CHAPTER 2
GENERAL DESCRIPTION OF THE STUDY AREA

2.1 TOPOGRAPHY AND GEOLOGY

2.1.1 TOPOGRAPHY

The river basin of Hron is of prolonged in nature with irregular shape, covering an area of 5465 km^2. Its upper and middle parts are situated in the area of Inner Carpathians, while the lower part of the basin belongs to the Danube lowlands. The river bed is formed tectonically and it follows the tectonic faults activated during Neogene and Quaternary period.

The individual parts of the basin are quite different depending on the relief, geological structure and development of the territory. From that point of view the Hron basin can be subdivided into three major parts as shown in Figure 2.1 - 1.

Table 2.1 - 1 Topographic specification in the Hron river basin

Part of Hron basin	Geographic description and Geology	Elevation, (m) above sea level	Specific discharge (l/s/km2)	Surface area (km2)	Stream length (km)
Upper Region: from source to Banska Bystrica	High mountains, forest Central Western Carpathians	Up to 2100	10 – 15	1770	100
Hron Alluvial Valley	Narrow valley, densely populated, Quaternary deposit				
Middle Region: From B. Bystrica to Velke Kozmalovce	Mountains and hills, variable forest cover, settlements Central Slovak Volcanic Field	500 – 1500	8 – 11	1440	100
Slatina catchment	Forested mountain area	Over 1000	4 – 8	800	55
Hron Alluvial Valley	Narrow valley, densely populated Quaternary deposit				
Lower Region: From Velke Kozmalovce to Danube	Lowland, agriculture, irrigation Danube Basin	300 – 500	0 – 3	1480	100

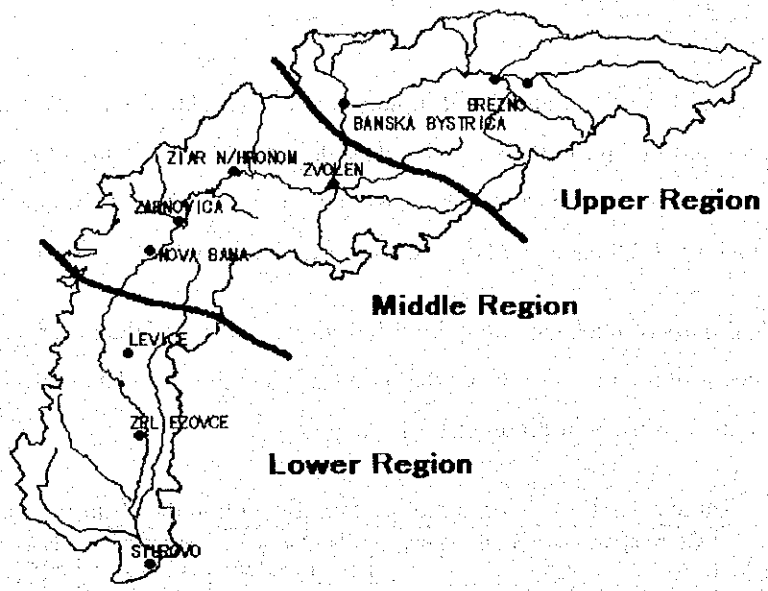


Figure 2.1 - 1 Conceptual Map of Three Region

The upper region of the basin is formed by the Upper Hron Valley with surrounding mountain ranges. It is a narrow ridge where flows with radial and rectangular texture are alternating.

The middle region of the basin from Banská Bystrica to Danube lowlands is more complicated covering larger Zvolen and Ziar Valleys which are separated by mountainous sinks. In this section a tributary(Slatina) river forms a larger basin with radial texture.

The lower region of the basin is situated in the Danube lowlands with a relatively undeveloped river net having partially asymmetrical texture. River Hron springs in the Slovenské Rudohorie mountains at an elevation of 934 m and joins the Danube river at Sturovo(103m). The length of the river is 284 km. The right-side tributaries are Bystrianka, Vajskový potok, Jesenský potok, Bystrica, Lutila and Pílanský potok, the left-side ones are Rohozná, Cierny Hron, Slatina, Sikenica and Parísz.

The river drainage is feather-shaped, formed by long main river channel with short tributaries in the mountains while in the valleys more complicated development of the drainage can be observed. The river drainage in the lowland is very simple as well.

2.1.2 GEOLOGY

Digital geological map was produced by GSSR and Study team based on the existing geological information. This map is shown in Map 2.1-1 Geological map in this main report.

The study area extends to the inner side of the Carpathian orogenic arc, which represent one segment in the northern branch of the Alpine orogenic belt in Europe. The orogenic arc is of Tertiary age, however, beside Mesozoic to Tertiary sediments it incorporates older crustal blocks, which build up internal parts of the orogene. Tertiary evolution of the orogenic arc was accompanied by extensive andesite/rhyolite volcanism and formation of inter-arc and back-arc basins. While the northeastern part of the study area (upper Hron valley) is build up dominantly by Cretaceous tectonic units of the central Western Carpathians, the central part of the study area is build up dominantly by Neogene volcanics of the Central Slovakia Volcanic Field and the southwestern part of the study area is build up by Neogene sediments of the Danube Basin with an exception of the Burda hills build of Neogene volcanics.

(1) Central Western Carpatians

The central Western Carpatians represent a Middle to Late Cretaceous fold-nappe complex which was incorporated into the Carpatian orogenic arc during Tertiary due to a lateral escape from the Alpine collision zone. The nappe complex incorporates Variscan crystalline rock basement and Late Paleozoic to Middle Cretaceous sedimentary formations, locally overlain by post-nappe Late Cretaceous to Neogene sedimentary and volcanic formations. The following Cretaceous tectonic units are distinguished in the study area:

Tatricum unit crops out in the northwestern part of the study area (western part of Nizke Tatry, Velka Fatra, Starohorske vrchy, Tribee). It is represented by the Variscan basement formed of granites, granodiorites, tonalites, migmatites, gneisses and rare amphibolites overlain by the Late Paleozoic and Mesozoic (Early Triassic to Middle Cretaceous) sedimentary cover, often reduced tectonically. Their lithology is similar to the lithology of the Veporicum unit (see bellow).

Veporicum tectonic unit s.l. comprises of: 1) the Krízna nappe made of Mesozoic complexes in a tectonic superposition over the Tatricum in the northwestern part of the study area and 2) Variscan basement with overlying Late Paleozoic and Mesozoic formations in the eastern part of the study area - the Veporicum tectonic unit s.s. It has been thrusted over the Tatricum at the North, the Èertovica tectonic line (=Krízna nappe root zone) being the trace of the thrust.

The Krízna nappe is composed of Permian shales, sandstones and arkoses, early Triassic quartzites and shales, Middle Triassic limestones and dolomites, Late Triassic Karpatian Keuper facies (sandstones, shales, dolomites, evaporites), Jurassic and Early Cretaceous deep water facies sequence with shales, nodular limestones, radiolarites and marls or a shallow water facies sequence with shales, sandstones and crinoidal limestones and finally the Middle Cretaceous flysch deposits. Complicated internal structure of the Veporicum s.s. comprises several Variscan litho-tectonic units (complexes), though a great deal of rejuvenation, or destruction has taken place during the Alpine deformations. Variscan litho-tectonic units are represented by granitic rocks of I and S types with migmatites and high grade metamorphic rocks, by mica schist complexes, and complexes of low grade metamorphic rocks including metavolcanic rocks and various phyllites. In the area of northern Veporicum the slightly metamorphosed Late Paleozoic and Mesozoic cover has an affinity to the Krízna nappe sequence, with silicic volcanics among Permian rocks.

Hronicum is represented by a group of rootless nappes above the Krízna nappe (Fatricum) in the Velka Fatra mountain range, surroundings of Banska Bystrica and upper Hron Valley. Late Carboniferous and Permian sequence is represented by terrigenous sediments, evaporites and bimodal tholeiite/rhyolite rift-related volcanics. Early Triassic quartzites and shales are overlain by a thick horizon of Middle to Upper Triassic dolomites. Silicicum forms a flat tectonic outlier of the Murao plateau, build of a thick complex of Triassic dolomites, limestones and nodular limestones.

In surroundings of Brezno and Banska Bystrica there are preserved remnants of the transgressive Inner Carpathian Paleogene. They are represented by basal breccias/conglomerates and overlying claystones and/or flysch type sediments. The position of Paleogene sediments, which cover the stack of the Inner Carpathian nappes, is essentially tabular, affected by tilting only. In the same area remnants of the early Middle Miocene gravels, sands and clays are also present.

Surficial Quaternary deposits in the mountainous environment in the eastern and central parts of the study area were formed mostly by periglacial processes during the last ice age. Eluvial-deluvial and deluvial loams, sandy loams, stony loams and scree cover most of the slopes of thickness up to 10 m. Periglacial block fields are rare with an exception of the highest parts of the Nízke Tatry mountain range, where moraines and periglacial fields are frequent owing to temporal glaciation. Wash-out sandy loams occur at the base of slopes along margins of neighboring basins. Coarse, unsorted deluvial-fluvial loamy gravels fill up bottom of small

valleys, passing into proluvial fans at the base of slopes. Widespread landsliding on Paleogene and Neogene clays lead to the thick accumulations of stony loams and blocks.

Pliocene deposits of the Hron valley occur in two forms: as high terraces of the Hron Gravel Formation and as a thick bottom sandy gravel accumulation of the subsiding Sliaè depression south of Banská Bystrica. Quaternary deposits of the Hron valley occur as a complete set of the Pleistocene sandy gravel terraces extending along the Hron river, eventually with a cover of appropriate final flood plain loams and/or younger wash-out loams. Fluvio-glacial deposits follow the Hron tributaries at southern slopes of Nízke Tatry. Younger terraces are often interrupted by extensive proluvial fans.

Quaternary deposit mainly of Holocene age is well developed along the alluvial valley of Hron river and its tributaries. These deposits are mainly composed of uncemented gravel and sand. The thickness of these deposits vary from place to place but less than 10m in most part.

(2) Central Slovakia Volcanic Field

The Central Slovakia Volcanic Field represents remnants of the Neogene andesite stratovolcanoes with subordinate dome/flow complexes of silicic andesite to rhyolite composition. Large stratovolcanoes Javorie, Polana, Stiavnica, Kremnica are dominantly effusive with periods of pyroclastic flow activity. Their central zones with lava flow and dome flow complexes of differentiated rocks are eroded to subvolcanic levels, exposing andesite, quartz diorite and granodiorite porphyry as well as diorite and granodiorite intrusions affected by propylitic alteration. Related hydrothermal systems created precious metal, base metal and porphyry/skarn copper mineralizations accompanied by extensive adularization, sericitization, kaolinitization, silicification and pyritization. Lava flows (± extrusive domes), hyaloclastite breccias or block and ash pyroclastic flow deposits, and coarse mudflow and debris flow deposits dominate the wide proximal zone. Epiclastic volcanic conglomerates and sandstones laid down in the ephemeral stream, fluvial and / or marine environment dominate the distal zone, grading outward into volcanosedimentary complexes in contemporaneous basins. Subsidence of the Ziar basin was accompanied by the extensive rhyolite volcanism, represented by numerous extrusive domes and related tuffs and breccias. Pliocene clay, silt and sand with rare lignite seams cover volcanosedimentary rocks in the Zvolen, Ziar and Batovce basins.

The Burda volcanics are represented by several hornblende-pyroxene andesite extrusive domes and related epiclastic volcanic breccias, conglomerates and sandstones.

Quaternary deposit mainly of Holocene age is well developed along the alluvial valley of Hron river and its tributaries also. Especially it is well developed at the Ziar triangle basin and form relatively wide valley. These deposits are mainly composed of uncemented gravel, sand and partially composed of silt and clay. The thickness of these deposits vary from place to place but less than 10m in most parts.

(3) Danube basin

The eastern part of the Danube basin is filled up by Early Miocene to Pliocene sediments. While in the east of the Hron river there are exposed Middle Miocene volcanosedimentary formations (distal marine reworked facies of the Stiavnica stratovolcano represented by conglomerates, sandstones, siltstones, tuffites and reworked tuffs of andesite composition), west of Hron there are Late Miocene and Pliocene sediments represented by delta gravels and sands at the North, otherwise by sands, silts and clays, often with thin lignite horizons.

In the eastern part of the Danube Basin Quaternary deposits are differentiated. At hills east of the Hron river alluvial flat there are only local accumulations of loess and loess loams beside the usual thin cover of eluvial loams and accumulations of wash-out sandy loams in small valleys.

Relatively wide alluvial flats of the Danube, Hron and Ipel rivers are formed by Late Pleistocene to Holocene fluvial sandy gravels of thickness 5 - 15 m (up to 25 m northwest of Levice over a recently subsiding block), covered by Holocene flood plain sandy loams.

In the west of the Hron river alluvial flat (and north of the Danube river alluvial flat), there are 3 -10 m thick accumulations of fluvial sandy gravels forming the Middle Pleistocene terraces, mostly covered by a thick veneer of loess and loess loams. Quite thick loess deposits cover also Pliocene sediments at hills further westward.

2.1.3 HYDROGEOLOGY

Digital hydrogeological map was prepared by GSSR and Study team based on the permeability information of digital geological map. This map is shown in the Map 2.1- 2 Hydrogeological map in this main report. Further, legend of hydrogeological map with estimated transmissivities, transmissivity intervals with corresponding hydrogeological units are shown as Table B.2-1 and B.2-2 in the support report.

The Hron river catchment can be divided into following three sections from hydrogeological

point of view, which are very similar to geological division :

- Central Western Carpathians at the north eastern part of the area
- Central Slovakia Volcanic Field in the center of project area
- Danube basin in the southern part of the area

(1) Central Western Carpatians

From hydrogeological point of view this part could be divided into two units such as Variscan basement of Tatricum and Veporicum units.

Variscan basement crops out in the northewestern part of the study area (western part of Nizke Tatray, Velka Fatra, Starohorske vrchy, Tribec). Variscan basement is formed of granites, granodiorites, tonalites, migmatites, gneisses, mica schist complexes, complexes of low grade metarmorphic rocks including metavolcanic rocks and various phyllites. The groundwater circulation in this rock type is very shallow, bound to weathered zone of the massive. Transmissivity coefficient derived from borehole database ranges from $1x10^{-6}$ to 1×10^{-4} m^2/sec.

Late Paleozoic and Mesozoic formations overlay the Tatricum unit and form Krizna and Choc nappes. These formations contain various types of rocks, both flow barriers and very good water bearing complexes. Early Triassic shales and Late Triassic Carpathian Keuper facies (sandstones, shales, dolomites, evaporites) are mainly considered as the flow barriers. The best water conducting formations are Middle and Upper Triassic limestones and dolomites. The limestones and dolomites play an important role in the hydrogeology of the region. In these formations also the biggest springs occur.

In the surroundings of Brezno and Banska Bystrica there are preserved remnants of the transgressive Inner Carpathian Paleogene. They are represented by basal breccias, conglomerates and overlying claystones and / or flysch sediments with limited groundwater sources.

Quaternary, mainly Holocene deposits are accumulated along the Hron river and its tributaries. This formation is mainly composed of gravel and sand. Transmissivity is relatively high and many boreholes have been drilled in this deposit.

(2) Central Slovakia Volcanic Field

The central Slovakia Volcanic Field represented by the Neogene andesite stratovolcanoes with

subordinate dome/flow complexes of silicic andesite to rhyolite composition. Large stratovolcanoes Javorie, Polana, Stiavnica, Kremnica are dominantly effusive with periods of pyroclastic flow activity. Generally the products of post volcanic activity are amore permeable than the primarily created rocks. The best from hydrogeological point of views (transmissivity) are the conglomerates, breccias and sandstones of andesites. Little worse are the adesites and tuffs, worst from volcanites are tuffaceous sands with clay, granodiorites and granites, porphyres and argillites. Transmissivity of these complexes ranges from $3x10^{-5}$ m^2/sec to $3x10^{-4}m^2$/sec.

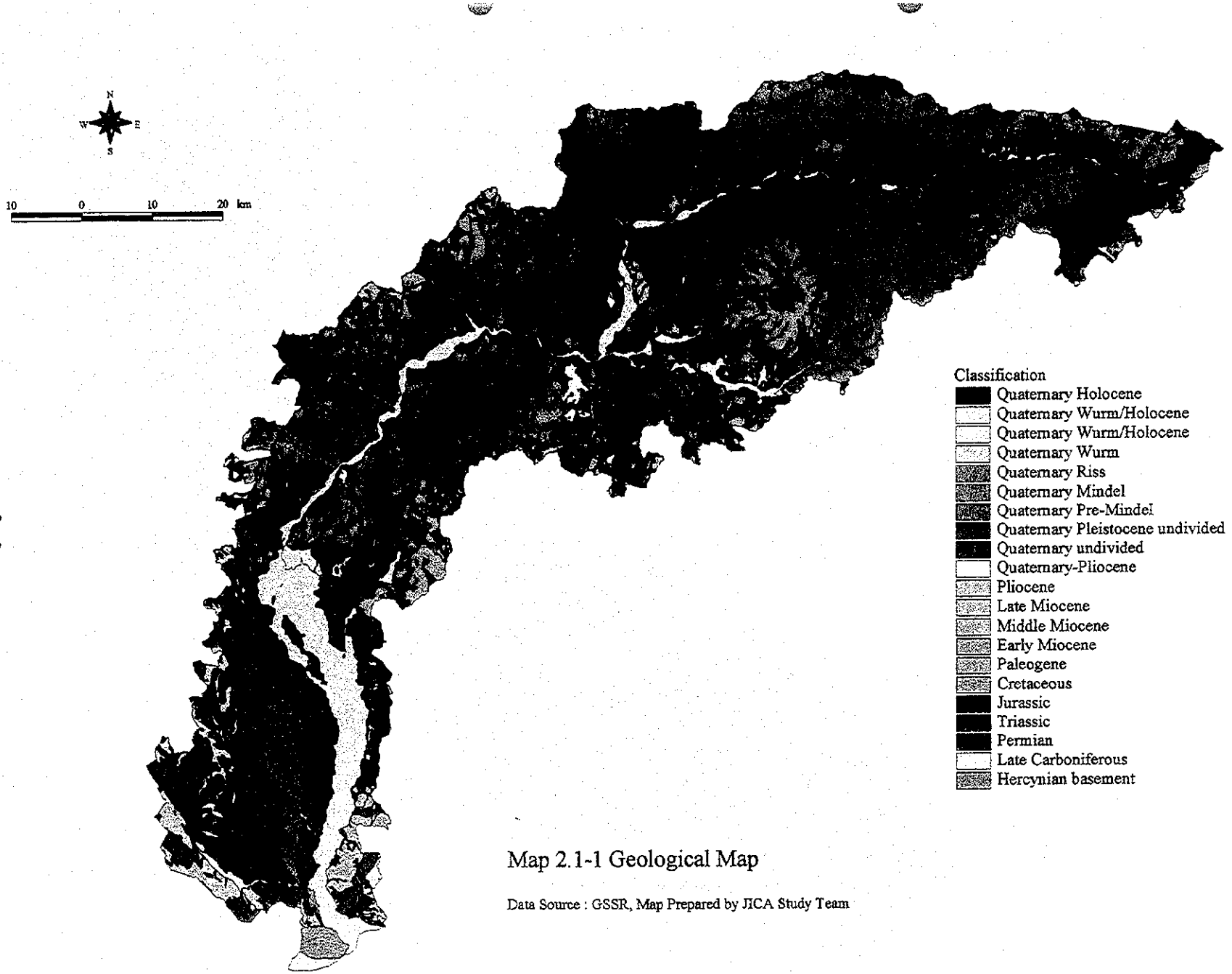
Quaternary sediments in mountainous region are formed mostly by periglacial processes during the last ice age. Eluvial-deluvial and deluvial loams, sandy loam, stony loams and scree cover most of the slopes in thickness up to 10m. Similar to fluvial deposits in the mountains, relatively poor thickness of the sediments with low transmissivity rates around $3x10^{-3}$ to $3x10^{-5}m^2$/sec.

Quaternary mainly Holocene deposits are accumulated along the Hron river and its tributaries. This formation is mainly composed gravel and sand partialy silt and clay. Transmissivity is relatively high and many boreholes have been drilled in these deposits.

(3) Danube basin

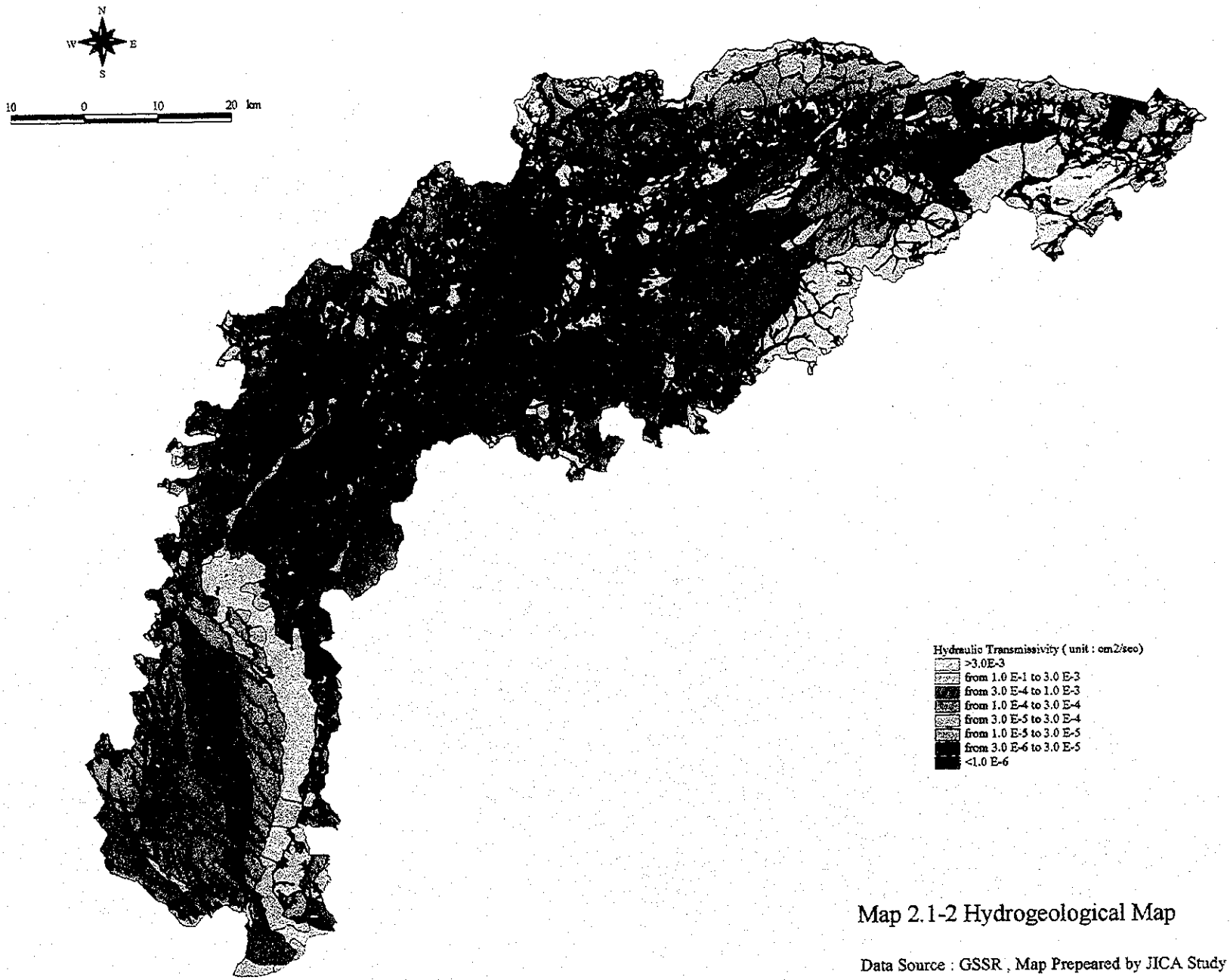
Early Miocene to Pliocene sediments (volcanosedimentary formations partially in the east of Hron) are distributed in Danube basin. These sediments are mainly composed of conglomerates, sand, silt, tuff and delta gravels. The thickness of these sediments are 5 – 15m but change from place to place. As a whole, these formations have relatively high transmissivity around $3x10^{-3}m^2$/sec. Many boreholes have been dug and groundwater is pumped up from these formations in the whole area of Danube basin.

Relatively wide alluvial flats of the Danube, Hron and Ipel rivers are formed by Late Pleistocene to Holocene fluvial sandy gravels in thickness 5 - 15 m (up to 25 m northwest of Levice over a recently subsiding block), covered by Holocene flood plain sandy loams. This deposit has relatively high transmissivity around $3x10^{-3}m^2$/sec. Especially, many boreholes are concentrated in this Alluvial flat and groundwater is pumping up from sandy gravel formations.



Map 2.1-1 Geological Map

Data Source : GSSR, Map Prepared by JICA Study Team



Map 2.1-2 Hydrogeological Map

Data Source : GSSR , Map Prepeared by JICA Study Team

2.2 CLIMATE

According to the Alisov classification, the climatic conditions of the Hron basin correspond to the European-continental climatic region of the mild zone, with oceanic air masses transforming into continental ones. Three subdivisions of this main region can be made, for the Hron Basin, according to relief and elevation (Ref. 22-10).

- Warm region, climate type A, is spreading out in the Danube lowland, Ziar and Zvolen Valleys.
- Mild warm region, climate type B, covers the mountain slopes up to 800 m a.s.l. and the whole Upper Hron Valley.
- Cold region, climate type C, is above 800 m a.s.l. in all surrounding mountains.

An outline of the climatic characteristics of the Hron basin is shown in Table 2.2 - 1. The average annual rainfall distribution and average annual mean temperature distribution in the Study Area, according to the SHMU's data, are shown in Maps 2.2 - 1 and 2.2 - 2.

Table 2.2 - 1 Climatic characteristics of the Hron Basin

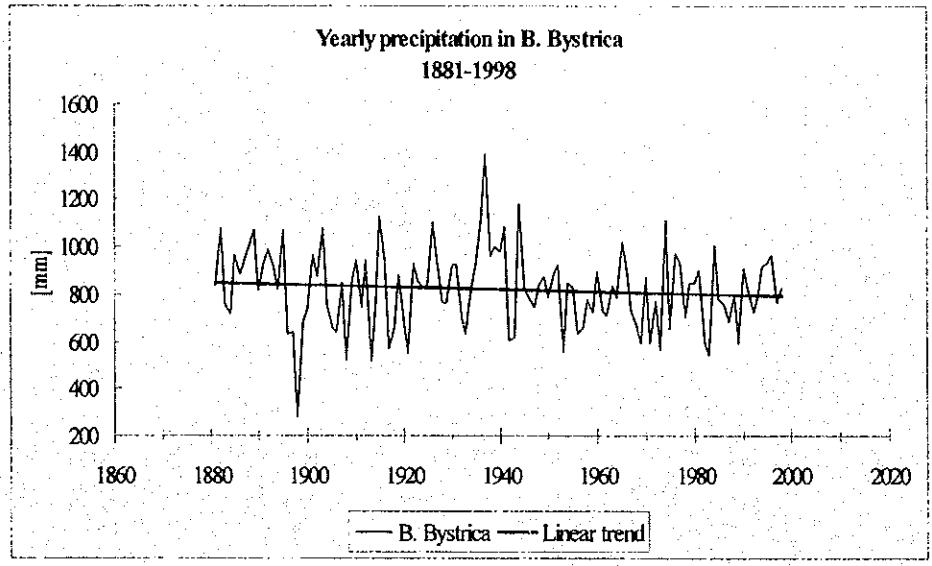
Climatic characteristics	Lowland	Valleys	Mountainous slopes
Mean temperature (°C) January	(-1.5) - (-2.5)	(-2.5) - (-6.5)	(-2.5) - (-8.0)
July	20.3 – 19.5	19.5 - 14.5	19.5 – 9.5
Days with temperature above 0 °C	320 – 300	300 – 245	300 – 195
First day	11.2. – 20.2.	20.2. - 20.3.	20.2. – 15.4.
Last day	20.12. – 12.12.	10.12. - 20.11.	10.12. – 25.10.
Summer days - number	75 – 60	60 – 20	60 – 0
Ice days – number	25 – 35	35 – 50	35 – 75
Days with soil temperature above 0°C	315 – 300	265 – 295	-
Days with frozen soil	45 – 60	70 – 100	-
Depth of frozen soil (cm)	30 – 35	50 – 60	-
Days with precipitation above 1 mm	85 – 100	100 – 120	100 – 150
Annual precipitation (mm)	570 – 700	700 – 900	700 – 1400
Warm season (mm)	330 – 400	400 – 500	400 – 750
Cold season (mm)	250 – 300	300 – 400	300 – 650
Number of days with snow cover	35 – 50	50 – 100	50 – 220
First day	5.12. – 1.12.	1.12. - 1.11.	1.12. - 1.10
Last day	5.3. – 10.3.	10.3. - 10.4.	10.3. – 20.5.
Evaporation (mm)	600 – 500	500 – 400	500 – 300
Actual evaporation (mm)	50	50 – 45	50 – 40
Wetness index (mm)	22 – 10	10 - (-10)	10 - (-80)

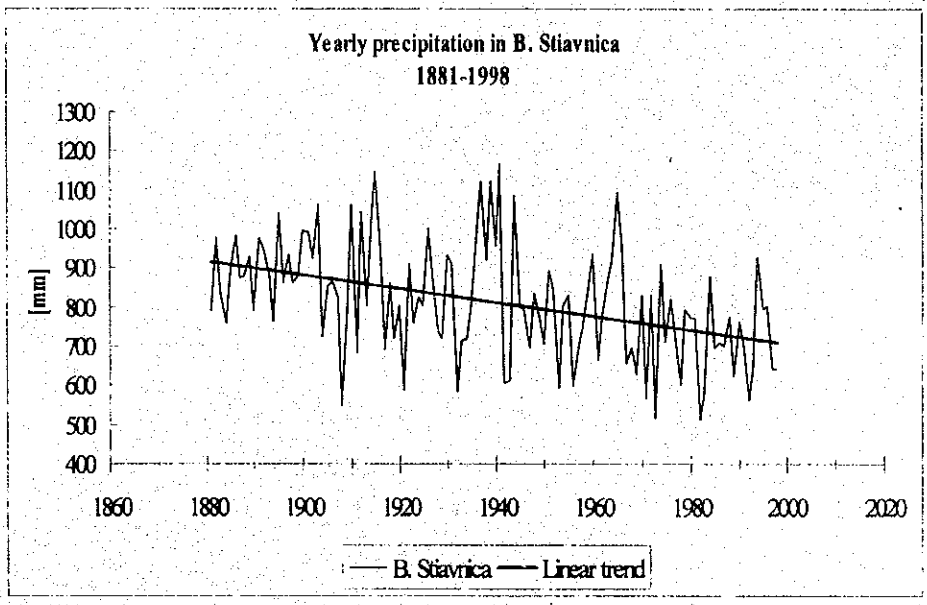
Source: Environmental Programme for the Danube River Basin, 1994, (Ref. 22 - 10).

The annual precipitation in the basin varies from 570 to 700 mm/y in the lowlands to about 700-1400 mm/y in the valleys and upper mountainous areas. The overall average is approximately 800 mm per year. Evaporation amounts to approximately 300 to 600 mm/y.

As shown in Figures 2.2 – 1, SHMU's long-term data (1881-1998) indicate decreasing tendensy of precipitation. It is particularly significant in Banska Stiavnica.

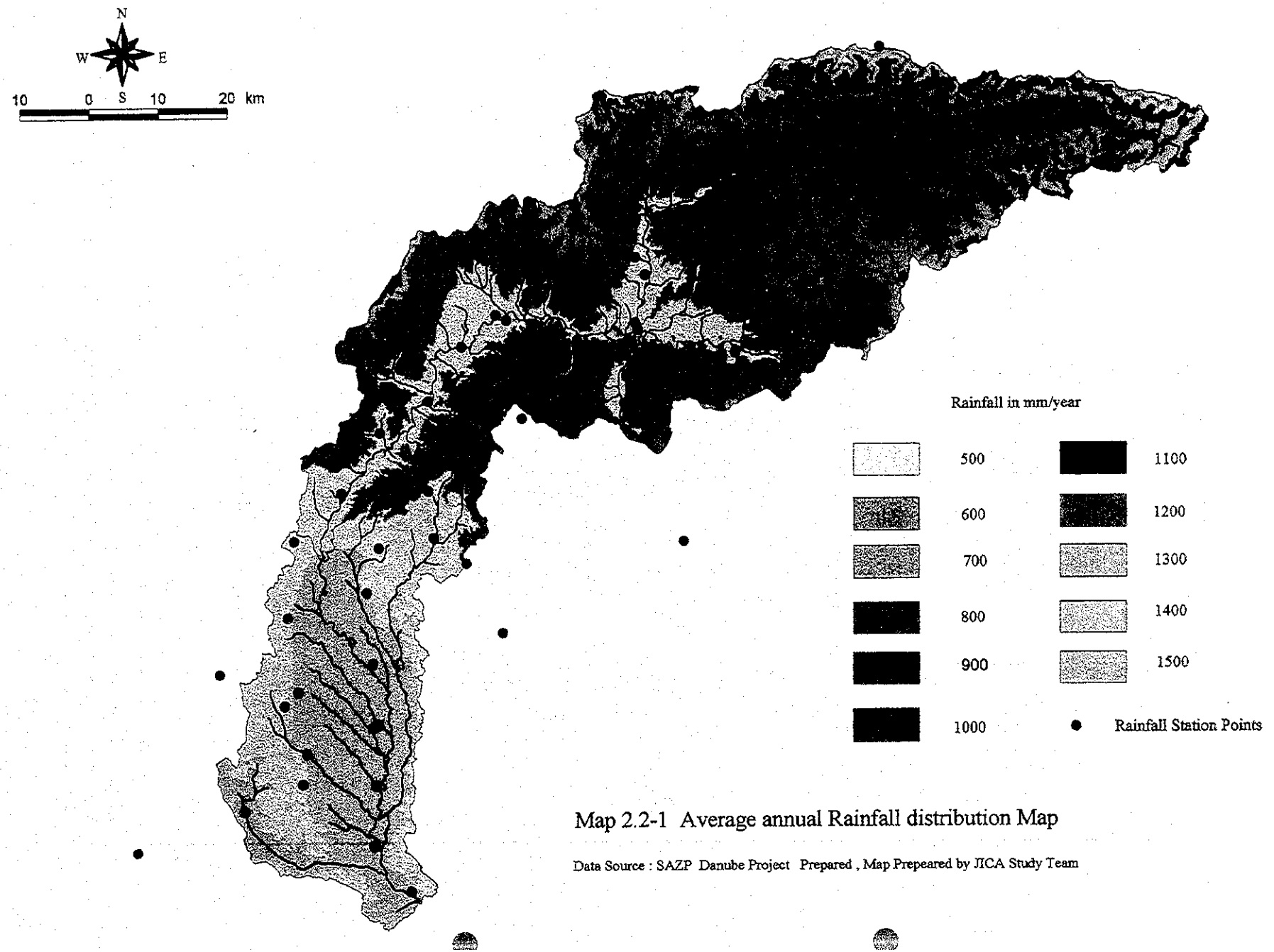
Spatial and time variations of precipitation is caused by the component characters of relief (altitude, variability of the earth's surface, orientation of the mountains) and the prevailing flow of the air. Influences of the Atlantic and Mediterranean Seas overlap with continental influences.





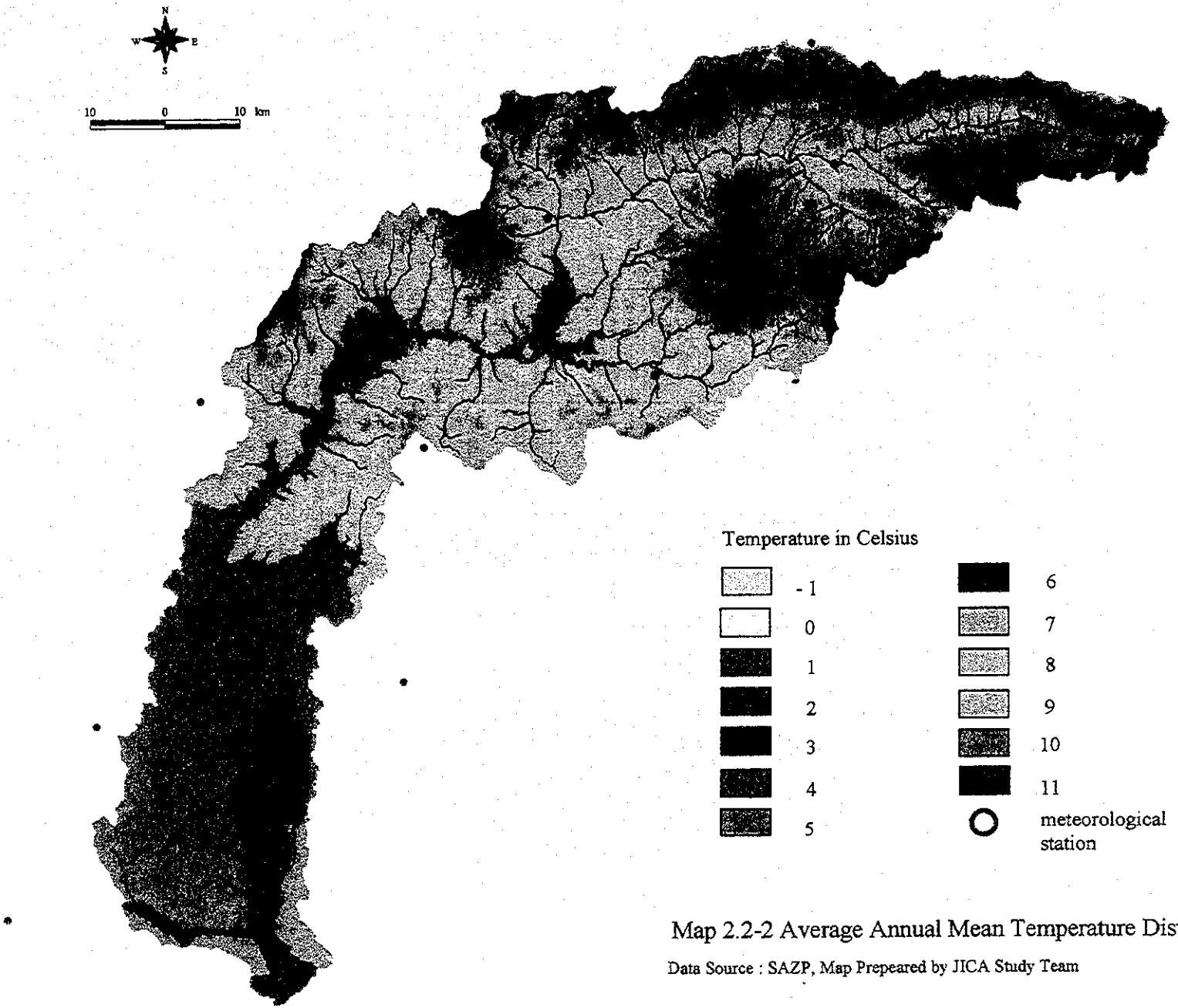
Source: Based on the Data provided by SHMU

Figure 2.2 - 1 Yearly Precipitation in B.Bystrica and B.Stiavica in the Period 1881 - 1998



Map 2.2-1 Average annual Rainfall distribution Map

Data Source : SAZP Danube Project Prepared , Map Prepeared by JICA Study Team



Map 2.2-2 Average Annual Mean Temperature Distribution

Data Source : SAZP, Map Prepeared by JICA Study Team

2.3 HYDROLOGY

2.3.1 GENERAL CHARACTERISTICS

The Hron River starts from a spring at an altitude of 934 m near the town of Telgart and enters the Danube at 103 m near Sturovo. The total length of the Hron River is 284 km and the river basin covers an area of 5 465 km^2. The river gradient varies from about 7.6 promille in the upper stretch to 0.9 promille in the lowland. The terrain elevation in the Hron basin varies between approximately 100 to 200 m in the Slovak Danube Lowlands, 1 000-1 500m in the Ore Mountains on the south side of the river, till 1 500 up to 2 000 m in the low Tatras on the northern side. The basic characteristics of the main tributaries of the Hron River are shown in Table 2.3-1 and Table 2.3-2.

Table 2.3 - 1 Basic characteristics of the Hron River and its tributaries

Tok – profil	A [km^2]	L [km]	A/L [km]	A/L^2
Hron-Brezno	582.08	56.2	10.36	0.18
Hron nad Č.Hronom	627.02	63.9	9.81	0.20
Cierny Hron-ústie	291.72	25.6	11.40	0.09
Hron pod Č.Hronom	918.74	63.9	14.38	0.23
Bystrianka-ústie	96.59	19.8	4.88	0.25
Hron pod Bystriankou	1017.71	65.3	15.59	0.24
Hron nad Jasenianskym p.	1141.20	74.0	15.42	0.21
Jasenianský p.-ústie	92.32	18.9	4.88	0.26
Hron pod Jasenianskym p.	1233.51	74.0	16.67	0.23
Hron nad Bystricou	1596.51	104.1	15.34	0.15
Bystrica-ústie	169.96	23.3	7.29	0.31
Hron pod Bystricou	1766.47	104.1	16.97	0.16
Hron nad Slatinou	1999.10	125.9	15.88	0.13
Slatina-ústie	792.58	59.8	13.25	0.22
Hron pod Slatinou	2791.68	125.9	22.17	0.18
Hron nad Lutilským p.	3165.25	147.9	21.40	0.14
Lutilský p.-ústie	145.27	20.2	7.19	0.36
Hron pod Lutilským p.	3310.52	147.9	22.38	0.15
Hron nad Kľakovským p.	3560.61	171.3	20.79	0.12
Kľakovský p.	132.33	18.4	7.19	0.39
Hron pod Kľakovským p.	3692.94	171.3	21.56	0.13
Hron nad Sikenicou	4263.48	238.0	17.91	0.08
Perec-ústie	110.79	52.6	2.11	0.04
Hron pod Perecom	5149.80	268.8	19.17	0.07
Hron nad Parížom	5159.16	272.3	18.95	0.07
Paríž-ústie	232.78	41.5	5.61	0.14
Hron pod Parížom	5391.94	242.3	19.80	0.07
Hron-ústie	5464.56	279.5	19.55	0.07

A – area of basin in km2 L – lenght of valley in km
A/L – development of river net in km A/L^2 – characteristich of basin shape
Source: Water management maps 2nd edition provided by SHMU

Table 2.3 - 2 Slope conditions of river Hron and its tributaries

Flow – profile	Area of basin [km²]	Length of vlley [km]	Highest point of basin [m n.m.]	Heinght of spring [m n.m.]	Lowest point of basin [m n.m.]	Difference of elevation [m]	Slope [‰]
Hron-Brezno	582.08	56.2	1948	934	491	443	7.9
Cierny Hron-ústie	291.72	25.6	1338	960	480	480	18.8
Hron po Bystrianku	921.12	65.3	1948	934	475	459	7.0
Bystrianka-ústie	96.59	19.8	2043	1650	475	1175	59.3
Hron po Jasenlansky p.	1141.20	74.0	2043	934	430	504	6.8
Jasenlansky p.-ústie	92.32	18.9	1987	1440	430	1010	53.4
Hron po Bystricu	1596.51	104.1	2043	934	335	599	5.8
Bystrica-ústie	169.96	23.3	1574	1330	335	995	42.7
Hron po Slatinu	1999.10	125.9	2043	934	280	654	5.2
Slatina-ústie	792.58	59.8	1458	900	280	620	10.4
Hron po Lutilu	3165.25	147.9	2043	934	240	694	4.7
Lutila-ústie	145.27	20.2	1168	790	240	550	27.2
Hron po Kľakovský p.	3560.61	171.3	2043	934	213	721	4.2
Kľakovský p.-ústie	132.33	18.4	1346	1005	213	792	43.0
Hron po Parlž	5159.16	272.3	2043	934	110	824	3.0
Parlž-ústie	232.78	41.5	287	195	110	85	2.1
Hron-ústie	5464.56	279.5	2043	934	103	831	3.0

Source: Water management maps 2nd edition provided by SHMU

2.3.2 HYDROLOGICAL CONDITIONS OF SURFACE WATER

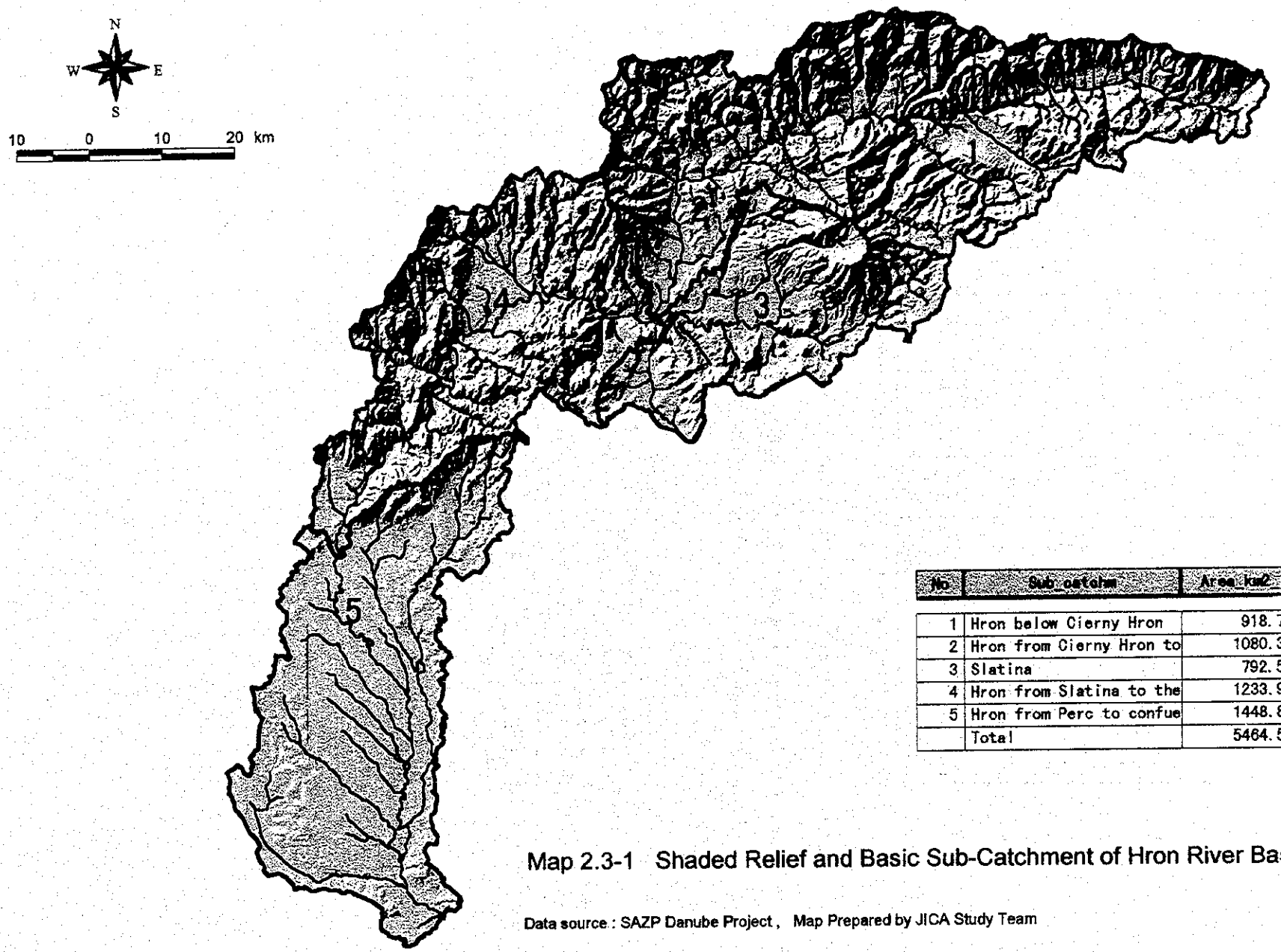
From a hydrological point of view, the catchment can be divided into five major sub-catchments as shown in Table 2.3-3, Map 2.3-1 that differ in the discharge regime.

Table 2.3 - 3 Basic Sub-catchments of the Hron River

Sub-catchment	*Area (km²)*
4-23-01 Hron below Cierny Hron	918.74
4-23-02 Hron from Cierny Hron to Slatina	1080.36
4-23-03 Slatina	792.58
4-23-04 Hron from Slatina to the digression of Perc	1233.99
4-23-05 Hron from Perc to confuence with Danube	1448.89
Total	5464.56

Source: Report on the State of the Environment in the Hron River Watershed, provided by SAZP to the JICA Preparatory Study Team, 1997, (Ref. 3-7) Environmental Programme for the Danube River Basin, 1994, (Ref. 22-10)

Some hydrological data and water balance characteristics of the Hron and its tributaries are shown in Table 2.3 - 4, and Table 2.3 - 5.



No.	Sub catchm	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 2.3-1 Shaded Relief and Basic Sub-Catchment of Hron River Basin

Data source : SAZP Danube Project, Map Prepared by JICA Study Team

Table 2.3 - 4 Discharge characteristics in selected profiles in the Hron basin

River Profile	Basin area	Mean annual discharges	Mean annual runoff	Mean monthly discharges for period 1931-80 ($m^3.s^{-1}$)					
	(km^2)	(m^3s^{-1})	(10^6 $m^3.y^{-1}$)	11	12	1	2	3	4
				5	6	7	8	9	10
Hron				26.690	24.440	17.490	20.020	37.050	57.230
Banská Bystrica	1766.48	27.990	883.3	42.850	31.080	23.850	18.960	16.450	19.760
Hron				48.490	47.980	34.760	47.270	82.540	99.310
Brehy	3821.38	49.970	1576.9	66.860	49.570	36.620	28.750	25.620	32.390

Source: Report on the State of the Environment in the Hron River Watershed, provided by SAZP to the JICA Preparatory Study Team, 1997, (Ref. 3-7) Environmental Programme for the Danube River Basin, 1994, (Ref. 22-10)

Table 2.3 - 5 Water balance characteristics of Hron and its tributaries in the period of 1931-1980

	Hron – mouth	Bystrianka	Vajskovský brook	Jasenianský brook	Bystrica
Precipitation in basin (mm)	869	1414	1466	1407	1194
Precipitation (10^6m^3)	4 748.70	136.57	86.31	129.89	202.93
Runoff (mm)	319	755	820	704	722
Runoff (10^6m^3)	1 743.19	72.92	48.28	64.99	122.71
Losses (mm)	550	659	646	703	472
Losses (10^6m^3)	3 005.50	63.65	37.84	64.90	80.22
Runoff coefficient	0.37	0.53	0.56	0.50	0.60
Specific runoff ($l.s^{-1}.km^{-2}$)	10.10	23.92	25.98	22.31	22.89
Mean annual discharge (m^3s^{-1})	55.200	2.310	1.530	2.060	3.890

	Slatina	Lutilský brook	Klak	Sikenica	Kvetnianka	Paríz
Precipitation in basin (mm)	809	910	956	728	591	578
Precipitation (10^6m^3)	641.19	132.75	126.50	181.97	69.27	133.96
Runoff (mm)	282	383	441	145	57	52
Runoff (10^6m^3)	223.50	55.87	58.35	36.24	6.68	12.05
Losses (mm)	527	527	515	583	534	526
Losses (10^6m^3)	417.68	76.87	68.14	145.72	62.59	121.91
Runoff coefficient	0.35	0.42	0.46	0.20	0.10	0.09
Specific runoff ($l.s^{-1}.km^{-2}$)	8.92	12.13	13.98	4.60	1.79	1.64
Mean annual discharge (m^3s^{-1})	7.070	1.770	1.850	1.150	0.210	0.380

Source: Report on the State of the Environment in the Hron River Watershed, provided by SAZP to the JICA Preparatory Study Team, 1997, (Ref. 3-7)
Environmental Programme for the Danube River Basin, 1994, (Ref. 22-10)

As mentioned in Section 2.2, the precipitation in the upper part of the Hron Basin reaches 1600 mm, while in lower flat areas it is only 600 mm. The surface runoff represents in the upper part up to 60 % of the precipitation, while in the flatlands only 10 %, the mean value for the whole basin being 37 %. The long-term mean annual discharge for the Hron in Brezno is 8.12 m^3s^{-1}, in Banská Bystrica 28.0 m^3s^{-1}, and at the confluence with the Danube it increases to 55.2 m^3s^{-1}.

Regarding the runoff from 1 km^2, in the Hron basin this value varies between 1.6 and 28 ls^{-1}

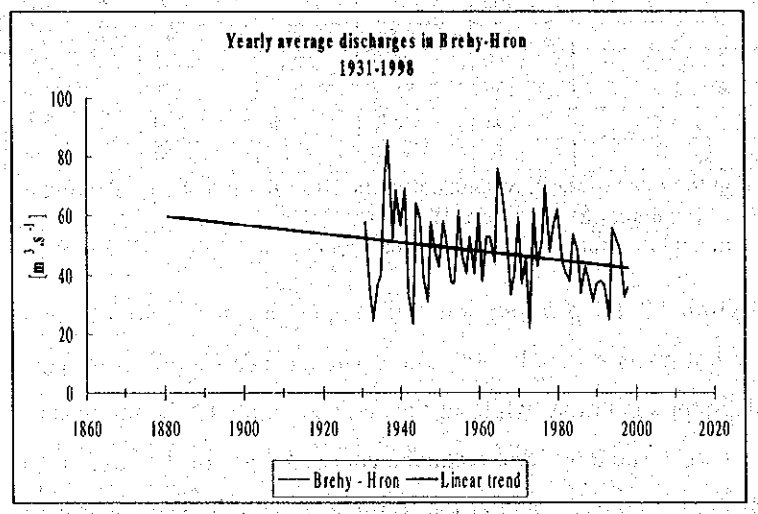
km^{-2}. The richest tributaries are Bystrianka, Jaseniansky potok, Vajskový potok and Bystrica where the values reach 22 - 25 $ls^{-1}km^{-2}$. In the flatland areas the specific yield is only 1.5 $ls^{-1}km^{-2}$. The integrated value for the whole basin is 10.1 $ls^{-1}km^{-2}$ which is 20 % more than that for the whole territory of Slovakia. Comparing the Hron with the Ipel River, where the specific yield is 4.19 $ls^{-1}km^{-2}$, the specific yield of the Hron is 2.3 times that of the Ipel.

The peak discharge in Brezno in October 1974 was 220 m^3s^{-1}, in Banská Bystrica 560 m^3s^{-1}, and in Brehy 1050 m^3s^{-1}. The minimum discharge was 1.2 m^3s^{-1} in Brezno on 27 Aug.1943, 4.8 m^3s^{-1} in Banská Bystrica on 24.Feb.1954, and 7.7 m^3s^{-1} in Brehy on 18 Sept.1947.

During the last 10 - 15 years such decreases of water resources have occurred that they have influenced the hydrological characteristics from the 50-years series. The mean annual runoff of the Hron in Banská Bystrica for the reference period 1931 - 1980 was 27.99 m^3s^{-1}, while for the period 1941 - 1990 it was 26.42 m^3s^{-1} (5.6 % less). The highest decrease occurs in November. For 1931 - 1980 the mean discharge was 26.69 m^3s^{-1}, while for 1941 - 1990 it was 21.74 m^3s^{-1} (18.5 % less). The situation is similar in other stations.

2.3.3 LONG-TERM CHANGES OF DISCHARGE IN THE HRON BASIN

As mentioned in Section 2.2, long-term change of precipitation in the Study Area shows decreasing tendency. In relation to this phenomenon, as shown in Figure 2.3-1, average discharges of Hron river show decreasing tendency as well as precipitation in Brehy-Hron.



Source: Based on the Data provided by SHMU

Figure 2.3 - 1 Yearly average discharge in Brehy-Hron in the period 1931 – 1998

2.4 ECOLOGY

2.4.1 FAUNA AND FLORA

The Hron Basin has a wide range of ecological conditions which in total provide the area with high biodiversity. Within the region there is a broad range of altitudes, climates, geological and soil conditions in combination with large areas of natural and semi-natural forests, grasslands, aquatic ecosystems and traditional agricultural lands. Additionally the Hron basin is located at the boundary of the mountainous western Carpathian and the lowland Pannonian (Danube) biogeographical regions. All these factors combine to provide the ecological conditions that result in a rich biodiversity.

The larger protected areas of the Hron basin (national parks and protected landscape areas) have the best ecological conditions and the highest biodiversity. For example the Muranska Planina National Park contains more than 80% of Slovakia's totals of mammal, reptile and amphibian species, whilst 55% of the country's birds are recorded from the Nizke Tatry National Park. Large mammal species which are rare or absent from many parts of Europe eg bear, wolf, lynx, wild cat, otter, wild boar and birds of prey occur commonly in the Hron basin. The presence of such important European species is a clear indication of the good ecological conditions in the Hron valley.

The occurrence of plant species is less well known. Muranska Planina National park has 1 150 higher plant species (37%) out of a total of 3 124 for Slovakia, whilst Vel'ka Fatra and Pol'ana Protected Landscape Areas have about 1 500 and 1 200 species respectively. Some of these are endemic species – mainly those that occur only in the Carpathian region, but also one whose only locality in the world is the Muranska Planina National Park. The protected areas also have high numbers of invertebrates. Many of the plant and animal species of the Hron basin belong to internationally recognised categories of endangered species and therefore have a high conservation value. For example 67% of fish species and 84% of mammal species in the Nizke Tatry National Park belong to endangered categories of fauna. All the protected areas of the Hron basin play an important role in protecting and conserving the flora and fauna of Slovakia and, for some species, of Europe.

The major ecosystems of the Hron basin can be divided into forest, grassland, aquatic/wetland and agricultural. About 47% of the area is covered in forest and much of it is natural or semi-natural. These are high proportions by European standards and they include a variety of different types, for example oak, beech, spruce, fir and mountain pine. All forests are actively

managed and generally maintain good ecological conditions although biodiversity will be less in the more managed forests than in those less intensively managed. The Hron basin grasslands are mainly the result of deforestation to provide agricultural lands, although natural ones exist above the tree line (about 1 500 m) in the Nizke Tatry National Park.

Aquatic and wetland habitats occur throughout the Hron basin, though generally they are small. There is a wide range from the slow flowing river and associated wetlands of the lower Hron to sub-alpine streams and bogs. Many wetland habitats have been lost through developments such as urban areas, roads, industry and agriculture whilst others have been badly affected by river engineering projects for water abstraction, irrigation and flood control. Despite such changes however the Hron river has high fish biodiversity with 52 species recorded from it. These include rare and endangered fish; between Brezno and Zvolen *Hucho hucho* and the lamprey *Tinca tinca* have been recorded. In the lower part of the Hron basin *Pelecus cultratus* has been recorded. Agricultural areas occupy about 45% of the Hron basin. They range from the intensively managed lands common in the lower valley to the more traditionally managed farmlands of, for example, Detva and Pol'ana. The ecology and biodiversity in the former lands have been badly affected, but the latter support good ecological conditions and high biodiversity.

2.4.2 PROTECTED AREAS AND FORESTS

The Hron basin has a large number (133) of protected areas that in total cover 30% of it. They include all categories (Levels II-V). The largest category is national park which covers 1 137 km^2 (21%) of the basin, with the majority being in the Nizke Tatry National Park. These areas are managed for their ecology and biodiversity by the relevant authority - National Parks Administration for national parks and the Slovak Environment Agency for all other categories. Four of the Hron basin's protected areas also belong to conservation categories designated through international conventions. These sites (Nizke Tatry National Park, Vel'ka Fatra and Pol'ana Protected Landscape Areas and the Parizske Mociare National Nature Reserve) are therefore recognised as being of major international significance.

Forested protected areas are also managed by the forestry authorities, principally for their timber production. They serve many other functions, for example for water and soil protection, avalanche control, health resort and immission control, and are also managed for these purposes. In some instances the differing objectives of the forestry and protected area authorities lead to disagreement over how the forested areas should be managed. It is clear

that most forests are in a good ecological condition with high biodiversity. However, evidence suggests that in the past both air pollution and soil contamination caused more widespread damage to forested areas, this has reduced over time. There may still be some localised damage to forests in certain areas. The main exceptions are those of the lower Hron in places where river engineering projects have altered water flows and water tables to the detriment of riverine forests. The regulation of water flow has changed the water flow regime, affected the water table and thus also the condition and composition of forests in the lower Hron.

Current forestry policy is to further increase forest management procedures for the benefit of ecology and biodiversity – the ecologisation of forestry. This can be done by increasing, for example, the amount of forests regenerated by the shelter belt method and by changing forest composition to more closely match the natural vegetation of the area.

2.4.3 HUMAN INFLUENCE ON ECOLOGY

A number of activities may affect the ecology of the Hron basin, but in general the effects are not well known or studied in detail. Air pollution, mostly originating from outside the Hron basin, adversely affects both tree health and soil acidity as well as the ecology of forest flora and fauna. Air quality has improved in recent years and tree health also, so the ecological effects of air pollution are probably not of major significance. Water pollution, originating mainly from discharges of inadequately treated industrial and domestic wastes, has in past years badly affected the Hron and caused loss of fish species in some sections of the river.

Some agricultural and forestry activities can also have negative effects on ecology and biodiversity. In agriculture this is mainly through intensive farming methods such as those practised in parts of the lower Hron valley. Here there are large areas of ploughed land with no or few trees and which therefore have a simple ecology with low biodiversity. In forestry, practices such as clear felling, planting of trees not best suited to the local ecological conditions and removal of dead wood can reduce forest biodiversity. Ecologisation of forestry techniques will improve forest ecology and biodiversity.

River engineering works on the Hron and its tributaries have had negative effects on the ecology of the river and adjacent dependent ecosystems. The absence of fish passes on major barriers, such as the Vel'ke Kozmalovce dam, has severely interrupted fish migrations and spawning. Flood control works, such as river straightening and the building of levees, have reduced flooding and lowered the water table, particularly in the lower Hron. Riverine forests and other wetland ecosystems have been lost or badly damaged in such areas.

Although there are pressures on the ecology and biodiversity of the Hron Basin, they are generally in good condition. They make a significant contribution to the quality of life in the valley and are essential for sustaining many of the recreation and tourism resources of the area. It is therefore essential for the future that they are well managed and continue to provide these functions, as well as maintaining or improving their ecology and biodiversity.

2.5 POPULATION

2.5.1 NATIONAL AND REGIONAL

The Slovak Republic is located in the heart of Europe. It is bordered by the Czech Republic, the Republic of Poland, the Ukraine, the Republic of Hungary and the Republic of Austria. The Republic of Slovak has a territory of 49 034.55 sq. km and 5 373 810 of the population, i.e. population density is 110 persons/ha in 1997 according to the national statistic data.

Since 1996, the territory of SR has been divided into 8 regions (Kraj) and 79 districts (Okres).

There are 2,878 municipalities, of which 136 are towns (Mesto) and the rest are villages (Obec).

The population figures in the country by the 8 regions are shown in Table 2.5 - 1.

Table 2.5 - 1 Population of the 8 Regions (Kraj) and Its Capital Towns (1997)

Name of Kraj	Population[1)]				Area of the	Population	Number
	Capital town		Kraj		Kraj	density	of
	1996	1997	1996	1997	(km^2)	(p/km^2)	Okres
Banska Bystrica	85 052	84 816	664 024	663 845	9 455	70	13
Nitra	87 555	87 555	717 585	717 241	6 343	113	7
Bratislava	452 288	451 395	618 904	618 673	2 053	301	8
Trnava	70 202	70 045	548 898	549 621	4 148	133	7
Trencin	59 039	59 252	610 135	610 349	4 501	136	9
Zilina	86 811	86 923	687 771	689 504	6 788	102	11
Presov	93 147	93 461	773 121	777 301	8 993	86	13
Kosice	241 606	242 170	758 494	761 116	6 753	113	11
Total SR	1 175 700	1 175 617	5 378 932	5 387 650	49 034	110	79

Source: Statistic of SR, Statistic Office of SR (Ref. 14 - 35)

The average annual growth rate of the population in Slovakia has been continually decreased in the past decades as shown below:

1960 - 70 : 1.26%
1970 - 80 : 0.96%
1980 - 90 : 0.61%
1990 - 96 : 0.29%

The annual growth rate of the population in the 2 regions relevant to the Study area during 1991 - 1996 was as follows:

Banska Bystrica Kraj : 0.04 %
Nitra Kraj : 0.02 %

The recent demographic trends have shown a steady decline of the birth rate and of the fertility rate, while the death rate has been relatively constant. On the other hand, the abortion rate

rose to 61 per 100 live births in 1994. The marriage rate has fallen since 1978, except for 1990, while the divorce rate has risen from 22 per 1 000 contracted marriages in 1990 to 31 in 1994. Those trends have contributed to a progressive fall in the annual population growth. The total fertility rate in Slovakia dcreased from 1.980 in 1992 to 1.471 in 1996.

2.5.2 POPULATION OF THE STUDY AREA

The basic population and area figures of the Study Area in 1996 by Kraj and Okres are shown in Table 2.5 - 2.

Table 2.5 - 2 Population and Its Density in the Study Area by Okres in 1996

Okres	Total				Study Area						
	No. of Obec/ Mesto	Population (1996)	Area (km2)	Density (p/km2)	No. of Obec/ Mesto	Population (1996)	Household NO.	Area (km2)	Density (p/km2)	Urban Population (1996)	Urban Pop. Ratio
BANSKA BYSTRICA	42	112 926	809	140	42	112 926	41 619	809	140	85 052	75.3%
BANSKA STIAVNICA	15	16 934	279	61	10	14 419	5 591	183	79	10 529	73.0%
BREZNO	30	66 078	1 265	52	28	65 483	23 002	1 243	53	23 007	35.1%
DETVA	15	34 014	445	76	12	32 541	11 977	343	95	23 881	73.4%
REVUCA	42	40 900	730	56	1	1 123	n.a.	103	11	0	0.0%
ZARNOVICA	18	27 780	425	65	18	27 780	10 553	425	65	14 126	50.8%
ZIAR NAD HRONOM	34	48 617	531	92	34	48 617	17 265	531	92	27 174	55.9%
ZVOLEN *1)	26	67 955	761	89	24	67 469	23 752	584	116	49 117	72.8%
Sub-total (BB Kraj)	222	415 204	5 245	79	169	370 358	133 759	4 221	88	232 886	62.9%
LEVICE	92	121 163	1 550	78	63	98 952	37 692	1 133	87	36 502	36.9%
NOVE ZAMKY	64	162 136	1 346	120	25	40 109	16 056	548	73	13 497	33.7%
ZLATE MORAVCE *1)	33	43 612	521	84	7	8 204	n.a.	129	64	2 332	28.4%
Sub-total (Nitra Kraj)	189	326 911	3 417	96	95	147 265	53 748	1 810	81	5 331	35.5%
Total	411	742 115	8 662	86	264	517 623	187 507	6 031	86	299 547	57.9%
Total of Banska Bystrica Kraj	515	664 024	9 455	70	33%	56%	-	45%	-	-	-
Total of Nitra Kraj	347	717 585	6 343	113	27%	21%	-	29%	-	-	-
Total of two Kraj	862	1 381 609	15 798	87	31%	37%	-	38%	-	-	-

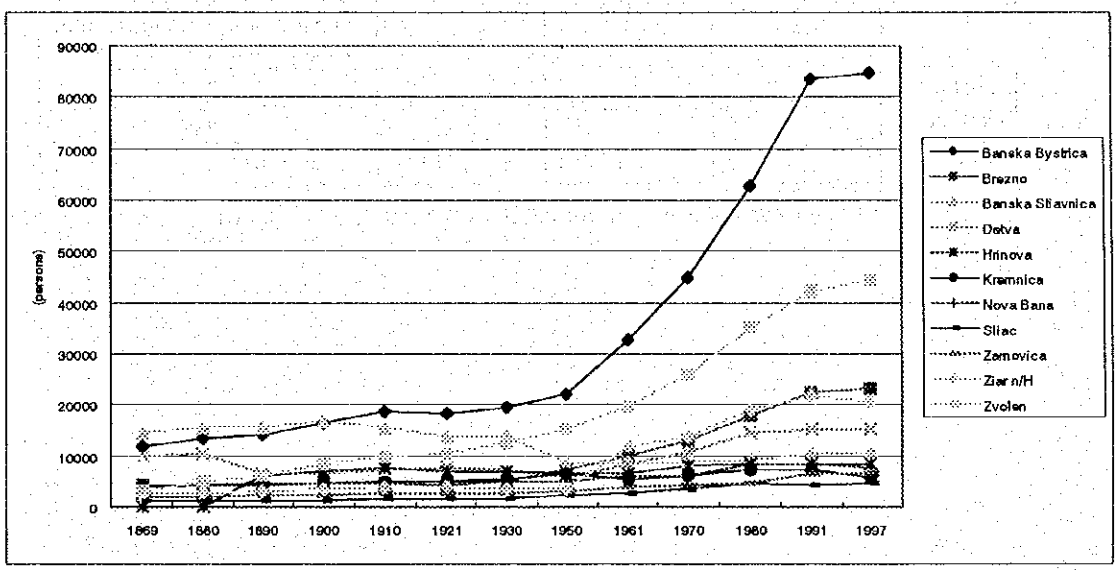
Note; *1) population data was calculated using the table provided below

Source: Statistical data of the Statistic Offices of the Kraj and supplemented by the territorial development plans of Banska Bystrica and Nitra Kraj 1998. (Refs. 14 - 4, 14 - 7 through 14 - 11, 14 - 14, 14 - 15)

		Areas in hectares					Population	
	Okres	Whole area of the Obec	Area of cadasters within the SA	Built up area of the Obec	Built up in SA	Ratio of built up areas	Obec	Study Area = (Obec pop) x (ratio)
Zlate Moravce	ZM	4 561	1 831	549	82	0.1493625	15 610	2 332
Volkovce	ZM	1 488	1 287	80	67	0.8375	1 038	869
Nemcinany	ZM	1 623	1 174	69	63	0.9130435	803	733
Pliesovce	ZV	5 570	3 113	84	76	0.9047619	2 221	2 009

2.5.3 URBANISATION

Figure 2.5-1 shows the population increase of the Mesto in Banska Bystrica Kraj. It is obvious that after the World War II, since 1950, the population of the Mesto has been increased with rapid curb until 1991. Since 1991 to the present, however, the population increase of the Mesto became very low with the annual increase rate of 0.14 %.



Source: Refs. 14 - 4, 14 - 8, 14 - 9

Figure 2.5 - 1 Changes in Population of Towns in Banska Bystrica Kraj

Table 2.5 - 3 shows the urbanization rates of the population of both Kraj in the recent years.

Table 2.5 - 3 Urbanization Rate in Two Kraj

Year	Territory	Share of urban population in total population	
		Banska Bystrica	Nitra
1991	whole Kraj	53.7 %	49.0 %
1997	whole Kraj	55.1 %	48.9 %
1997	Study Area only	62.9 %	48.4 %

Note: population of the Mesto = urban population
Source: Statistical Yearbook of the SR 1996, 1997, 1998 (Refs. 14-21,22,23)

2.5.4 POPULATION PROJECTION

(1) Slovakia

1) 5 744 200 in 2015; 3.56% annual average increase from 5 274 300 in 1991.

2) 241 600 surplus until the year 2000 (5 515 900 in 2000); 4.99% annual increase.

3) It was estimated that EAP population will be 2 701 200 to 2 804 000 in 2015.

Source: National Spatial Development Conception of SR, December 1994
Original source: SR Population Prognosis Including Migration-Induced Consequences for the year 2015, SR Office of Statistics, July 1994.

(2) Region (Kraj)

Population forecasts for Kraj of Banska Bystrica and Nitra are shown in Table 2.5 - 4.

Table 2.5 - 4 Population Forecast of the Regions

Kraj	Population in 1996	Population in 2005	Population in 2015	Ave. Annual increase ratio 1996 - 2005	Ave. Annual increase ratio 2005 - 2015
Banska bystrica	664 024	664 940	656 300	0.02%	-0.13%
Nitra	717 585	715 401	701 956	-0.03%	-0.19%

Source: Territorial Development Plans for the Banska Bystrica and Nitra Kraj

2.6 ECONOMY

2.6.1 GENERAL

The Study Area consists of the territories belonging to Banska Bystrica and Nitra Kraj. There are 11 Okres relevant to the Study Area. A detailed description of these Okres is given in Annex C.4. in the Supporting Report.

(1) Overlook of the Region

The socio-economic characteristics of the 2 Kraj can be overviewed in Figure 2.6-1, which shows the situations of the 2 Kraj comparing to the national average with selected socio-economic indicators, such as population and demography, employment and production, technical infrastructure and educational conditions.

It can be said that the socio-economic situations of 2 Kraj are medium level in the nation and many indicators keep within the national average in general. The advantages and disadvantages of the 2 Kraj, comparing to the national average, are as follows;

1) Advantages or factors more than national average

- Large area of territory in Banska Bystrica Kraj (1st in SR)
- Large agricultural areas in both Kraj (Nitra; 1st)
- Large forest land in Banska Bystrica Kraj (1st)
- Large arable land and high production of agriculture and livestock in Nitra Kraj (1st)
- Large number in passengers transport in Banska Bystrica Kraj (1st)

2) Disadvantages or factors less than national average

- Lower rate of live birth and higher rate of death in both Kraj (in lowest group)
- Lower gross output in both Kraj (BB; 4th , NT; 5th)
- Higher rates of unemployment in both Kraj (BB; 6th , NT; 5th)
- Very small area of forest land in Nitra Kraj (6th)
- Lower productions of industry and construction in both Kraj (in lowest group)
- Lower number in goods transportation in both Kraj (in lowest group)

(2) Banska Bystrica Kraj

The upper and middle parts of the Hron river basin belong to the Banska Bystrica Kraj, covering the area of 4 221 km^2 with a population of 370 867 in 1996. Thus the population density is 87.8 inhabitants/km^2.

The major economic activities of the area are industry, livestock, forestry and services. The major industrial factories are mainly located in the large towns along the main flow of the Hron

river, especially in the zones of;

1) Brezno – Banska Bystrica – Zvolen (Route 66), and

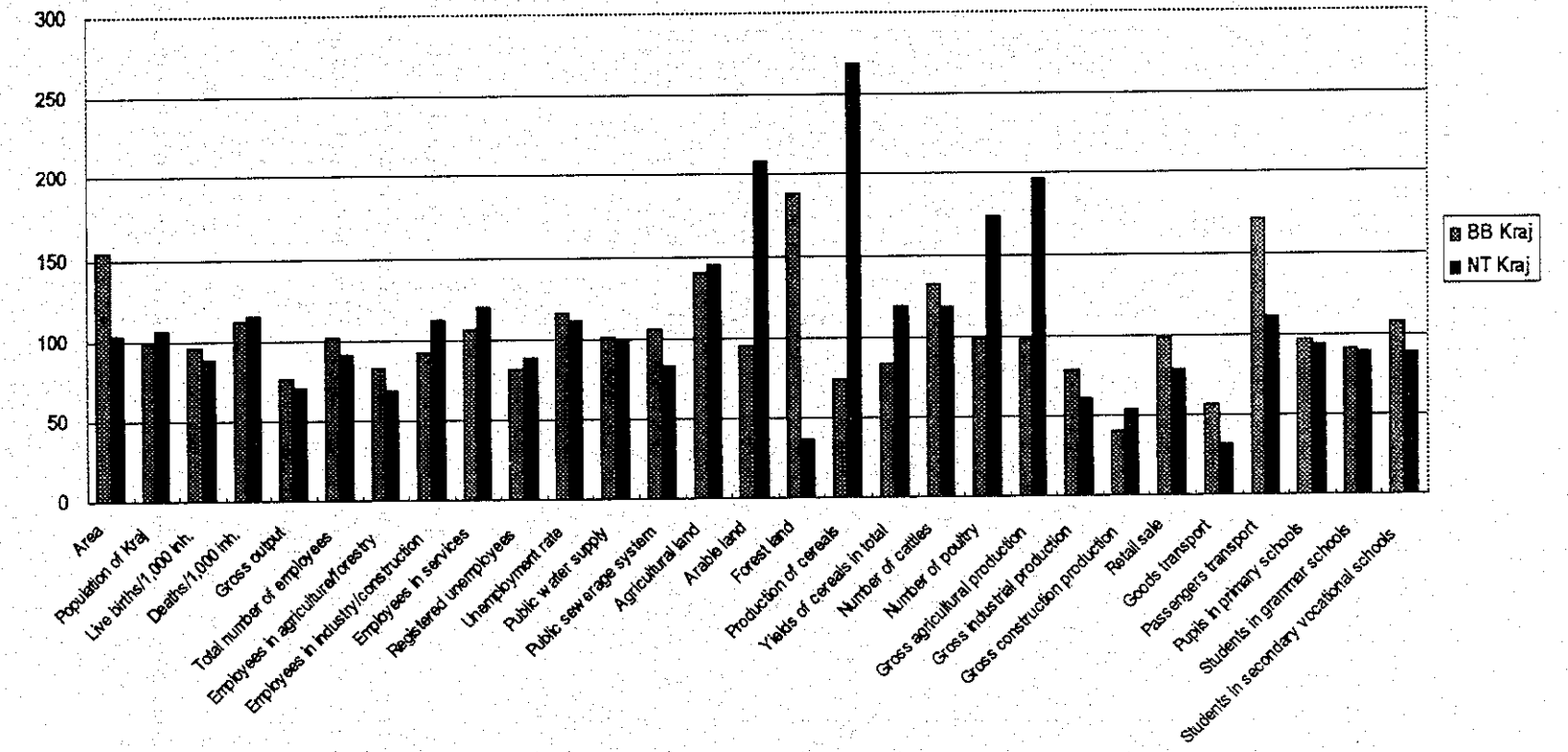
2) Zvolen – Ziar nad Hronom – Nova Bana (Route 50 and 65)

The zone of 1) above has been proposed to develop as one of the 4 metropolitan areas in SR in the National Conception of Territorial Development.

(3) Nitra Kraj

The lower part of the Hron river basin belong to the Nitra Kraj, covering the area of 1 810 km^2 with a population of 149 000 in 1996. Thus the population density is 82.3 inhabitants/km^2.

The major economic activities of the area are agriculture, agro-industry and services. The major industrial factories are mainly located in the so-called Pohronie Belt between Levice – Zeliezovce – Sturovo Mesto. The lower part of the Hron river basin has a large contribution to the agricultural and livestock productions in the Slovak economy.



Source: Stastistical Yearbook of the SR 1997 and 1998 (Refs.14 - 22, 23)

Figure 2.6 - 1 Selected Socio-economic Indicators of the Bansla Bystrica and Nitra Kraj (National Average = 100)

2.6.2 ECONOMIC ACTIVITIES OF THE REGION

(1) Profile of Economic Activities

Table 2.6-1 shows the Economically Active Population (EAP), its structure by sectors, number of unemployees registered of the Okres in the Study Area. The higher unemployment ratios of the most of the Okres, except Banska Bystrica and Zvolen Okres, are the one of the serious socio-economic issues of the region.

Table 2.6 - 1 EAP, Employment and Unemployment Rate of the Okres in the Study Area 1997

	No. of EAP*1)	Percentage by sectors*2)			No. of registered unemployees	Unemploy-ment rate
		I	II	III		
Revuca	18 732	12.3%	54.5%	33.2%	5 334	22.9%
Brezno	33 560	11.6%	54.6%	33.8%	5 441	15.0%
Banska Bystrica	59 098	12.2%	41.2%	46.6%	3 156	5.3%
Zvolen	34 087	6.9%	33.3%	59.8%	2 726	7.9%
Banska Stiavnica	8 022	5.1%	35.4%	59.5%	1 016	12.6%
Detva	17 354	14.2%	62.8%	23.0%	2 320	13.0%
Ziar nad Hronom	24 149	5.5%	56.9%	37.6%	2 435	10.5%
Zarnovica	13 156	9.1%	52.4%	38.5%	2 026	15.3%
Zlate Moravce	21 554	16.6%	52.9%	30.5%	3 081	13.7%
Levice	58 718	17.7%	38.8%	43.5%	10 613	17.4%
Nove Zamky	72 888	16.1%	30.1%	53.8%	11 971	15.5%
Reference;						
BB Kraj total	326 796	12.2%	41.2%	46.6%	46 511	14.9%
NT Kraj total	326 763	14.7%	34.9%	50.4%	52 263	14.3%

Note: the data are as of 31 Dec, 1997, except *1) 1991 and *2) 31 Dec, 1996
The unemployment rate of SR in 1997 was 12.5%.

Source: Territorial Development Plan of Banska Bystrica and Nitra Kraj (Refs. 5-6, 5-23)

Table 2.6–2 shows the detail data of the number of workers by the relevant Okres in 1997. For both Kraj, it can be seen that the compositions of the number of workers in various sectors are very similar, and also the compositions in the relevant Okres of the Study Area are also similar to that of both Kraj, except the following points;

- A little larger portion for agriculture in the relevant Okres of Nitra Kraj
- A little larger portion for industry in the relevant Okres of Banska Bystrica Kraj.

Table 2.6-2 Number of Workers in Economic Sector by Okres in 1997

		Agriculture & fishery	Industry	Building	Trade	Hotel & restaurants	Transport & communication	Banking & insurance	Trade services & research	Public administration	Education	Health service & social care	Other public services	Total
1	Banska Bystrica	1 813	14 570	5 061	11 879	1 991	4 755	1 292	5 315	3 010	5 349	4 025	1 705	60 765
2	Banska Stiavnica	541	1 769	539	894	225	224	32	261	302	877	298	348	6 310
3	Brezno	2 230	9 893	776	2 294	768	1 528	118	646	764	1 678	1 032	298	22 025
4	Detva	723	4 850	314	1 262	176	507	43	379	427	813	203	270	9 967
5	Revuca	1 028	5 886	481	1 360	336	587	53	270	589	1 430	603	346	12 969
6	Zarnovica	698	3 732	827	1 198	165	536	21	186	350	861	453	206	9 233
7	Ziar nad Hronom	921	9 253	1 165	2 336	597	1 443	271	656	686	1 625	1 180	538	20 671
8	Zvolen	1 673	7 804	1 792	5 353	722	5 011	560	2 235	1 163	3 129	2 254	590	32 286
BB Kraj sub-total		9 627	57 757	10 955	26 576	4 980	14 591	2 390	9 948	7 291	15 762	10 048	4 301	174 226
		6%	33%	6%	15%	3%	8%	1%	6%	4%	9%	6%	2%	100%
9	Levice	4 880	14 216	3 875	5 260	1 033	2 699	441	1 905	1 480	3 588	2 145	1 515	43 037
10	Nove Zamky	5 614	12 708	1 724	7 405	1 535	5 656	471	1 986	1 755	4 004	2 602	1 710	47 170
11	Zlate Moravce	1 706	5 270	1 147	1 399	266	843	45	410	442	1 361	557	313	13 759
Nitra Kraj sub-total		12 200	32 194	6 746	14 064	2834	9 198	957	4 301	3 677	8 953	5 304	3 538	103 966
		12%	31%	6%	14%	3%	9%	1%	4%	4%	9%	5%	3%	100%
Okres total(1 to 11)		31 454	147 708	28 656	67 216	12794	38 380	5 737	24 197	18 259	40 477	25 400	12 140	452 419
		7%	33%	6%	15%	3%	8%	1%	5%	4%	9%	6%	3%	100%
BB Kraj		20 524	79 727	14 927	39 070	7 834	20 390	3 239	12 315	11 443	23 502	15 007	6 389	254 367
		8%	31%	6%	15%	3%	8%	1%	5%	4%	9%	6%	3%	100%
Nitra Kraj		26 186	76 254	16 932	36 090	6 499	18 821	2 860	12 644	9 033	22 090	12 505	8 178	248 092
		11%	31%	7%	15%	3%	8%	1%	5%	4%	9%	5%	3%	100%
Slovak Republic		136 007	618 850	153 702	303 903	64 364	163 087	33 151	126 348	85 188	180 871	112 756	71 725	2 049 952
		7%	30%	7%	15%	3%	8%	2%	6%	4%	9%	6%	3%	100%

Note; The table includes - Only + Part Time -

Source; Zamestnanost v SR, krajoch a okresoch 1997, Statistical Office of SR (Ref. 14 - 30)

(2) Industrial Activities

Table 2.6 - 3 shows major industrial plants in the Study Area.

1) Banska Bystrica

In the industrial sector, a total of 67 177 people were employed in 1997 and the most important industries contributing the economy of the region are as follows;

- Metallurgical and mining industry (Brezno, Ziar nad Hronom, Zarnovica)
- Engineering industry (Brezno, Banska Bystrica, Zvolen, Detva)
- Food Industry (Zvolen, Banska Bystrica)
- Textile industry (Banska Bystrica, Banska Stiavnica)
- Wood processing industry (Banska Bystrica, Zvolen, Zarnovica)
- Chemical and pharmaceutical industry (Brezno, Banska Bystrica)

2) Nitra

The economic base and employment of the Kraj largely depend on industrial production. The industrial sector absorbs over 56 000 employees, and total production reached 36 billion SK in 1996. The most important branches in the industrial sector are;

- Food industry (Levice)
- Engineering industry (Tlmace)
- Metallurgical industry (Tlmace)
- Chemical industry (Levice)
- Textile industry (Levice)
- Paper industry (Sturovo)

Table 2.6 - 3 Major Industrial Factories in the Study Area

Place	Name of company	Type of products	No. of employees	Turnover (Bill. SK)	Year of data
BANSKA BYSTRICA					
Brezno	Bridge Producing Factory Inc.				
Podbrezova	Iron Works Inc.				
Dubova	Petrochemia Inc.	Oil processing & refinery			
Slovenska Lupca	BIOTIKA Inc.	Chemical & pharmaceutical	1 218	2.4	1998
	FERMAS Ltd.	Chemical & pharmaceutical	324	3.4	1998
	ESSEL Inc	Machinery	355	0.8	1998
Lubietova	KNK v.d. Lubirtova Inc.	Other	215	0.6	1997
Harmanec	Harmanec Paper Mills Inc.	Paper	1 014	1.2	1998
	Vojensky Kartography s.p.	Paper	234	0.5	1998
Banska Bystrica	Stredoslovenska Cement Works Inc.	Construction materials	280	1.8	1998
	SMERECINA Holding Inc.	Wood processing	790	0.8	1998
	DOKA DREVO Ltd.	Wood processing	139	1.8	1998
	LOB s.p.	Machinery	585	0.7	1997
	Pivovar	Brewery	338	1.2	1998
	FATRA Trading Inc.	Food	47	1.4	1998
	BELAMO Inc.	Food	284	0.6	1998
	SLOVENKA-NOVA Inc.	Textile	1 076	0.4	1998
	TLACIARNE SS Ltd.	Paper	326	0.6	1998
Vlkanova	Vlkanova Machinery Inc.	Machinery	585	0.6	1997
	Vikanova WITZEMANN Ltd.	Machinery	94	1.6	1998
	KUSTER-automobile technic Ltd.	Machinery	248	1.8	1998
Hronsec	Foundry Inc.	Glass			
Zvolen	BUCINA Inc.	Wood processing			
	EUPKA Ltd.	Meat food			
Hlinik nad Hronom	Pohronske machine works Inc.	Machinery			
Ziar nad Hronom	Z SNP Plant Inc.	Machinery & metallurgic			
Zarnovica	Preglejka Inc.	Wood processing			
Nova Bana	IZOMAT Inc.	Construction materials			
NITRA					
Levice	LEVITEX Levice Inc.	Textile	1 410	0.9	1996
	NOVOCHEMA Levice cooperation	Chemical	215	0.2	1996
	De Miclén Levice Inc.	Cosmetic	165		1996
	LENKO Levice Ltd.	Furniture	170		1996
	LEVICKE MLIEKARNE Inc.	Milk	220		1996
	ZAPADOSLOVENSKE ZRIEDLA Inc.	Mineral water	210		1996
	LEVICKY MASOVY PRIEMYSEL Inc.	Food	310		1996
Tlmace	SPP Inc.	Engineering	1 763	4.2	1996
	SES FKM Ltd.	Metal	280		1996
	PRECIOSA Inc.	Glass	340		1996
Pukanec	EXUNACO Inc.	Furniture	290		1996
Tsturovo	AssiDoman Packaging Inc.	Paper	2 567	3.2	1996

Note: the factories with more than 100 employees, and/or more than 1 billion SK of turn-over

Sources: 1) Territorial Development Plans of Banska Bystrica and Nitra Kraj (Refs. 5-6, 5-23)
2) Study for endangered area in the Central Part of the SR (Ref. 1 - 22)

(3) Agricultural Activities

1) Banska Bystrica

The agricultural production of the Banska Bystrica Kraj is at the average in the nation, in general. The livestock production is bit progressed especially in the production of cow and sheep milk, eggs and sheep wool. There are 63 companies of internal sale in the Kraj (only companies with more than 20 employees) that employed 6 574 persons. Table 2.6 - 4 shows the existing agricultural land use by Okres. A larger part of the agricultural area is utilised for permanent grass, while the area of arable land is not large except in Revuca and Zvolen Okres in the Kraj.

2) Nitra

The Nitra Kraj is the favorable for agriculture with good nature and climatic conditions and a high ratio of arable soil. The agriculture is the most important economic activities in the southern part of the Kraj where a variety of crops are able to grow, and breeding of cattle and pigs are high productive. The large-scale irrigation areas are in Okres Levice. These areas are among those that are most productive in the nation, supplying food products to other regions. Table 2.6-4 shows the existing agricultural land use by Okres. A large part of the agricultural area is utilised for arable land especially in Okres Levice and Nove Zamky. The arable land per capita in Okres Levice was 2.15 ha/capita, which was very high rate in the country.

Table 2.6 - 4 Agricultural Soils by the Okres in the Study Area 1997

	Agricultural area (ha)						Per capita	
	Total	Arable land	Vine yards	Vegetable	Fruits	Permanent Grass	Agricultural area	Arable land
Revuca	25 492	10 736	86	756	52	13 862	1.51	0.63
Brezno	34 972	5 366	0	769	8	28 829	0.53	0.08
Banska Bystrica	29 014	5 440	0	1 132	12	22 430	0.85	0.16
Zvolen	28 740	10 788	0	747	14	17 191	0.70	0.26
Banska Stiavnica	10 358	1 966	3	437	191	7 761	0.37	0.07
Detva	22 520	6 820	1	394	2	15 303	0.46	0.14
Ziar nad Hronom	20 609	6 312	0	896	34	13 367	0.30	0.09
Zarnovica	12 921	2 455	91	822	115	9 438	0.03	0.01
Zlate Moravce	25 031	19 511	473	1 156	142	3 749	0.15	0.12
Levice	112 446	93 879	3 189	2 856	632	11 890	2.58	2.15
Nove Zamky	106 929	93 753	3 581	3 100	2 078	4 417	0.33	0.29

Note: the data are as of 1 Jan, 1997
Source: Territorial Development Plan of Banska Bystrica and Nitra Kraj (Refs. 5-6, 5-23)
The Region of Nitra-selected indicators- 1997, Statistic Office of Nitra (Ref. 14-14)

(2) Recreation and Tourism Activities

1) Banska Bystrica

The Kraj is located in the central part of the country, having good accessibility's from major population centres in the country, and also stands in the southern Slovakian border, having good potential of international tourist connection from Krakow and Budapest.

In the northern part of the Kraj, there are the main recreational and tourism localities of Slovakia. The Kraj has various natural and cultural resources, such as National Parks, Historical towns, Ski resort areas, etc. In the southern part of the Kraj, it is possible to develop water tourism by thermal swimming pool, water sports, car and cycle-tourism and country and village tourism. It is remarkable that Banska Stiavnica and its surrounding areas are registered on the list of the World Cultural Heritage UNESCO.

The whole territory can be represented by bathing, health and relaxation tourism, and cultural and social tourism. The major tourist attractions of the importance in the Study Area are listed in Appendix-K of the Supporting Report.

2) Nitra

The lower part of the basin in the Kraj stands on the southern Slovakian border, having advantages in accessibility not only for domestic tourists, but also for the international tourists, especially from Hungary. The major tourist's attractions of the area are most the point individual recreational areas, countryside, vineyards, ponds, excavation sites, geothermal waters, and the river flows of Hron and Danube. cycle-tourism, car driving, horse riding are also attractions of the area. The major tourist attractions of the importance in the Study Area are listed in Appendix-K of the Supporting Report.