

JAPAN INTERNATIONAL COOPERATION AGENCY
SLOVAK ENVIRONMENTAL AGENCY
THE SLOVAK REPUBLIC

**THE STUDY
ON
THE REGIONAL ENVIRONMENTAL MANAGEMENT PLAN
FOR
THE HRON RIVER BASIN IN THE SLOVAK REPUBLIC**

**Final Report
GIS MAPS**

February 2000

**PACIFIC CONSULTANTS INTERNATIONAL, TOKYO
OYO CORPORATION, TOKYO**



1156014 [1]

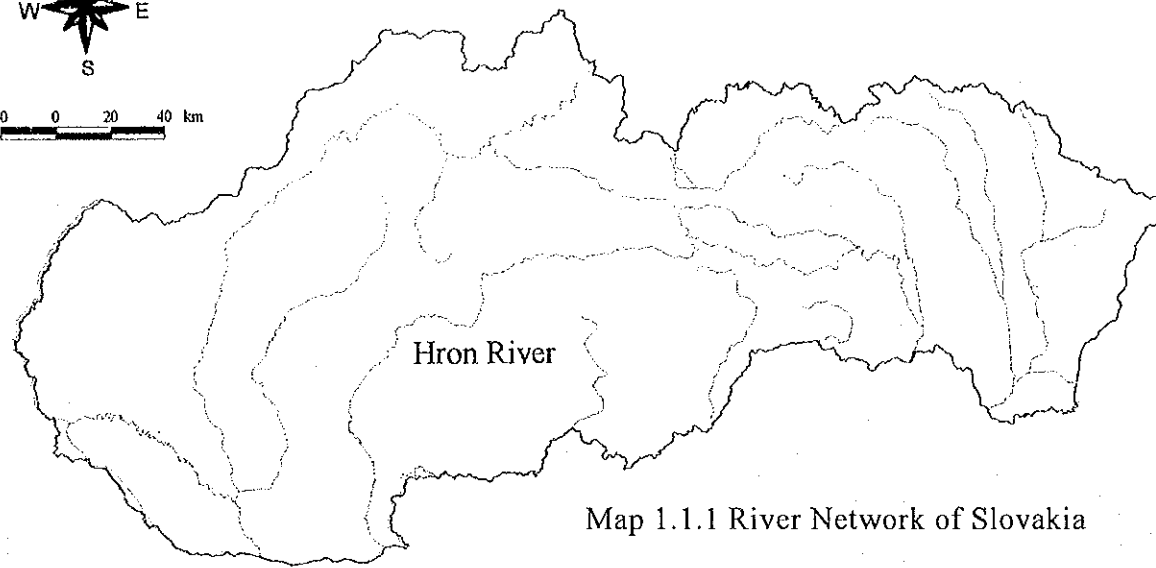
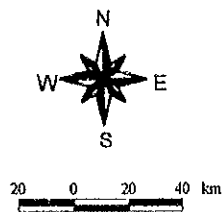
マイクロ
フィルム作成

MAP LIST in GIS MAPS

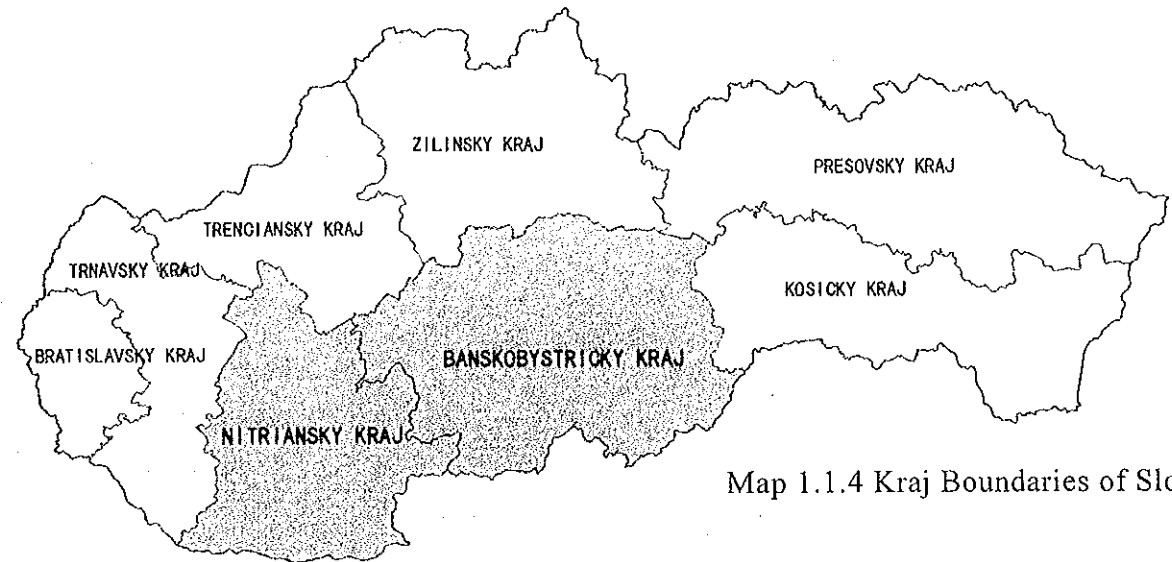
Table NO	GIS DATABASE	Data Owner	Map NO	Map Title	page
1.1	Water Management Data	SAZP GIS 1	1.1.1	River Network of Slovakia	1
			1.1.2	River Basins of Slovakia	1
			1.1.3	Sub-Basins of Slovakia	1
			1.1.4	Kraj Boundaries of Slovakia	1
			1.1.5	Obec/Mesto Administration Boundaries in Slovakia	1
			1.1.6	Okres Boundaries and Urban Areas of Slovakia	1
1.2	Administrative Boundaries of Slovakia	SAZP GIS 2	1.2.1	Kraj and Okres Boundaries in the Study Area	2
			1.2.2	Study Area and Hron River Basin	2
			1.2.3	Cadasters of the Study Area	2
1.3	Forest Management Units	SAZP GIS 3			
1.4	Protected Natural Areas of Slovakia	SAZP GIS 4	1.4.1	Nature Protected Areas of the Study Area	3
1.5	Caves of the Republic of Slovakia	SAZP GIS 5	1.5.1	Principal Caves in the Study Area	4
1.6	Protected Trees of the Republic of Slovakia	SAZP GIS 6	1.6.1	Protected Trees in the Study Area	5
2.1	Program of Village Renewal In 1998	SAZP BB 1			
3.1	Catalogue of Waste	SAZP BA 1			
4.1	CORINE Land Cover	SAZP RS 1	4.1.1	Land Cover Map 1990	6
4.2	Land Cover Map of the Study Area as of 1998	SAZP RS 5	4.2.1	CORINE Land Cover Map 1998	7
			4.2.2	Areas Changed between 1990 and 1998 (General)	8
			4.2.3	Areas Changed between 1990 and 1998 (Detailed - Main Land Cover Categories)	9
			4.2.4	Agricultural Land Use of the Study Area	10
			4.2.5	Areas of Forests in the Study Area	11
4.3	Soil Characteristics	SAZP RS2			
4.4	Hydrology, Meteorology, Pollution Sources	SAZP RS 3	4.4.1	Shaded Relief and Main Sub-Basins	12
			4.4.2	Average Annual Mean Temperature Distribution	12
			4.4.3	Average Annual Mean Rainfall Distribution	12
4.5	Simulation results of the project DANUBE	SAZP RS 4			
5.1	Endangered Landscape Areas	SAZP KE 1	5.1.1	Selected Characteristics of Geological Area	13
			5.1.2	Groundwater Pollution	13
			5.1.3	Quality of the Environment in Slovakia	13
6.1	Geochemical Atlas of Slovakia : Soils	VUPOP1	6.1.1	Soil Contamination Evaluation Maps (As)	14
			6.1.2	Soil Contamination Evaluation Map (Cd)	14
			6.1.3	Soil Contamination Evaluation Map (Cr)	14
			6.1.4	Soil Contamination Evaluation Map (Cu)	15
			6.1.5	Soil Contamination Evaluation Map (Hg)	15
			6.1.6	Soil Contamination Evaluation Map (Ni)	15
			6.1.7	Soil Contamination Evaluation Map (Pb)	16
			6.1.8	Soil Contamination Evaluation Map (Se)	16
			6.1.9	Soil Contamination Evaluation Map (Zn)	16
			6.1.10	Soil Contamination Integrated Evaluation Map	17
6.2	Soil Types and Pedogeochemical Data	VUPOP2	6.2.1	Soil Map	18
7.1	Borehole Database	GSSR 1	7.1.1	Location Map of Boreholes	19
7.2	Geological Units	GSSR 2	7.2.1	Geological Units	20
7.3	Hydrogeology	GSSR 3	7.3.1	Hydrogeology Transmissivity	21
7.4	Tectonics	GSSR 4	7.4.1	Tectonics	22
7.5	Geochemical Atlas of Slovakia: Groundwater	GSSR 5	7.5.1	Groundwater Pollution Evaluation Map (Al)	23
			7.5.2	Groundwater Pollution Evaluation Map (As)	23
			7.5.3	Groundwater Pollution Evaluation Map (Ca)	23
			7.5.4	Groundwater Pollution Evaluation Map (Cd)	23
			7.5.5	Groundwater Pollution Evaluation Map (Cl)	24
			7.5.6	Groundwater Pollution Evaluation Map (Cu)	24
			7.5.7	Groundwater Pollution Evaluation Map (F)	24
			7.5.8	Groundwater Pollution Evaluation Map (Fe)	24
			7.5.9	Groundwater Pollution Evaluation Map (Hg)	25
			7.5.10	Groundwater Pollution Evaluation Map (Mg)	25
			7.5.11	Groundwater Pollution Evaluation Map (Mn)	25
			7.5.12	Groundwater Pollution Evaluation Map (NH4)	25
			7.5.13	Groundwater Pollution Evaluation Map (NO3)	26
			7.5.14	Groundwater Pollution Evaluation Map (Pb)	26
			7.5.15	Groundwater Pollution Evaluation Map (pH)	26
			7.5.16	Groundwater Pollution Evaluation Map (Se)	26
			7.5.17	Groundwater Pollution Evaluation Map (SO4)	27
			7.5.18	Groundwater Pollution Evaluation Map (Zn)	27
			7.5.19	Integrated Groundwater Pollution Evaluation Map	28
			7.5.20	Location Map of Groundwater Sampling Points (Geochemical Atlas of SK)	29
7.6	Geochemical Atlas of Slovakia: Rocks	GSSR 6	7.6.1	Location Map of Rock Sampling Points (Geochemical Atlas of SK)	30
7.7	Stavica Region: rocks, river sediment, water	GSSR 7	7.7.1	Groundwater Pollution Maps in Stavica	31
7.8	Old Environmental Load Database	GSSR 8	7.8.1	Old Environmental Loads in the Study Area	32
			7.8.2	Licensed Landfill Sites in the Study Area	33
7.9	Landfill Suitability Maps	GSSR 9	7.9.1	Landfill Suitability Map of the Study Area	34
8.1	Groundwater Quality Data	SHMU/BA 1	8.1.1	Location of Groundwater Monitoring Well	35
8.2	Surface Water Quality Data	SHMU/BA 2	8.2.1	Location of Surface Water Monitoring Points	36
8.3	Wastewater Effluents	SHMU/BA 3			
8.4	Critical Loads - Acidity and Toxicity of Groundwater	SHMU/BA 5			
9.1	Air Pollution Sources	SHMU BA 4	9.1.1	Distribution of REZZO 1 Emission Sources in the Study Area	37

Table NO	GIS DATABASE	Data Owner	Map NO	Map Title	page
10.3	Yield of Springs	SHMU BB 3			
10.4	Register of Withdrawal of Underground Water	SHMU BB 4			
11.1	Meteorological Data Including Rain-Gauge Data	SHMU BB 5	11.1.1	Areal Distribution of Mean Annual Precipitation Totals calculated for the period of 1951-1980 by SHMU	39
			11.1.2	Areal Distribution of Mean Annual Air Temperatures calculated for the period of 1951-1980 by SHMU	39
			11.1.3	Areal Distribution of Mean Annual Wind Speed at 10m above Terrain calculated for the period of 1971-1990 by SHMU	40
			11.1.4	Areal Distribution of Mean Global Solar Radiation Sums calculated for the period of 1951-1980 by SHMU	40
11.2	SHMU BB -Air Quality Data	SHMU BB 6			
12.1	Tree Species Composition of Slovakia	LVU 1	12.1.1	Forest Health Condition Map of the Study Area	41
12.2	Crown Condition	LVU 2			
12.3	Soil Condition	LVU 3			
12.4	Foliar Condition	LVU 4			
12.5	Deposition	LVU 5			
12.6	Forest Regions	LVU 6	12.6.1	Forest Regions	42
12.7	Calculated Deposition of Sulfur and Nitrogen	LVU 7			
12.8	Calculated Critical Load of Sulfur and Nitrogen	LVU 8			
12.9	Forest Management Districts	LVU 9	12.9.1	Distribution of Commercial, Protectional and Special Purpose Forests in the Study Area	43
12.10	Forest Health Condition Map	LVU10			
13.1	Basic Map of the Slovak Republic, ZM200	IGC 1			
13.2	Basic Map of the Slovak Republic, ZM50	IGC 2			
13.3	Map of Administrative Division of Slovak Republic	IGC 3			
14.1	Evaluation of Ecological Capacity of Ziariska Valley Region	CU 1			
15.1	Immovable Cultural Monuments	SPU 1	15.1.1	Distribution of Monuments in the Study Area	44
			15.1.2	Construction State of Monuments in the Study Area	45
			15.1.3	Immovable Monuments in the Study Area by Okres and Type of Monument	46
15.2	Public Utilities	Stat.	15.2.1	Public Water Supply System (PWS)	47
			15.2.2	Public Sewerage System (PSS)	47
16.1	Hydroecological Plan	HEP 1	16.1.1	Waste Disposal Sites	48
17.1	Nitra Kraj Statistical Data	KSSU 1	17.1.1	Population Density Map of the Study Area	49
			17.1.2	Population Distribution Map of the Study Area	49
			17.1.3	Average Household size by Cadaster in the Study Area	50
			17.1.4	Settlement Structure of the Study Area	50
18.1	Nitra Kraj Territorial Plan	NR TR 1			
18.2	Banska Bystrica Kraj Territorial Plan	NR TR 2			
19.1	Tourist Sites in the Study Area	VKU	19.1.1	Sites of Tourism Interest in the Study Area	51
20.1	Fishing area in the Study Area	others	20.1.1	Fishing areas of Slovak Fishing Union along the Hron river	52
21.1	Endemic Species	others	21.1.1	Distribution of Endemic Species in Slovakia	53
21.2	Natural Forest Vegetation	others	21.2.1	Natural Forest Vegetation of the Study Area	54
			21.2.2		
22.1	Vulnerability of Groundwater Pollution by DRASTIC Method	GSSR	22.1.1	Depth to the Groundwater Table (D : Weight 3)	55
			22.1.2	Net Recharge (R : Weight 4)	55
			22.1.3	Aquifer Media (A : Weight 3)	55
			22.1.4	Soil Media (S : Weight 2)	56
			22.1.5	Topography (T : Weight 3)	56
			22.1.6	Impact of Vadose Zone (I : Weight 5)	56
			22.1.7	Hydrogeology Transmissivity (C : Weight 4)	56
			22.1.8	Groundwater Vulnerability Map	57
23.1	Case Study for Project Prioritization : Sewerage Development Projects	SHMU	23.1.1	Effects on Environment - 1 : Reduction of Pollution Load	58
			23.1.2	Effects on Environment - 2 : Improvement of Water Quality	58
			23.1.3	Socio-Political Acceptance/Resistance : Government Support	59
			23.1.4	People's Willingness : Community Support	59
			23.1.5	The Total Points (Final Evaluation)	60
24.1	Modelling Results:Air Pollution Index in the Study Area	SHMU	24.1.1	Modelling Results:Air Pollution Index in the Study Area in 1990(Annual Average)	61
			24.1.2	Modelling Results:Air Pollution Index in the Study Area in 1998(Annual Average)	61

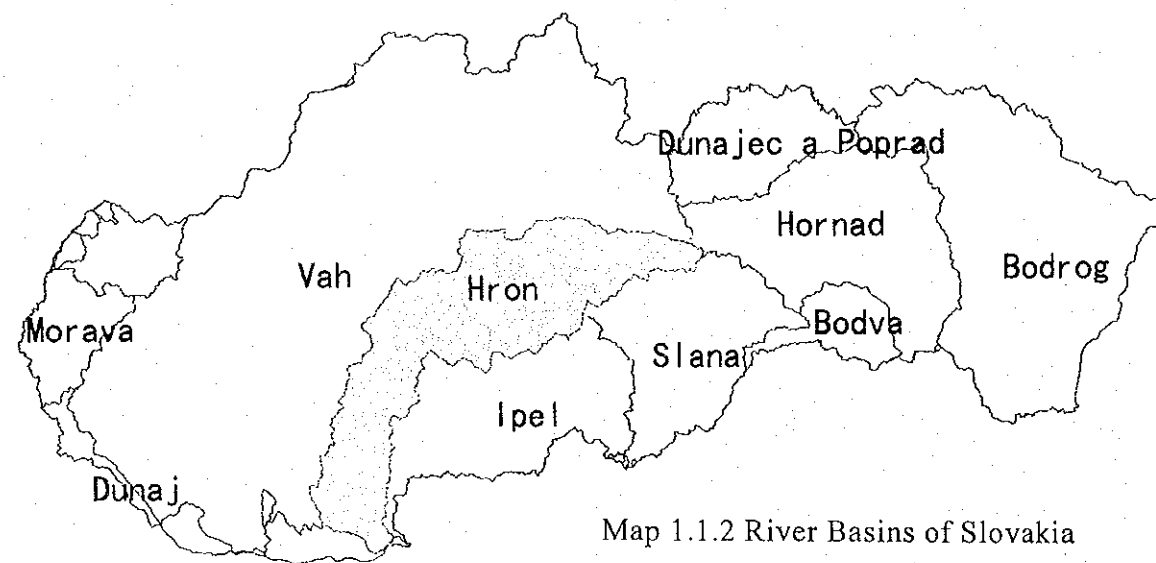
Note : "Table NO" from 1.1 to 19.1 is related to "ANNEX O.1 DETAILS of DIGITAL DATA SETS ACQUIRED BY THE STUDY TEAM" in the supporting report.



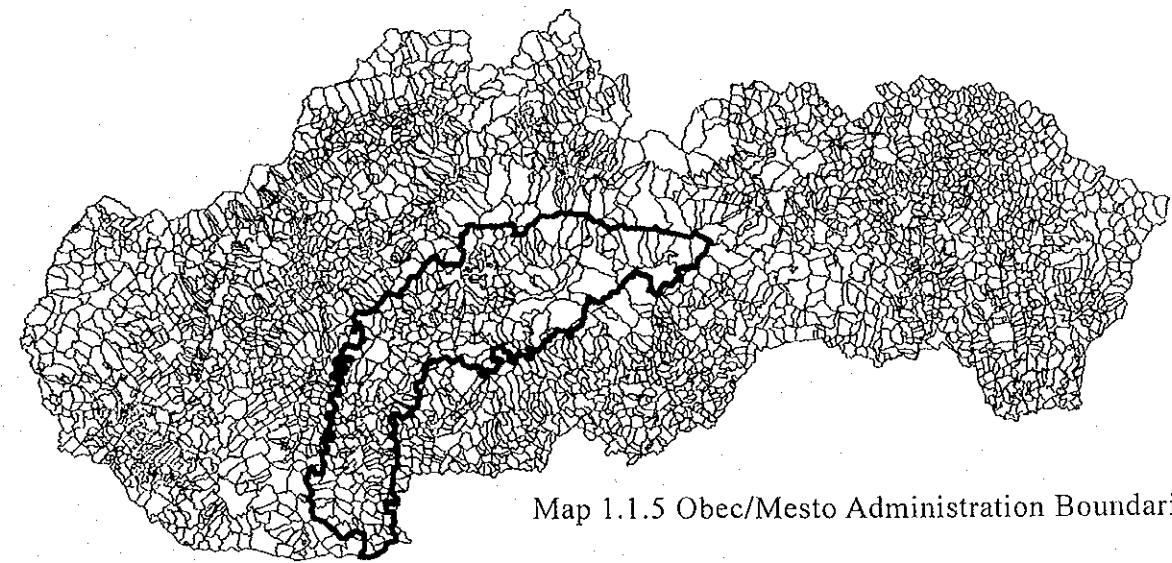
Map 1.1.1 River Network of Slovakia



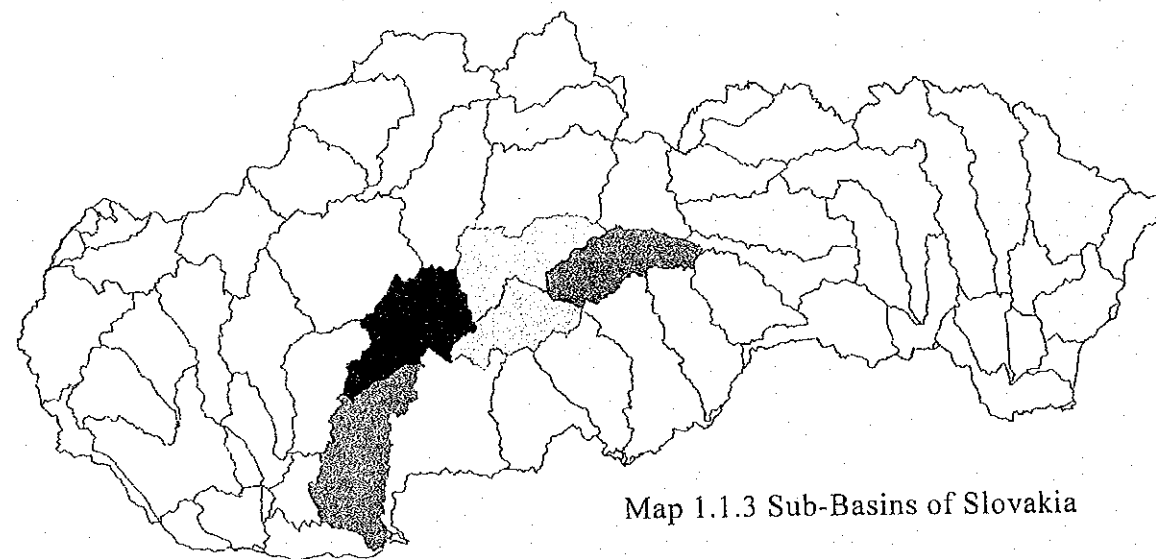
Map 1.1.4 Kraj Boundaries of Slovakia



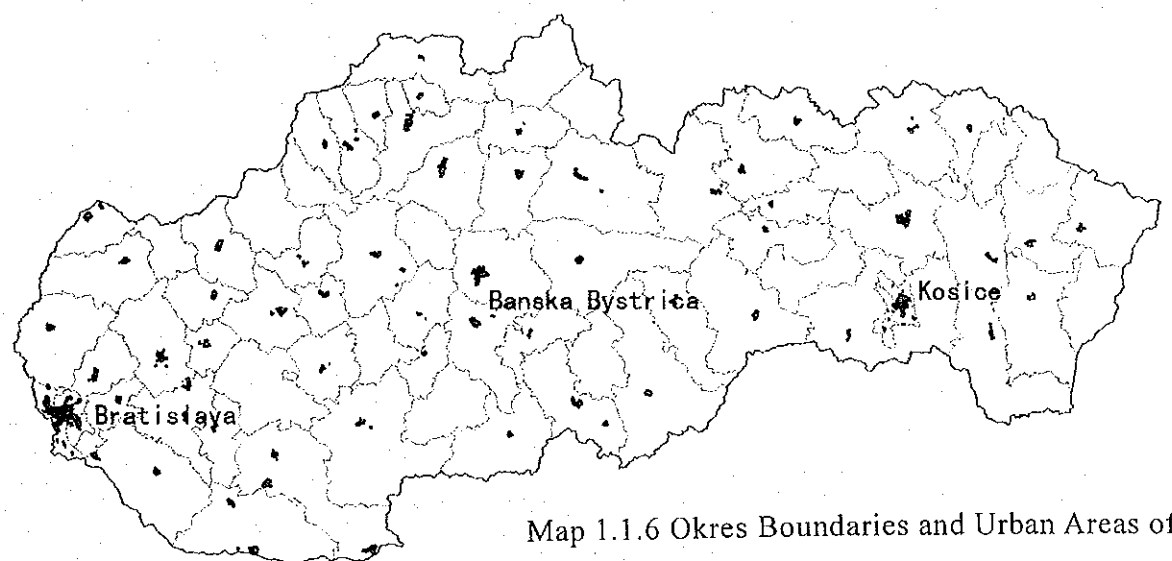
Map 1.1.2 River Basins of Slovakia



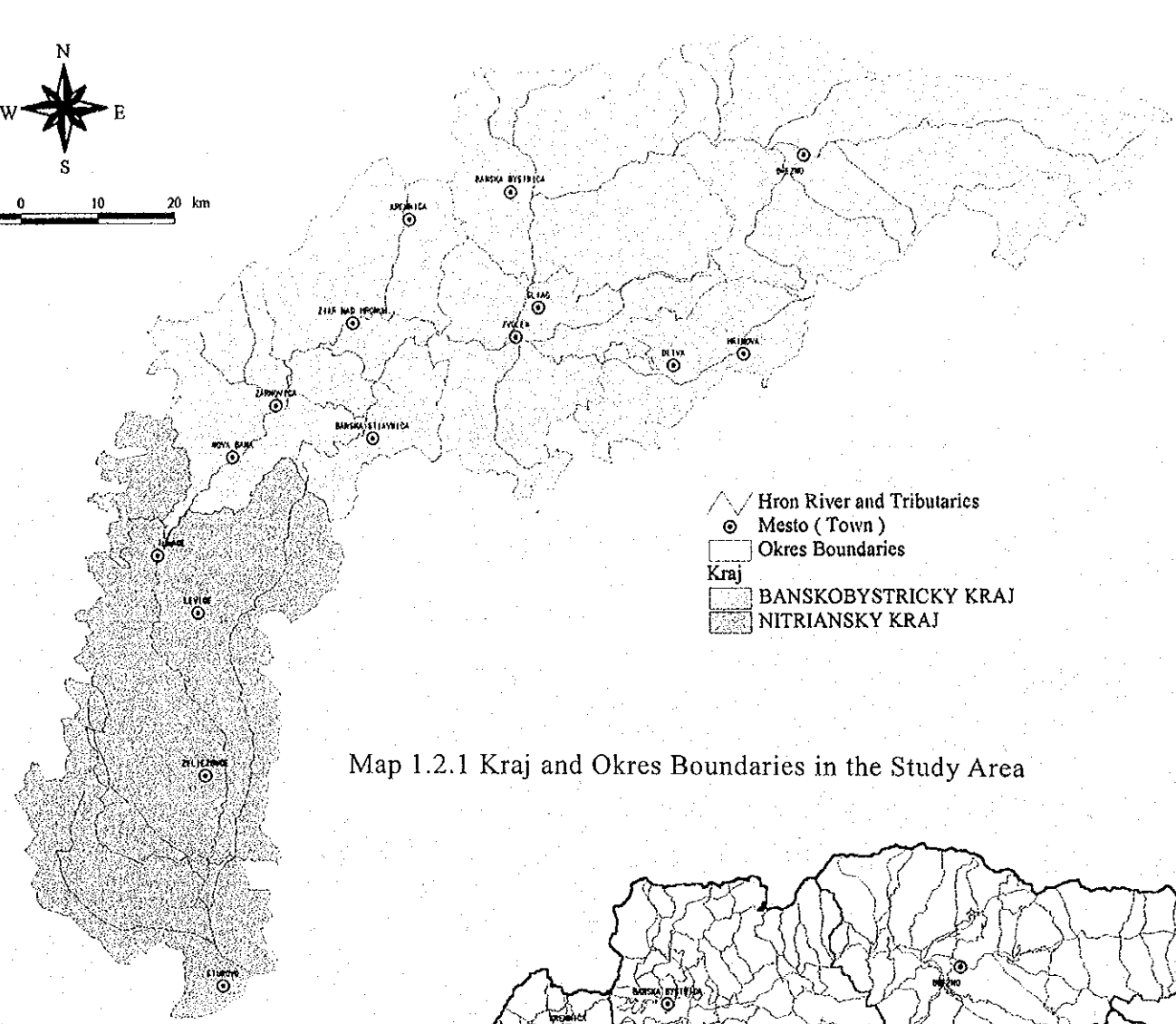
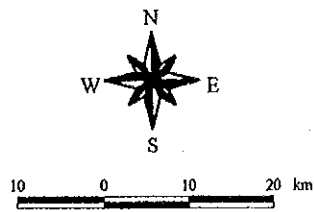
Map 1.1.5 Obec/Mesto Administration Boundaries in Slovakia



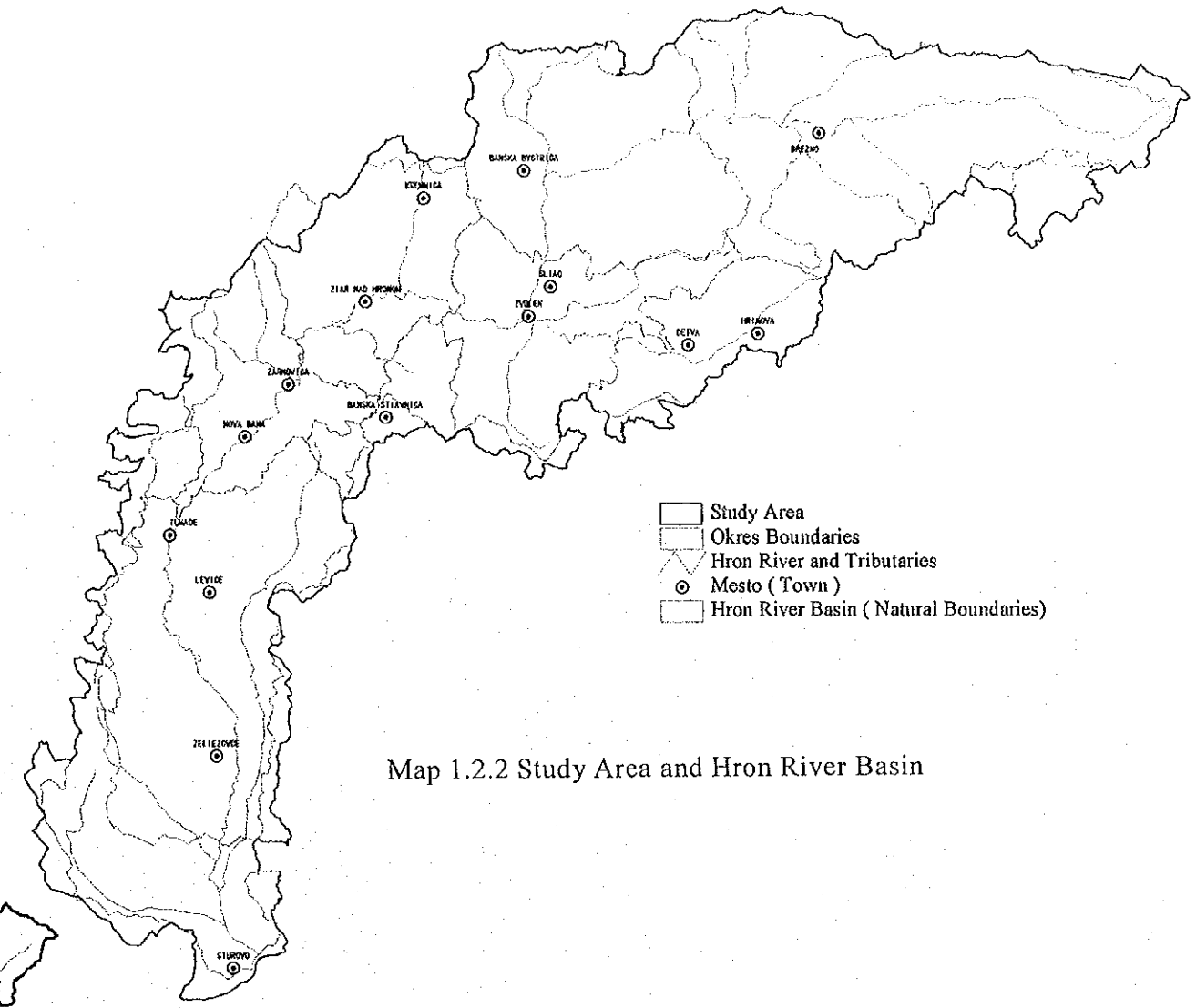
Map 1.1.3 Sub-Basins of Slovakia



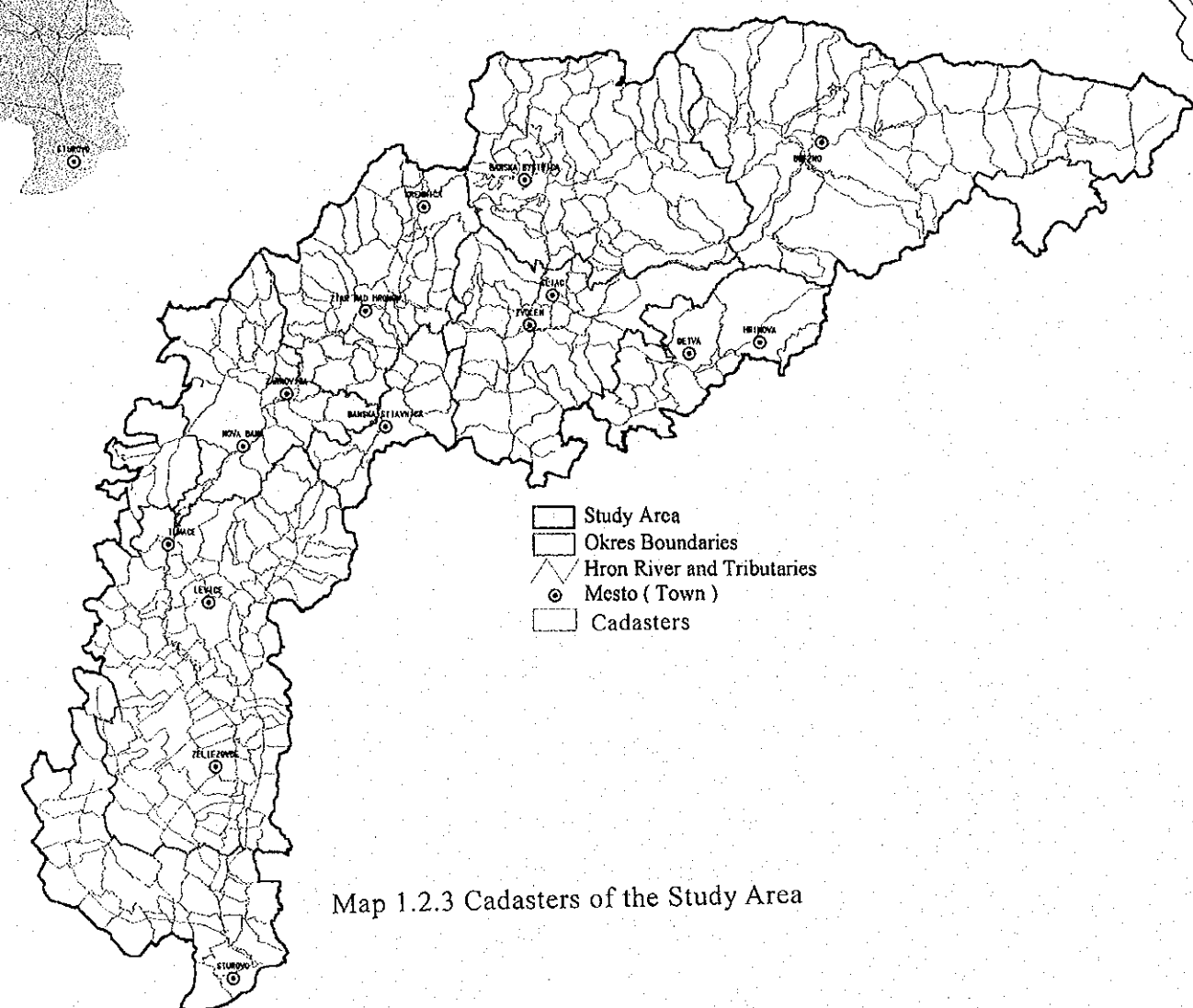
Map 1.1.6 Okres Boundaries and Urban Areas of Slovakia



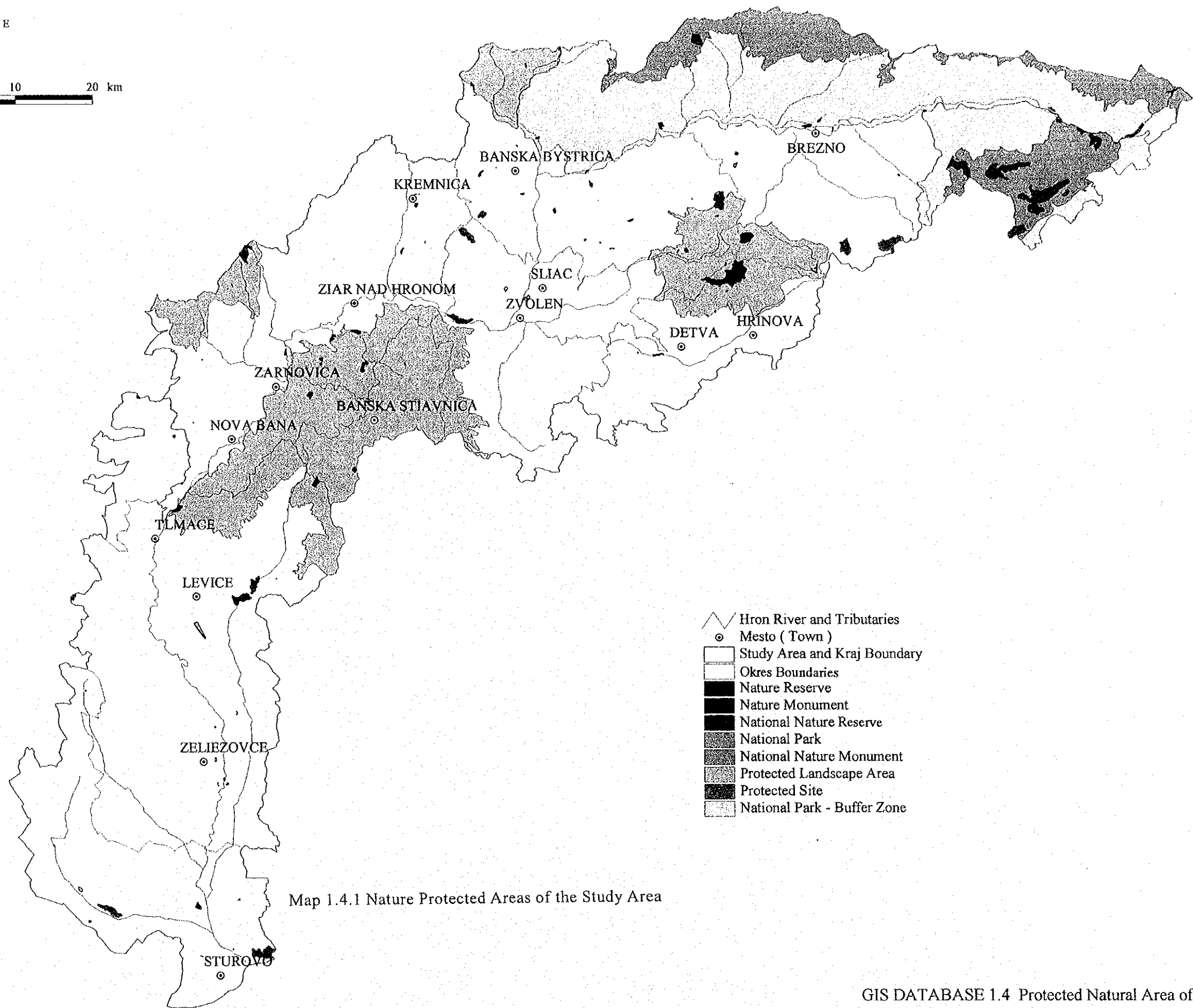
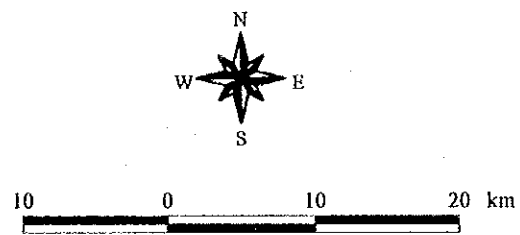
Map 1.2.1 Kraj and Okres Boundaries in the Study Area



Map 1.2.2 Study Area and Hron River Basin

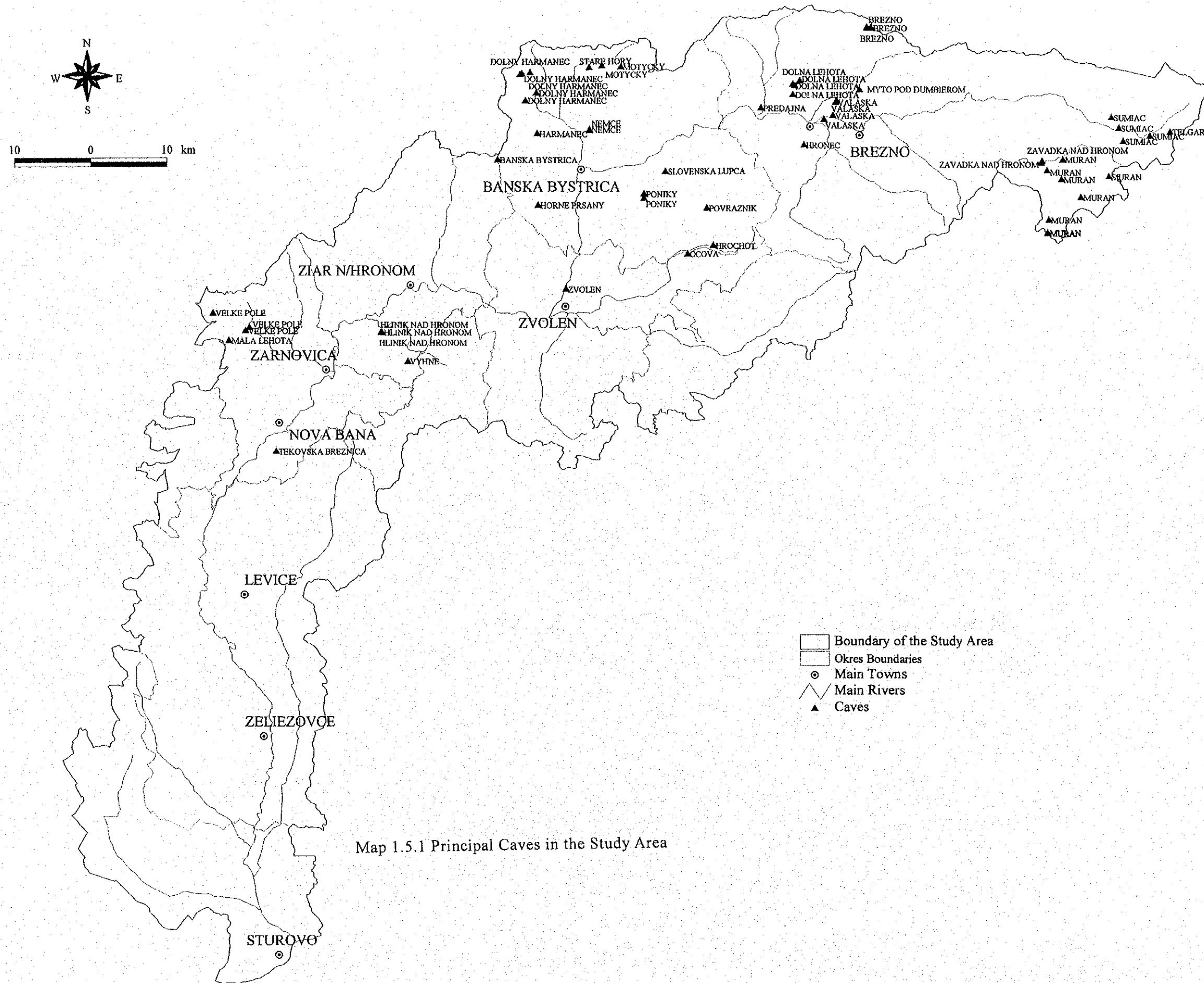


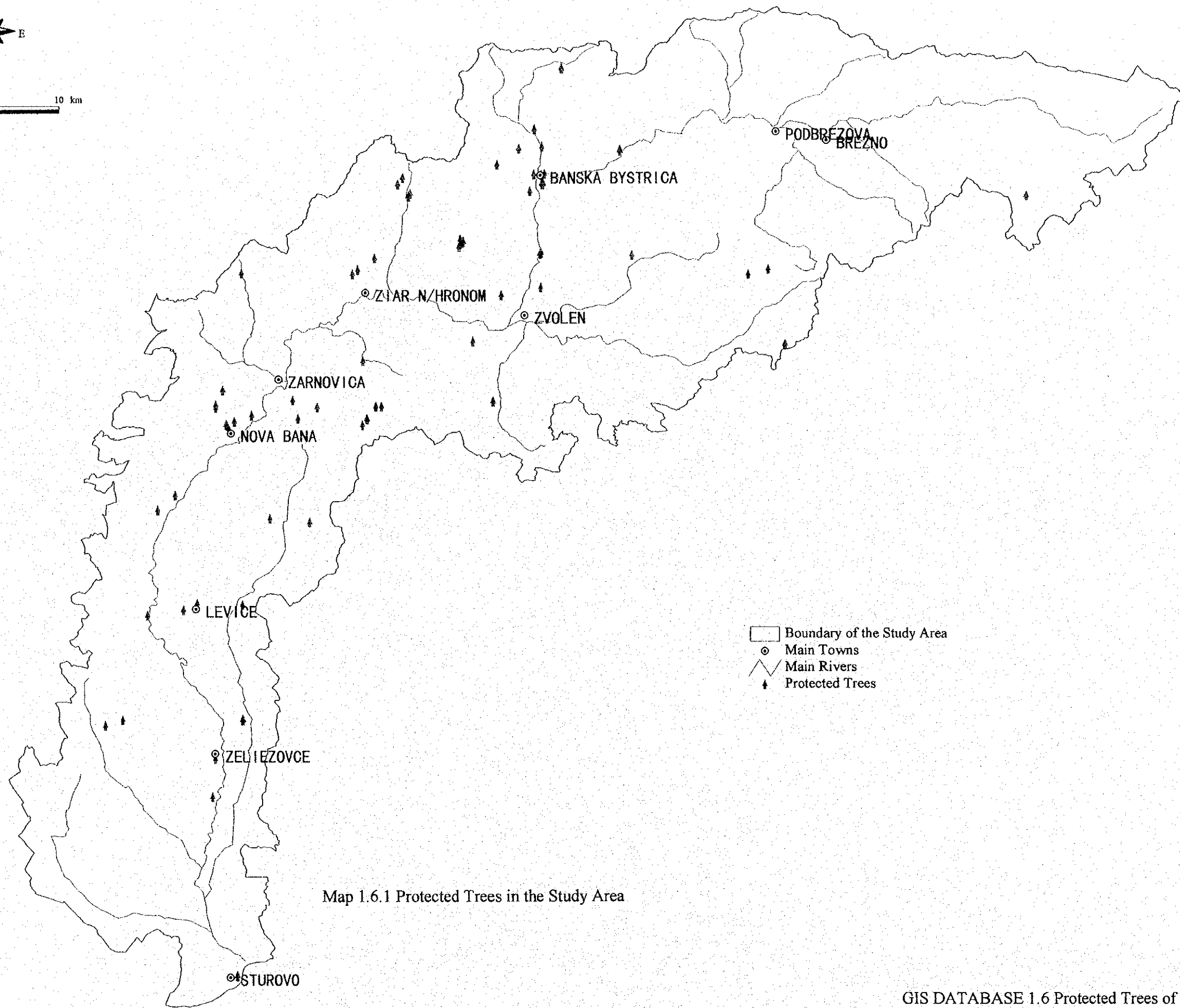
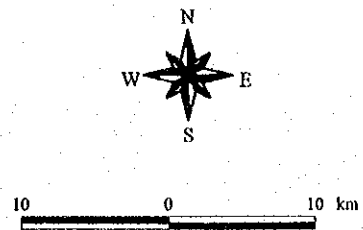
Map 1.2.3 Cadasters of the Study Area



- Hron River and Tributaries
- Mesto (Town)
- Study Area and Kraj Boundary
- Okres Boundaries
- Nature Reserve
- Nature Monument
- National Nature Reserve
- National Park
- National Nature Monument
- Protected Landscape Area
- Protected Site
- National Park - Buffer Zone

Map 1.4.1 Nature Protected Areas of the Study Area

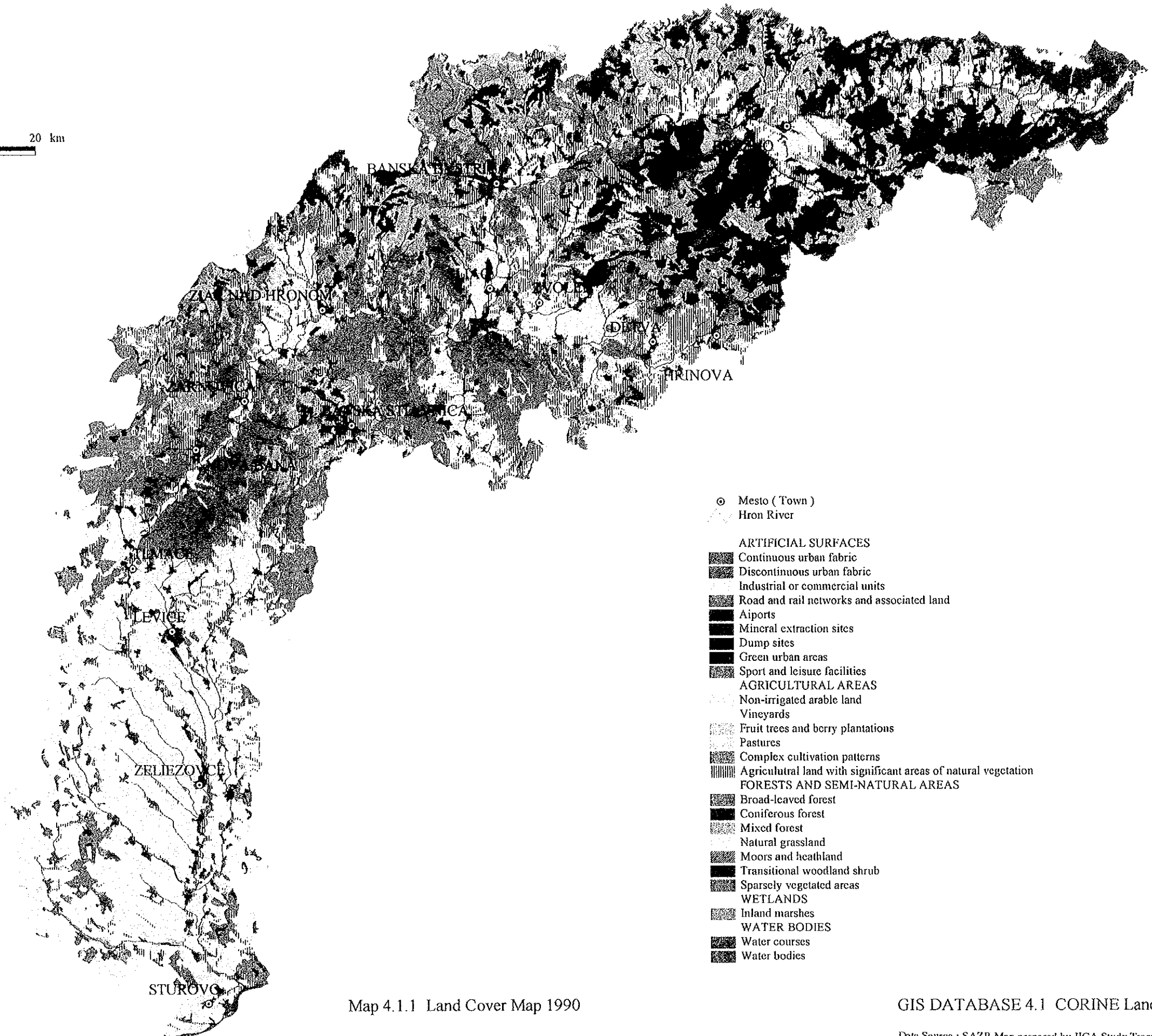




Map 1.6.1 Protected Trees in the Study Area



10 0 10 20 km

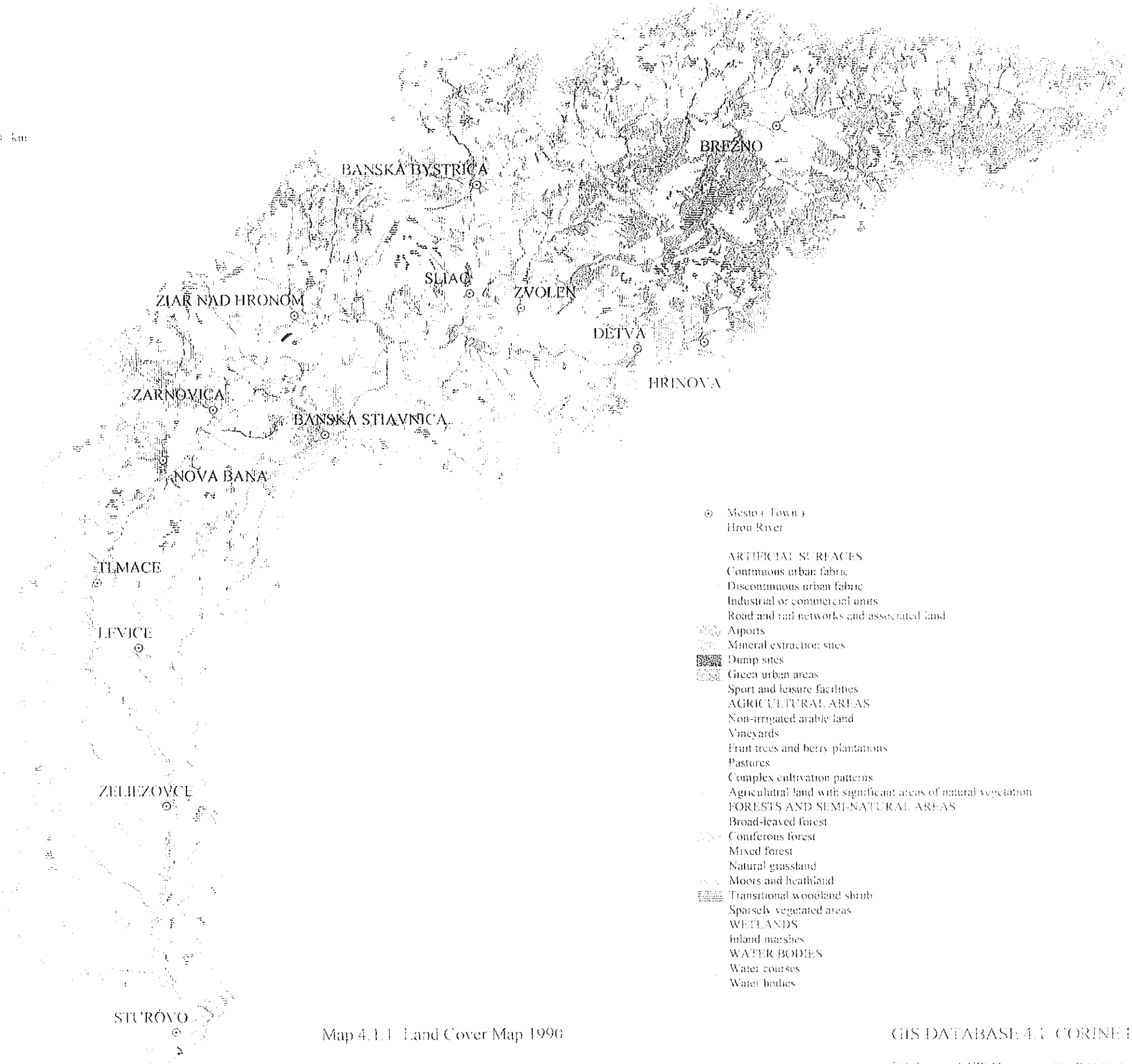
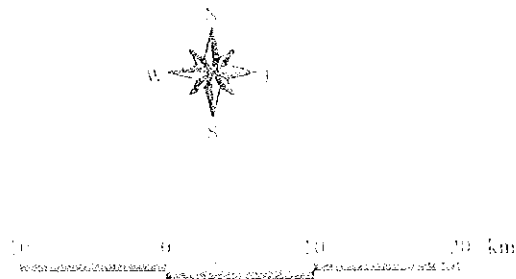


- ⊙ Mesto (Town)
- ~ Hron River
- ARTIFICIAL SURFACES**
- Continuous urban fabric
- Discontinuous urban fabric
- Industrial or commercial units
- Road and rail networks and associated land
- Airports
- Mineral extraction sites
- Dump sites
- Green urban areas
- Sport and leisure facilities
- AGRICULTURAL AREAS**
- Non-irrigated arable land
- Vineyards
- Fruit trees and berry plantations
- Pastures
- Complex cultivation patterns
- Agricultural land with significant areas of natural vegetation
- FORESTS AND SEMI-NATURAL AREAS**
- Broad-leaved forest
- Coniferous forest
- Mixed forest
- Natural grassland
- Moors and heathland
- Transitional woodland shrub
- Sparsely vegetated areas
- WETLANDS**
- Inland marshes
- WATER BODIES**
- Water courses
- Water bodies

Map 4.1.1 Land Cover Map 1990

GIS DATABASE 4.1 CORINE Land Cover

Data Source : SAZP, Map prepared by JICA Study Team

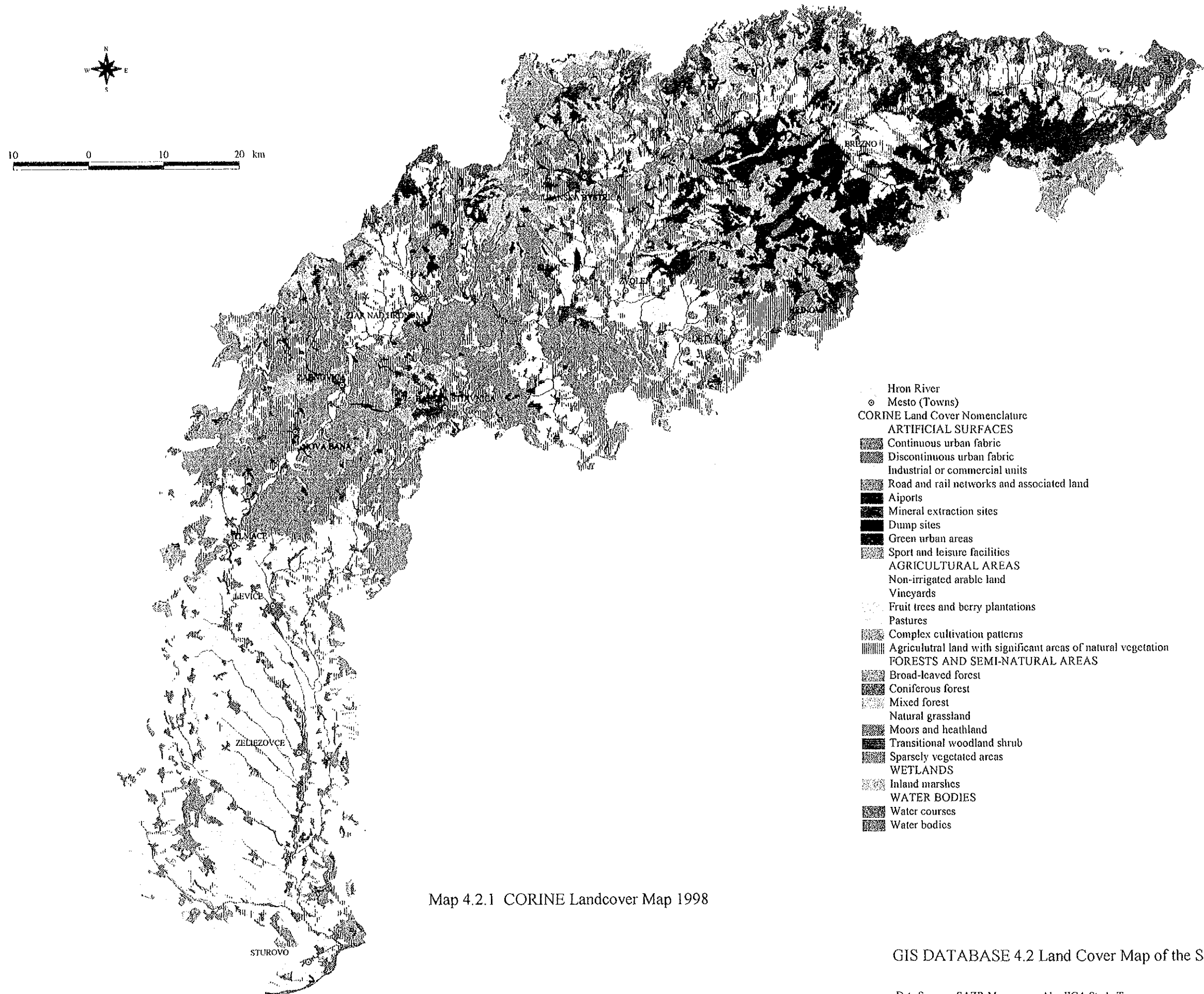


- ⊙ Mesto (Town)
- Iron River
- ARTIFICIAL SURFACES
- Continuous urban fabric
- Discontinuous urban fabric
- Industrial or commercial units
- Road and rail networks and associated land
- ✈ Airports
- ⊙ Mineral extraction sites
- ⊙ Dump sites
- Green urban areas
- Sport and leisure facilities
- AGRICULTURAL AREAS
- Non-irrigated arable land
- Vineyards
- Fruit trees and berry plantations
- Pastures
- Complex cultivation patterns
- Agricultural land with significant areas of natural vegetation
- FORESTS AND SEMI-NATURAL AREAS
- Broad-leaved forest
- Coniferous forest
- Mixed forest
- Natural grassland
- Moors and heathland
- Transitional woodland shrub
- Sparsely vegetated areas
- WETLANDS
- Inland marshes
- WATER BODIES
- Water courses
- Water bodies

Map 4.1.1 Land Cover Map 1990

GIS DATABASE 4.1 CORINE Land Cover

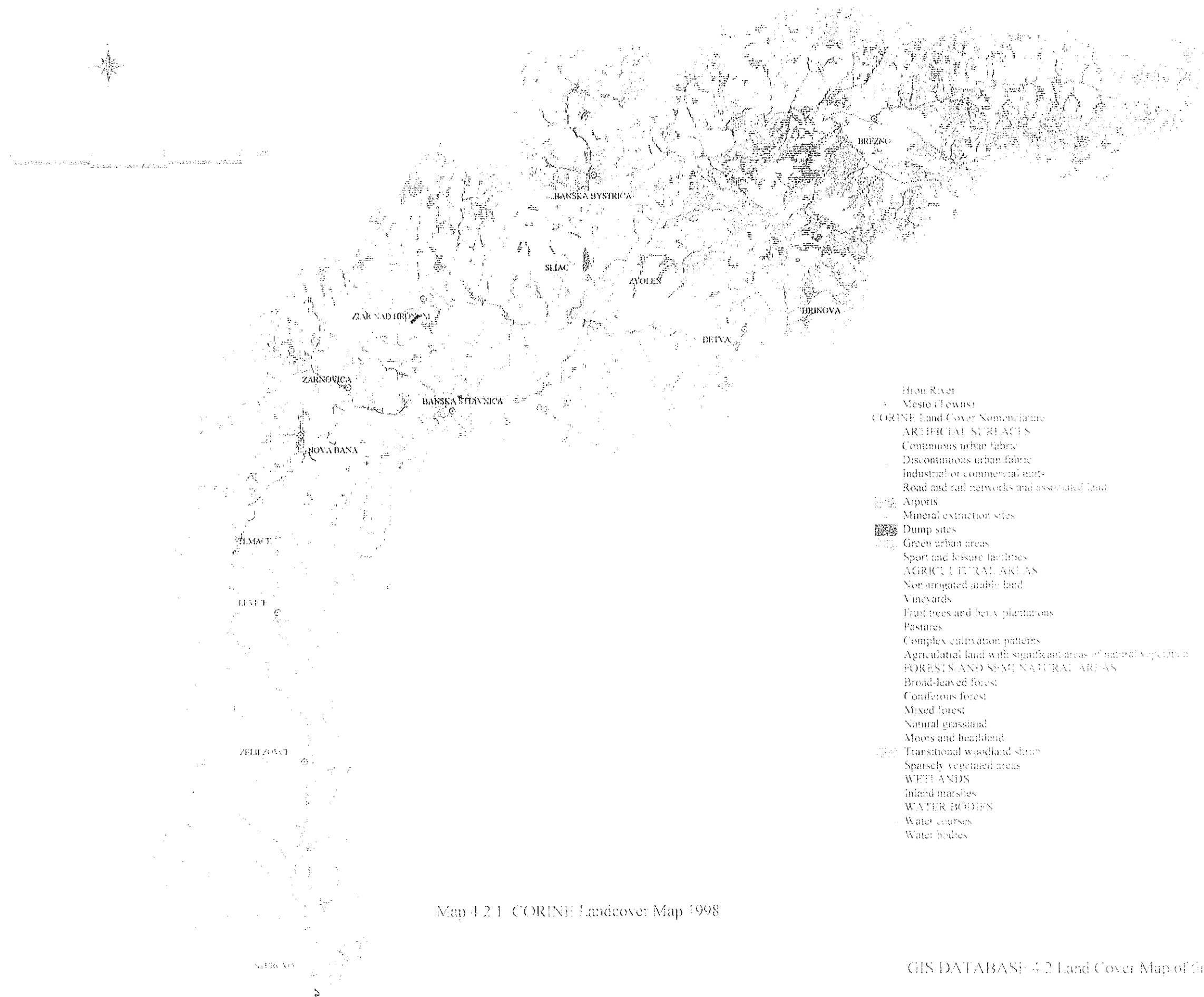
Data Source : SAZP; Map prepared by IICA Study Team



Map 4.2.1 CORINE Landcover Map 1998

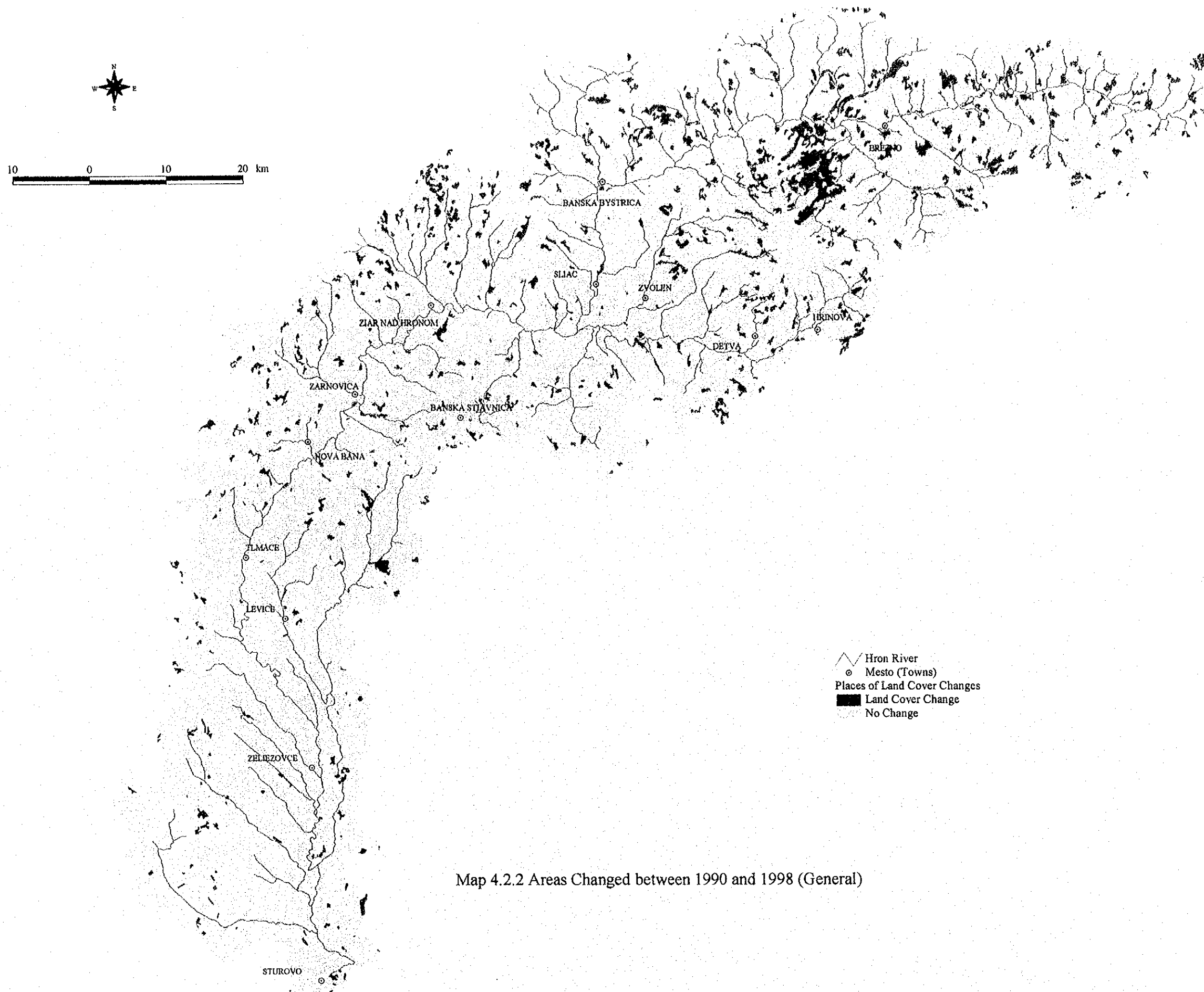
GIS DATABASE 4.2 Land Cover Map of the Study Area as of 1998

Data Source : SAZP, Map prepared by JICA Study Team

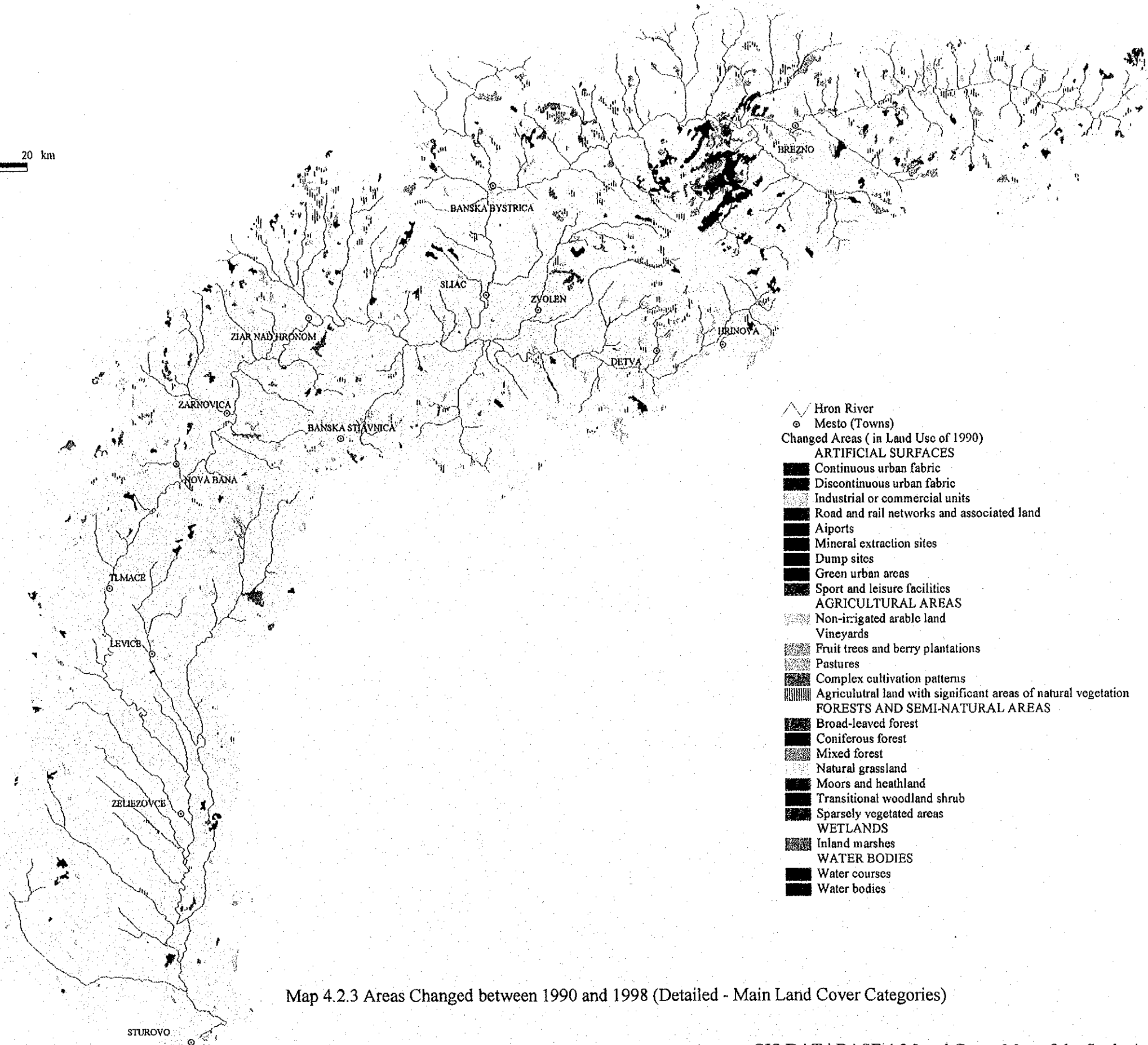
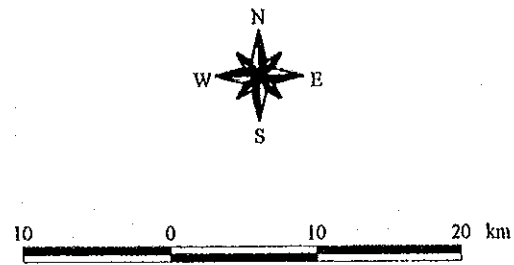


Map 4.2.1 CORINE Landcover Map 1998

GIS DATABASI - 4.2 Land Cover Map of the Study Area as of 1998

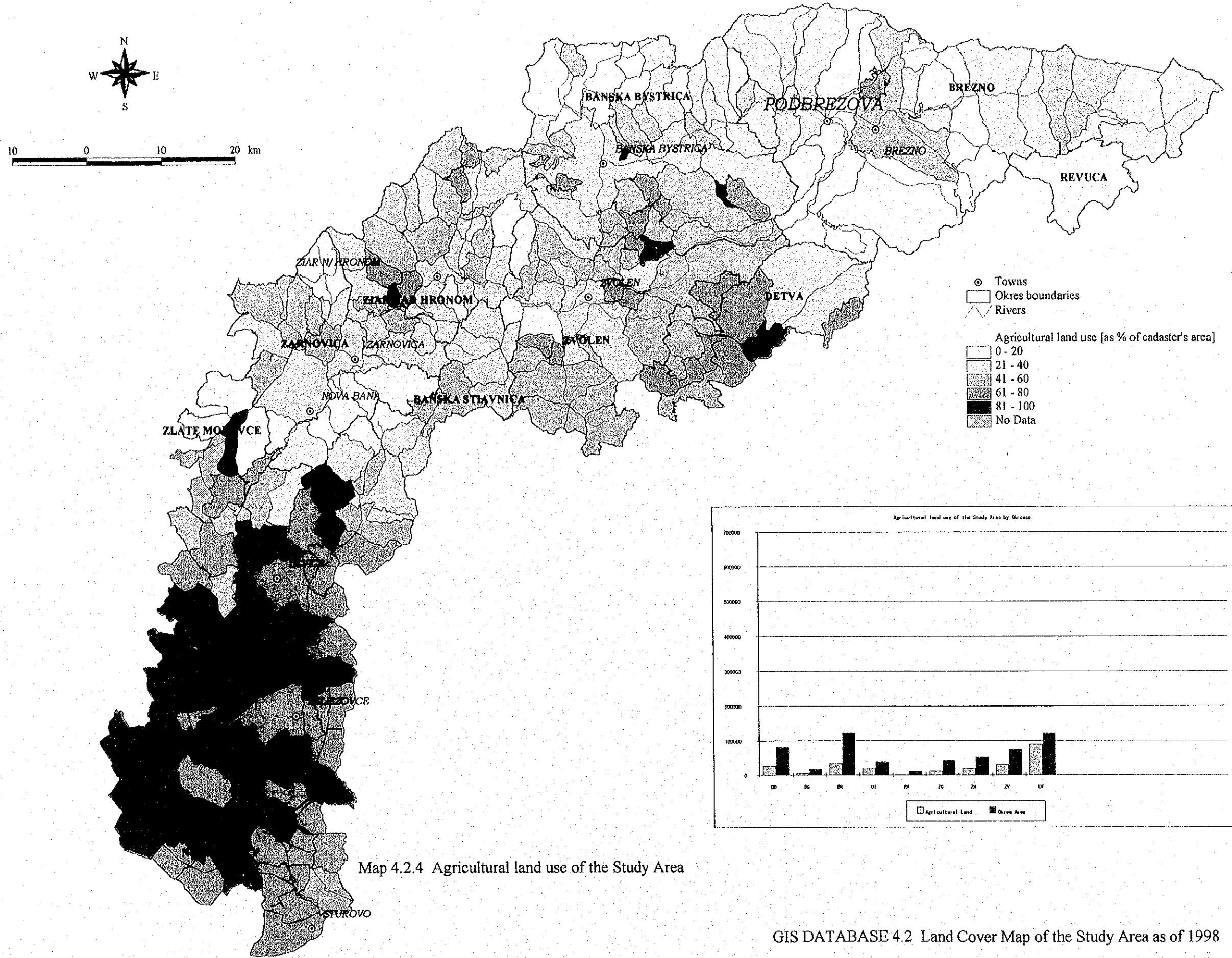


Map 4.2.2 Areas Changed between 1990 and 1998 (General)

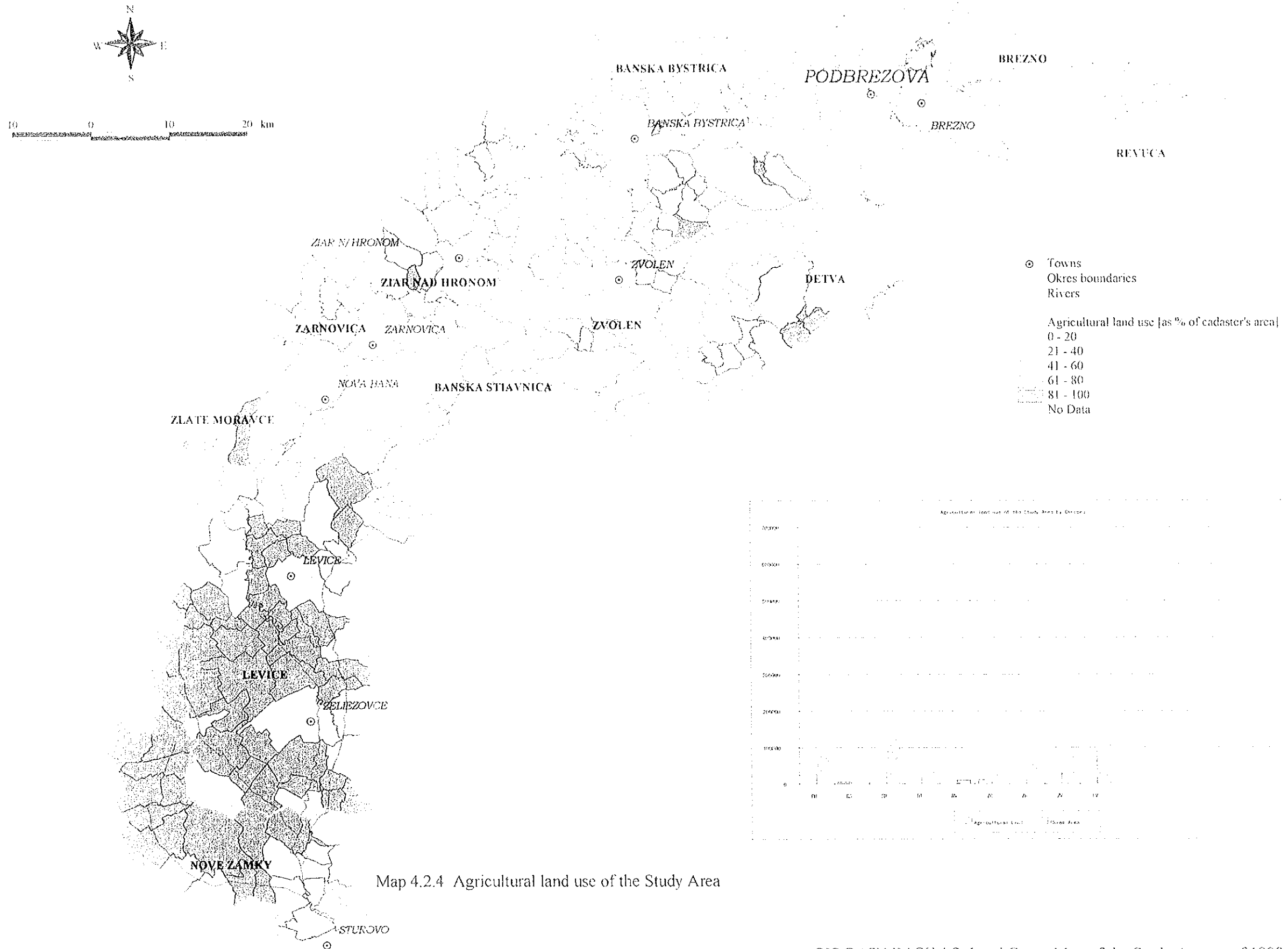


- ∩ Hron River
- Mesto (Towns)
- Changed Areas (in Land Use of 1990)
- ARTIFICIAL SURFACES**
- Continuous urban fabric
- Discontinuous urban fabric
- Industrial or commercial units
- Road and rail networks and associated land
- Airports
- Mineral extraction sites
- Dump sites
- Green urban areas
- Sport and leisure facilities
- AGRICULTURAL AREAS**
- Non-irrigated arable land
- Vineyards
- Fruit trees and berry plantations
- Pastures
- Complex cultivation patterns
- Agricultural land with significant areas of natural vegetation
- FORESTS AND SEMI-NATURAL AREAS**
- Broad-leaved forest
- Coniferous forest
- Mixed forest
- Natural grassland
- Moors and heathland
- Transitional woodland shrub
- Sparsely vegetated areas
- WETLANDS**
- Inland marshes
- WATER BODIES**
- Water courses
- Water bodies

Map 4.2.3 Areas Changed between 1990 and 1998 (Detailed - Main Land Cover Categories)

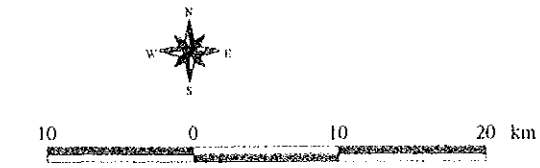


Map 4.2.4 Agricultural land use of the Study Area

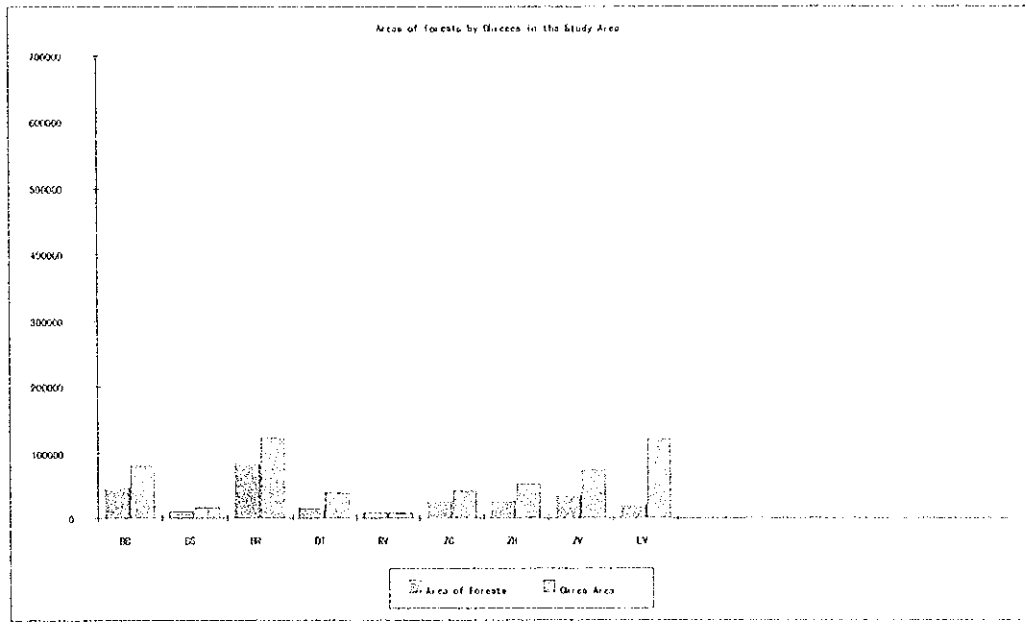
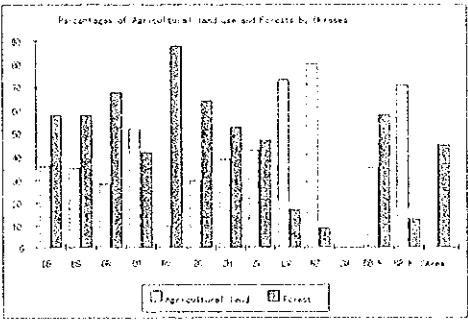
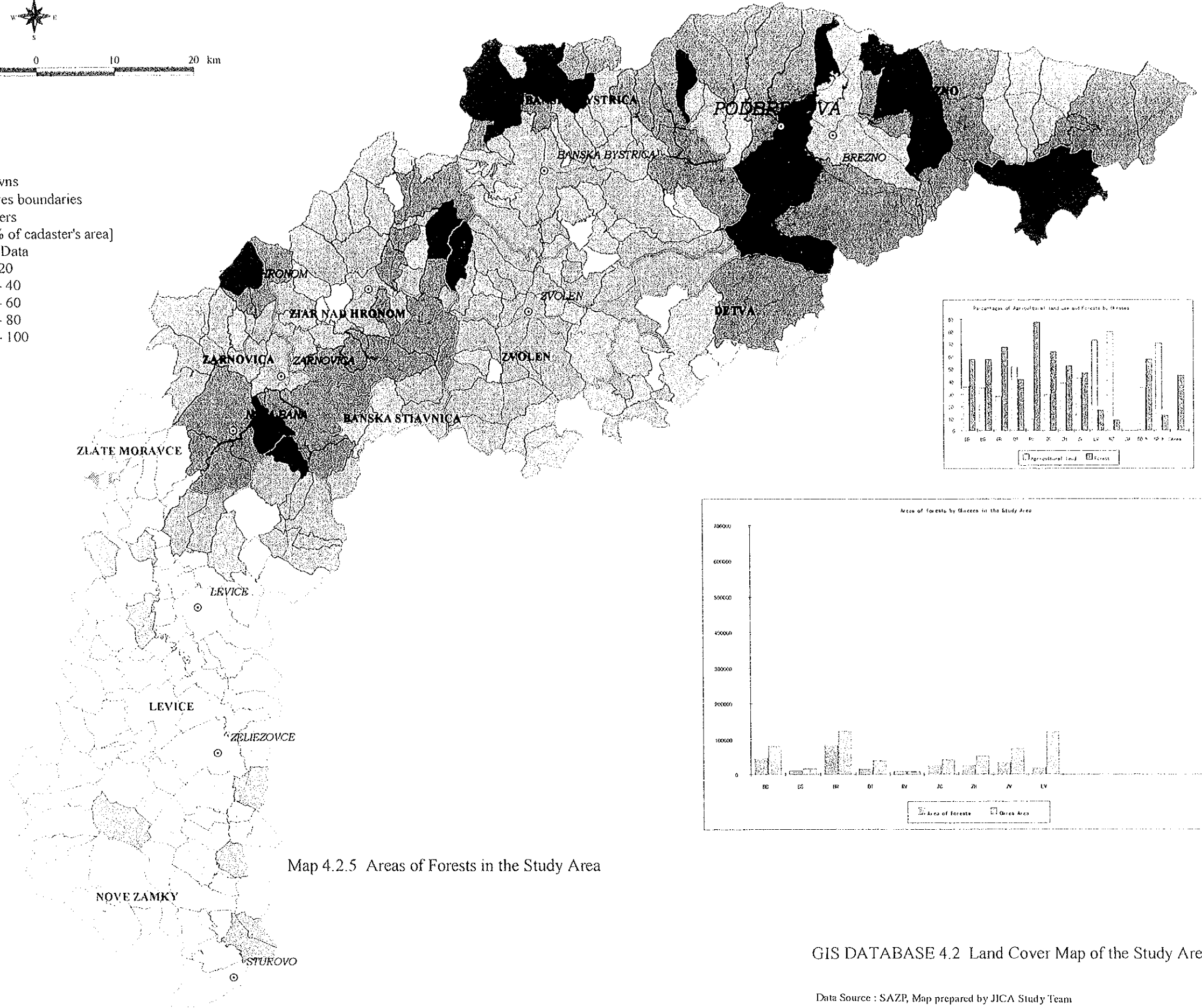


Map 4.2.4 Agricultural land use of the Study Area

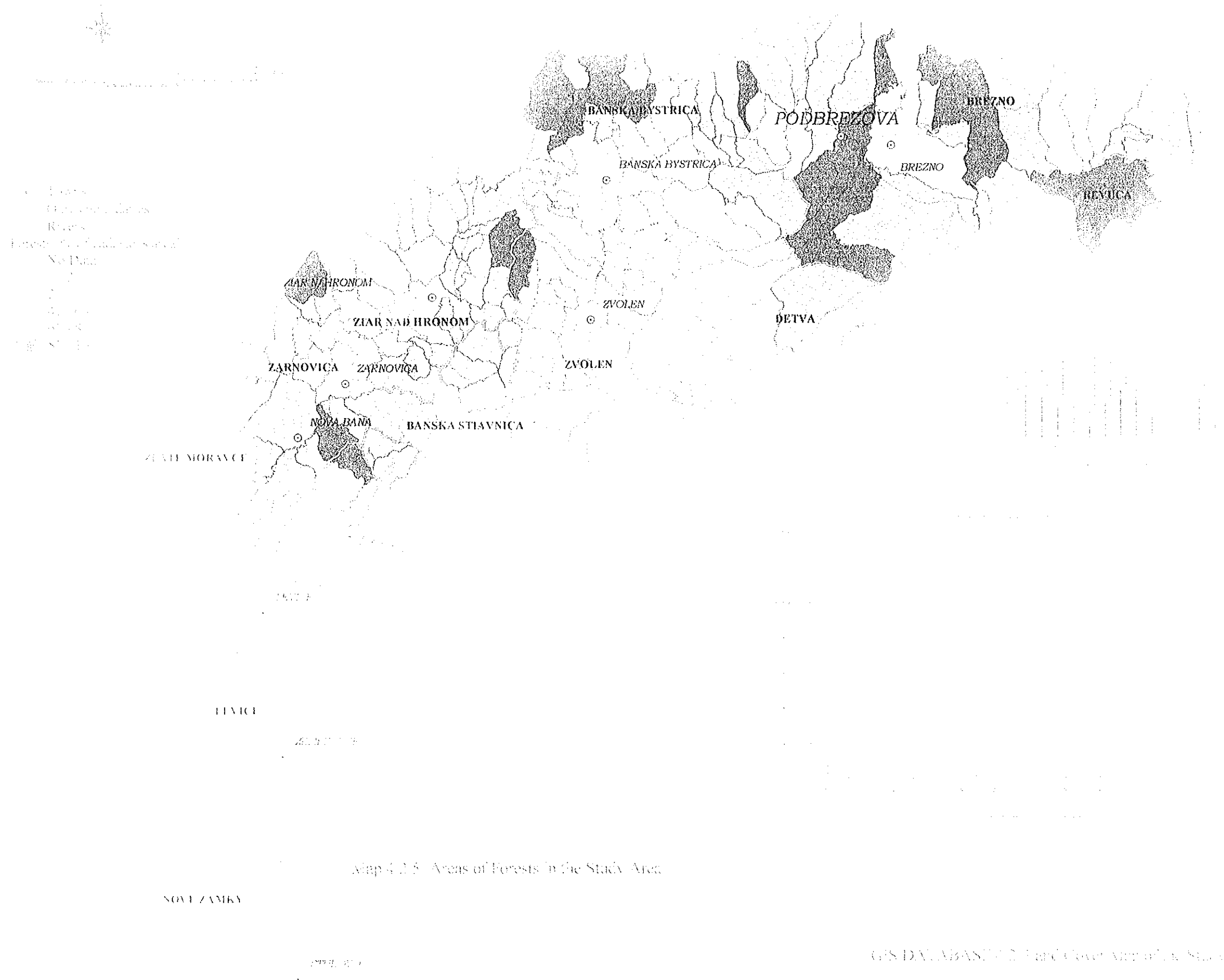
GIS DATABASE 4.2 Land Cover Map of the Study Area as of 1998



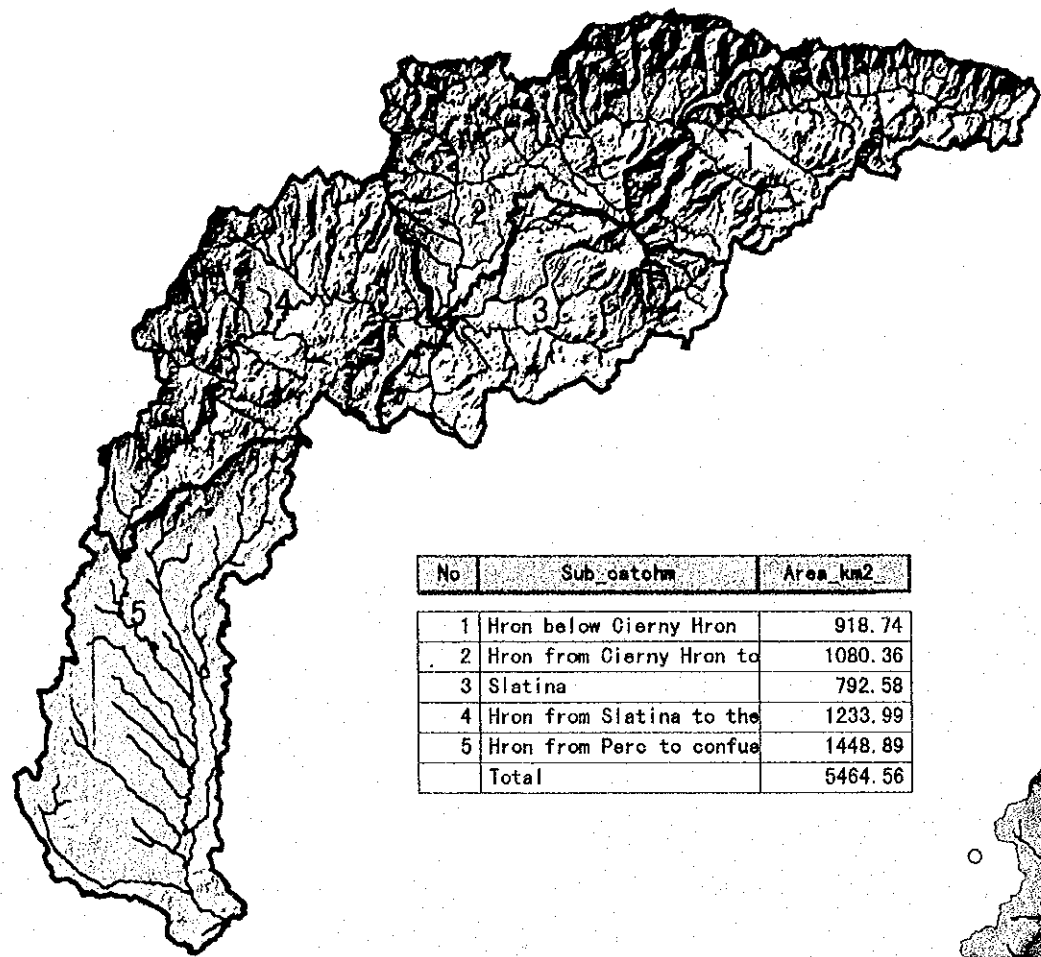
- ⊙ Towns
- Okres boundaries
- Rivers
- Forests [% of cadaster's area]
- No Data
- 0 - 20
- 21 - 40
- 41 - 60
- 61 - 80
- 81 - 100



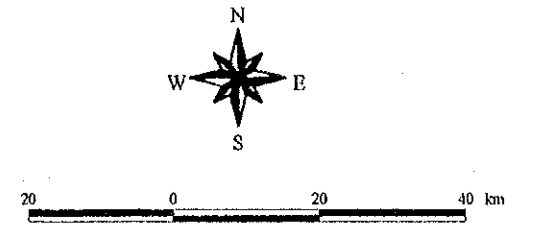
Map 4.2.5 Areas of Forests in the Study Area



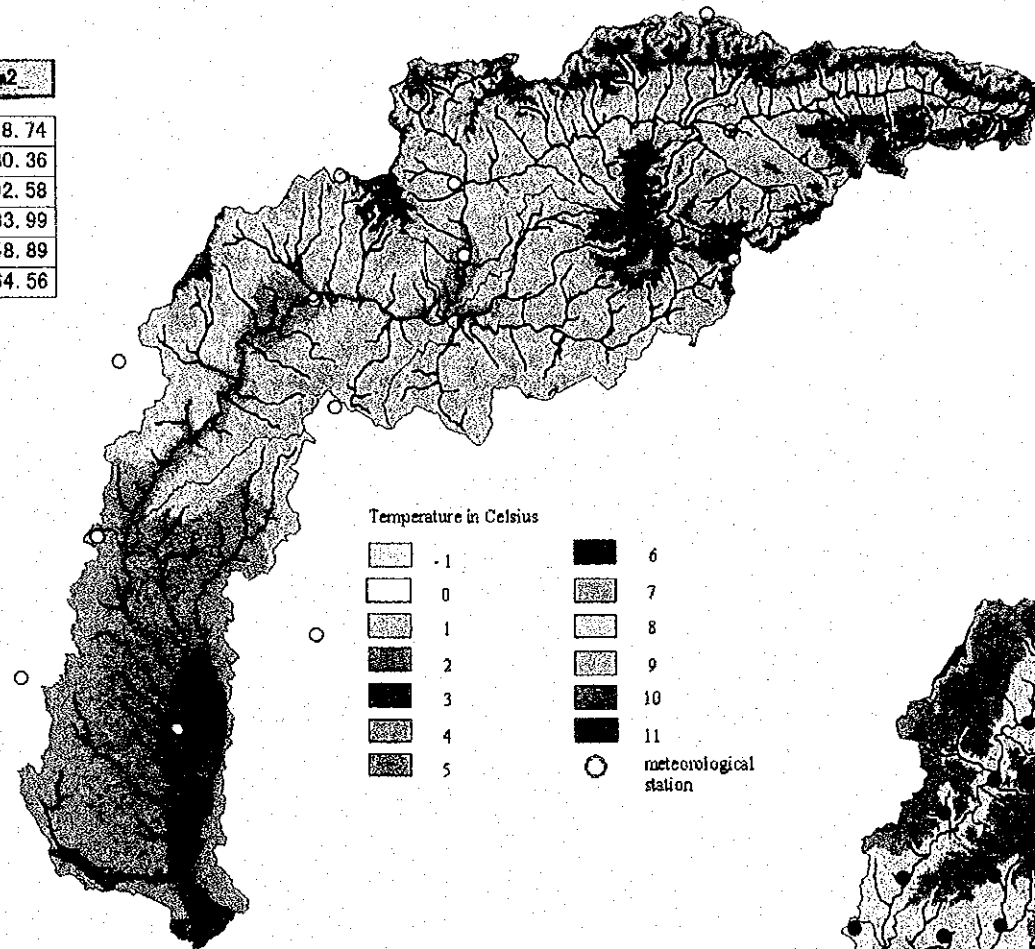
Map 4.2.5 Areas of Forests in the Study Area



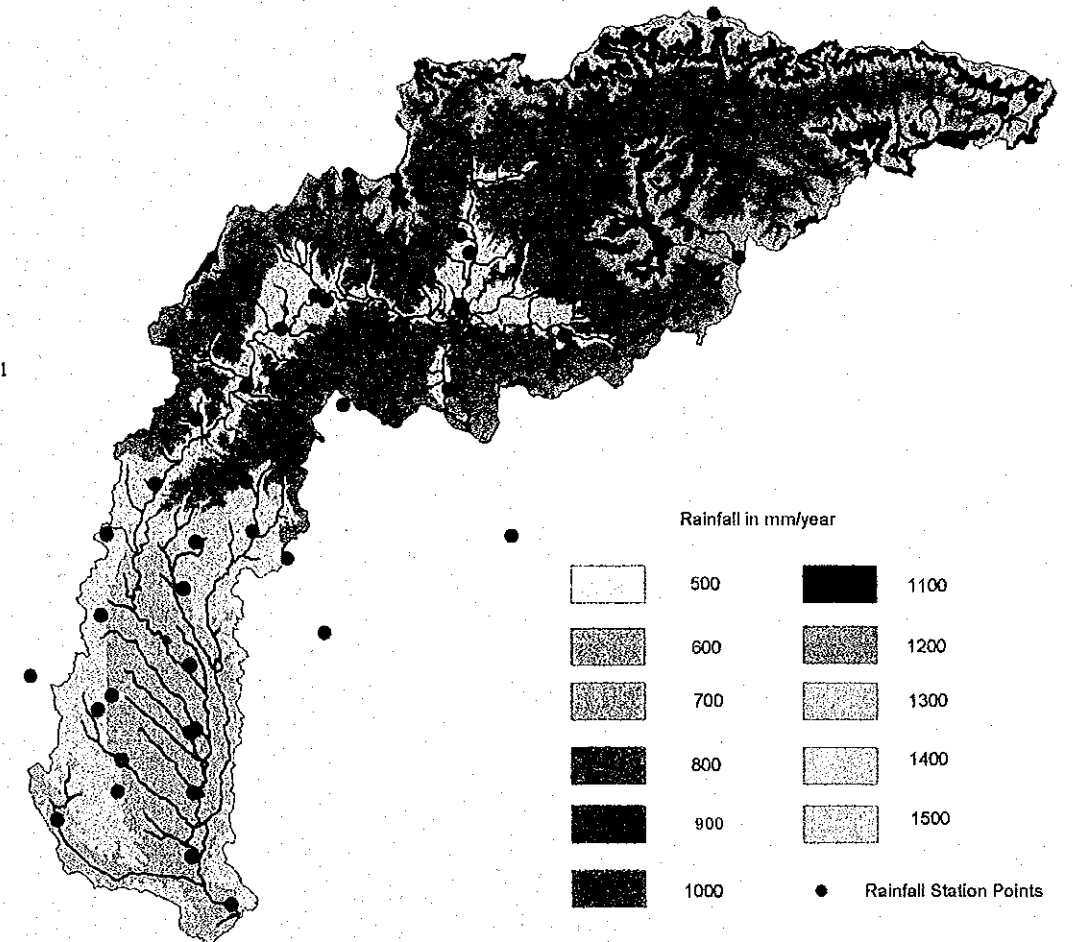
No	Sub_basins	Area_km2
1	Hron below Cierny Hron	918.74
2	Hron from Cierny Hron to	1080.36
3	Slatina	792.58
4	Hron from Slatina to the	1233.99
5	Hron from Perc to confue	1448.89
Total		5464.56



Map 4.4.1 Shaded Relief and Main Sub-Basins



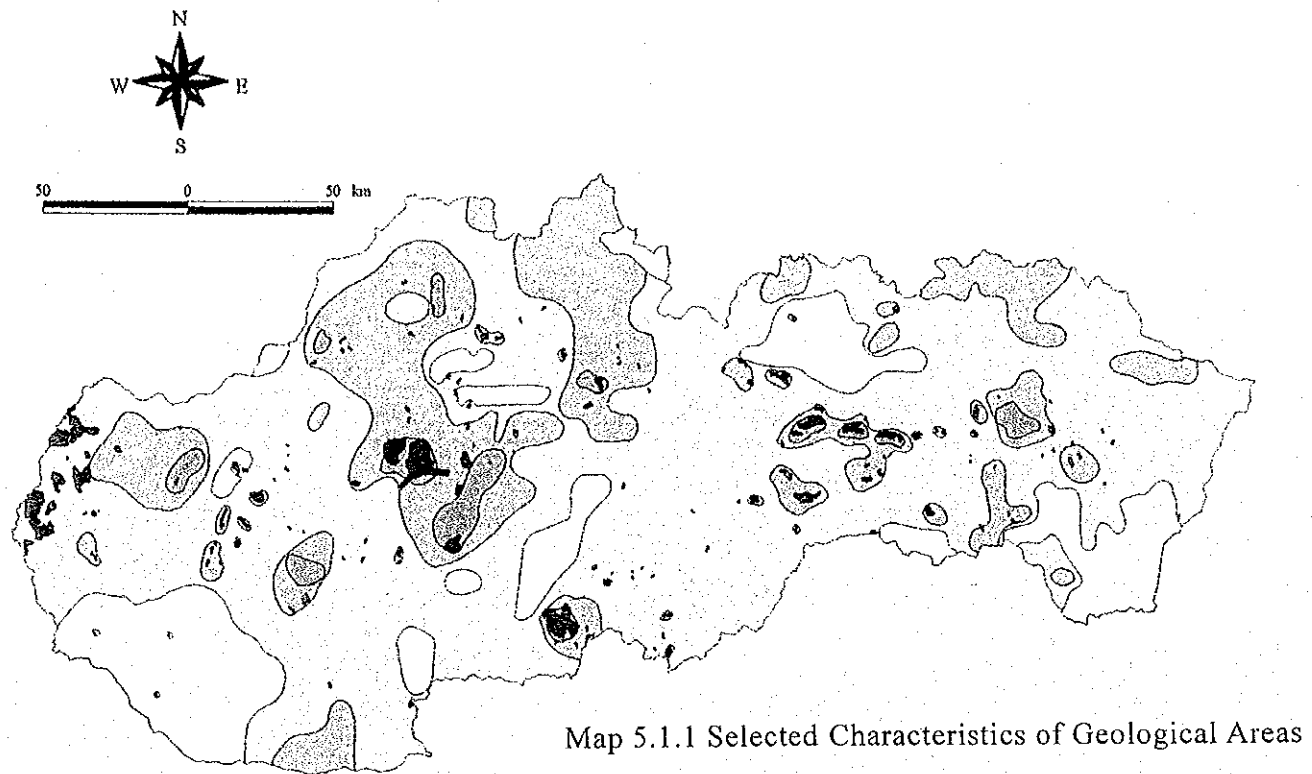
Map 4.4.2 Average Annual Mean Temperature Distribution



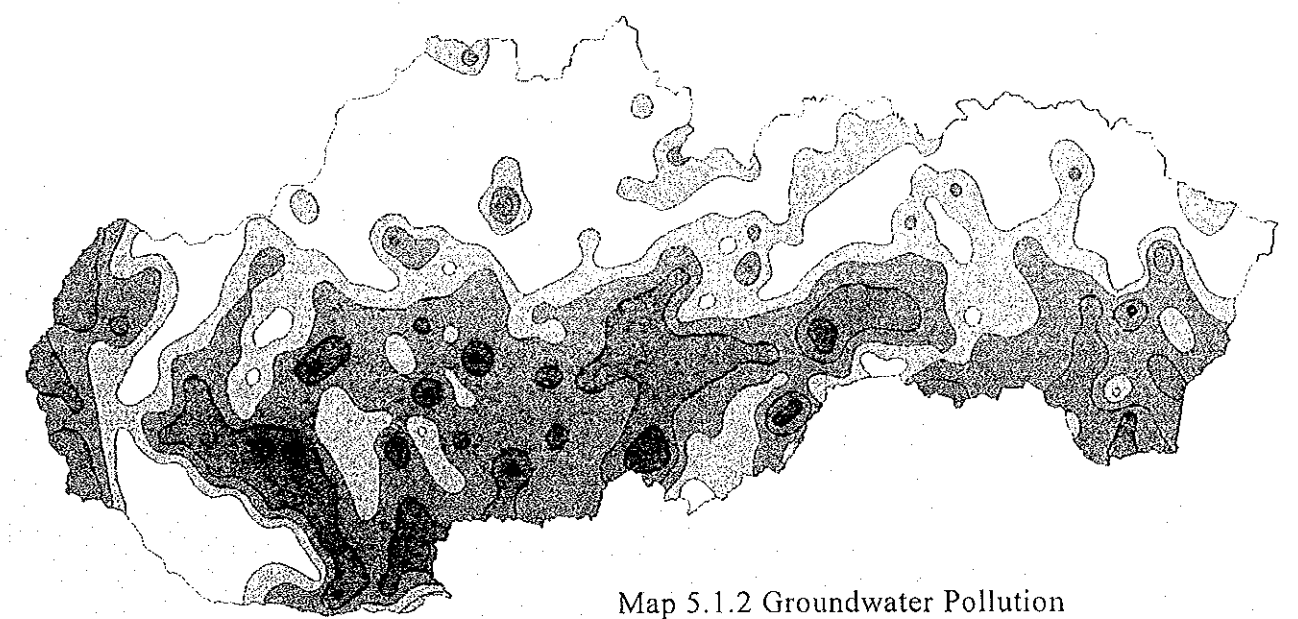
Map 4.4.3 Average Annual Mean Rainfall Distribution

GIS DATABASE 4.4 Hydrology, Meteorology, Pollution Sources

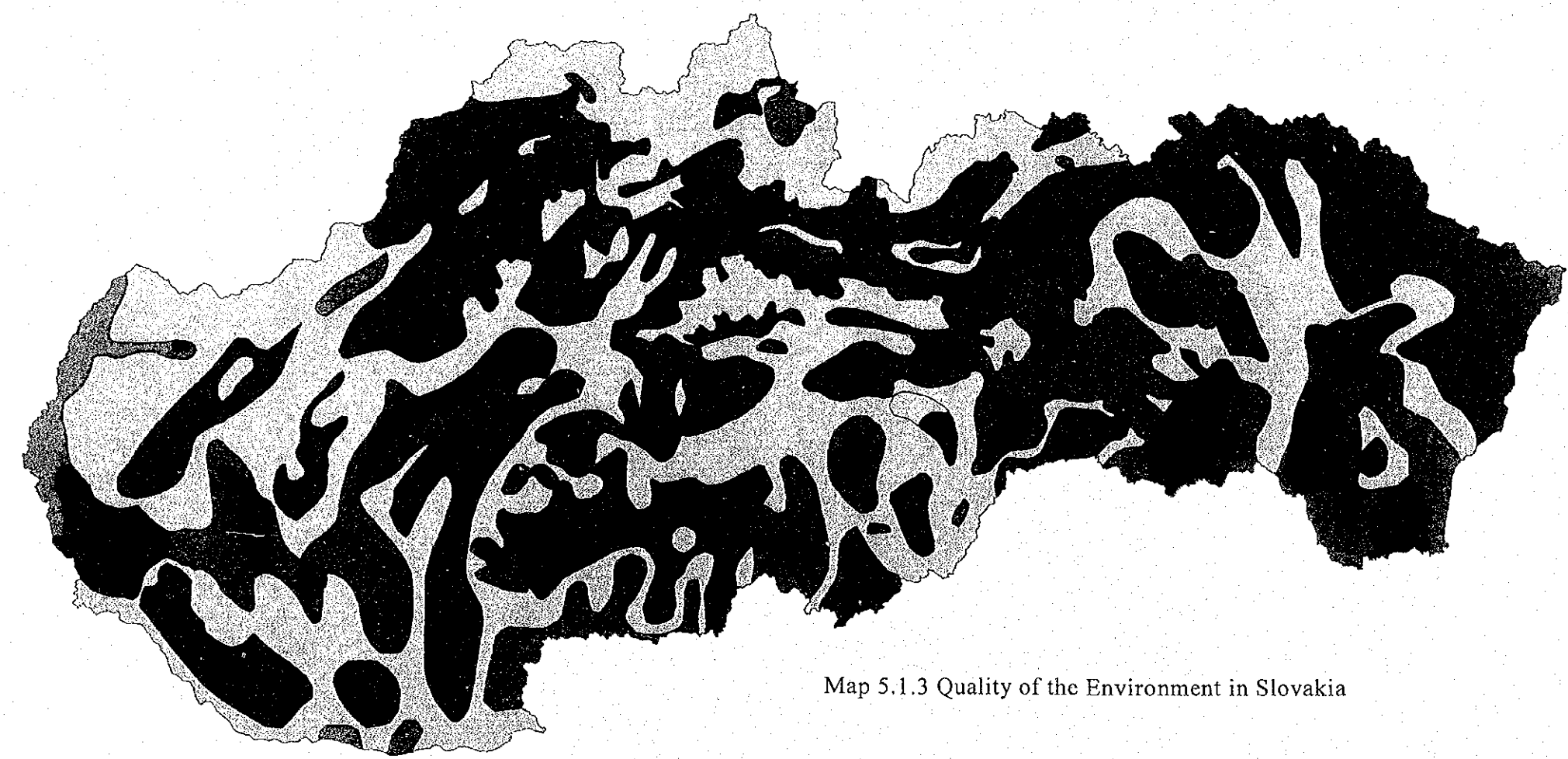
Data Source : SAZP, Map prepared by JICA Study Team



Map 5.1.1 Selected Characteristics of Geological Areas








Map 5.1.2 Groundwater Pollution



Map 5.1.3 Quality of the Environment in Slovakia



-  high quality environment
-  suitability quality environment
-  moderately deteriorated environment
-  deteriorated environment
-  heavily deteriorated environment

GIS DATABASE 5.1 Endangered Landscape Areas

Data Source: SAZP - Map Prepared by JICA Study Team