ANNEX B.8

HYDROLOGY

B.8 HYDROLOGY

B.8.1 OBSERVATION NETWORK AND DATA AVAILABILITY

SHMI has a responsibility for correcting, processing, evaluating and the systematic storage of quantitative and qualitative hydrological data. Measurements of surface water have been performed using a network of about 500 water gauging stations, groundwater levels measured in about 1,400 wells and spring yield measured in about 516 springs over the whole of country. In addition, surface water and groundwater quality is observed and evaluated in 290 stations.

In the Morava River Basin, there are 25 gauging stations for surface water measurement and 65 observation wells for groundwater measurement, of which 16 gauging stations and 41 observation wells are in the Study Area. The distribution of gauging stations and observation wells is shown in Figure B.8.1 and B.8.2

B.8.2 SURFACE WATER

(1) River System

In accordance with the river basin management system of Slovakia shown in the Water Management Plan of the Morava River Basin, the Morava river basin in the Slovakia territory is divided into three sub-basins, i.e., the Chvojnica, the Myjava and the lower Morava sub-basins. In the Study Area, major and important tributaries of the Morava River are considered to be the Myjava River, Rudava River and Malina River. The river system is summarized in Table B.8.1 and shown in the Figure B.8.3.

The effort to improve the Morava River and reduce flood damage was started at the end of the nineteenth century through river training and dike embankment. After the systematic regulation of the lower Morava River channels during the 1930's to 1960's and continuous improvement, the Morava River has been improved to cope with a 100-year frequency flood. The present condition of the river improvement and the major water structure of the Morava River Basin is summarized in Tables B.8.2 and B.8.3.

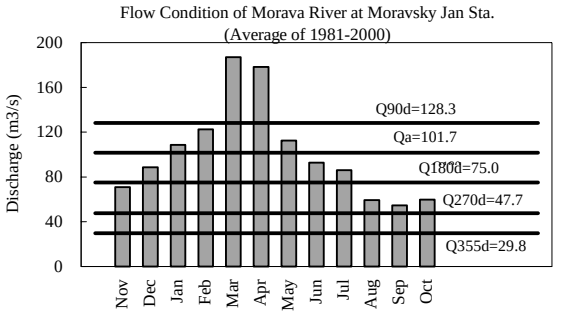
Furthermore, several reservoirs have been developed to obtain enough water resources especially in the middle and upper reaches of tributaries in the Basin. There are three (3) large-scale water reservoirs, which are characterised by more than 1million m^3 capacity, of which total effective capacity amounts to 5.025 million m^3 , and twenty-one (21) small-scale reservoirs, of which total effective capacity amounts to 4.606 million m3. In the Study Area, there are one (1) large-scale reservoir and six (6) small-scale reservoirs with total effective capacity of 3.284 million m^3. The reservoirs in the Morava River Basin are listed in Table B.8.4.

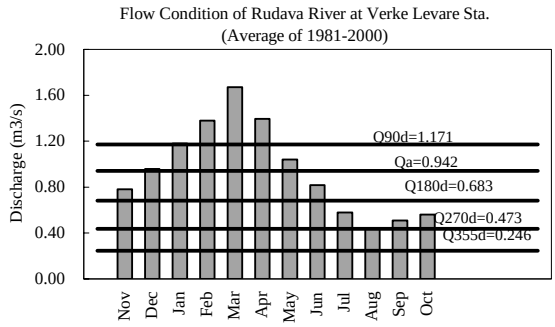
(2) Hydrological Review

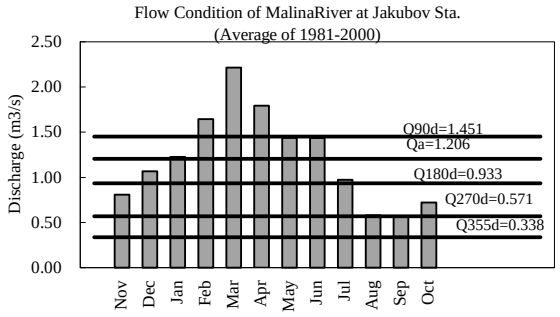
The Morava River, which has a total catchment area at the river mouth of 26,580 km^2, runs through three countries, i.e., Czech, Austria and Slovakia. The Morava River forms the border between Czech

and Slovakia from the confluence of the Dyje River to the northern end of Slovakia, and the border between Austria and Slovakia from the river mouth to the confluence of the Dyje River. Slovakia occupies 2,228 km^2 of the catchment that is equivalent to 8.6 % of the whole river basin. The basic hydrological characteristics of the whole Morava River Basin are summarized in Table B.8.5.

The river flow condition is characterized by N-year discharge and M-day discharge in Slovakia. The Morava River has a 100-year peak discharge of 1,500 m^3/s at the Moravsky Jan Station, which is one of the most important hydrological stations due to the separation of the backwater effect of the Danube River. The maximum recorded flow of 1,584 m^3/s occurred in 1941. The N-year probable peak discharge of the Morava River basin is summarized in Table B.8.6.







The monthly flow condition and M-day discharge of the Morava, the Rudava and the Malina River are shown to the left and in Table B.8.7. The Morava River has high values of discharge in March and April and the lowest period is from August to December. The high discharge period of the Morava River occurs simultaneously with the high discharge period of the internal tributaries, represented by the Rudava and Malina Rivers, which peak occurrs in March due to melting snow. This simultaneous outflow impedes the internal drainage of the basin through tributaries in the spring season due to the high water level of the Morava River. The water level of the Morava River from 1996/97 to 1999/2000 is shown in Figure B.8.4. Records show that periodically cruel floods occur in summer and winter caused by unusual heavy rain in the upper catchment of the Morava River, in addition to the regular high water period of spring.

The water balance character of the Morava River Basin is summarized in Table B.8.8. The run-off coefficient varies from 0.14 to 0.35 and the specific discharge (run-off unit yield) varies from 2.36 l/s/km^2 to 9.69 l/s/km^2. The high values of run-off coefficient and specific discharge appear in the northern part of the Basin and the low values appear in the southern part in general.

The specific discharges of peak flow at 2, 5 and 10-year frequency are calculated by estimating the N-year probable discharge of various profile points of the Basin, which are shown in Figure B.8.5.

(3) Water Management Balance

In Slovakia, the water balance of the river basins is monitored and managed by the State Water Management Balance (SWMB) organized by the SHMI. The SWMB is calculated by the monthly-based balance of the actual water exploitation. In SWMB, the real needs for water are evaluated with consideration of the maintenance of the minimal balance flow of water and the real status of the water sources in the evaluated year at the profiles. The balance status and exploitation possibility of water are evaluated monthly in two alternatives, i.e., the Balance Status (BSC and BSENP) and the Water Source Capacity (KZC and KZENP). BSC and KZC are evaluation by the condition of natural discharge and actual withdrawal and outlets, and BSENP and KZENP of influenced discharge (by water reservoirs or water transfers) and actual withdrawals and outlets. The evaluation of the flow discharge in time is made by comparison of monthly non influenced discharges with long term minimal monthly discharge (QMM) in the period of 1931-1980.

The balance status and water resources capacity are calculated as below;

BSC [the balance status of natural discharge] = C / MPP

Where, C [natural discharge] is defined as natural discharge without human influence, and MPP [minimum needed discharge] represents water demands of users with a guarantee of the minimum balance discharge.

BSENP [the influenced balance status] = ENP / MPP

Where, ENP [influenced discharge] is defined as discharge influenced only by reservoirs and water transfers.

KZC [the natural water source capacity] = C – MPP

KZENP [the influenced water source capacity] = ENP – MPP

The Influenced Balance Status (BSENP) and the Influenced Water Source Capacity (KZENP) of selected profiles of the Morava River Basin in 1999-2000 are shown in Fig.B.8.6. The most critical water balance status occurs in summer - autumn season . The minimum value of BSENP was 2.40 in the Morava River occurring in September 2000. Even though the year 2000 is evaluated as a drought year, the balance status (BSENP) had been “active”, of which definition is BSC or BSENP > 1.10. From the viewpoint of the water resources capacity, the Morava River had more than 21 m^3/s as minimum values, and 0.45m^3/s with BSENP 2.63 for the Rudava River and 0.90 m^3/s with BSENP 11.66 for the Malina River were observed.

(4) Flood Condition

In recent years, floods occurred frequently especially in the last 5 years. An extremely high flood occurred in July of 1997 and in June of 1999. The flood of 1997 was caused by the extremely large amount of rainfall in the upper catchment of the Morava River in the Czech territory and even the Slovak territory had heavy rainfall. The flood was unusual not only because of the high discharge values but also because of its duration. The maximum water levels occurred over two weeks without significant changes. This flood had catastrophic consequences in the Czech Republic where the protection dykes

were broken. The 1997 flood was evaluated to be more than 100-year frequency flood. On the other hand, the 1999 flood was mainly caused by the heavy rainfall in the lower Morava River basin and high outflow of the internal tributaries.

Monthly Precipitation in the Morava Basin

	1	2	3	4	5	6	7	8	9	10	11	12	Annual
1997	12,1 40%	22,7 68%	32,8 88%	36,9 90%	55,1 89%	68,8 93%	206,7 301%	30,0 53%	25,5 42%	22,4 60%	88,5 185%	35,0 76%	637 107%
1999	16,8 55%	65,3 194%	29,7 80%	67,3 164%	52,4 85%	153,3 208%	95,9 140%	49,1 87%	45,6 75%	18,3 49%	53,5 112%	43,6 94%	691 116%
Average of 1981-2000	30,5	33,7	37,1	41,1	61,9	73,6	68,7	56,4	60,6	37,4	47,9	46,3	595

Note: % shows the proportion against the average of 1981-2000.

B.8.3 GROUNDWATER

(1) Groundwater Level

The groundwater levels of selected points, i.e., Sekle, Gajary and Vysoka pri Morava, in the Study Area of recent 10 years are shown in Figure B.8.7. The groundwater of the lower Morava River Basin is said to have a 7 or 8 year period movement in general, and the year 1999 was considered to be the highest period. Groundwater level and river water level in the Hydraulic Year 1997/98 – 99/00 of Zahorska Ves are shown in Figure B.8.7. The high ground water occurs in March to May basically. However, the ground water along the Morava River course is strongly influenced by the river water level and the high groundwater level period depends on the river water level.

The groundwater depth in the year 1999 of the Morava River Basin is shown in Figure B.8.8. In accordance with the map, there are high groundwater areas along the Morava River, e.g. the lower reaches of the Rudava River and the Myjava River. Some of these areas had groundwater at less than 50 cm depth from ground surface , where negative effects to crop production by water logging are possible. Potential water logging areas are summarized below.

Possible Area A (influenced by the Morava River)
- 94 Vysoka Pri Morava (0.42m from ground surface in 1999)
- 2090 Zahorska Ves (0.37m from ground surface in 1999)

Possible Area B (influenced by the Morava River)
- 91 Gajary-Zapad (1.07m from ground surface in 1999)
- 21 Gajary (0.57m from ground surface in 1999)
- 2095 Gajary (0.96m from ground surface in 1999)

Possible Area C (influenced by the Morava River)
- 2016 Moravsky Svaty Jur (0.31m from ground surface in 1999)

Possible Area D (influenced by the Myjava River)
- 15 Borsky Jur (0.16m from ground surface in 1999)

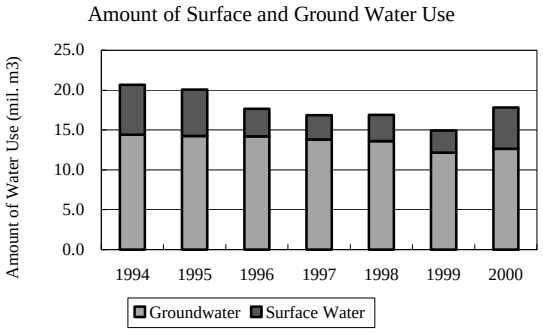
In fact, the effect of the shallow groundwater level is difficult to generalize because it impacts negatively in some case due to water logging and positively in other case due to abundant water supply from groundwater to crop roots. This will be examined in the succeeding study.

(2) Groundwater Balance Status

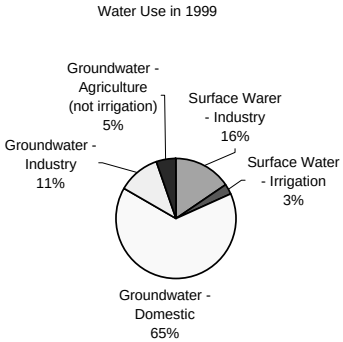
There are 142 groundwater balance units for quantitative evaluation in the whole of Slovakia, of which 12 units are included in the Morava River Basin. They are set up by SHMI, which is responsible for groundwater monitoring and management in Slovakia. The groundwater balance units are set up based on the Hydrogeological units. The groundwater balance units in the Morava River Basin are shown in Figure B.8.2 and the evaluation in 1995 is summarized in Table B.8.9. The balance status of groundwater in each balance unit is evaluated by five (5) categories from “good” to “emergency” according to the actual withdrawal and expected capacity. In general, the groundwater balance of the Basin is considered to be active and evaluated as “satisfied” to “good” except for a small area located in the northern part of the Basin.

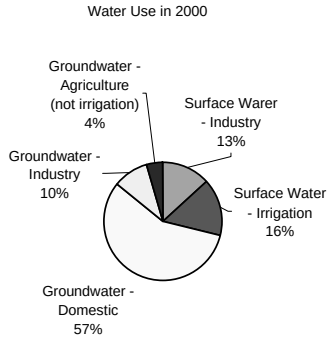
B.8.4 WATER USE

The total amount of water use of surface and groundwater resources in the Morava River Basin (Slovak territory) is summarized by resource and purpose in Table B.8.10. The total amount of water use varied from 12.6 million m^3 in 1999 to 17.4 million m^3 in 1994 and in the last 7 years there was a general trend of reduction in use. The total amount, especially of the surface water, is influenced by the fluctuation of the amount used for irrigation purposes, showing a wide variation year by year. Year 1998 and 1999 were evaluated as “very humid” or “extremely humid” years. Year 2000 was “normal” in annual precipitation but precipitation in the vegetation period (Apr to Sep) is evaluated as 10-year frequency drought, as mentioned in the Annex B.7 “Climate and Meteorology”. The amount of groundwater use is rather stable though with a reducing trend.



The surface water resource occupied 29% of total water use in the year 2000, and varied between 20% and 30% in the 7 years. The surface water source is used for industry and agricultural use and not used for domestic purposes. Irrigation occupied 10.5%, 14.9% and 53.7% of surface water use in the years 1998, 1999 and 2000, variation depending on climatic condition and irrigation requirements. The groundwater is mainly used for domestic purposes (more than 80%) and not used for irrigation.





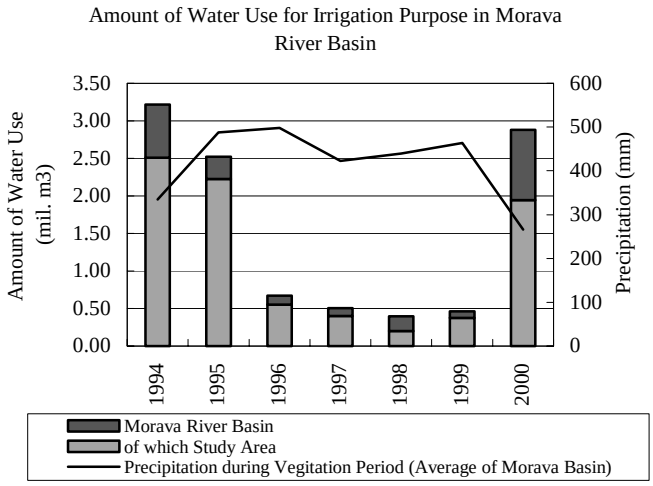
The number of water users for irrigation purposes in these 7 years is shown in the table below. Even though the number of registrations is increasing, the number of users who actually used water for irrigation does not increase. That is to say, even farming units who do not irrigate have water permission and that is increasing in these years. In year 2000, 34 water users were registered for irrigation purpose in the Morava Basin (24 in the Study Area), however only 12 of them took water and carried out irrigation in fact (7 users in the Study Area).

Number of Registered Water User for Irrigation Purpose and Actual User

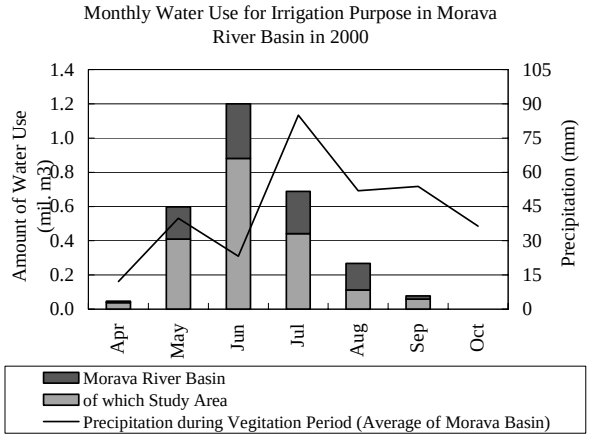
Year	Number of Registered Water User for Irrigation Purpose		of which acututally used water in the year	
	Morava Basin	within Study Area	Morava Basin	within Study Area
1994	17	9	16	9
1995	25	15	16	11
1996	25	15	12	8
1997	30	18	9	7
1998	30	18	9	4
1999	33	23	11	9
2000	34	24	12	7

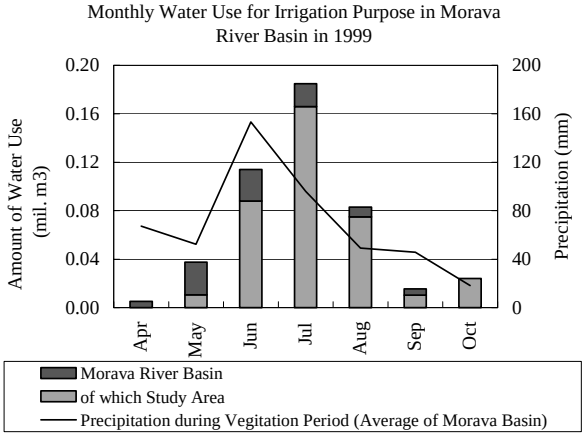
Source: Quantitative Water Management Balance Report (SVHB), SHMI

The total amount of water use for irrigation purpose in these 7 years is summarized in Table B.8.11. The water requirement for irrigation relies on climatic conditions, the water use after 1996 was significantly lower. There is the possibility that the change of farming practice especially in irrigation application would give some influence. In year 2000, the amount of irrigation use was 2.878 million m^3 in the Morava Basin and 1.944 million m^3 in the Study Area due to the drought conditions of that year.



The water for irrigation is used from April to September, and in some cases continued to October. Most of this is used in the 3 months of May to July or June to August, depending on the climatic conditions of the year.

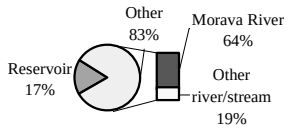




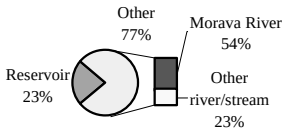
The water resources for irrigation purposes are summarized in Table B.8.12. The proportion of types or resources varies significantly under the influence of climatic condition. The importance of river and stream sources, especially the water directly from the Morava River, becomes high in drought conditions. The amount of water intake directly from the Morava River is shown in Table B.8.13.

Proportion of Water Resources for Irrigation Purpose in Year 2000

Morava River Basin



Study Area



B.8.5 WATER PERMISSION

The use of water resources is regulated by the Water Act 138/1973, which is the basic law for water management in Slovakia. The aim of the Water Act is to widely preserve water that can not be substituted over the whole of society, to plan its usage and other dealing with it, so that a balance between usage of water and the capacity of water resources is achieved. In the Water Act, the withdrawal of surface and ground water and their further use is regulated by requiring the permission from a water-management authority. The Slovakian Water Management Enterprise is the regulating agency at the moment, except for withdrawal of surface water for personal everyday needs. All water users who withdraw water in a quantity exceeding 15,000 m^3/year or 1,250 m^3/month, or use water power for electricity generation must pay certain charges for the water they use.

The water permissions of the Morava River basin are managed and maintained by the Branch Office Danube River Basin of SWME(SWME-PD). The Branch Office has responsibility for collecting charges in water management (the Water Charge) in addition to approving and issuing water permission. The water permission for internal tributaries of the Morava River running through Slovakian territory is simply approved and issued by the Branch Office, however, due to the status as a border river, the water permission of direct withdrawal from the Morava River requires rather a complicated process. To issue a water permission direct from the Morava River, approval from the International Commission on Border Water is required.

In the Morava Basin, 35 water permissions for irrigation purpose are given to around 24 thousand ha of cultivation as shown in Table B.8.14. (It is difficult to identify the portion of the Study Area due to the complicated location of intake and irrigation area.) The total discharge of water from permissions is 8.9 m^3/s, of which 6.1 m^3/s is directly from the Morava River. The largest water permission direct from the Morava River is the one for the canal system that runs from Holic to Zohor, which has a 1.70 m^3/s discharge using direct withdrawal by pump stations along the river. .

In comparison with the actual water use record mentioned in B.8.4, the number and value of permissions is rather large. There are some cases where the water permissions are no longer used, because of the break down of agricultural bodies or irrigation systems.

B.8.6 INDUSTRY AND TECHNOLOGY PARK IN ZAHORSKA

In the Study Area, an industrial development project, called the Industry and Technology Park in Zahorska (ITPZ), is planned in the center of the Zahosrka Lowland. The project is to be developed using the military area near the Plavecky Stvrtok. A significant influence of this development on the neighboring area is expected and the agriculture promoted by the Guidelines may be affected.

(1) Status of Project

The total area of ITPZ is planned to be 1,320ha and 6 towns/villages, i.e., Malacky, Lozorno, Zohor, Plavecky Stvrtok, Jablonove are expected to be related to the project. The project itself is under examination and the final plan is not yet decided. Due to the fact that the scale and location of ITPZ have not been finally decided and the invited companies or type of business are not clear, the detailed plan, including water use and water resources plan, drainage plan, drainage treatment plan, etc. of ITPZ has not been completed at the moment.

In accordance with the Environmental Impact Assessment report of the project on February 2002, the project period is 10 ~ 15 years. The first phase of the project is planned to start on March 2003 and it is expected to be completed on December 2005, and the total investment is expected to be 51～59 billion SKK.

(2) Expected Influence to Regional Agriculture and Water Management

Even the detailed plan of the ITPZ is unclear and it is difficult to assess its influence, it is important to note the possible influence to the regional agriculture and water management.

1) Water use

Even the detailed water use plan has not yet been established as mentioned above, however, 18,000 employees, 4,750 newly constructed residences, and hotel accommodation of 250 beds are expected for the ITPZ.The daily domestic water use of 26 liter/sec on average and 36.4 liter/sec in peak times are expected. Existing public water lines, which use groundwater, are planned to be used for satisfying the demand by constructing 2 new service reservoirs of 5,000 m^3 capacity each. Because groundwater is expected to be the water resource of ITPZ and there is no mention of development and use of surface water in the project, it is not expected to significantly influence regional agriculture such as creating conflicts of water resources between ITPZ and irrigation. However, because of the large water demand for industry, depending on the type of industry introduced , it is necessary to evaluate the influence on agricultural water use when the detailed plan of the ITPZ is ready.

2) Drainage

The most probable location of the ITPZ is in the military forest area eastward of Plavecky Stvrtok, located in the river basin of the Malina River. The possible ITPZ site is divided into micro basins as shown in the table below. In general, the site consists of the northern part which drains to the middle of the Malina River at km 23.2 through Balazov creek and Tancibok creek and the southern part which drains to the lower part of the Malina River at km 9.8 and km 8.0 though Oliva river, Macianska river and Sichy creek. 77 % of the site is included in the southern part, which drains to the lower part of the Malina River.

Composition of Micro-basin of ITPZ Area (Variant-1 and 2)

Part	Micro-basin	Canal / stream	Main Drainage	Confuluence	Area (ha)	Proportion
Northern Part	4-17-02-77	Balazov creek	Marina river	km23.2	85	6%
	4-17-02-82	Tancibocky creek	Marina river	km23.2	215	16%
Subtotal					300	23%
Southren Part	4-17-02-87	Oliva river	Marina river	km9.8	390	30%
	4-17-02-86	Mociarka river	Marina river	km9.8	595	45%
	4-17-02-90	Sucky creek	Marina river	km8.0	35	3%
Subtotal					1,020	77%
Total					1,320	100%

Contamination of river water by the industrial park is possible caused by industrial liquid waste and domestic drainage from the concentration of population. Even though the influence by industrial liquid waste is not clear because of the industrial type and scale is not decided at the moment, it is indispensable to prepare proper treatment facilities by the ITPZ for industrial liquid waste and for surface drainage contaminated by oil or other materials, because there is only waste water treatment plants for domestic drainage around the site. In addition, the existing domestic drainage treatment plants around the site do not have enough capacity to cope with the increase of population and it is necessary to enlarge them. The Malina River and its small tributaries have low run off in the drought season as shown in the table below and they are sensitive to the contamination caused by the industrial development. It is necessary to monitor their condition after starting operation of the ITPZ.

Flow Condition of River and Stream Receiving Drainage of ITPZ

River / stream	Locatin	Catchment area (km^2)	Average M-days dischare (m^3/s)					
			30	90	180	270	330	355
Malina river	Jakubov	171.5	1.73	0.86	0.55	0.35	0.24	0.18
Mociarka river	Lab	47.1	0.32	0.20	0.13	0.09	0.07	0.06
Oliva river	Lab	19.5	0.22	0.16	0.13	0.10	0.07	0.06
Suchy creek	Zohor	40.2	0.32	0.14	0.07	0.03	0.02	0.01

The irrigation area taking water from the Malina River is identified as agricultural land possibly influenced by the contamination of the river water. The irrigation systems possibly influenced by the drainage from ITPZ are the ZD DNV-Stupava II CS4, taking water by the Pump No.5 at the km 1.5 of the Malina River, the ZD DNV-Stupava II CS4A using the Pump No.5 and boosted by the Pump No.6, and the ZK Jakubov taking water by the Pump No.10 at the km 21.7 of the Malina River, as shown in Figure B.8.9. The planned irrigation area and current location of the facilities are shown in the table below. These irrigation systems have not been used in recent years due to superannuation and

malfunctioning. The facility of the Pump No.10 was assessed to be Category III, defined as facilities that have not been used for a long time and there is much equipment to be renewed, and the Pump No.5 and No.6 were assessed to be Category IV, meaning that the main equipment and the pump station area lost or severely damaged. Both of systems do not have the recovery plan at present, and it is necessary to consider the water quality of the Malina River for future use of irrigation.

Irrigation Systems Possibly Effected by Drainage of ITPZ

System	Pump station	Intake location	Pump capacity (l/s)	Planned irrigation area (ha)	Actual use	Facility condition	Remarks
ZD DNV-Stupava II	P.5	km 1.5 of Malina river	300	559	no use in 2001	Category IV	
ZD DNV-Stupava II	P.6	connected to P.5	200	110	no use in 2001	Category IV	Booster pump connected to P.6
ZK Jakubov	P.10	km 21.7 of Malina river	42	100	no use in 2001	Category III	
Total				769			

3) Socio-economic Conditions

If it is decided to locate the site of ITPZ in the military forest area as the 1st alternative, the loss of farming land will not be severe. However, there is the possibility of reduction of the agricultural labor force and the rise of labor wages due to the competition between the agricultural sector and industrial sector.

(3) Necessity for Continuous Monitoring

The water quality of the Malina River is monitored by SHMI and SWME-PD at the Jakubov (km19.6) and Zohor (km4.2) and the data has been accumulated. However, its tributaries and creeks which are directly influenced by the drainage of ITPZ are not monitored. The facilities, industries and housing will be designed and constructed according to the code concerning the environment and it is not expected to cause significant environmental pollution in the short term. Even so, enhancement of the monitoring network of those small tributaries and creeks and continuous monitoring are still important to prevent negative effects on the regional agriculture and water management.

(4) Conclusion

The extension or degree of influence of ITPZ development to the regional agriculture and water management cannot be discussed in detail because the plan itself is not clear at present. The influence needs to be studied and assessed in detail when the plan of ITPZ is finalised.

Table B.8.1 Summary of the Lower Morava River System

River Basin	River Basin (km^2)	Length of Stream (km)	Remarks	Micro-basin	Number of Micro-baisn
In accordance with Water Management Map					
Lower Morava River Baisn	2,227.6	107.1	Only Slovakian territory		
1.Chvojnica Sub-basin	231.336			4-13-02-63~69, 77~91, 94~98	27
1.1 Radejovka	55.211		Including 19.251 km^2 of CR territory	4-13-02-63~69	7
1.2 Chvojnica River	125.441	32.8		4-13-02-77~91	15
1.3 Uninsky Stream	50.684	16.3		4-13-02-94~98	5
2.Myjava Sub-basin	745.337	78.5		4-13-03~85	85
2.1 Myjava Mainstream	389.467	78.5	Including 20.874 km^2 of CR territory	4-13-03~13, 25~31, 47, 51~63, 73~85	47
2.2 Stara Myjava River	62.251	9.0		4-13-03-64~72	9
2.3 Teplica River	152.837	30.0	Including 20.420 km^2 of CR territory	4-13-03-32~46	15
2.4 Myjava Rudova	54.652	14.0		4-13-03-48~50	3
2.5 Bresovsky Stream	86.130	19.7		4-13-03-14~24	11
3. Lower Morava Sub-basin	1310.936				210
3.1 Rudava River	417.741	45.9		4-17-02-09~41	33
3.1.1 Rudava Mainstream	229.653	45.9		4-17-02-09~19, 29~33, 41	17
3.1.2 Raksarsky Stream	113.857	23.8		4-17-02-34~40	7
3.1.3 Rudavka River	74.231	12.8		4-17-02-20~28	9
3.2 Malina River	740.938			4-17-02-53~100	48
3.2.1 Drainage System	342.191			4-17-02-53~69	17
1) Zohorsky Canal	118.553	31.3		4-17-02-65~69	5
2) Malolevasky Canal	51.924	15.2		4-17-02-64	1
3) Kuty-Brodske Brodstiansky Ca	74.321	13.0		4-17-02-61~63	3
4) Tordonice-Holic Canal	56.169	12.2		4-17-02-56~60	5
5) Kopciansky Canal	41.224	11.5		4-17-02-53~55	3
3.2.2 Malina Mainstream	276.005	47.5		4-17-02-70~83, 89~94, 100	21
3.2.3 Srpavsky Stream	52.494	25.2		4-17-02-95~99	5
3.2.4 Mociarka River	70.248	13.5		4-17-02-84~88	5
3.3 Mlaka River	63.817	11.5		4-17-02-102~114	13
3.4 Morava River Direct	88.440	-		4-13-03-86, 4-17-02-1, 3~6, 8, 42, 44, 46, 48~52, 101, 115, 117	18

Source: Water Management Map of the Morava River Basin, 1997

Table B.8.2 Present Condition of River Improivement in the Morava River Basin

Hydrological number / River	Distance (rkm)	River training			Embankment	
		Length (km)	Discharge capacity (m^3/s)	Design discharge Qn (m^3/s)	Left bank (rkm)	Right bank (rkm)
4-13-02	0.000 ~ 7.230	7.23	70	$Q_n > Q_{100} = 37.00$	0.000 ~ 3.100	
Chvojnica River						
4-13-02	1.000 ~ 2.465	0.665	25	$Q_n = Q_{100} = 25.0$	0.000 ~ 1.984	
Zlatnicky Creek	2.465 ~ 3.435	0.97	25	$Q_n = Q_{100} = 25.0$		
(Skalický Creek)	3.435 ~ 3.641	0.206	25	$Q_n = Q_{100} = 25.0$		
4-13-03	0.468 ~13.731	13.271	155	$Q_n = Q_{100} = 155.0$	0.460 ~ 12.430	0.460 ~ 12.430
Myjava River	13.731 ~ 26.361	12.55	145	$Q_n = Q_{100} = 145.0$		
	26.281 ~ 27.611	1.338	120	$Q_n = Q_{100} = 120.0$		
	27.611 ~ 28.040	0.429	88	$Q_n = Q_{20} = 60.0$		
	28.040 ~ 34.020	5.98	65	$Q_n = Q_{20} = 65.0$		
	34.020 ~ 38.435	4.415	55	$Q_n = Q_{20} = 55.0$		
4-13-03	61.900 ~ 62.700	0.8				
Myjava River	65.700 ~ 67.900	2.2	52.8			
	68.200 ~ 68.790	0.59	50			
	73.881 ~ 74.100	0.219	17.5	$Q_n = Q_{20} = 17.5$		
	74.421 ~ 75.060		11	$Q_n = Q_{20} = 11.0$		
	75.396 ~ 75.524		6.1			
4-13-13	4.445 ~ 5.395	0.95	44	$Q_n = Q_{100} = 44.0$		
Brezovsky Creek	5.395 ~ 7.932	2.537	28	$Q_n = Q_{20} = 20.0$		
	7.932 ~ 11.400	3.468				
4-17-03	0.000 ~ 4.450	4.45	65	$Q_n = Q_{100} = 65.8$		
Teplica River	4.450 ~ 4.727	0.277	852.2	$Q_n = Q_{100} = 52.2$		
(Vrbovcianka)	4.727 ~ 5.110	0.383	52.2	$Q_n = Q_{100} = 52.2$		
	5.110 ~ 6455	1.345	52.2	$Q_n = Q_{100} = 52.2$		
	8.306 ~ 8.759	0.453	75	$Q_n > Q_{100}$		
	12.100 ~ 12.600	0.5				
	17.000 ~ 25.800	8				
4-17-02	0.000 ~ 5.571	5.571	66	$Q_n > Q_{100} = 37.0$	0.780 ~ 5.571	0.780 ~ 5.571
Rudava River	5.571 ~ 9.953	4.382	66	$Q_n > Q_{100} = 32.0$	5.571 ~ 6.825	5.571 ~ 6.825
	24.670 ~ 32.445	7.775	32 ~ 42	$Q_n > Q_{100} = 28.0$		
	32.445 ~ 35.098	2.653				
	35.098 ~ 37.225	2.127				
	24.900 ~ 30.118	5.218				
4-17-02	0.000 ~ 9.414	9.414	16	$Q_n = Q_{100} = 16.0$		
Laksarsky Creek						
4-17-02	0.000 ~ 0.620	0.62	11.8		0.0 ~ 0.620	0.0 ~ 0.620
Porec Creek						
4-17-02	0.000 ~ 3.220	3.22				
Hrudky Creek	5.870 ~ 6.200	0.33				
(Hanspil Creek)						
4-17-02	0.93 ~ 5.0	4.07	80 ~ 89	$Q_n > Q_{100} = 40.0$	1.7 ~ 22.4	0.93 ~ 22.4
Malina River	5.0 ~ 10.2	5.2	56 ~ 59	$Q_n > Q_{100} = 30.0$		
	10.2 ~ 19.7	9.5	36	$Q_n > Q_{100} = 25.0$		
	19.7 ~ 24.6	4.9	36			
	24.6 ~ 30.0	5.4	21			
4-17-02	0.0 ~ 1.055	1.055			0.0 ~ 0.63	0.0 ~ 0.63
Stupavsky Creek	4.081 ~ 6.400	2.319				
4-17-02	0.00 ~ 67.150	67.15	420 ~ 440	$Q_n = Q_1 = 420 \sim 440$	0.0 ~ 33.2	
Morava River				$Q_n = Q_1 = 440$	33.2 ~ 52.0	
	67.150 ~ 70.300	3.15	440	$Q_n = Q_{30d} = 167$l.b.	0.0 ~ 5.750	
	70.300 ~ 74.507	4.207	167	$Q_n = {}_{Q1} = 440$ l.b.	78.7	
				Qn = Q100 = 681	78.700 ~ 97.05	
	74.507 ~ 76.313	1.806	440	Qn = Q100 = 675	0	
				Qn = Q100 = 725	0.0 ~ 10.880	
	76.313 ~ 88.880	12.567	681	Qn = Q100 = 770		
	88.880 ~ 89.500	0.62	675		in total 81.98	
	89.500 ~ 92.772	3.272	725			
	92.772 ~ 107.00	14.228	770			

Source: Water Management Plan of Morava River Basin, 1997

Table B.8.3 Inventory of Major Water Structures in the Morava River Basin

River / distance	Name	Construction year	Purpose of facility	Dimensions
Morava River				
Km 74.116	Kuty submerged dam	1982	To optimize ground water regime and stabilize river bed	Length: 43.34m, width: 2.53m, height: 1.47m (149.60-148.22)
Km 76.916	Lanzhot weir	1980	To optimize ground water level for surrounding forest area and stabilize river bed	Automatic movable weir by water level, length: 30.0m X 2, width: 50m, height: 1.20m (151.09-149.89)
Km 79.500	Brodske roughnened skid	1976	To optimize ground water level for surrounding forest area and stabilize river bed	Length: 52.80m, width: 28.10m (slope of skid is 1:5), stone roughen cast with sheet pile, height: 1.55m (152.79-149.69)
Km 85.385	Drainage Syphone of Tvrdonice-Holic canal	1976	To stabilize river bed, to optimize groundwater level, to divert water to the Tvrdonice-Holic canal	Length: 65.5m, edge slope: 1:2.5~3.0, width: 6.2m Intake of T-H canal: diameter 210cm X 250cm X 2pcs, capacity: 8m^3/s, water is taken at discharge of the Morava River is Q_{120d}(=58m^3/s) or more
Km 89.500	Culvert		Culvert taking flood water into the retarding area in the right bank of the Morava River	Right bank of the Morava river (confirmation is necessary), 250cm X 250cm, maximum capacity is 45m^3/s
Km 92.750	Kopcany weir	1974	To optimize groundwater level, to stabilize river bed, Backwatering for water intake	Length of spillway: 64.0m, height: 1.50m (158.11-156.61)
Km 101.794 (km 115.132 in old map)	Hodonin weir and hydroelectric plant	1951	To stabilize water flow of the Morava River, to secure water for thermal power plant in Hodonin, for hydroelectric generation, to control groundwater level, other water intakes	Movable gate 15m X 3=45.0m, V=862,000m^3 Hydroelectric genration 1.92MW capacity at 7m3/s, design height: 3.60m
Km 101.814	Upper Mestskeho Culvert		To supply water to the Hodonin thermal power plant	Right bank of the Morava River Capacity: 10m^3/s, 300cm X 200cm X 3pcs
Km 102.172	Upper Novomlynskeho		To take water into the Kopcianskeho Canal	250cm X 180~100cm X 2 Q=1.5m^3/s (limited by the international agreement
Chvojnica River				
	2 submergible dams in the distance km 0.00 to km3.10		To control longitudinal profile and to stabilize river bed	
	3 submergible dams in the distance km 3.10 to km 7.25		To control longitudinal profile and to stabilize river bed	
Myjava River				
Km 5.727 (km 6.300 in old map)	Kuklov weir		Taking water to the left bank: for irrigation, the right bank: into the Kutskeho nahonu	Movable weir, check gate with 6.2m X 3pcs, controlled height: 2.1m, manual operated
Km12.430 (km 12.880 in old map)	Sastin Straze weir		To supply water for domestic use of Cary and Kuklov village and irrigation	Flap gate with 16.5m width, controlling height 1.95m Diverting water to Carskeho nahonu, max. capacity: 1.66m^3/s (actural amount of water to Carskeho nahonu is not over 0.5m^3)
Km 23.147 (km23.647 in old map)	Dojc weir	1990		Inflatable gate (rubber dam) with 19.2m length and 0.75m height 0.1m^3/s for Stara Myjava, DN400 X 331m X 3pcs
Km 28.020 (km 28.400 in old map)	Cacov weir		Supply water to a chemical company, Slovansky hodvab in Senica by pumping	Inflatable gate (rubber dam) with 8.8m length and 0.70m Water right for the company is 0.1m^3/s
Km 8.753 (km 9.350 in old map)	Siphon of Carskim Creek (Carske Kopanke)		To transmit water from Carske Kopanke in right bank of the Myjava River to Kuklovske Kopanke in the left bank	
Teplica River				
km 5.455	Weir			Spillway: 3.0m X 3, height 2.1m
km 12.200	Weir with check gate			Check gate: 1.5m X 2, height 0.8m
Rudava River				
km 32.820	Intake work			Connecting canal 530m, discharge 0.098m^3/s at depth on the spillway 10cm Intake: DN800mm, capacity 0.433m3/s
Km 10.798	Dividing work		To take water from Rudava River to Velkolevarskeho nahonu	Qmax=3.0m^3/s, Qpermanent=1.3m^3/s
Malina River				
Km 28.670	Weir		For industrial use	H=1.10m, capacity=21m^3/s
Km 24.621	Jakubov weir		Supply water to Jakubovskych rybnikov	Movable weir, Q=26m^3/s Check gate: 3.0m width X 2oces

Source: Water Management Plan of Morava River Basin, 1997

Table B.8.4 (1) Inventory of Large Scale Water Reservoirs (Volume over 1 million m^3) in the Morava River Baisn

No.	Hydro-logical number	Name of reservoir	River /distance	District	Main purposes	Year of launch	Hydrological characteristics	Volumes in mil. m3 and ponding area (at overall retention) in ha		Note
1.	4-13-03-039	Kunov	Teplica km 9.650	Senica	Flood control Irrigation Industry Recreation A	1965	F = 23.73 km^2 Q_a = 0.592 m^3 /s Q_{355d} = 0.034 m^3/s Q_{100y} =50.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.530 2.170 2.700 3.140 63.3	Passed handly order Oct 22nd 1993
2.	4-17-02-012	Bukova (Hanspíl)	Hrudky km 6.850	Trnava Senica	Irrigation Recreation Industry	1967	F =10.83 km^2 Q_a = 0.075 m^3/s Q_{355d} = 0.01 m^3/s Q_{100y}= 20 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.050 1.185 1.235 1.420 40.5	Passed handly order Dec 18 1991
3.	4-17-02-090	Lozorno II	Suchy creek + Zahorsky creek km 8.500	Malacky	Irrigation Industry	1985	F = 18.90 km^2 Q_a = 0.110 m^3/s Q_{355d} = 0.013 m^3/s Q_{100y} = 8 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.241 1.670 1.911 2.051 34.7	Passed handly order June 5, 1995
SUMMARY OF LARGE SCALE RESOURVOIR								Effective capacity Overall capacity Ponding area	5.025 6.611 138.5	

Table B.8.4 (2) Inventory of Small Scale Water Reservoirs (Volume upto 1 million m^3) in the Morava River Baisn

No.	Hydro-logical number	Name of reservoir	River /distance	District	Main purposes	Year of launch	Hydrological characteristics	Volumes in mil. m3 and ponding area (at overall retention) in ha		Note
1.	4-13-02-063	Kostonica	Sudomericky Creek	Skalica	Irrigation	1969	F=18.25 km^2 Q_a = 0.080 m^3/s $Q_{355d=}$ 0.005 m^3/s Q_{100y}=32.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.023 0.160 0.183 0.224 7.2	Volume of the store space in the over-damming area is increased to 180,000m^3
2.	4-13-02-080	Radosovce pond	Chropov-sky Creek	Skalica	Irrigation	1965	F =9.9 km^2 Q_a = 0.05 m^3/s Q_{100y}= 17.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.023 0.023 0.034 2.6	
3.	4-13-02-084/085	Radosovce	Kovalovsky Creek	Skalica	Irrigation	1973	F = 13.6 km^2 Q_a = 0.0664 m^3/s Q_{355d} = 0.070 m^3/s Q_{100y} =17.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.030 0.730 0.760 0.830 16.5	Passed handly order June 5, 1985
4.	4-13-02-090	Prietrzka	Rubanisko creek	Skalica	Irrigation	1990	F = 4.5 km^2 Q_a = 0.005 m^3/s Q_{355d} = 0.003 m^3/s Q_{100y} = 10.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.005 0.110 0.115 0.131 3.12	
5.	4-13-02-097	Unin /Petrova Ves/	Uninsky creek	Skalica	Irriagtion Recreation	1967	F = 34.0 km^2 Q_a = 0.120 m^3/s Q_{355d} = 0.045 m^3/s Q_{100y} = 30.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.106 0.660 0.766 0.940 43.9	Passed handly order June 13, 1989
6.	4-13-03-001	Stara Myjava	Myjava Km 74.300	Myjava	Recreation Flood contraol Industry	1970	F = 6.13 km^2 Q_a = 0.05 m^3/s Q_{355d} = 0.01 m^3/s Q_{100y} = 25.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.011 0.045 0.055 0.069 2.4	Passed handly order April 5, 1993
7.	4-13-03-002	Brestovec	Myjava Km 73.750	Myjava	Irrigation	1993	F = 17.85 km^2 Q_a = 0.150 m^3/s Q_{100y} = 38.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.001 0.342 0.343 0.405 10.92	Passed handly order February 5, 1996
8.	4-13-03-003	Myjava /Arm./	Myjava Km 67.900	Myjava	A Flood control	1964	F = 32.20 km^2 Q_a = 0.315 m^3/s Q_{355d} = 0.026 m^3/s Q_{100y} = 25.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.008 0.051 0.059 0.079 2.7	Passed handly order October 14, 1993

No.	Hydro-logical number	Name of reservoir	River /distance	District	Main purposes	Year of launch	Hydrological characteristics	Volumes in mil. m3 and ponding area (at overall retention) in ha		Note
9.	4-13-03-013	Osuske	Bedernicky Km 0.337	Senica	Irrigation	1977	F = 3.5 km^2 Q_a = 0.015 m^3/s Q_{355d} = 0.001 m^3/s Q_{100y} = 10.5 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.011 0.226 0.236 0.261 5.8	Passed handly order February 12, 1986
10.	4-13-03-19	Brezova	Bystrina	Myjava	Irrigation	1985	F = 5.31 km^2 Q_a = 0.035 m^3/s Q_{355d} = 0.003 m^3/s Q_{100y} = 15.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.0112 0.280 0.291 0.339 8.024	
11.	4-13-03-26	Jablonica	Zrubansky Km 1.100	Senica	Irrigation	1978	F = 6.23 km^2 Q_a = 0.030 m^3/s Q_{355d} = 0.002 m^3/s Q_{100y} = 14.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.005 0.345 0.350 0.382 8.4	Passed handly order May 14, 1998
12.	4-13-03-028	Hlboke	Babensky Km 4.750	Senica	Irrigation	1968	F = 2.87 km^2 Q_{100y} = 3.2 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	 0.004 0.6	
13.	4-13-03-054	Vrbovce	Zapasevnik Km 1.350	Myjava	Irrigation	1964	F = 3.2 km^2 Q_a = 0.061 m^3/s Q_{355d} = 0.0012 m^3/s Q_{100y} = 32.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	 0.033 1.0	
14.	4-13-03-054	Kovalov	Kovalovsky	Senica	Irrigation	1970	F = 17.38 km^2 Q_a = 0.050 m^3/s Q_{355d} = 0.003 m^3/s Q_{100y} = 24.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	 10.6	
15.	4-13-03-081	Smolinske	Smolinsky Km 5.600	Senica	Irrigation	1965	F = 6.55 km^2 Q_a = 0.025 m^3/s Q_{355d} = 0.003 m^3/s Q_{100y} = 6.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.003 0.020 0.022 0.032 2.7	
16.	4-17-02-021	Vyvrat /Rohoznik/	Vyvrat Km 3.100	Malacky	Irrigation Recreation C	1967	F = 10.55 km^2 Q_a = 0.070 m^3/s Q_{355d} = 0.0008 m^3/s Q_{100y} = 6.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	 0.296 0.296 0.344 11.1	
17.	4-17-02-037	Dolna Studena voda /Tomky I./	Studena voda km 4.100	Senica	Irrigation Recreation C	1964	F = 33.9 km^2 Q_a = 0.080 m^3/s Q_{355d} = 0.006 m^3/s Q_{100y} = 8.5 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.036 0.124 0.160 0.195 16.5	
18.	4-17-02-037	Horna Studena voda /Tomky II./	Studena voda Km 3.500	Senica	Irrigation Recreation C	1963	F = 30.46 km^2 Q_a = 0.074 m^3/s Q_{355d} = 0.006 m^3/s Q_{100dy} = 8.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	 0.430 0.430 0.490 28.7	
19.	0-17-02-070	Kuchyna	Kuchynska Malina Km 4.350	Malacky	Irrigation Recreation C	1985	F = 14.63 km^2 Q_a = 0.160 m^3/s Q_{355d} = 0.025 m^3/s Q_{100y} = 7.3 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.025 0.410 0.435 0.485 12.3	
20.	0-17-02-090	Lipniky – Hrube Lipniky	Suchy potok Km 13.500	Malacky	Irrigation	1967	F = 6.0 km^2 Q_a = 0.4 m^3/s Q_{355d} = 0.003 m^3/s Q_{100y} = 5.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.0192 0.0184 0.0376 0.0426 1.237	
21.	4-17-03-012	Prietrz	Pasecky Km 0.700 /Dankacky/	Senica	Irrigation	1981	F = 14.72 km^2 Q_a = 0.060 m^3/s Q_{355d} = 0.007 m^3/s Q_{100y} = 23.0 m^3/s	Dead capacity Effective capacity Total capacity Overall capcity Ponding area	0.025 0.336 0.361 0.403 8.47	Passed handly order March 3 rd, 1984
SUMMARY OF SMALL SCALE RESOURVOIR								Effective capacity Overall capacity Ponding area	4.606 5.723 204.7	
SUMMARY								Effective capacity Overall capacity Ponding area	9.631 12.334 343.2	

Source: Water Management Plan of Morava River Basin, 1997

Table B.8.5 Basic Hydrological Caharacteristics of the Morava River Basin

River Basin	Watershed area (km^2)	Mean annual discharge* (m^3/s)	Runoff unit-yield* ($l/s/km^2$)
Slovakian terriroty			
Chvoinica	125.4	0.640	5.10
Myjava	745.1	3.044	4.09
Myjava-Jablonica	238.5	1.340	5.62
Teplica	154.2	0.600	3.89
Rudava	417.7	1.861	4.46
Malina	516.6	1.804	3.49
Morava-Brodske	9,821.9	60.391	6.15
Morava downstream of Dyje Confluence	24,109.5	111.838	4.64
Morava upstream of Maina Confluence	25,794.5	116.265	4.51
Morava-DNV	26,580.0	118.664	4.46
Czech territory			
Morava-Straznice	9,146.9	58.16	6.36
Radejovka	124.4	0.45	3.62
Velicka	186.2	0.92	4.91
Kyjovka	680.9	1.01	1.48
Dyje	12,276.8	41.66	3.39
Austrian territory			
Zaya	627.5	-	-
Waiden	359.5	-	-

Note: * - Average of 1931-1980

Source: SVHB, Concept for Surface and Groundwatermentin the Border Region, ATA, 1998

Table B.8.6 N-year Probable Peak Disharge

River/stream	Station/profile	Catchment Area (km^2)	N-year (m^3/s)						
			1	2	5	10	20	50	100
CHVOJNICA	Lopasov	31.13	3.0	5.0	8.0	10.0	13.0	17.0	20.0
CHVOJNICA	Rivermouth	125.45	8.0	12.0	18.0	22.0	27.0	33.0	37.0
MYJAVA	Myjava	33.09	2.0	4.0	8.0	12.0	17.0	24.0	30.0
MYJAVA	Jablonica	238.43	8.0	13.0	23.0	33.0	44.0	60.0	73.0
TEPLICA	Sobotiste	85.58	2.0	5.0	11.0	17.0	24.0	36.0	47.0
TEPLICA	Rivermouth	129.78	3.0	6.0	14.0	21.0	30.0	44.0	56.0
MYJAVA	Dojc	497.56	16.0	24.0	38.0	50.0	64.0	83.0	99.0
MYJAVA	Sastin Straze	644.89	20.0	30.0	45.0	58.0	72.0	90.0	105.0
MYJAVA	Rivermouth	745.12	23.0	34.0	50.0	63.0	77.0	95.0	110.0
MORAVA	Moravsky Jan	24,129	440	600	840	1000	1150	1350	1500
RUDAVA	Unpstream of Rudavka	161.89	4.0	6.0	9.0	12.0	15.0	20.0	24.0
RUDAVA	Downstream of Rudavka	236.09	5.0	8.0	12.0	15.0	19.0	24.0	28.0
RUDAVA	Velke Levare	303.8	7.0	10.0	15.0	19.0	23.0	28.0	32.0
LAKSARSKY	Rivermouth	113.86	1.5	2.5	4.0	6.0	8.0	12.0	16.0
RUDAVA	Rivermouth	417.74	8.0	11.0	17.0	21.0	26.0	32.0	37.0
MALINA	Upstream of Mociarka	185.96	3.5	5.5	9.0	12.0	16.0	21.0	25.0
MALINA	Rivermouth	516.6	7.0	11.0	17.0	22.0	27.0	34.0	40.0
MOCIARKA	Rivermouth	86.92	1.5	2.5	4.0	5.0	6.5	9.0	11.0
MORAVA	Rivermouth	26,580	420	570	770	900	1030	1200	1320

Source: Water Management Plan, SWME Danube River Basin Branch Office, 1997

Table B.8.7 Average Discharge and M-day Discharge of the Morava River Basin (Comparing average of 1931-80 and average of 1981-2000)

				Average Monthly Discharge												M-day Discharge						
River/stream	Station/profile	Item	Q_a	XI	XII	I	II	III	IV	V	VI	VII	VIII	IX	X	30	90	180	270	330	355	364
CHVOJNICA	Lopasov	1931-1980	0.220	0.115	0.200	0.284	0.394	0.482	0.492	0.253	0.137	0.131	0.078	0.025	0.061	0.611	0.257	0.094	0.017	0.005	0.003	0.002
		1981-2000	0.147	0.064	0.119	0.214	0.243	0.334	0.247	0.164	0.124	0.115	0.054	0.027	0.056	0.346	0.176	0.076	0.029	0.014	0.009	0.009
		Difference %	-33.2%	-44.3%	-40.3%	-24.5%	-38.4%	-30.7%	-49.7%	-35.0%	-9.3%	-11.9%	-31.3%	6.1%	-7.7%	-43.4%	-31.5%	-19.0%	71.8%	173.0%	208.3%	325.0%
MYJAVA	Myjava	1931-1980	0.320	0.225	0.320	0.380	0.600	0.720	0.600	0.350	0.225	0.150	0.105	0.085	0.105	0.758	0.369	0.160	0.065	0.035	0.026	0.018
		1981-2000	0.289	0.171	0.243	0.309	0.423	0.660	0.482	0.315	0.280	0.243	0.122	0.098	0.121	0.711	0.354	0.174	0.096	0.053	0.042	0.035
		Difference %	-9.7%	-24.0%	-24.1%	-18.8%	-29.5%	-8.4%	-19.6%	-9.9%	24.4%	61.8%	15.9%	15.8%	15.5%	-6.2%	-4.2%	8.6%	48.0%	50.0%	59.8%	91.9%
MYJAVA	Jablonica	1931-1980	1.340	1.258	1.293	1.233	1.857	2.528	1.775	1.409	1.301	1.194	0.861	0.708	0.697	3.157	1.660	0.914	0.545	0.328	0.216	0.119
		1981-2000	1.206	0.808	1.067	1.226	1.646	2.215	1.794	1.439	1.437	0.973	0.581	0.566	0.721	2.467	1.451	0.933	0.571	0.398	0.338	0.300
		Difference %	-10.0%	-35.8%	-17.5%	-0.6%	-11.4%	-12.4%	1.1%	2.1%	10.4%	-18.5%	-32.6%	-20.1%	3.5%	-21.9%	-12.6%	2.1%	4.8%	21.4%	56.4%	151.9%
TEPLICA	Sobotiste	1931-1980	0.460	0.270	0.445	0.670	0.900	0.845	0.750	0.540	0.395	0.225	0.210	0.130	0.170	1.247	0.612	0.230	0.089	0.065	0.033	0.016
		1981-2000	0.460	0.295	0.334	0.470	0.686	1.036	0.782	0.540	0.393	0.418	0.154	0.171	0.241	1.023	0.550	0.274	0.125	0.081	0.059	0.050
		Difference %	0.0%	9.2%	-24.9%	-29.9%	-23.7%	22.6%	4.3%	0.0%	-0.4%	85.8%	-26.6%	31.9%	42.0%	-18.0%	-10.2%	19.2%	40.7%	24.1%	80.2%	212.2%
MYJAVA	Sastin Straze	1931-1980	2.750	2.320	2.660	2.940	4.250	5.160	3.880	2.990	2.590	2.150	1.630	1.270	1.320	6.600	3.438	1.815	1.045	0.638	0.413	0.225
		1981-2000	2.488	1.739	2.152	2.488	3.446	4.451	3.477	2.983	2.942	2.121	1.279	1.217	1.564	4.953	2.891	1.857	1.218	0.844	0.707	0.640
		Difference %	-9.5%	-25.0%	-19.1%	-15.4%	-18.9%	-13.7%	-10.4%	-0.2%	13.6%	-1.4%	-21.5%	-4.2%	18.5%	-25.0%	-15.9%	2.3%	16.6%	32.3%	71.2%	184.6%
MORAVA	Moravsky Jan	1931-1980	111.8	92.8	100.2	101.8	141.6	211.7	201.3	125.4	98.0	80.0	70.2	63.5	58.7	257.1	134.2	76.7	45.8	30.2	20.7	13.2
		1981-2000	101.7	70.9	88.6	108.5	122.5	186.8	178.4	112.4	92.8	86.2	59.3	54.7	59.6	219.1	128.3	75.0	47.7	35.6	29.8	25.9
		Difference %	-9.0%	-23.6%	-11.5%	6.6%	-13.5%	-11.8%	-11.4%	-10.4%	-5.3%	7.7%	-15.6%	-13.8%	1.5%	-14.8%	-4.4%	-2.2%	4.2%	17.8%	43.8%	96.1%
SOLOSNICKY	Solosnica	1931-1980	0.075	0.052	0.077	0.073	0.112	0.098	0.151	0.121	0.059	0.054	0.036	0.032	0.034	0.178	0.082	0.045	0.025	0.018	0.014	0.008
		1981-2000	0.057	0.034	0.039	0.047	0.069	0.102	0.117	0.097	0.054	0.041	0.027	0.029	0.023	0.118	0.066	0.037	0.022	0.015	0.012	0.010
		Difference %	-24.6%	-35.4%	-48.8%	-36.0%	-38.4%	3.9%	-22.6%	-19.9%	-8.1%	-23.2%	-24.8%	-8.9%	-33.0%	-33.8%	-19.8%	-18.6%	-12.6%	-16.1%	-11.8%	28.8%
RUDAVKA	Rohoznik	1931-1980	0.090	0.079	0.103	0.138	0.137	0.068	0.155	0.097	0.068	0.082	0.062	0.036	0.058	0.196	0.107	0.059	0.032	0.020	0.010	0.006
		1981-2000	0.085	0.072	0.081	0.116	0.111	0.141	0.129	0.083	0.074	0.063	0.040	0.049	0.059	0.187	0.102	0.060	0.037	0.023	0.017	0.012
		Difference %	-5.8%	-8.3%	-21.4%	-15.8%	-18.6%	107.0%	-17.1%	-14.7%	9.0%	-23.4%	-36.1%	35.5%	1.6%	-4.6%	-4.3%	1.8%	16.1%	14.8%	72.5%	106.7%
RUDAVA	Studienka	1931-1980	1.510	1.850	1.705	1.720	1.910	2.170	2.000	1.540	1.250	1.090	0.973	0.834	1.130	2.825	1.770	1.165	0.750	0.528	0.347	0.241
		1981-2000	1.097	0.988	1.148	1.298	1.510	1.812	1.562	1.171	0.964	0.694	0.589	0.646	0.780	2.088	1.314	0.850	0.594	0.475	0.411	0.370
		Difference %	-27.4%	-46.6%	-32.6%	-24.5%	-20.9%	-16.5%	-21.9%	-24.0%	-22.9%	-36.3%	-39.5%	-22.5%	-31.0%	-26.1%	-25.8%	-27.0%	-20.9%	-10.0%	18.5%	53.6%
MORAVA	Zahorska Ves	1931-1980	115.6	96.6	104.0	105.7	146.4	218.0	207.2	129.5	101.3	82.7	72.6	65.6	61.1	264.1	139.7	79.5	47.7	31.7	21.9	14.0
		1981-2000	104.3	73.1	90.1	111.3	125.5	189.2	184.2	116.0	96.0	87.4	61.4	56.5	60.5	221.4	133.9	78.2	49.8	37.0	30.8	27.0
		Difference %	-9.8%	-24.3%	-13.3%	5.3%	-14.3%	-13.2%	-11.1%	-10.5%	-5.3%	5.7%	-15.5%	-14.0%	-0.9%	-16.2%	-4.2%	-1.7%	4.6%	16.7%	40.7%	93.1%
MALINA	Kuchyna	1931-1980	0.091	0.059	0.087	0.092	0.119	0.136	0.145	0.142	0.106	0.067	0.048	0.044	0.042	0.200	0.110	0.060	0.035	0.024	0.017	0.011
		1981-2000	0.097	0.057	0.067	0.077	0.102	0.172	0.179	0.147	0.115	0.085	0.047	0.058	0.054	0.215	0.114	0.067	0.043	0.030	0.024	0.019
		Difference %	6.1%	-3.3%	-22.7%	-16.6%	-14.5%	26.1%	23.3%	3.5%	8.2%	26.5%	-1.2%	31.7%	27.9%	7.6%	3.3%	12.3%	23.4%	26.3%	42.1%	75.5%
MALINA	Jakubov	1931-1980	0.836	0.644	0.745	0.774	1.010	1.170	0.990	0.833	0.959	0.803	0.711	0.728	0.672	1.710	1.030	0.627	0.410	0.280	0.200	0.125
		1981-2000	0.736	0.454	0.494	0.677	0.762	0.972	0.879	0.778	1.253	1.232	0.417	0.477	0.441	1.729	0.858	0.551	0.347	0.239	0.183	0.154
		Difference %	-11.9%	-29.5%	-33.7%	-12.5%	-24.5%	-16.9%	-11.2%	-6.6%	30.6%	53.4%	-41.3%	-34.5%	-34.4%	1.1%	-16.7%	-12.1%	-15.5%	-14.8%	-8.8%	23.0%
MOCIARKA	Lab	1931-1980	0.220	0.223	0.219	0.199	0.246	0.397	0.339	0.239	0.184	0.171	0.157	0.134	0.149	0.442	0.261	0.169	0.111	0.077	0.054	0.031
		1981-2000	0.170	0.144	0.173	0.186	0.190	0.252	0.255	0.186	0.185	0.158	0.097	0.103	0.112	0.321	0.202	0.127	0.091	0.069	0.057	0.050
		Difference %	-22.7%	-35.6%	-21.0%	-6.3%	-22.7%	-36.6%	-24.7%	-22.0%	0.7%	-7.8%	-38.3%	-23.0%	-24.6%	-27.4%	-22.5%	-24.7%	-18.1%	-10.1%	4.6%	61.0%
OLIVA	Lab	1931-1980	0.155	0.182	0.162	0.171	0.188	0.201	0.160	0.136	0.142	0.126	0.131	0.132	0.135	0.271	0.184	0.130	0.100	0.076	0.057	0.037
		1981-2000	0.134	0.129	0.119	0.129	0.143	0.142	0.135	0.151	0.171	0.123	0.120	0.118	0.124	0.216	0.159	0.126	0.095	0.073	0.061	0.053
		Difference %	-13.7%	-29.1%	-26.4%	-24.4%	-24.2%	-29.5%	-15.5%	10.9%	20.5%	-2.1%	-8.3%	-10.8%	-7.8%	-20.3%	-13.7%	-3.2%	-5.0%	-3.4%	7.1%	42.6%
STUPAVKA	Borinka	1931-1980	0.300	0.194	0.296	0.312	0.380	0.468	0.489	0.428	0.310	0.237	0.173	0.158	0.160	0.660	0.400	0.230	0.150	0.100	0.065	0.030
		1981-2000	0.328	0.211	0.276	0.317	0.359	0.511	0.551	0.422	0.347	0.312	0.221	0.218	0.190	0.633	0.423	0.279	0.176	0.125	0.095	0.081
		Difference %	9.3%	9.0%	-6.7%	1.6%	-5.4%	9.3%	12.6%	-1.4%	11.8%	31.6%	27.9%	38.0%	18.6%	-4.1%	5.7%	21.2%	17.6%	25.4%	45.8%	169.7%

Source: Based on data provided by SHMI and Water Management Plan, SWME Danube River Basin Branch Office, 1997

Table B.8.8 Balance Character of Morava River Baisn (Average of 1931-80)

River/stream	Station/profile	Profile for	Catchment Area (km^2)	Rainfall P (mm)	Evaporation E (mm)	Balance (mm)	Coefficient E/P	Runoff unit-yield ($l/s/km^2$)	Annual Mean Discherge (m^3/s)
CHVOJNICA	Lopasov	G	31.13	811	223	588	0.28	7.07	0.22
CHVOJNICA	Rivermouth		125.42	670	161	509	0.24	5.10	0.64
MYJAVA	Myjava	G	33.09	875	305	570	0.35	9.67	0.32
MYJAVA	Jablonica	B, Q, G	238.43	815	177	638	0.22	5.62	4,340
TEPLICA	Sobotiste	G	85.58	799	170	629	0.21	5.38	0.48
TEPLICA	Rivermouth	B	129.78	780	146	634	0.19	4.62	0.6
MYJAVA	Dojc	Q	497.56	760	147	613	0.19	4.66	2,320
MYJAVA	Sastin Straze	G	644.89	722	135	587	0.19	4.26	2,730
MYJAVA	Rivermouth	B	745.12	717	129	588	0.18	4.09	3,045
MORAVA	Moravsky Jan	G, Q	24,129	634	146	488	0.23	4.63	111.8
RUDAVA	Plavecky Mikulas	G	92.76	752	128	624	0.17	4.04	0.375
RUDAVKA	Rohoznik	G	26.1	795	109	686	0.14	3.45	0.09
RUDAVA	Studienka	G	278.16	736	171	565	0.23	5.43	1.51
LAKSARSKY	MoravskyJan		65.67	590	74	516	0.13	2.36	0.155
RUDAVA	Rivermouth	B	417.74	702	141	561	0.2	4.45	1.86
MORAVA	Downsteram of Malina	B	25,794	633	142	491	0.22	4.51	116.3
MALINA	Jakubov		157.8	681	167	514	0.25	5.30	0.836
MALINA	Rivermouth	B	516.6	656	110	546	0.17	3.48	1.8
MOCIARKA	Lab		62.75	793	111	682	0.14	3.51	0.22
MORAVA	Devinska Nova Ves	G, Q, B	26,580	633	141	492	0.22	4.47	118.7

Note: Q:Quality Profile
B: Balance Profile (SVHB)
G: Gauging Station

Source: Water Management Plan, SWME Danube River Basin Branch Office, 1997

Table B.8.9 Groundwater Balance Unit in the Morava River Baisn and their Status in 1995

Unit	Description of Unit	Micro-basin of surface water	Area (km^2)	Balance Profile	Capacity evaluated in 1995 (l/s)	Withdrawal in 1995 (l/s)	Balance conditions
Q001	**Morava Quaternary to Brodske**	**4-17-02, 4-13-02**	**106.7**			**68.5**	**satisfying**
-MA10	Sedimental Morava Basin Area		64.5	1360(Morava-Brodske)	15.0	24.6	emergancy
				3400(Morava-above Malina)	101.0	43.0	satisfying
-MA20	Sedimental Morava Terrace		42.2	1360(Morava-Brodske)	9.0	0.9	good
N002	**Neocene Chvojnická Hilly Area**	**4-17-02, 4-13-02**	**367.3**		**229.5**	**30.0**	**good**
				1360(Morava-Brodske)	57.0	8.8	good
				3400(Morava-above Malina)	38.0	3.3	good
				2020(Teplica-river mouth)	14.5	14.5	satisfying
				2560(Myjava-river mouth)	70.0	2.9	good
Q003	**Myjava Quaternary**	**4-13-03**	**49.8**	**2560(Myjava-river mouth)**	**50.0**	**2.6**	**good**
Q004	**Morava Quaternary from Brodské to Vysoku pri Morave**	**4-17-02, 4-13-02**	**160.2**		**357.0**	**7.4**	**good**
				4000(Malina-river mouth)	227.5	11.4	good
				2560(Myjava-river mouth)	10.0	0.1	good
				3400(Morava-above Malina)	119.5	0.5	good
NQ005	**Neocene of Central Borska Lowland**	**4-17-02, 4-13-02**	**431.0**		**300.0**	**17.8**	**good**
				2560(Myjava-river mouth)	17.0	0.8	good
				3160(Rudava-river mouth)	64.5	8.6	good
				4000(Malina-river mouth)	218.5	8.4	good
QN006	**Quaternary and Neocene of North-east Borska Lowland**	**4-17-02, 4-13-03**	**134.3**		**210.0**	**1.5**	**good**
-MA10	Eolic Sand Area of Laksarska Elevation Area		98.9		123.5	1.5	good
				2560(Myjava-river mouth)	100.5	1.5	good
				3400(Morava-above Malina)	23.0	0.0	good
-MA20	Plavecka Depression		35.4		86.5	0.0	good
				2560(Myjava-river mouth)	49.4	0.0	good
				3400(Morava-above Malina)	37.1	0.0	good
Q007	**Quaternary and Neocene of South and South-east Borska Lowland**	**4-17-02**	**386.0**		**1000.0**	**78.9**	**good**
-MA10	Sub-small Carpatian Depression		211.2	4240(D.N.V.-Morava)	920.0	64.9	good
				4240(D.N.V.-Morava)	240.0	23.3	good
				4000(Malina-river mouth)	680.0	41.6	good
-MA20	Sedimental Edge Block of Small Carpatian		174.8	4240(D.N.V.-Morava)	80.0	14.0	good
				4000(Malina-river mouth)	18.0	3.3	good
				4240(D.N.V.-Morava)	62.0	10.7	good
MG008	**Crystalline and Mesozoic of South-west Small Carpatians (Sub-region of Morava**	**4-17-02, 4-21-15**	**120.8**		**219.0**	**19.0**	**good**
-MA10	Borinsky Carst Mesozoic Area		48.4	4240(D.N.V.-Morava)	190.0	14.0	good
-MA20	Northen Crystalline Area		34.4	4000(Malina-river mouth)	14.0	0.0	good
-MA30	Southern Crystalline Area		38.0	4240(D.N.V.-Morava)	15.0	5.0	satisfying
PM043	**Paleogen and Mesozoic of Clippen Belt of Western White Carpatians**	**4-13-02, 4-13-03**	**255.4**		**27.0**	**9.4**	**satisfying**
-MA10	Paleogene Area		238.3	2625(Morava-under Dyjou)	25.0	8.9	satisfying
				1760(Myjava-Jablonica)	10.9	0.3	good
				2020(Teplica-river mouth)	5.6	8.4	emergancy
				1360(Morava-Brodske)	8.5	0.2	good
-MA20	Mesozoic of Clippen Belt Area		17.1	1760(Myjava-Jablonica)	2.0	0.5	good
NM044	**Neocene-Cretaceous Myjava Hilly Land, South-west of Clippen Belt (Sub-region of Morava Basin)**	**4-13-03**	**115.7**	**1760(Myjava-Jablonica)**	**3.0**	**9.3**	**good**
MN053	**Mesozoic of Northern Pezinske Carpatian and Brezovske Carpatian (Sub-region of Morava Basin)**	**4-13-03, 4-17-02**	**128.3**		**408.0**	**174.1**	**satisfying**
-MA10	Mesozoic in Dobra Vode Sorroundings		25.7	1760(Myjava-Jablonica)	109.0	35.2	satisfying
-MA20	Mesozoic and Paleogene in Bukova		72.1	3160(Rudava-river mouth)	289.0	135.8	satisfying
-MA30	Neocene Area		30.5	3160(Rudava-river mouth)	10.0	3.1	satisfying
M054	**Mesozoic of Kriznansky Nappe of Small Carpatians (Sub-region of Morava Basin)**	**4-17-02**	**11.1**		**87.8**	**33.8**	**satisfying**
				4000(Malina-river mouth)	8.3	3.1	satisfying
				3160(Rudava-river mouth)	79.5	30.7	satisfying

Criteria of balance status of groundwater unit

good: less than 30% of the allocated exploitable amount is exploited
satisfying: 30%-69% of the allocated exploitable amount is exploited
tense: 70%-84% of the allocated exploitable amount is exploited
critical: 85%-99% of the allocated exploitable amount is exploited
emergency: more than 99% of the allocated exploitable amount is exploited

Source: Hydroecological Plan of the Morava River Basin, 1997

Table B.8.10 Water Use Summary of the Morava River Basin

(Unit: million m^3, %)

Year	Item	Surface Water Resource						Groundwater Resource						Ground Total
		Domestic	Industry	Agriculture			Total	Domestic	Industry	Agriculture			Total	
				Irrigation	Others	Subtotal				Irrigation	Others	Subtotal		
1994	Amont	0.000	3.217	3.027	0.000	3.027	6.244	11.794	1.671	0.000	0.946	0.946	14.412	17.439
	% of grand total						30.2%						69.8%	100%
	% in resource	0.0%	51.5%	48.5%	0.0%	48.5%	100%	81.8%	11.6%	0.0%	6.6%	6.6%	100%	
1995	Amont	0.000	3.658	2.144	0.000	2.144	5.803	11.416	1.861	0.000	0.978	0.978	14.254	16.399
	% of grand total						28.9%						71.1%	100%
	% in resource	0.0%	63.0%	37.0%	0.0%	37.0%	100%	80.1%	13.1%	0.0%	6.9%	6.9%	100%	
1996	Amont	0.000	2.744	0.631	0.063	0.694	3.437	11.132	2.050	0.000	1.041	1.041	14.223	14.917
	% of grand total						19.5%						80.5%	100%
	% in resource	0.0%	79.8%	18.3%	1.8%	20.2%	100%	78.3%	14.4%	0.0%	7.3%	7.3%	100%	
1997	Amont	0.000	2.554	0.473	0.000	0.473	3.027	10.975	1.798	0.000	1.041	1.041	13.813	14.286
	% of grand total						18.0%						82.0%	100%
	% in resource	0.0%	84.4%	15.6%	0.0%	15.6%	100%	79.5%	13.0%	0.0%	7.5%	7.5%	100%	
1998	Amont	0.000	2.964	0.347	0.000	0.347	3.311	11.038	1.640	0.000	0.915	0.915	13.592	13.939
	% of grand total						19.6%						80.4%	100%
	% in resource	0.0%	89.5%	10.5%	0.0%	10.5%	100%	81.2%	12.1%	0.0%	6.7%	6.7%	100%	
1999	Amont	0.000	2.334	0.410	0.000	0.410	2.744	9.682	1.703	0.000	0.788	0.788	12.173	12.583
	% of grand total						18.4%						81.6%	100%
	% in resource	0.0%	85.1%	14.9%	0.0%	14.9%	100%	79.5%	14.0%	0.0%	6.5%	6.5%	100%	
2000	Amont	0.000	2.397	2.775	0.000	2.775	5.172	10.123	1.734	0.000	0.788	0.788	12.646	15.421
	% of grand total						29.0%						71.0%	100%
	% in resource	0.0%	46.3%	53.7%	0.0%	53.7%	100%	80.0%	13.7%	0.0%	6.2%	6.2%	100%	

Source: Quantitative Water Management Balance Report (SVHB), SHM

Table B.8.11 Water Use for Irrigation Purpose in the Morava River Basin

(unit : million m^3)

Item	Month												Annual
	1	2	3	4	5	6	7	8	9	10	11	12	
Morava Basin Tota	0.000	0.000	0.000	0.036	0.051	0.542	1.037	1.122	0.428	0.000	0.000	0.000	3.215
Study Area	0.000	0.000	0.000	0.029	0.040	0.404	0.809	0.849	0.378	0.000	0.000	0.000	2.509
Out of Study Area	0.000	0.000	0.000	0.008	0.011	0.137	0.228	0.273	0.049	0.000	0.000	0.000	0.706
Morava Basin Tota	0.000	0.000	0.000	0.000	0.204	0.135	0.841	1.074	0.267	0.000	0.000	0.000	2.520
Study Area	0.000	0.000	0.000	0.000	0.166	0.101	0.710	0.983	0.264	0.000	0.000	0.000	2.224
Out of Study Area	0.000	0.000	0.000	0.000	0.037	0.034	0.131	0.091	0.003	0.000	0.000	0.000	0.296
Morava Basin Tota	0.000	0.000	0.000	0.008	0.013	0.288	0.134	0.230	0.000	0.000	0.000	0.000	0.673
Study Area	0.000	0.000	0.000	0.000	0.000	0.244	0.126	0.185	0.000	0.000	0.000	0.000	0.554
Out of Study Area	0.000	0.000	0.000	0.008	0.013	0.044	0.008	0.046	0.000	0.000	0.000	0.000	0.119
Morava Basin Tota	0.000	0.000	0.000	0.008	0.115	0.205	0.048	0.046	0.073	0.011	0.000	0.000	0.505
Study Area	0.000	0.000	0.000	0.003	0.096	0.184	0.043	0.008	0.054	0.011	0.000	0.000	0.399
Out of Study Area	0.000	0.000	0.000	0.005	0.019	0.021	0.005	0.037	0.018	0.000	0.000	0.000	0.106
Morava Basin Tota	0.000	0.000	0.000	0.008	0.086	0.132	0.102	0.070	0.000	0.000	0.000	0.000	0.397
Study Area	0.000	0.000	0.000	0.000	0.054	0.078	0.043	0.027	0.000	0.000	0.000	0.000	0.201
Out of Study Area	0.000	0.000	0.000	0.008	0.032	0.054	0.059	0.043	0.000	0.000	0.000	0.000	0.196
Morava Basin Tota	0.000	0.000	0.000	0.005	0.037	0.114	0.185	0.083	0.016	0.024	0.000	0.000	0.464
Study Area	0.000	0.000	0.000	0.000	0.011	0.088	0.166	0.075	0.010	0.024	0.000	0.000	0.374
Out of Study Area	0.000	0.000	0.000	0.005	0.027	0.026	0.019	0.008	0.005	0.000	0.000	0.000	0.090
Morava Basin Tota	0.000	0.000	0.000	0.047	0.597	1.200	0.688	0.268	0.078	0.000	0.000	0.000	2.878
Study Area	0.000	0.000	0.000	0.039	0.410	0.881	0.442	0.112	0.060	0.000	0.000	0.000	1.944
Out of Study Area	0.000	0.000	0.000	0.008	0.187	0.319	0.246	0.155	0.018	0.000	0.000	0.000	0.934

Table B.8.12 Type of Water Resources for Irrigation Purpose

(Unit: million m^3, %)

Type of Water Resource	Year						
	1994	1995	1996	1997	1998	1999	2000
In the Morava River Basin							
Reservoir	0.881	0.530	0.180	0.161	0.151	0.255	0.607
	27.4%	21.0%	26.8%	31.9%	37.9%	54.9%	21.1%
River/stream	2.334	1.991	0.493	0.344	0.247	0.209	2.271
	72.6%	79.0%	73.2%	68.1%	62.1%	45.1%	78.9%
of which Morava River	1.647	0.815	0.178	0.294	0.151	0.175	2.226
	51.2%	32.4%	26.4%	58.3%	38.0%	37.7%	77.3%
of which other rivers/streams	1.569	1.705	0.496	0.211	0.246	0.289	0.652
	48.8%	67.6%	73.6%	41.7%	62.0%	62.3%	22.7%
Total	3.215	2.520	0.673	0.505	0.397	0.464	2.878
In the Study Area							
Reservoir	0.750	0.471	0.153	0.153	0.116	0.255	0.567
	29.9%	21.2%	27.7%	38.3%	57.7%	68.1%	29.2%
River/stream	1.759	1.754	0.401	0.246	0.085	0.119	1.377
	70.1%	78.8%	72.3%	61.7%	42.3%	31.9%	70.8%
of which Morava River	1.180	0.607	0.107	0.215	0.013	0.109	1.355
	47.0%	27.3%	19.3%	53.9%	6.5%	29.1%	69.7%
of which other rivers/streams	1.329	1.617	0.448	0.184	0.188	0.265	0.589
	53.0%	72.7%	80.7%	46.1%	93.5%	70.9%	30.3%
Total	2.509	2.224	0.554	0.399	0.201	0.374	1.944

Table B.8.13 Intake Amount of Water for Irrigation Purpose from Morava River Direct

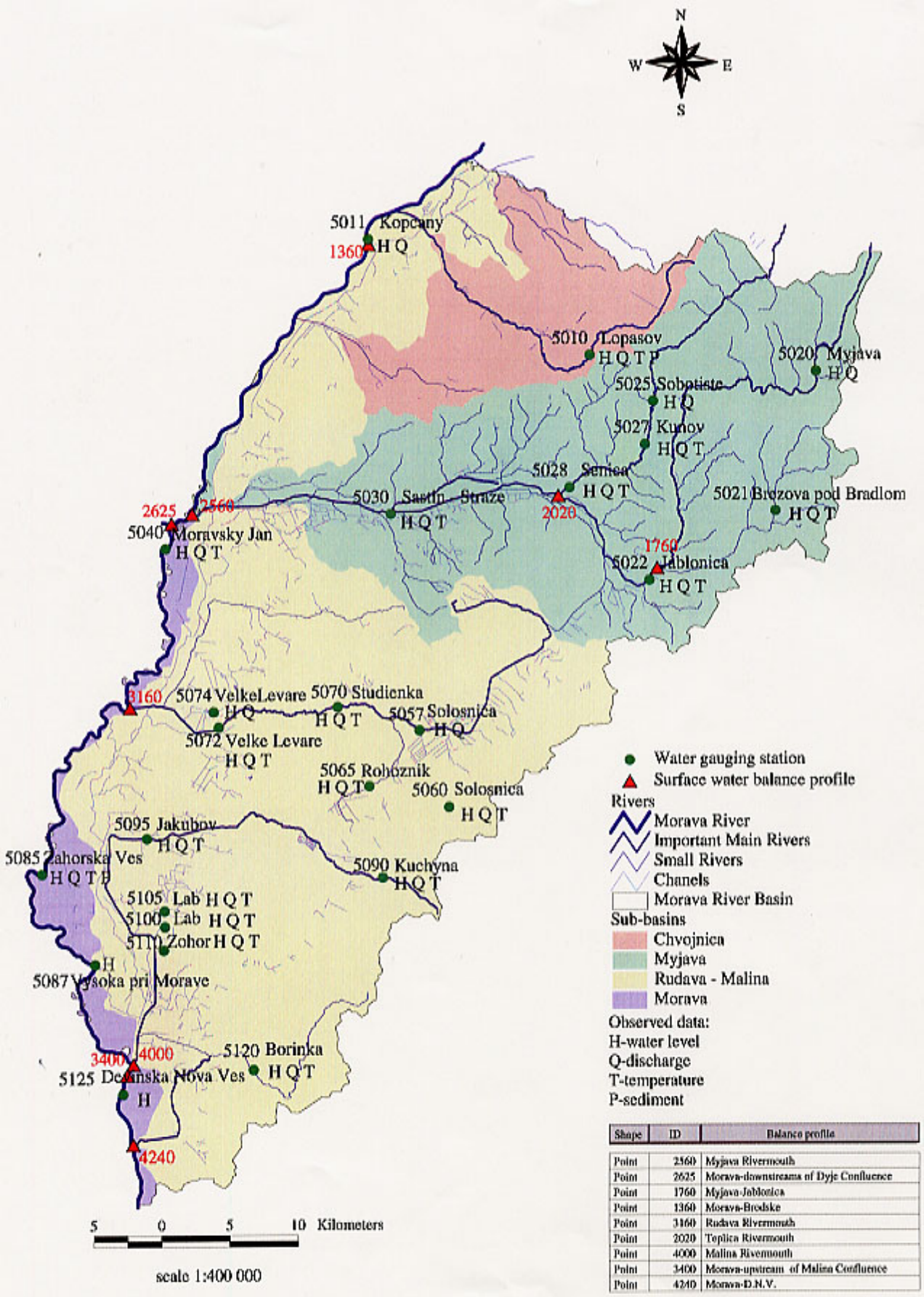
(Unit: million m^3)

Intake Point (km)	Year						
	1994	1995	1996	1997	1998	1999	2000
8.200							
8.430							0.013
50.000	0.133	0.126	0.060	0.094			
50.800	0.990	0.409	0.003	0.108	0.013		
51.100	0.057	0.072	0.044	0.013		0.109	1.342
Sub-total for Study Area	1.180	0.607	0.107	0.215	0.013	0.109	1.342
74.000	0.351				0.003		0.508
75.200				0.034			
93.000		0.120	0.026		0.072		0.273
101.000	0.116	0.088	0.045	0.045	0.063	0.066	0.090
Total of Morava Basin	1.647	0.815	0.178	0.294	0.151	0.175	2.226

Table B.8.14 List of Water Permission for Irrigation Use in Morava River Basin (as of August 2001)

No.	Location	Water Source	Water Permission			
			Permission ID	Irrigation Area (ha)	Permitted Amount (l/s)	Premitted Amount (1000 m^3)
1	Tomky + Husky	Reservoir Studena	ONV Senica E-25/1310/76	535	214.0	
2	Plavecky Peter	Reservoir Bukova	ONV Senica E-13-2/67	600	183.0	
3	Sekule - Male Levare	Kuty-Brodske Canal	ONV Senica E-22/1974	660	-	
4	Sekule - Male Levare	Morava	ONV Senica E-63/1944/88	142	-	
5	ZH Jakubov	Malina	ONV Bratoislava 3501/69	100	40.0	
6	Kuchyna	Reservoir Kuchyna	ONV Bratislava 1436-E-22/1983	490	235.0	376.6
7	Jablonove	Jablonsky Stream	ONV Bratislava 6007/1969	54	14.8	2.0
8	Malacky-Velke Levare	Morava (km50.800)	ZsKNV,PLVH-4/158/79-4	2,066	775.0	3,952.0
9	Rohoznik	Reservoir Vyvrat	ONV Senica E-49/3020/84-3	200	80.0	
10	Malacky-Velke Levare	Morava (km50.800)	ZsKNV, PLVH-4/989/81	1,783	720.0	3,356.0
11	Malacky-Velke Levare	Morava	ZsKNV, PLVH- 4/1947/83-2	1,768	640.0	3,758.0
12	Malacky-Velke Levare	Morava	ONV Senica E44/Q614//3292/84-	856	305.0	
13	Lozorno	Reservoir Lozorno 1 & 2	ONV Bratislava 1647-E-32/84	1,375	521.0	2,237.5
14	Zahorska Ves	Strkovisko	ONV Bratislava 885/72/E-34	298	120.0	
15	D.N.Ves -Stupava	Morava	KNV Bratislava 248/74	3,109	1,126.0	
Sub-total of the Study Area				**14,036**	**4,974**	
16	Zavlaha	Morava (Dolec Canal)	ONV Senica E-37/1120/83-3	52	-	
17	Borsky Jur	Morava (Dolec Canal)	ONV Senica E-38/3664/83-3	93	117.0	
18.1	Sekule - Male Levare	Morava (km 81.860)	ONV Senica E/10/67	552	280.0	
18.2		Morava (km 75.200)		634	320.0	
18.3		Morava (km 75.200)		3,113	1,500.0	
19	Holic - Petrov	Stream Barinky	MZP ER 860/263/97-Ja	753	110.0	
20	Skalica	Sudomer Stream	ONV Senica E-18/70, 9.7.70	124	-	
21	Gbely-Petrova Ves	Reservoir Petrova Ves	ONV Senica E-14/1968-2	149	80.0	
22	Radosovce Borsky Jur	Reservoir Radosovce	ONV Senica E-27/5095/77-3	825	350.0	
23	Skalica - Gbely	Morava	OUZP Bratislava 233/E-6/1993	1,310	477.0	
24	Saklica - Gbely	Reservoir Petrova Ves	OUZP Bratislava E-8/1994-14	258	200.0	466.2
25	Sobotiste	Reservoir Kunov	ONV Senica E-67/831/88-1	145	81.0	
26	Jablonica	Myjava (km36.020)	ONV.Senica H2-14/3917/84-1	50	49.5	
27	Osuske	Reservoir Osuske	ONV Senica 6480/72A/18	256	75 .0	
28	Jablonica	Reservoir Jablonica	ONV Senica 6103/73-A/19	313	3.0	
29	Prietrzlokalita	Reservoir Prietrz	ONV Senica E/35/S-198/3301/81-3, E-39/1984-3	268	119.0	
30	Brezova	Reservoir Brezova	ZsKNV-OPLVH Bratislava PLVH-4/295/81	167	-	
31	Kunov	Reservoir Kunov	ONV Senica E-29/1472/79-3	-	3.1	
32	ZP Kovalov	Reservoir Kovalov	ONV Senica E-17/70	244	-	
33	Smolinske	Reservoir Smolinske	ONV Senica E-21/74	140	80.0	
34	Stefanov	Myjava (km23.800)	ONV Senica E-46/1984-3	150	80.0	
35	Jablonica - Cerova		ONV Senica E-26/PLVH/5779/76	51	45.0	
Sub-total of outside of the Study Area*				**9,647**	**3,895**	
Total of the Morava River Basin				**23,683**	**8,868**	
Summary of Withdrawal from the Morava River Direct				**15,191**	**6,143**	
Summary of Withdrawl from Internal Catchment				**8,492**	**2,725**	

Note: Distribution of irrgation area in the Study Area and Morava Basin is based on the location of intake, not by the location of irrgated area.
Sourece: Based on data provided by Branch Office for Danube River Basin, SWME



Shape	ID	Balance profile
Point	2560	Myjava Rivermouth
Point	2625	Morava-downstreams of Dyje Confluence
Point	1760	Myjava-Jablonica
Point	1360	Morava-Brodske
Point	3160	Rudava Rivermouth
Point	2020	Teplica Rivermouth
Point	4000	Malina Rivermouth
Point	3400	Morava-upstream of Malina Confluence
Point	4240	Morava-D.N.V.

Figure B.8.1 Observation Network of Surface Water of the Morava River Basin

Source: SHMI

Figure B.8.2 Observation Network of Groundwater of the Morava River Basin

Source: SHMI

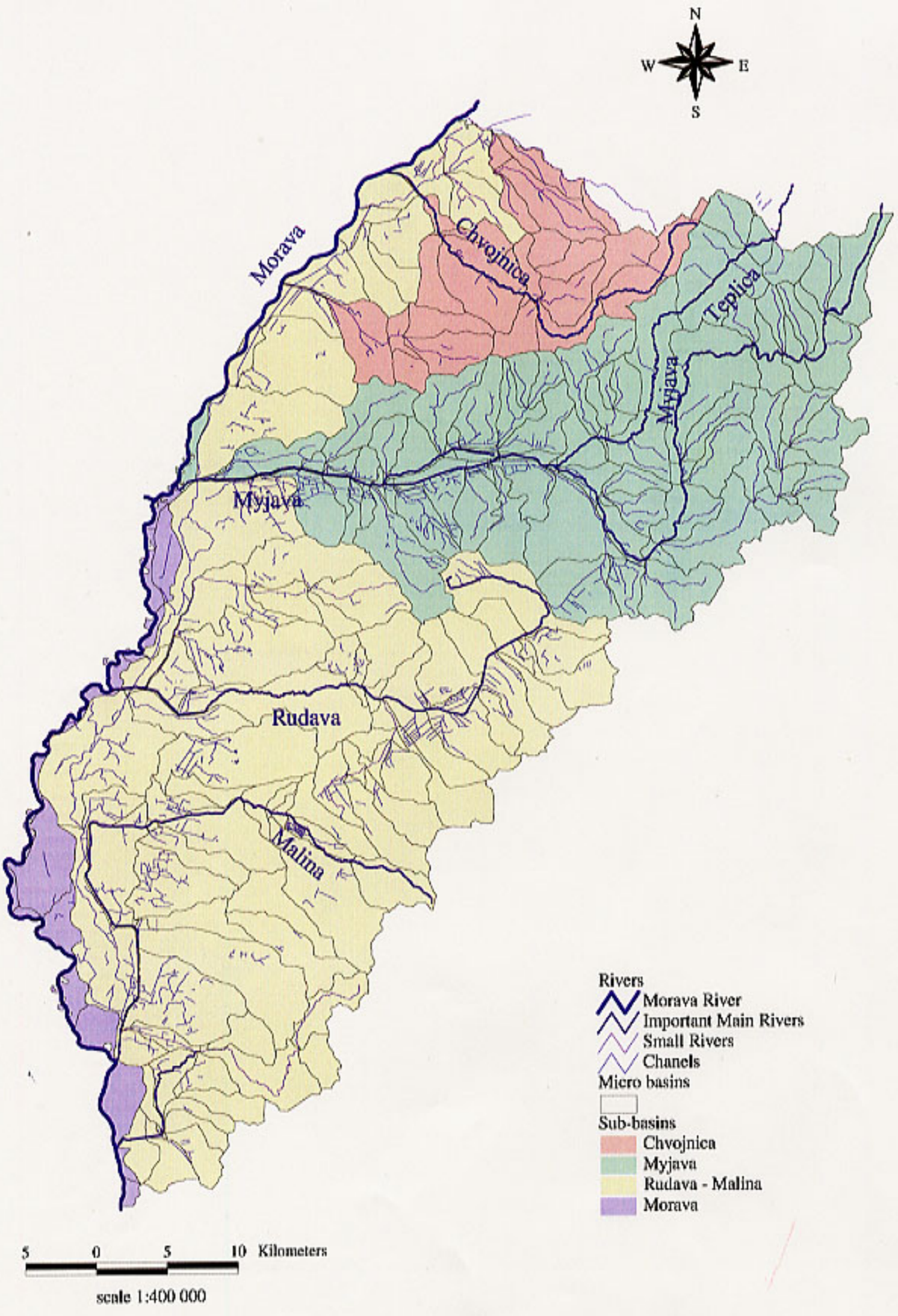


Figure B.8.3 River System and Microbasins

Source: SHMI

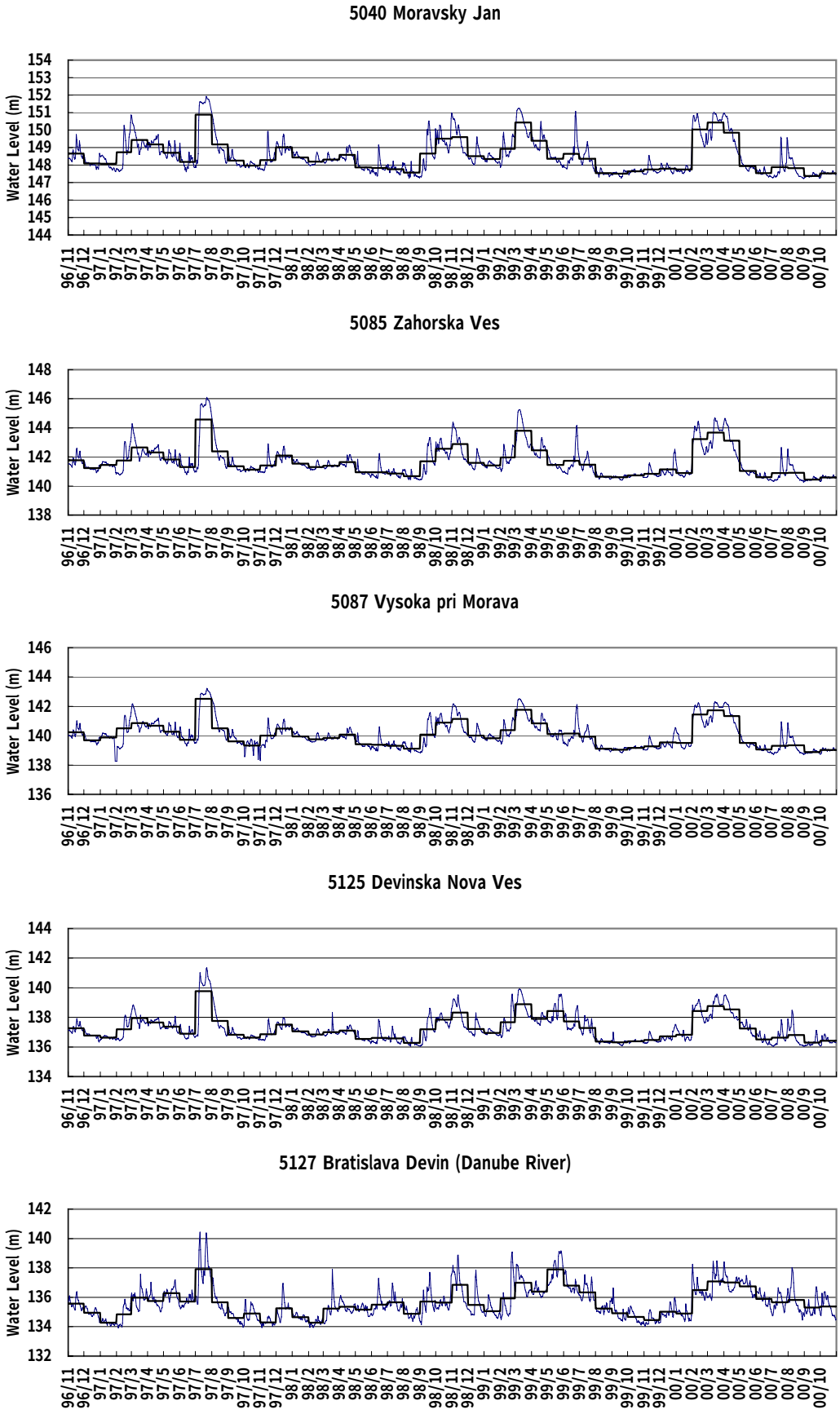
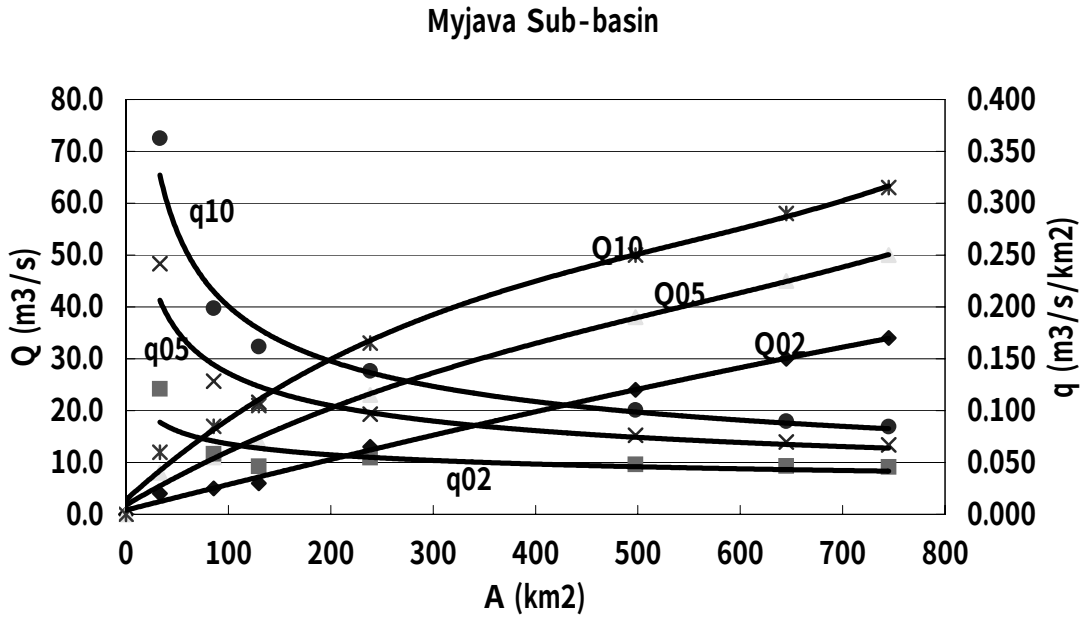
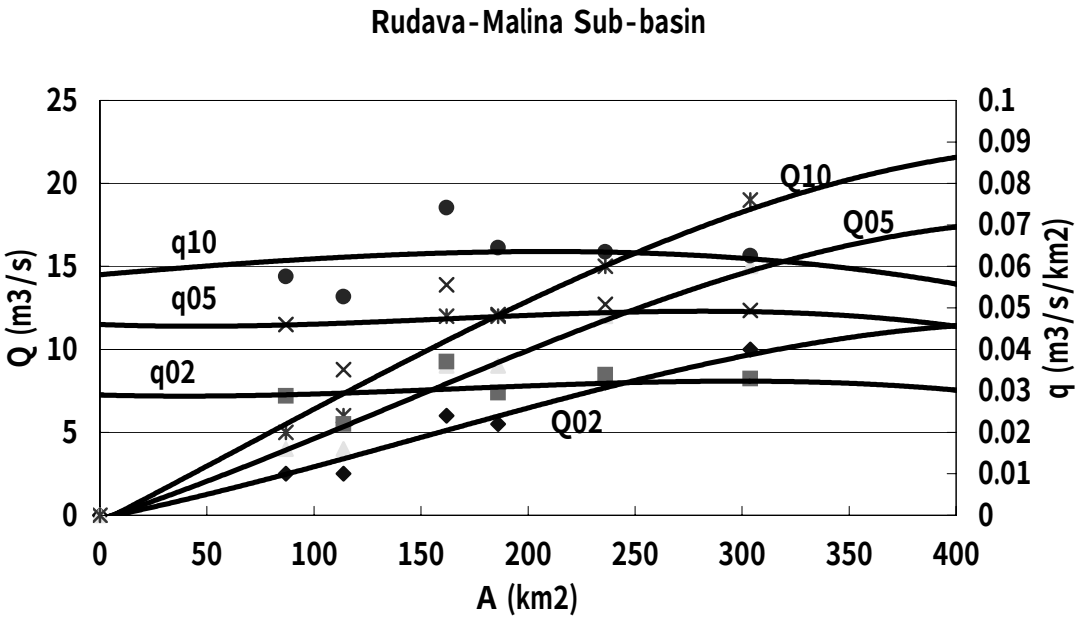


Fig. B.8.4 Water Level of the Morava River



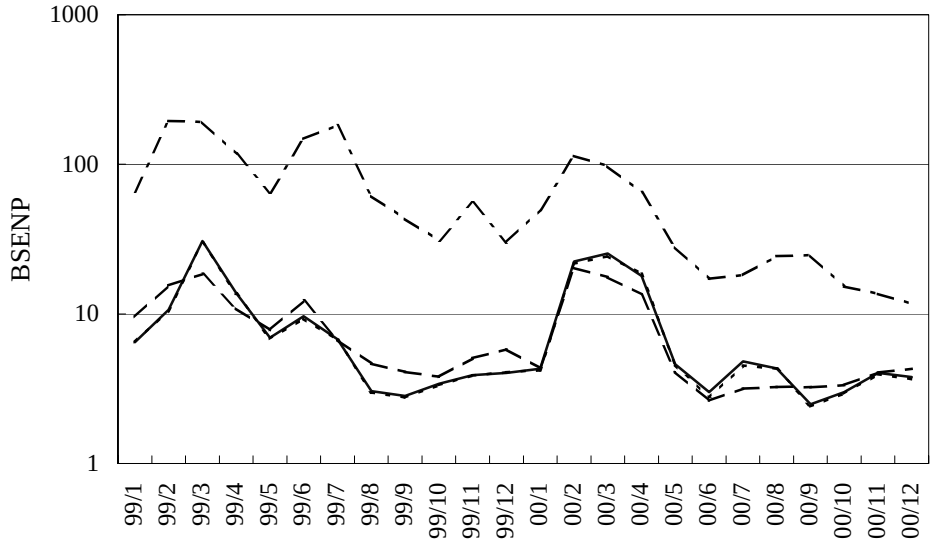


Q10: Discharge at 10-year frequency
Q05: Discharge at 5-year frequency
Q02: Discharge at 2-year frequency

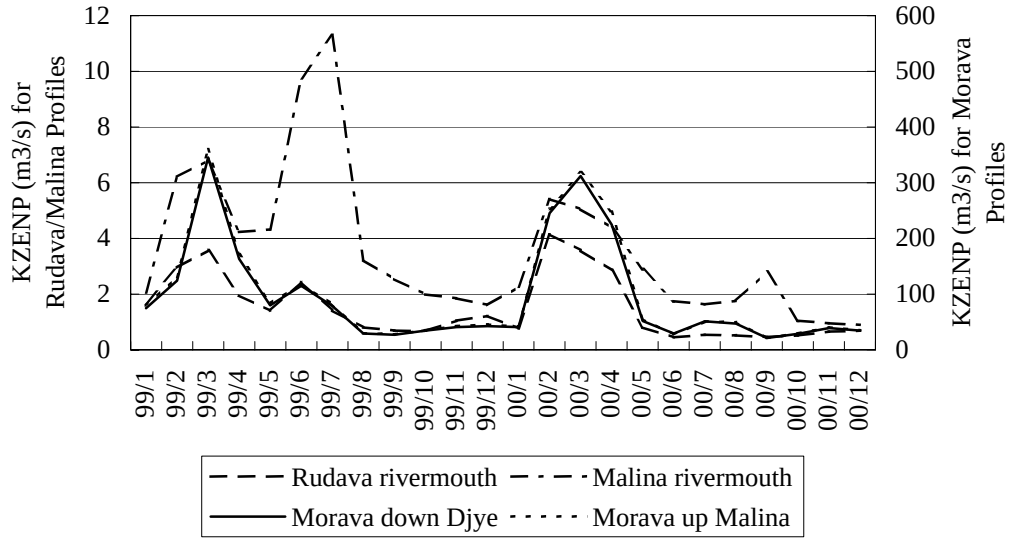
q10: Specific discharge at 10-year frequency
q05: Specific discharge at 5-year frequency
q02: Specific discharge at 2-year frequency

Fig. B.8.5 Specific Discharge of Myjava and Rudava-Malina Sub-basins

Influenced Balance Status (BSENP)



Influenced Water Source Capacity (KZENP)



Minimum Values of BSENP and KZENP

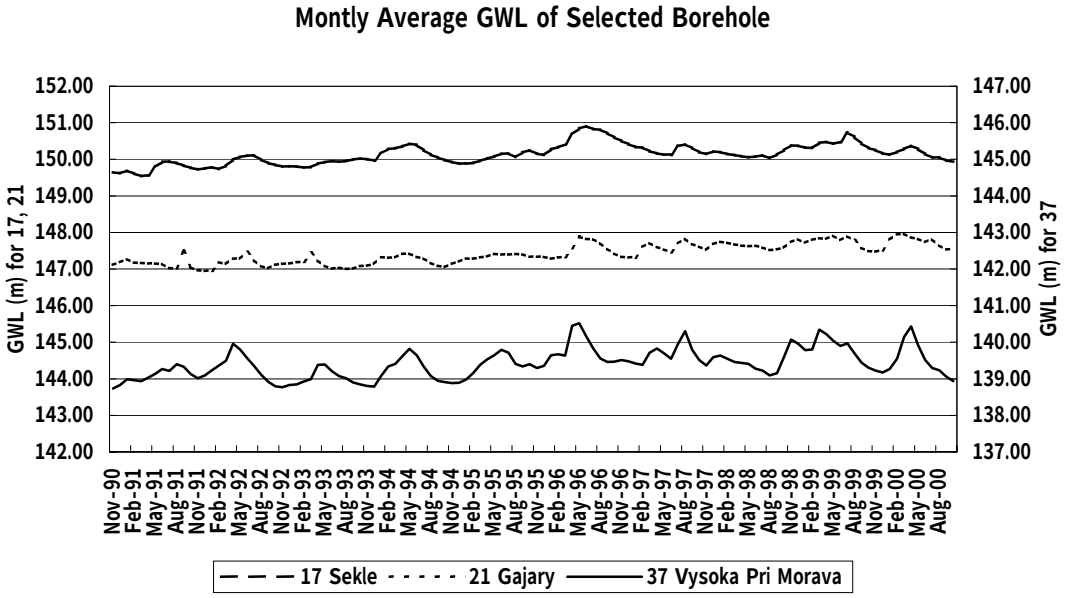
Profile	BSENP		KZENP	
	Min. Value	Month	Min. Value	Month
Morava down Dyje	2.49	00/9	21.410	00/9
Rudava rivermouth	2.63	00/6	0.451	00/6
Morava up Malina	2.40	00/9	21.340	00/9
Malina rivermouth	11.66	00/12	0.901	00/12

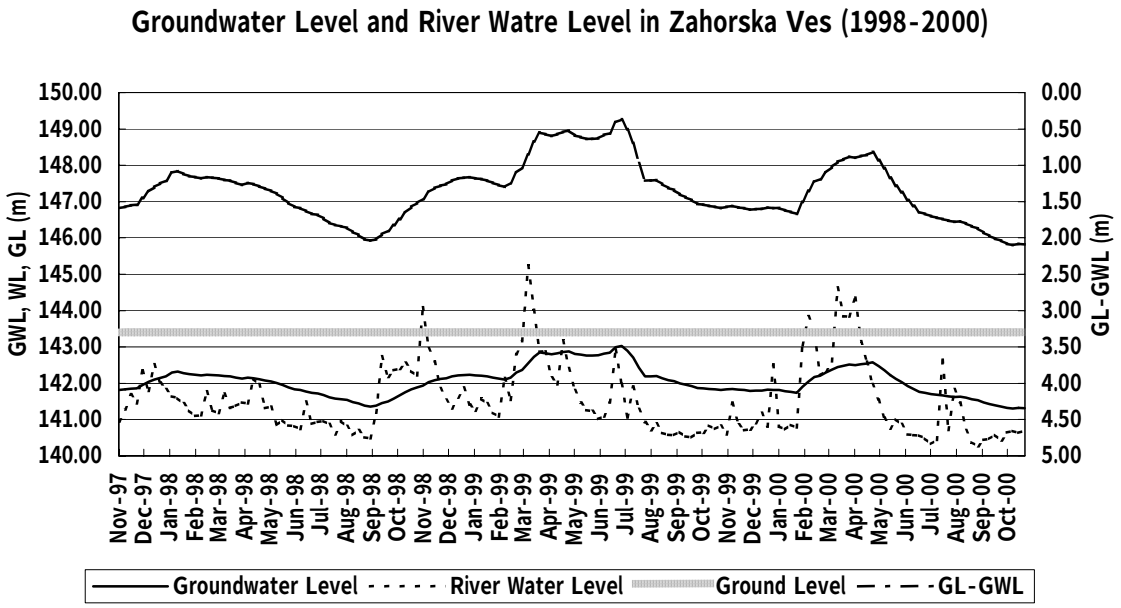
Definisiono of BSENP and KZENP

BSENP[Influenced Balance Status] = ENP[Influenced Discharge] / MPP[Minimum Needed Discharge]

KZENP[Influenced Balance Status] = ENP[Influenced Discharge] - MPP[Minimum Needed Discharge]

Fig. B.8.6 Water Management Balance of Selected Profiles in 1999 - 2000





Source: Hydrology Year Book of Year 1999 – Groundwater, SHMI, 2000

Fig. B.8.7 Groundwater Level of Selected Boreholes

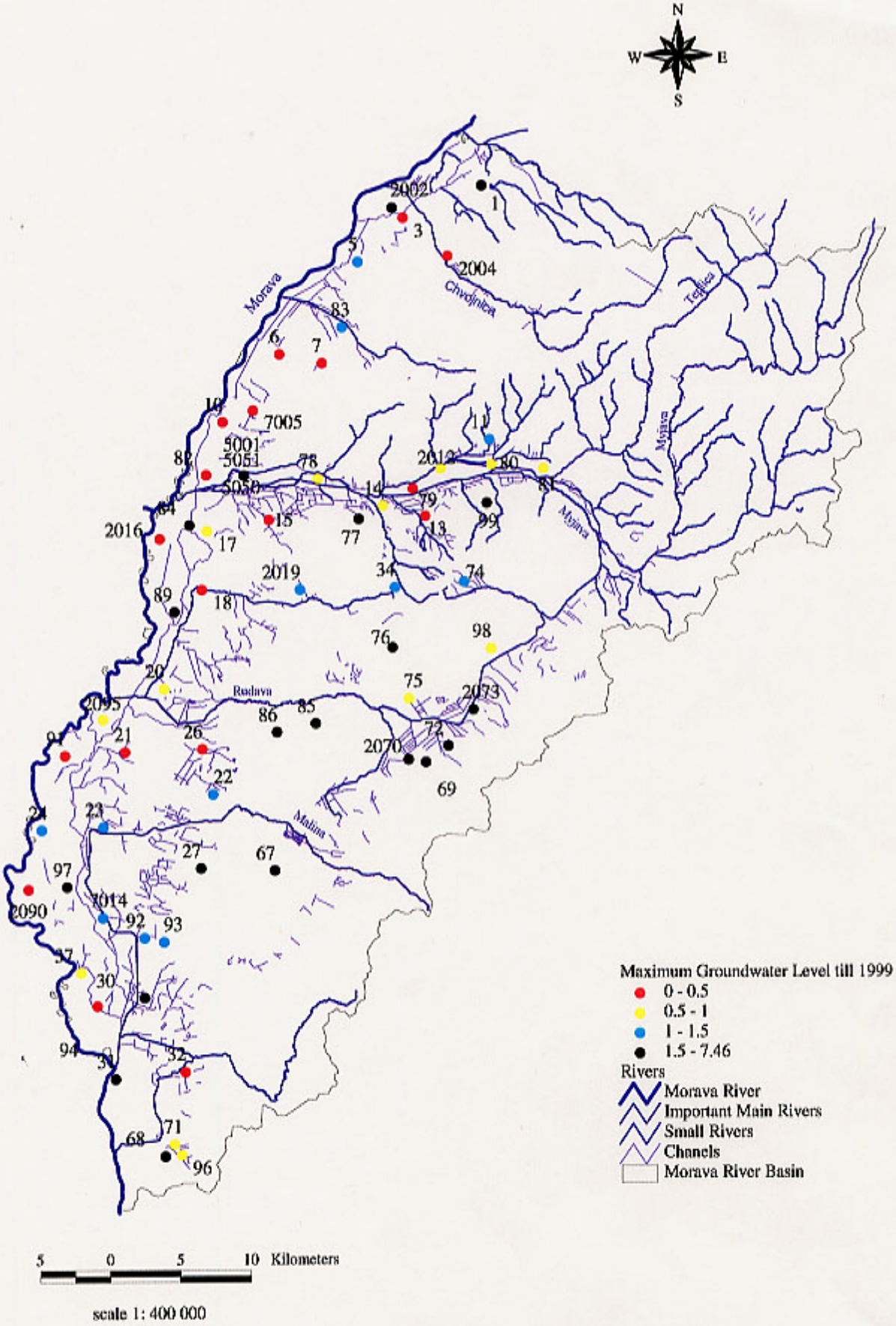


Figure B.8.8 Maximum Groundwater Level Observed in the Morava River till 1999

Source: SHMI

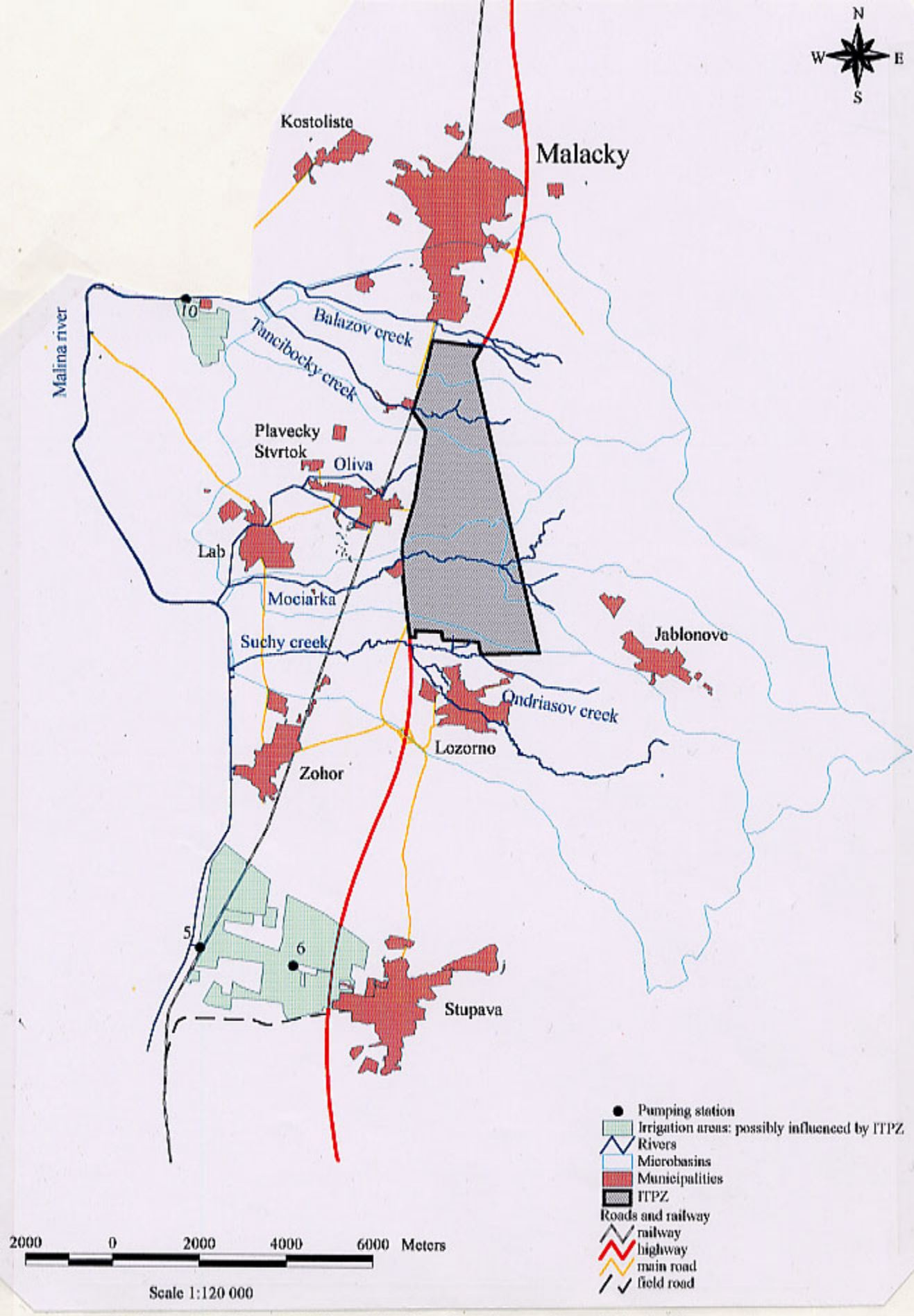


Figure B.8.9 ITPZ and Irrigation Areas Possibly Influenced