken in Estonia not simply to improve the existing plans but rather to create the new updated plan covering both areas. Apart from being Estonian contribution to the work of MLW this draft plan will also form the basis for initiating the regional sustainable development programme under the Sustainable Development Act.

Relation to other planning processes

This plan is closely connected to spatial and developmental planning, carried out in the counties and municipalities involved, under the Planning and Building Act. On the other hand it is also connected to management planning for the protected areas in the region, that is carried out under the Nature Conservation Act. Instrumental to the success of the project is a need to participate in the above-mentioned planning processes. At the same time it is necessary to ensure wide public participation in this integrated coastal management initiative.

Task area

Task area includes part of Väinameri and its coastal zone in Hiiumaa and Läänemaa counties. Strict definition of the coastal zone is not in accordance with the aim of the project. The task area is defined more narrowly or more widely depending on the problems tackled. In the biodiversity context more attention is given to coastal ecosystems in Läänemaa and Hiiumaa. Dealing with socio-economic problems Läänemaa and Hiiumaa counties are the basic unit; more attention is given to Hanila, Lihula, Martna, Ridala, Oru, Noarootsi, Vormsi, Pühalepa and Käina municipalities. Regarding water pollution the whole catchment - including in addition to significant parts of Läänemaa and Hiiumaa most of the Rapla county and small parts of Pärnu and Harju counties - is dealt with. It is interesting to note that pre-war Lääne county included most of the task area.

Next steps in ICM planning

Saaremaa county is not dealt with in this project. This is due to understanding that widening the area step by step will provide better results in management than taking one big area at a time. However the next step of integrated coastal management planning must include whole of Väinameri together with coastal zone in Lääne-, Hiiu- and Saare counties, and in longer run whole of West Estonia should be integrated.

Implementing the plan

More important than next steps of planning is the integrated coastal management itself. Different agencies will be in charge of implementation various actions foreseen in the plan. In order co-ordinate the activities management and monitoring body shall be created based on the present ATT.

Description of the Task Area

1. Geology

Crystalline layer is located below 100-400 metres and is inclined southwards 2-4 metres per kilometre. It is covered by upper Ordovician and lower Silurian limestone and dolomites that are also inclined southwards. The latter are mostly sedimentary but some of them like Salevere Salumägi, Kirbla clint, Mihkli Salumägi, Huitberg and others are biohermal rocks made up of ancient corals.

Glaciers have eroded area so that stronger biohermal rocks are now higher than surroundings. Glaciers have also brought moraine and boulders to the area. Thickness of glacial and post-glacial sediments varies from zero on hillocks to above ten metres in depressions.

Due to geological structure of the area the ground-water is mostly connected to Silurian and Ordovician lime-stones. Best conditions both for ground-water formation and higher pollution risks are on uplands with exposed bedrock. Most of the settlements in the area use Silurian-Ordovician water.

2. Waters

Väinameri.

Väinameri is a semi-enclosed shallow part of the Baltic Sea. This plan covers about half of Väinameri, ca 1000 sq. km. Depth of the sea in the task area is mostly less than 6 – 7 metres and large areas near coasts and between islets are only 3 – 4 metres deep. Salinity is between 5 – 7 per mille. Water level and chemistry depend strongly on wind direction and other meteorological conditions. Bottom is mostly flat and covered by aleurite, sand, clay or gravel, sometimes limestone is exposed. With normal winters ice covers the sea from Christmas to mid-April. Nutrient content is moderate.

Väinameri coast forms complicated and dynamic pattern of bays and inlets. Both coastline and rivers have been permanently changing due to landlift. Length of coastline in the task area is over 300 km.

Bays.

Jausa, Õunaku and *Soonlepa* bays on Hiiumaa, *Hullo* and *Sviby* bays on Vormsi and *Topu, Topi* and lot of smaller bays on mainland are relatively open shallow bays with hydrology similar to the Väinameri sea. Main difference is somewhat longer ice period.

Matsalu bay, (map 2) being one of the largest bays in Estonia has surface of 67 sq. km (together with the reed-beds ca 90). Bay is 18 km long (from West to East) and up to 6.5 km wide. Bay is shallow – 3.5 m on the Western end, 1 – 2 m in the middle part and less than a metre in the Eastern part. Water-table is strongly dependent of the weather, west wind rise it and east winds lower. Difference between high and low water level is over 1.5 m and water volume differs about 2 times. Water chemistry is determined by mixing of Kasari river and Väinameri water. Salinity is always less than 7 per mille and can drop to zero. Ice formation starts usually in the end of November and ice melts usually around 20 of April. By the end of winter ice is usually 40 – 50 cm and on very cold winters Eastern part of the bay can freeze to the bottom. Long ice period is caused by low salinity together with shallowness and relative isolation from the rest of Väinameri. Due to the same causes the bay is relatively warm in summer. The bay can be divided into three approximately equal parts. Inner bay is the part east from Keemu-Haeska line. Reeds cover about half of it. Border between the middle and the outer part is the Saastna-Kalaküla line. Conditions of the outer part are similar to these of Väinameri.

Nutrient concentrations in Matsalu bay were rising until mid-eighties, when ammonium-nitrogen concentrations reached 0.4 – 0.5 milligram per litre; by now they are below 0.1 mgN/l. Nitrate dynamics has been more complicated but general picture is that of decrease

during the decade, with concentrations of 0.8 –1.4 mgN/l during the eighties and 0.4 –1 mgN/l in the nineties. Total phosphorus in the inner part was 0.06 – 0.08 mgP/l in the eighties and 0.04 – 0.06 mgP/l in the nineties.

Haapsalu bay (map 3) is quite similar to Matsalu bay, the biggest difference being much smaller fresh-water inflow. It is located 18 km to the north from the former and is second-largest bay in the area. It is 13 km long and divided into four parts by its complicated coastline. Depth is up to 4.4 m and salinity 1.5 – 6.5 per mille. Water fluctuations exceed 1.5 m. The bottom is mostly sandy, with mud deposits in middle and inner parts of the bay. Active resource of curative mud is 169.9 thousand m³, reserved resource 48 thousand m³.

Rame and *Mõniste* (map 4) bays between Virtsu and mainland are also relatively isolated bays with muddy bottoms, salinity about 5 – 6 per mille and wind-driven water-level fluctuations about half metre as an average and above 2 metres as maximum. *Vaemla* bay off north coast of Kassari is similar.

Lagoons

Käina bay situated between Hiiumaa and Kassari (map 5) is the largest coastal lagoon in the area. It is connected to the outer sea via three outlets. Surface of the bay is 900 ha and 200 ha of it is covered by reed. Average depth is only 0.3 – 0.5 m and maximum about 1 m. There are significant deposits of curative mud, especially in the southern part of the lagoon. *Sutlepa* lagoon close to Haapsalu bay (map 3) is somewhat smaller. Close to Rame bay *Mõisalaht* and *Kasselaht* are situated (map 4). Between Matsalu and Topi bays *Sauemeri* and *Teorehe* lay. *Prästvik* lies close to Hullo bay (map 6). Salinity of the lagoons is usually below 5 per mille. The lagoons are relics of former bays and straits that have been isolated from the sea by land-lift. Same process leads to gradual drying out and overgrowth of the lagoon. Water regime of several lagoons has been to some extent influenced by man for example by building dams for road construction purposes. Some of the former lagoons like *Heinlaht* have been drained. Bottom of the lagoons is usually muddy.

Rivers and streams

Of several rivers flowing into Väinameri *Kasari* is the biggest. It is 112 km long and it carries 90% of total flow to Matsalu bay (map 7). Total inflow to Matsalu bay is 950 million cubic metres, that is 8 times more than the volume of the bay. Catchment area of the bay is 3500 sq. km. *Kasari* had a well-developed delta that was dredged in 1927 – 1937. Straight *Kloostri* (*Kasari*) channel that now takes most of the water was dug through the delta floodplain far into the bay. Other branches of the delta were also totally (*Rõude*) or partly (*Raana* and *Aru*) deepened and straightened. All the rivers flowing into the eastern part of the bay (*Tuudi*, *Penijõgi* and *Martna*) were also dredged and connected to the *Kasari* delta.

Because of flat landscape, lack of lakes on the catchment and little infiltration into deeper layers, lower reaches of *Kasari* are extensively flooded. Water-table difference between the flood and low water is about 2 m. Due to dredging of the rivers and intensive land draining that have been carried out in the past the, floods are somewhat shorter than natural. Main flooding in spring is usually in April-May and autumn flood in October-November. Delta is flooded 34 days per year on the average.

Average flow is 25 m³/s, fluctuating mostly between 10 and 40 m³/s. Absolute recorded minimum 0.68 m³/s and maximum 688 m³/s differ more than thousand times. During winter and especially summer low-flow periods the dilution conditions for waste water are poor. Nutrient input from *Kasari* had risen to 2000 tons of inorganic nitrogen and 70 tons of phosphorus per year by eighties but has now fallen to less than one thousand tons of nitrogen and 50 tons of phosphorus.

Outside *Kasari* delta system Matsalu bay receives some minor input from *Kiideva*, *Sinalepa*, *Saardo* and *Haeska* ditches on the north-coast and *Kasevälja* ditch that flows into small *Salmi*

inlet in the Matsalu bay south-coast. *Männiku* stream flows into Sauemeri lagoon and via Teorehe lagoon its waters reach Topi bay. *Kõera* creek flows directly into the Topi bay. Haapsalu bay gets inflow from *Salajõgi* and *Taebla* river that is also dredged. *Suuremõisa*, *Vaemla*, *Luguse* and *Jausa* rivers on Hiiumaa area also largely dredged.

3. Landscape and soils

Due to the bedrock and geological history the landscape is relatively flat. After the retreat of the glaciers the land-lift of 2-3 mm per year started and is still going on. During first stages of the Baltic sea development the area was under water. Higher parts of the area like limestone cliffs appeared first from the sea. Under the water thick layer of clay developed in big parts of the area. On other parts moraine dominates.

Significant areas of dry land started to appear about 4000 years ago. Islets appeared, grew, joined each other and the mainland, and the whole coastline shifted towards the sea. Accumulation of sediment, especially in Kasari delta increased the impact of land-lift. Due to flat relief the coastline changes quickly in such circumstances. Saastna peninsula was a separate islet in 17th century, Sassi as late as last century; Kassari that is still considered to be a separate island has in fact grown very close to Hiiumaa. Noarootsi and Virtsu are also former islets. Most of the coastal lowlands are younger than 500 years. This change is taking place nowadays as well.

There are over 300 islets in the Väinameri (map 8), the precise number depends on the minimum size of an islet to be counted. With several smaller ones it depends on the water level if they reach at all out of water. Tens of islets are also located in Matsalu and Haapsalu bays and Käina lagoon. Biggest island totally in the task area is Kassari (1900 ha), it is followed by Vohilaid (390 ha) and Tauksi (270 ha). Due to the flat relief the flooded area forms significant part of the islets. Larger and higher islets stay mostly out of water even during strong storms. The islets are vary diverse, varying from higher stony ones (Kakrarahu, Hoorahu, Sipelgarahu, Tondirahu, Papirahu, Papilaid, Anemaa, Suur- and Väike-Härjamaa, Harilaid, Selgrahu, Kakralaid, Eerikulaid, Suur- and Väike-Pihlakare, Auklaid, Hanerahu, Langekare, Viirekare, Rukkirahu, Kumari) to low-lying coastal islets (Esi- and Tagarahu, Paljarahu, Mustakivi-Laeka, Suurrahu, Koharahu, Uusmererahu, Ruserahu, Taguküla laid, most of the islets in the bays and lagoons).

Flooded area is large also on the mainland, being in some cases several hundred metres wide. Especially large coastal lowlands (ca 3000 ha) are located in Matsalu wetland (map 2). Several hundreds of hectares of coastal lowlands are also to be found in eastern part of Kassari (map 5), on coasts of Haapsalu bay (map 3) and elsewhere. Higher coast can be found on Topu and Kukeranna in Läänemaa and on Sarve peninsula in Hiiumaa. Kasari delta (4000 ha) is the largest freshwater floodplain in the area (map 2).

Flat relief and heavy soils favour wetland development. Young coastal wetlands have usually thin peat but several peat-bogs are located in the Matsalu bay catchment area. Marshes cover 22% (780 sq. m) of the catchment.

Most of the area is included into the landscape regions of West-Estonian islands and West-Estonian lowland, and only eastern part of Kasari catchment is included into the North-Estonian region. Over 80% of the area is lower than 50 metres above sea-level.

4. Flora and vegetation

Over 900 species of vascular plants have been recorded in the area, about half of these belong to the Red Data Book of the Baltic Sea Region but much smaller amount is rare in Estonia. Plant species richness is connected to alkaline soils and landscape diversity. Most typical plant communities are reed-beds, marshes, coastal meadows, alluvial meadows, alvars, wooded meadows and wood-pastures, and woodlands that have developed as the result of the over-growth of the above-listed communities.

The vegetation of the area is the long-term human impact: land-use started immediately after the land had emerged from the sea. As the result most of the coast was open, and most of the forests were used as wooded meadows or wood-pastures.

Meadows

One of the largest remaining alluvial meadow complexes in Europe covers most of the 4000 ha large delta floodplain. Väinameri, Matsalu bay, Haapsalu bay, other bays and lagoons are surrounded by ca 4000 ha of coastal meadows that are typical also to many islets. This can be the biggest semi-natural brackish meadow complex in Europe or even in the world. Dry meadows and alvars are typical to higher parts of the islets and coasts while peat develops on the low meadows with poor run-off. The meadows have developed as the result of grazing and mowing. Due to cessation of the above-listed activities they are over-growing and meadow area is decreasing. Wooded meadows that have features of meadow and forest are dealt with in next paragraph.

Woodlands

The area covered by older forest is relatively small on the coast, and mostly these are former wooded meadows or wood-pastures. There are some still mown wooded meadows, biggest of these being Laelatu, others are small plots in Matsalu, Kirikuküla, Haeska, Puise, Kassari, Norrby and some other locations. Some small plots of wood-pasture are also grazed. Forests that are former wood-pastures or wooded meadows are also present on the larger islets. Most of the old woods are quite dense nowadays but their structure, especially wide canopies of the older trees show clearly that once they were much more open. Bush-land and young forests that grow on former open landscapes, including the islets, are quite widespread. The tree-cover is spreading as mowing and grazing decrease. Increase in wood-cover has been to some extent accelerated by forestation of marginal lands in soviet times. Oak, ash, birches, aspen and black alder are quite widespread in the area. There is very little regeneration of oak in old dense oak-stands but quite good regeneration on formerly open plots in the woods and also on the forest margins. Other species regenerate both in the open and under woods. Of conifers juniper and pine are common. In bush-land willows and alders dominate; in Hiiumaa white alder is almost absent. Area of forest land is ca 40% in Hanila, Lihula, Martna and Ridala municipalities, over 60% in Oru, Noarootsi and Vormsi, ca 50 in Käina and ca 60% in Pühalepa

Reed-beds

Reed-beds form belts on low coasts and large stands in sheltered bays and lagoons. Reed-beds cover ca 5000 ha, the largest ones are located in Matsalu bay, Haapsalu bay, also in Käina bay and other locations. Big parts of the reed-beds are mono-stands of common reed. Reed productivity is 11 – 13 tons per hectare. Proximate to the open waters cat-tails and rushes are also common.

The extent of the reed-beds depends on human impacts. Grazing and summer mowing decrease while pollution increases the reed-beds. In the long run shift towards the sea due to land-lift can be observed together with spreading of the reeds and decrease in open-water patches due to input of nutrients and silt. The reeds have in many locations also spread inland and invaded several formerly open coasts due to cessation of mowing and grazing.

Aquatic plants

Green algae like *Cladophora* dominate shallow areas up to 2 metres, in shallow bays together with *Chara aspera*. Brown algae like *Fucus vesiculosus* prefer waters up to 5 metres deep. A loose dwarf form of the latter grows in shallow bays. Red algae like *Furcellaria lumbricalis* grow in somewhat deeper waters. Largest site of the loose form of the latter is in the Kassari

bay. The most common algae species is that of a red algae *Polysiphonia fucooides*. About 70 species of algae are known in Väinameri.

Of vascular plants *Potamogeton spp*, *Zostera marina* and *Zannichellia spp* are common. In sheltered locations *Myriophyllum spicatum* grows.

Largest changes in aquatic vegetation during last decades are connected to eutrophication and were especially manifest in shallow sheltered bays. Maximum in algae blooms was in late 70ies and in the 80ies. Green algae proliferated and covered large areas with thick mats, water transparency was reduced. Some species disappeared from Matsalu and Haapsalu bays. The blooms have greatly decreased in the 90ies. In Väinameri and more open bays the changes have not been so pronounced. Nowadays the vegetation here is typical to areas in good ecological state.

A list of plant species from Väinameri is presented in Annex 1.

5. Fauna

5.1. Birds

Over 270 bird species have been registered in the area, 175 of these nest here. A list of waterfowl and other birds typical to the area together with data on their status is presented in Annex 2.

Migration

Väinameri is located on the East-Atlantic flyway. Over 2 million of waterfowl migrate through the area in spring.

Total of over 50000 black-throated and red-throated divers pass on transit migration. Most numerous are various ducks which stay here a week or two. Diving ducks like long-tailed ducks (up to 1.6 million), velvet scoters (ca 400000), common scoters (ca 200000), scaups (ca 30000) and goldeneyes (10000) stop in shallow parts of the open sea and Hari strait. In bays and lagoons, open-water patches in the reeds and in flooded meadows stay goldeneyes, pochards, goosanders, smews, tufted ducks (over 30000) and tens of thousands of dabbling ducks like mallards, wigeons, teals, pintails and others. Greylag, bean and white fronted geese (ca 20000 in total), whooper and Bewick's swans (over 10000), and barnacle geese (ca 60000) stop on the bays, in the reeds and on the coast for a month or more. Most of the European population of the lesser white-fronted geese (ca 40 individuals) also migrates through the area. Various waders stop on low coasts, shallow waters and floodplains. Lapwing and ruff are most common among them and can be met both on the sea-shore and in the alluvial meadows. The ruff once migrated in flocks of 15000 but now the total numbers are about 10000. Wood sandpipers (counted up to 5000), green sandpipers, black-tailed godwits and snipes stop in alluvial meadows, while other waders like redshanks, spotted redshanks, greenshanks, avocets (over 30 at a time have been counted), numerous plovers, bar-tailed godwits, ringed plovers, dunlins and others can be seen on the islets and the coast where bottom is exposed with low water level. The islets and coast are also important migration corridors for passerines.

In autumn mostly the same species migrate through the area. Since part of the migration goes over northern part of Hiiumaa several species are less abundant around Väinameri. Common cranes are more abundant in the autumn (over 25000), they feed mostly in the fields and rest on the coast. Coots and pochards are also more frequently seen in the autumn. Migration starts in August, culminates in September-October and ends in November.

The dabbling ducks, geese, swans, cranes and waders stop in the biggest numbers in Matsalu bay and the surrounding meadows, they are numerous also on Haapsalu bay and its surroundings, Topu bay with its coast and islets of Tauksi, Liia and Sõmeri, Käina bay, northern and eastern coast of Kassari, Hellama bay with its surroundings and other locations.

Moulting

Most numerous birds that moult in the area are eiders (over 15000), goldeneyes (ca 17000), mute swans (ca 3000), grey-lag geese, wigeons and mallards. Somewhat less numerous are scaups, goosanders and cranes. The number of moulting birds has increased.

Most important waterfowl moulting areas are shallow parts of Hari strait, Käina bay, Õunaku bay, area of Hiiumaa islets from Kõrgelaid to Kõverlaid, surroundings of Tauksi, Liia and Sõmeri, east from Kumari, Papi and Kessu till Matsalu bay, northern and eastern parts of Matsalu bay. Several hundred cranes moult in Kasari delta and coastal marshes of inner part of Matsalu bay. Smaller moulting site is located in Vaemla river mouth area.

Nesting

Coastal meadows are characterised by nesting ducks, waders and passerines. Numbers of most of the dabbling ducks have decreased: on Matsalu coast long-tailed ducks have not been seen nesting during last decade, shoveler has become very rare; around Käina bay long-tailed ducks and garganeys are all but gone. Numbers of ruffs, black-tailed godwits, dunlins and lapwings have strongly declined. Since these waders have declined elsewhere as well the task area still holds significant proportion of Estonian populations of these species. Among waders snipes, curlews and oyster-catchers have increased. Open-landscape passerines have increased almost three-fold. Passerines typical to woodlands and reedbeds have increased many times.

Reed-beds are inhabited by great crested grebes, bitterns, mute swans, grey-lag geese, mallards, pochards, tufted ducks, marsh harriers, water rails, spotted crakes, little crakes, little gulls, black-headed gulls, black terns, great reed warblers, reed warblers, sedge warblers, reed buntings, Savi's warblers (since 1977), bearded tits (since 1990). Numbers of geese and swans have increased and they have inhabited several smaller reed-beds. Numbers of gulls, grebes, pochards and coots have declined.

Islets are most densely populated (over 300 pairs per hectare on several islets) sites in the area. Most of the species are same as on coastal meadows. However e.g. cormorants, barnacle geese, velvet scoters nest only on the islets and some species present on the coast do not nest here, also many species nest here at much higher densities. Big changes in time and significant differences between the islets can be observed.

Eider became the dominant species in the seventies, replacing common and black-headed gulls. By nineties herring gulls became second in numbers. Smaller birds like dabbling ducks, waders, and common and black-headed gulls have declined on most of the islets. Larger birds like eiders, grey-lag geese and large gulls have increased in numbers, and new large species like mute swan, barnacle goose and cormorant have started to nest in increasing numbers. Numbers of nesting cormorants have grown to three thousand nesting pairs on three islets and there are about 10000 of non-nesting cormorants. The only dabbling duck that has not declined is mallard. Most of waders have declined but species typical to coastal meadows with the exception of oyster-catcher and ringed plover that nest on stony coast. Overall nesting density has increased. Difference between dominant and less numerous species has also increased. Such changes are most typical to stony marine islets.

On former near-coast hay-islets that now have strongly over-grown with reed and high grass mostly former abundance of gulls, terns, waders and water-fowl is gone. The dominant group is passerines like yellow wagtail and meadow pipit, or reed bunting and sedge warbler. Similar changes have happened on several larger islets where the meadows have over-grown. In such case also numbers of passerines typical to woodlands have increased.

Alluvial meadows are home to about 20 typical species of waders and ducks as well as corn-crake and spotted crake, and passerines like sky-lark, yellow wagtail, meadow pipit, reed bunting, sedge warbler. In Kasari floodplain four leking sites with 30-35 males of endangered great snipe are known. Numbers of open-landscape passerines have increased in last decades. Waders dropped dramatically in late eighties and now only numbers of curlews and red-shanks are comparable to earlier times. Especially big has been decline of black-tail godwits and ruffs in last years. At the same time the numbers of corn-crakes have increased last years. Due to over-growth of part of the meadows woodland passerines have increased.

Forests are home to over 80 species, 4/5 of who are passerines. Nesting density of some locations is very high. Passerines common to Estonia like chaffinch, willow warbler and garden warbler dominate; several other passerines are also numerous. Mallards and other ducks, goosanders, snipes, woodpeckers, buzzards, eagle owls and others also nest in the woods. In the larger woods white-tailed eagles, golden eagles and black storks nest. Many of the listed species depend on water and open landscapes for foraging.

Villages are home to many passerines, partridges, small number of quails, on the mainland also white storks, who are especially numerous around Kasari alluvial meadows.

Summing up the bird fauna is constantly changing. Cormorants, mute swans, geese, eiders, large gulls, several passerines are on increase. Many duck and wader species are declining. However the task area still holds significant proportion of the populations of these species as the decline is also widespread and probably even more pronounced outside the area. Not all of the changes have good explanations. Some of these, most notably decline of the waders are apparently mostly due to over-growth of the meadow communities. Over-all decrease in habitat patchiness in the woods and reeds could take its toll on some other species.

5.2. Mammals

There are above 40 species in the area and over half of them are listed in the Red Data Books of the Baltic region and Estonia. Both grey and ringed seals live in Väinameri and sometimes enter the bays or even rivers. The largest concentration of ringed seals, about 70 animals can be found near Ahelaid, and total of 400 – 500 grey seals can be counted in the three largest resting-sites. One of the causes of mortality of the young seals is drowning in the fishing-gear. Nevertheless seal numbers exhibit moderate increase. The drowned animals have been in good shape and chlorinated organic compounds were present in much lower concentrations than in other studied sites. Numbers of beavers and otters are high in Läänemaa but low on Hiiumaa and they are not found on the islets. These animals are mostly found in rivers, creeks and ditches but sometimes also in the bays, especially the otter. Wolf and lynx are quite common in most of Läänemaa and lynx lives also on Hiiumaa and Vormsi but wolf is rare there. Bear is common in the northern woody part of Läänemaa but a sporadic visitor in coastal area of Väinameri and absent from small islets. Fox, racoon dog and American mink are all common in the area and can sometimes live on the islets having considerable impact on birds in such cases. Roe deer is usual in the area, as in the rest of Estonia. Same applies to the elk and the wild boar. Population numbers were very high in late 70ies, dropped in the late eighties and early nineties and are now slowly increasing. Wild boar reaches sometimes the islets. Red deer that is numerous in Hiiumaa lives mostly in the woody western part of the island and is less common on the Väinameri coast; it is a rare visitor to Läänemaa. Most of Estonian bat species can be found on the Läänemaa mainland, four on Hiiumaa and one on Vormsi. Water-vole is numerous on the islets and the coast.

5.3. Reptiles

Four species live in the area, all of them listed in the Baltic Red Data book but common in Estonia. Important hibernation sites are Salevere hill in Läänemaa, and Ussikelder and Valipe hillock on Hiiumaa. On Läänemaa mainland coast the grass snake is more common than the viper but some kilometres inland the viper is also common. Viper is common also on Vormsi. Small and unstable reptile populations exist or have existed on islets.

5.4. Amphibians

Five species live in the area and all are included in the Baltic Red Data book. The only species of these included in Estonian Red Data Book is the Natterjack toad. This now threatened species was widespread throughout coastal areas in 1950ies but exists now only in small and probably declining relic populations on Kumari, Vormsi, Kõverlaid and Noarootsi.

5.5. Fishes

Over 40 species of fish and lamprey species, including most of the fresh-water species live in the area. Species composition varies in space and time. Marine species live mostly in Väinameri and open bays or outer parts of the larger bays. Baltic herring spawns along most of the coast and in open bays, the reproduction of this species in the area determines to the big extent its numbers elsewhere in the Baltic. Freshwater species dominate in the middle and especially eastern parts of Matsalu and Haapsalu bays and even more in the lagoons. Marine species enter these waters to spawn. Even the freshwater species partly move out into deeper waters in summer. During the recent years predatory species have decreased and cyprinids and stickle-backs increased.

Perch is common throughout the area but the numbers have declined since 1993 when catch was intensified. Pike-perch spawns in Matsalu bay but seldom reaches its eastern part. In summers only juveniles stay in the bay. Pike is present in the whole area but the numbers of this once numerous species are relatively low.

Roach is numerous in the bays and spawns in rivers. Larger individuals move out into deeper waters in summer. Predator species other than pike feed little on this species. Vimba bream spawns in Kasari river but lives mostly in Väinameri. Younger individuals stay longer in western part of Matsalu bay. Status of the spawning sites is not clear.

Matsalu bay and Kasari river together with the floodplain are breeding sites of several commercial species. Same is true for other bays and lagoons. Concentrations of mercury and other heavy metals in Matsalu bay fish were relatively high in the eighties but have declined by now and tend to fluctuate within the limits that pose no threat to the consumer health.

5.6. Invertebrates

Bottom fauna of Matsalu bay is species rich and dominated by insect larvae and crustaceans. Fresh-water species make up over 70% of Matsalu bay bottom fauna. Some species present in Väinameri are not found in Matsalu bay because of fluctuating salinity. Eutrophication has caused tenfold increase in bottom fauna biomass between sixties and eighties. Data from the nineties are relatively scarce.

Terrestrial invertebrates have not been sufficiently investigated. Slightly over 2000 species have been described in the area but the probable number is ten times more.

6. Human population

Man has inhabited the land since it appeared from the sea as the result of land-lift. In pre-agricultural times most of the area was under the sea. The coastline and islets (inland from the present coastland) were probably intensively used by fishermen and hunters. Population that was formed as result of several migration waves can be considered ethnically Estonian since about 5000 years ago. Estonians have been majority in most of the area ever since. Population of the coastal plains increased with coming of agriculture about 4000 years ago. Small German-speaking upper-class was formed as the result of German-Danish-Swedish crusade to Estonia. The Germans lost their privileges after Estonia independence in 1918 and most of them left the country in the wake of WW II. Swedes settled part of the area in the Medieval times. Vormsi (Ormsö) and Noarootsi (Nuckö) were the places where most of the

population was Swedish. Most of the Swedes left for Sweden during WW II. Another compactly settled minority was the Russians of Keemu village on Matsalu coast. They had been settled here in 1920ies. Most of them have left for Tallinn or elsewhere by now. There has been no major colonisation of the area by Russian-speaking people during the Soviet period. There are no compact minorities in the area at present. Lot of Estonians fled to Sweden during WW II but majority remained. Deportations to Siberia and leaving villages for towns in later times did not manage to depopulate most of the area to the same extent as had happened on Vormsi and Noarootsi.

About 32000 people live in Läänemaa now, 17000 women and 15000 men. Average age is 37 years (women - 39 and men – 34). In Taebala and Ridala municipalities the average age is 32 – 33, in the rest of municipalities 36 – 39. Yearly total birth rate for the county is slightly above 300 and declining. Total mortality is over 400. Annual immigration to the county is ca 1000 and about the same number of people leave the county every year. Population balance is therefore negative. Due to dramatic drop of birth-rate in early nineties age group below five years is smaller than between five and ten. Rural population slightly exceeds urban but is mostly concentrated in villages. Population living in isolated farmsteads is sparse.

The only town with over 10000 inhabitants in Läänemaa is Haapsalu (ca 13000, population density 1200 persons per sq. km). Lihula town with 1700 inhabitants and 460 per sq. km is currently also a separate municipality. Population is unevenly distributed in the county. Some tens of kilometres wide belts around Risti-Virtsu and Risti-Haapsalu highways that pass through Risti, Taebala, Oru, Ridala, Lihula and Hanila municipalities and where several villages as well as both above-mentioned towns are located are home to about 80% of county population. These belts reach the coastline in Haapsalu and Virtsu, the rest of the coast is sparsely populated. Population of Lihula (country) municipality is 1500 and density 4 per sq. km. The town and country municipality will soon be united that will result in formal revision of these numbers. Population of Martna municipality is 1200 and density 4-5 per sq. km. Population of Hanila municipality is 2100 and density 9 per sq. km, that of Ridala municipality 3300 and density 13 per sq. km. These relatively higher numbers are result of Virtsu settlement in Hanila municipality and Paralepa and Uuemõsa that are in fact Haapsalu suburbs belonging to Ridala. Noarootsi and Vormsi are currently most depopulated municipality with 900 and 330 people respectively and population density below 4 per sq. km. There are about 1000 people in Oru municipality and population density there is ca 5 per sq. km. In all municipalities the population is declining, most clearly is the birth-rate below the death-rate in Noarootsi. Population is also getting older in all the municipalities.

There are about 12000 inhabitants on Hiiumaa and population density slightly below 12 per sq. km. The only town is Kärđla with slightly above 4000 inhabitants and there are four country municipalities Käina, Pühalepa, Kõrgessare and Emmaste. The first two of them are included into the task area. Population of Käina municipality is below 2500 and population density about 13 per sq. km. Population of Pühalepa is about 2000 and density ca 8 per sq. km.

Population of Rapla county is about 39000. with over 6000 living in Rapla. Märjamaa and Kohila (the latter is outside Matsalu catchment) are slightly above 3000 inhabitants each. Järvakandi settlement has about 1700 inhabitants. The rest of the population is rural.

Annex 3 presents some basic demographic data for counties of Estonian Republic.

7. Agriculture

Agriculture is apparently the human activity with strongest long-term impact on the area's nature. During the initial stages of agriculture the thin alvar soils were tilled. After development of agriculture caused shift to ploughing up more heavy and fertile soils, the alvars have been used as pastures. The retreating coastline has also been used as pasture for

millennia. The coastal pastures where reed and bush could not take hold were thus created. The floodplains were probably also pastures in the beginning but later they have mostly been used as hay-meadows. Thus the alluvial meadows were formed. Forests were also used for hay-making and grazing, resulting in formation of wooded meadows and pastures. Heavy soils and flat relief have caused some draining activities for centuries. Gradually about $\frac{3}{4}$ of arable land was to some extent ditched. Hay meadows and pastures were drained to a much lesser extent. As the result of clearing the fields from the stones stone-walls were erected along the field margins. Meadows and pastures were cleared from stones to much lesser extent. Thus the traditional coastal landscape was created with relatively densely ditched small fields and sparsely ditched or totally unaltered large hay-meadows and pastures, and also thin woodlands used for hay-making or grazing. The historical border between fields and meadows/pastures is often marked by a stone wall. Such a pattern was especially typical to Matsalu wetland. On Hiiumaa and Vormsi the historical network of ditches is not so dense and the coastal meadow belt is narrower. In the eastern, drier part of the Matsalu catchment (in Rapla county) the size of the meadows and the density of the drainage on the arable land are smaller.

The historic land-use has varied a lot but still on several maps a landscape pattern similar to the present can be recognised. Considerable changes happened after the independence and subsequent land-reform in twenties. Farmers got access to the fields that had belonged to the large estates. This reduced demand for hay from the distant woods, resulting in over-growth of more remote wooded meadows. This change however was not as dramatic as the rapidly increased drainage activity that was also supported by the state. New large ditches were dug and Kasari delta was dredged.

The impact of soviet collectivisation and concentration of agriculture was even more dramatic. Most of the wooded meadows were abandoned during the sixties. Large-scale drainage resulted in replacing former open ditches with under-ground pipes on $\frac{4}{5}$ of drained fields. To some extent such large fields were also created by draining former wetlands. Use of open alluvial meadows continued but tractors replaced the hand-mowing and horse-driven machines. Large kolhoz herds of cattle differed significantly from the pre-war farm-herds but not so much from the herds owned by estates in older days. More distant wet grasslands however gradually fell out of use. Grazing and mowing ceased also on most of the islets. Intensification, concentration, mechanisation and chemisation of agriculture resulted in growing run-off of pollutants that peaked in the eighties.

Regaining of Estonian independence followed by radical de-regulation of agriculture (including unregulated import) resulted in dramatic drop of agricultural production throughout Estonia. Use of agro-chemicals and pollution also dropped. Many fields fell out of use, area under cereals decreased by one third. Number of domestic animals dropped quickly: cattle numbers dropped two times, pigs three times, sheep almost five times. Coastal and alluvial meadows started quickly to fall out of use. Employment in agriculture also dropped but it is still providing more employment than any other rural sector in Läänemaa.

There are currently ca 15000 cattle, ca 10000 ha under cereals, less than 10000 pigs and 2000 sheep in the county. There are two holdings with over 500 cows, 15 with over 100 cows, same number with herd between 50 and 100, and about 150 farms have between 5 and 50 cows. Three enterprises have over thousand pigs. Three farms have more than 50 sheep.

Agricultural machinery in Läänemaa county is old, only 1% is newer than 3 years. There are no milk processing industries in Läänemaa mainland, the milk is collected by industries located in other counties. There is small cheese production on Vormsi that buys milk from the local farmers. In mainland Läänemaa there are 3 medium-sized and 7 small butcheries.

There are currently ca 4500 cattle and 1200 ha of cereals on Hiiumaa. No holding has over 500 cows, three have over 100, six have between 50 and 100. Three farmers have over 50 sheep. There are no holdings with large number of pigs.

There is a cheese factory in Emmaste. Some farmers produce home-made cheese, butter and yoghurt. There are two small butcheries and one medium-sized industry producing canned meat and sausages.

Land reform in agriculture is still going on and many farmers still do not own the land their use. Annex 4 shows importance of agricultural employment in the area, annex 4a shows numbers of farm animals by villages..

8. Fisheries and hunting

Fishing and hunting were vital for the first settlers in the area. Migrating birds, spawning fish and seal-nurseries did not lose their importance even with development of agriculture. In middle ages significant part of the hunting and fishing rights were monopolised by the land-lords. Situation changes radically with Estonian independence in the twenties. Matsalu bay and surroundings became intensive fishing and hunting areas. Next wave of changes was after WW II. With creation of Matsalu Nature Reserve in second half of the fifties the hunting was banned here and restrictions were set to fishing. Due to creation of protected areas hunting and fishing restrictions were later set to Käina bay and Hiiumaa islets, in the second half of the eighties on Rumpo peninsula and Hullo bay islets and in late nineties on Haapsalu bay.

During independence between the world wars the fishing was main source of livelihood for 100 – 150 families and part-time occupation for ca 500 families in Läänemaa. There were about ten fishermen's organisations. After the WW II the picture was first rather similar, since the fishing kolhozes were small. Gradually they were united into one big fishing kolhoz 'Lääne Kalur'. After regaining of independence decentralisation of the fishing was carried out followed by accelerated coastal fishing. Number of fishermen increased from 300 to 500. Fishing is main source of income to about 200 fishermen.

History of fishing in Hiiumaa was similar and for several years fishing kolhoz 'Hiiumaa Kalur' united the professional fishermen. Currently there are seven professional fishing organisations, four of these being direct descendants of 'Hiiumaa Kalur'. There are 190 professional fishermen and 200 part-time coastal fishermen.

There was a quick drop in pike, pike-perch and perch catches during the nineties, while catches of cyprinids tend to rise. From second half of the nineties several restrictions have been set in order to protect the stock. By now the pressure of professional and semi-professional fishing has decreased both due to restrictions and as a direct consequence of scarcity of marketable fish. Of sport-fishing the most popular are spring fishing on the rivers, summer fishing from the boats and winter fishing from ice.

Hunting is a hobby for most of the hunters and hunting-related employment is small. Areas close to nature reserves are usually good hunting grounds because of game spreading out from the reserves. Hunting of some species is allowed in nature reserves also, mostly for management purpose. This concerns the exotic species (American mink and racoon dog) in the first place but some of the native animals are also included. Action to trap all the American minks on Hiiumaa has been recently initiated in order to re-introduce the European mink to the island.

9. Forestry

Long-time intensive use of the young coastal areas has resulted in low forest coverage and hence moderate role of forestry. Forest cover and importance of forestry are bigger upstream on Matsalu catchment in Rapla county and also in northern part of Läänemaa and western part of Hiiumaa, that is areas not in proximity of Väinameri. Though forest cover has also during recent decades increased closer to the coast, the importance for the modern forestry is moderate. Most of the forests are young or have been much thinner in older days thus providing little material for modern forestry. Significant part of the cutting is made for fire-wood. Cutting rates are strongly below the growth-rates.

Significant part of the forests in Läänemaa, Hiiumaa and Rapla county are wet but have been ditched to some extent. Many ditches have overgrown by now, resulting in return of almost natural water balance.

State forestry in Läänemaa is divided between three forestry units. Coastal areas of Väinameri (including Vormsi and Lihula municipality) are managed by Haapsalu forestry unit. Most of the forest in the coastal areas is former private forests and land-reform including restoration of ownership rights is still going on.

10. Reed-harvest and handicraft

Reed-harvest and handicraft are old traditions in the area. In older days the reed was important thatching material and its importance seem to be increasing again. Several private undertakers and some medium-sized companies are engaged in the harvest and making of reed roofs. The latter also buy reed and export it to Scandinavia and Germany. Handicraft production is both a hobby and a small-scale economic activity.

11. Industry and energy supply

There are no major industries or power-plants in the area. Some industries worth mentioning are located in Rapla, Järvakandi, and Haapsalu. Lihula. Light and food industries dominate. Extraction of dolomite, gravel and peat also exist.

Electricity is not produced in Läänemaa. Annual electricity consumption is ca 100 GWh. Electric grid is owned by 'Läänemaa Elektrivõrk'. Municipal heating is produced without electricity co-generation and mostly from fossil fuel.. Significant renewable resources have not been adequately used.

Annual electricity consumption of Hiiumaa is below 50 GWh and municipal heating fuel consumption ca 70 GWh. Tahkuna wind-generator (150 kW) produces annually ca 300 MWh, that is less than 1% of consumption in the county. Wood chips cover 30% of municipal heating.

Hiiumaa has good resource of renewable energy. The annual production of firewood could supply 123 GWh. Wind resource is considerable, especially that of possible off-shore sites. Biosphere Reserve Hiiumaa Centre has initiated Renewable energy island strategy for Hiiumaa.

Assessment of Matsalu wetland biomass as fuel has been recently carried out. The results show sufficiency of the biomass to cover needs of local community. Especially significant is reed as energy resource. Study shows the biomass to be economically competitive. Wind resource is also considerable but large-scale utilisation would need separate planning. Kasari river has some potential for hydro-energy that could be carefully exploited in combination with measures to restore historic flow patterns

12. Transport

Tallinn-Risti-Haapsalu-Rohuküla and Risti-Virtsu highways and Haapsalu-Laiküla and Lihula-Pärnu regional roads pass through Läänemaa. Network of local roads is of uneven density due to abundance of wetlands. Many local roads are gravel-covered. County lacks bicycle roads.

Rohuküla-Heltermaa ferry line connects Läänemaa to Hiiumaa and Virtsu-Kuivastu ferry to Muhu and Saaremaa. Both ferry-lines and the according highways are quite loaded, especially on weekends.

Plans exist that have also reached draft spatial planning for Lääne County to build bridges from Virtsu to Kuivastu and from Haapsalu to Noarootsi. Feasibility studies and environmental impact assessments have not been conducted for these studies. Some of the proposed versions of the Noarootsi bridge pass through the recently established Silma Nature Reserve.

Bus companies were privatised in Läänemaa and Hiiumaa already in 1993. The total length of bus lines has grown from ca 1200000 to ca 1400000 km during the nineties while monetary turnover of the companies – over half of it state subsidy – has grown about four times. Buses are relatively old, only 18% of the buses are newer than 10 years.

13. Water regulation

In addition to ditching of fields and to some extent forests and meadows the natural rivers and streams have been gradually deepened and straightened. In some places the natural river-beds were totally replaced by artificial channels. At the same time lot of small mills were built on the rivers through centuries. Thus relatively natural flow pattern was maintained - some speeding up of the flow due to dredging activities was balanced by its slowing down due to many small dams – until the big dredging of the Kasari delta in 20ies and 30ies. The above-mentioned big dredging and especially digging of the totally artificial Kasari (Kloostri) main channel followed by elimination of some of the dams and decay of the others has speeded up the flow and decreased the flooding time. In older days there were over thirty small dams on Kasari catchment but now there are less than ten. The impact of destroying over 200 years old Kasari dam during reclamation activities of the soviet time was especially strong. Most of the other rivers and creeks of Läänemaa have also been dredged and some of the lagoons like Heinlaht have almost dried as the result of these activities. On Hiiumaa also most of the rivers and streams have also been dredged and connected to each other.

Regulators have been built on the three outlets of Käina bay in order to prevent drying out of this site important for birds and fish-spawning as well as maintaining the deposits of mud. The regulators make it possible to slow down the outflow of water from the lagoon while letting the fish to move through the small gates or if necessary close the outlets totally. The work was foreseen in the Käina bay ICZM plan and was done with support from WWF Sweden.

A study to determine needs and possibilities of hydrology restoration of Matsalu wetland and other coastal sites of Läänemaa is under discussion.

14. Wastewater management and waste handling

The estimated amount of waste-water in Läänemaa is ca 1.2 million m³, half of it being from Haapsalu. Slightly over 0.4 million is discharged to the surface water while somewhat below 0.8 million is let out to the sea. About 1.15 million m³ is treated, slightly over half of it the new Haapsalu waste-water treatment plant and the rest in about 50 small plants. Untreated wastewater is known to be discharged into marine environment only in Hanila municipality - 18 thousand m³. The surface waters receive untreated wastewater in Kõmsi settlement of Hanila municipality, Kirna settlement of Martna municipality, Vormsi municipality and 20% of Lihula town. In the last case the cause is lack of sewers, the Lihula waste-water treatment plant is capable of treating discharge from the whole town. There is no system for handling mud residue of the treatment plants and raw mud is spread on the fields. Lihula waste-water treatment plant was built in the second half of the nineties. It is a modern aerobic treatment plant with simultaneous phosphorus removal. After-treatment is carried out in old sedimentation ponds and new constructed wetland. Recently eight small waste-water treatment plants have been built on the Kasari catchment in accordance with the integrated coastal zone management plan for Matsalu area but not all of them function well enough. Sewer system for Hullo and the treatment plant are built on Vormsi with plans to be finalised this year.

Untreated wastewater is not discharged into the sea from Hiiumaa. However the existing sewers and treatment plants are worn out in Suuremõisa, Hellamaa, Palade, Kassari and elsewhere.

Household waste is currently legally deposited in Läänemaa only to Pullapää garbage dump and the only company handling household waste is Ragn-Sells. The other dump sites,

most of them illegal, were closed in the nineties though illegal waste disposal still happens. The dumps closed in the second half of the nineties are: Ohemäe, Martna, Rõude, Lähtru, Palivere, and Asuküla. The disposal site for waste oil in Oonga has also been closed. Separate handling of hazardous waste has been initiated. West-Estonian hazardous waste project was carried out by Turu University in 1995 – 1997. Municipal employees responsible for waste management were informed about hazardous waste handling, situation in the municipalities was mapped, booklet about hazardous waste was prepared and distributed, waste handling plans for municipalities were initiated, hazardous waste collection was organised.

New West-Estonian waste programme run by Turu University and the municipalities of Lääne, Hiiu and Saare counties was initiated in 1998 in order to prepare waste handling plans for all municipalities. Two seminars and a study tour were organised in 1998.

Ragn-Sells has conducted preliminary site selection for a new inter-county waste-disposal. The site chosen is Ääsmäe in Saku municipality of Harju county. The company has got a preliminary agreement with Saku municipality, the feasibility study and environment impact assessment are yet to be conducted.

15. Tourism

Over 20 thousand tourists stay over-night in Läänemaa every year, six to eight of them are foreigners. In addition to that there are many one-day visitors and campers. Among foreign visitors bird-watchers are important in spring and school-excursions by bus are important among domestic visitors. There are over 30 lodging places in Läänemaa, most of these in Haapsalu or Ridala municipality but several also elsewhere. A hotel was recently opened in Lihula. There are five lodging places on Vormsi and their number will probably grow. Most visited camping-sites are at Kukeranna and Topu, on Vormsi there are two official camping sites. Other sites, including those where camping is forbidden for nature conservation reasons are also to some extent used for this purpose. Importance of tourism-related employment in rural areas is smaller than in Haapsalu but it is gradually rising.

There are about 40 lodging places in Hiiumaa with about 800 beds. There are about 90 thousand tourists annually visiting the island and the share in the economy is ca 2% with ca 20% annual growth rate in the sector.

There are 10 bird-watching towers in Läänemaa. Three of these have been constructed after completion of the Matsalu area ICZMP. However these have been made mostly by private initiative and the five towers foreseen in the plan have not been constructed. There are three nature trails in Matsalu Nature Reserve but several trails foreseen in the plan are not ready. Camping sites foreseen in the plan have not been prepared. Several pamphlets about Matsalu wetland have been published recently.

In the framework of Phare project 'Nature tourism in Western Estonia' construction of nature visitors' centre in Orjaku, Hiiumaa as planned and tourism infrastructure including a nature trail is built in Matsalu.

Local people, especially the rural dwellers travel little. The main cause is insufficient economic resource. Therefore the area is more receiver of tourists and provider of the service than its consumer.

16. Administration

Coastal areas dealt with in this plan belong today to Lääne and Hiiu counties. Matsalu catchment encompasses - in addition to significant part of Läänemaa - also most of Rapla county, small part of Pärnu county and very small part of Harju county. Counties in Estonia are nowadays mostly state bodies and there is no directly elected political representation. Local political body in a county is the union of municipalities that has mostly advisory role towards the county administration. County governors are appointed by the Government in consultation with municipality unions and if the latter do not agree with governmental

proposal Government has the right to overrule them. County governor is the head of county administration, the latter being in charge of county planning, environment protection, rescue service etc. County administrations are under administration of the ministry of interior. It is possible that county borders will be revised in near future.

State administrative bodies outside county administrations include Hiiumaa and Läänemaa centres of the West-Estonian Archipelago Biosphere Reserve, Matsalu Nature Reserve administration, Hiiumaa Islets Protected Landscape administration, county forest services, county land register offices, marine inspection office and environmental inspection office. The above-listed institutions are subordinate to the ministry of environment. The Biosphere Reserve centres are mostly in charge of general sustainable development issues but Läänemaa Centre is also in charge of management of Rumpo and Silma reserves. Matsalu Nature Reserve is in charge of management of Matsalu nature reserve, Laelatu nature reserve, Lihula protected landscape. The last was established in 1998 according to recommendation made in ICZM plan for Matsalu area. The other protected areas recommended in the ICZMP have not yet been created. There are total of ten protected areas in Läänemaa and they are managed by the Biosphere Reserve Centre, Matsalu Nature Reserve administration, County Administration and county forest board. Summary table of protected areas is presented in Annex 5. A reform of environmental management is currently carried out which includes transfer of the county environment protection departments from county administrations to direct subordination of the Ministry of Environment, reorganisation of environmental law enforcement and protected area management. The reform has not been openly discussed and its details are largely unknown to the public.

Other state structures outside county administrations include police and border-guard under Ministry of Interior, Home Guard in the general administrative sphere of the Ministry of Defence and several institutions subordinate to Ministry of Agriculture. There is no unified official statute for regional co-ordination of different state bodies. There is some informal co-operation between different state bodies but it is insufficient.

Municipalities are formally independent of state executive power and the state regulation of their activities is carried out via legislation. However since existing legislation and economic situation do not provide the municipalities with sufficient budget they are in effect strongly dependent on the state. Municipalities are in charge of local planning (including both strategic development and building legislation enforcement), land-reform, municipal infrastructure, social welfare, and municipal educational and cultural institutions. There are several small schools, libraries etc. in rural areas but their future is insecure due to financial situation. Municipalities have the right to participate in other spheres of public administration but the division of responsibilities and mechanisms of co-ordination with state bodies are not established. Some informal co-operation between municipal and state bodies exists but is of uneven quality.

17. Existing plans and their implementation

An attempt to view Väinameri in an integrated way was made in the end of the soviet time. 'Scheme of nature use and conservation of Väinameri' that had been commissioned by Hiiumaa Forest Service was ready in 1987. Due to quick changes of late eighties and early nineties it became outdated before any major implementation. However part of the approach in this scheme can be used nowadays.

The first plan to significantly influence local life after the regaining of independence was the management plan for Matsalu wetland endorsed by the minister of environment in 1994. The plan gives the overview of the specific values of the wetland and threats to these. Most valuable feature of the wetland are its meadows that to large extent determine also the status of the wetland as the bird area. Most important threat is the over-growth of the meadows and the main action against it are mowing and grazing contracts with the farmers. Nature reserve

employees started to look for additional financing necessary for the plan implementation immediately after the plan was ready. Some modest foreign financing was obtained, most notably from WWF Sweden. Some bush-cutting and wooded meadow mowing was carried out. Money for large-scale grazing and mowing has been made available by the Parliament since 1996. Since then about ten contracts have been made every year for alluvial meadow management. Less than half of these are large (over 300 ha) but these cover most of the meadow massive. Majority of the contracts has been at least partly fulfilled. The area of the mown alluvial meadows has risen from ca 500 ha in 1995 to more than a thousand. About ten contracts have been made every year for wooded meadow management and 25 ha (including 10 ha in Laelatu nature reserve) have been mown every year. Every year over sixty grazing contracts have been made. These cover ca 1500 ha of coastal pastures. Though grazing pressure has slightly increased it is in most cases strongly below optimal. There are less than four hundred cattle (ca 200 cows), about 50 horses and less than three hundred sheep and lambs. In order to achieve optimal grazing the number of animals should increase about five times. In Laelatu reserve there are ca 20 cows and less than ten of other grazers. There is also very little mixed grazing, on most of the pastures there are only cattle, on some only sheep or only horses. Primary measures for improvement of tourism infrastructure, especially bird-watching towers, as well as nature conservation law enforcement and monitoring were also outlined in the Plan. most of the planned actions have been implemented.

Integrated coastal zone management plans for Matsalu and Käina areas were ready in 1996. Management plan for Matsalu area further elaborated the management plan for the wetland, complimenting it with plan for the catchment area, mostly in order to decrease the pollution load, plan for fisheries and tourism. Some of the proposed waste-water treatment plants are ready by now, including Lihula treatment plant and constructed wetland. Part of the waste-water programme is not implemented, especially the sewers and mud treatment. Environmentally unacceptable dumps and pesticide storage sites have been closed according to the plan but the system of waste handling is not totally operational yet. Recommendations for additional regulations on fishing have been implemented but the condition of the stocks is still poor. Tourism infrastructure has been developed but the towers, trails and camp-sites foreseen in the plan are not ready. Of protected areas recommended in the plan only one has been created. To sum up most of the actions foreseen in the plan have been partly fulfilled. Due to recession in agriculture the failure to implement measures to decrease agricultural pollution has no effect on environmental quality. Main action in Käina bay ICZP – installation of water regulation on the outlets of the bay – has been implemented.

Draft spatial planning has been prepared for all the counties by now. Planning documents of different counties do not fit together well, because of often different base and lack of national vision about structure and objectives of a county planning. The public hearings of the plans have been carried out in relatively narrow circles. Planning for municipalities is in relatively early stage yet. Some of the narrower sector plans have been mentioned earlier. Poor co-ordination between planning in different sectors can be observed, even when these sector plans are included into county planning. For example plans for transport infrastructure and nature conservation in Lääne county planning contradict each other.

Evaluation

1. Valuable fauna and flora

The region is extremely important for migrating, moulting and nesting birds. This has been recognised by designating several IBAs. Significant number of the global populations of

barnacle geese and globally threatened lesser white-fronted geese migrate through the area. Area is also very important for waders both on migration and during nesting time.

Of mammals populations of grey and ringed seals, otters and beavers are important. Area is rich in reptiles and amphibians, most important of who is the endangered Natterjack toad. The fish resource is also considerable.

Flora and vegetation are also remarkable. Due to high species richness the area is significant as representative set of typical habitats for Estonia, that are now rare in the Baltic region. Especially important are alluvial and coastal meadows, alvars and wooded meadows.

It is obvious that landscape, vegetation and fauna are closely interconnected. Therefore the problems and solutions to these are also intertwined.

2. Valuable ecosystems

Due to above-mentioned reasons it is more practical to treat the ecosystems in the task area as the valuable features and the individual species as the indicators of value. In this plan relatively big systems are dealt with in a lumped way while similar task has to be undertaken in a much more detailed manner during management planning for individual nature reserves. The corresponding indicators are of state indicator (S) type. The development is sustainable only if it does not cause decline in the ecosystem quality as shown by the indicators.

- 2.1. **Väinameri.** Väinameri, especially its shallow parts is important stop-over and moulting site of long-tailed ducks, scoters, goldeneyes and other waterfowl. It is important fishing area for humans, seals and cormorants. Rare bottom-plant communities are present. Parts of the area are important for tourism and this importance is increasing. *Indicators* – numbers of migrating and moulting birds, numbers of seals, presence of rare bottom-plant communities, fish catches.
- 2.2. **Bays, lagoons and reed-beds.** Thousands of migrating whooper and Bewick's swans, geese and dabbling ducks stop here. White-tailed eagles and other birds catch fish. Important fish spawning areas, partly also important for fishing. Reed is important thatching material and potentially important source of renewable energy. Mud is important resource i.a. as curative mud. Of mammals otter is important. Most important are Matsalu and Haapsalu bays and Käina lagoon but other bays and lagoons are also important. *Indicators* – numbers of typical birds, presence of otters, successful spawning of fish, mud quality, water quality.
- 2.3. **Rivers and ditches.** Most of the rivers and creeks have been dredged thus reducing their natural diversity and value. In addition the rivers and streams have transported significant pollution load for years. However they still have importance as inflows of bays and lagoons, fish migration corridors and spawning sites, feeding sites of birds, otter and beaver habitats, popular sport fishing sites. Their value is enhanced by decrease in pollution load that has happened during this decade. Most important is Kasari river system but Vaemla, Suuremõisa, Taebla and other streams are also important. Restoration of more natural flow patterns could further improve the value of the rivers and streams, and bays and lagoons they flow into. *Indicators* - successful spawning of fish, presence of beavers and otters, water quality.
- 2.4. **Grasslands (coastal, alvar, alluvial or marshy)** are important sites for many rare and endangered plant species, nesting and migrating waders like dunlins, ruffs, black-tailed godwits, redshanks, migrating barnacle geese and other geese species including lesser white-fronted goose. They have been important pastures and hay-meadows for millennia. Some of them have significant value for out-door recreation. Most important coastal meadows are located on the coasts of Matsalu bay, Haapsalu bay, Kassari islet and Käina lagoon. Most important alluvial meadow lies in Kasari delta. *Indicators* - numbers of typical waders and waterfowl, present of typical

amphibians, especially natterjakk toads, area of typical vegetation, presence of rare and endangered plants, as well as continuation of traditional land-use.

- 2.5. **Woodlands.** Most valuable are those wooded meadows that are regularly mowed but wood-pastures and other old forests are also valuable. Characteristic to the woods is high plant diversity including abundance of orchids, fungi connected to old trees, bird richness. Most important wooded meadow in the area is Laelatu, Allika, Viita and other sites in Matsalu wetland, several sites in Kassari and elsewhere are also very important. Regularly mowed are in Laelatu is 10 ha, total for Matsalu wetland is 15 ha, total for Kassari is 10 ha. Total for the area is less than 100 ha. Wood-pastures also still exist in some locations. Rare plant community that is not grazed now is Sarve alvar birch-wood. Some of the larger old woods are nesting sites of eagles and black storks. *Indicators* – species-rich plant communities, old trees, natural regeneration of oak and other broad-leaved trees, bird richness, including nesting of eagles and black storks, and continuation of traditional land-use.
- 2.6. **Islets.** Uninhabited islets form compact systems of the above-listed communities. Most of the larger ones (Tauksi, Kumari, Papi, Saarnaki, Hanikatsi, Hobulaid and others) have been once inhabited. All islets except the very smallest ones have experienced some human impact like temporary dwellings of fishermen, grazing, mowing etc. Summerhouses exist nowadays on Hobulaid and Kaevatsi. Most of the islets have overgrown to smaller or bigger extent, meadow flora has declined and meadow birds almost vanished. That means decrease of their biodiversity value. Many of the natural values of the islets like meadow flora and the birds are result of the past human influence that is not realistic to restore. However the active management that could partly be built upon co-operation with inhabitants of the closest villages could restore and maintain part of the former biodiversity of the islets. Some grazing and mowing is carried out on Saarnaki and Hanikatsi in Hiiumaa Islets protected landscape. Very diverse legal status of the islets, from strict nature reserve of Matsalu Nature reserve (Tondi, Sipelga) to lack of any special designation (Hobulaid) provides diversified management and makes it possible to use some of the islets for nature tourism. *Indicators* are plant diversity, birds diversity, presence of natterjacks, presence of open parts, presence of traditional land-use.
3. **Valuable cultural heritage and social-economical importance** includes traditions of wise use of the above-mentioned ecosystems, local architecture, handicraft etc. that can be used as the base for future development. The importance for border protection and national defence can also be neglected.
4. **Development opportunities.** The above-mentioned values are interconnected and can be protected in the long run only as one complex. Sustainable development for the area can be described as use of these values in a way that secures their survival. It is clear that the area has significant potential for sustainable development of agriculture, especially extensive pastoralism, but also renewable energy, tourism, handicraft and other sectors. Such a development implies use of local renewable resources and cross-sector integration.

Interests

Stemming from above-mentioned features of the area there are various local, national and international interests related to it. Since same person has sometimes several interests it is more practical to list these than to try to demarcate the interest groups or 'stakeholders'.

- Nature conservation. The protected areas, wetlands of international importance, important bird areas, species and habitat diversity need effective management.
- Agriculture. The national policy is not friendly to agriculture but most of those farmers who have survived want to continue. Sustainable development of agriculture, especially

pastoralism, is in line with nature conservation interests. Investments are minor, many of them made because of nature conservation needs.

- Fisheries. Due to declined stocks and partly also unfavourable market situation the situation of the fishermen is not as good as in the first half of this decade. Conservation of the stocks is in long-term interests of both fisheries and nature conservation but at the same time fishermen are usually not very happy about strict regulations. The sector does not attract currently significant investments.
- Tourism. Nature is an important tourist asset and therefore its conservation coincides with the long-term interests of the sector. However the regulations are sometimes unfavourable to the short-term interests of tourism. Relations to other sectors can sometimes be competitive but at the same time tourism can provide better markets for agriculture and others. Tourism attracts some commercial investment and is a popular theme of foreign assistance projects.
- Reed harvesting. Some of those active in the area are interested in maintaining status quo but some want to increase the output. Increase of the output coincides both with local economical needs and with nature conservation interests. Investment this far have been very small but there is some hope for both private and public funds.
- Transport. There exist interests in large-scale construction of road infrastructure using public funds. No economic feasibility studies or environmental impact assessments have been carried out. Small-scale infrastructure like bicycle paths and maintenance of local road network is in accordance with local development, ecotourism and nature conservation interests.
- Forestry. Due to small amount of marketable wood the financial interest connected to the sector are moderate and the activities mostly legal. There are no significant contradictions with other sectors.
- Hunting. The economic interest connected to the sector are small but it is a relatively popular past-time. Hunting regulations are mostly respected and contradictions to other interests is minor.
- Berry and mushroom picking is a popular hobby and is a source of income to some of the poor.
- Handicraft has some significance both as a hobby and as a source of income. Tourism development could improve the marketing opportunities.
- Industry is moderate and does not attract significant investments. Sometimes contradiction of interests with nature conservation, tourism, gathering and hunting arise from pressure to open up new peat-bogs or mineral deposits for excavation. Development of food industry and other possible ways to utilise local renewable resource would be favourable both from agricultural and nature conservation point of view, and contribute to local employment.
- Energy. Sector plans and investments are mostly connected to moderate renovation of infrastructure, switching to renewable sources is going slowly. More active development of renewable energy would be in accord both with nature conservation and local development.
- Public safety. Task area does not differ from rest of Estonia. Expected cuts in police and possible cuts in rescue services can cause problems. Co-operation between institutions is insufficient.
- Border control and national defence. The area is located close to the border but it is not viewed as a national priority in this context.
- Education. Network of schools is currently satisfactory but its continued functioning can become problematic due to financial constrains and decreasing number of school-

children. Due to diversity of nature the area has national and also international significance for environmental education.

- Science. Biodiversity of the area makes it a very appealing study site. Good quality of the applied research can in turn contribute to the effectiveness of management.

Problems

Based on the situation described following problems, that is threats to the area's future and conflicts of interests can be listed. Every problem has a set of indicators to describe it.

1. **Overgrowth of the meadows** is the main threat to areas biodiversity and its international importance. Economic importance of semi-natural grasslands has significantly decreased and their use is not profitable. The end of grazing and mowing triggers overgrowth of the sites leading to disappearance of characteristic flora, including most of the orchids. Overgrowth of the short-grass communities leads to vanishing of typical nesting birds, especially the waders. Value of the area for migrating geese also decreases. Overgrowth of the flooded meadows leads to decreased success of pike spawning. Area's importance for tourism also declines. Change in economic situation can make use of semi-natural meadows profitable again. Clearing of once overgrown meadows would consume much more resources than uninterrupted management. *Indicators*: change in the vegetation pattern, change in flora, decline of the nesting waders, disappearance of the Natterjack, decrease in mowed area and grazing intensity
2. **Change in woodland structure** is the next significant threat to biodiversity of the area. There are very few remaining wooded meadows or wood-pastures in the area. Overgrowth of the last remaining ones would lead to dramatic decrease of biodiversity, including disappearance of most of the orchids. Less is known about impacts on birds but decline of black grouse numbers can be connected to overgrowth. Important tourist sites are lost. Already overgrown areas tend to undergo further loss of biodiversity as the result of succession. Cutting of old trees sometimes further worsens the situation. *Indicators*: disappearance of orchids, decreasing mowing or grazing, decrease in habitat patchiness, *potentially* also cutting of old trees, decrease in eagle and black stork nesting.
3. **Conflict between land-users and beavers**. Most complains come from the owners and other users of the forests but some damage is made also to agriculture. Biodiversity is mostly enhanced by beavers though some damage to wooded meadows is possible. Beaver is a usual game species outside protected areas and beaver hunt is an important 'earth-wire' for the conflict. Beaver protection in some of the nature reserves is mostly accepted. The problem can escalate if due to international pressure the beaver hunt would be totally banned. *Indicator* is the land-users' generally negative attitude towards the beavers.
4. **'Wolf problem'** partly also connected to bear and lynx. Large carnivores, especially the wolf are sometimes a serious threat to domestic animals. Hunters are also discontent with killing of wild herbivores. As long as large carnivores themselves are game species the conflict is not too sharp but making them protected species due to international obligations would increase the conflict.
5. **Decrease in patchiness of the reed-beds and accumulation of dead biomass**. Disappearance of open-water patches in the reeds can be a threat to typical bird species like dabbling ducks or even bittern. Importance of the reed-beds as fish habitat and spawning site also decreases. Amphibian habitats worsen. The water-purification effect of the reeds also decreases as rotting reed releases significant part of the plant nutrients tied up during vegetation back into the water and depletes the oxygen supply. *Indicators*:

decline of characteristic birds, lack of spawning success, disappearance of the open-water patches

6. **Overgrowth of the islets** leads to almost total decline of meadow vegetation and vanishing of meadow waders from the islets, disappearance of the last populations of the natterjacks, and deteriorating of migration and moulting conditions for the geese. *Indicators* are changes in overall appearance of the islets (increase in bush and reed cover, decrease in meadow plots), decrease in meadow plants and birds, decrease in Natterjack numbers, decrease in remaining or restored mowing or grazing.
7. **Conflict between the farmers and geese and cranes.** These birds are a significant problem for the farmers but at the same time are highly dependent upon meadows and fields as stop-over and feeding sites. Therefore if farming would stop this would also detrimental for the birds. Mechanisms to compensate for the damage are not effective enough. *Indicator* is complaining by the farmers, *indicator of the problem acceleration* would be appearance of serious poaching.
8. **Further decline in agriculture** accelerates the above-listed problems, especially the first one. Mechanisms of support to agriculture are not sufficient. Decline of agriculture also decreases job opportunities and thus worsens the socio-economic situation in the area. It would also lead to loss of part of the rural culture. *Indicators* (in addition to above-listed): further decline in numbers of cattle, horses and sheep, further decline in area of agricultural land, further decline in agricultural employment, lack of investment.
9. **Unsustainable increase in agricultural production** could cause pollution of water with nutrients and pesticides, further impoverishment of agricultural landscape due to drainage activities etc. Because of the current trends in agriculture this threat is presently not important. *Indicators* would be increase in environmentally not sound drainage activities, increased use of mineral fertilisers and pesticides as well as pollution from manure, and problems indicated in the next point.
10. **Water eutrophication and pollution with bio-accumulating substances** that is partly caused by agricultural run-off and partly by municipal and industrial waste, is a problem that has lost most of its acuteness. Due to decrease in agricultural production, low industrial activity, sparse population and measures undertaken to improve waste-water treatment the problem is small though still present to some extent. Nutrient loading has decreased and so has pollutant content in biota but it is still premature to declare the problem totally solved. *Indicators of worsening situation* would be elevated levels of BOD, N and P, decreased water transparency (e.g. measuring with Secci disk), and increase of heavy metals and chlorinated organic content in biota.
11. **Decrease in fish stocks** is a problem mostly for fishermen though to some extent it has influence on the ecosystem as a whole. Main cause is probably the over-fishing but other factors cannot be excluded. (See also next point). *Indicators* are decreasing catches of perch, pike-perch, pike and white-fish in commercial and monitoring catches alike.
12. **Conflict between fishermen, and cormorants and seals.** Cormorant numbers have increased rapidly in recent years, both grey and ringed seals also tend to increase. Cormorant was quite recently an endangered and protected species but due to rapid recovery throughout Europe it is not protected any more. Due to much slower recovery of the seal populations that are still markedly smaller than by the turn of the century both seal species are still protected. Fishermen accuse both seals and cormorants in depleting fish stocks, and especially the latter also in destroying fishing gear. The latter damage is certainly serious. At the same time drowning of seal pups in fish traps is also significant cause of mortality though the precise numbers are hard to estimate. Frustration of the fishermen can potentially cause significant threat to both seal and cormorant populations. *Indicators* are voiced discontent concerning seals and cormorants by the fishermen, and

drowning of seal pups. *Indicator of the serious conflict would be* deliberate killing of seal pups or destroying of cormorant nests.

13. **Poaching** certainly exists in the area but its intensity is low. It is mostly problem for the legal hunters, whose hunting-rights are 'stolen'. Poaching of geese migrating through protected areas is minimal. No cases of deliberate killing of 'problem species' young are known. Potentially the problem can escalate. *Indicator of increasing problem would be* change in behaviour of the poached species like flight from a longer distance or decrease in their numbers.
14. **Disturbance to wildlife, trampling etc.** is problem on the riverbanks mostly because of spring sport-fishing, on the seashore and the islets mostly due to leisure activities like boating, off-road driving etc in summer. Most sensitive sites are usually protected and some legal regulations are in place; however the enforcement is sometimes insufficient. The problem can be described as a conflict between tourism and recreation (including sport-fishing) on one hand, and conservation of natural diversity. The solution therefore lies in finding balance between these interests. *Indicators* are destroyed vegetation and other signs of destruction.
15. **Illegal building** is more common on popular holiday sites where it is mostly a nuisance for the other people, but there are cases of damage to really valuable and protected sites. Partly the problem reflects the same conflict as the previous one but mostly it is the conflict inside between recreational interests as building summerhouses decreases opportunities of other people to enjoy the site. Nature conservation legislation set significant constrains to building on the coast but the law enforcement is not always secured. *Indicators* are the illegal buildings.
16. **Waste handling problems and littering of the countryside** are mostly connected to the two previous points, and to insufficient environmental awareness. However the waste-handling system itself is also insufficiently developed. In this case also the conflict is partly between nature conservation and recreation but partly within recreation sector itself. *Indicator* is the litter in the countryside.
17. **Decline and ageing of population** contributes to the other problems, especially decline of agriculture and over-growth of the meadows. *Indicator* is emigration and decreasing birth-rate.
18. **Disintegration of social infrastructure** is partly caused by the previous problem but it in turn magnifies it. Current situation is not very bad yet but worsening can be forecasted. *Indicator of worsening* would be closing down of the village schools and libraries, end of NGO activities.
19. **Poor state of communication and road infrastructure** magnifies the previous problems. Bad telephone connection hampers development of internet. Local gravel roads are in poor state, cycle roads are absent, trekking paths are few.
20. **Conflicts related to land tenure** especially monopolisation of land by absentee 'landlords' contributes to sense of insecurity of local population and decreases motivation to invest in agriculture.
21. **Poor cross-sector integration and insufficient communication** *Indicators:* plans are often too general and lack clear objectives and actions, too much is kept in secret, plans of different sectors contradict each other, and sometimes there are no plans at all.

Goals and objectives

General goals

There are five closely related goals:

1. Conservation of biodiversity of the valuable ecosystems like grasslands, islets etc. *Strategic success indicator* would be recovery of typical species and communities.

2. Promotion of sustainable development of agriculture, energy and other sectors based on wise use of the renewable resources. *Strategic success indicator* would be development of viable economic activities based on sustainable resource use.
3. Regional integration of various socio-economic and administrative sectors. *Strategic success indicator* would be continual exchange of information and dialogue between different interest groups and public sector institutions
4. Stabilisation of human population. *Strategic success indicator* would be stable birth-rate sufficient to compensate for the deaths, balance of immigration and emigration, and stable demographic composition
5. Improving image of the area both among local people and the visitors.

Objectives for five years

Since the goals are interconnected the objectives usually refer to more than one goal and are sometimes also interconnected

1. **Restoration and maintaining of optimal grazing intensity (average: one cattle or horse and two sheep per hectare) on coastal pastures, alvars etc.** *Indicator of success* – grazing intensity restored to target levels
2. **Harvest of hay on 3000 ha of alluvial and other wet meadows and 100 ha of wooded meadows** *Indicator of success* – hay mown and harvested
3. **Clear valuable meadow sites from bush or reed** *Indicator of success* – area cleared
4. **Harvest ca 20000 tons of reed per year** (about 2/3 of total production). *Indicator of success* – reed harvested
5. **Improve water quality and fish spawning conditions, restore diversity of the lagoons, reed-beds and flowing waters** *Indicators of success* – successful spawning of pike and perch, further decline on heavy metal content in these fishes, further decline on chlorinated organic content in seals, further increase in water transparency, further moderate decrease in BOD and nutrient content in the water, further decrease in green algae blooms, restored and maintained aquatic biodiversity.
6. **Support sustainable agriculture, including organic farming** *Indicator of success* – number of farms converted to organic farming and acreage of arable land tilled in organic way (plus indicators in points 1 and 2)
7. **Diversify local economy by promoting renewable energy, handicraft and ecotourism** *Indicators of success* – municipal heating converted from fossil fuels to renewable, pilot scale renewable-based electricity production, improved marketing of local handicraft, increased number of tourist farms and rise in tourism incomes without increase in disturbance to nature.
8. **Improve environmental education** *Indicators of success* – active public participation in sustainable development initiatives and decrease in problems related to low environmental awareness
9. **Develop administrative capacity** *Indicators of success* – co-operation between different institutions, flexible and swift reacting to situation, decrease in illegal activities (including violations of environmental legislation), increase in efficiency of law enforcement
10. **Make information available and improve communication between different institutions and interest groups.** *Indicator of success* – availability of information referred to in the previous points.

Actions necessary to achieve the objectives

Because of interconnectedness of the objectives actions usually refer to more than one objective and are often interdependent. Brief analysis of necessary actions grouped by the

main objective they serve is presented below. Brief descriptions, reference to objectives and goals, and which values are protected against which treats, possible implementing agencies, priority, cost assessment and possible donors, and indicators of action being implemented (R-indicators) are presented.

Restoration and maintaining of optimal grazing intensity

Grazing contracts are currently made between protected area management and owners of the grazing animals, number of animals by species and age class, and time interval when animals are kept on the pasture are agreed upon. Fulfilment of the contract is monitored jointly by the contacting parties, that is the protected area manager and owner of the animals. Such a mechanism is instrumental only in protected areas with clear management responsibilities, outside protected areas there is currently no administrative and legal mechanism for such an approach. Grazing contract are meant first and foremost to restore and maintain the optimal grazing but they contribute to the sustainable agriculture in general; they are connected to all three strategic goals but especially to first two of these: to conserve biodiversity of open meadows, wood-pastures and islets against overgrowing with reed and bush, and to maintain traditional sustainable land-use patterns. Grazing compensations must be upgraded to 5 EEK per day for a grown-up cow or horse, 4 EEK/day for heifer or a yearling horse, 3 EEK/day for sheep, goat, calf or foal, 2 EEK/day for a lamb. With the current number of animals this would make 550 000 EEK/year. With numbers of animals restored to the optimum levels the expenditure would increase to 5 500 000 EEK/year. The action is of top priority therefore the sum cannot be considered big. Currently the expenses are covered from the state budget. Since this action is in accordance with the agri-environmental regulation of CAP the EU sources must also be used for its implementation. In such case valuable pastures outside protected areas will be also eligible for payment. The responsible agency would then be the same as for the other EU agricultural payments. It is possible that shift to area payments would then be necessary. The unclear land ownership and insufficient grazing can become obstacles in this case. During accession the resources of SAPARD must be used for the implementation. *Indicators* – grazing contracts and real grazing.

Procurement of the grazing animals is necessary to reach the target levels of grazing. This action is complementing the previous one and addresses same objectives and goals. Number of cattle and horses must reach ca 6000 and that of sheep ca 12 000. At least 2000 cattle and horses and 4000 sheep must be procured. Total expenditure is 10 million EEK. The funding must be sought from SAPARD but smaller pilot projects can be implemented with aid from WWF and other nature conservation funds. Local implementing body is in case of pilot project Estonian NGO-partner of donor NGO. In case of SAPARD the responsible body would be the agency in charge of implementing EU agricultural policy. The action is to be made in co-operation with the farmers who will receive the animals upon a contract as tenants or owners and will be responsible for the animals and grazing. *Indicators* – animals procured and distributed.

Fencing of the pastures is necessary to complement the previous actions and serves the same objectives. Currently many fences are in poor state and would not withstand increase in grazing pressure. First step would be construction of 50 km of fences. The cost varies depending on situation but can be estimated as being 20 EEK per metre on average. The total cost would be thus 1 million EEK. Presumed donors are same as for the previous points. The implementing bodies are also presumably the same but it is also possible to use volunteers on selected priority sites. *Indicator* – fences installed

Procurement of transportation means for the animals including lorries and means of water transport is necessary to enhance grazing of the remote areas, especially the islets, and transportation of the marketed animals. It has the same objectives as the previous actions.

Financing sources and implementing bodies could be the same as for the previous actions.
Indicators – transportation means procured and used.

Harvest of hay on 3000 ha of alluvial and other wet meadows and 100 ha of wooded meadows

Contracts for management of hay-meadows secure mowing and hay removal from alluvial meadows and other wet grasslands, and wooded meadows. The contracts are made between protected area managers and farmers or other agricultural producers. They are meant to secure the continued harvest of the valuable hay-meadows but also contribute to the sustainable agriculture in general. The contracts specify site location, type and size, and amount of the compensation paid. Implementation of the contract is checked jointly by the protected area manager and the farmer. In case of partial fulfilment of the task (including leaving the mown hay not harvested) partial compensation is paid. Currently such a mechanism is applied in Matsalu and Puhtu-Laelatu nature reserves and Hiiumaa Islets protected landscape. The compensation rates must be upgraded to 300 EEK/ha on open meadows and 3000 EEK/ha on wooded meadows. Together with increase of the mowed area this will rise annual expenditure to 1200000 EEK. The national budget is currently the only financial source but SAPARD source should be looked for in the framework of agri-environmental measures. In case of increased expenses like rise in fuel prices or further decline in market for hay the compensation rates will have to be increased. *Indicators* – management contracts and areas managed.

Procurement of the tractors, mowers, balers etc is a necessary complement to the previous activity and serves the same purposes. It is necessary because of very small capital available to the farmers. Tractors suitable for alluvial meadows cost between 200 and 500 thousand EEK, mowers between 180 and 250 thousand EEK, rakes 30 to 50 thousand, balers 200 to 300 thousand EEK; small mowers suitable for wooded meadows cost 30 and 50 thousand EEK. The need for alluvial meadows is 6 more sets and 20 small mowers are needed for wooded meadows and islets. Total expenditure is about 7 million EEK. Possible donor: SAPARD. *Indicators* – procurement and use of the equipment.

Clear valuable meadow sites from bush or reed

Bush-cutting contracts are complementing the grazing and hay-meadow managing contracts in order to clear meadows from bush. The obligation to cut bush can also be included into the grazing and mowing contracts. Financing: state budget or WWF and other international environmental foundations. Implementing: protected area managers in co-operation with the farmers or other interested persons. *Indicators* – contracts made and area cleared from bush.

Bush-cutting camps are organised to compliment the previous activity. In addition to direct effect of clearing meadows and islets from bush they contribute to raising environmental awareness by bringing young people close to practical management. Donors: WWF of other environmental foundations. Implementing: protected area managers or Estonian environmental NGOs. *Indicators* – camps organised, numbers of participants, area cleared.

Procurement of the bush-cutting equipment is needed because the existing equipment is constantly worn out. However, most important equipment is in place already, and because of the moderate price this equipment can partly be procured by the executants themselves. This action will contribute to clearing meadows from bush. Suitable chain-saws cost between 6 and 8 thousand EEK and suitable bush-cutters between 7 and 10 thousand EEK. Necessary amount is 10 chain-saws and 20 bush-cutters, necessary expenditure ca 250 thousand EEK. Donors: WWF and other environmental foundations. *Indicators* – equipment procured and used.

Harvest ca 20000 tons of reed per year

Procurement of reed harvesters will lay foundation to increase of reed harvest. SEIGA costs ca 2 million EEK and the need is 20 of them. The action will also contribute to achievement of the next objective. Total expenditure 40 million. Possible donors: Danish environmental aid, the World Bank, commercial loans. *Indicators* – harvesters procured and used

Improve water quality and fish spawning conditions, restore diversity of the lagoons, reed-beds and flowing waters

Further improvement of the waste-water treatment according to the existing plans is needed to continue improvement in water quality. Finances: state budget, ISPA and other foreign aid. *Indicators* – waste-water treatment plants and related infrastructure

Further improvement of waste handling is necessary in order to continue improvement of environmental situation and in connection to tourism development. Donors: local budgets, state budget, ISPA. Implementing – waste handling enterprises, local municipalities, nature reserve managers, tourism operators. *Indicators* – public dustbins on most visited sites, separate collection of hazardous waste, increase in number of waste handling contracts.

Cutting open patches into the reeds is needed to restore biodiversity of the reed-beds and improve spawning conditions for the fish. Financing source WWF and similar foundations. *Indicator* – patches cut

Studies of possibilities to restore water flow patterns are necessary to make competent decisions. Differently from previous actions there is currently not enough information for planning best possible actions. Action not based on informed decisions can make more harm than good. Donor. Danish environmental aid. Implementing agency: protected area managers. *Indicator* – information available for informed decision

Actual restoration on the large scale can be carried out only after successful implementation of the previous action. Costs, donors and implementing agencies will also be determined during the study.

Support to sustainable agriculture, including organic farming will partly be implemented via actions under first two objectives. However these alone will fall short of laying foundation for sustainable agriculture in the long run.

Marketing of local agricultural production like meat, milk, wool of animals from coastal pastures, wet grassland hay, organically produced cereals and other products, and so on is necessary in order to make sustainable agriculture competitive on the market. the action includes market investigation and preparation of the marketing strategy. Donor: WWF. Implementing: local NGOs. *Indicator* – existing information for good marketing.

Subsidies and loans to sustainable agriculture are necessary for balanced development of the sector. Important components are support to organic agriculture and to breeding of local endangered breeds like Estonian horse and Estonian cattle, and investments into equipment and infrastructure. Donor: SAPARD in the framework of agri-environmental payments. Implementing agency: the one responsible for CAP pre-accession measures. *Indicator* – working system of support.

Preparing agri-environmental plan would increase the effectiveness of the previous action though it is not an absolutely necessary pre-requisite for the latter. Donor and implementing agency would be the same.

Develop small-scale local dairies, butcheries and wool-processing industries in order to improve marketing situation for local producers. Implementation of the action depends on the marketing strategy. Donor and implementing agency - same as for previous actions.

Diversify local economy by promoting renewable energy, handicraft and ecotourism

Use of reed and other natural biomass for energy according to report of Matsalu biomass energy project includes investment both in equipment and infrastructure. Additional benefits would be contribution to the objectives of hay-meadow management, clearing meadows from bush and increased use of the reeds. The necessary investment in equipment largely coincides with above-listed investments in hay and reed harvesting machinery, and saws and bush-cutters. Additional needs are the wood chippers and special equipment for the reed-harvesters. Investments in infrastructure mean switching Lihula central heating to biofuel in the first place. Donors: ISPA, the World Bank. Implementing agency: municipality in co-operation with local entrepreneurs. *Indicator* – actual use of biofuel

Planning for wind-energy would assess the best sites and necessary investments. Attention should be given to avoid conflict with nature conservation interests.

Develop wind-energy according to the above-mentioned plan.

Planning for small-scale hydro in co-ordination with studies for water-regime restoration.

Practical implementation of small-scale hydro according to the plan.

Courses and workshops promoting local handicraft traditions would also help to diversify incomes. Donors: WWF, SIDA, Phare. Implementing – NGOs. *Indicators* – number of courses and participants.

Further improvement of tourist infrastructure is necessary for sustainable development of tourism. It includes bird-watching towers and platforms, camping-grounds and resting places, bicycle paths and nature trails. Donors: SAPARD, ISPA, Phare, state budget. Implementing – nature reserve managers, municipalities, county administrations, NGOs. *Indicators* – trails, info-boards, towers, improved info about services.

Environmental courses and camps for tourism operators are basis for keeping tourism on sustainable way of development and also contribute to improved environmental awareness. Donors: Phare, SIDA, state budget. Implementing – NGOs, municipalities, county administrations, nature reserve managers. *Indicators* – course and camps organised, numbers of participants.

Support to farm-based tourism Donor: SAPARD. Implementing – agency responsible for EU support implementation in co-operation with the farmers, protected area managers, municipalities, county administrations and NGOs.

Disseminate tourism info by means of printed booklets and via internet.

Maintenance of telecommunication and road network

Improve environmental education

Seminars and workshops on sustainable development are necessary to increase public awareness, improve mutual understanding between different interest groups and agencies. Donors: WWF, SIDA, Phare. Implementing – NGOs, municipalities, county administrations, protected area managers. *Indicators* – number of seminars and participants.

Study tours for local people to the areas with similar values and problems in Estonia and abroad would help people to put their experience into broader context. Donors: WWF, SIDA, Phare. Implementing – NGOs, municipalities, county administrations, protected area managers. *Indicators* – number of tours and participants.

Environmental courses and camps for students and teachers would greatly increase the general level of understanding of nature conservation issues. Donors: state budget, WWF, SIDA, Phare. Implementing – NGOs, municipalities, county administrations, protected area managers. *Indicators* – number of courses and camps, and participants.

Maintain the network of municipal schools in the area. Small local schools contribute to development of sense of home and environment in students. They also constitute the

infrastructure for other educational actions. Donor and implementing agencies: municipalities.

Developing and maintaining administrative capacity is a pre-requisite of successful implementation of the management plan

Development of the technical base includes procurement of the vehicles, communication tools, office facilities and outdoor equipment.

Establishing regional e-mail list would enhance information exchange and co-ordination between different state and municipal officials.

Provide available information

Environmental monitoring must secure the updated information on indicators of environmental situation, problems and status related to the goals for the public and the responsible agencies be able to assess the effectiveness of management. Following information must be collected:

- hydrology and hydrochemistry – water level and run-off, water transparency, BOD, N and P;
- hydrobiology – changes in plankton and benthos;
- ichthyology – composition and abundance of fish, ratio of predatory vs. non-predatory fish;
- landscape monitoring (aero-photography);
- vegetation and flora monitoring – sample squares on the meadows and rare plant;
- herpetology – amphibian and reptile counts, assessments of amphibian reproductive success; special attention to the natterjacks;
- ornithology – counts of migrating, moulting and nesting birds in different habitats;
- mammalogy – seal, otter, beaver and small mammal numbers.

Monitoring social-economic processes and natural resource use would help to assess the status of solving the corresponding problems, and provide additional (indirect) info on state of environment.

- fish catches;
- hunting bag;
- quantity of reed cut;
- numbers of farm animals by species, location and size of farms;
- demography of local population, spatial distribution, education, employment;
- land-use
- land tenure and reform
- situation of economic infrastructure
- transport intensity
- tourist numbers and incomes from tourism

Documenting implementation of the action plan is the basis for evaluation both the plan and its implementation. For every action at least the corresponding R-indicator(s) must be documented.

Applied research provides additional info to complement the long-term monitoring and lays foundations for planning new actions.

Action plan

Below the above-described actions are presented as one list grouped by the type of action.

1 Contracts with land-owners and other land-users.

- 1.1 Grazing contracts
- 1.2 Mowing contracts

- 1.3 Bush-cutting contracts
- 1.4 Organic farming contracts
- 1.5 Contracts for keeping endangered breeds
- 2 Investments**
- 2.1 Equipment
 - 2.1.1 Mowing equipment: tractors, mowers, rakes, balers
 - 2.1.2 Transport means for the animals
 - 2.1.3 Reed-harvesters
 - 2.1.4 Bush-cutters and chain-saws
 - 2.1.5 Wood-chippers
 - 2.1.6 Equipment related to the implementation of the management plan like vehicles, communication, office and outdoor equipment
- 2.2 Infrastructure
 - 2.2.1 Sheds, barns, manure-storage
 - 2.2.2 Small-scale dairies, butcheries and wool processing enterprises
 - 2.2.3 Fences
 - 2.2.4 Waste-water treatment plants
 - 2.2.5 Municipal heating switched to biomass
 - 2.2.6 Wind-generators
 - 2.2.7 Small hydro and water regulation
 - 2.2.8 Tourism trails and cycle roads, local roads
- 2.3 Animals
- 3 Supplementary actions to restore habitats**
- 3.1 Bush-cutting camps
- 3.2 Cutting open-water patches in the reeds
- 3.3 Restore natural flow patterns
- 4 Educational measures**
- 4.1 Sustainable development seminars
- 4.2 Study tours
- 4.3 Handicraft courses
- 4.4 Environmental courses and camps for students and teachers
- 4.5 Environmental courses and camps for tourism operators
- 5 Administrative measures**
- 5.1 Improving protected area network
- 5.2 Maintaining municipal school network
- 5.3 Establishing regional e-mail list
- 6 Applied research and monitoring**
- 6.1 Inventory of protected areas and areas worth protection
- 6.2 Investigating of possibilities to restore natural water-flow patterns
- 6.3 Making plans for small hydro
- 6.4 Making plan for wind energy
- 6.5 Preparing agri-environmental plan
- 6.6 Monitoring

ON CONSERVATION OF BIODIVERSITY IN PUBLIC-PRIVATE PARTNERSHIP IN MATSALU WETLAND

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Abstract

Matsalu Wetland of International Importance is situated in Western Estonia. Most of its habitats have been affected by man since land appeared from the sea. This influence included mowing, grazing *etc* as well as forest clearing and reed harvest. Semi-natural communities are among chief values of the wetland. Measures to counteract abandonment of the meadows are therefore given high priority in the Management Plan for Matsalu Wetland. These include making grazing or mowing contracts with the farmers and paying compensations according to these. Management in co-operation with the farmers has now been carried out for several years. Negative trends have been slowed down and partly reversed but lot of work remains to be done.

What is Matsalu Wetland?

Matsalu Wetland is situated in Western Estonia. It is formed by shallow Matsalu Bay together with Kasari River delta, seashores and adjacent part of Moonsund Sea together with over forty islets. Coastline of Matsalu Bay forms a complicated pattern and there are over ten islets in the bay. Bedrock of the area is formed by limestone and is divided by the valley containing the bay and the delta. Glaciations have influenced local nature by eroding the bedrock and bringing clay and granite to the area. After retreat of the last glacier land-rise of 2 to 3 mm per year started and is continuing today. Most of the delta and the coastline has appeared from the sea during last 500 years.

The area has been inhabited by man for several thousand years. Therefore most of the habitats have been affected by human activities "from the start". This influence included mowing, grazing *etc* as well as forest clearing and reed harvest. Minor ditching activities have also long history here, but it is only in twenties and thirties that large-scale dredging of the river delta system were carried out. These had pronounced adverse effect on the wetlands hydrology. Nevertheless fluctuations of the water-table can reach two metres. By now channels have partly silted up and hydrology is slowly developing back towards natural state.

The above-mentioned conditions have produced high variety of habitats. These include shallow brackish water, coastal pioneer vegetation, extensive reed-beds, coastal-, marshy- and alluvial meadows, alvars and woodlands including wooded pastureland and mowed wooded meadows. This variety of habitats leads in turn to the high species-richness of the area. The wetland's flora includes ca 700 species and half of these are listed in the Red Data Book for the Baltic Region, Over 260 species of birds nest here or migrate through the area and 150 of these are also included in the Red Data Book. Nesting bird-fauna includes Corn Crake, various waders and waterfowl. Thousands of cranes, swans and migrate through the area.

The extraordinary richness of the wetland's nature, especially its bird fauna, has been noticed over hundred years ago. Matsalu Nature Reserve was established in 1957 and the wetland was first Ramsar-listed in 1975. Due to regaining of independence by Estonian Republic the listing was renewed in 1994. Management Plan for Matsalu wetland of international importance was ready in 1993 (Lotman, 1994) and endorsed by the Minister of Environment in 1994. This is a comprehensive document that has been main basis for our work on the spot since then. The Integrated Coastal Zone Management Plan for the area (including the wetland's catchment) prepared in 1996 and Integrated Coastal Management Plan for Väinameri drafted in 1999 further elaborate the principles of integrating nature conservation and sustainable use.

Last fifty years have seen gradual abandonment of traditional agricultural practices and hence decrease in use of semi-natural meadows. At the same time increased use of fertilizers and concentration of animal farming into big farm complexes have created serious pollution problems due to runoff from agriculture. Nineties have witnessed dramatic decrease in agricultural production. The positive side-effect has been decrease in pollution of Matsalu bay. The serious negative consequence has been dramatic acceleration of loss of semi-natural habitats.

Semi-natural communities - partnership between man and nature

It is well-known that semi-natural communities like various meadows and pastures contribute significantly to overall biological and landscape diversity (*e.g.* A Programme..., Danielson 1995, Estonian Coastal and Floodplain Meadows, Gordon *et al* 1990, Kukk & Kull 1997, Lotman (in press), Palmred 1995, Parks for Life). Wooded meadows are known to be communities of extremely high small-scale vascular plant species richness,

coastal pastures and other wet grasslands are essential habitats for various waders etc. Biodiversity of the meadow ecosystems is directly connected to human use and declines significantly with neglect. Threat of stopping traditional use like grazing or mowing is serious due to present policies in agriculture. Conservation of these communities must therefore include active management in the form of support to traditional uses like grazing or mowing. It must be noted that intensification of agriculture, including both active threats like drainage, fertilization, ploughing up etc as well abandonment of semi-natural biotopes is one of the most prominent dangers to the bird richness of Europe.

According to our management plan the semi-natural communities are among the chief values of the wetland. As active threats are either banned or strongly regulated in the Nature Reserve, passive threat of stopping traditional use like grazing or mowing is more acute at present. Therefore measures to counteract abandonment of the meadows are given high priority. These include making grazing or mowing contracts with the farmers and paying compensations according to these. (Lotman 1994)

Earmarked financing for meadow management was allocated by the Parliament for budget year 1996. This was the first precedent of this kind in Estonia. Similar measures have been approved since then for other Estonian protected areas and national programme for semi-natural habitat management has started in 2001.

These measures have resulted in increased in the farmers' interest to participate in management. Mowed area in alluvial meadows has increased to more than 2000 ha and there was some success in increasing numbers of grazing animals. Area of managed wooded meadows has also increased.

Apart from making yearly contracts with the farmers that are based on yearly payments with state money, Nature Reserve administration has been successful in obtaining foreign aid to renew the machinery used in the meadow management. It must be kept in mind that old Soviet tractors, mowers and balers are worn out and their quality has never been satisfactory. By combining international aid and state budget three new tractors and mowers have been procured. Herds of hardy beef cattle have been established to increase numbers of grazing animals. EU Phare, WWF Sweden and Ramsar Small Grants Fund have been most prominent among foreign donors.

What of the future?

Cooperation with the farmers must continue and increase. Better technology for hay, reed and bush harvest must be introduced and other ways of wise use of wetland's natural resources integrated into the wetland management. Nature Reserve administration must also continue its monitoring, enforcement and environmental education activities.

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