DANUBE POLLUTION REDUCTION PROGRAMME

NATIONAL REVIEWS 1998
BULGARIA

TECHNICAL REPORTS

Part C: Water Quality

Part D: Water Environmental Engineering

MINISTRY OF ENVIRONMENT AND WATER

in cooperation with the

Programme Coordination Unit
UNDP/GEF Assistance

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Preface

The National Reviews were designed to produce basic data and information for the elaboration of the Pollution Reduction Programme (PRP), the Transboundary Analysis and the revision of the Strategic Action Plan of the International Commission for the Protection of the Danube River (ICPDR). Particular attention was also given to collect data and information for specific purposes concerning the development of the Danube Water Quality Model, the identification and evaluation of hot spots, the analysis of social and economic factors, the preparation of an investment portfolio and the development of financing mechanisms for the implementation of the ICPDR Action Plan.

For the elaboration of the National Reviews, a team of national experts was recruited in each of the participating countries for a period of one to four months covering the following positions:

- Socio-economist with knowledge in population studies,
- Financial expert (preferably from the Ministry of Finance),
- Water Quality Data expert/information specialist,
- Water Engineering expert with knowledge in project development.

Each of the experts had to organize his or her work under the supervision of the respective Country Programme Coordinator and with the guidance of a team of International Consultants. The tasks were laid out in specific Terms of Reference.

At a Regional Workshop in Budapest from 27 to 29 January 1998, the national teams and the group of international consultants discussed in detail the methodological approach and the content of the National Reviews to assure coherence of results. Practical work at the national level started in March/April 1998 and results where submitted between May and October 1998. After revision by the international expert team, the different reports have been finalized and are now presented in the following volumes:

Volume 1:	Summary Report		
Volume 2:	Project Files		
Volume 3 and 4:	Technical reports containing:		
	-	Part A:	Social and Economic Analysis
	-	Part B:	Financing Mechanisms
	-	Part C:	Water Quality
	-	Part D:	Water Environmental Engineering

In the frame of national planning activities of the Pollution Reduction Programme, the results of the National Reviews provided adequate documentation for the conducting of National Planning Workshops and actually constitute a base of information for the national planning and decision making process.

Further, the basic data, as collected and analyzed in the frame of the National Reviews, will be compiled and integrated into the ICPDR Information System, which should be operational by the end of 1999. This will improve the ability to further update and access National Review data which is expected to be collected periodically by the participating countries, thereby constituting a consistently updated planning and decision making tool for the ICPDR.

UNDP/GEF provided technical and financial support to elaborate the National Reviews. Governments of participating Countries in the Danube River Basin have actively participated with professional expertise, compiling and analyzing essential data and information, and by providing financial contributions to reach the achieved results.

The National Review Reports were prepared under the guidance of the UNDP/GEF team of experts and consultants of the Danube Programme Coordination Unit (DPCU) in Vienna, Austria. The conceptual preparation and organization of activities was carried out by **Mr. Joachim Bendow**, UNDP/GEF Project Manager, and special tasks were assigned to the following staff members:

- Social and Economic Analysis and Financing Mechanisms: **Reinhard Wanninger**, Consultant
- Water Quality Data: **Donald Graybill**, Consultant
- Water Engineering and Project Files: **Rolf Niemeyer**, Consultant
- Coordination and follow up: **Andy Garner,** UNDP/GEF Environmental Specialist

The **Bulgarian National Review** was prepared under the supervision of the Country Programme Coordinator, **Mr. Nikolai Kouyumdziev**. The authors of the respective parts of the report are:

- Part A : Social and Economic Analysis: **Ms. Ada Bainova**
- Part B : Financing Mechanisms: **Ms. Svoboda Tosheva**
- Part C : Water Quality: **Ms. Marieta Stoimenova**
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Special acknowledgments are presented to D-r. Michail Mollov - Senior Expert from the National Center of Environment and Sustainable Development - Sofia for the support in the process of the water quality data processing. (Annex 4 - tables 4.8-1 to 27)

Part C

Water Quality

Table of Contents

Annexes

List of Tables

List of Figures

List of Maps

List of Abbreviations on Water Quality

BASc	Bulgarian Academy of Sciences
DO	Dissolved Oxygen
EC	European Communities
ECE	Economical Commission for Europe
EIA	Environmental Impact Assessment
HMS	Hydrometric station
LTP	Local Treatment Plant
m^3/s	cubic meters per second
MLIM	Monitoring, Laboratory Information Management
MOEW	Ministry of Environment and Waters
NASEM	National System for Environmental Monitoring
NGO	Non Governmental Organisation
NIMH	National Institute of Meteorology and Hydrology at BASc.
PHARE	Poland and Hungary Assistance and Reconstruction of Economy
PS	Pumping Station
REWI	Regional Environment and Waters Inspectorate
WPS	Water Power Station
WWTP	Waste Water Treatment Plant
WWTPs	Waste Water Treatment Plants
NECSD	National Center for Environment and Sustainable Development
AMNPED	Administration for Maintenance of Navigation Passes and Exploration of the Danube
EMIS	Emission Expert Group
EPDRB	Environmental Programme for the Danube River Basin
GIS	Geographic Information System

Glossary on Water Quality

Agrochemicals	All chemicals used in agriculture (pesticides, herbicides, fertilizers, etc.)
Alluvial	Made of soil and sands deposited by rivers or floods.
Anaerobic	Breakdown of organic matter in the absence of free or dissolved oxygen, often facilitated by specific bacterial strains
Aquifer	Underground porous rock which contains water and allows water to flow through it
Atmospheric deposition	The process whereby solids or dissolved inorganic or organic substances are deposited via atmospheric conditions, e.g. rain, at ground level.
Bed-load	Material (silt, sand, gravel) moving on or immediately above the stream bed
Biodiversity	The sum total of different species of flora and fauna in a given region, area or habitat.
BOD	Biochemical Oxygen Demand - measure of oxygen required to breakdown all organic material in a water body
Catchment	Area from which rainfall flows into a river
COD	Chemical Oxygen Demand- A measure of the quantity of oxygen used in the chemical oxidation of compounds in a specified time, at a specified temperature and under specified conditions.
Discharge	The flow rate of a fluid at a given instant expressed as volume per unit of time (see stream discharge)
Ecosystem	A natural unit consisting of living and non-living parts interacting with each other, formed by the organisms of a natural community and their environment
Emission	Release of substances from a source
Emission limit	A numerical limit set on the emissions of a substance from a source
Environmental quality standard	The requirements which must be fulfilled by a given environment or part thereof (e.g. air, surface water, ground water)
Eutrophic	Water with very high nutrient levels
Eutrophication	The process of over-fertilization of a body of water by nutrients producing more organic matter than the self-purification processes can overcome
Fauna	Animals, birds, insects
Fertiliser	Any substance containing calcium, nitrogen, phosphorus, potassium and micro compounds used on land to enhance the growth of vegetation. It may include livestock manure, the residues from fish farm and sewage sludge. A component necessary for plant growth
Flora	Plants
Groundwater	Water contained in the pores and fissures of aquifers. All subsurface water.

Hazardous Substances	Substances which have adverse impacts on living organisms, e.g. toxic, carcinogenic, mutagenic, teratogenic, harmful for the environment
Hot spot	A local land area, stretch of surface water or specific aquifer which is subject to excessive pollution and which requires specific action to prevent or reduce the degradation caused
Immission	The concentration of pollutants in a surface water (see environmental quality standards)
Landfill	Disposal of solid waste materials at land based sites
Leachate	Liquid which has percolated through a substrate (e.g. soil, ore, waste dump, etc.)
Microbiological contamination	Pollution with micro-organisms-such as viruses, bacteria, protozoa, etc.- that might cause diseases in humans or animals
Mineral oil	One of the products of fossil hydrocarbons
Nutrient	A substance, element or compound necessary for the growth and development of plants and animals.
Point source, non-point source	A localised discharge of pollutants (e.g. from an industrial plant); diffuse pollution in a catchment area (e.g. agricultural run-off)
Pollution	The discharge, directly or indirectly, of compounds from sources into the environment in such quantity as to pose risks to human health, living resources or to aquatic ecosystems, damage to amenities, or interference with other legitimate uses of water
Population equivalent	No uniform definition exists. Used as a measure of water pollution load based on figures of an average ” pollution production” of one person in one day. Often-used figures are BOD5 (60 g/day); total nitrogen (12 g /day) and total phosphorous (2,5 g /day).
Primary treatment	A one-step treatment process of urban waste water by a physical or chemical process involving settlement of suspended solids.
Reach	A length of a river the exact distance of which may or may not be specified
Secondary treatment	Treatment of waste water by a process generally involving biological treatment with a secondary settlement or other process.
Sediment	Solid fragmented material originating from weathering of rocks or by other processes, deposited by air water or ice, or that accumulated by other processes such as chemical precipitation from solution or secretion by organisms.
Sediment load	The amount of sediment passing a cross section of a river or stream, in a specified period of time.
SS	Suspended Solids
TDS	Total Dissolved Substance
Toxic substance	Substances which cause harm to living organisms
Tributary	A river which ultimately flows into the Danube River
Water quality criteria	A scientific requirement on which a decision or judgment may be based concerning the suitability of water quality to support a designated use

1. Summary

The analysis of the quality of the surface waters in the catchment of the Danube River in the Bulgarian section for the period of 1994-1997 are based on the available data from the National Environmental Monitoring System, as well as on the database of the National Institute on Meteorology and Hydrology at the Bulgarian Academy of Sciences and the Board for the Study and Maintenance of the Danube River.

The average annual natural outflow, formed on the territory of the country is around 20,7 billion cubic meters, unevenly distributed in space and time. Concerning the Danube hydrography region under examination, it is around 7,5 billion cubic meters, covering the northern part of the country and representing 42,3% of the overall territory.

The Danube catchment area covers the major part of North Bulgaria and the Sofia Region. The tributaries from west to east are as follow:

- Topolovetz (catchment area-305 km2, river length-67.6 km),
- Voinishka (catchment area-277 km2, river length-55.2 km),
- Vitbol (catchment area-330 km2, river length-23.6 km),
- Archar (catchment area-365 km2, river length-59.4 km),
- Skomlia (catchment area-163 km2, river length-41.6 km),
- Lom (catchment area-1187 km2, river length-92.5 km),
- Tzibritza (catchment area-845 km2, river length-87.5 km),
- Ogosta (catchment area-3112 km2, river length-144.1 km),
- Iskar (catchment area-8366 km2, river length-368 km),
- Vit (catchment area-2236 km2, river length-188.6 km),
- Ossam (catchment area-2154 km2, river length-314 km
- Yantra (catchment area-6860 km2, river length-285,5 km) and
- Russenski Lom (catchment area-2869 km2, river length-196,9 km) *(Map C6-1)*

The discrepancy between the available water stocks and the water needs are characteristic both for the country, as well as for the Danube region. To be accessible for use and to satisfy the needs, water is managed by means of the many hydrotechnic facilities. More data are given in Section 4 of this section.

The annual outflow of the river in the Bulgarian sector amounts to about 185 billion cubic meters. The amount of Danube waters used by our country directly from the river or from its terraces is about 0,8 to 1,0 billion cubic meters per annum.

The water deficit in 1994-1995 is attributable to climatic changes, increased consumption, and institutional failures in the management of water resources, which necessitates a reassessment of the whole water resource management establishment.

1.1. Updating, Evaluation and Ranking of Hot Spots

In the Danube River basin there are 37 towns with a population of over 10000 inhabitants. In 11 of them there are operational WWTPs *(Map C6-2)*.

Untreated and partly treated municipal wastewater is a significant source of water pollution. The major settlements within the catchment are indicated on *Map C6-2*. They range from highly urbanized industrial cities, to small agriculture-based villages situated mainly in the upper and lower reaches of the catchment. Within this range, some towns have high sewerage system coverage and only few of them have WWTP.

For the period 1994-1997 a lot has been done for the improvement of the environment in particular for the diminishing of the pollution outlined in SAP. Taking into consideration the economic state of the country only several projects defined in SAP have started. Among them:

Copper Smelter factory Eliseina (Iskar River Basin).

Currently the copper smelter factory at Eliseina is ranked as a “hot spot” and is one of the main polluters of the Iskar River water. A programme for the improvement of the environmental status of the Copper Smelter factory Eliseina was launched in 1995 aided by the Japanese Government. A soft loan granted by the OECF rehabilitation of the technological equipment is carried out and wastewater treatment facilities are being constructed for reduction of heavy metal load in the water body.

Pleven - WWTP (Vit River Basin)

The WWTP (sludge treatment facilities) is reconstructed and rehabilitated under the IBRD Water Companies restructuring and Modernization Project Loan following a restructuring of the Water Company.

Sevlievo-Tannery ”Sevko” (Yantra River Basin)

Currently a project for technological rehabilitation is under execution. This project aims to reduce emission loads of $N\text{-}NH_4$, S^{-2}, SO_4 and Cr^{+6}. EC PHARE, the National Environmental Protection Fund and the National Eco Trust Fund finance the construction of an industrial wastewater pre-treatment plant. A study is carried out under an EC PHARE project for studying the possibilities of treatment of the industrial wastewater with that of the municipality of Sevlievo.

Russe - West Industrial Zone (Danube River Basin)

The main sewer collector is under construction and the completion of the Pumping station is ongoing too, with the financial support of the National Eco Trust Fund.

Note: Section 2 of Part C discusses in detail every “hot spot” and evaluates the group in which it is categorized.

1.1.1. Municipal Hot Spots

1.1.1.1. High Priority

- Hot Spot No. 1- Municipal WWTP Gorna Oriahovitza and Liaskovetz *Yantra River Basin, Yantra River*
- Hot Spot No. 2 - Municipal WWTP Troyan *Ossam River Basin, Ossam River*
- Hot Spot No. 3 - Municipal WWTP Lovetch *Ossam River Basin, Ossam River*
- Hot Spot No. 4 - Municipal WWTP Vratza- rehabilitation and expansion *Ogosta River Basin, Dabnika Leva River*
- Hot Spot No. 5 - Municipal WWTP Sofia- rehabilitation and expansion *Iskar River Basin, Iskar River*
- Hot Spot No. 6 - Municipal WWTP Sevlievo *Yantra River Basin, Rossitza River*

1.1.1.2. Medium Priority

- Hot Spot No. 1 - Municipal WWTP Montana *Ogosta River Basin, Ogosta River*
- Hot Spot No. 2 - Municipal WWTP Popovo Russenski Lom River Basin, Popovska River
- Hot Spot No. 3 - Blato River basin/ Several small towns- Slivnitza, Kostinbrod and Bojurishte *Iskar River Basin*

1.1.1.3. Low Priority

- Hot Spot No. 1 - Municipal WWTP - Russe Danube River
- Hot Spot No. 2 - Municipal WWTP - Levski Ossam River,
- Hot Spot No. 3 - Municipal WWTP - Svishtov Danube River
- Hot Spot No. 4 - Municipal WWTP - Vidin Danube River
- Hot Spot No. 4 - Municipal WWTP - Lom Danube River
- Hot Spot No. 4 - Municipal WWTP - Silistra Danube River

1.1.2. Industrial Hot Spots

1.1.2.1. High Priority

- Hot Spot No. 1 - Sugar and alcohol factory Gorna Oriahovitza Yantra River Basin, Yantra River
- Hot Spot No. 2 - Fertiliser plant “Chimco” Vratza Ogosta River Basin, Ogosta River
- Hot Spot No. 3 - Pharmaceutics plant “Antibiotic” Razgrad Russenski Lom *River Basin, Beli Lom River*

1.1.2.2. Medium Priority

- Hot Spot No. 1 - Metallurgical plant Kremikovtzi Iskar River Basin, Lesnovska River

1.1.2.3. Low Priority

- Hot Spot No. 1 - Elatzite Mining Iskar River Basin, Malak Iskar River

When discussing the industrial plants directly discharging into the Danube or its tributaries one should bear in mind that most of them are privately owned and according to their business plans most of the owners intend to shift to “clean” production.

The following ex-hot spots have been removed from the list due to ongoing activities to remedy the situation:

1. WWTP Botevgrad.
2. WWTP Pleven.
3. The Sugar Plants in Dolna Mitropolia.
4. The Copper Smelter Factory at Eliseina.
5. Russe -West Industrial Zone.
6. Sevlievo-Tannery "Sevko".

No ranking of agricultural hot spots has been made due to partial shift of ownership to private farmers and undeclared future plans of the new owners. Nevertheless many of them continue to be diffuse sources of pollution through their accumulated past environmental burdens (i.e. discharge ponds, lagoons etc.).

Additionally due to the problems with the erosion of the Danube coast and health risk considerations additional “hot spots” have been added as follows:

1. The Danube River bed from km 844 to km 347 is subject to intensive erosion processes, which necessitates regular bathymetric survey.
2. The Danube River bank at Long Tzibritza Section (km 710) being subject to intensive erosion needs urgent fortification.

3. The Danube River Bank at km 542 to km 536 – Yantra River estuary being subject to intensive erosion urgently requires fortification.
4. Restoration of the water regime of the wetlands Persin and Vardin.
5. Restoration of the biodiversity in the Belene Island.

1.2. Updating, Analysis and Validation of Water Quality Data

The negative impact on the hydrosphere and the changes in the quality component of water is due to anthropogenic activity, which leads to changes in the regime of the water outflow, the discharge of fecal-household and industrial wastewater.

The main source of pollution is the inadequately treated domestic wastewater but there are also important industrial discharges, including copper mines, integrated steel works, chemical industrial plants etc.

The quality of surface water varies and in some cases is not satisfactory due to direct industrial and partly untreated municipal discharges.

Still there are no discharge/emission water standards and enforcement is based on ambient standards.

This makes enforcement difficult and industries often discharge untreated effluents in the rivers, which severely affects the ecology of some river sections.

Three categories (water quality objectives) for running surface water are established in Bulgaria according to their water quality and possible use:

First category	potable water for the municipal water supply, food industry and other industries, using potable water.
Second category	water supply for agriculture, water sport and recreation and fish breeding.
Third category	water for irrigation and industrial water supply.

The standards for ambient water quality are specified in Regulation No 7 from 1986 (The text of the regulation can be found in Annex No 1, Table1.2-1).

The water quality data are freely available to everyone and are published quarterly in an information bulletin issued by the NCESD. An Annual report is published every year according to the requirements of the Environmental Protection Act (1992).

The control and monitoring of the quality of surface waters during the relevant period is carried out by the Regional Environmental Inspectorates in the towns of Sofia, Montana, Vratza, Pleven, Veliko Tarnovo, Russe and Shumen. The results are accumulated in the database of the National System for Environmental Monitoring (NSEM).

This control is performed in 67 points of the river network of the tributaries and in 8 points on the Danube River according to the updating made at the end of 1997. (Table 1.2-2: NSEM Sampling Points in the Bulgarian Stretch of the Danube River)

Annex 4 Table 4.1-1 “Index of Water Quality and Discharge Records” shows information on 119 sampling points identified by nearest settlement or river stretch. Points where water quality and quantity are simultaneously measured are identified by their co-ordinates. Adversely, at points not identified by co-ordinates only water quality is measured. The table also includes the year of commencement of monitoring and parameters measured.

The quality of the water is determined by analyzing monthly or quarterly water samples, depending on their importance and the presence of pollution. The evaluation is done in accordance with Regulation No 7 (State Gazette, No 96, 1986 – Annex 1).

The dynamics in the modification of the water quality is characterized basically by the indicators of dissolved oxygen (DO), biochemical oxygen demand (BOD_5) and permanganate oxidation, which reflect the presence of biodegradable pollutants of organic origin and their transformation. The content of biogenic substances is characterized by the concentration of different forms of nitrogen compounds, phosphates and total iron, which are linked with the cycle of formation and degradation of organic substances.

In many cases the concentration of heavy metals, phenols, oil products, suspended solids and other indicators, connected mainly with industrial activity of some plants with a local significance are taken into consideration.

The information on the state of surface waters, classified by river basins is presented in table format (see Annex 4).

Analysis of this data allow determination of the tendency in the river water quality changes in the selected period of time.

The general tendency is towards stabilization, and in many cases improvement of the water quality in the river basins in the Danube tributaries. In the investigated points on the Bulgarian sector of the Danube River no deviations in the concentrations of the regulated indicators have been observed. The measured high values of BOD5 and permanganate oxidation in the point after the town of Svishtov, which are within limits, are improved slightly in comparison to previous years. In this point often above the limits is the petroleum products indicator, which is definitely of local significance. The summary of the annual water quality control results along the whole Danube bank shows an insignificant deterioration of the oxygen regime, sustenance of the nitrogen indicators, BOD5 and the permanganate oxidation. Episodic deviations from the standards for the III category in certain cases are recorded for the indicator SS (Tables 1.2-3: Annual min and max values of basic water quality parameters (1995), Tables 1.2-4: Average annual values of basic water quality parameters (1996)).

Table 1.2-3: Annual min and max values of basic water quality parameters (1995) in (mg/l)

Points	BOD5	Permanganete Oxidizability	Suspended solids	Ammonia N	Nitrate N
Max conc. III category	25	40	100	5.0	20
Before Timok	1.2-.5.0	3.5-8.8	29-96	0-0.13	0.4-2.2
At Novo Selo	1.4-6.2	2.9-10.2	28-98	0-0.12	0.3-2.1
Before Vidin	1.2-4.4	3.3-10.6	30-80	0-0.24	0.27-2.0
Before Archar	1.2-4.2	2.8-9.8	39-112	0-0.3	0.23-1.55
After Lom	1.9-3.9	3.2-10.7	28-116	0-0.14	0.27-1.52
After Kozloduy	2.1-4.7	1.0-3.6	6.7-73	0.04-0.54	10
After Oryahovo	1.1-4.9	1.3-3.8	27-87	0.16-0.95	8
After “Sviloza”	1.3-14.7	3.7-16	26-190	0.12-0.7	0.03-2.3
After Svishtov	2.9-5.7	7.2-14.6	32-82	0.43-0.98	0.31-1.04
Before Russe	2.5-3.3	3.4-3.6	8-28	0.07-0.15	1.05-2.4
After Russe	2.6-3.5	3.6-4.2	16-40	0.06-0.15	1.4-2.7
At Tutrakan	2.4-2.8	3.3-3.5	12-32	0.03-0.18	1.14-2.6
At Silistra	2-3.2	3.2-3.6	10-38	0.07-0.18	1.12-3.0

Source: State of the Environment in the Republic of Bulgaria, Annual Yearbook 1995

Table 1.2-4: Average annual values of basic water quality parameters (1996) in (mg/l)

River	Parameters							
Mouth or output	DO	Permanganate oxidizability	BOD_5	NH_4-N	NO_3-N	Dissolved substances	SS	Phosphates
Danube	9.7	4.5	3.7	0.35	1.85	267.3	46.6	0.06
Ogosta	8.4	5.4	3	0.61	6.23	476.2	50.4	0.56
Iskar	10.9	8.5	5.3	1.24	3.28	314.7	73.6	0.31
Vit	10.7	6.7	4.1	0.73	2.31	314.7	37.2	0.26
Ossam	10.7	8	4.2	0.57	3.45	393.7	47	0.18
Yantra	8.3	5.6	4.9	0.37	2.58	310	38.4	0.06
Russenski Lom	8.1	9.9	11.3	1.07	8.6	638	502.4	1.24

Source: State of the Environment in the Republic of Bulgaria, Annual Yearbook 1996

2. Updating of Hot Spots

The updating of hot spots is necessary due to the changes in the period after the adoption and approval of the SAP (end of 1994). Reviewing table 2.2 of SAP titled "Hot Spots" it is necessary to update the information, since the process of restructuring in the country continues.

An overview of the current situation is given below:

The process of transition from the central planned to market orientated economy compels the Bulgarian authorities to establish new principles for their political, economic and social institutions.

The privatization of the industrial plants and the land reform are still in progress. There has been a decline in industrial output accompanied by a decrease in pollution loads.

The evaluation and comparison of the hot spots is made difficult due to the still progressing of the structural reform in the country. The list of Hot Spots in the SAP contains descriptions of the emissions are very brief and expressed in units which prevent aggregation, incorporation into nutrient balances, or testing of investment and clean-up scenarios.

This justifies the use of a new approach and methodology for the inclusion, exclusion and ranking of “Hot Spots”.

2.1. General Approach and Methodology

This section is presented the general approach and methodology that was applied to update, evaluate and rank hot spots. Statements of this methodology that were debated and mostly accepted by the water quality working group during the January 1998 national reviews workshop are presented intact, except for some minor modifications, under the following subsections.

1. Evaluation of environmental and health hazards based on the monitoring system available.
2. Evaluation of the results achieved u to now and planned projects.

2.1.1. Evaluation of Existing Hot Spots

One major sub-objective of the national review is to improve the descriptions of existing hot spots to facilitate their comparison and technical and economic evaluation. Specific measures for accomplishing this improvement are:

Defining 3 categories and listing hot spots in three groups –

- municipal hot spots
- industrial hot spots
- agricultural hot spots

In the evaluation and ranking of the hot spots the EMIS reports on municipal and industrial emissions made available in April 1998 was used.

Following this methodology the hot spots are grouped in three groups where information on them is based on the EMIS report.

Insufficient information on pathogens and TOC led to their exclusion from the specific fiche for each hot spot.

The high priority hot spots are situated along major tributaries and do not have a direct trans-boundary effect.

2.1.2. Deletion of Existing Hot Spots

A second major sub-objective of the national review is to clarify if major changes or discoveries may have occurred which eliminate the justification for some of the hot spots to be on the list.

From the additional investigations, it was established that from the "Hot Spots" List the following could be removed:

1. **The Copper Smelter Factory at Eliseina.** Presently it is included in the "hot spots" and is one of the major polluters along the Iskar River basin. The implementation of the Programme for the improvement of the environmental situation in the area of the Copper Smelter Factory at Eliseina began in 1995. The Programme is financially supported by the Japanese government. An OECF soft loan finances the renovation of the technological equipment and the construction of treatment facilities for the reduction of the negative impact from heavy metals on Iskar River waters.
2. **WWTP Botevgrad.** The structural changes in the industry and decline of output require revaluation of the balance of pollution and water quantities taking into consideration the business programmes of the newly privatized enterprises. At the moment part of the wastewater is treated mechanically. The design of the WWTP should be reviewed. For the reviewed period no exceeded values of the controlled indicators have been registered in the Iskar River where the wastewater is discharged.
3. **WWTP Pleven.** The WWTP (sludge treatment facilities) is reconstructed and rehabilitated under the IBRD Water Companies Restructuring and Modernization Project Loan following a restructuring of the Water Company.
4. **The Sugar Plants in Dolna Mitropolia** have stopped the productive activity, polluting the waters of the Vit River over two years ago.
5. **Sevlievo-Tannery "Sevko".** Currently a project for technological rehabilitation is under execution which aims reduction of emission loads of N-NH4, S-2, SO4 and Cr+6. EC PHARE, the National Environmental Protection Fund and the National Eco Trust Fund finance the construction of an industrial wastewater pre-treatment plant. A study is carried out under an EC PHARE project for studying the possibilities of treatment of the industrial wastewater with that of the municipality of Sevlievo.
6. **Russe -West Industrial Zone.** The main sewer is under construction and the completion of the Pumping station is ongoing too, with the financial support of the National Eco Trust Fund.

2.1.3. Addition of Hot Spots

A third major sub-objective is to justify the addition of new “Hot Spots” to the list. The following is subject to investigations:

Municipal WWTP Lom. The population of the town according to the National Statistical Institute on 31.12.1995 is 30609 inhabitants. According to data from the annual report-1997 of the REWI Montana the non-treated wastewater quantity is from 600 to 800 l/sec. Actually the National Environmental Protection Fund is providing financial assistance for the completion of the construction of the internal sewage network of the town. In order to prevent the health risk for the population it is necessary to deviate the wastewater collector outside the settlement, as well as to construct facilities for the primary wastewater treatment.

An evaluation of the diffuse sources of pollution is not presented in Part C because such an assessment exists in the Applied Research Project "Nutrient Balances for Danube Countries" (November 1997). The study covers the period 1989-1992 and the tendency is reproduced in the 1994 – 1997 period.

Specific conditions in the Bulgarian stretch of the Danube River impel the inclusion of localization of bank erosion and some conservation sites to the hot spot list

Proposed New "Hot Spots"

1. The Danube River bed from km 844 to km 347 is subject to intensive erosion processes, which necessitates regular bathymetric survey.
2. The Danube River bank at Long Tzibritza Section (km 710) being subject to intensive erosion needs urgent fortification.
3. The Danube River Bank at km 542 to km 536 – Yantra River estuary being subject to intensive erosion urgently requires fortification.
4. Restoration of the water regime of the wetlands Persin and Vardin.
5. Restoration of the biodiversity in the Belene Island.

2.1.4. Ranking of Hot Spots

A fourth major sub-objective of the national review is to develop and apply a format for ranking hot spots (following proposed criteria) from the perspective of the scope and seriousness of the problem. The following paragraphs a ranking on the basis of criteria involving size of load, dilution factor, ambient water quality at the source of emissions, nearby downstream use of water and transboundary implications.

Note: Agriculture has not been included in the ranking due to the incomplete progress of land ownership reform, privatization of animal breeding facilities, and lack of information on the business plans of the new owners.

There are hot spots of high priority where different projects for their remediation are currently underway. (For example WWTP Samokov, WWTP Gabrovo and WWTP Veliko Tarnovo).

In determining hot spots and critical sections of the Bulgarian tributaries, we have been guided by the following:

- extent of the pollution of the examined river section at minimum water quantities (section category);
- character and type of water use in the section and after it;
- specific features of production capacity and distribution in time, if the pollution from an industrial enterprise(s) has led to the identification of a hot spot;
- longitudinal location of the stretch;
- degree of treatment of the discharged wastewater;
- duration of the water flow in the river stretch;
- perspective development and urbanization of the water catchment area as a whole.

Taking into consideration the extent of pollution of separate sections of the Bulgarian tributaries of the Danube River, linked with the impact of separate hot spots, the following classification for priority improvement of the state of the riverine waters can be made:

1. Yantra River below the town of Gorna Oriahovitza
2. Ossam River below the town of Troyan
3. Yantra River below the town of Gabrovo
4. Russenski Lom River below the town of Razgrad
5. Ossam River below the town of Lovetch
6. Ogosta River below the town of Vratza
7. Iskar River below the town of Novi Iskar
8. Rossitza River below the town of Sevlievo
9. Yantra River below the town of Veliko Tarnovo

2.1.5. Map of Hot Spots

Map C6-2 shows the hot spots from the municipal and industry group. The same map shows the towns, which have constructed WWTP also when the treatment effect is insufficient.

2.2. Municipal Hot Spots

Each municipal hot spot has a fiche format summarizing information which are attached in Annex 2 (Tables 2.2.1-1 to 2.2.1-6; Tables 2.2.2-1, 2; Tables 2.2.3-1, 2 and 3).

2.2.1. High Priority

The following "Hot Spots" are considered to be in most urgent need of control on the basis of the criteria (a) size of the loads of critical parameters such as N, COD, BOD_5 and SS, (b) sensitivity of nearby downstream uses to the emissions and (c) characteristic of the problems caused for receiving waters and (d) the potential health risk.

- Hot Spot No. 1 - Municipal WWTP Gorna Oriahovitza and Liaskovetz *Yantra River Basin, Yantra River*
- Hot Spot No. 2 - Municipal WWTP Troyan *Ossam River Basin, Ossam River*
- Hot Spot No. 3 - Municipal WWTP Lovetch *Ossam River Basin, Ossam River*
- Hot Spot No. 4 - Municipal WWTP Vratza- rehabilitation and expansion *Ogosta River Basin, Dabnika Leva River*
- Hot Spot No. 5 - Municipal WWTP Sofia- rehabilitation and expansion *Iskar River Basin, Iskar River*
- Hot Spot No. 6 - Municipal WWTP Sevlievo *Yantra River Basin, Rossitza River*

2.2.2. Medium Priority

- Hot Spot No. 1 - Municipal WWTP Montana Ogosta River Basin, Ogosta River
- Hot Spot No. 2 - Municipal WWTP Popovo Russenski Lom River Basin, Popovska River
- Hot Spot No. 3 - Blato River basin/ Several small towns- Slivnitza, Kostinbrod and Bojurishte Iskar River Basin

2.2.3. Low Priority

- Hot Spot No. 1 - Municipal WWTP - Russe Danube River
- Hot Spot No. 2 - Municipal WWTP - Levski Ossam River,
- Hot Spot No. 3 - Municipal WWTP - Svishtov Danube River
- Hot Spot No. 4 - Municipal WWTP - Vidin Danube River
- Hot Spot No. 4 - Municipal WWTP - Lom Danube River
- Hot Spot No. 4 - Municipal WWTP - Silistra Danube River

2.3. Agricultural Hot Spots

Pollution from animal-breeding farms has diminished significantly with the decline of this activity. Due to the privatization in the sector, some of the big animal-breeding farms were closed. In some of them the number of animals was reduced. The few existing private animal-breeding farms are smaller and with a limited capacity.

With the rise of the price of chemical fertilizers the solid manure from cattle-breeding farms after composting is almost entirely used for fertilization.

The more significant animal-breeding farms identified as “Hot Spots” in the Ogosta River catchment are as follows:

- **Pig farm, Studeno Buche village,** owned by "Agropromstroy" Montana. The capacity of the farm is 20000 equivalent animals (of 100 kg.). It has a functioning treatment plant - mechanical treatment and open precipitation ponds in need of reconstruction and modernization It has been privatized in 1994, but regardless of the assumed engagements on the part of the owner, the necessary measures for achieving the effluent standards have not been carried out.
- **Military animal-breeding complex Vratza.** The complex is property of the Ministry of Defense Wastewater is discharged without treatment. It is necessary to construct a WWTP.

The more significant animal-breeding farms in the catchment of the Iskar River are as follows:

- **Inter co-operative enterprise "Pig complex", Knezha.** In the reviewed period the number of animals varies widely. It has a mechanical treatment facility, whose treatment effect is insufficient. It is necessary to construct a biological treatment facility.

The more significant animal-breeding farms identified as “Hot Spots” in the Yantra River basin are as follows:

- **Pig-breeding farm in the village of Samovodene.** The wastewater after the sedimentation pits is discharged in the Yantra River and pollute it and for this reason a monetary fine has been imposed by the relevant authorities.
- **Pig breeding farm "Geran"- town of Liaskovetz.** Wastewater after precipitation is discharged in the Yantra River and pollutes it and for this reason a monetary fine has been imposed.

The tendency towards diminishing of the total number of animals is evident from Table 2.3-1. It is based on the table "Number of Animals" (Annex 2, Table 2) from “Nutrient Balances for Danube Countries”, EPDRB, March 1996.

Table 2.3-1 Numbers of animals in all sectors

Year	Cattle (units)	Pigs (units)	Sheep (units)	Hens/Chickens *(units)*
1989	854 774	1 829 277	3 164 714	18 805 997
1992	706 403	1 114 312	2 060 237	10 265 461
1994	314 255	963 455	1 639 381	10 750 613

Source: Statistical Reference Book 1995, National Statistical Institute, Bulgaria;
Nutrient Balance for the Danubian Countries, Final Report, Bulgaria, August 1996

Their ratio to the total number of animals in the private farms is as follows:

- cattle - 65,26% of the total number of animals are in the private farms
- pigs - 33,66 % of the total number of animals are in the private farms
- sheep - 87,92 % of the total number of animals are in the private farms
- hen/chicken - 62,61% of the total number of animals are in the private farms

As agricultural hot spot we can define the sites for the accumulation and composting of the manure. In the greater part of the villages the manure mass is piled in the yards of the houses or along the banks of the nearest river.

2.4. Industrial Hot Spots

The listing of industrial hot spots needs the following explanations:

- The first round of privatization of the Bulgarian industry was completed in 1997. More than 30% of the government sector went into private hands.
- A second round of privatization is scheduled to begin in the second half of 1998.
- The private enterprises are listed as “Hot Spots” due the fact that some continue to affect the environment adversely and especially the water quality of the receiving water body.
- In applying the selection and ranking criteria, the size of the pollution load of the critical parameters turned out to have the highest weight.
- A Summary of Information on the Industrial Hot Spots is give in Tables 2.4.1-1 & 2; Tables 2.4.3-1 in Annex 2.

2.4.1. High Priority

- Hot Spot No. 1 - Sugar and alcohol factory Gorna Oriahovitza *Yantra River Basin, Yantra River*
- Hot Spot No. 2 - Fertilizer plant “Chimco” Vratza *Ogosta River Basin, Ogosta River*
- Hot Spot No. 3 - Pharmaceutics plant “Antibiotic” Razgrad *Russenski Lom River Basin, Beli Lom River*

2.4.2. Medium Priority

- Hot Spot No. 1 - Metallurgical plant Kremikovtzi *Iskar River Basin, Lesnovska River*

2.4.3. Low Priority

- Hot Spot No. 1 - Elatzite Mining Iskar River Basin, Malak Iskar River

3. Identification of Diffuse Sources of Agricultural Pollution

Agriculture is one of the most important sectors of the Bulgarian economy. It is well known that in a past, Bulgaria was famous as a well-developed agricultural country. The Danube catchment area is 42.3 % of the total territory of Bulgaria (110 000 km2). The agricultural land in the Bulgarian part of the Danube River basin is about 3 208 000 hectares or 54,3 % of the total agricultural lands of the country. The uncultivated land area is 24,6% and the cultivated land area is 75,4%.

There is a number of diffuse sources of agricultural pollution in a Danube catchment area. It is well known that the reason is the excessive application of fertilizers, pesticides, the irrigation with polluted water and the rain erosion.

An indicator of the non-point pollution is the content above the set limits of nutrients, such as nitrogen, phosphorus, potassium and some toxic substances. Due to the fact that up to now the land reform in the country is not concluded, i.e. there is still no clarity concerning the ownership of the land, no steps have been undertaken for the development of the control of non-point pollution.

The utilization of the irrigation systems for the country as a whole has diminished to 10%, which is considered critical, because of the prolonged process of restitution of the ownership of agricultural lands. Under the EPDRB there are such examples for the evaluation of the non-point pollution as the “Integrated Regional Environmental Study”, EC PHARE, May 1994, Applied Research Programme - "Nutrient Balances for Danube Countries", EC PHARE, 1996, where internationally acknowledged estimation methodologies are used.

A pilot project "Agroecology", water quality in the catchment of the Yantra River, Parvomaitzi village" for determining the non-point pollution of ground waters and soils, including pollution from agricultural sources in the period 1993-1996 in the catchment of the Yantra River at the village of Parvomaitzi is being executed. Seven monitoring wells have been installed and water and soil quality has been monitored in determined profiles. The results from the project have been used as an example by the Bulgarian experts who have participated in the Applied Research Programme- "Nutrient Balances for Danube Countries", EC PHARE, 1996.

3.1. Land Under Cultivation

The total land under agricultural cultivation in Danube Catchment Area is shown below:

Table 3.1-1 The total land under agricultural cultivation in Danube catchment area

Year	Total Agricultural Land	Fields	Perennial Crops	Meadows	Pastures
	(ha)	(ha)	(ha)	(ha)	(ha)
1989	2 079 564	1 735 577	104 683	130 602	108 701
1992	2 154 977	1 831 400	97 200	130 800	10 100
1994	2 168 000*				

Source: Statistical Reference Book 1995, National Statistical Institute, Bulgaria
Nutrient Balance for the Danubian Countries, Final Report, Bulgaria, August 1996

Detailed breakdown of crops is given below:

Table 3.1-2 Agricultural land (Bulgaria - Danube River basin)

No	Crops	Area	Structure	
		Ha	*% of the country*	*% Cultivated land in Danube region*
	Field and perennial crops (total)	2168600	53.1	100
1	Wheat, barley, etc.	1078000	63.4	49.7
2	Maize	385000	68	17.8
3	Soybean	12000	60	0.6
4	Legumes (beans, etc.)	41000	58.6	1.8
5	Sunflower	285000	81.4	13.1
6	Sugar beet	21000	52.5	1
7	Tobacco	7000	13.1	0.3
8	Potatoes	20500	47.1	0.9
9	Other vegetables	50000	40	2.3
10	Lucerne	151000	45.8	7
11	Stone fruits	46000	60.5	2.1
12	Pome fruits	7000	40	0.3
13	Vineyards	60000	60	2.8
14	Others	43000	-	0.3

Source: EPDRB Danube Regional Pesticide Study, Bulgarian Report, Phase 1, December 1995

Land Reform and Land Use

Significant steps have been made in 1998 in the area of agrarian reform. Twenty per cent of the agricultural land has been returned to its owners in 1997 amounting to almost 1/3 of the land returned in the period of 1991 – 1997.

To settle the land use issue, a Lease Act was adopted in 1996 stipulating the general conditions for leasing of land. This Act provides for better conditions for long-term leasing of land. Also, the Agricultural Lands Ownership and Use Act was amended and a Regulations on its implementation was adopted, representing an important prerequisite for speeding up of the agrarian reform.

Table 3.1-2.1 Structure of private farms by Arable Land Size

Arable Land Size	% of Farmers	% of Land Size
up to 0.2 ha	51%	3%
up to 0.5 ha	20%	5%
from 0.5 to 1 ha	14%	7%
from 1 to 2 ha	9%	8%
from 2 to 5 ha	4%	8%
from 5 to 10 ha	1%	3%
more than 10 ha	1%	66%
	100.00%	100.00%

Source: Ministry of Agriculture, Forestry and Agrarian Reform- 1997

Fertilization

The monocrop growing of crops, especially cereals, poses a serious problem in agriculture with the significant increasing of weeds typical for cereal crops. During the last three years, the cereal crops (wheat, barley and maize) the relative share of treated areas has increased. In 1994, 56% of the areas were treated, 53% in 1995 and 70% in 1996. For the same period (1994 – 1997) the amount of mineral fertilizers used has decreased fivefold as compared to 1980 – 1981. There is a relatively lower decrease of nitrous fertilizers at 3.4 times, and more than 25 times reduction of phosphorous fertilizers. Potassium fertilizers are used only in green house production.

The extremely unfavorable ratio of fertilizers does not allow utilization of the nitrogen introduced into the soil by the plants and leads to its entering into other elements of the ecosystem cause pollution of soil and waters.

Table 3.1-3.0 Mineral fertilizers utilized by the crop 1994-1996 in (kg/ha)

Crop	**1994**		**1995**		**1996**	
	nitrogen	*P_2O_5*	*nitrogen*	*P_2O_5*	*nitrogen*	*P_2O_5*
Wheat	0.92	0.07	0.64	0.06	0.69	0.06
Barley	0.68	0.70	0.51	0.06	0.53	0.06
Maize-corn	0.78	0.11	0.45	0.13	0.52	0.11
Sugar beet	0.64	-	0.32	-	0.43	-
Sunflower	0.41	-	0.21	-	0.31	-
Potatoes	0.82	-	0.61	-	0.72	-

Source: Ministry of Agriculture, Forests and Agrarian Reform - Bulletin for the situation and perspective analysis for 1995-1998 (June, 1998)

The areas of intensive agricultural activities are given below:

The fields (areas in crops) and perennial plants (orchards, bacciferous plants and vineyards) are subjected to intense plant protection by treating with pesticides. The structure of the cultivated land area includes cornfields (86,3 %), perennial plants (4,8 %) and natural meadows (8,9%). Pesticides are mostly applied on fields with industrial crops and vegetables.

The present technological production system requires a definite range of the areas with different types of crops, treated with herbicides, fungicides and insecticides. Annually with herbicides are treated about 75-80% of the areas planted with cereals, 70% of the land with industrial crops and vegetables, and 30-40% of the zones with fodder. Fungicides and insecticides are applied on 75-79% of the areas with cereals, 80-85% of those with industrial crops and vegetables, 90-100% of the perennial plants and up to 35-40% of the fodder. The part of the treated areas varies mainly depending on the climatic conditions, provoking different degrees of development of diseases, pests and weeds. After 1990 the application of pesticides decreased with about 50%. This is caused by the decline of agricultural output during the agrarian reform process.

The technological normalization began in 1995, accompanied by significant structural changes of areas and production.

The Danube catchment area comprises about 54% of the cornfields and 65,6% of the areas with perennial plants as orchards and vineyards in Bulgaria. The Danube region is the place, where are produced 62,1% of the cereals, 55,3% of the industrial crops and a significant part of the vegetables and fodder. About 80% of the sunflower production belong to this region too.

Information on the principal pests, requiring treatment is given in the Table 3.1 –3 in Annex 3.

The findings of the erosion effects in project EU/AR/102A/91 Nutrient Balance for the Danube Countries for Bulgaria are as follows:

Table 3.1-4 Erosion (including fertilizer washout)

1988/1989	1992
34% non eroded areas; 34% slightly eroded areas with 4-5 kg N/ (ha/y) and 0.4-0.6 kg P/ (ha/y); 32% moderately eroded areas with 8-10 kg N/ (ha/y) and 0.8-1.2 kg P/ (ha/y)	34% non eroded areas; 34% slightly eroded areas with 3-4 kg N/ (ha/y) and 0.3-0.5 kg P/ (ha/y); 32% moderately eroded areas with 6-8 kg N/ (ha/y) and 0.6-1.0 kg P/ (ha/y)

Source: Nutrient Balance for the Danubian Countries, Final Report, Bulgaria, August 1996

Table 3.1-5 shows the analysis of plant growing in the Danube River Basin, 1995 - 1997

Table 3.1-5 Analysis of plant growing in the Danube River basin, 1995-1997

Crop	Production (thousand tons)	Average yield (kg/ha)	Market price (leva/kg)
Wheat	1366	28.9	230
Barley	271	29.9	210
Maize	938	34.8	200
Sunflower	208	9.3	75
Sugar beet	60	173.0	50
Tomatoes	53	68.4	878
Peppers	33	56.6	800
Potatoes	68	67.5	650
Grapes	176	43.0	450
Orchards	38	73.6	1250

Source: Ministry of Agriculture, Forests and Agrarian Reform- Bulletin for the situation and perspective analysis for 1995-1998 (June, 1998)

3.2. Grazing Areas

The common pastures and grazing areas were with the surface of 423 577 ha at the end of 1996. The meadows were 117 902 ha also at the end of 1996.

4. Updating and Validation of Water Quality Data

This section is intended to complete the description of receiving waters and link their status to descriptions of the hot spots in a meaningful way for environmental analysis.

4.1. Index of Water Quality Monitoring Records

Investigations on the water quality in the Bulgarian tributaries of the Danube River have been carried out since 1951. These first investigations cover mainly the mineral content of waters and the oxygen regime and have an episodic character.

Since 1967 an attempt has been made for the gradual organizing of a system of monitoring stations for the quality parameters of the water of all Danubian tributaries, including for the Danube River itself which was completed and began to function in 1972.

Since 1975 on the basis of the achievements, this monitoring system with the relevant updating, was included as an element of the National Monitoring System for the Protection of the Natural Environment by decision of the Bulgarian State Council.

Measurements of water quantities in Bulgaria started in 1935, and a National Hydrometric Stations Network was founded and further developed.

30-40% of all stations in the Bulgarian section of the Danube basin for the water outflow and alluvia coincides with the water pollution sampling points. Water quantities are calculated for those for those of the hydrometrical points, which do not coincide with the water quality sampling points. There are some stations, however, whose water outflow may not be calculated. At present an approximation of the two networks is attempted aiming their better integration.

The location setting of the separate hydrochemical stations along the Bulgarian tributaries was determined using the following guiding criteria:

- the location should facilitate direct assessment of the impact of human activity and temporal alterations along the rivers;
- the location should facilitate control over the major pollution sources and help assess the efficiency of existing treatment facilities;
- the location should make possible the calculation of water quantities at the hydrochemical stations;
- the distance between the stations is defined in a way ensuring the possibility of tracing back the pollution by different sources; (See Map C6-2 and Table 4.1-1 Index of Water Quality and Discharge Records).

At present for the Bulgarian sector of the Danube basin, i.e. for the Bulgarian tributaries of the Danube River there are 118 sampling points for determining the water pollution in tributaries and 21 points for the Danube River itself.

4.2. Data Quality Control and Quality Assurance

Samples are taken from the middle of the river once a month in a strictly defined procedure. Water quantity is measured daily. Samples from the Danube River are taken from the Bulgarian bank. Only for the frontier points at Novo Selo (km. 833) and Silistra (km 375) they are taken from the Bulgarian bank, from the middle and from the Rumanian bank in accordance with the Declaration of the Danubian Countries signed in Bucharest. The controlled parameters of the state of riverine water quality include: the mineral content components, organic pollution with, toxic and biological elements, petroleum products and other hazardous substances.

According to the legislation in force (Regulation No 7 of 1989), the possibilities for use of the waters classify three categories of receivers depending on the extent of their pollution.

Monitoring results are published every three months in the *Bulletin on the State of the Environment*, issued by the Ministry of the Environment and Waters.

The water quality control is carried out based on analysis of instantaneous samples. The sampling in the framework of the NSEM is carried out monthly (from the 1st to 10th day) by the respective REWI. Their laboratories and the NCESD are equipped with modern equipment supplied by the EC PHARE programme. The personnel has undergone respective training courses (see Table 4.2-1 - Methods for analysis, Annex 4). It contains a list of the standards and standard methods used by each of the water quality monitoring institutions analyzing the different water quality parameters. The analysis methods correspond to the respective standard.

4.3. Data Consistency, Compatibility and Transparency

The samples for the general parameters were collected, conserved and analyzed according to the requirements of the applied method and method detection limits as shown in Table (See Table 4.2-1 - Methods for analysis, Annex 4).

In determination of the indicator dissolved phosphates the samples are filtered.

The data are reliable since the methods used comply with BNS and ISO.

The comparability of the whole database requires an analysis and expertise due to:

- The correlation between water quality and water quantity cannot be made in many of the studied points – this applies especially to NCESD data.
- Parallel measurement of water quality and quantity is only done in the NIMH sampling network. The distribution of the sampling points however is inadequate for many analytical purposes.
- Information Q probabilities (80%, 90%, and 95%) is incomplete and the respective chemical parameters cannot be recalculated.

4.4. River Channel Characteristics

4.4.1. Network

This study has the objective to provide the necessary information for the "National Review Summary Report". An analysis was made of the changes of the hydrometric cross sections for the Bulgarian part of the Danube River, as well as an analysis of the rating curves for the cross sections of the gauges for 1974-1997.

The calculations and studies were made on the basis of verified data from field measurements along the Danube River conducted by the Administration for maintenance of navigation passes and exploration of the Danube – Russe, and additional studies.

Hydrological Network - main River

Studies were made of the first class hydrometric stations at Novo Selo, Lom, Oryahovo, Svishtov, Russe and Silistra (Table 4.4.1-1- Coordinates of the Hydrometric Cross Sections, Annex 4).

There is an existing network of 72 hydrometric stations of which 68 are located on 14 rivers and their tributaries in north Bulgaria. 2 hydrometric stations are located on Dobrudja River in their upper reaches where the water flows are constant and 2 at the Nishava River and its tributary the Erma River which is a Danube tributary running through Yugoslavia.

The hydrometric (water quantity) stations for the Danube tributaries that are presently operation are under the rule of the National Institute of Meteorology and Hydrology (NIMH).

The locations of the hydrometric stations are shown on Map C6-3, Annex 6. The water levels at all hydrometric stations are measured at 08:00 AM and 08:00 PM once or twice daily with the aid of gauges with mechanical limnigraphs (mechanical water level stage recorder). The temperature of the water and air temperatures are measured at 08:00 AM daily. Turbidity sampling is carried out at about half of the hydrometric stations and the quantity of suspended sediments is determined.

Water discharge is measured according to the traditional method “velocity – watercourse surface” with the aid of a velocity current meter, rods and whets, and manual or mechanical devices. During high waves the velocities are measured with the aid of a surface float.

Cross sections and logtitudinal profiles in the section of the station are recorded once annually with a high precision level.

Daily and hourly water quantities are correlated with the “water quantity – water levels” which are regularly measured.

The daily sediment quantities are correlated to the daily water quantities. The primary data processing from the observations including the establishment of correlation functions and the calculation of daily, monthly and annual values are carried out in one calendar year cycles.

The general hydrological profile of the Danube River tributaries in the Bulgarian section was made by reference to 21 hydrometric stations. Table 4.1 shows the numbers of the hydrometric stations, the river names and location, the geographical co-ordinates (northern longitude and eastern latitude in degrees and minutes), the elevation of the datum of the gauge (Black sea system) in [m], the catchment area in [km2], the study period [y], and the mean water discharge in [cu./s]. The mean multi-annual water discharge was calculated on the basis of the period 1975-1996, which includes a wet and a dry cycle and a relatively stable human impact on the river runoff.

4.4.2. Channel Cross Sections

It should be noted that the hydrometric cross sections and the gauge cross sections are different. They are situated as follows (Table 4-1):

Table 4.4.2-1 Cross section location and gradients of the main hydrological station on the Bulgarian sector of the Danube River.

HMS	Gauge	Location of the Hydrometric Cross Section	Zero elevation (Black sea system -Varna)	Zero elevation (Baltic sea system - Kronstadt)	Water Surface Slope
Point	*Km*	*km*	*m*	*m*	*mm/m*
Novo Selo	833.600	833.900	27.00	26.75	0.041
Lom	743.300	746.000	22.89	22.65	0.044
Oryahovo	678.000	678.650	21.56	21.34	0.033
Svishtov	554.300	553.400	15.10	14.89	0.048
Russe	495.600	492.050	11.99	11.80	0.046
Silistra	375.500	379.300	6.50	6.27	0.052

The hydrometric cross sections are shown in Figures 4.4.2 – 1, 2 (Annex 4). The bed elevation is measured by use of the Black Sea height system (Varna), which Bulgaria has adopted as its official one for the Danube River. Having in mind the future computations and studies it should be noted that the differences between the Black Sea and Baltic height systems for the Bulgarian part of the Danube River vary between 0.19 m and 0.25 meters. Table 4.4.1-1 Coordinates of the Hydrometric Cross Sections, Annex 4 includes the gauge datum given in the two height systems (columns 5 and 6).

Another important issue is that the elevations along the Danube River presented in Romania’s Black Sea system (Sulina) differ from those presented in Bulgaria’s Black Sea system (Varna).

This difference is mainly the result of the different input Black Sea levels, as well as to peculiarities of a geodetic nature. The author is not aware of any formal treaty between the two countries for transition from the one to the other Black Sea height system.

A comprehensive survey for the Bulgarian part of the Danube has not been made since 1967 and therefore the analysis of the changes of the cross sections was based on the hydrometric profiles. It is evident from the profiles presented in Figure 4.4.2-1 - Stream Cross Section Profiles for a Discharge Measurement. Hydrometric Stations (HMS) Novo Selo and Lom, and Figure 4.4.2-2 - Stream Cross Section Profiles for a Discharge Measurement. Hydrometric Stations (HMS) Svishtov and Silistra, Annex 4 that the Danube Riverbed has changed significantly over time. The coordinates of the cross sections are shown in Table 4.4.1-1 Coordinates of the Hydrometric Cross Sections, Annex 4, Table 4.4.1-1.

Bank erosion processes and substantial bed transformations prevail. These changes are mostly expressed in the form of profile erosion. The development of the riverbed deformations is accelerated after 1974, when Iron Gates 1 and 2 were launched. In recent years it is assumed that the bed has been stabilized.

The characteristics of the cross sections were computed based on the water surface slopes in the sections between the hydrometric profile and the profile of the gauge cross section.

It should be noted that since 1967 no updated survey of the Danube riverbed has been made and the survey data available cannot be matched by time discretization to the rating discharge curves.

The cross-sections of the rivers at the hydrometric stations, selected during the measurements taken in 1996, are also presented in graphic form (Figures 4.4.2-3 to 9, Annex 4).

4.4.3. Gradients

The Danube River gradients of the water surface are shown in Table 4.4.2-1 and Figures 4.4.2-10 to 16. The gradients of the tributaries are shown in the enclosed profiles.

The main Bulgarian tributaries of the Danube River are almost with the similar configuration of the longitudinal profiles. It is possible to identify three zones as follow: a zone with high slop of the riverbed, a zone of transition and a zone with low slop of the riverbed. They are corresponding of upper, middle and lower reaches of the rivers (see Figures 4.4.2-10 to 4.4.2-16). The longitudinal profile of the flat rivers is light, with low slop along the whole river coarse. The longitudinal profile of the Russenski Lom River is a typical example for that (see Figure 4.4.2-16). The more complicated is the longitudinal profile of the Iskar River (see Figure 4.4.2-12).

4.4.4. Flood Plains

There are no large, flooded areas in the Bulgarian part of the Danube River Basin. All the Danube lowlands, which are with surface 853.4 km^2, are protected with levees (Table 3) against high waters once in 100 years. The river’s terraces of the Bulgarian Danube tributaries, which are with surface around 452.6 km^2, are protected with one-sided or two-sided levees against high water once 20 years. We cannot describe the flooded areas by co-ordinates, because no GIS layer “Flood Plains for High Frequency Events” for Bulgaria has been set up (see Map C6-4, Annex 6).

4.4.5. Wetlands

Actually the wetlands, flood plains and reserves are identical for the Danube River right bank. Prior to 1950 wetlands were situated in the lowest parts of the lowlands where swamps had developed over an area of approximately 62 km^2. The flooded area of the lowlands was 853.4 km^2. Later, after the construction of levees in 1956, more than 45 km^2 of swamps dried up.

Among the wetlands are the Srebarna swamp and the marshes, situated on the Belene Island (Persin), and some small swamps on the flooded islands of Kitka, Tsibritsa, Vardim, Garvan and Popina. (See Map C6-5, Annex 6.)

4.4.5.1. The Group of Belene Islands

The site includes the eastern part of the largest Bulgarian island in the Danube with three largest freshwater marshes, surrounded by seasonally flooded forests and wet meadows, and two smaller islands. The group is situated between the 576-560 km of the Danube, with co-ordinates 43^{o} 40’N 25^{o}10’E and a total area with a conservation status of 1714 ha. It is one of the most important habitats in the country for Phalacrocorax pygmeus, Plegadis falcinellus and Lanius minor. The group of Belene islands is significant for its biodiversity, fisheries, forestry and tourism. This reserve is under partial legal protection. It has been included in the Bird Life International list of important Bird Areas in Europe. It is a wetland of European-wide importance.

The Danube River islands were formed under the impact of the river stream. The main problems of the Belene island are the disturbed water balance and the drying-up of its wetlands. Special measures to restore the water regime are needed, including partial removal of the existing levees and development of a management plan.

Hydrological and Hydraulic Features

The Belene island is the largest one in the section from km 375 to km 844. The island has levees, impossible to be flooded by water discharges with a return period of less than 100 years, as a result of which the water balance of the reserve territory has been severely affected.

Flood Peak Discharges

The flood peak discharges have been computed with the aid of a stochastic model for the flood runoff. The model was developed on the basis of the popular stochastic Svanidze method, known as the ‘fragments method” The calculations were based on data for the period 1941-1992.

The Probability of exceeding flood peak discharges is shown in Table 4.4.5.1-1. The water discharges cited are also true for the Vardim Island.

Table 4.4.5.1-1 Probability of exceeding flood peak discharges

Probability of exceeding, %	20.0	10.0	3.33
Return Period in Years	5	10	30
Peak discharge in m^3/s	12230	13300	14900

4.4.5.2. Vardim Island

This island in the Danube is situated between the 546-542 km east of the town of Svishtov and north of the village of Vardim, with the co-ordinates 43^{o} 37’N 25^{o}28’E and a total area with a conservation status of 458 ha including the “Old Oak” protected area (98,7 ha). The island is made of temporary sandbars, covered by seasonally flooded forest. It is one of the most important habitats in the country for *Platalea leucororax carbo, Nycticorax nycticorax* and *Platalea leucorodia*. Half of the territory is protected. Its main problems are a disturbed water balance and disturbance of the colonies of breeding birds outside of the protected area. There is a project for the restoration of the island’s water balance. the implementation of which will be overseen by the Danube Programme of WWF and the German Institute of Flooded Forests. Action is required for the restoration of the natural habitats of oaks, the maintenance and optimization of the water regime and the development of a management plan.

The flood peak discharges for the Danube are shown in Table 4.4.5.2-1.

Table 4.4.5.2-1 Flood peak discharges for the Danube River at the 546 km (Vardim reserve)

Probability of exceeding, %	20.0	10.0	3.33
Return Period in Years	5	10	30
Peak discharge in m^3/s	12250	13340	14950

4.4.5.3. Kalimok island - Nova Cherna

A former fish farm, situated on the right Danube River bank, north of the village of Nova Cherna near the town of Tutrakan, river section from km 437.5 to km. 441.5 with co-ordinates 44^{o}00’N 26^{o}28’E and a total area with a conservation status of 73,8 ha. The former fishponds, spanning 683 ha, should soon be declared as a protected area. The former ponds are covered by rich marsh vegetation and are surrounded by dense rush. The site is separated from the river by a seasonally flooded forest. An unnamed island in the Danube near Nova Cherna belongs to the same group and is of a national significance. Fish farming ceased in 1993 because of financial problems and the land is currently neither used nor managed. The main problems are a disturbed water balance and adverse human impact.

Action is required to restore the link with the Danube River and to develop a management plan.

The peak water discharges are shown Table 4.4.5.3-1.

Table 4.4.5.3-1 Flood peak discharges for the Danube River at the 437.5 km (Kalimok reserve)

Probability of exceeding, %	20.0	10.0	3.33
Return Period in Years	5	10	30
Peak discharge in m^3/s	12400	13550	15200

4.4.5.4. Garvan Marsh Natural Site

This is a marsh in an advanced succession stage, located at a distance of 30 km west of the town of Silistra, Danube River km 405.5 - 408.5, about 1 km from its bank. Its total area is 280 ha and it has the conservation status of a natural site since 1985. It is a wetland of a national importance. It is the surviving part of a larger marsh along the Danube, isolated from the river by a levee. It is currently fed by an insufficient amount of groundwater and its depth does not exceed 1m. Over time, the marsh has been gradually silted and could be classified as eutrophic, its open water surface having been overgrown by reed. Action is required to restore the water regime by reconnecting it to the Danube.

4.4.5.5. Srebarna Natural and Biosphere Reserve

The site is a eutrophic lake located on the Danube River bank between the kilometers 393-391, at a distance of 18 km west of the town of Silistra, with the co-ordinates 44^o 07’N 27^o 04’E and a total area with a conservation status of 1444,9 ha including the buffer zone (542,8 ha). The village of Srebarna is situated on its western bank. *Srebarna is a reserve of global importance*. It has been a natural reserve since 1948. In 1975 it was classified as a Wetland of International Importance - Ramsar Site, and since 1977 it is a biosphere reserve. In 1983 it was included in the UNESCO list of the World Natural and Cultural Heritage Sites. It is a national and an international tourism site. It is of global importance for *Pelecanus crispus* and is also important for the wintering geese. Five hundred meters of the levee near the Srebarna Lake was torn down in 1978 because of the need to renew the lake water during the flood periods.

The link between the lake and the Danube River has been restored with the construction of the new reverse canal in 1994 with the support of the MOEW and USAID. A new levee has been constructed for the Aidemir plain too. The natural water regime has been restored partially. The monitoring system was developed in 1995 with the support of UNESCO. The development of the management plan of the reserve and its buffer zone has just started. The household and agricultural pollution by the villages and farms should be restricted.

Flood Peak Discharges

The flood peak discharges for the Danube are shown in Table 4.4.5.2-1.

Table 4.4.5.5-1 The flood peak discharges for the Danube River at the 392.5 km (Srebarna reserve)

Probability of exceeding, %	20.0	10.0	3.33
Return Period in Years	5	10	30
Peak discharge in m^3/s	12950	14100	15900

Water Balance Components of the Srebarna Lake

The assessments of the water balance components of the Srebarna Lake are sizably different for the period prior to 1949, marked by natural conditions. During 1949 - 1978 the lake was wholly isolated from the impact of the Danube River by means of a non-flooded levee. In 1978 the levee was partially removed, while in 1993 a new link was constructed between the lake and the Danube River. The values of the water balance components are shown in Table 4.4.5.5-2.

The hydraulic features of the Danube cannot be calculated precisely because of the lack of a modern riverbed map. The last comprehensive hydrographic map of the Danube in the section covering the 375 of the 844 km was surveyed between 1967 - 1974

The additional wetlands not included in a strategic action plan (SAP) are given in Table 4.4.5-1. These zones are as important as the ones included in the SAP. They have the status of a CORINE SITE and Bulgarian experts are convinced they should be included in the SAP during its updating.

Table 4.4.5.5-2 Water balance components of the Srebarna Lake

Components	Natural conditions (before 1949)	Impaired conditions (1949 – 1978)
Mean elevation of the water level in m	12.50	11.90
Area of the water surface in km^2	5.0	2.5
Storage in $m^3.10^6$	5.40	2.90
Evaporation in mm	900	900
Evapotranspiration from reed in mm	1200	1200
Area under reed in km^2	1.65	1.44
Area free of reed in km^2	3.35	0.61
Precipitation in mm	492	492
Runoff from own catchment in $m^3.10^6$	15.2	5.0 *
Overflow from Danube River in $m^3.10^6$	6.45	0.00
Inflow from springs in $m^3.10^6$	0.69	0.69
Outflow to the Danube River in $m^3.10^6$	13.37	0.0 **

* *some 11 reservoirs have been built in the catchment*

** *before 1949 the lake was linked to the Danube by a small river. During 1949 - 1978 this link was severed by a levee. The average multi annual discharge of the river is 0.424 m^3/s.*

Table 4.4.5-1 Additional important wetlands in the Danube River basin

Name	Location	River basin	Area in ha	Co-ordinates
Rayanovtci Meadows	village Kraklevtsi	Iskar	1500	42^o 06' – N 23^o 04' - E
Dolni Bogrov – Kazichene	near the city of Sofia	Iskar	1000	43^o 41' - N 23^o 27' - E
Zimevitza Meadows	near the town of Svoge	Iskar	500	43^o 03' - N 23^o 15' - E
Orsoya – fishponds	village Orsoya and village Dobri Dol	Danube	360	43^o 47' - N 23^o 07' - E
Ibisha Island	north of the village Dolni Tzibar at Danube km. 717	Danube	70	43^o 52' - N 23^o 27' - E
Island near to the village Gorni Tzibar	east of the Ibisha island	Danube	60	43^o 49' - N 23^o 32' - E
Mechka fishponds	west of the village Mechka	Danube	800	43^o 44' - N 25^o 49' - E
Pozharevo Island	north of the village Pozharevo	Danube	170	44^o 04' - N 26^o 40' - E

4.4.6. Erosion and Degradation

Specific conditions in the Bulgarian stretch of the Danube River impel the inclusion of localization of bank erosion. The most endangered sections are the Danube River bank at the Long Tzibritza section (km 710) and the Yantra River estuary (km 542 – 536 km) as well as the region of the major Danube towns (Lom, Oryahovo, Svishtov, Nikopol, Russe and Silistra).

4.5. Dams and Reservoirs

Eight hundred and nineteen large and small reservoirs are in operation in the Bulgarian Danube River basin. The total volume of the reservoirs is 2.311 billion m^3. Only 30 of them have a storage exceeding 5 m^3x10^6 (Table 4.5-1). Depending on their regulating capacity 2 of them are multi-annual regulators and the remaining ones have seasonal regulating functions. Table 4.6.4-2 contains summarized data from the west, central and eastern part of the basin. Most of the reservoirs were built between 1950 and 1982.

There do not exist any special operational rules on the central government level. In abidance of the ecological requirements a 95% (probability of exceeding) mean monthly multi-annual water discharge is released during the low flow period downstream of the dam.

The reservoirs contribute to the decrease of sediment load in the Bulgarian Danube River tributaries.

4.6. Other Major Structures and Encroachments

4.6.1. Levees

The levees on the right Danube River bank in its Bulgarian section were constructed between 1930-1950. Their length and location, as well as the geographical names of the lowlands protected against flooding are given in Table 4.6.1-1, Annex 4. The total levee length is 260.679 km. The territories protected against flooding cover an area of 853.4 km^2. The crest elevation of the levees has been designed to safeguard the lowlands against flooding at Danube River water discharges with a probability of exceeding 0.1% (1000 years' return period) for the populated areas and important manufacturing facilities, and 1% for areas of a lesser economic significance.

The construction of the levees on the right Danube River bank does not exert a sizeable impact over the hydraulic features of the stream due to the low regulating capacity of the protected lowlands and to the fact that the high river terrace of the right bank is prone to flooding at a water discharge in excess of 12000 - 14000 m^3/s, marked with a relatively low return period of 10-20 years. The bank gets flooded at a water discharge of 9500 - 10500 m^3/s, with a return period of 2-4 years. This is also why the rating curves for the Danube River have not recorded any substantial deviations between 1941-1960. The construction of the levees on the right Danube riverbank has neither impacted the river's hydrological regime, nor the hydraulic characteristics of the river stream. The result, however, was a discontinued supply of Danube River waters to a series of marshes situated in the lowest parts of the lowlands and larger islands (Belene, Vardim, etc.). After 1978 and especially after 1992, a number of internationally funded projects aimed at the restoration of the natural conditions of particularly important reservation areas were designed and implemented, involving the partial removal of levees and facilities to enable a renewed supply of Danube River waters to these areas (see Annex 4, Table 4.6.1-1).

The state of part of the levees is doubtful due to the lack of proper maintenance in the past decade.

4.6.2. Bank Protection Structures

The main features of the bank protection structures constructed on the right Danube riverbank are shown in Table 4.6.2-1. The protection structures are predominantly passive, including bank protection walls, spur dikes and rubble groins, dry-rubble masonry and bio-protection of diverse tree- and shrub species.

The various types of bank protection structures cover the following bank sections:

- the total length of bank protection by means of retaining walls is 51.1 km, or 10.8 % of the total length of the Bulgarian Danube riverbank (471 km);
- the protection by means of embankments is a mere 0.8 km or 0.2 % of the total bank length;
- the spur and rubble groins cover a bank length of 8.8 km, which represents 1.9% of the Bulgarian riverbank;
- the bio-protection with trees and shrubs covers 17 km or 3.6 %.

The total length of the protected bank is 77 or not more than 16.5 % of the Bulgarian bank are protected against river erosion.(see Annex 4, Table 4.6.2-1)

The protected banks of the Bulgarian tributaries (Table 4.6.2-2) to the Danube have a total length of 499.1 km. The tributaries' bank protection in its predominant part is combined with levees.

Table 4.6.2-2 Rectification and levee construction along the Bulgarian Danube tributaries

	River	Total Length of Rectification	Total Length of Levees (unilateral and bilateral)	Protected Area
		km	*km*	*ha*
1	Timok		6.82	326
2	Topolovets	25.81	21.65	9351
3	Voinishka	8.05	0.40	1946
4	Vidbol	0.65	0.52	275
5	Lom	9.44	9.44	486
6	Tcibritca	5.34	5.34	1184
7	Ogosta	48.65	33.52	2871
8	Skat	11.64	10.58	1610
9	Botuna	8.75	-	-
10	Iskar	93.15	91.86	15409
11	Vit	23.05	23.05	1739
12	Osam	126.10	122.0	6100
13	Iantra	71.33	31.80	2258
14	Rusenski Lom	67.11	22.50	1705
	Total	499.07	379.48	45260

New parts of the riverbank are endangered subject to investigations and urgent restoration measures (see New Hot Spots).

4.6.3. Dredging

Two types of dredging works are conducted in the Bulgarian section of the Danube River. The dredged material volumes are shown in Table 4.6.3-1

The first type is applied for maintenance of the navigation conditions. There are 19 rapids in the section which restrict navigation during the low flow period. Bulgaria has assumed international commitments to maintain the navigation in the section between Silistra and Somovit. The second type of dredging activities is conducted for extraction of sand and gravel for the construction industry.

The above types dredging differ substantially in their impact over the natural development of the river morphology.

In connection with the first type of dredging activities, open water disposal is ordinarily applied, generating local turbidity by re-suspending fine-grained materials to the flow. The influence of this kind of dredging on the river bed processes is usually only local. Bulgaria’s share in the dredging works for navigation maintenance in the Danube downstream is 14.6% of the total dredging works between 1960-1990.

Dredging of the second type usually requires different ways of site-disposal. Part of the suspended material is removed from the riverbed. If the volume of the dredged materials exceeds the sediment bed load, irreversible riverbed processes may be stimulated. Bulgaria’s share in the overall dredging works for extraction of raw materials in the Danube downstream is 12.8 % of the overall dredging works between 1960-1990. Between 1960-1990 Bulgaria has conducted dredging activities at 27.4 % of the total dredging works in the section.

Table 4.6.3-1 Materials extracted from the Danube River by Bulgaria (2) by types for different periods

Period	Dimension	Type 1 (for navigation maintenance)	Type 2 (for sand and gravel extraction)	Total volume dredged from Bulgaria	Total volume of dredging in the section
1961-1970	10^3 m^3	2753	2530	5283	14749
Mean annual	10^3 m^3 y^{-1}	275.3	253.0	528.3	1474.9
	%	18.7	17.2	35.9	100
1971-1990	10^3 m^3	9986	8639	18625	72346
Mean annual	10^3 m^3 y^{-1}	499.3	431.9	931.2	7234.6
	%	13.8	11.9	25.7	100
1961-1990	10^3 m^3	12739	11169	23908	87095
Mean annual	10^3 m^3 y^{-1}	424.6	372.3	796.9	8709.5
	%	14.6	12.8	27.4	100

(2) *Assessments based on data published in "Die Furten der Donau" - Die Donau und ihr Einzungsgebiet" - Eine hydrologishe Monographie, Internationalen Hydrologishen Proramms der UNESCO,1996*

4.6.4. Human Impact on the Bulgarian Danube Catchment Runoff

Measurements and assessments of the Bulgarian Danube catchment runoff have been made after 1935. The global assessment of the water resources is given in Table 4.6.4-1.

Table 4.6.4-1 Potential and residual water resources of the Bulgarian section of the Danube catchment up to 1994

Section (1)	Potential Resources	Water Losses	Residual Resources
	10^6 m^3	10^6 m^3	10^6 m^3
West	3274	350	2924
Central	2562	295	2267
East	200*	20	190
For the catchment	6036	665	5381

* *Excluding groundwater in the Dobrudja region*

(1) *WEST: from the west frontier of the Republic of Bulgaria to the catchment of the Iskar River (incl.);*
CENTRAL: from the catchment of the Iskar River to the catchment of The Yantra River (incl.);
EAST: from the catchment of the Yantra River to the east border of the Bulgarian catchment of the Danube River.

During the period between 1950-1970, marked by an active economic development, numerous water management and surface erosion and river bed erosion facilities were constructed in Bulgarian territory and in the Danube catchment in particular (Table 4.6.4-2 and Table 4.6.4-3).

Table 4.6.4-2 Summary data for the reservoirs situated in the Bulgarian Section of the Danube basin

Section (1)	Reservoir capacity in mil m^3			% from natural river runoff
	for irrigation	others - include integrated use	total	
West	238.6	1247.8	1486.4	45.6
Central	342.7	369.4	712.1	28.0
East	112.7	-	112.7	32.0
For the catchment	694.0	1617.2	2311.2	37.6

(1) WEST: from the west frontier of the Republic of Bulgaria to the catchment of the Iskar River (incl.);
CENTRAL: from the catchment of the Iskar River to the catchment of The Yantra River (incl.);
EAST: from the catchment of the Yantra River to the east border of the Bulgarian catchment of the Danube River.

Table 4.6.4-3 Irrigation systems during 1985 *(Summary)*

Section (1)	Fit for Irrigation	With Irrigation system	
	10^3 ha	10^3 ha*	%
West	655	197	30.4
Central	587	179	37.4
East	857	64	7.5
For the catchment	2089	440	21.1

* *After 1992 only 10% for the irrigation systems have been in use*
(1) WEST: from the west frontier of the Republic of Bulgaria to the catchment of the Iskar River (incl.);
CENTRAL: from the catchment of the Iskar River to the catchment of The Yantra River (incl.);
EAST: from the catchment of the Yantra River to the east border of the Bulgarian catchment of the Danube River.

Table 4.6.4-4 Water consumption from Danube River (Master plan for the integrated use and protection of the water resources - 1983)

Section (1)	Irrigation Supply		Water supply*		Total
	Area	Total	Domestic	Industrial	
	10^3 ha	$10^6 m^3$	$10^6 m^3$	$10^6 m^3$	$10^6 m^3$
West	96.50	248.4	15.7	34.2	298.3
Central	31.21	84.7	24.4	83.5	192.6
East	81.12	137.8	83.4	80.0	301.2
For the catchment	208.83	470.9	123.5	197.7	792.1

(1) WEST: from the west frontier of the Republic of Bulgaria to the catchment of the Iskar River (incl.);
CENTRAL: from the catchment of the Iskar River to the catchment of The Yantra River (incl.);
EAST: from the catchment of the Yantra River to the east border of the Bulgarian catchment of the Danube River.
* *from the river and the terrace.*

Therefore we could assume that natural runoff conditions existed between 1935 - 1960 only. After 1970 these conditions were severely affected for a significant part of the catchment area. The negative impact differs both in intensity and origin for the different catchment sections. Common picture is given in Table 4.6.4-5 regarding the water consumption from the Danube River.

Human impact on the natural water resources can be classified into two groups:

- impact within the catchment (forestry, agriculture and related irrigation, water supply and draining, urbanization, open mines, gravel-pits, sandpits, etc.);
- impact inherently connected with the river network (construction works for hydropower plants, municipal and industrial water supply systems, irrigation and so on).

The analysis of the consequences of the different types of impact between 1935-1995 reveal the following facts:

- the impact of large-scale afforestation is expressed in a change of the tree species and age of the forests leading to an increased surface runoff and a decreased groundwater flow. This in turn results in an increased annual runoff and a decreased regulation capacity of the river basins. Presently afforestation impacts the quantity of the water resources within the limits of the uncertainty of the water discharge measurements in the open channel flow and cannot be deemed to be of significance;
- the area of the arable lands has not changed substantially between 1965-1995. As a result of the increased areas under farming crops, which require frequent irrigation, there is a certain increase of the water used for irrigation by 34 x 10^6 m^3 p.a. After 1992 the crisis in the farming sector has brought the volume of the irrigation water to its level in 1935.

After 1959 some 200 000 ha of slopes have been benched.

Table 4.6.4-5 Irrigation Pump Stations on the Right Bank of the Danube River *(Summary)*

Section [(1)]	Q [(2)] m^3 /s	N [(2)] kW
West	23.20	8823
Central	41.25	39870
East	63.92	27364
For the catchment	128.37	76057

(1) WEST: from the west frontier of the Republic of Bulgaria to the catchment of the Iskar River (incl.);
CENTRAL: from the catchment of the Iskar River to the catchment of The Yantra River (incl.);
EAST: from the catchment of the Yantra River to the east border of the Bulgarian catchment of the Danube River.
(2) installed capacity

In 1985 the state irrigation system occupied an area of 440 000 ha. The annual water consumption or irrigation water has reached 1.35 x 10^9 m^3, showing a low coefficient of performance of the irrigation systems. Table 4.6.4-7 shows the distribution of the irrigated areas by the manner of water supply to the irrigation systems - via pump stations (105.8x10^3 ha) or gravitational (92.3x10^3 ha), and 10.7x10^3 ha are equipped with combined systems. Although the crisis in Bulgarian agriculture led to a decrease of the irrigated areas up to 1992, after 1994 they have been increasing continuously. Bulgarian experts predict that in the year 2010 the irrigated areas would reach 60-70 % of their size in 1985.

Headlong urbanization took place in Bulgaria after 1935. The relative share of the urban population increased from 22% to 65% and that process has intensified after 1950. By 1983 water consumption for household and industrial needs had reached 1.3 m^3.10^9, the share of drinking water being 0.7 m^3.10^9. In 1995 water consumption went down by around 20% - 30% basically because of the recession in industry.

The losses of water in 1995 are shown in Table 6. They amounted to 666 m^3.10^6 which is an insignificant quantity with respect to the Danube River runoff at Silistra. Table 4.6.4-4 shows the quantities of unutilized Danube River water by 1983.

Table 4.6.4-6 Draining pump stations on the right bank of the Danube River

Section (1)	Q (2) m^3 /s	N (2) KW
West	26.43	4696
Central	75.76	11972
East	36.20	4840
For the catchment	138.39	21508

(2) *installed capacity*

Table 4.6.4-7 Types of irrigation supply systems

Section (1)	Irrigated Areas - 10^3 ha		
	Gravitational	by pumping	Total
West	35.6	38.3	73.9
Central	47.9	52.5	100.4
East	8.8	15.0	23.8
For the catchment	92.3	105.8	198.1

(1) *WEST: from the west frontier of the Republic of Bulgaria to the catchment of the Iskar River (incl.);*
CENTRAL: from the catchment of the Iskar River to the catchment of The Yantra River (incl.);
EAST: from the catchment of the Yantra River to the east border of the Bulgarian catchment of the Danube River.

The right bank of the Danube is steep. The annual fluctuations of the water levels frequently reach an amplitude of 6 to 9 m. Use of the Danube's waters is made through pumping systems. The pump stations designated for irrigation have a potential of 128.4 m^3/s, and those which return water from the drainage systems back into the Danube are capable of pumping 138.4 m^3/s. A list of the pump stations is given in Table 4.6.4-8.

The results from the above tables show that the Danube water intakes for the irrigation systems and the return volumes of water from the drainage systems are practically equal.

Table 4.6.4-8 List of the Pump stations (PS) located on the Bulgarian bank of the Danube River

No	Section and Name of the PS	Q	N	Year of operation
		dm^3/s	*kW*	
I	**West**			
1	Gomotartci	13600	5000	1958
2	Yassen	5200	1400	1966
3	Florentin	900	1015	1962
4	Nishava	750	115	1961
5	Archar	1800	293	1962
6	Ursoia	955	1000	1960
II	**Central**			
1	Belene 2	1620	282	1951
2	Belene 3	7410	1220	1968
3	Dragan Voyvoda	2500	687	1951
4	Gigen	2275	583	1957
5	Belene 4	750	115	1984
6	Svishtov 16	2200	803	1950
7	Vardim 16A	4500	600	1957
8	Lyulyaka	20000	30560	1975

III	East			
1	Batin – Krivina	460	200	1966
2	Slivo pole 20	6000	2034	1953
3	Slivo pole 21	1000	215	1953
4	Slivo pole 22	2730	900	1953
5	Slivo pole 13	600	164	1955
6	Slivo pole 23	19200	2605	1965
7	Slivo pole 24	14600	4680	1951
8	Bobovo	980	1250	1988
9	N 20	1000	487	1970
10	N 25	4500	3333	1956
11	N 25A	6000	5041	1964
12	Tutrakan	1350	2400	1972
13	Antimovo	3600	3226	1983
14	Popina	600	500	1963
15	Vetren	600	144	1963
16	N 27	500	160	1957
17	Silistra 1	200	25	1958

4.7. Major Water Transfers

There is no water transfer from the Bulgarian part of the Danube River basin to others. Between 1983-1997 the average annual transfer of water from the southern Bulgarian rivers Struma and Mesta to the basin of the Iskar tributary amounted to 75 mil. m^3 and was conducted for covering the water demand of the city of Sofia. This practice is an exception from the rule and was only adopted as a result of the prolonged drought between 1981 and 1995.

4.8. Preferred Sampling Stations and Data Sets

In the present National Review of Bulgaria as priority were examined the assumed hot spots and critical sections of the tributaries of the Danube River for which there is available simultaneous information on water quantity, alluvia and riverine water quality for the period 1994-1997. In addition to the foresaid on certain sections, water quantities were calculated - e.g. for the river Yantra below the town of Veliko Tarnovo.

The main attention was directed towards the major tributaries of the Danube River -. Tributaries of II and III grade and monitoring points are indicated in Tables 4.8-1 to 4.8-24 and Map C6-6. Due to their great number, no information on them is given, regardless that significantly polluted sections exist.

The examined 25 hydrochemical and hydrological stations describe well the impact of the separate hot spots on the quality indicators in the critical sections of the rivers and allow to infer the character and the type of the polluting emission. At the same time, these stations meet the requirement that they be situated in the downstream river sections of the Bulgarian tributaries, since this allows the calculation of the introduced pollution load into the Danube River.

In the Bulgarian monitoring system the number of samples from the separate stations is the same and no priority is given to separate indicators.

Due to the small runoff of the Bulgarian tributaries and its wide dynamic range (compared to that of the Danube River), no direct conclusion on the impact of non-point sources of pollution may be drawn from the standard monitoring information. For this purpose other sources of information are necessary which must be additionally statistically analyzed.

Table 4.8-28 shows the critical sections and the hot spots of the main Bulgarian tributaries of the Danube River.

Table 4.8-28 The hot spots of the main Bulgarian tributaries

River basin	Most polluted sections	Sources of pollution	Indicators above maximum permissible concentration at minimum water quantities
Ogosta (st. Kobiliak)	River Varteshnitza below town Vratza	Plant “Himko Vratza“ and Municipal wastewater treatment plant	N-NO_2 = 0.09-0.15mg/l N-NH_4 = 10-12 mg/l
Iskar	Upstream the town Novi Iskar	Poor operation of Sofia WWTP	BOD5 =15-17 mg/l N-NO_2 = 0.18 mg/l N-NH_4 = 7.3 mg/l
Vit	Downstream the town Pleven	45% of the sewage of the town of Pleven are discharged untreated	BOD5= 38 mg/l/ ’94 N-NO2=0,395 mg/l/ ’95 N-NH4=14,2 mg/l/ ’95 PO4= 1,3 mg/l/ ’94 SS=277 mg/l/ ’94 Oils ‘94&’95
Osam	Downstream the town Troyan	Wood polates plant and industrial and wastewater of the town Troyan	BOD5 = 60-68mg/l
	Downstream the town Lovetch	Industrial and sewage waters of the town Lovetch	BOD5 = 28-30mg/l N-NO_2 = 0.10-0.14mg/l
Iantra	Downstream the town Gabrovo	Sewage system of Gabrovo	BOD5 = 30-39mg/l N-NH_4 = 6.0-11.3mg/l
	Downstream the town V.Tarnovo	Sewage system of V.Tarnovo	BOD5 = 13-17mg/l N-NO_2 = 0.11-0.14mg/l
	Downstream the town Gorna Oriahovitza (st. Varbitza)	Sugar plant, Sewage system of Gorna Oriahovitza and Liaskovetz	BOD5 = 140-160mg/l N-NO_2 = 0.19mg/l N-NH_4 = 8.13mg/l
	River Rositza - Downstream the town Sevlievo	Industrial and sewage water of the town Sevlievo	BOD5=14-16mg/l N-NH_4 = 8.0mg/l
Russenski Lom	River Beli Lom - Downstream the town Razgrad	Antibiotic plant Industrial and sewage water of the town Razgrad	BOD5 = 25-27mg/l N-NO_2 = 0.11mg/l N-NH_4 = 6.20mg/l

The comparative analysis of the results of the samples of the two frontier points on the Danube River (Novo Selo, km. 833) and Silistra (km. 375) indicate that no significant differences exist in the examined quality characteristics of the Danubian water. This once again shows that the contribution of the Bulgarian tributaries is insignificant and that the basic quality content of the Danube River water is determined above the Bulgarian section.

On Table 4.8-29 are indicated the limits of modification of the examined indicators for the frontier points in the Bulgarian section of the Danube River.

Table 4.8-29 The Fluctuation Ranges of Indicators Examined

Indicator in mg/l	Novo Selo, km. 833	Silistra, km. 375
BOD_5	1.40-1.70	2.00-4.50
N-NO_3	0.40-2.90	0.70-3.00
N-NO_2	0.01-0.09	0.01-0.09
N-NH_4	0.02-0.52	0.07-0.44
P-PO_4	-	0.01-0.10

The multi-annual investigations carried out in Bulgaria indicate that the wastewater directly discharged in the Danube River and the tributaries disperses in a comparatively narrow strip of 300 m width and up to 20 km length and there is a so called "drop-like" distribution /1/.

As the most deteriorated in qualitative aspect section in the Bulgarian sector is considered the area around the town of Nikopol (km.597), above which the rivers Iskar, Vit, Ossam and Olt discharge.

4.9. Water Discharges

The AMNPED - Russe carry out all of the water discharge measurements at the Bulgarian HM Stations. All of the measurements are based on the “velocity-area” method (following the Danube Commission rules). The coordinates of the stream cross section are measured by the help of echosaunders and controlled with weighted lot. The velocity measurements are carried out by the help of AOTT Kempten velocity current meters. The velocity current meters are calibrated one time annually in a special rating tank at the University of Architecture Civil Engineering and Geodesy - Sofia.

The standard error of the velocity current meter is less then 0.7%. The annual number of the discharge measurements decreased after 1993 by 2 - 3 annually comparing with the period before 1992 when the discharge measurements reached 10 - 15 annually for each hydrometric station.

4.9.1. Danube River Rating Curves

A study was made of the annual rating curves for the above mentioned hydrometric stations. The analysis shows that for the entire section from km 833.6 to km 375.5 for the years following 1974 the rating curves have been shifting down. The processes have stabilized downstream of the Danube. The shift of the rating curves in recent years in the upper part of the section has been insignificant. Compared to the period prior to 1974, the shift of the rating curves in the zone of the mean and low flow ranged between 0.25 and 0.45 m. Another peculiarity is that in some years the rating curves remained stable or rose slightly.

So far these processes do not exhibit a clear regularity. For this reason in this study the use of averaged multi annual rating curves is proposed.

Based on of the water discharge measurements between 1990-1996, average multi annual rating curves have been developed for the hydrometric cross sections and presented in Figures 4.9.1-1 and 4.9.1-2 (Averaged Discharge Rating Curves at Hydrometric Stations Novo Selo and Lom, Svishtov and Silistra). The co-ordinates of the rating curves are presented in Table 4.9.1-1.

The studies were conducted by polynomial or power function approximation, both of which showed good results during rating curve joint studies of Bulgarian, Romanian and Serbian experts. The figures bear an indication of the standard errors of the discharge rating curves.

It is very important to agree on the height system for which the input data for the hydraulic models will be used.

It is recommended that after the selection of the internal cross sections of the computational model has been made, calibration studies are conducted with the rating curves proposed hereby.

In addition to the overall hydrological features given in Table 4.4.1-2 and to item 4.4.4 Flood Plains, Table 4.9.3-2 gives the maximum water discharge with return periods of 5, 10, 20, 30 and 50 years, determined by the use of empirical probability curves, represented by theoretical approximations. The return periods also include the design values of the maximum water discharge applied in the construction of protective dykes in the low river sections mid- and downstream (10 to 50 years).

The daily river runoff hydrographs are shown in drawings under Fig. 4.9.3-1 to 21 and cover a three year period (1994-1996) for all 21 hydrometric stations used. The drawings are grouped by stations (Figs. 4.9.3-1 to 21, Annex 4).

The mean monthly and annual values of the river runoff measured at the hydrometric stations between 1994 and 1996 are shown in Table 4.9.3-3, and the analogous maximum values are shown in Table 4.9.3-5.

The averaged distribution curves for the periods of exceeded daily water discharge within the calendar year are shown in Table 4.9.3-6. The observations are based on the period 1978-1996.

The rating curves for each hydrometric station have been worked out by averaging and rounding off data collected during 1994-1996 and do not take into account the fluctuations during the individual shorter periods (Figs. 4.9.3-22 to 28, Annex 4).

The calendar values of the water discharge and turbidity (where such observations exist) have been determined as mean for the 24 hours during which the sample had been taken. They are included in the tables on water quality.

As the 1997 data are currently processed they were not included in the present study.

4.10. Sediment Discharges

The first steps of the sediment monitoring in the Bulgarian sector of the Danube River can be dated back to 1956. Up to now Bulgaria does not have a completed monitoring system to UNESCO’s definition. In the process of collecting the data about sediments are included the follow institutions:

Suspended sediments time series are available for the stations Novo Selo, Lom, Oryahovo, Svishtov and Silistra. The common period of the Bulgarian time series is 1978 - 1996. For some of the stations the data are with significant differences comparing with the Romanian corresponding stations.

The representative periods of the study are periods, which are typical of the changes in human activities and of climatic variations. For the Bulgarian Danube River section the representative periods are as follows:

1956 - 1970 - period with relatively natural conditions;

1971 - 1986 - Danube River reservoirs Iron Gate 1 and 2 are in operation;

1956 - 1980 - period with normal climatic conditions;

1981 - 1996 - period which includes the severe drought in the Balkan region.

Significant lowering of the water discharges is observed from flow duration curves, given in the Figures 4.10-1 and 4.10-2 and from 4.10-1 and 4.10-2. The duration curves and the comparison between the hydrographs shown on Fig. 4.10-3 Hydrographs of the Danube River Daily Discharges and 4.10-4 Hydrographs of the Danube River Suspended Sediment Daily Discharges indicate the significant decreasing of the runoff and suspended sediment load spread over the whole Danube downstream catchment area. The decreasing of the sediment load of the main river started in 1970 and can be dated with coming in operation of the complexes Iron gate 1 and 2. The initial year of the changes of the sediment transport of the tributaries can be dated to 1980.

In natural conditions (1956-1970) the Bulgarian Danube tributaries formed 2.7% of the Danube River runoff (PHARE Project - 1997). For the same period the contribution of the Bulgarian tributaries to the sediment transport of the main river is 11.5%. After Iron Gate 1 and 2 was put in operation the Danube River sediment load at Novo Selo was only 23.2% of the natural one. The contribution of the Bulgarian tributaries is 11.6% of the main river sediment load – almost the same as under natural conditions. After the construction of Iron Gates reservoirs the sediment load decreased downstream considerably. There is also a decreasing trend of sediment input in the Iron Gates reservoirs. The sediment input of the Danube River at the Bulgarian section decreased too, approximately at the same rate. The decreased suspended load and the almost stopped upstream bed load in the Bulgarian section can be judged as irreversible.

The severe droughts all over the Balkan and Carpat region (the downstream catchment of the Danube) which occurred in the last 15 years caused a decrease in the tributary water contribution with consecutive decreasing of the tributaries sediment load. It may increase again but it cannot be expected that the sediment transport will reach the levels of the decades before. The unfavorable development of the morphological processes is under the impact of four group processes: reception of the sediments in the Iron Gate reservoirs, dredging of the Danube River bed, stopping of the bed sediment load from the reservoirs on the tributaries and decreasing of the runoff as a result of the human activities (Upstream and in the Balkan part of the catchment) together with the decreasing under the impact of climate variations. Without a sound knowledge of these processes it is impossible to define sustainable actions against the negative consequences for the banks, islands, wetlands reserve territories and so on. Figure 4.10-5 (Erosion Intensity at the Bulgarian Bank (EC PHARE Project 1997) shows a good example of the negative effects, where the intensity of the Bulgarian bank erosion is presented.

At the end of 1997 detailed study was done in the PHARE Project "Morphological changes and abatement of there negative effects on a selected part of the Danube River". Final conclusions are as follows:

"... In the last years, significant morphological changes appeared. Consequently, numerous problems arise, like damages on the waterway, the pump stations and harbors. The lowering water level caused by erosion and frequent low flows generates serious impacts on the groundwater systems, the flood plains, ponds, wetlands, ecosystems and habitats...

The processes that cause the changes in river morphology cannot be stopped or reversed, but can only be controlled to some extent. A policy should be defined in order to make measures which are in accordance with the ongoing processes and are sustainable for the future."

Figure 4.10-6 (Suspended Sediment Rating Curves in the Bulgarian Sector of the Danube River) shows some examples for the relationships between water discharge to suspended sediment discharges". The relations are with low quality. Because of that the computations of daily sediment discharges for the Bulgarian section of the Danube River are based on the UNESCO methodology, given in the Project 5.3 of the IHP, published in Sedimentation problems in river basins, 1982, UNESCO, Paris, ISBN 92-3-102014-5.

There are not Bulgarian bed load measurements. Usually bed load is computed by using empirical or semi-empirical formulas..

4.11. Suspended sediment concentrations for 1994 - 97, reported as computed (i.e., not transformed)

The monthly Minimum, Mean and Maximum suspended sediment discharges in [kg/s] for the Danube River are presented in Table 4.10-1.

4.12. Water Quality Data

Information on the state of surface water, classified by river basins is presented in table format (see Annex 4, Tables 4.8-1 to 26). In addition one more table (Table 4.8-27) is available with combine data for easier analyses of the water quality. The mean value of the different parameters is calculated as a simple average of all measurements.

The utilization of these data allows to determine the tendency in the range of riverine water quality in the period 1994 to 1997. The general trend is towards improvement of the water quality in the river basins in the Danube catchment area.

Infringements of the monitored indicators are not registered in the investigated points on the Bulgarian sector of the Danube River. The measured values of BOD_5 and permanganate oxidation after the town of Svishtov, which are within the limits, are improved insignificantly in comparison to previous years. The indicator for oil products in this point is often above the limits, which is definitely caused by a local source. The sum of the annual results from the samples of the water quality along the whole Danube bank shows an insignificant deterioration of the oxygen regime, conservation of the nitrogen indicators, BOD_5 and permanganate oxidation. Episodic deviations from the standards for III category, in separate cases, are registered concerning the indicator SS (Table 1.2-3&4, Annex1)

The state of the basins of the main Danube tributaries in 1997 comparing with 1994 is as follows:

The Ogosta River Basin

Along the Ogosta River (see Table 4.8-1,2 and 5, bold figures), three hydrochemical monitoring stations are analyzed for the evaluation of the water quality, where the water quantity is measured too. For its main tributary- Skat River other 2 hydrochemical monitoring stations are analyzed (see Table 4.8- 3&4).

The organic contamination of the Ogosta River, indicated by the parameter BOD5 is not too high. Along the river, BOD5 is raising till the station near Kobiliak village (BOD5av= 4,63 mg/l, see Table 4.8-27) and decreasing till the station near Mizia town (BOD5av= 4,63 mg/l, see Table 4.8-27), very close to the river estuary. The augmentation of BOD5 is due to the confluent of the highly polluted rivers Leva and Dabnika. The level of dissolved oxygen does not differ significantly.

As far as the nutrients are concerned, a certain augmentation has been registered of N-NO3, which is higher downstream. All values of the indicators in the monitoring stations comply with the relevant project category. A problem is the pollution of the rivers Leva and Dabnika due to the wastewater discharge of "Chimko", Vratza. In the Leva River the mean annual concentration of N-NH4 reaches up to 16 times above the permissible limit concentration. About 1,5 times above the limit is the registered maximum value of N-NO3. The same high values are recorded for the concentrations of N-NO2 as well. The same reason is for the increased concentration of N-NH4 at the station near Kobiliak village (N-NH4min= 0.18 mg/l to N-NH4av=3,58 mg/l, see Table 4.8-27). The augmentation is over 22 times. Near the estuary N-NH4 is decreasing significantly (N-NH4av= 0.70 mg/l to N-NH4max=1.63 mg/l, see Table 4.8-27) and is corresponding to the II category.

For the parameters N-NO3 and N-NO2 the augmentation is about 3 times and for P-PO4 is about 6 times (see Table 4.8-27).

The main tributary Skat River joints the Ogosta River very near to its estuary. In fact the water quality of Skat River has not significant impact on the water quality of Ogosta River (see Table 4.8- 1to 5 and 4.8-27).

The only differences are in the value of BOD5av=5.74 mg/l, which is higher (see Table 4.8-27 st. Mizia) and in P-PO4av=0.21 mg/l. The only parameter, which is above the permissible limit is $N\text{-}NO_2$, but assuming the Ogosta River low water inflow, the $N\text{-}NO_2$ load introduced to the Danube River is insignificant.

The content of heavy metals is quiet low, excluding some findings in the upper stream of the Ogosta River tributaries, due to old mines closed now, but still a source of pollution.

Iskar River Basin

In the Iskar River basin there are 14 hydrochemical stations maintained by NIMH. Three of them, at Novi Iskar Town; Kunino Village and Oryahovitza Village (see Table 4.8-6 to 8 and 4.8-27) are analyzed. The Iskar Reservoir in fact separates the upstream and downstream parts of the river, as it is a long period storage reservoir for multi-year regulation. The other reason to divide Iskar River into several sections is the different degree of water pollution. The defined river sections are, as follow:

Upper section, down to Iskar reservoir with about 3% of the total amount of water pollution in the river.

The main pollution source is the wastewater from the town of Samokov.

Sofia region section, with about 78% of the river pollution. It comes from the discharge of the insufficiently operating Sofia WWTP, the discharge of untreated wastewater from the rest of the Sofia agglomeration and the discharge of Iskar's tributaries Blato and Lesnovska Rivers. Sofia WWTP is eliminating only 30% of the pollution. For this reason the pollution is highest at hydrochemical station near Novi Iskar Town (Kurilo). In this point the parameter BOD5min is from 4.35 mg/l (Q=42.70 m3/s-10/5/96, for the whole period Qmax = 64.7 m3/s) to BOD5max=16.46 mg/l (Q=9.60 m3/s-19/8/94, for the whole period Qmin =8.3 m3/s). The mean annual concentration of BOD5av is 10.12 mg/l, which is calculated as a simple average of all measurements (see Table 4.8-6 and 4.8-27). The oxygen regime has deteriorated. In 1995 at the points of discharge of Sofia WWTP has been registered a nearly two-times decrease of the mean annual concentration of organic polluters in comparison to 1994, expressed by BOD5 and oxidation. Regarding this parameters, the Iskar River water is III category. The indicators for N-NO2 and N-NH4 exceed the permissible limits (see Table 4.8-6 and 4.8-27). The parameter N-NO2max is 0.27 mg/l (Q=9.60 m3/l- 27/3/95) and N-NO2av is 0.08 mg/l. The parameter N- NH4av is 7.46 mg/l.

The Lesnovska River is polluted with oil products, iron, cianides, phenol and others above permissible concentrations. In this section of the Iskar River, the content of oil products reaches concentrations up to 27 mg/l (Q=11.40 m3/s-21/2/95 for the whole period Qmin =8.3 m3/s) and up to 36 mg/l (Q=13.20 m3/s-16/1/96)

Now, in comparison with previous years some improvement in the water quality has been registered in the area of Sofia plain and in the remaining of this section of the river.

Iskar gorges, down to the town of Roman. In this section about 8% of the total river water pollution is generated . The Iskar's tributary Malak Iskar river is the main pollution source in this section. It is due to the insufficiently treated wastewater of the towns of Botevgrad and Etropole, the leather factory near it and the Elatzite mining. (see Table 4.8 - 7-Kunino)

From the town of Roman down to the Danube River. This is the longest section, which generates about 11% of the total pollution caused mainly by untreated domestic and industrial wastewater from the towns of Knezha, Lukovit and Tcherven briag.

The content of organic maters is decreasing after the Iskar gorge, because of the self purification processes, indicated by the parameter BOD5. At the hydrometrical station near Oriahovitza Village, before the river estuary BOD5av is 7.38 mg/l (see Table 4.8-8 and 4.8-27). According this parameter the Iskar River water is II category. The longitudinal distribution of the parameters N-NO_2, N-NH_4, P-PO_4 is similar. The scheme of the longitudinal distribution of the parameters N-NO_3 is quite different: it decreases after the Novi Iskar station (in the mountainous section - Iskar gorge) and increases near the estuary as a result of the denitrification processes. Near Oriahovitza station N-NO_3av is 3.09 mg/l (see Table 4.8-27). Improvement of the water quality up to the project category is registered after the Iskar gorge, up to the river estuary. At the estuary, the Iskar River water quality corresponds to the II category regarding the parameters BOD_5, N-NH_4, P-PO_4 and N-NO_3 and to the III category regarding the parameter N-NO_2.

The content of heavy metals is low, except some samples near Elissyna and Elatzite mines with higher concentration of Cd, Pb, Ni Cr, but this is very rare (see Tables 4.8-6 to 8).

The Vit River Basin.

Along the Vit River (see Table 4.8-9 and 10, bold figures and Table 4.8-27) two hydrochemical monitoring stations (Sadovetz Village and Yassen Village) are analyzed for evaluation of the water quality, where the water quantity is measured too. The last station near Yassen Village is not representative for the assessment of the impact of the Vit River to the Danube, because it is located too far from the estuary at about 35 km. The water quality monitoring system has other 3 stations, which are closer to the Danube River, but they are not provided for water quantity measurements. They are representative for assessing the impact of the wastewater discharge from the town of Pleven and the catchment area. The decrease of the water pollution (about 10 to 15%) is a matter of fact in the last section.

The basic pollution source in the river basin is the untreated municipal wastewater from the town of Pleven, discharged in the Tuchenitza River. This river is a tributary of the Vit River and is a critical sector for the registered DO concentrations, N-NH4, N-NO2, PO4, BOD5, SS, oil products, H2S. In the period after 1994 a gradual tendency towards improvement is observed. This is indicated by the value of the following parameters, measured at Yassen station: BOD5max is 8,2 mg/l (Q=0.34 m3/s-6/9/94, for the whole period Qmin=0.34 m3/s), N-NO3max is 3.6 mg/l (Q=0.34 m^3/s-6/9/94), N-NH_4max is 0.62 mg/l (Q=6.70 m^3/l-3/7/97 for the whole period Qav=6.90 m^3/s) and P-PO_4max is 0.017 mg/l (Q=30.80 m^3/s - 12/8/97 for the whole period Qmax=33.61 m^3/s)(see Annex 4, Tables 4.8-9,10 and 4.8-27).

The Ossam River Basin.

Along the Ossam River (see Table 4.8-11 to 13, bold figures and Table 4.8-27) 3 hydrochemical monitoring stations (Troyan Town, Lovech Town and Izgrev Village) are analyzed for the evaluation of the water quality, where the water quantity is measured too. There is one more water quality monitoring station, close to the estuary, but it is not equipped for water quantity measurement. The station, near Izgrev Village is located 20 km from the Danube River. The BOD5, as an indicator of organic contamination is decreasing along the Ossam River from BOD5av-18.93 mg/l at the station town of Troyan to BOD5av-10.54 mg/l, town of Lovech and to BOD5av-7.17 mg/l station village of Izgrev. (see Table 4.8-11 to 13 and Table 4.8-27). In 1994 BOD5 values of 71.1 mg/l (Q=0.39m3/s for the whole period Qmin=0.39m3/s) were observed.

The parameter N-NO3 is increasing from N-NO3av-0.77 mg/l at the station of Troyan town to N-NO3av-1.02 mg/l at the town of Lovech and to N-NO3av-1.76 mg/l near the village of Izgrev (see Table 4.8-11 to 13 and Table 4.8-27). The scheme for the longitudinal distribution of the parameter P-PO4 is similar. The parameters N-NO2 and N-NH4 are increasing from N-NO2av-0.039mg/l; N-NH4av-1.29mg/l at the station of Troyan town to N-NO2av-0.062mg/l; N-NH4av-1.46 mg/l at the town of Lovech and after that are decreasing to N-NO2av-0.032mg/l; N-NH4av-0.61 mg/l station village of Izgrev (see Table 4.8-11 to 13 and Table 4.8-27). The peaks include N-NH4max up to 3.94 mg/l (Q=0.39 m3/s-8/11/94 for the whole period Qmin=0.39m3/s), N-NO2max up to 0.082 mg/l (Q=1.59m3/s-25/6/96) and P-PO4 up to 1.64 mg/l (Q=1.45m3/s-20/12/94) at station of Troyan town,

N-NH4max up to 4.95 mg/l (Q=0.80 m3/s-8/11/94 for the whole period Qmin=0.80m3/s), N-NO2max up to 0.290 mg/l (Q=1.05m3/s-11/10/94) and P-PO4 up to 0.42 mg/l (Q=7.69m3/s-13/2/95) at the station of Lovech town.

The main reason for this is the discharge of untreated wastewater from the industrial towns of Troyan and Lovech.

The Yantra River Basin.

Along the main river Yantra (see Table 4.8-15 to 19, bold figures and Table 4.8-27) 5 hydrochemical monitoring stations (Gabrovo Town, Cholakovtzi Village, Samovodene Village, Varbitza Village and Karantzi Village) are analyzed for the evaluation of the water quality, where the water quantity is measured too. The last station near Karantzi Village is not representative for the assessment of the impact of the Yantra River to the Danube, because it is located too far from the estuary at about 40 km. The water quality monitoring system has other 2 stations, which are closer to the Danube River, but they are not provided for water quantity measurements.

Main sources of pollution in the river basin are the wastewater from the towns of Gabrovo and Veliko Tarnovo, the industrial wastewater from Gorna and Dolna Oriahovitza, the pollution of the tributaries Drianovska and Rossitza Rivers and the developed animal-breeding in the catchment area of the Yantra River.

The organic contamination of the Yantra River, indicated by the parameter BOD5 is high, BOD5max=39.2 mg/l (Q=0.44 m3/s-8/11/94 for the whole period Qmin=0.44 m3/s) and BOD5av= 15.85 mg/l (see Table 4.8-27). The content of organic maters is decreasing 3 times till the station Cholakovtzi (BOD5av= 5.50 mg/l, see Table 4.8-27), because of the self purification processes. At the hydrometrical station Samovodene Village, after the wastewater discharge from the town of Veliko Tarnovo BOD5 is raising again BOD5max=16.70 mg/l (Q=1.78 m3/s-1/12/94 for the whole period Qmin=1.78 m3/s) and BOD5av= 8.98 mg/l (see Table 4.8-27). In the next 12 km, BOD5 value is decreasing insignificantly. At the hydrometrical station Varbitza Village, after the wastewater discharge from the town of Gorna Oriahovitza and its Sugar & Alcohol production factory BOD5 is raising 5 times BOD5av= 40.33 mg/l (see Table 4.8-27) and BOD5max=160.0 mg/l (Q=3.65 m3/s-1/12/94 for the whole period Qmin=1.25 m3/s, see Table 4.8-18 and 4.8-27). In the next 35 km, BOD5 value is decreasing BOD5av= 8.14 mg/l (see Table 4.8-27) at the hydrometrical station Karantzi Village, after the discharge of the main tributary Rossitza River. The reduction of BOD5 in Yantra River is due to the confluent of the low polluted river Rossitza BOD5av= 6.92 mg/l (see Table 4.8-14, Rossitza River, Sevlievo town and Table 4.8-27). At the river estuary BOD5av is between 5.5-6.2 mg/l according to the results of the previous surveys. The Yantra water quality corresponds to the III category in the main section of the river, but at the estuary, it corresponds to the II category regarding the parameter BOD5.

As far as the nutrients (N-NO3, N-NO2, N-NH4 and P-PO4) are concerned, a certain scheme of longitudinal distribution has been registered (see Tables 4.8-14 to19 and Table 4.8-27). The augmentation N-NO3 and N-NO2 is stronger downstream Gabrovo town. At the station Karantzi $N\text{-}NO_3$av is 1.52 mg/l and $N\text{-}NO_2$av is 0.07 mg/l. The Yantra water quality corresponds to the III category along the whole river regarding the parameter $N\text{-}NO_2$ and II category, regarding the parameter $P\text{-}PO_4$. This section of the river, from the station Varbitza till Karantzi is considered as the most polluted in the Danube catchment area.

Nevertheless, in comparison to 1994, all monitored indicators have improved in the river basin. A problem is also the exceeded concentrations of oil products measured in many points, both along the Yantra River, as well as in its tributaries the rivers Rossitza, Drianovska and Belitza. Despite these isolated cases, a tendency towards overall improvement of the water quality in the river basin is observed and it meets its designed category.

The Russenski Lom River Basin

The Russenski Lom River flow is formed by two main tributaries rivers Beli Lom and Cherni Lom. The confluent of both tributaries is 25 km from the Russenski Lom River estuary. The scheme of longitudinal distribution is totally different. Along the Beli Lom River (see Table 4.8-20, bold figures and Table 4.8-27) one hydrochemical monitoring station (Razgrad Town) is analyzed for evaluation of the water quality, where the water quantity is measured too. The organic contamination of the Beli Lom River, indicated by the parameter BOD_5 is high,

BOD_5max=27.43 mg/l (Q=0.46 m^3/s-10/11/94 for the whole period Qmin=0.44 m^3/s) and BOD_5av= 16.42 mg/l (see Table 4.8-27). This is caused by insufficient wastewater treatment from "Antibiotic Plant" in Razgrad.

DO, SS, N-NH_4, N-NO_2 parameters in the upstream tributary Cherni Lom exceed permissible norms. The concentrations of P-PO_4 (P-PO_4max=91.3 mg/l, see Table 4.8-27) at the village of Kardam are many times above the maximum admissible limits. The reason is the discharge of the Popovska River (BOD_5max=134.0 mg/l), which is polluted by the town of Popovo and the insufficiently treated water of the pig breeding farm "Svimex".

Downstream the Cherni Lom River (see Table 4.8-23, bold figures and Table 4.8-27) one hydrochemical monitoring station (Shirokovo Village) is analyzed for evaluation of the water quality, where the water quantity is measured too. The organic contamination of the down stream Cherni Lom River is lower in comparison of the organic contamination of the Beli Lom River. It is indicated by the parameter BOD_5. BOD_5av is 5.19 mg/l at Shirokovo village (see Tables 4.8-23 and 4.8-27).

At the Russenski Lom River (see Table 4.8-24, bold figures and Table 4.8-27) one hydrochemical monitoring station (Bassarbovo Village) is analyzed for evaluation of the water quality, where the water quantity is measured too. The organic contamination of the down stream Russenski Lom River is highest in comparison of the organic contamination of the Cherni Lom River. It is indicated by the parameter BOD_5. BOD_5av is 10.29 mg/l at Bassarbovo village (see Tables 4.8-24 and 4.8-27). The Russenski Lom River water quality corresponds to the III category, regarding the parameter BOD_5.

The both main tributaries have the similar concentration of N-NO_3 as follows: for Beli Lom River at the station Razgrad town N-NO_3av is 6.46 mg/l and N-NO_3max is 11.88 mg/l (Q=0.49m^3/s-23/02/95 for the whole period Qmin=0.44m^3/s); for Cherni Lom River at the station Shirokovo N-NO_3av is 5.44 mg/l and N-NO_3max is 8.0 mg/l (Q=3.50m^3/s-20/02/96 for the whole period Qmin=0.74m^3/s, see table 4.8-27)

The N-NO_3 contamination of the down stream Russenski Lom River is similar too, N-NO_3av is 6.58 mg/l and N-NO_3max is 11.0 mg/l (Q=14.38m^3/s-2/04/96 for the whole period Qmin=1.17m^3/s and Qmax=14.38m^3/s, seest. Bassarbovo table 4.8-24 and 4.8-27). The Russenski Lom River water quality at the estuary corresponds to the II category, regarding the parameter N-NO_3.

The distribution of the other parameters N-NO_2 and P-PO_4 is similar. The Russenski Lom River water quality at the estuary corresponds to the III category, regarding the parameter N-NO_2 and II category, regarding the parameter P-PO_4.

The scheme of the longitudinal distribution of the parameter N-NH_4 is similar to the scheme of distribution of BOD_5, the highest concentration of N-NH_4 is after Razgrad town N-NH_4av is 4.62 mg/l (see table 4.8-27)and N-NH_4max is 6.5 mg/l (Q=0.51m3/s -14/03/95, Qmin = 0.44m3/s, see table 4.8-20), the lowest concentration of N-NH_4 is at Shirokovo village N-NH_4av is 0.22mg/l (see table 4.8-27) and N-NH_4max is 0.45mg/l (Q=1.66m3/s -08/08/95, Qmin = 0.74m3/s, see table 4.8-23) and mean concentration of N-NH_4 is at the station Bassarbovo N-NH_4av is 0.71mg/l (see table 4.8-27) and N-NH_4max is 1.33mg/l (Q=1.17m3/s -05/07/94, Qmin = 1.17m3/s, see table 4.8-24).

Higher concentrations of SS and N-NO2 have been registered in the Russenski Lom, just before the inflow into the Danube. This is due to the discharge of untreated wastewater from the West Industrial Zone of the town on Russe.

Note: NCESD and NIMH (with bold figures) water quality data are presented in Annex 4.

The Danube River

As it was mentioned in point 4.8, the contribution of the Bulgarian tributaries is insignificant and the basic quality content of the Danube River water is determined above the Bulgarian section.

More information for the state of Danube River water quality is available in the Informing Report on the state of environment in the Danube area along the Romanian-Bulgarian boundary (No 1/1996&97 and No 2/1996).

Romania and Bulgaria are the first countries from the whole Danube catchment having a data exchange concerning the water quality according to DEFF (Data Exchange File Format) International procedure since 1996.

The joint boundary has a length of 631.3 km out of which 420 km are 4 the Danube midstream (thalweg). Both countries are located in the downstream sector area of the Danube River, and are subject to a severe pollution generated upstream.

According to Danube River water quality evaluation, made in the report (No1/96):

Compared to the previous periods (1995), a significant change of the Danube River water quality was not recorded.

The tendency of water quality improvement on the Bulgarian sector meets the same tendency determined in 1995. These results confirm the fact that the Bulgarian Danube tributaries have a low contribution to the state of Danube pollution and an insignificant impact on the capacity of the River water self treatment. The measurements also showed concentrations of SS and nitrates higher than the admissible limits at Ossam and Russenski Lom Rivers estuaries.

Table 4.12 - 1 Mean concentrations measured at the Bulgarian tributaries estuaries during 01/01/1996- 30/06/1996

Tributaries	Dissolved oxygen	Permanganate oxidizability	BOD_5	Nitrogen ammonium	Nitrogen nitrates	Phosphates
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Lom	11.4	7.58	3.6	0.26	1.31	-
Ogosta	8.4	5.4	3.0	0.61	6.23	0.56
Iskar	11.6	7.9	5.5	1.72	3.25	0.15
Vit	11.6	7.6	4.9	0.92	2.40	0.12
Ossam	10.6	7.8	3.6	0.70	3.50	0.08
Yantra	8.3	5.7	4.9	0.37	2.60	0.06
Russenski Lom	6.9	15.2	20.1	1.46	8.00	0.68

Source: The Informing Report on the state of environment in the Danube area along the Romanian-Bulgarian boundary (No 1/1996).

In the 2^{nd} quarter of 1996, according to the monitoring data the tendency of the improvement of Danube River water quality on the Bulgarian border is still the same as in the 1^{st} quarter of 1996.

Table 4.12 - 2 Mean concentrations measured at the Bulgarian tributaries estuaries during 01/07/1996- 31/12/1996

Tributaries	Dissolved Oxygen	Permanganate oxidizability	BOD_5	Nitrogen ammonium	Nitrogen nitrates	Phosphates
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Lom	11.70	24.4	3.6	0.13	0.56	49.0
Ogosta	12.60	2.8	1.8	0.10	16.00	58.0
Iskar	9.94	9.6	4.9	0.43	3.30	53.0
Vit	9.80	4.9	2.5	0.65	2.50	41.0
Ossam	10.90	8.5	5.3	0.33	3.20	29.3

Source: The Informing Report on the state of environment in the Danube area along the Romanian-Bulgarian boundary (No 2/1996).

In the 1st quarter of 1997, according to the monitoring data the tendency of the improvement of Danube River water quality on the Bulgarian border is still the same as in the 1st and 2nd quarters of 1996.

Table 4.12 - 3 Mean concentrations measured at the Bulgarian tributaries estuaries during 01/01/1997- 30/06/1997

Tributaries	Dissolved Oxygen	Permanganate oxidizability	BOD_5	Nitrogen ammonium	Nitrogen nitrates	SS
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Ogosta	7.7	3.1	2.5	0.17	12.60	40.0
Yantra	7.6	4.1	4.0	0.10	1.80	18.0
Russenski Lom	7.0	9.3	4.9	0.30	3.70	228

Source: The Informing Report on the state of environment in the Danube area along the Romanian-Bulgarian boundary (No 1/1997).

The comparative analysis of the results of the samples of the two frontier points on the Danube River (Novo Selo, km. 833) and Silistra (km. 375) for 1996 and for the 1st half year1997 indicate that no significant differences exist in the examined quality characteristics of the Danubian water (see Table 4.8-25&26, Annex 4). The organic contamination of the Danube River, indicated by the parameter BOD_5 for the whole period 1994-1997 at the station Novo Selo is BOD_5max- 5.6mg/l (Q=7525 m3/s-08/05/95, Qmin=2745m3/s, Qmax=9265 m3/s, see Table 4.8-25) and for the station Silistra BOD_5max-4.9mg/l (Q=3955 m3/s-08/05/95, Qmin=3240m3/s, Qmax=8815 m3/s, see Table 4.8-26) This once again shows an insignificant influence of the Bulgarian tributaries along the Bulgarian border.

One can refer also to the data (1986 to 1993) in the publication “ Environmental assessment and Protection of the water bodies”, 1995, see Table 4.12-4 Data for the water quantity and quality at the 22 discharge points along the joint Romanian- Bulgarian section of the Danube River (Q_{95} river low flow, 1986-1993) as an example.

4.12.1. Nitrogen

The findings are that in period 1994-1997 the main Danube tributaries are with high concentrations of $N\text{-}NO_2$ and $N\text{-}NH_4$.

Sampling point	Name	Design Category	Permissible limit	Findings	Date
30009178	Ogosta River basin – Dabnika River after Himko – Vratza	III	0,06mg/l 5mg/l	$N\text{-} NO_2$= 2,39mg/l $N\text{-} NH_4$= 169mg/l	05.10.1995 11.01.1994
30009336	Buchka River before inflow Ogosta River	II	0,04mg/l 2mg/l	$N\text{-} NO_2$= 0,31mg/l $N\text{-} NH_4$= 59,6mg/l	06.05.1996 03.07.1997
30010027	Iskar River basin – Iskar River, Novi Iskar	II	0,04mg/l 2mg/l	$N\text{-} NO_2$= 0,18mg/l $N\text{-} NH_4$=7,3mg/l	
30012044	Osam River basin – Osam River after Lovech town	III	0,06mg/l	$N\text{-} NO_2$= 0,10-0,14mg/l	
30017209	Yantra River basin – Yantra River after Gabrovo town	II	2mg/l	$N\text{-} NH_4$= 6-11,3mg/l	
30017049	Yantra River basin- Yantra River after Veliko Tarnovo	II	0,04mg/l	$N\text{-} NO_2$= 0,11-0,14mg/l	
30017049	Yantra River basin- Yantra River, near Varbitza village	II	0,04mg/l 2mg/l	$N\text{-} NO_2$= 0,19mg/l $N\text{-} NH_4$= 8,13mg/l	
30017053	Yantra River basin – Rositza River after Sevlievo	II	2mg/l	$N\text{-} NH_4$= 8mg/l	
30018055	Russenski Lom River basin – Beli Lom River after Razgrad town	II	0,04mg/l 2mg/l	$N\text{-} NO_2$= 0,11mg/l $N\text{-} NH_4$=6,2mg/l	
30018362	Russenski Lom River basin – Popovska River after Popovo town	II	0,04mg/l 2mg/l	$N\text{-} NO_2$= 2,46mg/l $N\text{-} NH_4$= 16mg/l	26.11.1996 12.10.1995

The group of Bulgarian experts is prepared Nutrient balance for Danube catchment area with the Applied Research Programme/EPDRB in 1996, but research period is 1989-1992.

4.12.2. Phosphorus

The findings are that in period 1994 – 1997 the main Danube tributaries are with high concentrations of Phosphorus P-PO_4.

Sampling point	Name	Design Category	Permissible limit	Findings	Date
30009178	Ogosta River basin-Dabnika River after Himko- Vratza	III	3mg/l	P- PO_4= 4,3mg/l	07.12.1995
30009021	Ogosta River basin-Dabnika River at the mouth of Leva River	III	3mg/l	P- PO_4= 3,5mg/l	06.06.1997
30018055	Russenski Lom River basin – Beli Lom River after Razgrad	II	2mg/l	P- PO_4= 4,6mg/l P- PO_4= 3,1mg/l	08.02.1994 19.03.1996
30018056	Russenski Lom River basin – Cherni Lom River – Kardam town	II	2mg/l	P- PO_4= 9,5mg/l P- PO_4= 4,6mg/l P- PO_4= 91mg/l P- PO_4= 4,4mg/l	01.11.1994 08.08.1995 27.06.1996 17.04.1997
30018362	Russenski Lom River basin – Popovska River after Popovo town	II	2mg/l	P- PO_4= 17mg/l P- PO_4= 7,5mg/l P- PO_4= 116mg/l	01.11.1994 03.05.1995 27.06.1996

4.12.3. COD

Increased concentrations of COD in the period 1994-1997 have been observed in the Ogosta River at point 30009178 at the Dabnika River after Chimco – Vratza on the 16th November 1994

Sampling point	Name	Design Category	Permissible limit	Findings	Period
30009178	Ogosta River basin-Dabnika River after Himko- Vratza	III	100mg/l	141mg/l	1994-1997

4.12.4. Heavy Metals

Specific heavy metals have been observed in the flow of the Ogosta River at point 30009334 – the Chiprovska River before inflow at Belimel on the 14 Sep 1995 0.10 mg/l of As, amdoim the Iskar River basin at sampling point 30010193 – the Malak Iskar River after the town of Etropole on the 02 Aug 1994 8,2 mg/l-Cu; and on the 07 May 1996-0,6 mg/l- Cu.

Sampling point	Name	Design Category	Permissible limit	Findings	Date
30009334	Ogosta River basin – Chiprovska before inflow Belimel village	II	0.05mg/l	As = 0.10mg/l	04.09.1995
30010193	Iskar River basin – Malak Iskar River after Etropole	II	0.1mg/l	Cu = 8,2mg/l Cu = 0,6mg/l	02.08.1994 07.05.1996

4.12.5. Oil and Other Hazardous Chemicals

The findings are summarized below:

Sampling point	Name	Design Category	Permissible limit	Findings	Date
30010193	Iskar River basin – Malak Iskar River after Etropole	II	3mg/l	12mg/l 8,8mg/l	19.05.1994 03.02.1995
30010349	Iskar River basin – Gradska River before inflow Iskar River	II	3mg/l	72mg/l	19.12.1995
30010186	Iskar River basin – Lesnovska River, Svetovrachene village	II	3mg/l	16mg/l 6,4mg/l	25.05.1994 13.01.1997
30010035	Iskar River basin – Blato River before inflow Iskar River	II	3mg/l	19,6mg/l 7,8mg/l	09.11.1994 13.11.1997
30010027	Iskar River basin – Iskar River, Novi Iskar	II	3mg/l	55mg/l 36mg/l	13.04.1994 16.01.1996
30017209	Yantra River basin – Yantra River after Gabrovo t.	II	3mg/l	54mg/l 21,5mg/l	06.12.1995 03.04.1996
30017049	Yantra River basin- Yantra River, near Varbitza village	II	3 mg/l	50mg/l 33,5mg/l	15.11.1994 15.10.1996
30017053	Yantra River basin – Rositza River after Sevlievo	II	3mg/l	41,5mg/l 20,5mg/l	06.09.1994 09.01.1997

4.12.6. Special Linkages

Due to the low runoff of the tributaries in the Danube Rivers and its wide variation (in relation to that of the Danube River) the regularly collected information on the water quality cannot serve to reach conclusions about the effect of the non point sources of pollution. A different information type is required with the necessary additional statistical processing. Several projects have been completed in Bulgaria treating the linkage land use and water quality; fertilizer sales and N&P in river water, detergent sales and phosphate in river water. No methodologies have been developed in Bulgaria for the calculation of the contribution of non point sources to the overall river quality. Other methodologies have been used up to now for this purpose.

5. Brief Overview of Legal and Institutional Framework for Water Quality Control

The analysis of hot spots and water quality data is related to the legal and institutional framework that exists in the country for developing and managing water quality data.

The basic law in the country is the Constitution of the Republic of Bulgaria of 1991. The updating of the legislative basis in the water sector should abide by this basic law. Article 18 of the Constitution proclaims that waters are exclusive state property. Decision No 19 of the Constitutional Court of 21.12.1993 defines the exclusive property over the objects under article 18 as public property. Therefore, they have to be maintained and managed in the interest of the citizens and society.

If we review the hierarchy of the existing legislative basis on investigation, use and protection of water in Bulgaria, we can distinguish two groups:

1. General legislation
2. Legislation of interinstitutional and institutional significance.

The acting Waters Law and the legislative basis in the field of the protection of waters have been adopted before the socio-political and economic changes after 1989. Taking into consideration that Bulgaria is an associated member of the European Community, she is obliged to harmonize Bulgarian legislation with that of the Community.

The effective water management to a considerable degree depends on the legislative basis and the implemented management mechanisms.

At present prerequisites for the decentralized water management in Bulgaria have emerged as a consequence from the existing legislation, because water management is considered besides in the Water Law, also in the Water and Soils Protection Law, the Health Law, the Law of the territorial and urban development and other legislation.

The scheme of the water management in Bulgaria according to the Water Law and the Decree of the Council of Ministers No. 202 about the functions and the tasks of the former National Water Council, is shown in Figure 5-1 (Structure Of The Water Management According To The Water Law In Force From 1969) and Figure 5-2 (Organization Of The Water Management (according to the Decree of CM No. 202 from 1992) in Annex B6 from which one can see its great complexity and clumsiness.

The recent changes in the governmental structure presume the unification of the management of the quantity and the quality of the water, as well as the concentration of more than one function in one institution - the Ministry of Environment and Water, which would implement the national policy for integrated water management (Figure 5-3). However some problems related to the provision of the necessary available information for water management, still remain unsolved as well as the decentralization of this management, the more effective use of the permitting regime and the economic regulators in this area.

Until June 1997, the competent bodies in the field of water management are besides the National Water Council, also the following Ministries and institutions: - the Ministry of Regional Development and Public Works; the Ministry of Agriculture and Food Industry; the Ministry of Health; the Ministry of Industry; the Committee of Energy; the Ministry of Transport; the Ministry of Environment; the Committee of Forestry; the Committee of Geology and Mineral Resources and Civil Defense.

Almost all listed Ministries and institutions collect information, which is used for their own needs. Systematic monitoring of the regime is carried out only by the National Institute of Meteorology and Hydrology, whose hydrometeorological information since 1983 is not published and is almost inaccessible (because of the autonomy of the Bulgarian Academy of Sciences), practically. In the last years, due to the deteriorating economic situation, the operation of the precipitation measuring stations and the basic hydrological and hydrogeological networks is considerably impeded and reduced, which poses a real danger of deterioration of the information quality. It should be taken into consideration that this information is extremely important for the state system for water management, which requires corresponding structures, financial provision and mechanisms for ensuring the exchange and the access to the information.

Standards for water quality in running surface water in Bulgaria are set by the Ministry of Environment and are based on water use criteria. The base for the surface water classification in Bulgaria is Regulation No 7 of 1986 (The text of the regulation can be found in Annex NoB1)

A set of regulations will provide clearer targets and effluent standards when the draft water law is enacted.

The necessity for changes in the water management in the country, is provoked from some international documents: the Dublin document about the water resources and sustainable development - 1992, the Documents from the Rio Conference - 1992, the Draft Framework Directive in the area of water policy by the Council of European Union - 1997. etc. The most important international agreement is the Danube River Protection Convention, based on the Bucharest Declaration. The Danube River basin countries and the European Union signed the Convention on Cooperation for the Protection and Sustainable Use of the Danube River on 29 June 1994, in Sofia.

Annexes

1 Summary

2 Updating of Hot Spots

3 Identification of Agricultural Source of Agricultural Pollution

4 Updating and Validation of Water Quality Data

4a Data on Water and Sediment Discharge and Water Quality

5 Brief Overview of Legal and Institutional Framework for Water Quality Control

6 Bibliography

Annex 1

Summary

Table 1.2-1 Regulation No. 7

MINISTRIES AND OTHER DEPARTMENTS

Committee on Environmental Protection
Ministry of Public Health
Committee on Territorial and Settlement Policy

Regulation No. 7

of August 8, 1986
on Unit and Norms for Determining the Quality of Flowing Surface Waters

Unit and Norms for Determining the Permissible Degree of Pollution
Of Different Categories of Surface Flowing Waters

No	Indexes	Unit		Category	
			I	II	III
1	2	3	4	5	6
	Group A				
	General Physical And Inorganic Chemical Indexes				
1	Temperature	°C	should not exceed by 3° the average temperature for the season		
2	Color	degrees	20°. Without apparent additional coloring		
3	Smell	grades	2	3	3
4	Active reaction	pH	6.5 -8.5	6.0 -8.5	6.0 -9.0
5	Oxygen saturation	%	75	40	20
6	Conductance	MKS	700	1300	1600
7	Dissolved oxygen	mg/dm3	6	4	2
8	Dissolved substances	mg/dm3	700	1000	1500
9	Nondissolved substances	mg/dm3	30	50	100
10	Total hardness	mgeq/dm3	7	10	14
11	Chlorine ions	mg/dm3	200	300	400
12	Sulphate ions	mg/dm3	200	300	400
13	Hydrogen sulphide (free)	mg/dm3	not permitted		0.1
14	Iron (total)	mg/dm3	0.5	1.5	5
15	Manganese (total)	mg/dm3	0.1	0.3	0.8
16	Nitrogen (ammonium)	mg/dm3	0.1	2	5
17	Nitrite nitrogen	mg/dm3	0.002	0.04	0.06
18	Nitrate nitrogen	mg/dm3	5	10	20
19	Phosphates (PO4)	mg/dm3	0.2	1.0	2
20	Phosphorus (total content as PO4)	mg/dm3	0.4	2.0	3
21	Selenium	mg/dm3	0.01	0.01	0.01
22	Beryllium	mg/dm3	0.0002	0.0002	0.0002
23	Vanadium	mg/dm3	0.1	0.01	1
24	Molybdenum	mg/dm3	0.5	0.5	3
25	Barium	mg/dm3	1	1	4
26	Boron	mg/dm3	not permitted		1
27	Silver	mg/dm3	0.01	0.01	0.01
28	Uranium	mg/dm3	0.6	0.6	0.6

29	Radium 226	mBq/dm3	150	150	150
	Group B.				
	General Indexes for organic contaminants				
30	Organic nondissolved substances	mg/dm3	5	15	25
31	Oxidizability (permanganate)	mg/dm3	10	30	40
32	COD (bichromate)	mg/dm3	25	70	100
33	BOD5	mg/dm3	5	15	25
34	Dissolved organic hydrogen	mg/dm3	5	12	20
35	Extracted substances	mg/dm3	0.5	3	5
	(with tetrachloromethane)				
36	Organic nitrogen	mg/dm3	1	5	10
	Group C.				
	Indices for inorganic substances of industrial origin				
37	Mercury	mg/dm3	0.0002	0.001	0.01
38	Cadmium	mg/dm3	0.005	0.01	0.02
39	Lead	mg/dm3	0.02	0.05	0.2
40	Arsenic	mg/dm3	0.02	0.05	0.2
41	Copper	mg/dm3	0.05	0.1	0.5
42	Chromium (threevalent)	mg/dm3	0.1	0.5	1
43	Chromium (sixvalent)	mg/dm3	0.02	0.05	0.1
44	Cobalt	mg/dm3	0.02	0.1	0.5
45	Nickel	mg/dm3	0.05	0.2	0.5
46	Zinc	mg/dm3	1	5	10
47	Total beta activity	mBq/dm3	750	750	750
48	Cyanides (easily splittable)	mg/dm3	not permitted	0.05	0.1
49	Cyanides (total quantity)	mg/dm3	not permitted	0.5	1.0
50	Fluorides (total quantity)	mg/dm3	0.5	1.5	3
51	Free active chlorine	mg/dm3	not permitted	0.05	0.1
	Group D.				
	Indices for organic substances of industrial origin				
52	Anionoactive detergents	mg/dm3	0.5	1	3
53	Phenols (volatile)	mg/dm3	0.01	0.05	0.1
54	Petroleum products	mg/dm3	not permitted	0.3	0.5
55	Aldrin	mg/dm3	0.0002	0.0002	0.0002
56	Pyridine	mg/dm3	0.2	0.2	0.5
57	Xanthagenates	mg/dm3	0.001	0.01	0.1
58	Saponins	mg/dm3	0.2	0.2	1
59	Styrene	mg/dm3	0.1	0.2	0.5
60	Benzene	mg/dm3	0.5	0.5	1
61	Formaldehyde	mg/dm3	0.5	0.5	1
62	Caprolactam	mg/dm3	1	1	1

63	Phtalic acid	mg/dm3	0.5	1	5
64	Phenyltrotione (Agria 1050)	mg/dm3	0.0001	0.0001	0.3
65	Zolon (Agria 1060)	mg/dm3	0.0001	0.0001	0.002
66	Saturn	mg/dm3	0.1	0.1	1
67	Atrazine (Caezine)	mg/dm3	0.25	0.25	2.5
68	Lasso	mg/dm3	0.3	0.3	0.5
69	2.4D	mg/dm3	1	1	5
70	Sevin (Dicarbam)	mg/dm3	0.002	0.002	0.1
71	Vinylchloride	mg/dm3	0.01	0.01	0.01
72	Dichloroethane	mg/dm3	1.5	1.5	1.5
73	Apholone	mg/dm3	0.5	1.0	1.0
74	Patoran	mg/dm3	0.2	2.0	2.0
75	Dimide	mg/dm3	1.0	1.0	5.0
76	Ramrod	mg/dm3	0.5	0.5	1.0
77	Treflan	mg/dm3	1.0	1.0	5.0
78	Propanide	mg/dm3	0.1	1.0	2.0
79	Diphensoquate	mg/dm3	0.2	1.0	5.0
	Group E. Biological Indexes				
80	Saprobity		oligo	beta meso	alpha meso
	Pantle - Book index		< 1.5	< 2.5	< 3.2
	Zelinka - Marvan - Rotstain index		> 60	> 40	> 25
81	Macrozoobentos species diversity				
	(after Shennon)		> 3	> 2	> 1
82	Macrozoobentos matching degree		> 0.7	> 0.6	> 0.5
83	Macrozoobentos domination degree		< 0.2	< 0.3	< 0.5
84	Total number of microorganisms				
	(direct count)		< 106	< 5.106	105
85	Total coli titre	cm3	< 0.1	< 0.1	< 0.001
86	Escherichia coli titre -				
	heat resistant	cm3	< 1.0	< 1.0	< 0.01
87	Pathogenic microorganisms		not permitted		

Table 1.2-2 NSEM Sampling Points – Danube Catchment Area

Station No.		Descritpion	Category
30001000		Danube river basin	
30001001	1	Danube river , Novo Selo Village - 833,6 km	III
30001003	2	Danube river after inflow Lom river under Lom town - 741 km	III
30001005	3	Danube river under Oryahovo town	III
30001168	4	Danube river after inflow Iskar river	III
30001007	5	Danube river after Nikopol town	III
30001008	6	Danube river after Svishtov town	III
30001172	7	Danube river before Russe town	III
30001011	8	Danube river, Silistra town - the harbour	III
30070000		Timok river basin	
30070012	9	Timok river, Bregovo town	III
30003000		Voynishka river basin	
30003474	10	Voynishka river above Rayanovtzi village	I
30003013	11	Voynishka river, Tarnyane village	II
30005000		Archar river basin	
30005475	12	Archar river above Rayanovtzi village	I
30005014	13	Archar river, Archar village	II
30007000		Lom river basin	
30007476	14	Lom river, Gorni Lom village	I
30007015	15	Lom river before Lom town	II
30008000		Tzibritza river basin	
30008477	16	Tzibritza river above Smolyanovtzi village	I
30008016	17	Tzibritza river, Dolni Tzibar village	II
30009000		Ogosta river basin	
30009173	18	Chiprovska Ogosta river above Chiprovtzi town	I
30009478	19	Ogosta river before Ogosta dam	
30009479	20	Ogosta dam before dam wall	
30009017	21	Ogosta river after Ogosta dam	II
30009480	22	Botunya river above Varshetz town	
30009175	23	Botunya river, Boychinovtzi town	
30009018	24	Ogosta river, Kobilyak village	III
30009481	25	Skat river, Vesletz village	
30009181	26	Skat river after Mizia town	III
30009019	27	Ogosta before inflow Danube river	III
30010000		Iskar river basin	
30010347	28	Iskar river after Beli Iskar dam	I
30010482	29	Cherni Iskar river before Govedartzi village	I
30010024	30	Iskar river before Iskar dam	I
30010483	31	Iskar dam before dam wall	
30010484	32	Iskar river after Iskar dam	
30010485	33	Matitza river above Potop village	
30010185	34	Lesnovska river, Dolni Bogrov village	II
30010027	35	Iskar river, Kurilo sb.(HMS) - Novi Iskar town	II

30010029	36	Iskar river, Rebarkovo village (HMS)	III
30010351	37	Iskar river, Roman town	II
30010486	38	Malak Iskar river before Etropole town	II
30010036	39	Malak Iskar river, Roman town	II
30010197	40	Iskar river, Orehovitza village (HMS)	III
30010032	41	Iskar river, Gigen village	III
30011000		Vit river basin	
30011198	42	Beli Vit river above Ribaritza village	II
30011487	43	Cherni Vit river above Cherni Vit village	
30011201	44	Vit river after Sadovetz village	II
30011039	45	Vit river after inflow Bara river, Yasen village	II
30011041	46	Vit river after Gulyantzi town	III
30012000		Osam river basin	
30012488	47	Cherni Osam river above Cherni Osam village	
30012042	48	Osam river after Troyan town	II
30012044	49	Osam river after Lovech town	III
30012489	50	Osam river above Izgrev village	
30012046	51	Osam river, Cherkvitza village	II
30017000		Yantra river basin	
30017209	52	Yantra river after PS - Gabrovo town (under big bridge)	II
30017490	53	Dryanovska river above Plachkovtzi town	
30017258	54	Yantra river after inflow Dryanovska river - the bridge for Debeletz t.	II
30017356	55	Golyama river, HMS	II
30017491	56	Stara Reka river above Stara Reka village	
30017492	57	Stara Reka river after Kesarevo village	
30017493	58	Zlatarishka river, Ilakov Rat village	
30017494	59	Djuliunitza river, Djuliunitza village	
30017220	60	Lefedja river before inflow Yantra river	II
30017495	61	Rositza river, Valevtzi village	
30017053	62	Rositza river under Sevlievo town of roat bridge Sofia-Varna	II
30017496	63	Rositza river before Stamboliyski dam	
30017497	64	Stamboliyski dam before dam wall	
30017498	65	Rositza river after Stamboliyski dam	
30017358	66	Rositza river before inflow Yantra r./Polikraishte village/	III
30017359	67	Yantra river, Karantzi village	III
30017052	68	Yantra river before inflow Danube river, Novgrad village	III
30018000		Russenski Lom river basin	
30018361	69	Beli Lom river above Beli Lom dam	II
30018229	70	Beli Lom river, Pisanetz village	II
30018499	71	Baniski Lom river above Gorski Senovetz village	
30018500	72	Cherni Lom river, Aprilovo village	
30018232	73	Cherni Lom river, Ostritza village	III
30018234	74	Cherni Lom river, Cherven village	III
30018057	75	Russenski Lom river, Basarbovo sb.	III

Annex 2

Updating of Hot Spots

Table 2.2.1-1 Summary of information for the municipal hot spots WWTP Gorna Oryahovitza & Lyaskovetz

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Gorna Oriahovitza & Liaskovetz	Location-Yantra River Basin
Critical Emissions	Total population 49 800 ; G.Oriahovitza -96 % sewered, Liaskovetz- 68% sewered; Qav = 50 920 m3/day; BOD5=480 mg/l; raw water load = 407 TEGW; TN=27 mg/l;TP=2,7 mg/l; BOD = 8921 t/a;COD=20 430 t/a; TN=502 t/a; TP= 50 t/a; The pollution originates from the population and the industry. The contribution of the industry to the BOD5 pollution load is 85-91%. This is mainly due to the sugar and alcohol factories (75-90% of the total contribution) depending on the seasonal load.
Seasonal Variations	The sugar beet treatment campaign (60-100 days) adds additional emission loads to the typical pollution from alcohol production (shlamp). The low water quantities in the river and high temperatures during this season lead to a compounding of the situation. The point at the Yantra River after the town of Gorna Oryahovitza. The sampling point after the town of Gorna Oryahovitza 35% of all samples show BOD concentrations (30,8 - 160 mg/l) above maximum permissible limits; in 24% of the cases of N-NH4 are above maximum permissible limits (5,3-11,9 mg/l) in 40% of the cases of N-NO2 (0,08-0,11mg/l) compounded with oxygen deficit.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of potable groundwater sources. Construction of a WWTP will improve sanitary conditions for local people The Yantra has been classified as Category III water body in this region, but the water is unsuitable for irrigation purposes because of its high organic load. If this project is implemented, it will reduce organic pollution sufficiently that the water may be used for irrigation downstream.
Receiving Waters	The wastewater at the discharge point are coloured dark brown and have the specific odour of the pollutants, including H2S
Nearby Downstream Uses	The river and terrace waters are used for water supply and irrigation and water supply. After the discharge of the municipal waste waters the waters from the Yantra river terrace are used for water supply by the villages Pissarevo, Varbitza, Dolna Oryahovitza, Dobri Dyal and Kozarevetz and as sources for industrial waste water supply by some plants in the region. This poses a higher health risk in the region.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority

Table 2.2.1-2 Summary of information for the municipal hot spots WWTP Troyan

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Troyan	Location-Osam River Basin; Beli Osam Sub-basin
Critical Emissions **1994-1997**	Population 24 721; 80 % sewered; Qav = 28 200 m3/day; BOD5 = 200 mg/l; raw water load - 94 TEGW; SS = 220 mg/l; TN = 29, 0 mg/l; N- NH4 = 18,0 mg/l; TP = 3,4 mg/l; BOD =2 059 t/a; COD =4 460 t/a ; N=298 t/a; P=35 t/a
Seasonal Variations	1. The regitered concentrations of BOD5= 30,6-71,1 mg/l and N-NH4 = 2,56-3,94 mg/l are during the low flow months at the water quality monitoring station Ossam River, town of Troyan, which makes the river dilution capacity low. 2. There are some food industrial plants (winery, dairy, meat processing) with high emissions of organics and SS – these present a high pollution load during the low flow months.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	The town has a combined sewerage system. The industrial plants with high BOD5 pollution load are discharging in the sewerage. Contribution of the industrial emission Wastewaters from the industry are discharged into the municipal sewerage system and they form more than 85% of the BOD5 load ("Lessoplast" factory alone produces about 55%)
Receiving Waters	Periodically coloration of the waters is observed after the inflow of wastewater from the town of Troyan, as well as H2S odor.
Nearby Downstream Uses	River and terrace waters are used for water supply, irrigation and animal breeding. 25 km after the discharge point of the municipal waste 80-100 l/sec are extracted for the water supply of Lovetch. It poses a health risk to more than 30 000 people who use the terrace waters for irrigation as a potable water source.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority

Table 2.2.1-3 Summary of information for the municipal hot spots WWTP Lovetch

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Lovetch	Location-Osam River Basin
Critical Emissions	Population 47 477; 55 % sewered; Qav = 29 600 m3/day; BOD5=160 mg/l; raw water load- 79 TEGW; SS= 170 mg/l; TN=42 mg/l; TP=2,8 mg/l; BOD = 1729 t/a; COD = 4020 t/a; TN=454 t/a; TP=30 t/a
Seasonal Variations	1. BOD5 concentrations of 25,42 - 29,40 mg/l, N-NH4 concentrations of 3,6-4,95 mg/l and N-NO2 concentrations reaching 0,29 mg/l have been measured during the low runoff seasons at the Ossam point at the town of Lovetch. (See Annex 4). No significant dilution by the waterreceiving body may be achieved. 2. Industrial plants (foodstuffs industry – Vinprom, canning industry, milk and meat processing) with higher emissions of organics and SS. This coincides with the low water periods.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	Waste waters from the industry, discharged into the municipal sewerage system form more than 40% of the total BOD5 load (the load attributable to “Velur” leather and hide plant is 15)
Receiving Waters	The discharge point of the wastewater has a weak H2S odor at low water levels.
Nearby Downstream Uses	The river and terrace waters are used for potable water supply, animal breeding. After the municipal wastewater discharge point water is extracted from the river terrace near the Omarevtzi village (potable water supply of the town of Lovech) This presents a high health risk for more than 60 000 people using the river terrace waters for irrigation and water supply.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority

Table 2.2.1-4 Summary of information for the municipal hot spots WWTP Vratza

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Vratza	Location-Ogosta River Basin; Leva River Sub-basin; Botunya River
Critical Emissions	Population 76 576 ; 80 % sewered; Qav = 37 400 m3/day;raw water load- 112 TEGW; WWTP under operation; WWTP-Qav = 34 800 m3/day; BOD5= 20 mg/l, 254 t/a; TN=15 mg/l, 191 t/a; TP=2,4 mg/l, 30 t/a untreated Qav = 2 600 m3/day;BOD5=180mg/l, 171 t/a; raw water load- 8 TEGW; SS= 180 mg/l, 171 t/a; TN=35 mg/l, 33 t/a; TP=3,4mg/l, 3 t/a;
Seasonal Variations	Industrial enterprises (foodstuffs industry-Vinprom, milk and meat processing) with a higher emissions of organics and SS. The higher emissions coincide with the lower water runoff seasons.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of potable groundwater sources. Construction of a WWTP will improve sanitary conditions for local people The Ogosta has been classified as Category III water body in this region, but the water is unsuitable for irrigation purposes because of its high organic load. If this project is implemented, it will reduce organic pollution sufficiently that the water may be used for irrigation downstream.
Receiving Waters	The discharge of polluted water into the river has an adverse effect on the riverine ecosystem. It also affects the shallow underground water resources, which are infiltrated by water from the river. There is already a shortage of fresh water, both underground and at the surface. It is therefore very important to prevent contamination of those fresh water resources remaining.
Nearby Downstream Uses	River and terrace waters are used for water supply, irrigation and animal breeding. This represents a high health risk for the irrigation and water supply purposes.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority

Table 2.2.1-5 Summary of information for the municipal hot spots WWTP Sofia

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Sofia	Location- Iskar River Basin
Critical Emissions	Population 1 116 823 ; 87 % sewered; Qav =642 200 m3/day, raw water load 1 371 TEGW; WWTP under operation Qav = 466 500 m3/day;BOD5 = 15 mg/l, 2 554 t/a; TN = 11 mg/l, 1 873 t/a; TP = 4,9 mg/l, 834 t/a; untreated Qav = 175 700 m3/day; BOD5 = 115 mg/l, 7 375 t/a; SS = 100 mg/l, 6 413 t/a; TN = 20 mg/l, 1 283 t/a; TP = 5,1 mg/l, 327 t/a.
Seasonal Variations	
Immediate Causes of Emissions	The reason for the emission is the need of rehabilitation and expansion of WWTP.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of surface water.
Receiving Waters	Periodically higher values of the indicators N-NH4, N-NO2 and petroleum products has been registered
Nearby Downstream Uses	River waters are used for the irrigation of adjacent agricultural lands, water supply for animal breeding and others.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority.

Table 2.2.1-6 Summary of information for the municipal hot spots WWTP Sevlievo

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Sevlievo	Location-Yantra River Basin; Rossitza River Sub-basin
Critical Emissions	Population 25 435 ; 80 % sewered; Qav = 14 800 m3/day; BOD5= 220 mg/l; raw water load 54 TEGW; SS= 300 mg/l; TN= 34 mg/l; TP= 4,8 mg/l BOD =1188 t/a; COD = 2 280 t/a; TN= 184 t/a; TP= 26 t/a
Seasonal Variations	At the Rossitza River, Sevlievo Town sampling point, measured BOD5 values in the low water months range from 8,92 to 15,12 mg/l, N-NH4 concentrations range from 5,31 to 9,84 mg/l, at water quantities Q=0,16-0,87 m3/s. No significant dilution of the wastewater takes place in the receiver. Industrial plants from the food processing industry (canning factory, dairy and meat processing) with high organic and SS emission load, which coincides with the low water flow.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of the receiving waters. Construction of a WWTP will improve sanitary conditions for local people The Rossitza has been classified as Category III water body in this region, but the water is unsuitable for irrigation purposes because of its high organic load. If this project is implemented, it will reduce organic pollution sufficiently that the water may be used for irrigation downstream.
Receiving Waters	Industrial wastewater discharge contributes to more than 60% of the total BOD5 load (this includes “Sevko” a tannery plants share is 26% of the BOD5 load.) The wastewater at the discharge points within the town limits has a specific odor. Coloration of the wastewater has also been observed.
Nearby Downstream Uses	The river waters are used for irrigation after the discharge of the municipal wastewaters. This poses a health risk for the population.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority.

Table 2.2.2-1 Summary of information for the municipal hot spots WWTP Montana

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Montana	Location-Ogosta River Basin
Critical Emissions	Population 52 670 cap; 90 % sewered; Qav = 29 800m3/day; raw water load 124 TEGW; BOD = 250 mg/l, 2 719 t/a; SS = 260 mg/l, 2 828 t/a; TN= 41 mg/l, 446 t/a; TP = 6 mg/l, 65 t/a
Seasonal Variations	1. Concentrations of N-NO2 up to 0.13 mg/l, N-NH4 up to 11,7 mg/l were measured at the sampling point at the Ogosta River at the village of Kobiliak at Q=3,5-5,15 m3/s (See Annex 4) No significant dilution may be achieved in the water recipient body. 2. Production plants foodstuffs sector (milk and meat processing industry and poltry slaughterhouse) has a higher emission load (organics and SS) which coincides with the low runoff months.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of potable groundwater sources. Construction of a WWTP will improve sanitary conditions for local people The Ogosta has been classified as Category III water body in this region, but the water is unsuitable for irrigation purposes because of its high organic load.
Receiving Waters	The discharge of polluted water into the river has an adverse effect on the riverine ecosystem. It also affects the shallow underground water resources, which are infiltrated by water from the river. There is already a shortage of fresh water, both underground and at the surface. It is therefore very important to prevent contamination of those fresh water resources remaining.
Nearby Downstream Uses	The villages Edrin, Protitovtzi, Vladimirovtzi, Marchevo, Beli Brod, Kobiliak, as well as five other get their water supply from the terrace of the Ogosta River. The canning factory in the Boitzinovtzi village uses potable water quality water for its process needs from the river terrace too. This presents and increased health hazard.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of medium priority

Table 2.2.2-2 Summary of information for the municipal hot spots WWTP Popovo

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Popovo	Location-Russenski Lom River Basin, Cherni Lom Sub-basin, Popowska River
Critical Emissions	Population 19 873; 95 % sewered; raw water load- 60 TEGW Qav = 14 500 m3/day; BOD = 250 mg/l, 1 323 t/a; SS = 260 mg/l, 1378 t/a; TN= 26 mg/l, 138 t/a; TP= 5,9 mg/l, 31 t/a
Seasonal Variations	Concentrations higher than the admissible norms have been registered in the Cherni Lom River at the Shirkovo sampling point (See Annex 4). BOD5 concentrations up to 97.5 mg/l, N-NH4 up to 50 mg/l and N-NO2 up to 1,1 mg/l have been measured at the sampling point after the town of Popovo. No significant dilution by the waters of the receiver may be expected. The industrial plants from the foodstuffs industry (canning factory, milk and meat processing, production of vegetable oils) have a higher emission loads of organic pollutants (N-NH4, N-NO2, P-PO4)
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of surface water. Construction of a WWTP will improve sanitary conditions for local people If this project is implemented, it will reduce organic pollution sufficiently that the water may be used for irrigation downstream.
Receiving Waters	The discharge of polluted water into the river has an adverse effect on the riverine ecosystem. It is therefore very important to prevent contamination of those fresh water resources remaining.
Nearby Downstream Uses	River water is used for animal breeding and irrigation. This presents a higher health risk for the water users (used for irrigation) and negative impacts on the flora and fauna.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of medium priority

Table 2.2.3-1 Summary of information for the municipal hot spots WWTP Russe

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Russe	Location-Danube River
Critical Emissions	Population 168 051 ; 78 % sewered; Qav = 245 200 m3/day; raw water load - 1022 TEGW; BOD = 250 mg/l, 22 375 t/a; SS = 320 mg/l, 28 639 t/a; TN=32mg/l, 2 884 t/a; TP=5,4 mg/l, 483 t/a
Seasonal Variations	Industrial plants from the foodstuffs industry (Sugar factory, Vinprom, a canning factory, a brewery, yeast, dairy and meat processing) with higher emissions of organics and SS coinciding with the summer months of low water quantities.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of potable groundwater sources. Construction of a WWTP will improve sanitary conditions for local people The Danube River has been classified as Category III water body in this region, If this project is implemented, it will reduce the pollution sufficiently.
Receiving Waters	Higher than permissible discharges of SS have been registered.
Nearby Downstream Uses	Terrace waters are used for water supply, animal breeding, and irrigation. This presents a higher health risk for the population in the region, using the waters from the terrace for water supply and irrigation.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of low priority.

Table 2.2.3-2 Summary of information for the municipal hot spots WWTP Svishtov

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Svishtov	Location-Danube River
Critical Emissions	Population 32 411 ; 86 % sewered; raw water load- 55 TEGW Qav = 15 100 m3/day BOD = 270 mg/l, 1488 t/a; TN=41 mg/l, 226 t/a; TP=5 mg/l, 28 t/a
Seasonal Variations	There are some food industrial plants (winery, canning, dairy, meat processing) with high emissions of organic and SS – these present a high pollution load during the low flow months.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities. The petrol products pollution in the region of the warehouse, near the harbor is caused by the insufficient work of the existing wastewater treatment facilities and also because of accidental discharges.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of potable groundwater sources. Construction of a WWTP will improve sanitary conditions for local people The Danube River has been classified as Category III water body in this region.
Receiving Waters	There were find the petrol products over the permissible limit near the town of Svishtov
Nearby Downstream Uses	River and terrace waters are used for water supply, irrigation and animal breeding. It poses a health risk to the people who use the terrace waters for irrigation as a potable water source.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of low priority.

Table 2.2.3-3 Summary of information for the municipal hot spots WWTP Silistra

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Silistra	Location-Danube River
Critical Emissions	Population 47 530 ;70 % sewered; Qav =12 850 m3/day BOD = 200 mg/l, 938 t/a; TN = 18 mg/l, 84 t/a; TP = 3,5 mg/l, 16 t/a;
Seasonal Variations	There are some food industrial plants (winery, canning, dairy, vegetable oil production, meat processing) with high emissions of organic and SS – these present a high pollution load during the low flow months.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of potable groundwater sources. Construction of a WWTP will improve sanitary conditions for local people The Danube River has been classified as Category III water body in this region.
Receiving Waters	There were find the deviations of SS and petrol products over the permissible limit near the town of Svishtov
Nearby Downstream Uses	The town of Silistra is situated on the boundary with Romania.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of low priority.

Table 2.2.3 - 4 Summary information for the municipal hot spots WWTP Levski

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Levski	Location-Osam River Basin
Critical Emissions	Population 13 067 cap. ; 80 % sewered; 90% of the population is connected to sewerage. Qav = 16 250 m^3/day; 5 931x 10^3 m^3/year; BOD_5=200 mg/l; BOD_5 raw water load-1186 t/year, 60.20 TEGW ; SSM = 200 mg/l, 1186 t/year ; TN= 27 mg/l, 160 t/year; NH4-N= 160 t/year; TP=4.8 mg/l, 28 t/year;
Seasonal Variations	There are some food industrial plants (dairy, meat processing, poultry-slaughterhouse) with high emission of organic, greases and SS - these present a high pollution load during the low flow months.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of potable groundwater sources. Construction of a WWTP will improve sanitary conditions for local people The Osam has been classified as Category III water body in this region, but the water is unsuitable for irrigation purposes because of its high organic load. If this project is implemented, it will reduce organic pollution sufficiently that the water may be used for irrigation downstream.
Receiving Waters	After the discharge of the untreated wastewater in the Ossam river there were find from time to time such a deviations of BOD_5, permanganate oxidizability (COD^{Mn}), SS, $N\text{-}NH_4$, $N\text{-}NO_2$, $N\text{-}NO_3$ with combination of oxygen deficit.
Nearby Downstream Uses	The river and terrace waters are used for industrial water supply animal breeding and irrigation. After the municipal wastewater discharge point water is extracted from the river terrace for the different purposes. This present a health risk for more than 30 000-35 000 people.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of low priority

Table 2.2.3 - 5 Summary information for the municipal hot spots WWTP Vidin

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Vidin	Location-Danube River
Critical Emissions	Population 63 560; 67 % sewered; 90% of the population is connected to sewerage; the domestic and industrial wastewater is discharged to the Danube river through pumping station without treatment; Qav =39 000 m3/day, 1423.5 x 10^3 m^3/a; BOD - 110 mg/l, 4290 kg/day, 1565.85 t/a; SSM - 180 mg/l, 7070 kg/day, 2562.3 t/a; TN- 23 mg/l, 897 kg/day, 327.4 t/a; $N-NH_4$- 15 mg/l, 585 kg/day, 213.5 t/a; TP- 3 mg/l, 117 kg/day, 42.7 t/a
Seasonal Variations	There is some food industrial plants (dairy, meat processing, canning) with high emission of organic, greases and SS and nutriance - these present a pollution load during the low flow months.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of potable groundwater sources. Construction of a WWTP will improve sanitary conditions for local people The Danube River has been classified as Category III water body in this region.
Receiving Waters	The range of some Danube water quality indicators during 1995 is as follow: before Vidin- BOD_5-1.2 to 4.4 mg/l; permanganate oxidizability- 3.5 to10.6 mg/l; SS- 30 to 80 mg/l; $N-NH_4$-0 to 0.24mg/l; $N-NO_3$-0.27 to 2.0 mg/l after Vidin- BOD_5-2.2 to 6.0 mg/l; permanganate oxidizability-4.0 to 11.4 mg/l; SS- 28 to 94 mg/l; $N-NH_4$-0.06 to 0.66 mg/l; $N-NO_3$-0.25 to 2.6 mg/l. The permissible limits for the III category are: BOD_5-25 mg/l; permanganate oxidizability-40 mg/l; SS- 100 mg/l; $N-NH_4$-5 mg/l; $N-NO_3$-20 mg/l. There were find the deviations of $N-NO_2$ near the Lom river mouth during October 1996
Nearby Downstream Uses	The river and terrace waters are used for water supply, irrigation and animal breeding. The N and P forms are in low concentration and they have no negative impact on the human health. But the combination of N and P forms causes the process of eutrophication and Black Sea damages.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of low priority

Table 2.2.3 – 6 Summary information for the municipal hot spots WWTP Lom

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Lom	Location-Danube River
Critical Emissions	Population 30 400 cap ; 40 % sewered; part of the domestic and industrial wastewater is discharged to the Danube river through pumping station and other part of it is discharged to the Lom river ;population connected ‘95 18 000 cap Qav = 26 000 m3/day, 9 490x10^3 m^3/a BOD = 106 mg/l, 2 730 kg/day, 996.45 t/a, 50.56 TEGW; SSM = 180 mg/l, 4 680 kg/day, 1 708.2 t/a; TN=20 mg/l, 520 kg/day, 189.8 t/a; N-NH_4=14 mg/l, 364 kg/d, 132.9 t/a TP=4 mg/l, 104 kg/d, 38 t/a
Seasonal Variations	There are some food industrial plants (canning, dairy, meat processing, brewery, soft drinks and sugar factory) with high emission of organic, greases and SS - these present a pollution load during the low flow months.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of potable groundwater sources. Completion of sewerage network and construction of a main collector and WWTP will improve sanitary conditions for local people and will prevent the riverbank from erosion. The Danube River has been classified as Category III water body in this region.
Receiving Waters	Mean concentration measured at the Lom river mouth during 01.01.96-30.06.96 dissolved oxygen-11.4 mg/l; permanganate oxidizability-7.58 mg/l; BOD_5-3.6 mg/l; nitrogen ammonium-0.26 mg/l; nitrogen nitrates-1.31 mg/l; The range of some Danube water quality indicators during 1995 is as follow: before Archar river- BOD_5-1.2 to 4.2 mg/l; permanganate oxidizability- 2.8 to 9.8 mg/l; SS- 39 to 112 mg/l; N-NH_4-0 to 0.3 mg/l; N-NO_3-0.23 to 1.55 mg/l after Lom river- BOD_5-1.9 to 3.9 mg/l; permanganate oxidizability-3.2 to 10.7 mg/l; SS- 28 to 116 mg/l; N-NH_4-0 to 0.14 mg/l; N-NO_3-0.27 to 1.52 mg/l. The permissible limits for the III category are: BOD_5-25 mg/l; permanganate oxidizability-40 mg/l; SS- 100 mg/l; N-NH_4-5 mg/l; N-NO_3-20 mg/l. There were find the deviations of N-NO_2 near the Lom river mouth during October 1996
Nearby Downstream Uses	The river and terrace waters are used for water supply, irrigation and animal breeding. The N and P forms are in low concentration and they have no negative impact on the human health. But the combination of N and P forms causes the process of eutrophication and Black Sea damages.
Rank	The hot spot is presented as a simple statement of low priority

Table 2.4.1-1 Summary of information for the industrial hot spots "Sugar & Alcohol Factory", Gorna Oryahovitza

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Gorna Oriahovitza- Sugar and alcohol factory	Location-Yantra River Basin
Critical Emissions	The sugar and alcohol industrial wastewater is highly organics polluted. The variations are in a wide range during the day and during the year, depending of the type and the quantity of the production and the used row material. Presently, the factory is working with the half capacity. The annual amount of the sugar been sugar is 13 000 to 15 000 t/a and the sugar reed sugar is 58 000 - 62 000 t/a. The annual production of sugar products is 6 000-6 500 t/a. Qav = 10 000 - 34 000 m3/day or 9 455 000 m3/a BOD = 6 800 t/a; TN = 300 t/a; TP = 0,55 t/a; SS = 7 330 t/a;
Seasonal Variations	The sugar and alcohol factories have the typical seasonal character. **The sugar factory**- The quantity of the wastewater discharge is high (Qav= 25 000 - 30 000 m3/day, 2 800 000 m3/a) during the sugar been campaign, which is 60 to 100 days in a year as well as September, October, November. The organic contamination is high too as BOD5= 500 to 1 100 mg/l, 1 540 t/a; TN= 35 mg/l, 98 t/a; SS= 400 to 600 mg/l, 1400t/a. The quantity of the wastewater discharge is high (Qav= 20 000 - 24 000 m3/day, 2 200 000 m3/a) during the sugar reed campaign, which is 60 to 100 days in a year as well as June, July, August. The organic contamination is high too as BOD5= 400 to 800 mg/l, 1 000 t/a; TN= 35 mg/l, 77 t/a; SS= 350 to 500 mg/l, 880t/a. The quantity of the wastewater discharge is high (Qav= 10 000-12 000 m3/day) out of campaign, during the all year. The organic contamination is BOD5= 80-300 mg/l, 290 t/a; TN= 15 mg/l, 50 t/a; SS= 100-130 mg/l, 430 t/a. The total quantity of the wastewater discharge is Qav= 8 300 000 m3/a; BOD5=2 830 t/a; TN= 225 t/a; SS= 2 710 t/a. **The alcohol factory** is working temporary. The organic pollution load is BOD5= 15-70 kg/m3. The average wastewater quantity is Qav=2 500 to 4 000 m3/day, 1 155 000 m3/a. The average concentration of BOD5 is from 2 to10 mg/l or 3970 t/a; TN= 30-100 mg/l, 75 t/a; TP= 0,55 t/a; SS= 1-5 mg/l, 4 620 t/a. The high value of the organic pollution is during the month with low river runoff. The sugar been sugar production campaign is running in the same time. Taking in to account the contribution of the other production lines as the alcohol and sugar products production is possible to explain the high BOD5, COD and SS loads and oxygen deficit.

Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of potable groundwater sources. Construction of a WWTP will improve sanitary conditions for local people The Yantra has been classified as Category III water body in this region, but the water is unsuitable for irrigation purposes because of its high organic load. If this project is implemented, it will reduce organic pollution sufficiently that the water may be used for irrigation downstream.
Receiving Waters	The wastewater at the discharge point is colored dark brown and has the specific odor of the pollutants, including H2S. The low water quantities in the river and high temperatures during this season lead to a compounding of the situation. The point at the Yantra River after the town of Gorna Oryahovitza. The sampling point after the town of Gorna Oryahovitza 35% of all samples show BOD concentrations (30,8 - 160 mg/l) above maximum permissible limits; in 24% of the cases of N-NH4 are above maximum permissible limits (5,3-11,9 mg/l) in 40% of the cases of N-NO2 (0,08-0,11mg/l) compounded with oxygen deficit. (see Annex 4). Moreover, it causes severe eutrophication and degradation of the riverine ecosystem.
Nearby Downstream Uses	The river and terrace waters are used for water supply and irrigation and water supply. After the discharge of the municipal waste waters the waters from the Yantra river terrace are used for water supply by the villages Pissarevo, Varbitza, Dolna Oryahovitza, Dobri Dyal and Kozarevetz and as sources for industrial waste water supply by some plants in the region. This poses a higher health risk in the region.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority

Table 2.4.1-2 Summary of information for the industrial hot spots Fertilizer Plant "Chimco", Vratza

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Vratza "Himco"	Location-Ogosta River Basin; Dubnica River Sub-basin; Lewa River
Critical Emissions	Qav = 15 000-24 000 m3/day BOD5 = 5-20 mg/l, 25 t/a; SS =119,6 t/a; TN = 20- 270 mg/l, 242,3 t/a; TP=3,6 t/a
Seasonal Variations	The regitered concentrations of N-NH4 over 100 mg/l; N-NO2 to 2,9 mg/l; N-NO3 to 31 mg/l are during the low flow months at the water quality monitoring stations Lewa River and Dabnika River. The high concentration of N-NO2 and other pollution caused the high concentration of N-NO3 near the mouth of the Ogosta River. No clear defined tendency towards water quality improvement may be observed.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of potable groundwater sources. Construction of a WWTP will improve sanitary conditions for local people The Ogosta has been classified as Category III water body in this region, but the water is unsuitable for irrigation purposes because of its high organic load. If this project is implemented, it will reduce organic pollution sufficiently that the water may be used for irrigation downstream.
Receiving Waters	Stronger ammonia odor is observed in the summer months. The discharge of polluted water into the rivers Lewa and Dabnika has an adverse effect on the riverine ecosystems. The presence of ammonia in the surface water is detrimental due to its toxic effects on the fish. In 1995 the annual average was 16 times over the maximum permissible limits. Higher concentrations of SS and petroleum products have also been observed. It also affects the shallow underground water resources, which are infiltrated by water from the river. There is already a shortage of fresh water, both underground and at the surface. It is therefore very important to prevent contamination of those fresh water resources remaining.
Nearby Downstream Uses	The river and terrace waters are used for irrigation, water supply and animal breeding. This presents a higher health risk for the population in contact with it.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority

Table 2.4.1-3 Summary information for the industrial hot spots "Antibiotic" Razgrad

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Razgrad - "Antibiotic"	Location- Beli Lom River, Russenski Lom River Basin
Critical Emissions	*Inflow from "Antibiotic" Co* -Qav = 60.0-75.0 l/s, 5 200-6 500 m^3/day or 2 129x10^3 m^3/year; BOD_5 = 200-500 mg/l, BOD_5av=250 mg/l; SS= 70.0-400.0 mg/l SSav=200 mg/l; N-NH_4=60-150.0 mg/l; Norg=10-30 mg/l; P-5.0-15.0 mg/l The wastewater from the factory is treated biologically together with the domestic wastewater from the town of Razgrad. *Inflow from the town*- Qav=180-200 l/s; BOD_5 = 130-207 mg/l, BOD_5av=165mg/l *Inflow from "Antibiotic" Co+ the town*- - Qav=240-270 l/s; BOD_5av=188mg/l; SS=210-250 mg/l; N-NH_4=25-55.0 mg/l; Norg=10-20 mg/l; P-5.0-8.0 mg/l Outflow- combine WWTP- BOD_5 = 55-97 mg/l, BOD_5av=60mg/l; SS=80-200 mg/l, SSav=150 mg/l; N-NH_4 over 2.0 mg/l; P over the permissible limit.
Seasonal Variations	There is some food industrial plants (dairy, meat processing, canning) with high emission of organic, greases and SS and nutriance - these present a pollution load during the low flow months.
Immediate Causes of Emissions	The reason for the emission is the insufficient wastewater treatment from "Antibiotic Plant" in Razgrad.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of potable groundwater sources. Completion of a WWTP will improve sanitary conditions for local people The Russenski Lom River has been classified as Category II water body in this region, but the water is unsuitable for irrigation purposes because of its high organic load. If this project is implemented, it will reduce organic pollution sufficiently that the water may be used for irrigation downstream.
Receiving Waters	The organic contamination of the Beli Lom river, indicated by the parameter BOD_5 is high, BOD_5max=27.43 mg/l (Q=0.46 m^3/s-10/11/94 for the whole period Qmin=0.44 m^3/s) and BOD_5av= 16.42 mg/l (see Table 4.8-27); N-NO_3av is 6.46 mg/l and N-NO_3max is 11.88 mg/l (Q=0.49m^3/s-23/02/95 for the whole period Qmin=0.44m^3/s); N-NH_4av is 4.62 mg/l (see table 4.8-27)and N-NH_4max is 6.5 mg/l (Q=0.51m3/s -14/03/95, Qmin = 0.44m3/s, see table 4.8-20);
Nearby Downstream Uses	The river and terrace water is used for water supply of the village of Getzovo and Drianovetz and partly of the town of Razgrad. After the discharge of the industrial & municipal wastewater, there are about 19 sallow wells. The nearest one is located at 8 km. down the discharge.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority

Table 2.4.3-1 Summary of information for the industrial hot spots Elatzite Mining Company

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Elatzite- Mining	Location- Iskar River Basin; Malak Iskar Sub-Basin; Negrashtitza River
Critical Emissions	The mean annual outflow from the territory of the mining complex " Elatzite" is about 216, 2 l/sec (multiannual average). The contamination of the water in the Negarshtitza catchment area is characterized with wide variety of pH from acid to alkaline and high content of dissolved solids, SS, and SO4 >8 gr./l; N- NH4; N-NO2; Cu; Mn; Fe.
Seasonal Variations	There is no such a seasonal variations
Immediate Causes of Emissions	Particular character of the generation of the wastewater and the widely varying of the indicators.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem, which defines the hot spot. This includes a combination of an emissions discharge and a protection of Malak Iskar River water quality.
Receiving Waters	|The findings of REI-Sofia in1995 for Negarshtitza River before the discharge to the Malak Iskar River are pH=4,49-6,4;DSS=1 190mg/l;SS= 62-1 868 mg/l; N-NH4= 2,73-4,68mg/l;N-NO2=0,96-4,27;Fe = 1,7-5,5 mg/l; Mn= 1,8-11,6; Cu= 1,5-10,5 mg/l Malak Iskar River before the town of Etropole- pH=4,6-4,85; SS=58-837 mg/l; N-NH4= 2,7 mg/l; N-NO2=0,057- 0,273 mg/l; Mn=0,8-5,2 mg/l;Cu=2,5-2,9 mg/l|
Nearby Downstream Uses	The Malak Iskar River water is used for irrigation and as a water supply for animal breeding. It is a potential health risk for the population in the region.
Transboundary Implications	There are no transboundary implications.
Rank	The rank of the hot spot is presented as a simple statement of low priority. Note: Large investments were made to solve the environmental problems since 1995. The result is the correction of pH and the reduction of the heavy metal emissions. The additional volumes for equalization, neutralization and accumulation of the peak reinflow should be put under operation very soon.

Annex 3

Identification of Diffuse Sources of Agricultural Pollution

Table 3.1-3 Cultivated crops in the Bulgarian stretch of the Danube catchment area and principal pests, requiring treatment with pesticides

Crops	Pathogens	Pests	Weeds
Cereals			
- Wheat	Erysiphe graminis	Aphididae	Broad-leaved
	Fusarium spp.	Eurygaster spp.	Grass weeds
	Tilletia levis	Lema spp.	
	Ustilago tritici	Zabrus tenebrioides	
-Barley	Ustilago nuda		Broad leaved
	Helminthosporim		Grass weeds
	gramineum		
Maize	Fusarium spp.	B. punctiventris	Broad leaved
	Pythium	T. dilaticolis	Grass weeds
	Ustilago zeae	Elateridae spp.	
Grain's legumes			
-Bean	Colletotrichum	Aphididae	Broad leaved
	lindemuthianum		Grass weeds
	Fusarium		
	Rizoctonia solani		
	Pythium		
-Soybeans	Colletotrichum	Aphididae	Broad leaved
	lindemuthianum		Grass weeds
	Fusarium		
	Rizoctonia solani		
	Pythium		
Sunflower	Plasmopara halstedii	B. punctiventris	Broad leaved
	Fusarium	T. dilaticolis	Grass weeds
	Rizoctonia	Elateridae	
	Pythium		
	Sclerotinia		
Grass and fodder			
Crops			
- Harbage legumes/	Fusarium	Aphididae	Broad leaved
Peas	Rizoctonia solani		Grass weeds
	Pythium		
Alfalfa		Sucking and chewing	
		Insects	
Potatoes	Phytophtora infestans	Leptinotarsa	Broad leaved
	Rhizoctonia solani	Decemlineata	Grass weeds
		Aphididae	
Sugar beet	Cercospora beticola	B. punctiventris	Broad leaved
	Phoma betae	Aphis fabe	Grass weeds
	Pythium	Chaetocnema	
		Cassida nebuloa	
Tobacco	Peronospora tabacina	Thrips tabaci	Broad leaved
		Aphididae	Grass weeds
Vegetables	Phytophtora infestans	Trialeurodes	Broad leaved
	pawder mildew	Vaporariorum	Grass weeds
		Tetranychys urtica	
		Lepidoptera	

Fruits	Venturia inaequalis	L. pomonella	Broad leaved
	Podosphera leucotricha	L. molesta	Grass weeds
	Monillia fructigena	Panonychus ulmi	
	Monillia laxa	Q. perniciosus	
	Taphrina pruni	Cemiostoma scitella	
	Taphrina deformans		
	Venturia pirina		
Grapevine	Plasmopara viticola	Mites	Broad leaved
	Uncinula necator	Lobessia botrana	Grass weeds
	Botrytis cinerea	Clysia ambiguella	
Forest crops		Loxostega sticticticalis	
		Lymantria dispa	
** Sources of information:EPDRB Danube Regional Pesticide Study, Bulgarian Report, phase 1, December 1995*			

Annex 4

Updating and Validation of Water Quality Data

Table 4.1-1: Index of water quality and discharge records

	Sampling	River	River	Coordinates			Number of years of records and the latest year of record				
	Station Name	Name	Bank				for each of the following categories of parameters				
					Water Discharge	Sediment Discharge	Total N	Total P	BOD	Heavy Metals	Other Toxics
1	Tarnene village	Voinishka	middle		54/98		24/98	24/98	24/98	11/98	NR
2	Archar village	Archar	middle				24/98	24/98	24/98	11/98	NR
3	before Lom town	Lom	middle				24/98	24/98	24/98	11/98	NR
4	after Lom town	Lom	middle				24/98	24/98	24/98	11/98	NR
5	Dolni Tzibar	Tzibritza	middle		49/98	35/98	24/98	24/98	24/98	11/98	NR
6	Belimel village	Tchiprovska Ogosta	middle				24/98	24/98	24/98	11/98	NR
7	G.Genovo village	Ogosta	middle	43°24'/23°06'	13/98		14/98	14/98	14/98	11/98	NR
8	Borovtzi village	Barzia	middle				24/98	24/98	24/98	11/98	NR
9	after dam Ogosta	Ogosta	middle				24/98	24/98	24/98	11/98	NR
10	Estuary	Butchka	middle				24/98	24/98	24/98	11/98	NR
11	Boitchinovtzi town	Ogosta	middle				24/98	24/98	24/98	11/98	NR
12	after Varshetz town	Botunia	middle		49/98		24/98	24/98	24/98	11/98	NR
13	Dolno Ozerovo	Glavarka	middle				24/98	24/98	24/98	11/98	NR
14	Goliamo Babino	Botunia	middle				24/98	24/98	24/98	11/98	NR
15	Vratza town	Leva	middle				24/98	24/98	24/98	11/98	NR
16	after chemical plant	Dabnika	middle				24/98	24/98	24/98	11/98	NR
17	Estuary	Dabnika	middle				24/98	24/98	24/98	11/98	NR
18	Beli izvor village	Leva	middle				24/98	24/98	24/98	11/98	NR
19	Krivodol town	Leva	middle				24/98	24/98	24/98	11/98	NR
20	Kobiliak village	Ogosta	middle	43°31'/23°27'	39/98	35/98	24/98	24/98	24/98	11/98	NR
21	Sofronievo village	Ogosta	middle				24/98	24/98	24/98	11/98	NR
22	Glogene village (Mizia)	Ogosta	middle	43°31'/23°50'	85/98	34/98	24/98	24/98	24/98	11/98	NR
23	Ninianin village	Skat	middle	43°30'/23°48'	46/98	34/98	24/98	24/98	24/98	11/98	NR
24	Tarnava	Skat	middle				24/98	24/98	24/98	11/98	NR
25	Estuary	Barzina	middle				24/98	24/98	24/98	11/98	NR
26	estuary (Mizia)	Skat	middle	43°41'/23°51'	74/98	37/98	24/98	24/98	24/98	11/98	NR
27	Saraevo village	Skat	middle				24/98	24/98	24/98	11/98	NR
28	estuary (Glogene, Mizia)	Ogosta	middle		85/98	34/98	24/98	24/98	24/98	11/98	NR
29	before Iskar dam	Iskar	middle		45/98	43/98	24/98	24/98	24/98	11/98	NR
30	before Samokov town	Iskar	middle				24/98	24/98	24/98	11/98	NR

31	after Samokov town	Iskar	middle				24/98	24/98	24/98	11/98	NR
32	Estuary	Palakaria	middle				24/98	24/98	24/98	11/98	NR
33	Gorubliane village	Iskar	middle				24/98	24/98	24/98	11/98	NR
34	Estuary	Gradska	middle				24/98	24/98	24/98	11/98	NR
35	Svetovratchene village	Iskar	middle				24/98	24/98	24/98	11/98	NR
36	Dolni Bogrov village	Lesnovska	middle		62/98	33/98	24/98	24/98	24/98	11/98	NR
37	Tchelopetchene village	Lesnovska	middle				24/98	24/98	24/98	11/98	NR
38	Svetovratchabe village	Lesnovska	middle				24/98	24/98	24/98	11/98	NR
39	Kubratovo village	Lesnovska	middle				24/98	24/98	24/98	11/98	NR
40	Estuary	Blato	middle				24/98	24/98	24/98	11/98	NR
41	Novi Iskar town	Iskar	middle	42º50'/23º22'	63/98	44/98	24/98	24/98	24/98	11/98	NR
42	Estuary	Batoloiska	middle				24/98	24/98	24/98	11/98	NR
43	Estuary	Iskretzka	middle		50/98	45/98	24/98	24/98	24/98	11/98	NR
44	Estuary	Kakatch	middle				24/98	24/98	24/98	11/98	NR
45	Eliseina station	Iskar	middle				24/98	24/98	24/98	11/98	NR
46	Zverino village	Iskar	middle				24/98	24/98	24/98	11/98	NR
47	Rebarkovo village	Iskar	middle				24/98	24/98	24/98	11/98	NR
48	Roman town	Iskar	middle				24/98	24/98	24/98	11/98	NR
49	Laga village	Malak Iskar	middle				24/98	24/98	24/98	11/98	NR
50	after Botevgrad town	Kalna	middle				24/98	24/98	24/98	11/98	NR
51	Svode village	Malak Iskar	middle				24/98	24/98	24/98	11/98	NR
52	Roman town	Malak Iskar	middle				24/98	24/98	24/98	11/98	NR
53	Kunino village	Iskar	middle	43º11'/24º00'	52/98	29/98	24/98	24/98	24/98	11/98	NR
54	Reseletz village	Iskar	middle				24/98	24/98	24/98	11/98	NR
55	Petrevene village	Zlatna Panega	middle		60/98		24/98	24/98	24/98	11/98	NR
56	Estuary	Zlatna Panega	middle				24/98	24/98	24/98	11/98	NR
57	Tcomakovtzi village	Iskar	middle				24/98	24/98	24/98	11/98	NR
58	Estuary	Gostilia	middle				24/98	24/98	24/98	11/98	NR
59	Orehovitza village	Iskar	middle	43º35'/24º22'	64/98	38/98	24/98	24/98	24/98	11/98	NR
60	Gigen village	Iskar	middle				24/98	24/98	24/98	11/98	NR
61	Ribaritza village	Beli Vit	middle				24/98	24/98	24/98	11/98	NR
62	Teteven town	Beli Vit	middle		61/98	37/98	24/98	24/98	24/98	11/98	NR
63	Tcherni Vit village	Tcherni Vit	middle		50/98		24/98	24/98	24/98	11/98	NR
64	Glogene village	Vit	middle				24/98	24/98	24/98	11/98	NR
65	Sadovetz village	Vit	middle	43º18'/24º22'	64/98		24/98	24/98	24/98	11/98	NR
66	Iasen village (Tarnyane)	Vit	middle	43º24'/24º31'	64(30)/98	30/98	19/98	19/98	19/98	11/98	NR
67	Pleven town	Tutchenitza	middle				24/98	24/98	24/98	11/98	NR

68	Bivolare village	Vit	middle				19/98	19/98	19/98	11/98	NR
69	Reben village	Vit	middle				24/98	24/98	24/98	11/98	NR
70	Guliantzi town	Vit	middle				24/98	24/98	24/98	11/98	NR
71	Oreshak village	Tcherni Osam	middle		54/98		24/98	24/98	24/98	11/98	NR
72	before Troian town	Beli Osam	middle		50/98		27/98	27/98	27/98	11/98	NR
73	after Troian town	Osam	middle	42º55'/24º42'	63/98	28/98	24/98	24/98	24/98	11/98	NR
74	before Lovetch town	Osam	middle	43º09'/24º43'	76/98	33/98	24/98	24/98	24/98	11/98	NR
75	after Lovetch town	Osam	middle				27/98	27/98	27/98	11/98	NR
76	Gradishte village	Osam	middle				24/98	24/98	24/98	11/98	NR
77	Levski town	Osam	middle				24/98	24/98	24/98	11/98	NR
78	Izgrev village	Osam	middle	43º28'/25º03'	29/98	28/98	27/98	27/98	27/98	11/98	NR
79	Tcherkvitza village	Osam	middle				27/98	27/98	27/98	11/98	NR
80	Iabalka village	Iantra	middle				24/98	24/98	24/98	11/98	NR
81	Gabrovo town	Iantra	middle	42º54'/25º20'	50/98		27/98	27/98	27/98	11/98	NR
82	Pushevo village	Iantra	middle				24/98	24/98	24/98	11/98	NR
83	Triavna town	Drianovska	middle				24/98	24/98	24/98	11/98	NR
84	Gantchovetz village	Drianovska	middle				24/98	24/98	24/98	11/98	NR
85	Estuary	Drianovska	middle				24/98	24/98	24/98	11/98	NR
86	Debeletz town	Belitza	middle				24/98	24/98	24/98	11/98	NR
87	after Drianovska river	Iantra	middle		67/98	47/98	24/98	24/98	24/98	11/98	NR
88	Veliko Tarnovo town	Iantra	middle	43º06'/25º04'	67/98	47/98	24/98	24/98	24/98	11/98	NR
89	Samovodene village	Iantra	middle				24/98	24/98	24/98	11/98	NR
90	Varbitza village	Iantra	middle				24/98	24/98	24/98	11/98	NR
91	Elena town	Zlatarishka	middle				24/98	24/98	24/98	11/98	NR
92	Strajitza town	Goliama	middle	43º13'/25º58'	26/98		24/98	24/98	24/98	11/98	NR
93	Estuary	Lefedga	middle				24/98	24/98	24/98	11/98	NR
94	Draganovo village	Iantra	middle				24/98	24/98	24/98	11/98	NR
95	Before Sevlievo town	Rositza	middle	43º02'/25º06'	71/98	43/98	24/98	24/98	24/98	11/98	NR
96	estuary	Vidima	middle		62/98		24/98	24/98	24/98	11/98	NR
97	after Sevlievo town	Rositza	middle				24/98	24/98	24/98	11/98	NR
98	Biala Tcherka village	Rositza	middle				24/98	24/98	24/98	11/98	NR
99	Stambolovo village	Rositza	middle				24/98	24/98	24/98	11/98	NR
100	Estuary	Rositza	middle				24/98	24/98	24/98	11/98	NR
101	Karanzi village (Radanovo)	Iantra	middle	43º23'/25º40'	36(67)/98	36/98	24/98	24/98	24/98	11/98	NR
102	Estuary	Eliska	middle				24/98	24/98	24/98	11/98	NR
103	Biala town	Iantra	middle				24/98	24/98	24/98	11/98	NR
104	Estuary	Iantra	middle				24/98	24/98	24/98	11/98	NR

105	before Beli Lom dam	Beli Lom	middle				24/98	24/98	24/98	11/98	NR
106	before Razgrad town	Beli Lom	middle	43º32'/26º32'	76/98	48/98	24/98	24/98	24/98	11/98	NR
107	after Razgrad town	Beli Lom	middle				24/98	24/98	24/98	11/98	NR
108	Pisanetz village	Beli Lom	middle				24/98	24/98	24/98	11/98	NR
109	Nisovo village	Beli Lom	middle				24/98	24/98	24/98	11/98	NR
110	estuary	Omurovski Lom	middle				24/98	24/98	24/98	11/98	NR
111	Popovo town	Popovska	middle				24/98	24/98	24/98	11/98	NR
112	Kardam village	Tcherni Lom	middle		51/98	37/98	24/98	24/98	24/98	11/98	NR
113	Gorsko Ablanovo village	Tcherni Lom	middle				24/98	24/98	24/98	11/98	NR
114	Ostritza village	Tcherni Lom	middle				24/98	24/98	24/98	11/98	NR
115	Shirokovo village	Baniski Lom	middle				24/98	24/98	24/98	11/98	NR
116	Shirokovo village	Tcherni Lom	middle	43º33'/25º57'	51/98	37/98	24/98	24/98	24/98	11/98	NR
117	Tcherven village	Tcherni Lom	middle				24/98	24/98	24/98	11/98	NR
118	Basarbovo village (Bojichen)	Russenski Lom	middle	43º47'/25º57'	78(22)/98	36/98	24/98	24/98	24/98	11/98	NR
119	Estuary	Russenski Lom	middle				24/98	24/98	24/98	11/98	NR

Table 4.2-1 Methods for analysis

Determ code	Determinand name	Anal.meth. code	Detect limit	Reference to literature	Unit	Analytical method name	Vali dation
01.25	Temperature	BG.010		BNS 17.1.4.01-77	^0C	HG Thermometer	N
01.30	Suspended solids	BG.010	1	BNS 17.1.4.04-80	mg/l	Blue paper filtration, dried 105^0C, gravimetric	N
01.35	Dissolved oxygen	BG.010	0,2	BNS 17.1.4.08-78	mg/l	Winkler - titrimetric	N
01.40	pH	BG.010		BNS 17.1.4.27-80	mg/l	Electrometric	N
02.10	Nitrite (NO_2-N)	BG.010	0,002	BNS EN 26777-97	mg/l	Spectrophotometric	Y
02.15	Nitrate (NO_3-N)	BG.010	0,05	BNS ISO 7890-3-97	mg/l	Spectrophotometric	Y
03.15	Calcium (Ca^{2+})	BG.010	10	BNS 17.1.4.05-80	mg/l	Titrimetric/EDTA	N
03.20	Magnesium (Mg^{2+})	BG.010	0,5	BNS 17.1.4.05-80	mg/l	Titrimetric/EDTA	N
03.25	Chloride (Cl^-)	BG.010	10	BNS 17.1.4.24-80	mg/l	Titrimetric/$AgNO_3$	N
04.05	BOD(5)	BG.010		BNS 17.1.4.07-78	mg/l	Iodometric titration/DO electrod	N
04.10	COD (Cr)	BG.010	5	BNS 17.1.4.02-77	mg/l	Titrimetric/Dichromate reflux	N
04.15	COD(Mn)	BG.010	10	BNS 17.1.4.16-79	mg/l	Titrimetric	N
04.35	Anionic active surfactants	BG.010	0,05	BNS 17.1.4.25-80	mg/l	Spectrophotometric	N
01.45	Conductivity	BG.005	5	ISO 7888	µS/cm	Electrochemical	N
01.50	Alkalinity - total	BG.005	0,4	ISO 9963-1	mmol/l	Titrimetric	N
02.20	Organic nitrogen	BG.005		ISO 5663	mg/l	Kjeldahl after mineralisation with Se	N
02.25	Orthophosphate (PO_4-P)	BG.005	0,02	ISO 6878-1	mg/l	Spectrophotometric	Y
02.30	Total phosphorus	BG.005	0,02	ISO 6878-1	mg/l	Spectrophotometric	N
03.15	Calcium (Ca^{2+})	BG.005	2	ISO 6058	mg/l	Titrimetric/EDTA	N
03.20	Magnesium (Mg^{2+})	BG.005		ISO 6059	mg/l	Titrimetric/EDTA	N
03.35	Iron (Fe)	BG.005	0,01	ISO 6332	mg/l	Spectrophotometric	N
03.40	Manganese (Mn)	BG.005	0,01	ISO 6333	mg/l	Spectrophotometric	N
04.20	TOC	BG.005		ISO 8245	mg/l	Combustion, IR determination	N

04.25	DOC	BG.005	0,1	ISO 8245	mg/l	Combustion after 0,45µ filtration, IR detrmination	N
04.30	Phenol index	BG.005	0,01	ISO 6439	mg/l	Spectrophotometric	N
04.40	Petroleum hydrocarbonats by UV	BG.005	0,1	DIN 38409 Part 18	mg/l	Extraction with 1,2,2 Trichlorotrifluoroethane, IR	N
04.40	Petroleum hydrocarbonats by UV	BG.005	0,1	VITUKI method	mg/l	Spectrophotometric (UV)	N
01.35	Dissolved oxygen	BG.005	0,2	ISO 5813	mg/l	DO electrod	N
02.05	Ammonium (NH_4-N)	BG.005	0,05	ISO 7150-1	mg/l	Spectrometric	Y
03.05	Sodium (Na^+)	BG.005	0,1	ISO 9964-3	mg/l	Flame emission spectrometry	N
03.10	Potassium (K^+)	BG.005	0,1	ISO 9964-3	mg/l	Flame emission spectrometry	N
03.30	Sulphate (SO_4^{2+})	BG.005	1	PERKIN-ELMER	mg/l	Spectrometric/$BaCl_2$ gelatin	N
02.20	Organic nitrogen	BG.006		-	mg/kg	Mineralisation/Titrimetric	N
02.30	Total phosphorus	BG.007		-	mg/kg	Mineralisation/Spectrophotometri c	N
03.35	Iron (Fe)	BG.001	0,001	-	mg/l	AAS graphite tube	N
03.40	Manganese (Mn)	BG.001	0,001	DIN 38406 Part 22	mg/l	ICP - OES	N
03.45	Zinc (Zn)	BG.001	0,001	ISO 8288	mg/l	AAS	N
03.50	Copper (Cu)	BG.001	0,001	ISO 8288	mg/l	AAS	N
03.55	Chromium (Cr) - total	BG.001	0,01	ISO 9174	mg/l	AAS	N
03.60	Lead (Pb)	BG.001	0,001	ISO 8288	mg/l	AAS	N
03.65	Cadmium (Cd)	BG.001	0,001	ISO 8288	mg/l	AAS	N
03.70	Mercury (Hg)	BG.001	0,0003	ISO 5661	mg/l	AAS	N
03.75	Nickel (Ni)	BG.001	0,001	ISO 8288	mg/l	AAS	N
03.80	Arsenic (As)	BG.001	0,0003	ISO/DIN 11969	mg/l	AAS	N
03.85	Aluminium (Al)	BG.001	0,02	DIN 38406 Part 22	mg/l	ICP - OES	N
03.35	Iron (Fe)	BG.015	3	DIN 38406 Part 22	mg/kg	ICP - OES	N
03.40	Manganese (Mn)	BG.015	0,3	DIN 38406 Part 22	mg/kg	ICP - OES	N
03.45	Zinc (Zn)	BG.015	0,3	DIN 38406 Part 22	mg/kg	ICP - OES	N

03.50	Copper (Cu)	BG.015	3	DIN 38406 Part 22	mg/kg	ICP - OES	N
03.55	Chromium (Cr) - total	BG.015	3	DIN 38406 Part 22	mg/kg	ICP - OES	N
03.60	Lead (Pb)	BG.015	10	DIN 38406 Part 22	mg/kg	ICP - OES	N
03.65	Cadmium (Cd)	BG.015	0,5	DIN 38406 Part 22	mg/kg	ICP - OES	N
03.70	Mercury (Hg)	BG.015	0,1	DIN 38406 Part 22	mg/kg	AAS, reduction+purging with inert gas	N
03.75	Nickel (Ni)	BG.015	3	DIN 38406 Part 22	mg/kg	ICP - OES	N
03.80	Arsenic (As)	BG.015	1	DIN 38406 Part 22	mg/kg	AAS, reduction with Na-tetrahydroborat	N
04.60	Lindane	BG.005	0,01	ISO 6468	µg/l	Extraction LL, GC-MS	N
04.65	pp-DDT	BG.005	0,01	ISO 6468	µg/l	Extraction LL, GC-MS	N
04.70	PCBs (7 congeners)	BG.005	0,01	ISO 6468	µg/l	Extraction LL, GC-MS	N
04.75	Artrazine	BG.005	0,1	ISO/CD 10695-1	µg/l	Solid phase extraction, GC-MS	N
04.80	Chloroform	BG.005		DIN 38407-5	µg/l	HS, GC-MS	N
04.85	Carbon tetrachloride	BG.005		DIN 38407-5	µg/l	HS, GC-MS	N
04.90	Trichlorethylene	BG.005		DIN 38407-5	µg/l	HS, GC-MS	N
04.95	Tetrachlorethylene	BG.005		DIN 38407-5	µg/kg	HS, GC-MS	N
04.55	PAHs (Borneff)	BG.015	2,5	Individual	µg/kg	Soxhlet toluene, GC-MS	N
04.60	Lindane	BG.015	1,0	DIN 38414-20	µg/kg	Soxhlet toluene, GC-MS	N
04.65	pp-DDT	BG.015	1,0	DIN 38414-20	µg/kg	Soxhlet toluene, GC-MS	N
04.70	PCBs (7 congeners)	BG.015	1,0	DIN 38414-20	µg/kg	Soxhlet toluene, GC-MS	N
05.05	Total beta	BG.005		ISO 9697	beq/l	Low level gas supply alpha/beta counter	N
05.10	Caesium 137	BG.015		-	beq/kg	High resolution gamma spectrometry	N
06.40	Saprobic/ biotic index	BG.005		ISO 38410/2			
06.45	Chlorophyl A	BG.005		ISO 10260	µg/l		
07.05	Total coliforms (37^{0}C)	BG.005		ISO 9308-1 (1990)	CFU/100ml		
07.15	Faecal spectrococci	BG.005		ISO 7899-2 (1984)	CFU/100ml		

Table 4.4.1-1 Coordinates of the hydrometric cross sections

HMS Novo selo		HMS Lom		HMS Oriahovo		HMS Svistov		HMS Russe		HMS Silistra	
km.833.9		*km.746.0*		*km.678.5*		*km.553.4*		*km.492.05*		*km.379.3*	
D [(1)]	Z [(2)]	D	Z	D	Z	D	Z	D	Z	D	Z
m	m	m	m	m	m	m	m	m	M	m	m
1	2	3	4	5	6	7	8	9	10	11	12
864	35.6	822	32.1	4	30.3	1	23.4	5	21.0	-25	14.7
861	34.4	809	28.8	5	24.3	1	20.6	5	17.9	-3	13.4
851	32.1	807	28.4	11	24.3	4	18.7	6	17.9	-2	13.4
805	28.4	768	25.0	12	23.5	8	16.3	9	15.1	7	12.3
793	28.2	761	24.8	13	23.2	9	16.0	18	12.3	25	7.2
782	27.6	743	22.2	15	22.0	20	13.1	31	6.3	30	6.8
778	27.0	739	22.0	25	17.4	30	11.5	38	2.9	37	5.7
760	25.0	734	20.8	28	17.4	34	11.6	49	2.4	42	4.3
756	23.6	723	20.8	33	15.8	45	11.2	56	2.1	57	3.2
751	21.9	715	20.8	36	14.3	60	10.7	67	1.7	67	3.0
741	21.8	699	20.7	44	14.2	69	11.1	84	2.0	85	2.6
731	21.5	691	20.7	58	14.2	103	10.0	103	2.3	98	3.2
721	21.6	686	20.2	75	14.8	114	10.1	117	2.2	112	2.9
717	21.5	671	19.5	91	14.4	125	11.0	130	2.4	127	2.8
703	21.4	648	18.4	99	14.3	151	10.4	136	2.8	146	2.3
691	21.2	631	17.9	115	14.4	156	10.1	179	3.3	178	2.4
673	21.5	625	17.9	130	14.3	166	10.1	198	3.9	191	2.4
652	21.9	613	17.9	165	14.7	181	10.2	226	4.3	209	2.2
640	22.5	602	17.5	174	15.0	202	10.8	231	4.2	236	1.5
617	21.9	584	17.3	179	15.2	208	10.7	240	4.6	256	0.8
605	22.2	572	17.5	197	15.3	221	10.6	276	5.1	279	0.9
598	22.3	566	17.5	214	15.6	233	10.5	292	5.2	288	1.2
562	21.9	557	17.4	219	15.7	259	10.6	315	6.0	293	1.2
549	22.2	547	17.5	227	15.7	263	10.4	328	6.1	310	0.6
525	21.7	537	17.9	248	16.2	276	10.8	387	6.1	330	0.5
511	22.0	520	18.0	264	16.3	279	10.9	405	6.5	340	0.2
483	21.5	508	18.0	270	16.3	287	10.5	416	7.0	348	0.3
459	21.5	494	18.1	281	16.4	297	9.9	439	7.2	371	0.1
448	22.2	486	18.0	300	16.0	313	9.7	454	7.3	376	0.3
446	22.3	480	18.0	313	16.3	324	10.5	472	7.9	405	0.2
423	22.3	464	17.9	321	16.1	333	10.2	499	7.9	409	0.2
410	22.2	449	17.9	346	16.4	345	9.9	519	8.1	428	-0.3
402	22.4	436	17.8	350	16.5	367	10.1	533	8.9	451	0.0
383	22.6	432	18.0	363	16.4	374	11.3	540	8.8	466	-0.6
368	22.5	405	17.7	397	15.9	397	11.1	565	8.9	468	-0.7
359	22.1	387	18.0	408	15.8	416	11.0	577	9.1	487	-0.9
347	22.1	377	17.7	433	15.8	430	11.2	603	9.5	511	-0.9
339	22.0	345	17.4	455	15.7	451	11.2	623	9.7	529	-1.1
331	22.1	342	17.7	462	15.4	474	11.4	657	9.9	537	-1.0
323	22.0	336	17.7	473	15.3	497	11.4	669	10.1	549	-0.9

Table 4.4.1-1 Coordinates of the hydrometric cross sections
(Cont'd)

HMS Novo selo		HMS Lom		HMS Oriahovo		HMS Svistov		HMS Russe		HMS Silistra	
km.833.9		*km.746.0*		*km.678.5*		*km.553.4*		*km.492.05*		*km.379.3*	
D (1)	Z (2)	D	Z	D	Z	D	Z	D	Z	D	Z
m	m	m	m	m	m	m	m	m	m	m	m
1	2	3	4	5	6	7	8	9	10	11	12
311	21.8	314	17.6	492	15.3	512	10.9	698	10.2	564	-0.8
297	21.5	293	17.0	498	15.4	523	11.0	704	10.1	567	-0.9
287	21.5	270	17.1	506	15.3	542	11.3	715	10.3	581	-1.1
281	21.4	264	17.1	523	15.2	559	10.0	725	10.2	606	-0.9
262	21.1	246	17.0	535	15.1	569	9.9	751	10.5	620	-0.9
242	20.9	239	17.1	558	15.4	578	9.7	780	12.3	634	-0.4
234	20.8	217	17.2	560	15.2	605	9.5	797	15.1	646	-0.6
221	21.0	202	17.4	566	15.3	612	9.5	817	17.9	651	-0.7
203	21.1	184	17.3	577	15.4	649	8.4	912	21.0	663	-0.6
190	21.1	179	17.3	594	15.6	662	8.3	-	-	679	-0.7
185	21.0	171	17.3	601	15.8	679	8.1	-	-	689	-0.6
168	20.9	153	16.9	609	15.9	684	8.3	-	-	697	-0.5
155	21.0	133	16.9	620	15.9	696	8.6	-	-	715	-0.4
139	21.5	127	16.7	626	16.2	710	8.7	-	-	733	-0.6
122	22.4	108	16.9	655	17.1	726	7.6	-	-	734	-0.1
112	23.3	101	17.0	663	17.3	731	7.6	-	-	742	6.9
108	23.7	98	17.0	667	17.3	735	7.5	-	-	749	6.9
106	24.2	83	17.2	675	17.8	760	6.5	-	-	751	6.8
93	25.6	79	18.2	682	17.9	766	6.5	-	-	756	7.2
88	25.8	76	18.2	699	18.3	787	6.6	-	-	776	14.7
65	27.9	69	18.3	706	18.5	801	6.6	-	-	-	-
60	28.4	51	25.1	713	18.4	824	7.1	-	-	-	-
56	29.0	47	28.4	720	18.4	827	7.6	-	-	-	-
21	32.1	0	30.1	733	18.3	835	9.5	-	-	-	-
0	35.6	-	-	733	18.6	856	14.8	-	-	-	-
-	-	-	-	736	19.5	857	16.1	-	-	-	-
-	-	-	-	738	20.4	860	16.3	-	-	-	-
-	-	-	-	757	22.0	865	16.3	-	-	-	-
-	-	-	-	758	23.2	896	18.7	-	-	-	-
-	-	-	-	778	24.3	900	20.6	-	-	-	-
-	-	-	-	800	30.3	903	23.4	-	-	-	-

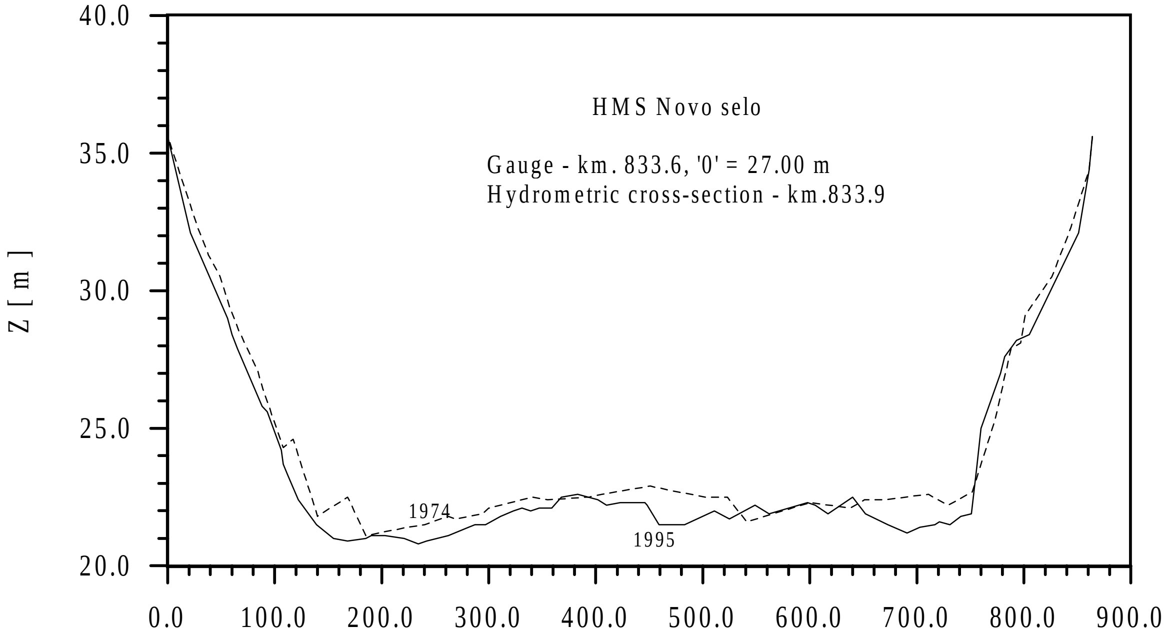
(1) Distance from the left bank initial point in [m];
(2) River bed elevation (Black See -Varna height system) in [m].

Table 4.4.1-2 - Basic characteristics of the hydrological stations used

No	Station number	River, location	River bank	Coordinates	Elevation of the staff gauge zero [m]	Basin area [km^2]	Basin mean elevation [m]	Observati-on period	Annual mean discharge (1975-96) [m^3/s]
1	16670	Ogosta, G.Genovo	R	43°24'/23°06'	200.75	350.0	-	13/98	4.156
2	16800	Ogosta, Kobilyak	L	43°31'/23°27'	74.71	2250.0	496	39/98	15.843
3	16850	Ogosta, Mizia	R/L	43°31'/23°50'	26.32	3112.0	395	62/98	19.860
4	17650	Skat, Nivyanin	L	43°30'/23°48'	163.62	252.0	295	46/98	.614
5	17850	Skat, Mizia	R	43°41'/23°51'	29.84	1035.0	201	74/98	1.870
6	18700	Iskar, NovyIskar	L	42°50'/23°22'	502.63	3662.0	945	63/98	21.044
7	18800	Iskar, Kunino	L	43°11'/24°00'	124.50	6697.0	831	52/98	51.340
8	18850	Iskar, Oryahovitza	R	43°35'/24°22'	31.20	8366.0	706	64/98	46.195
9	21750	Vit, Sadovetz	L	43°18'/24°22'	107.17	1750.0	595	64/98	8.320
10	21800	Vit, Tarnyane	R	43°24'/24°31'	52.16	2236.0	489	64/98	10.606
11	22700	Osam, Troyan	R	42°55'/24°42'	353.10	458.1	1034	63/98	6.243
12	22750	Osam, Lovech	R	43°09'/24°43'	169.45	908.5	723	76/98	9.225
13	22800	Osam, Izgrev	R	43°28'/25°03'	40.32	2154.0	-	29/98	10.763
14	23150	Golyamareka, Strajitza	L	43°13'/25°58'	78.15	605.0	312	26/98	1.778
15	23500	Rositza, Sevlievo	R	43°02'/25°06'	196.24	958.0	604	71/98	6.944
16	23650	Yantra, Gabrovo	L/R	42°54'/25°20'	370.39	282.1	781	50/98	3.965
17	23700	Yantra, Cholakovtzy	L	43°06'/25°04'	134.96	1289.0	545	67/98	11.579
18	23850	Yantra, Karantzy	L	43°23'/25°40'	30.90	6860.0	440	67/98	37.596
19	31550	Cherni Lom, Shirokovo	R	43°33'/25°57'	91.80	1383.0	287	51/98	3.065
20	31700	Bely Lom, Razgrad	R	43°32'/26°32'	195.67	378.0	327	76/98	.404
21	31830	Rusensky Lom, Bojichen	L	43°47'/25,57'	33.48	2800.0	273	22/98	4.903

Source: National Institute of Meteorology & Hydrology

Figure 4.4.2-1 Stream cross section profiles for a discharge measurement. Hydrometric stations (HMS) Novo selo and Lom



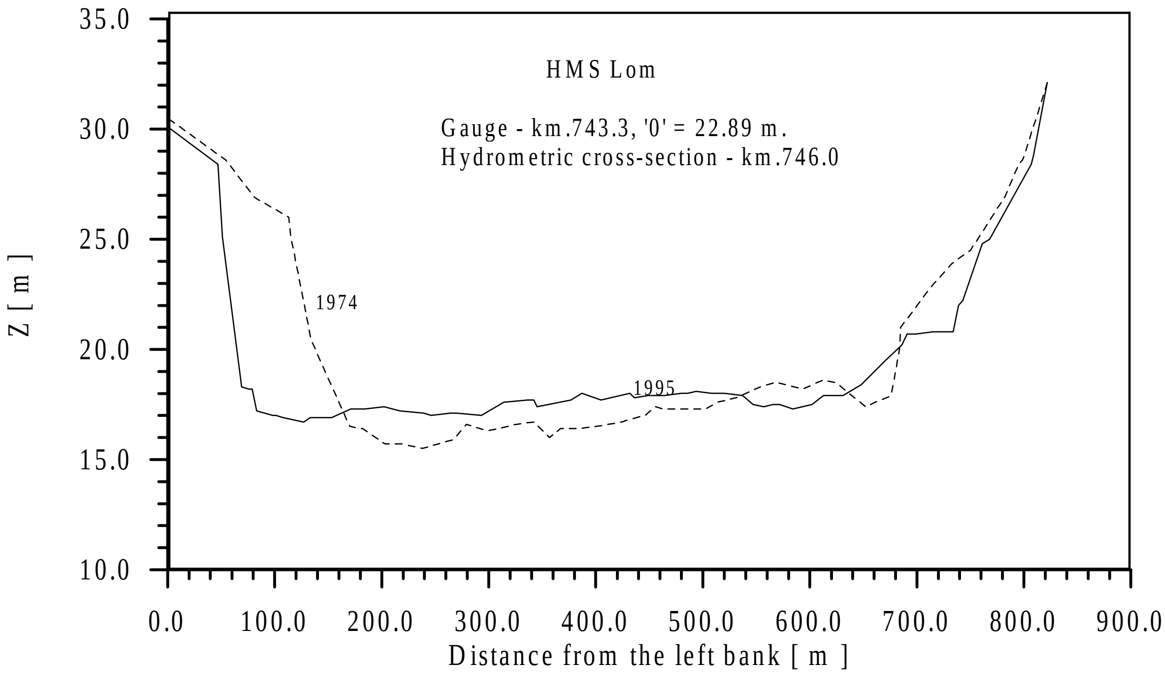


Fig. 4.4.2-1.1 Stream cross section profiles for a discharge measurement. Hydrometric station (HMS) Oriahovo and Russe.

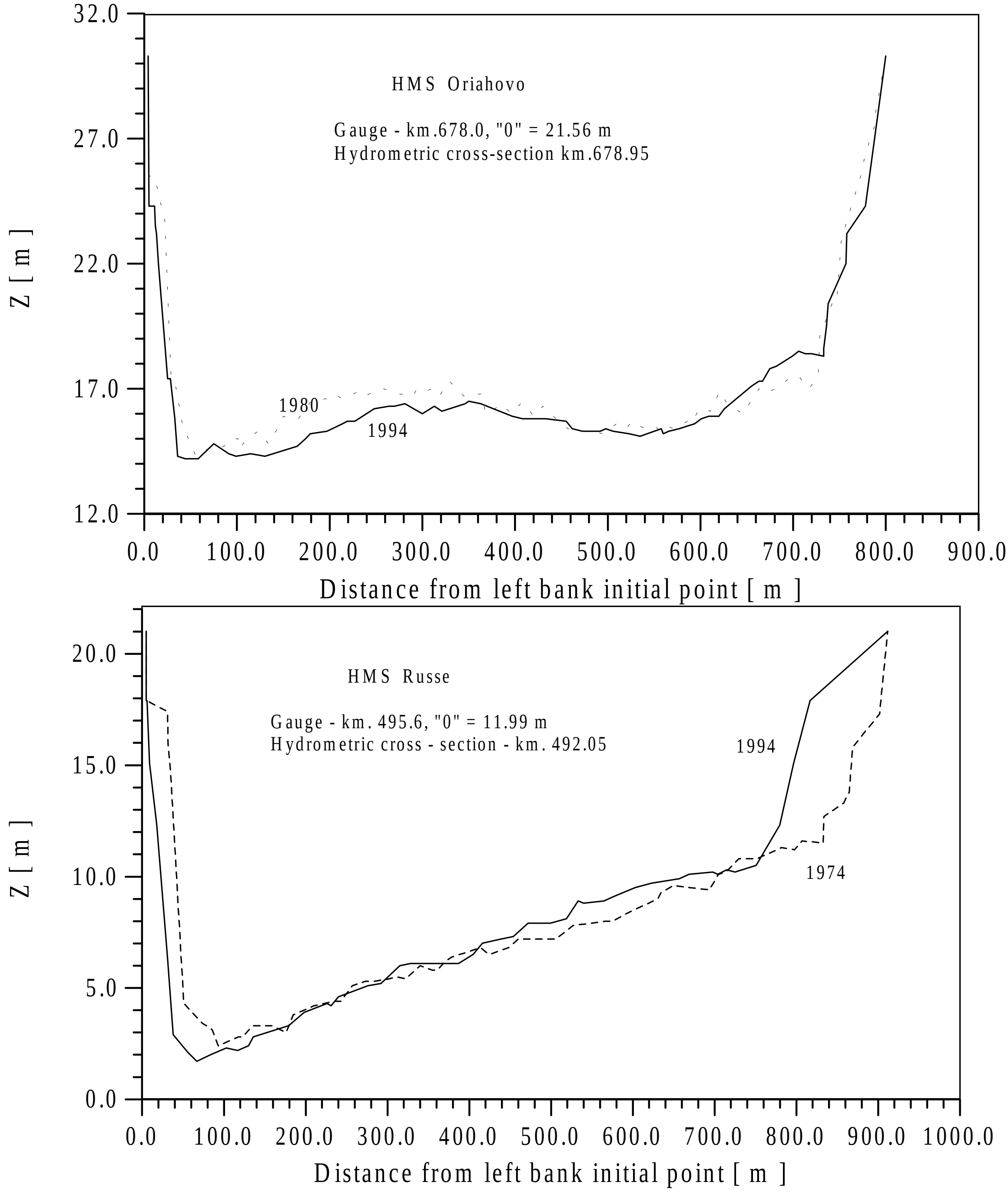
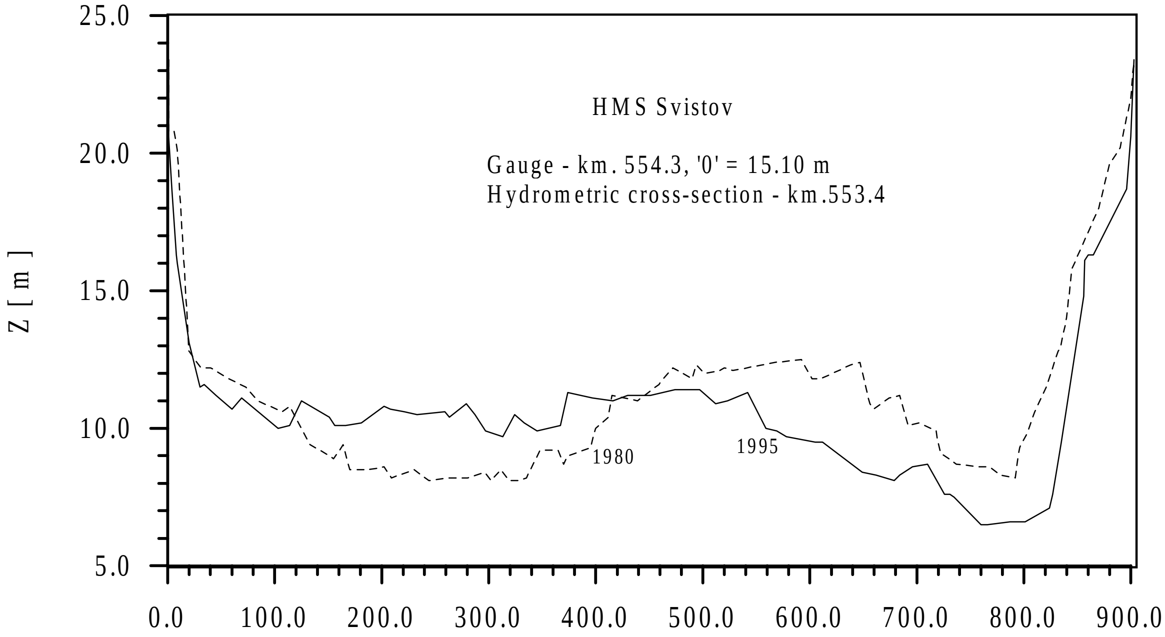


Figure 4.4.2-2 Stream cross section profiles for a discharge measurement. Hydrometric stations (HMS) Svistov and Silistra.



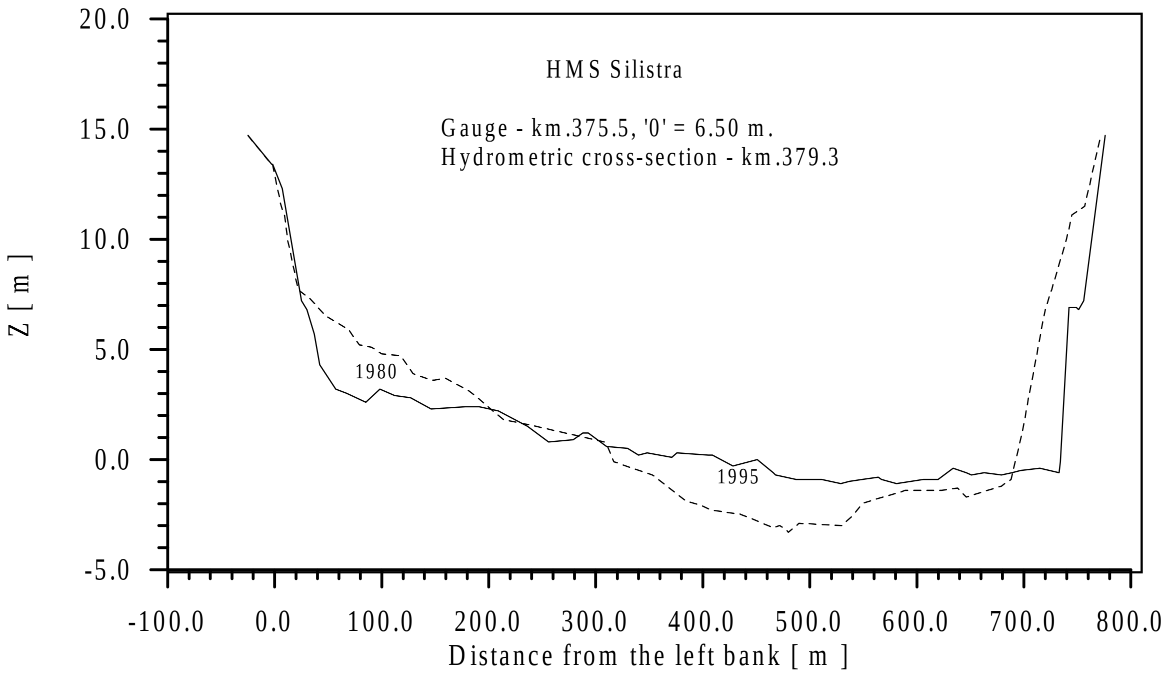
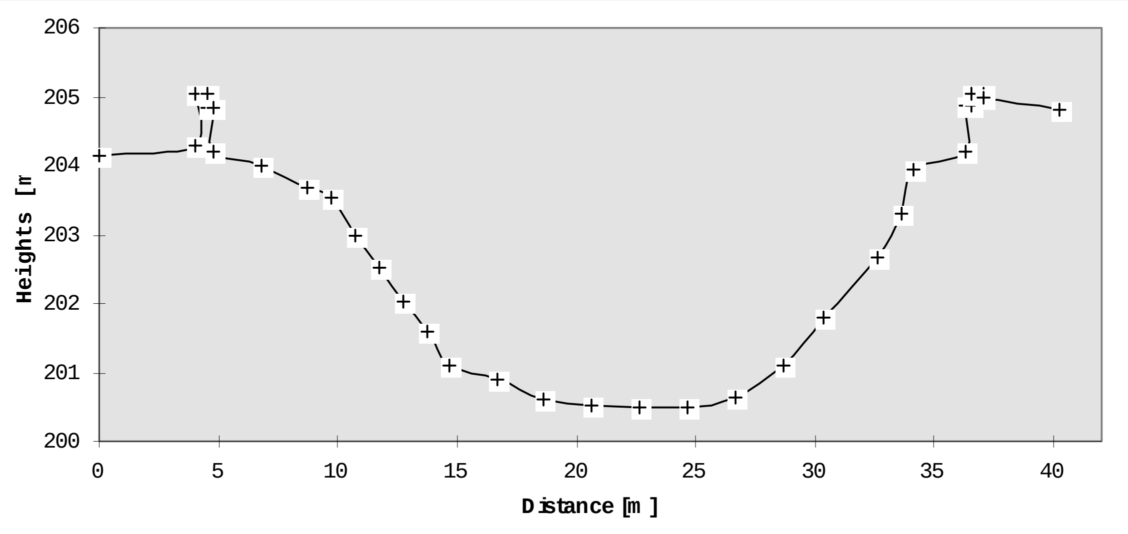
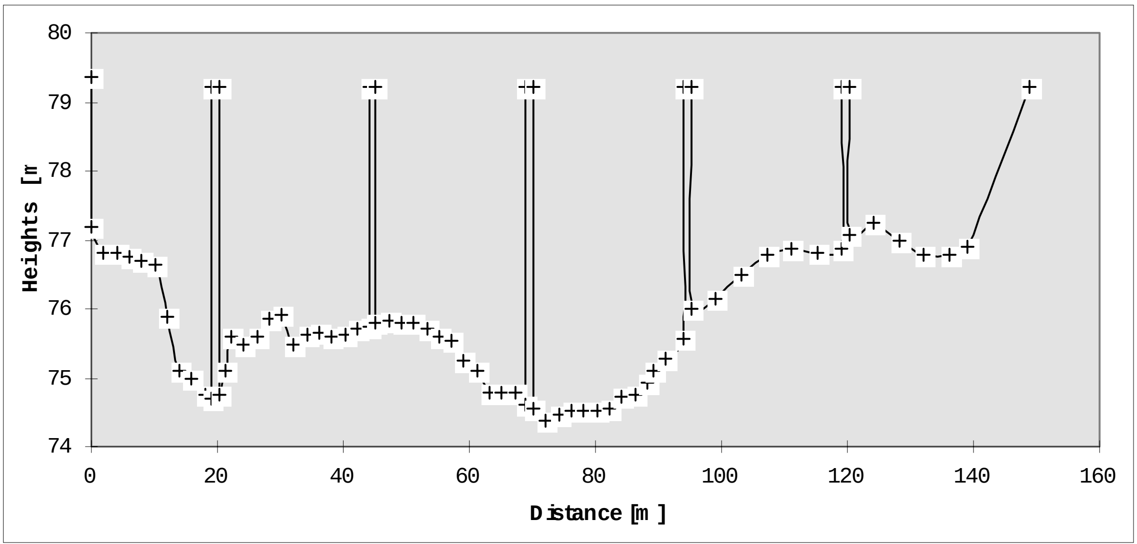


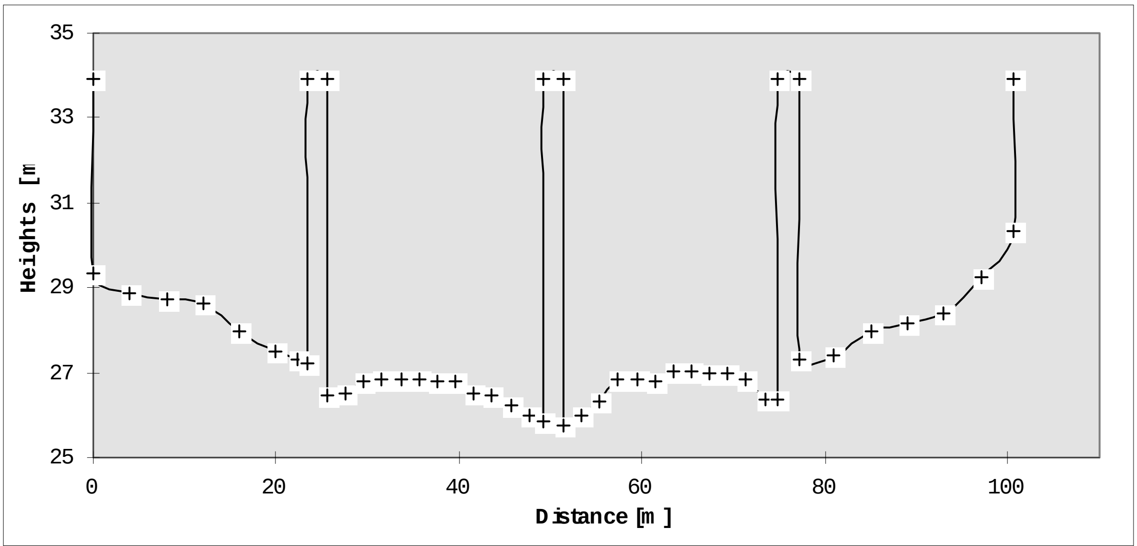
Figure 4.4.2-3 River cross sections of stations 16670, 16800, 16850 Ogosta River.



River cross section of station 16670, Ogosta River, village G. Genovo

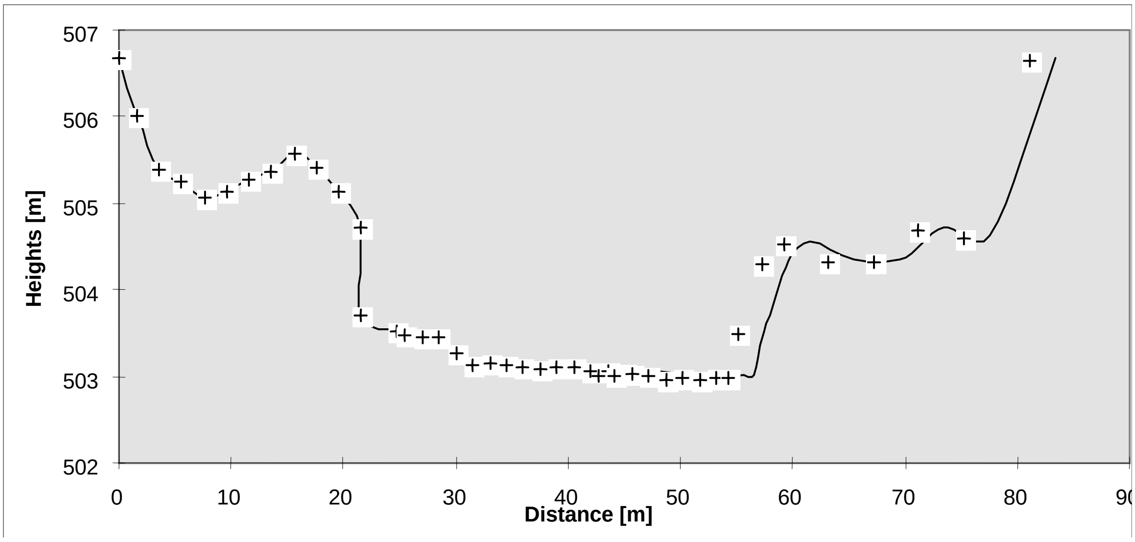


River cross section of station 16800, Ogosta River, village Kobilyak

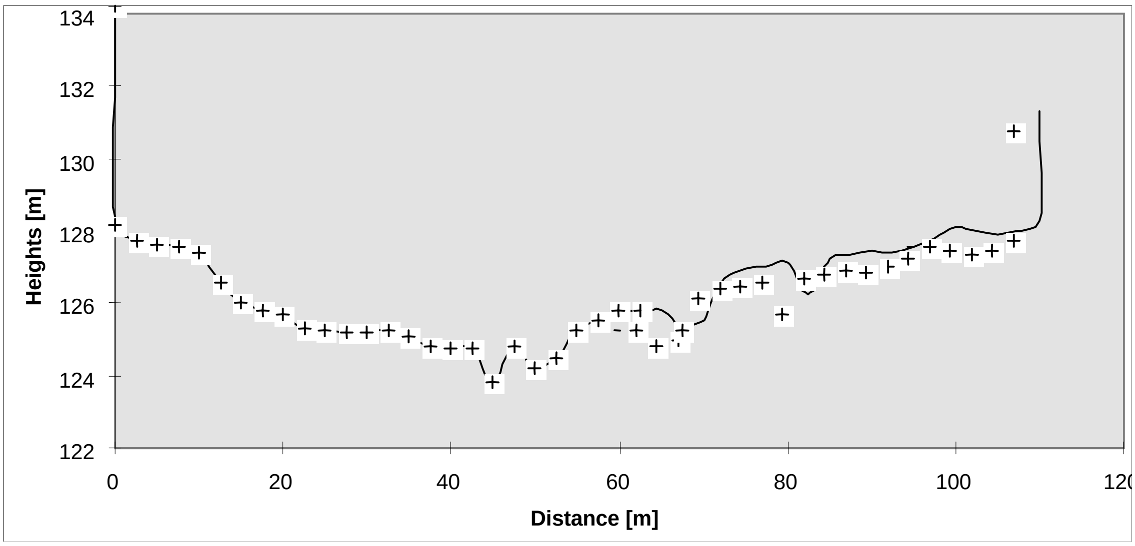


River cross section of station 16850, Ogosta River, town Miziya

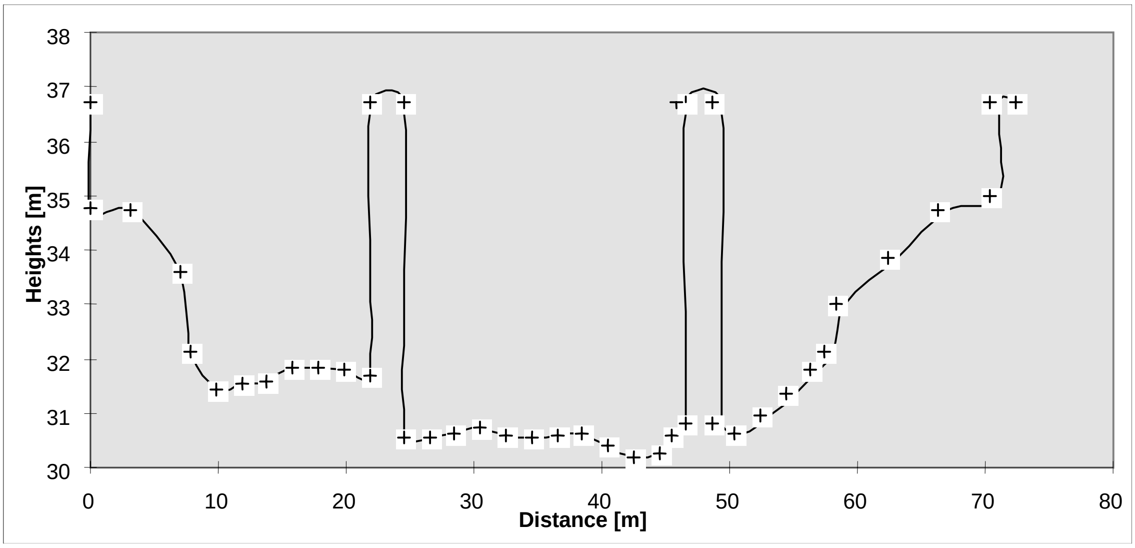
Figure 4.4.2-4 River cross sections of stations 18700, 18800, 18850 Iskar River



River cross section of station 18700, Iskar River, town Novi Iskar

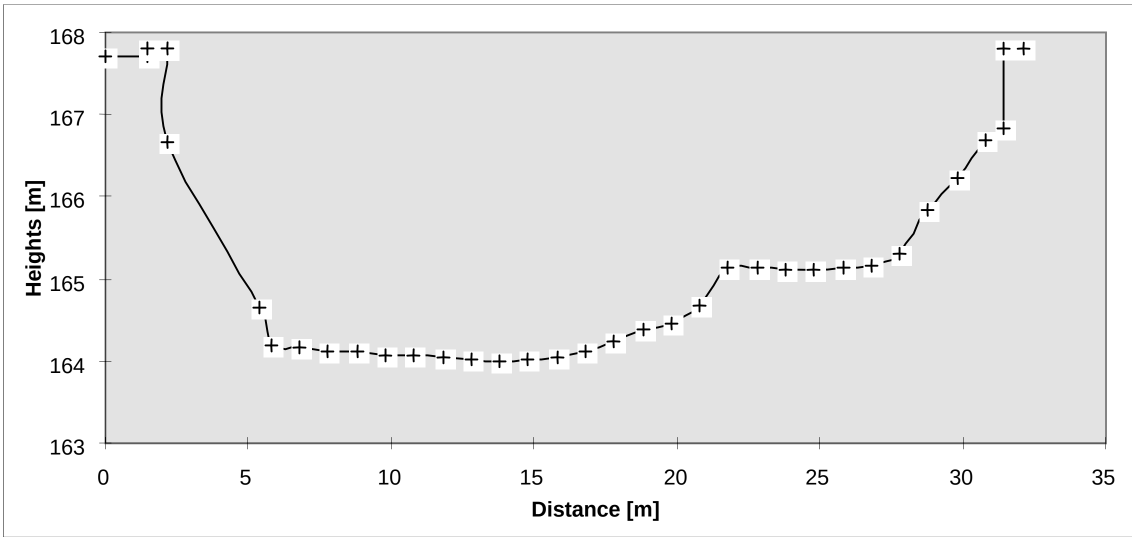


River cross section of station 18800, Iskar River, village Kunino

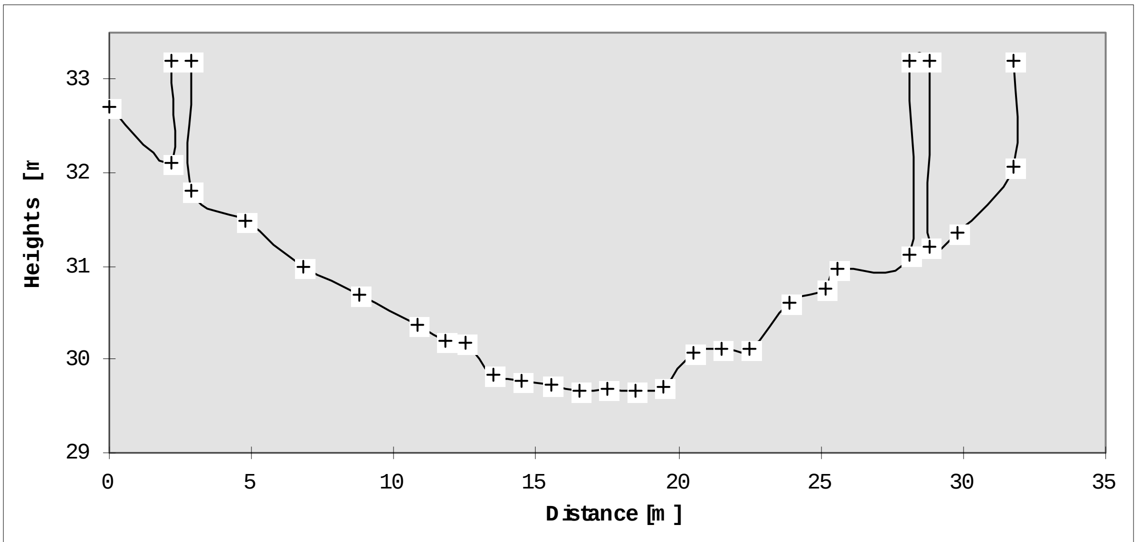


River cross section of station 18850, Iskar River, village Oryahovitza

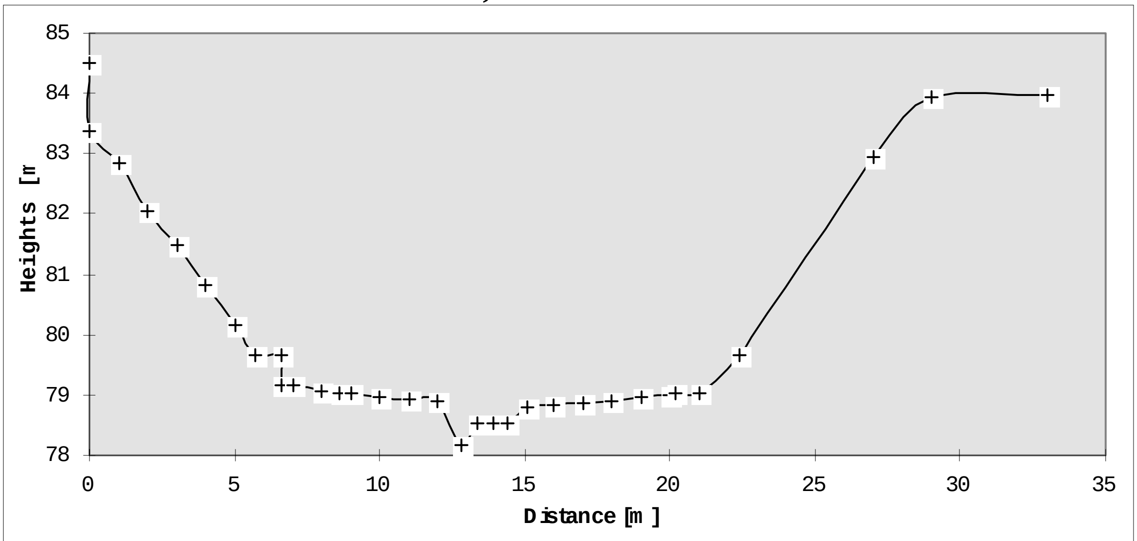
Figure 4.4.2-5 River cross sections of stations 17650, 17850 Skat River, 23150 Golyama River



River cross section of station 17650, Skat River at village Nivyanin

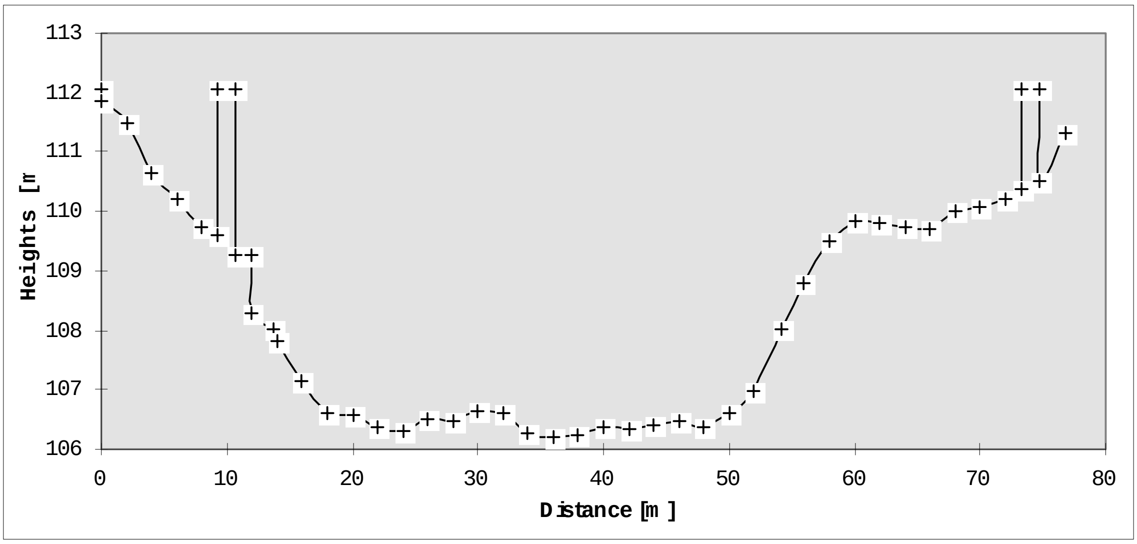


River cross section of station 17850, Skat River at town Mizia

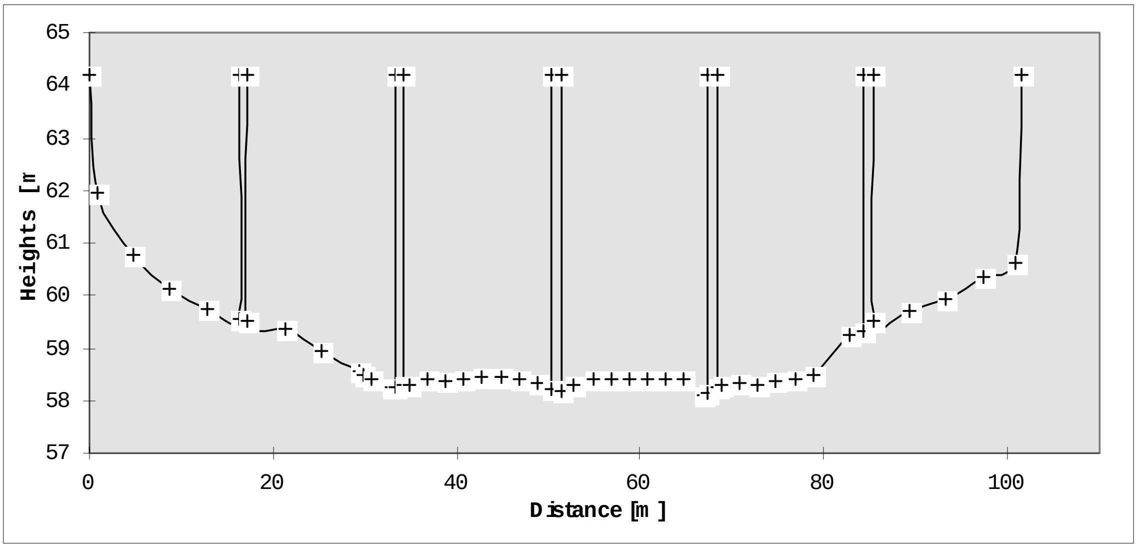


River cross section of station 23150, Golyama Reka River at town Strajitza

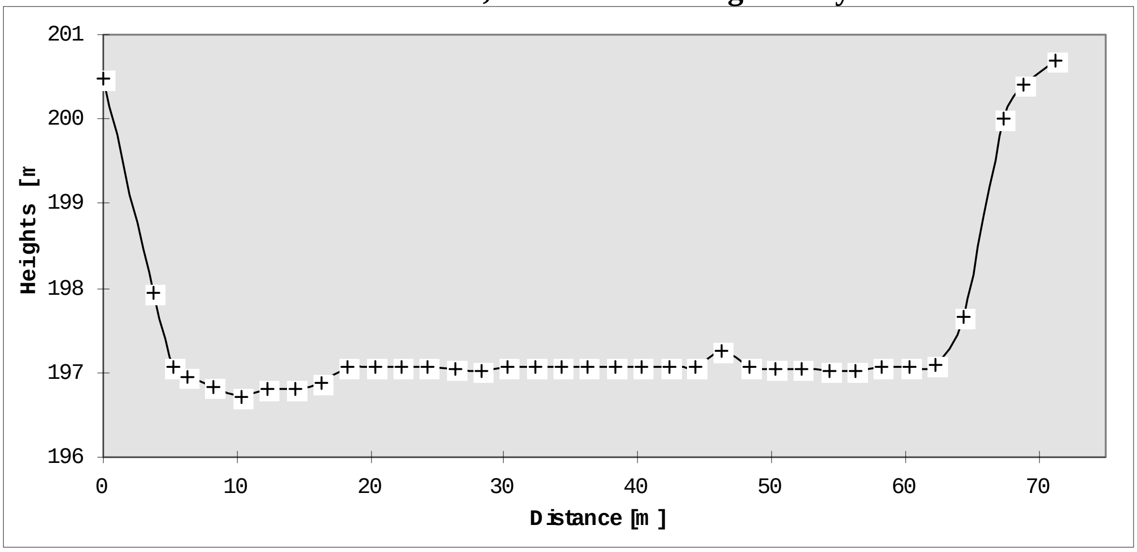
Figure 4.4.2-6 River cross sections of stations 21750, 21800 Vit River, 23500 Golyama River



River cross section of station 21750, Vit River at village Sadovetz

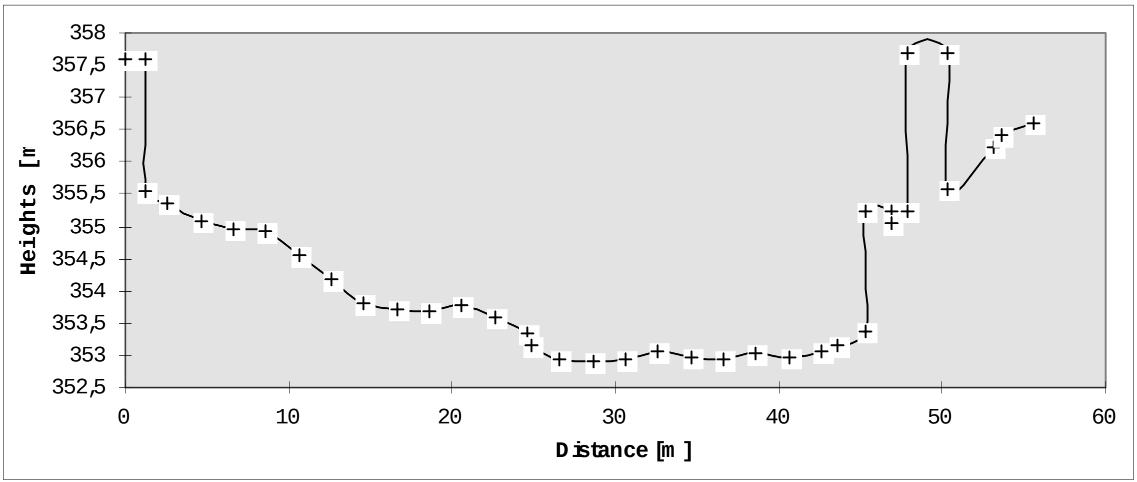


River cross section of station 21800, Vit River at village Tarnyane

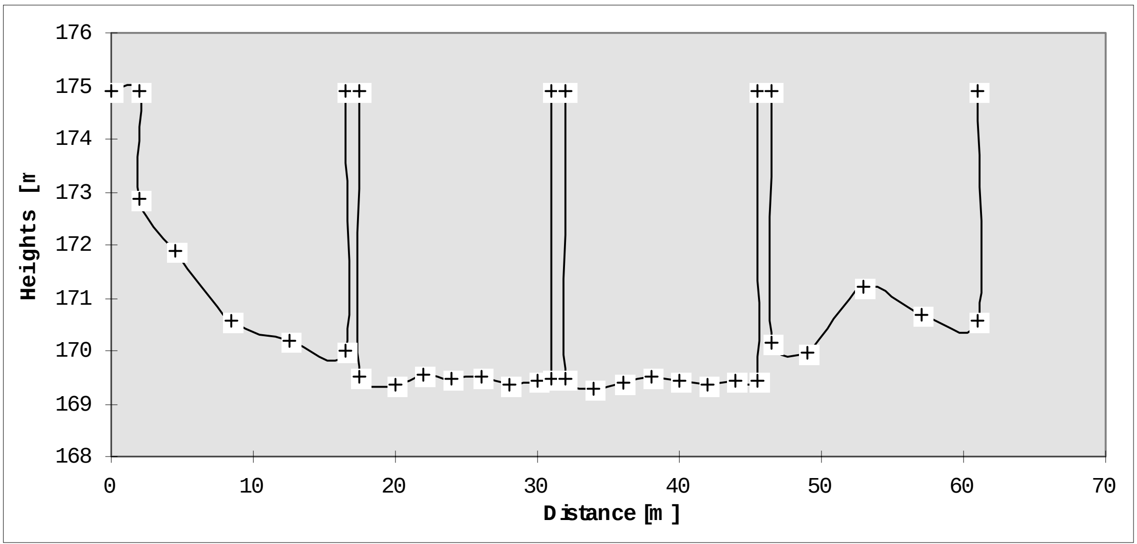


River cross section of station 23500, Rositza River at town Sevlievo

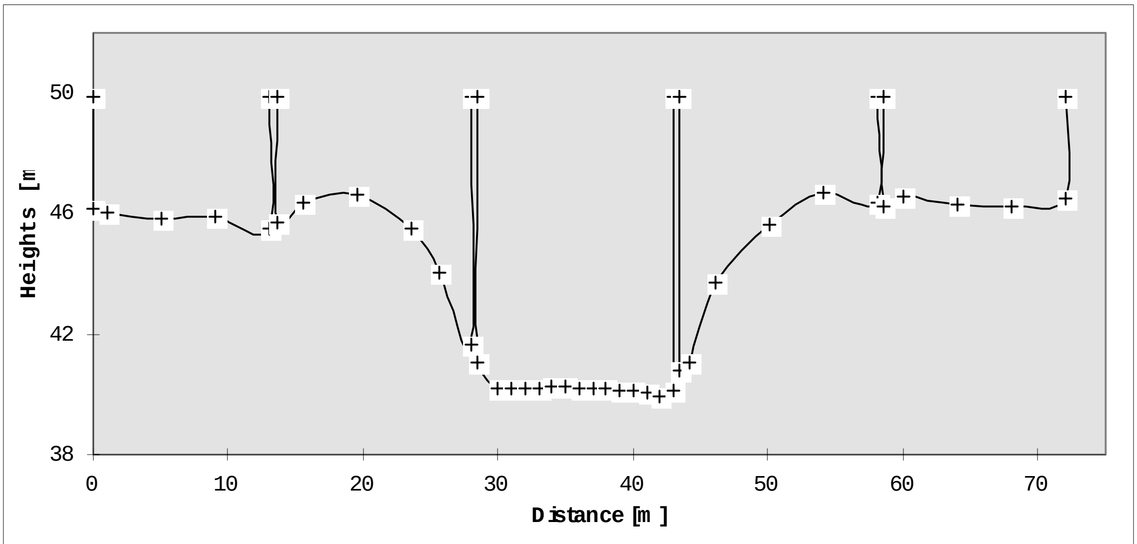
Figure 4.4.2-7 River cross sections of stations 22700, 22750, 22800 Ossam River



River cross section of station 22700, Osam River, town Troyan

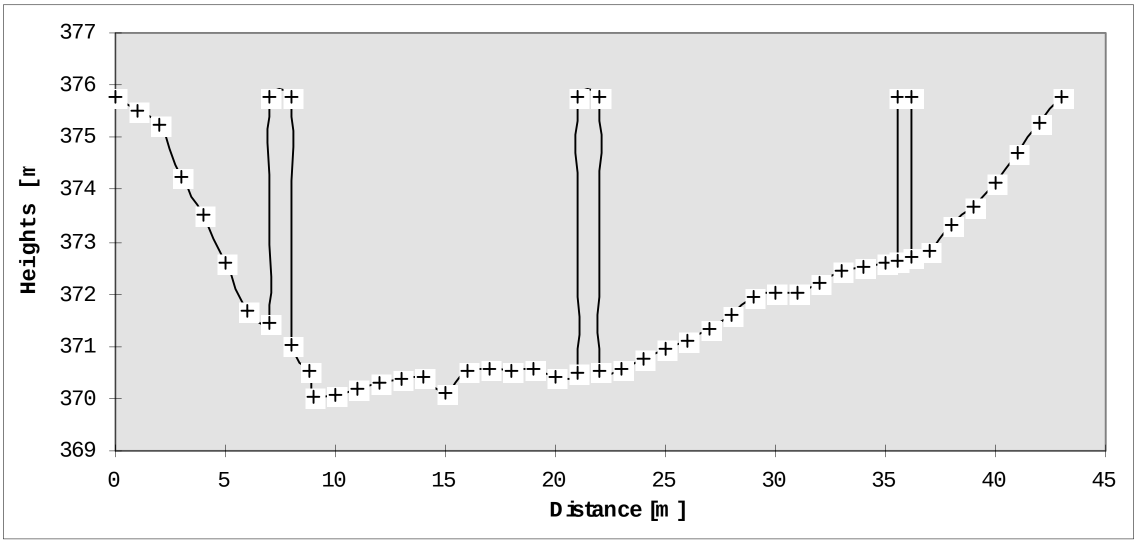


River cross section of station 22750, Osam River, town Lovech

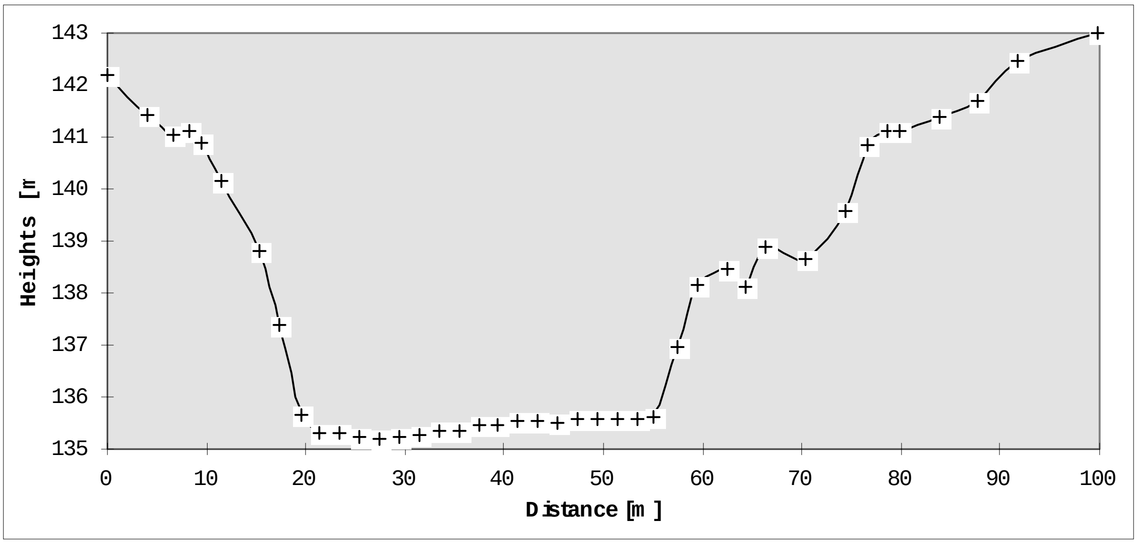


River cross section of station 22800, Osam River, village Izgrev

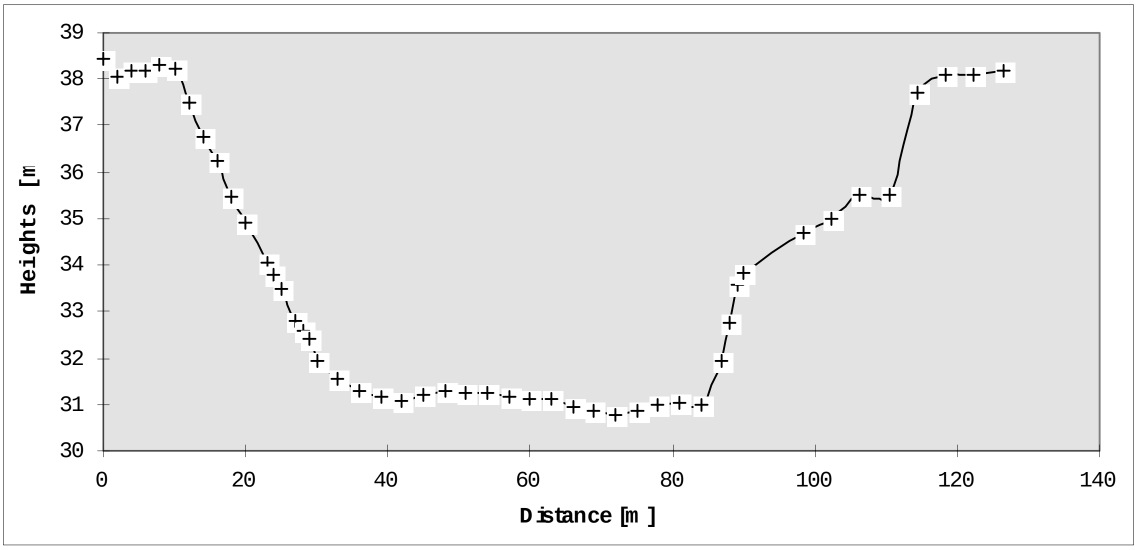
Figure 4.4.2-8 River cross sections of stations 23650, 23700, 23850 Yantra River



River cross section of station 23650, Yantra River, town Gabrovo

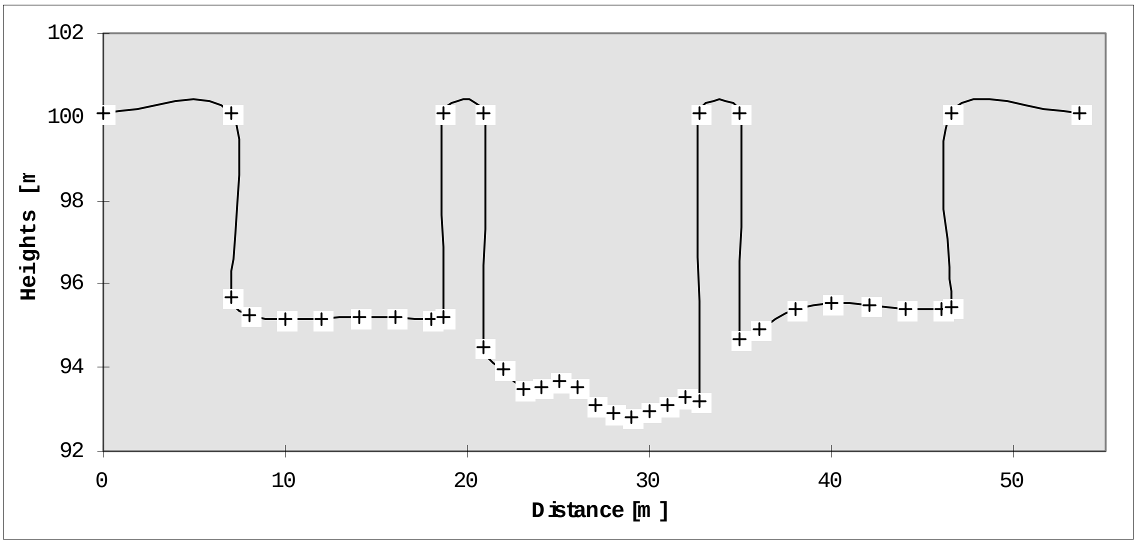


River cross section of station 23700, Yantra River, town Tarnovo

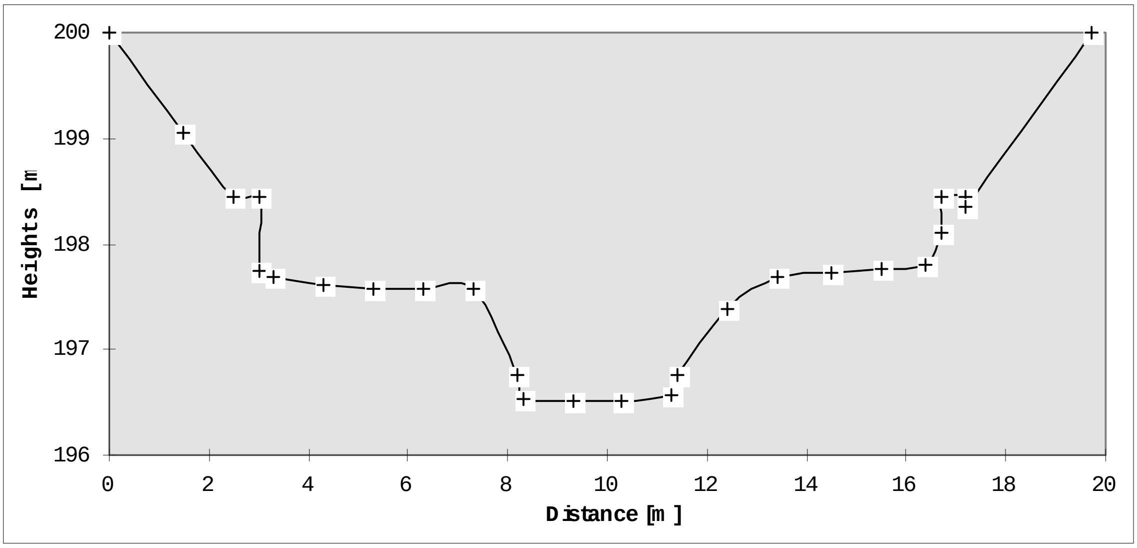


River cross section of station 23850, Yantra River, village Karantzi

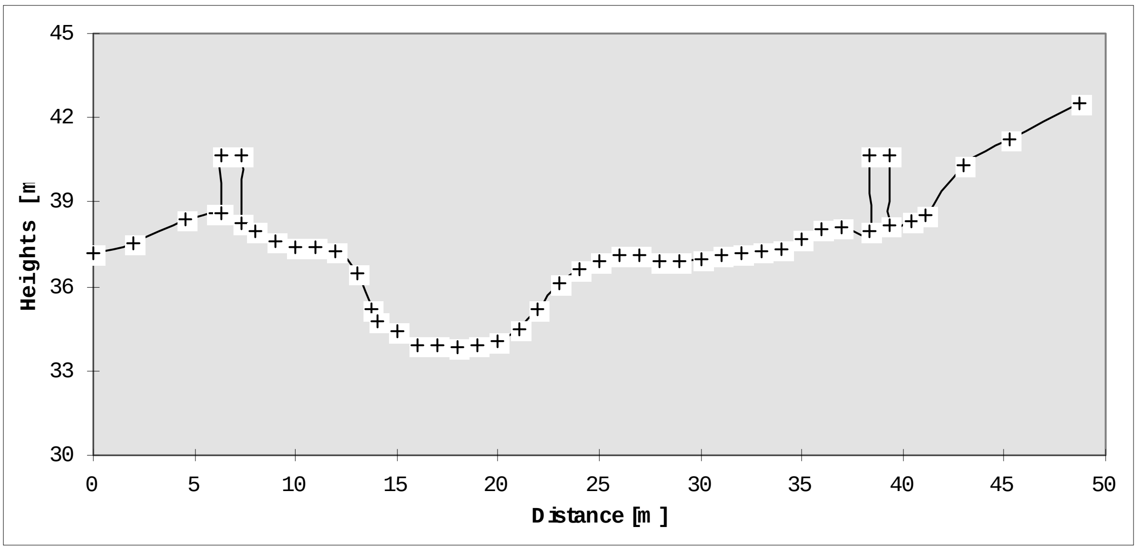
Figure 4.4.2-9 River cross sections of stations 31550, 31700, 31830 Russenski Lom & Tributaries



River cross section of station 31550, Cherni Lom River at village Shirokovo



River cross section of station 31700, Rusenski Lom River at town Razgrad



River cross section of station 31830, Rusenski Lom River at town Bojichen

Table 4.5-1 Characteristics of the reservoirs situated in the Bulgarian Danube catchment area

No	Name of the reservoir	River	Storage in $m^3.10^6$			Surface area	Catchment area	Average multi annual inflow	P	WS	I	F	Transferred water
-	-	-	Useful	Dead	Total	$m^2.10^3$	km^2	$m^3.10^6$	-	-	-	-	-
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Kula	Topolovetz	19.50	0.75	20.25	2766	57.0	10.67		+	+	+	No
2	Poletcovtzi	Voinishka	16.20	1.30	17.50	1630	69.6	13.05			+	+	No
3	Rabisha	Archar	42.60	2.40	45.00	3246	-	-			+	+	Yes
4	Drenovetz	Medovitza	11.48	0.52	12.00	1070	60.0	6.26			+	+	No
5	Chr. Smirnensky	Nechinska	8.90	0.60	9.35	935	95.0	15.40			+	+	No
6	Kovatchitza	Tzibritza	7.74	0.12	7.86	1120	38.4	2.78*			+	+	No
7	Srechenska Bara	Srechenska	14.50	1.00	15.50	870				+			Yes
8	Ogosta	Ogosta	438.0	67.0	505.0		972.0	308.80	+		+	+	No
9	Enitza	-	37.40	0.20	37.60	4100	27.0	2.83*			+		No
10	Dabnitza	Dabnitza	9.10	0.24	9.30	1392				+	+		Yes
11	Beli Iskar	Beli Iskar	14.70	0.40	15.10	845	28.7	28.20		+		+	No
12	Iskar	Iskar	573.0	90.0	663.0	30000	1040.0	357.90	+	+	+	+	No
13	Pancharevo	Pancharevo	6.40	0.30	6.70	880	191.7	45.50		+	+	+	No
14	Ognianovo	Lesnovska	32.00	4.00	36.00	8000	128.1	18.40		+	+	+	No
15	Asparuhov Val	from Danube river	14.00	1.00	15.00	2060					+	+	Yes
16	Gorni Dabnik	from Vit river	129.20	0.80	130.0	11800				+	+	+	Yes
17	Telish	from Vit river	15.80	0.20	16.00	1400			+		+	+	Yes
18	Sopot	Kalnik	60.00	1.30	61.30	5350	77.5	20.20		+	+	+	No
19	Malchitza	from Ossam r.	10.02	1.11	11.13	2060	-	-			+	+	Yes
20	Kamenetz	from Ossam r.	10.68	0.08	10.76	1946	-	-			+	+	Yes
21	Aleksandrovo	from Ossam r.	7.90	0.40	8.30	1300	-	-			+	+	Yes
22	Kazal Dere	from Ossam r.	8.40	0.10	8.50	412	-	-			+	+	Yes
23	Stamboliisky	Rositza	200.0	22.0	222.0	10860	1478.0	354.00	+	+	+	+	No
24	Kara Isen	from Rositza	949.0	0.81	10.30	1800	1600.0	1.77		+	+	+	Yes
25	Krapetz	Rositza	16.30	1.30	17.80	1780	64.8	15.30			+	+	Yes
26	Chr. Smirnensky	Yantra	14.50	4.20	18.70	1054	51.0	34.60	+	+			No
27	Yastrebino	Golyama r.	58.90	3.90	62.80	4950	225.0	60.50		+	+	+	No
28	Saedinenie	Aka Dere	11.32	1.50	12.82	2518	186.0	19.50			+	+	No
29	Beli Lom	Beli Lom	22.30	3.20	25.50	3500	122.0	13.50		+	+	+	No
30	Lovkovtzy	Vesselina	83.20	9.00	92.90	5700	214.8	66.72		+			No

P - power; W S - water supply; I - irrigation; F - fishery

Table 4.6.1-1: Levees on the right Danube River bank section from km 845.6 to km 374

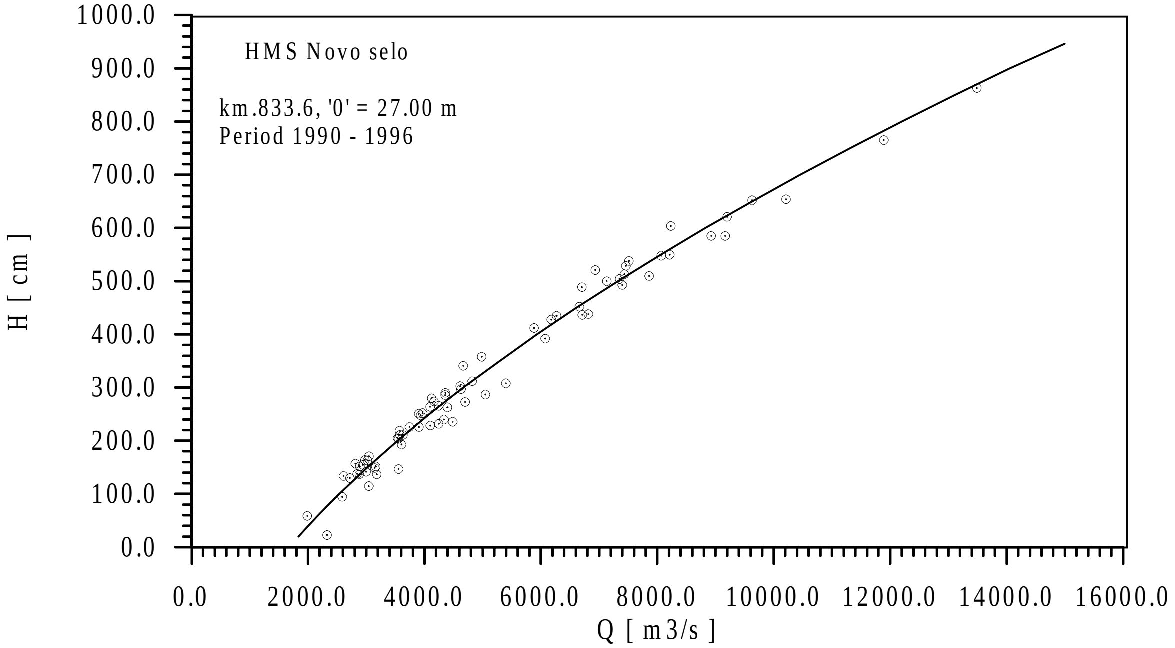
N	Region	Name of the Lowland	Protected Lowland [ha]	Location		Length [km]
				from km	to km	
1	Vidin	Vidinska	6600	779+000	809+000	
		Archar-Orsoiska	1600	760+070	769+200	36.968
2	Montana	Orsoiska	600	752+222	760+070	
		Tchibarska	1800	713+910	723+188	13.860
3	Vratza	Kozloduiska	2800	685+000	698+270	
		Ostrovska	2200	661+304	673+120	20.301
4	Pleven	Baikal	900	636+840	639+840	
		Karaboaz	17500	609+000	636+840	
		Milkovitza	600	607+800	609+000	
		Cherkvitza	800	600+400	602+100	
		Nikopol -Belene	7000	575+000	591+500	
			-	567+000	573+800	92.770
5	Veliko Tarnovo	Belene -Svishtov	9000	556+000	574+200	
		Vardim -Novgrad	2300	536+750	543+850	17.700
6	Russe	Batin - Krivina	6000	527+000	538+500	
		village Metchka	4000	517+000	524+000	
		Sandrovo	4500	433+370	441+570	24.080
7	Tutrakan	Brashlian	9840	441+570	472+820	
		Popina - Garvan	3800	399+500	408+250	
		Aidemirska	3500	381+000	396+470	55.000
	Total		85340			260.679

Table 4.6.2-1: Bank protection structures on the Danube River right bank from km 845.6 to km 375

Location	Settlement	Type	Length
km	-	-	km
840	village Vrav	wharf	0.1
832.3-834.3	town Novo Selo	retaining wall	2.0
824.0-824.4	village Iasen	retaining wall	0.4
816.2-817.7	village Gomotartci	retaining wall	1.5
808.7-810.8	village Koshava	retaining wall	2.1
802.0-804.0	village Kutovo	4 rubble groins	2.0
792.6-792.8	Vidin	wharf	0.2
789.4-791.0	Vidin	ret. wall+wharfs	1.6
785.1-785.3	Vidin	ret.wall+wharfs	0.2
775.2-776.6	village Simeonovo	retaining wall	1.4
773.2-774.0	village Botevo	retaining wall	0.8
770.6-770.7	village Archar	wharf	0.1
742.0-744.1	town ofLom	ret. wall+wharfs	2.1
733.9-734.0	vStanevo	wharf	0.1
732.6-732.7	-	retaining wall	0.1
717.6-717.7	village D.Tcibar	wharf	0.1
707.2-707.3	-	wharf	0.1
703.3-703.4	town ofKozloduy	wharf	0.2
687.0-687.5	NPS.Kozloduy	water intake system	0.5
685.7-686.0	NPS.Kozloduy	wharf	0.3
677.8-684.2	town ofOriahovo	retaining wall	6.4
661.5-661.6	village Ostrov	wharf	0.1
653.4-653.5	village Gorni Vadin	wharf	0.1
640.8-640.9	village Baikal	wharf	0.1
628.1-628.3	village Zagrajden	wharf	0.2
625.0-625.1	village Zagrajden	retaining wall	0.1

601.9-607.8	village Somovit	retaining wall	5.9
596.3-597.5	town of Nikopol	retaining wall	1.2
571.0-571.5	town of Belene	retaining wall	0.5
553.7-556.0	town of Svistov	retaining wall	2.3
516.1-519.0	village Stalpiste	retaining wall	2.9
509.9-510.0	village Pirgovo	wharf	0.1
493.8-498.9	town of Russe	ret. wall+wharf	5.1
491.0-491.3	town of Russe	wharf	0.3
489.0-490.2	town of Russe	ret. wall+wharf	1.2
486.4-486.7	town of Russe	wharf	0.3
483.8-484.9	town of Russe	retaining wall	1.1
482.0-486.5	town of Russe-village Srabcheto	9 rubble groins	4.5
481.8-481.9	village Marten	wharf	0.1
466.8-467.7	village Riahovo	2 rubble groins	0.9
466.8-467.7	village Riahovo	embankment	0.6
459.6-461.0	village Mishka	6 rubble groins	1.4
432.2-433.3	town of Tutrakan	retaining wall	1.1
427.1-427.3	village Pojarevo	retaining wall	0.2
415.0-418.0	village M. Preslavetc	brush revetment	3.0
413.7-413.9	village M. Preslavetc	retaining wall	0.2
397.0-405.0	village Popina	brush revetment	8.0
402.9-403.0	village Popina	wharf	0.1
396.8-397.0	village Vetren	embankment	0.2
388.1-389.4	village Vetren	retaining wall	1.3
382.0-388.0	village Vetren	brush revetment	6.0
379.8-381.9	Silistra	retaining wall	2.1
378.3-378.9	Silistra	retaining wall	0.6
374.6-377.6	Silistra	retaining wall	3.0

Figure 4.9.1-1 Averaged discharge rating curves at hydrometric stations Novo Selo and Lom



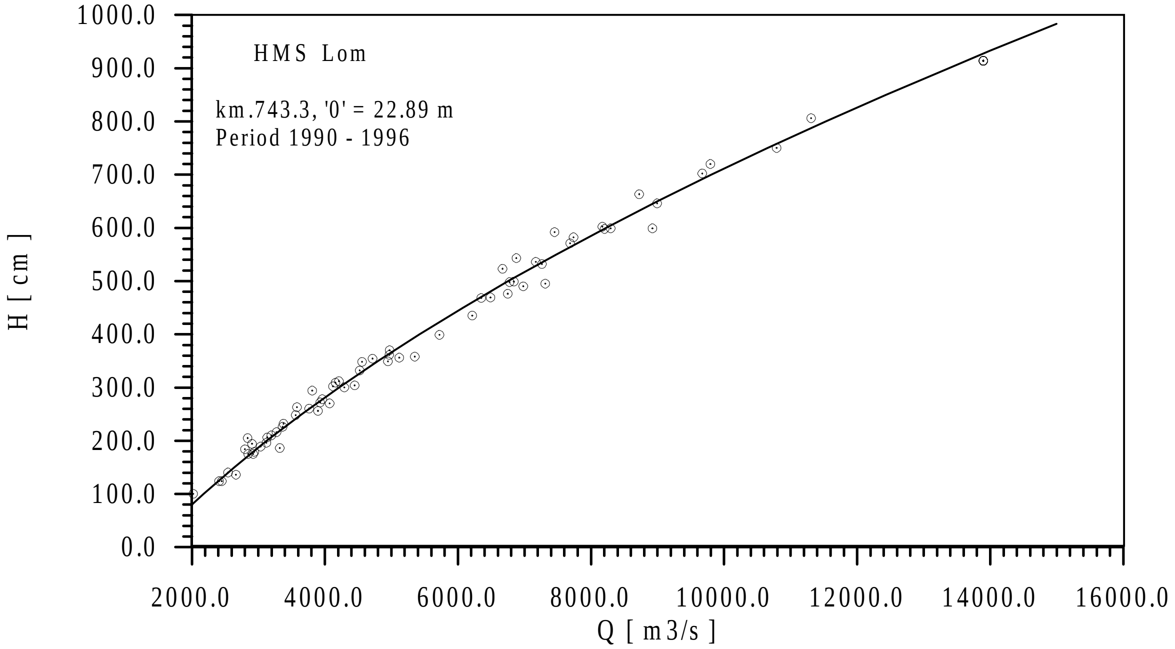
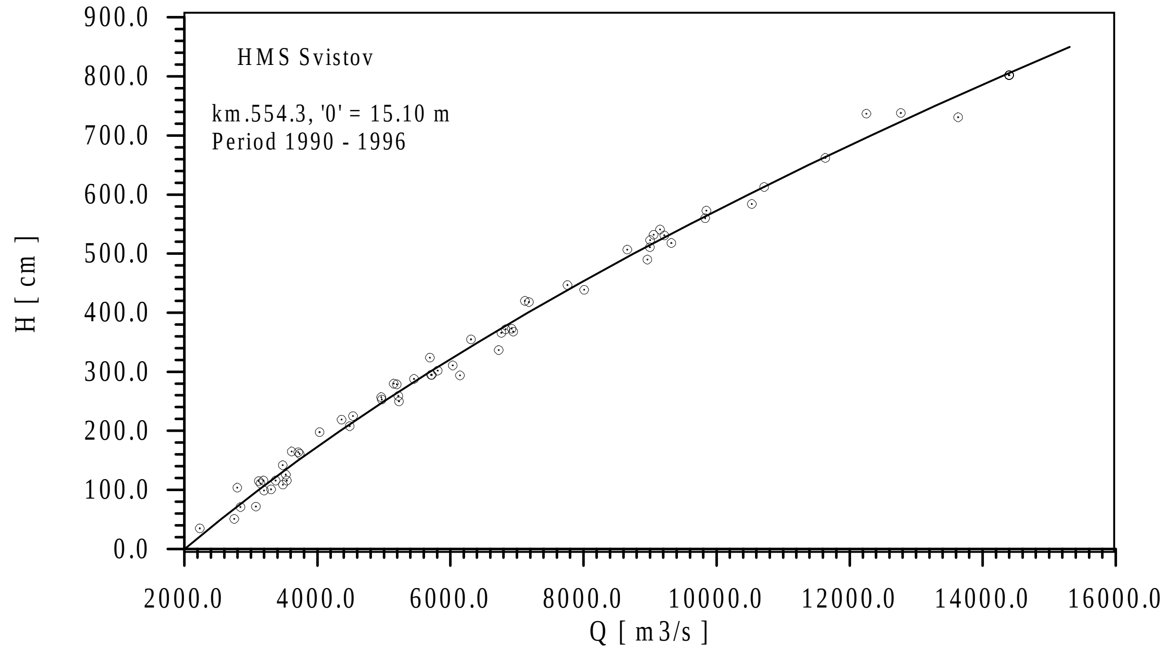


Figure 4.9.1-2 Averaged discharge rating curves at hydrometric stations Svishtov and Silistra



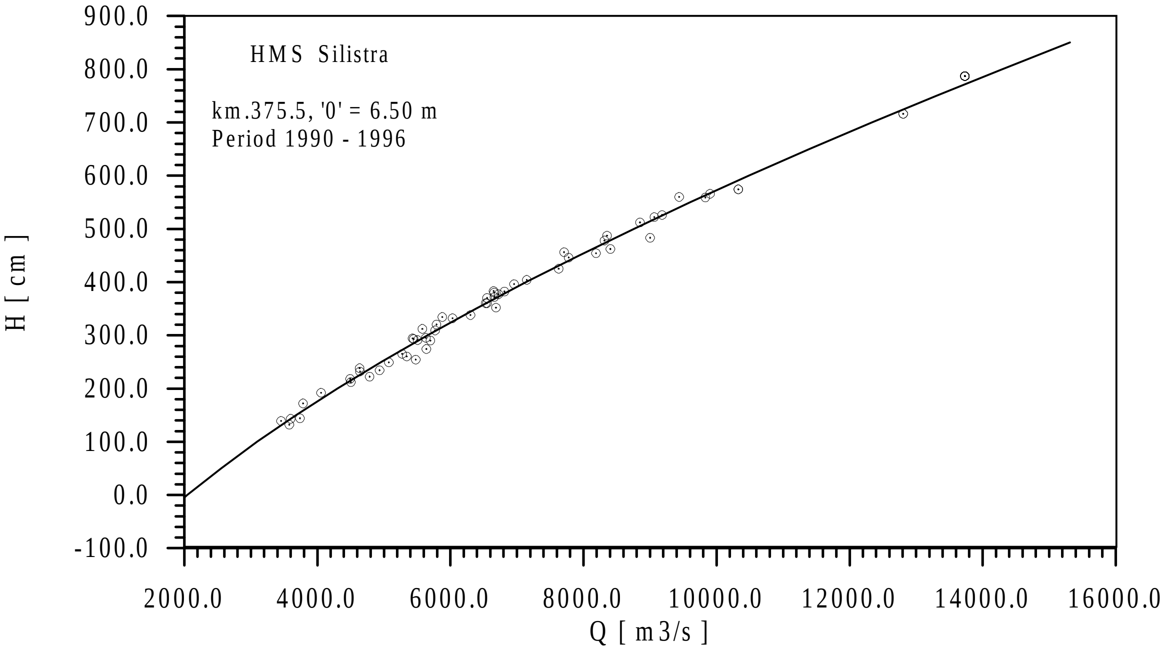
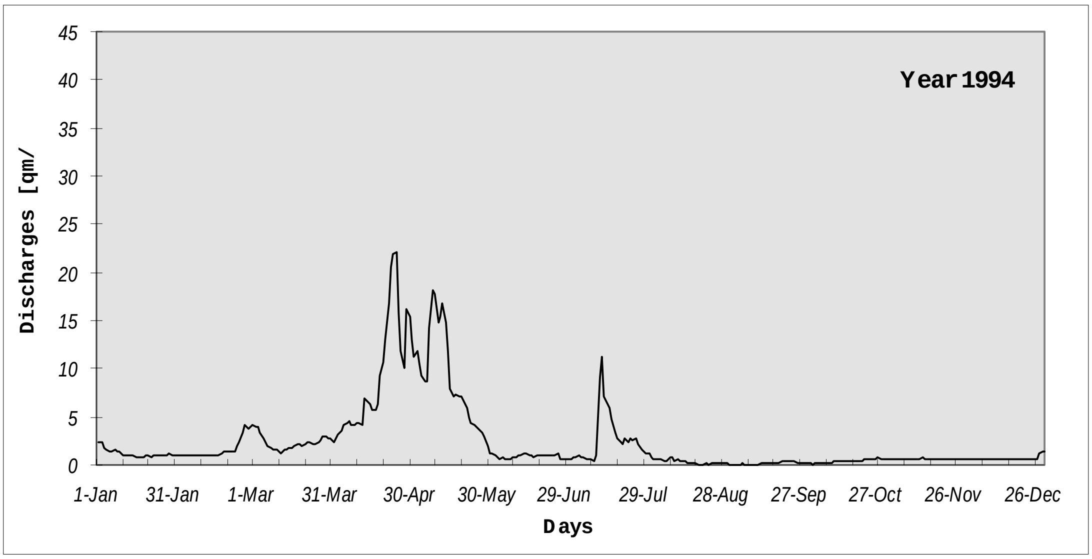
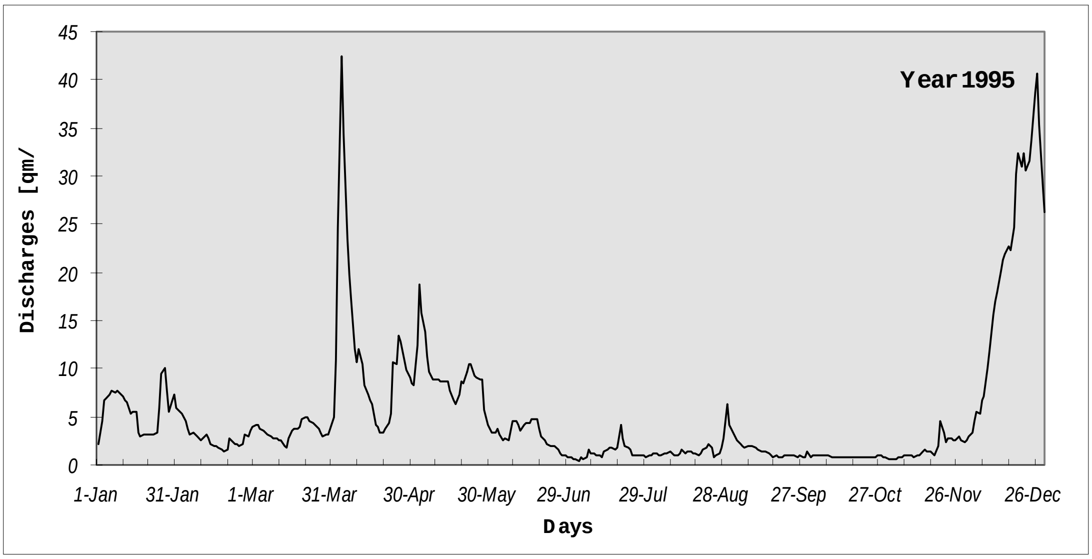


Figure 4.9.3 -1 Hydrograph of Ogosta River at Gavril Genovo Village, Station 16670





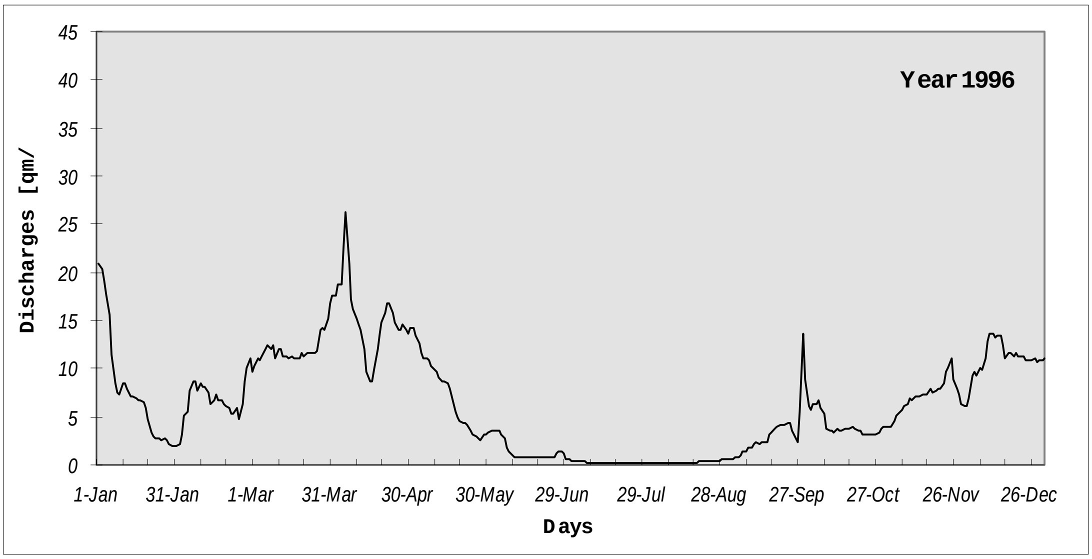
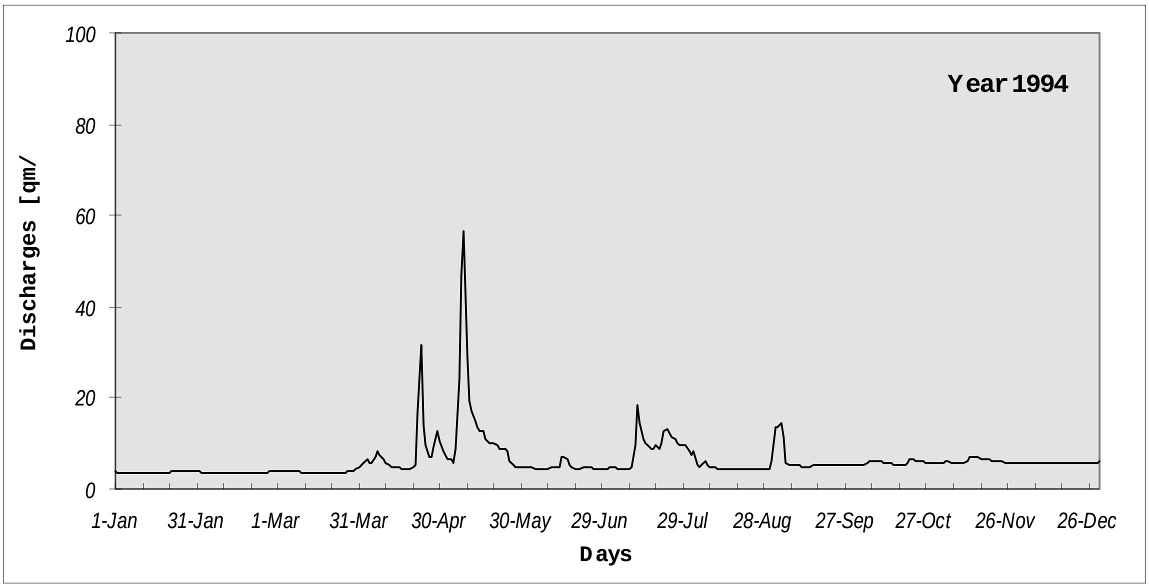
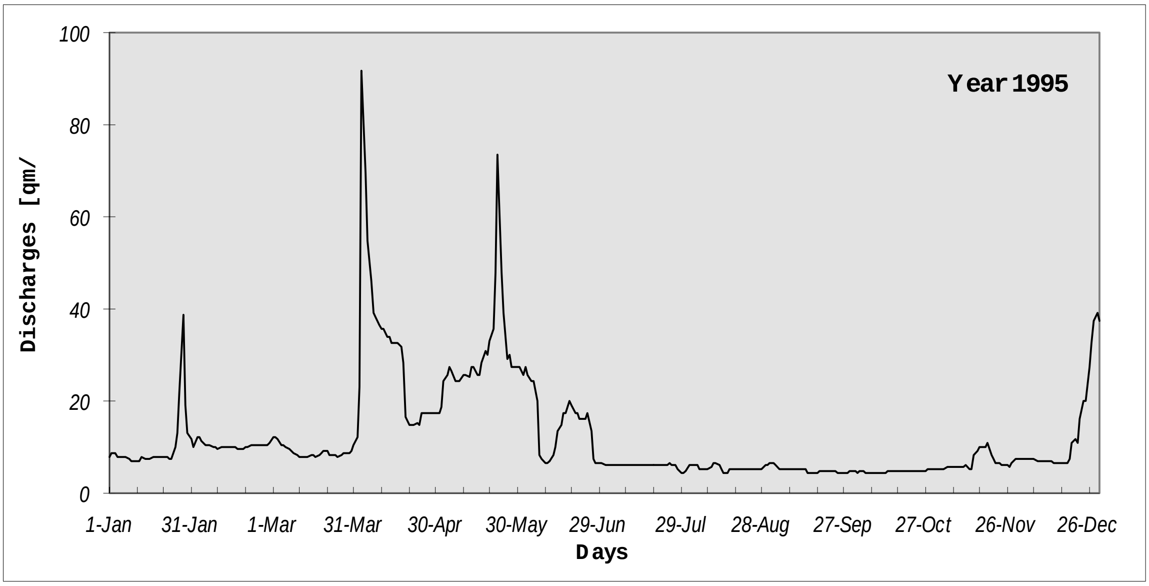


Figure 4.9.3 -2 Hydrograph of Ogosta River at Kobilyak Village, Station 16800





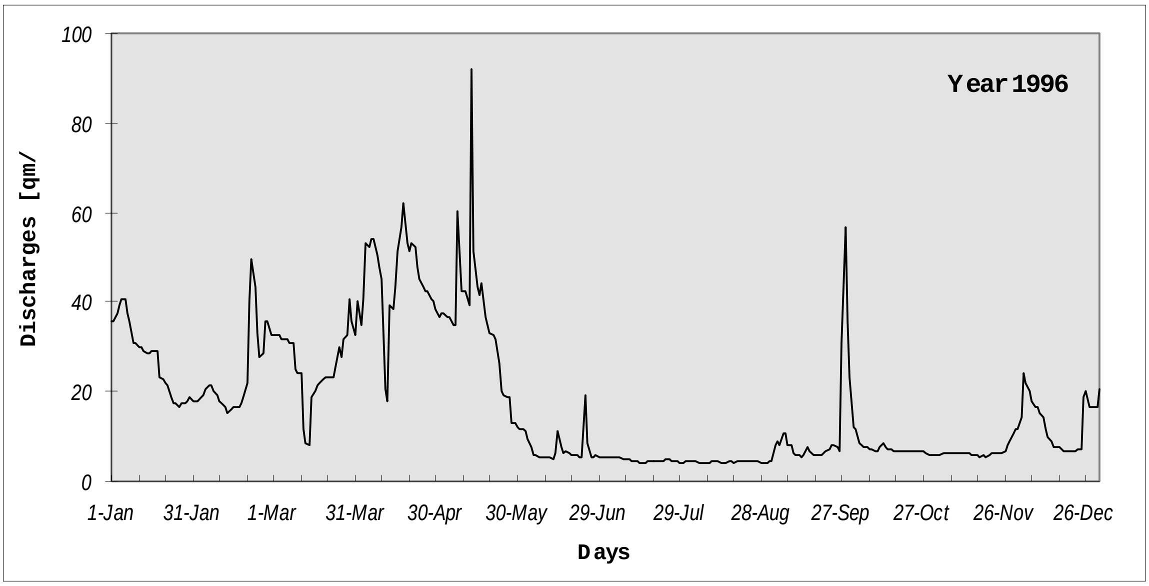
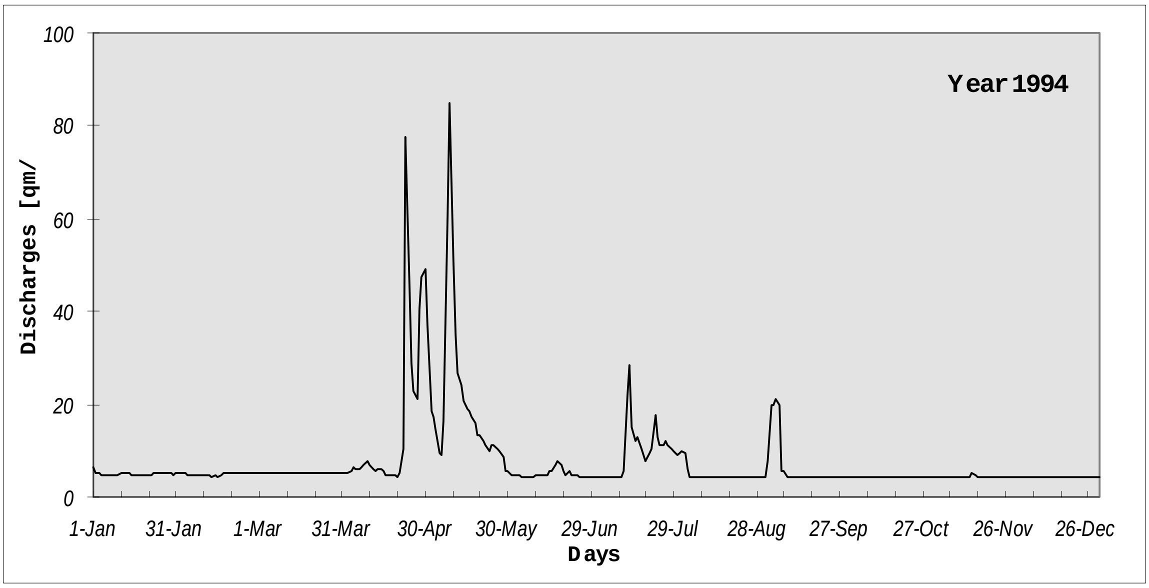
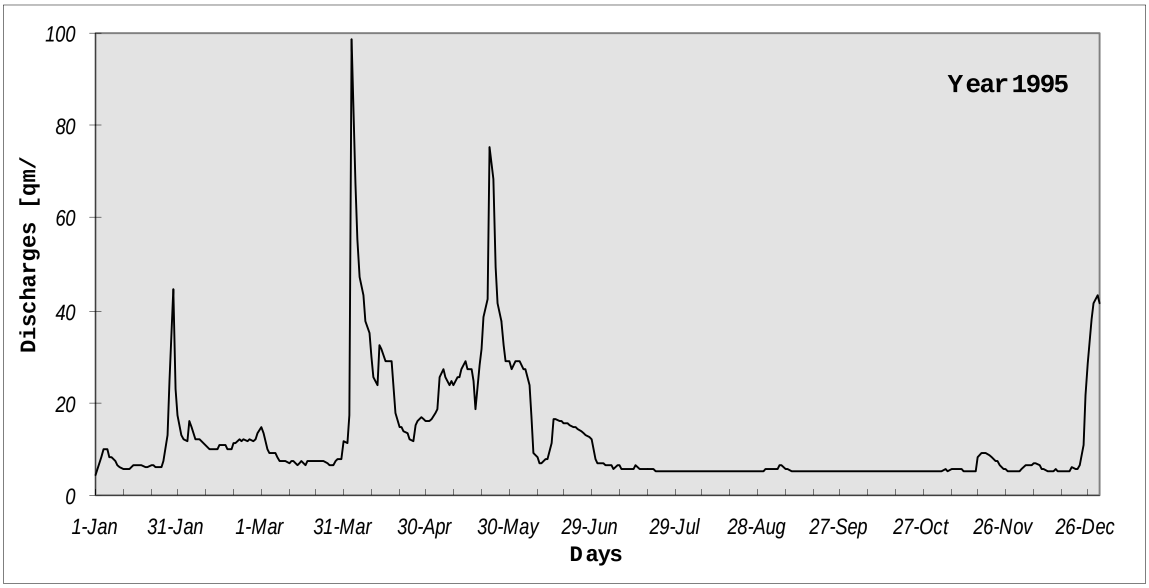


Figure 4.9.3 -3 Hydrograph of Ogosta River at the town of Mizia, Station 16850





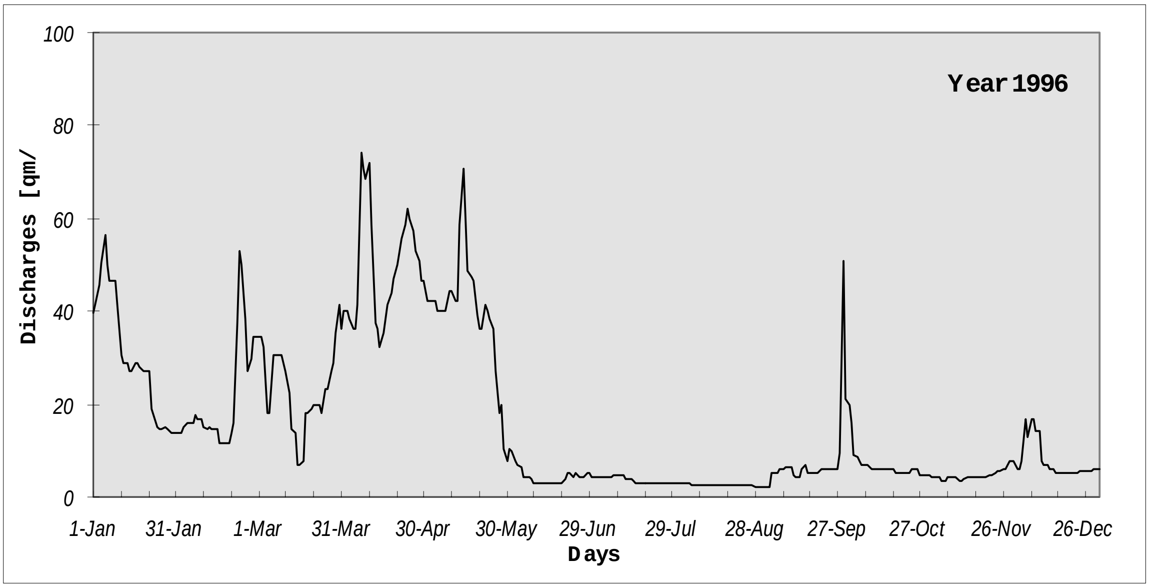
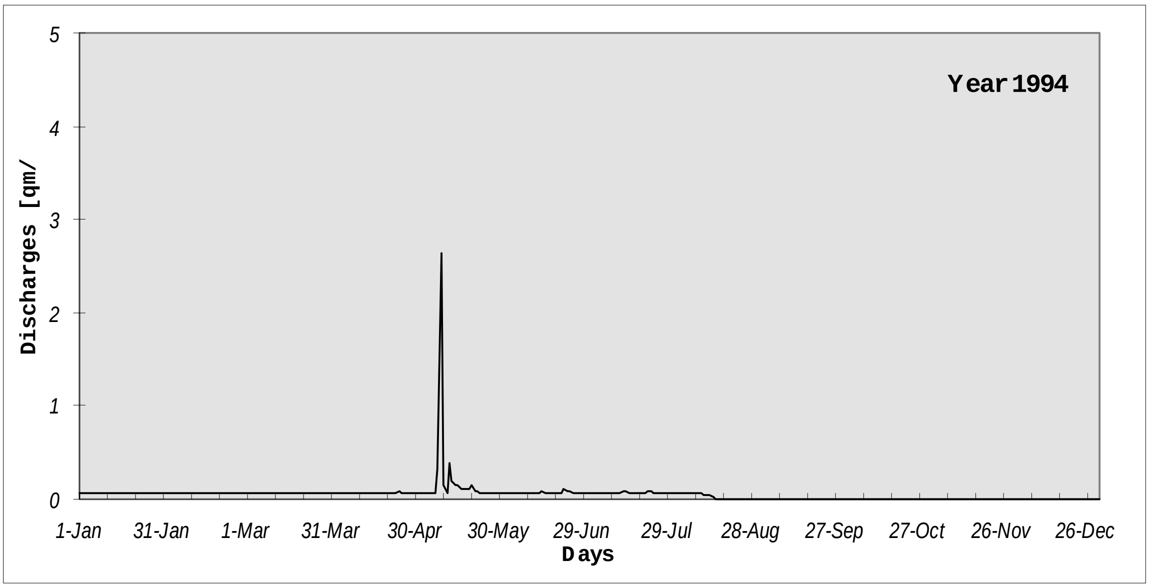
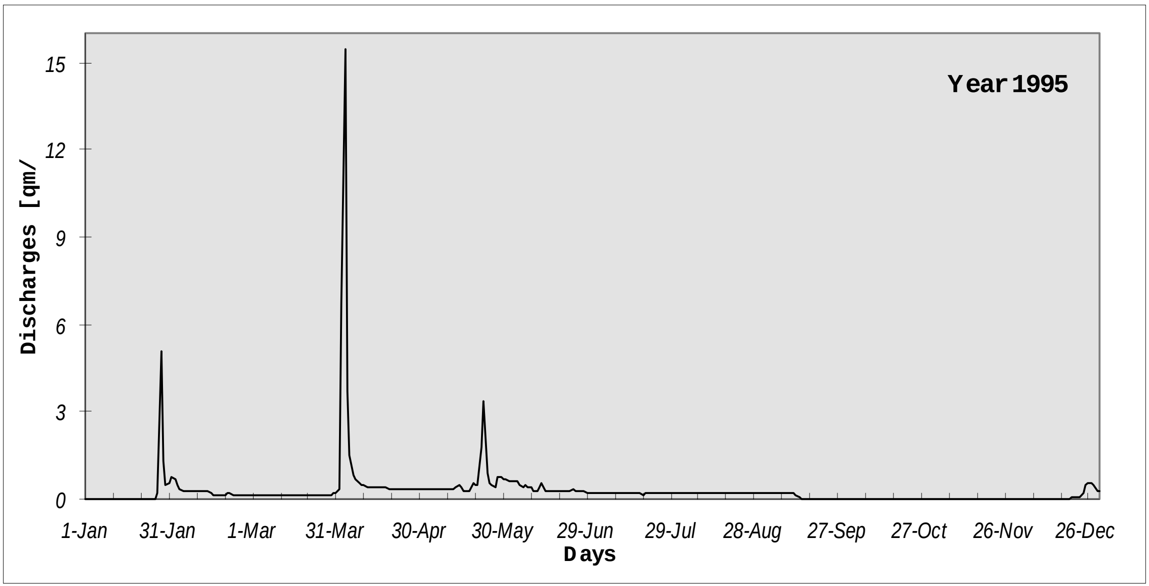


Figure 4.9.3 -4 Hydrograph of Skat River at Nivyanin village, Station 17650





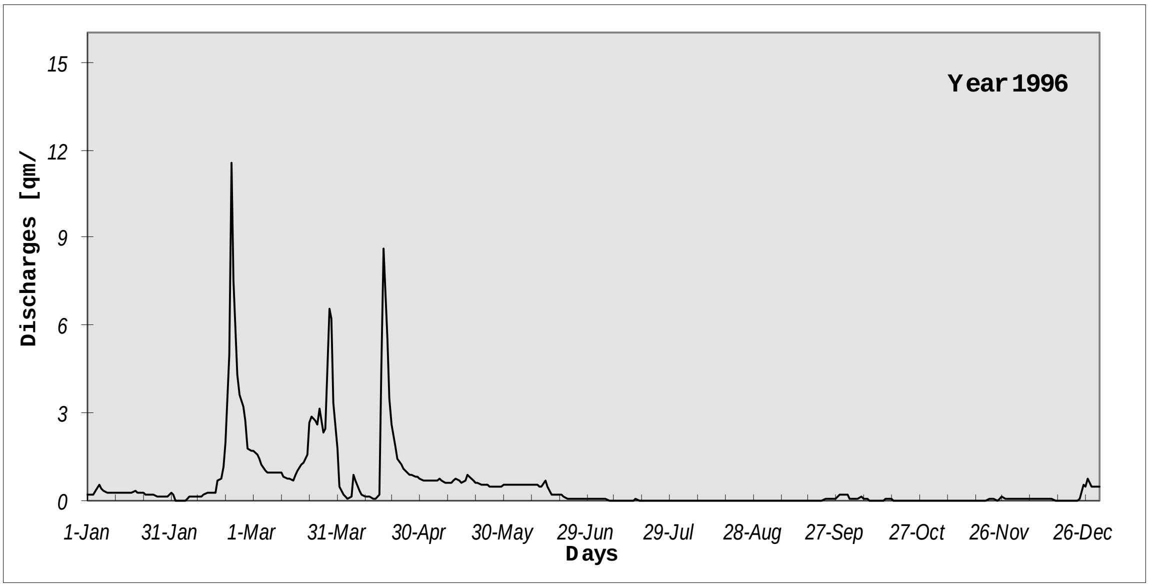


Figure 4.9.3 -5 Hydrograph of Skat River at the town of Mizia, Station 17850

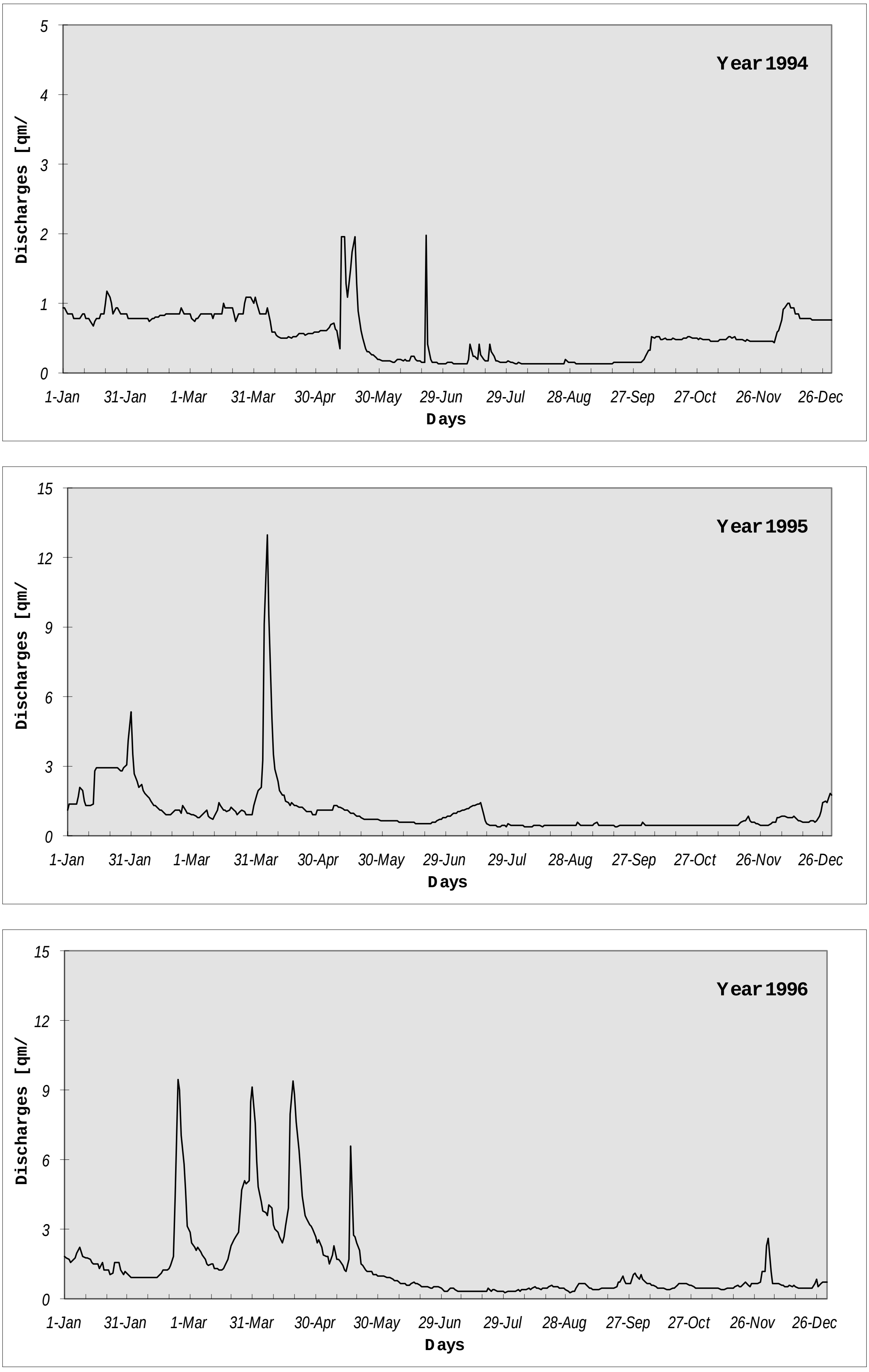
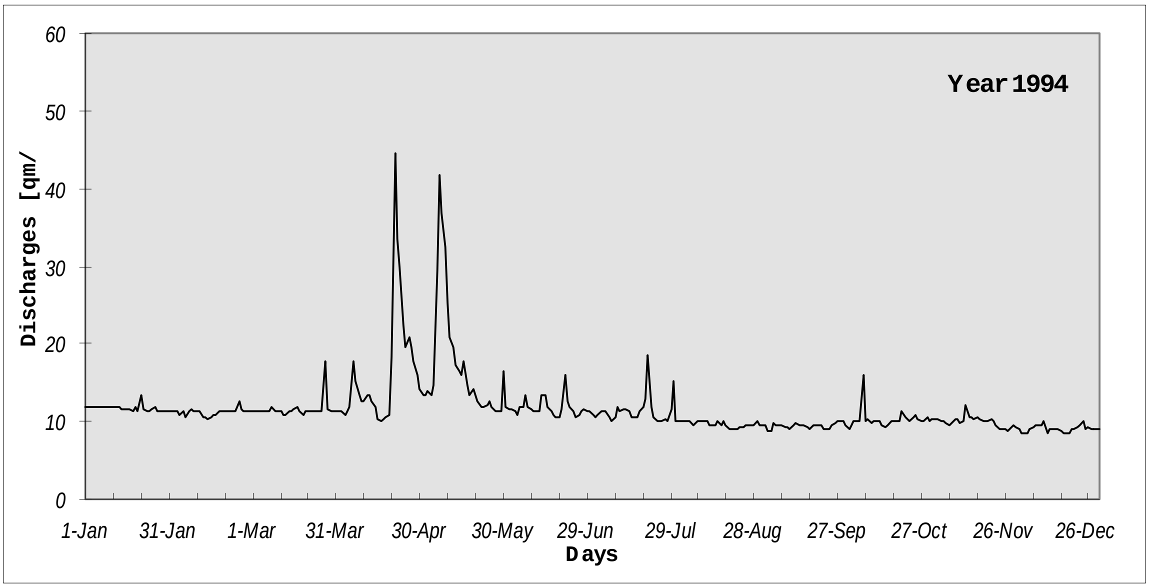
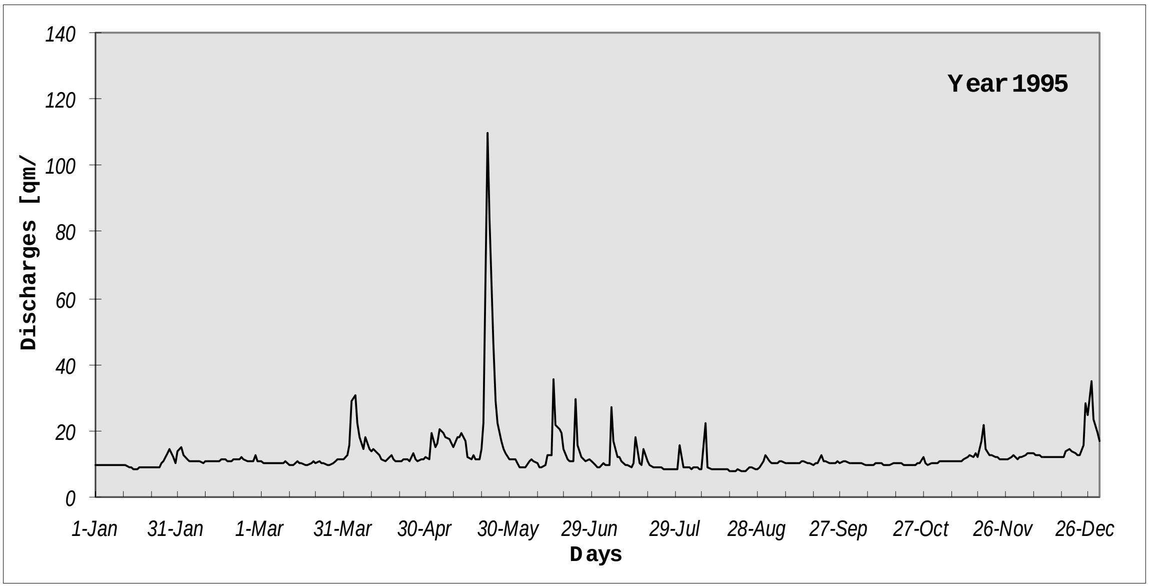


Figure 4.9.3 -6 Hydrograph of Iskar River at the town of Novi Iskar, Station 18700





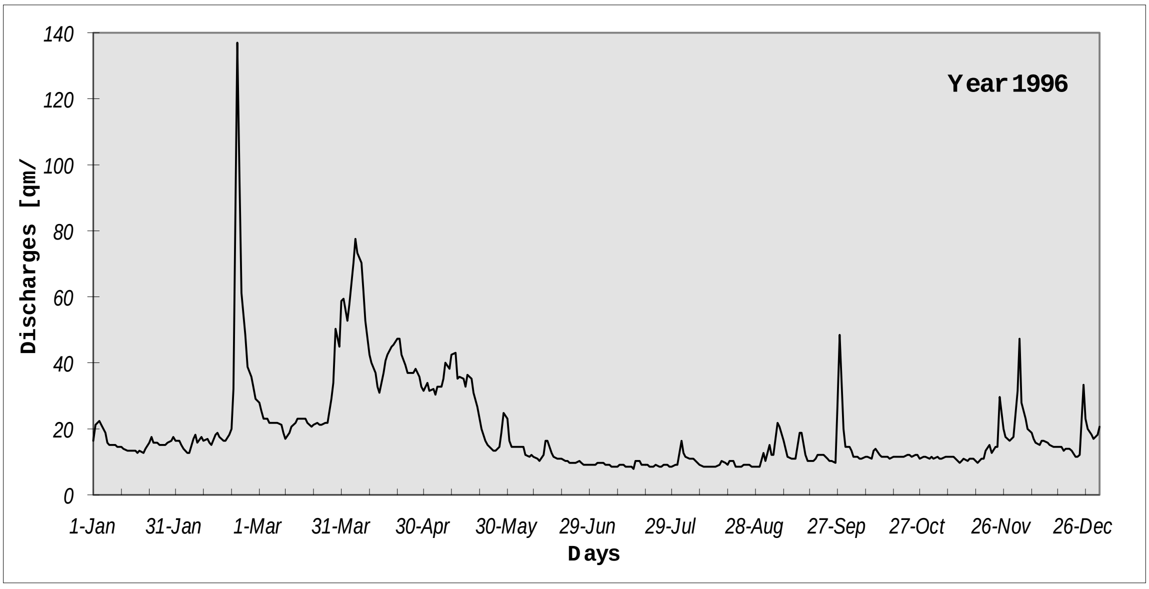
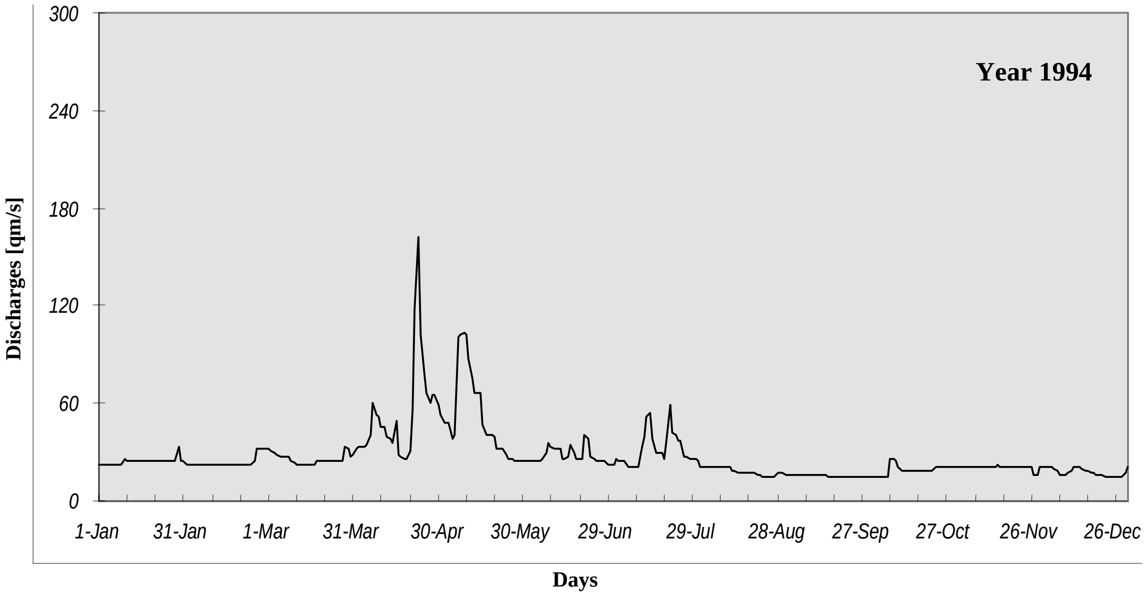
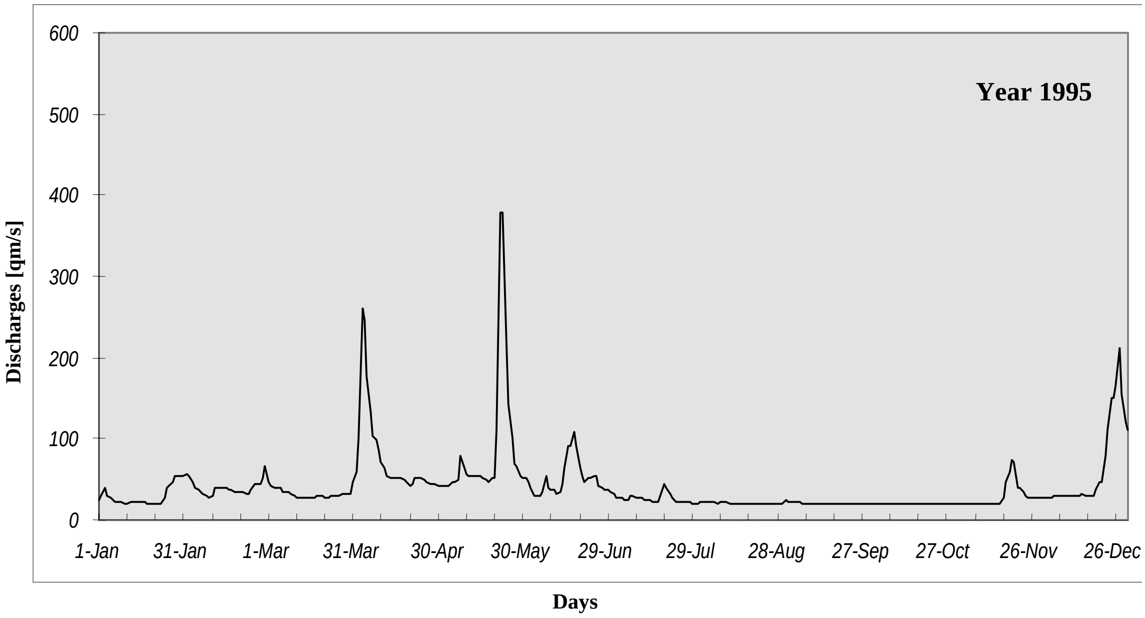


Figure 4.9.3 -7 Hydrograph of Iskar River at Kunino village, Station 18800





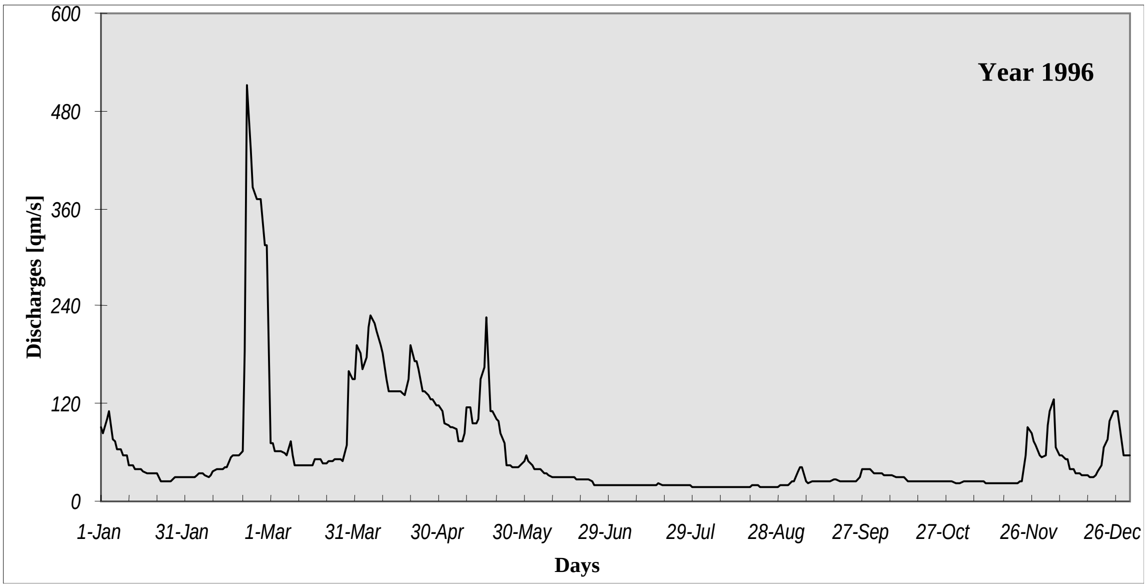


Figure 4.9.3 -8 Hydrograph of Isakar River at Oryahovitza village, Station 18850

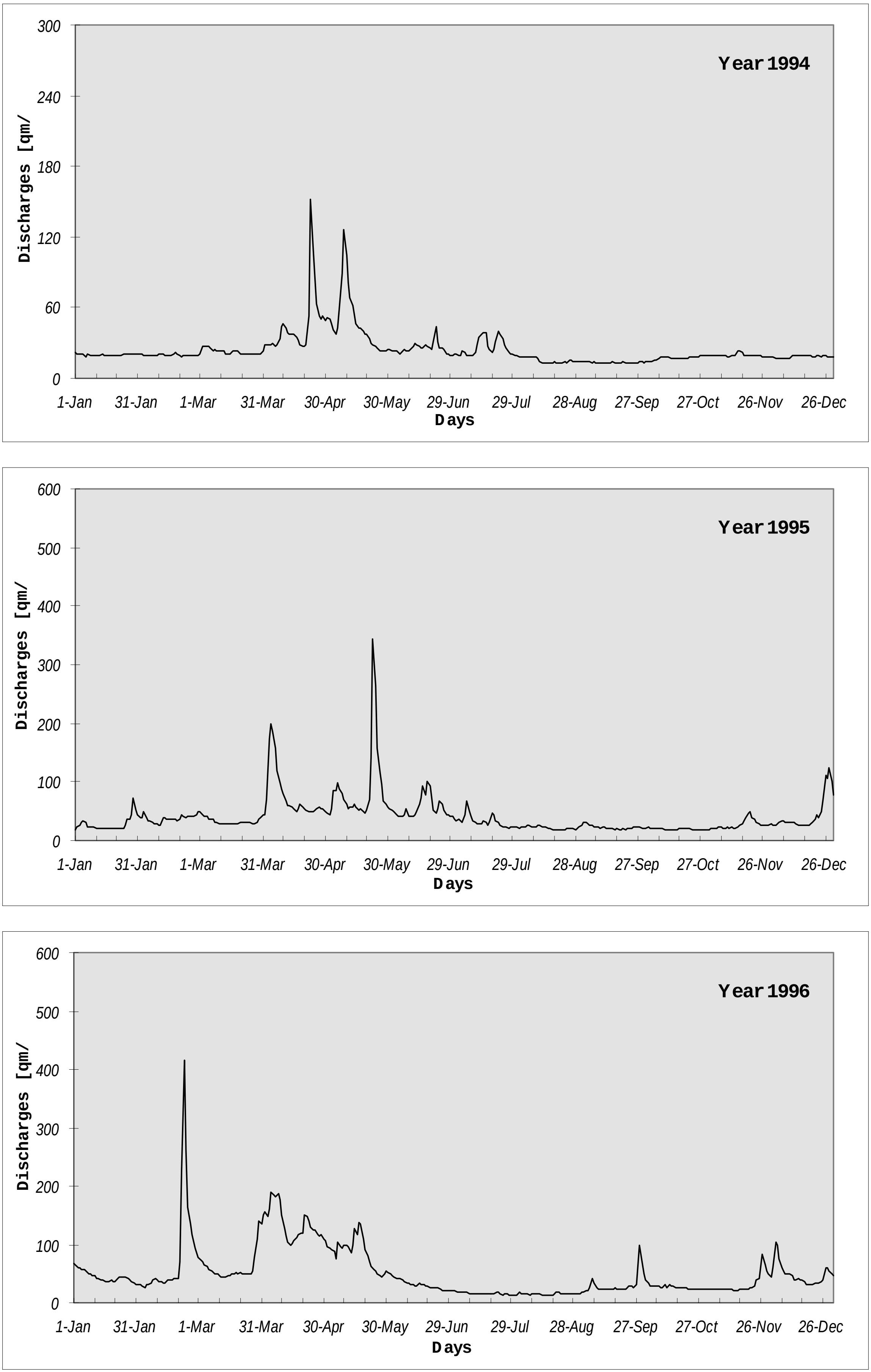
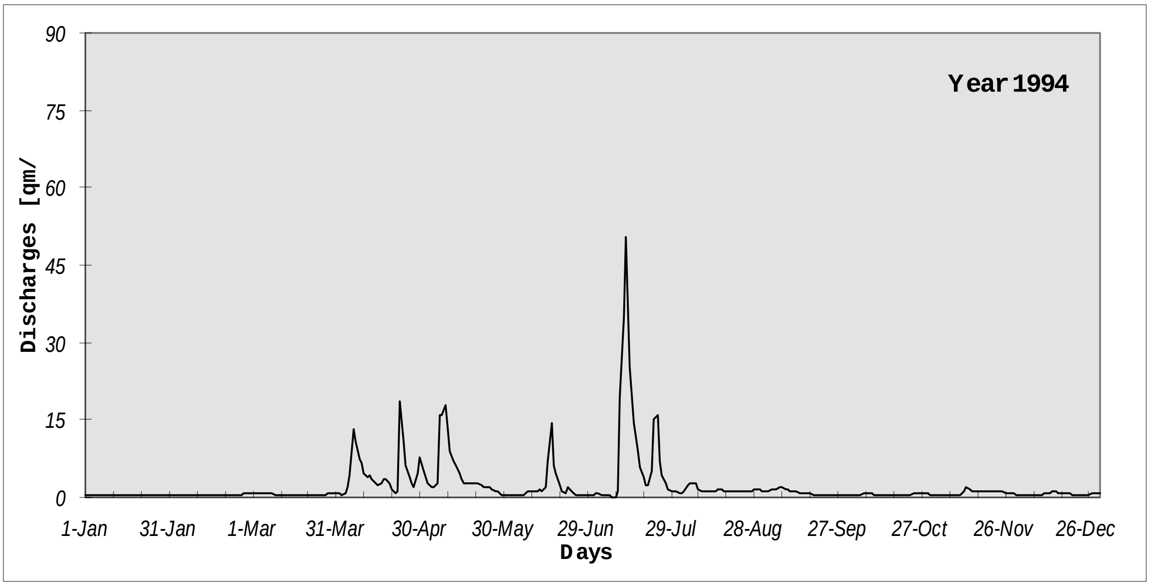
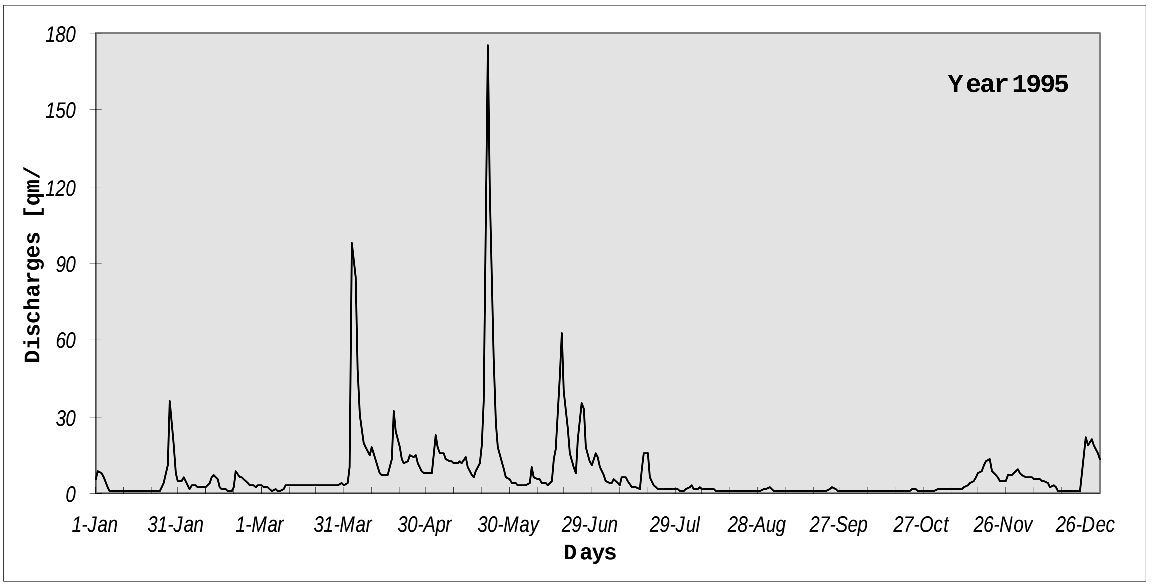


Figure 4.9.3 -9 Hydrograph of Vit River at Sadovetz village, Station 21750





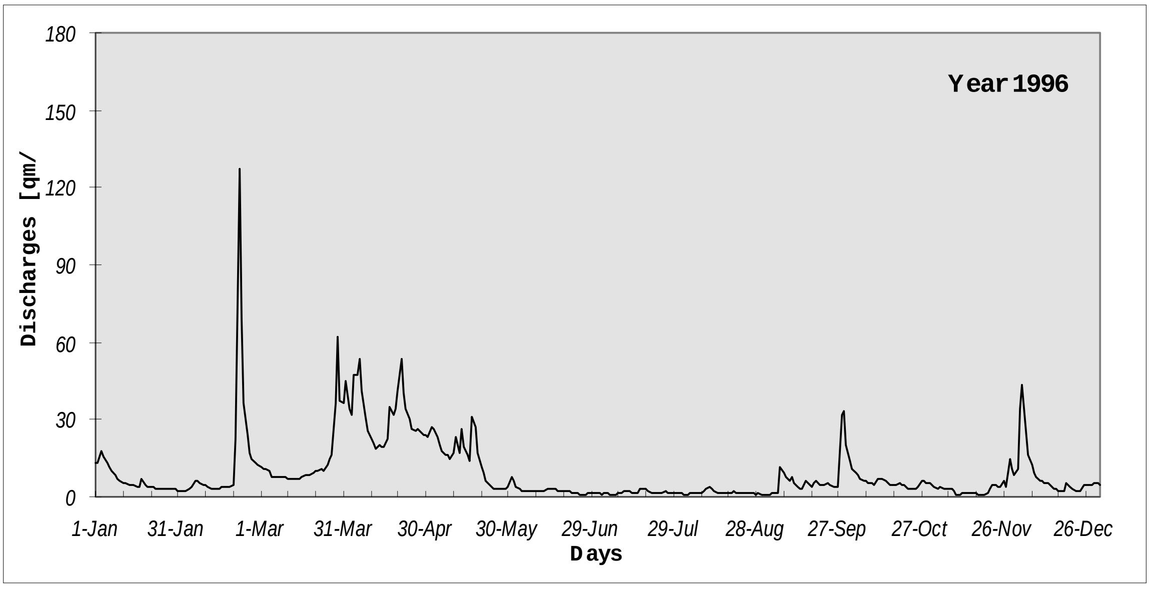


Figure 4.9.3 -10 Hydrograph of Vit River at Tarnyane village, Station 21800

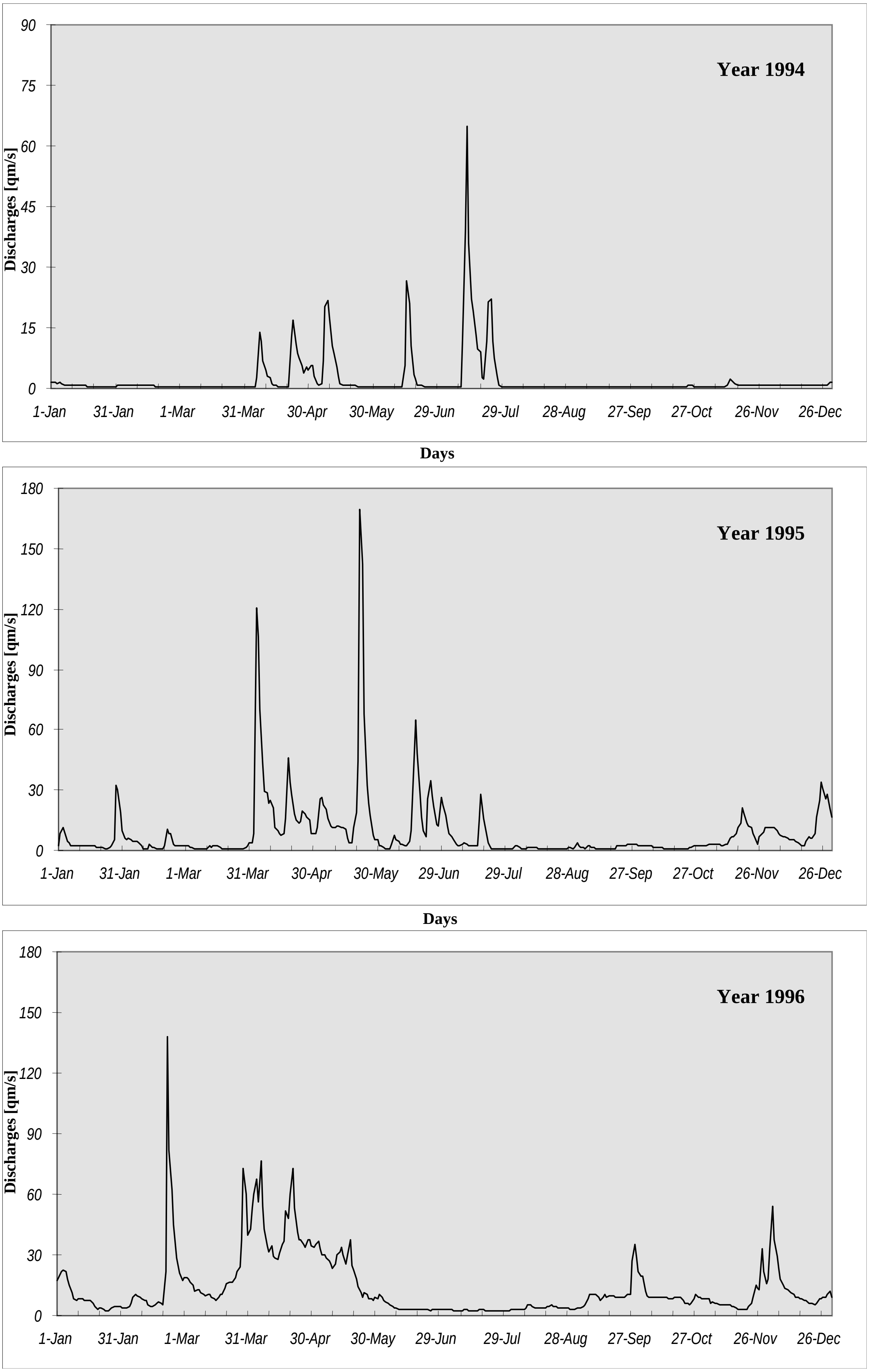
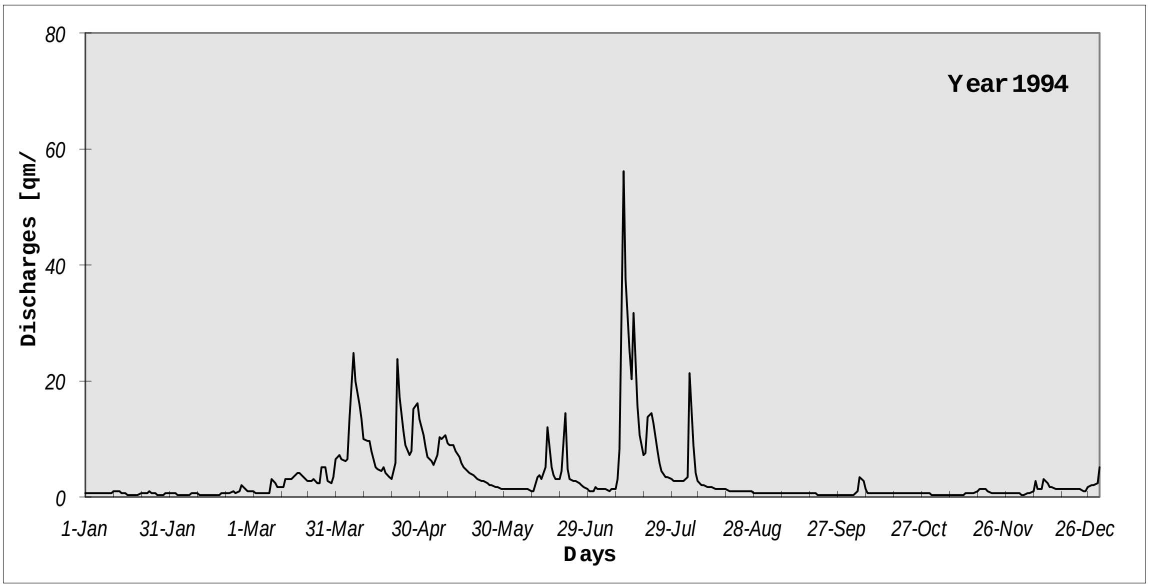
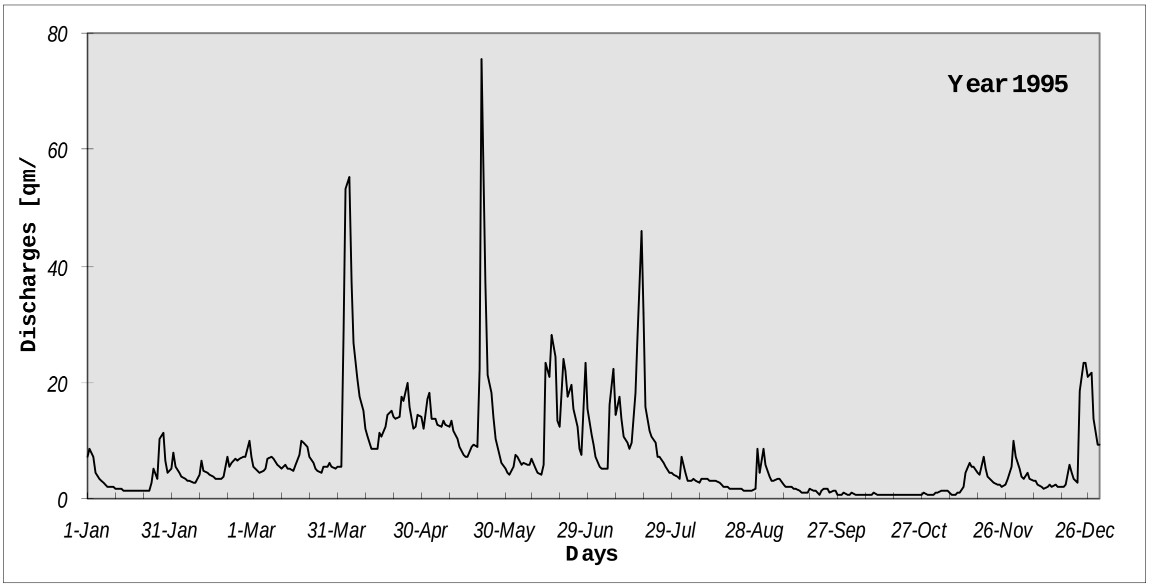


Figure 4.9.3 -11 Hydrograph of Ossam River at the town of Troyan, Station 22700





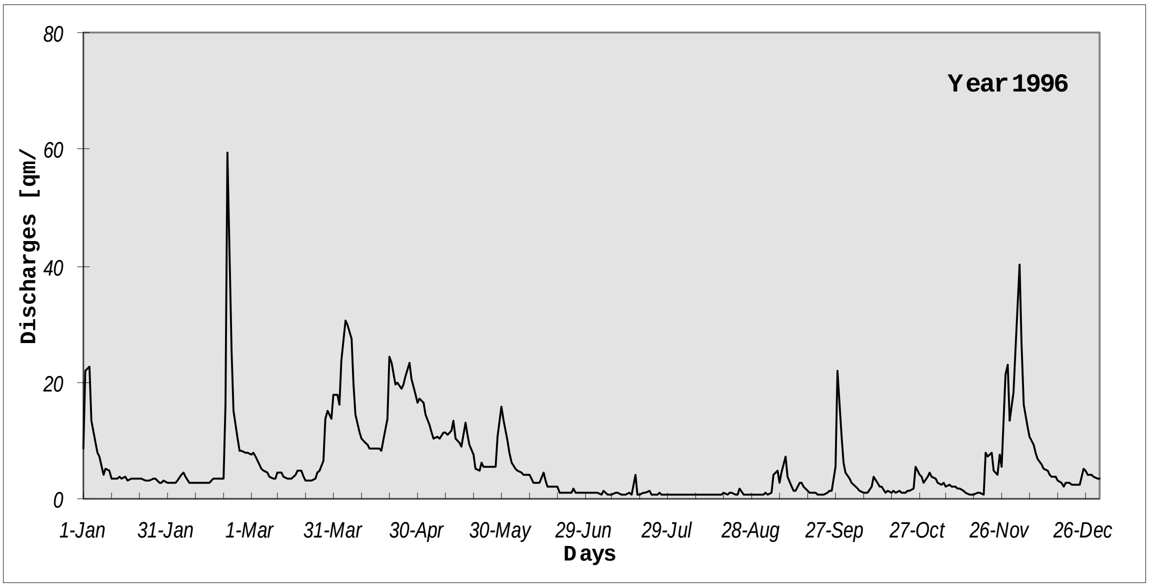
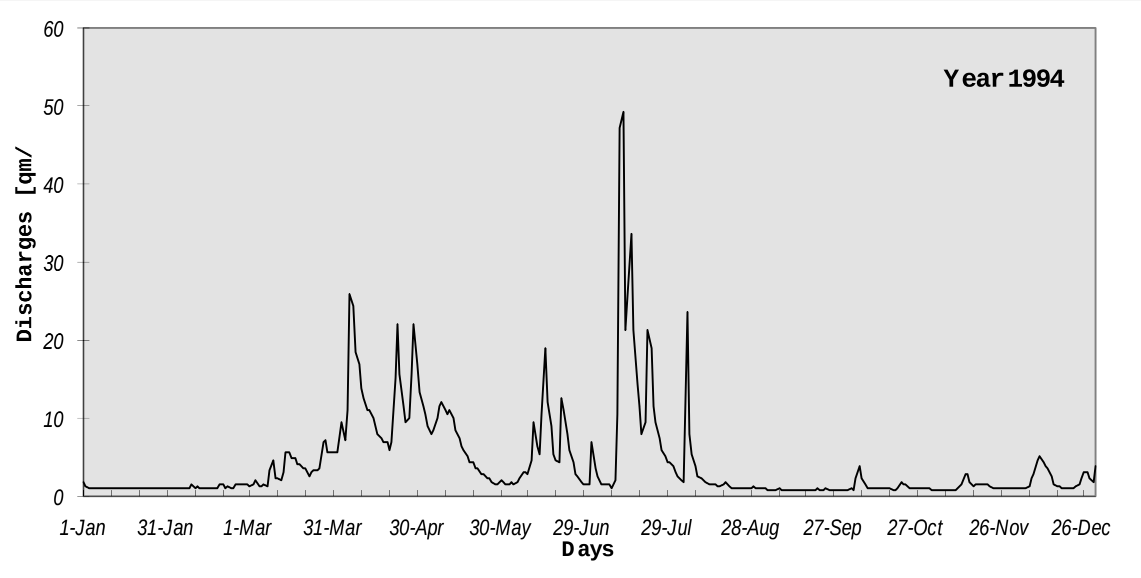
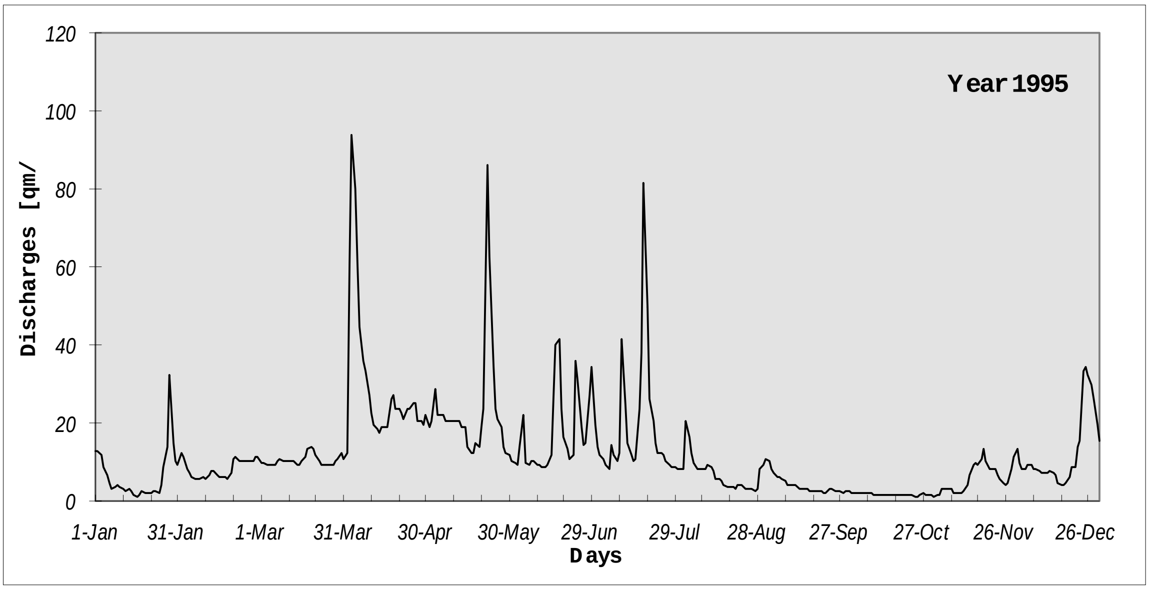


Figure 4.9.3 -12 Hydrograph of Ossam River at the town of Lovech, Station 22750





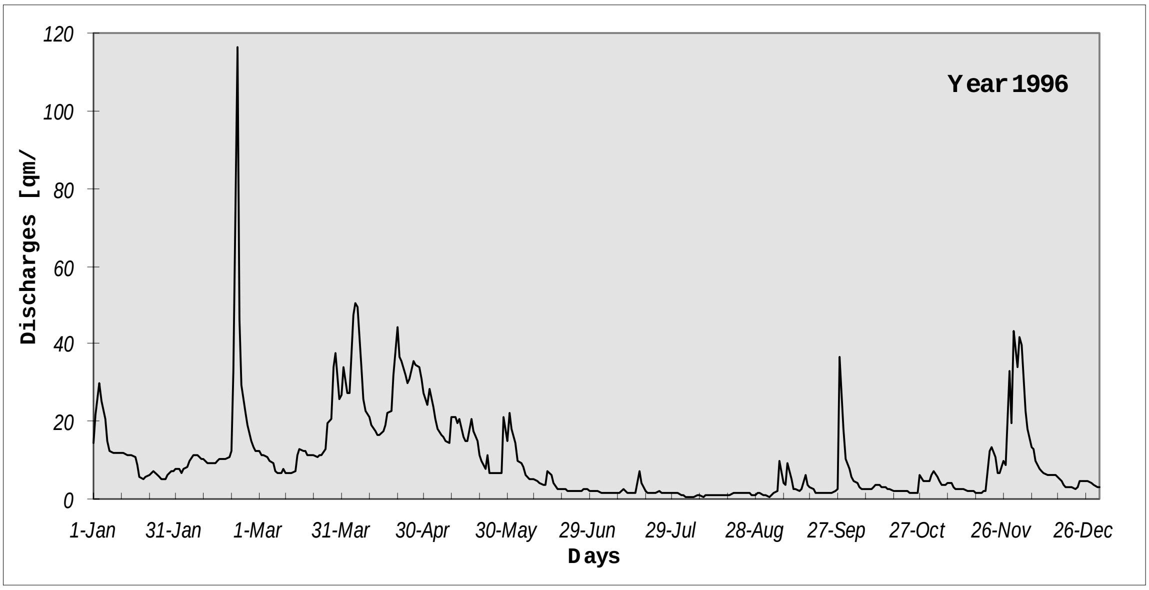
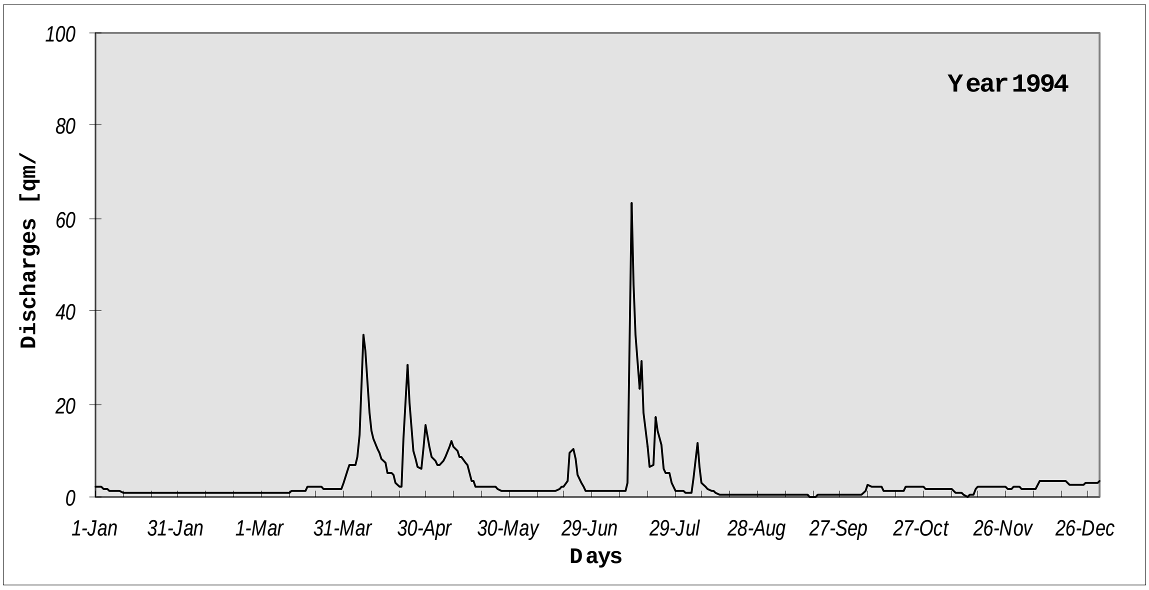
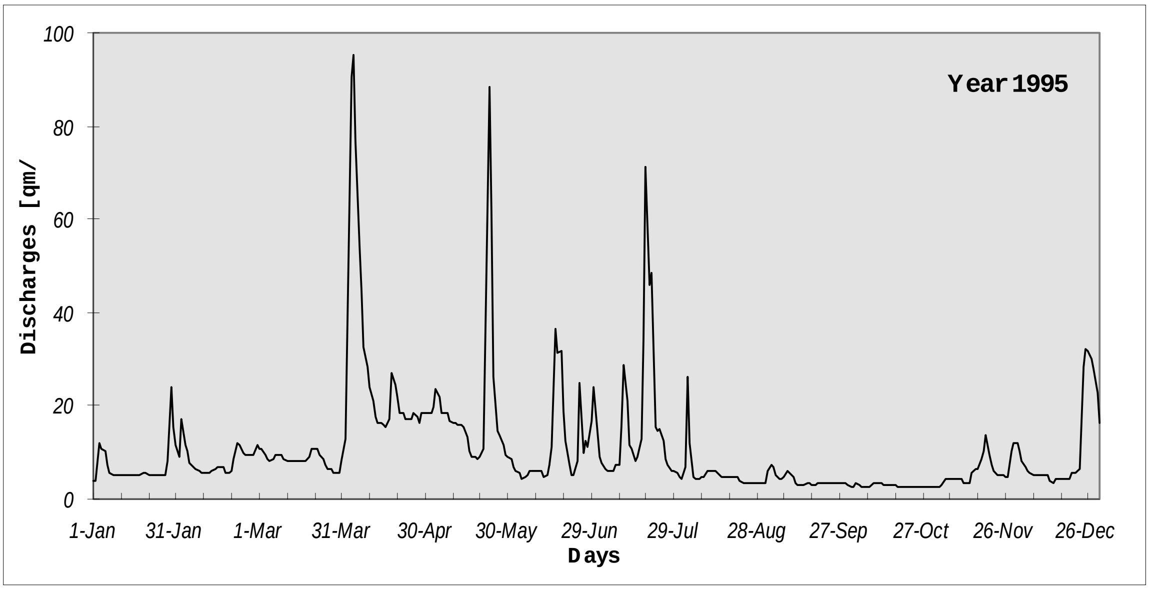


Figure 4.9.3 -13 Hydrograph of Ossam River at Izgrev village, Station 22800





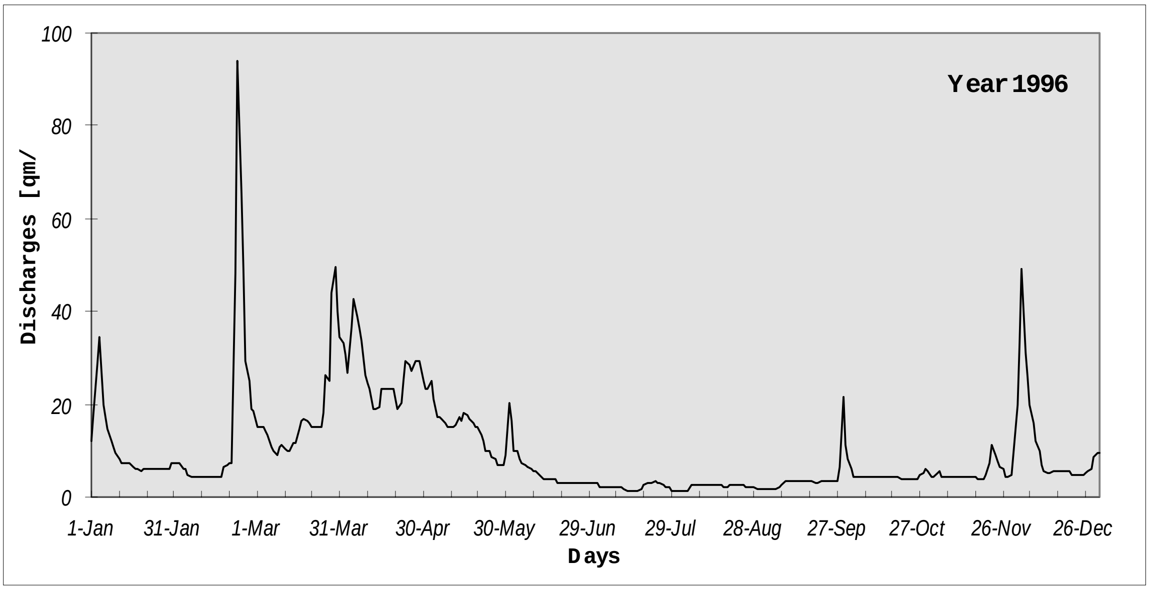
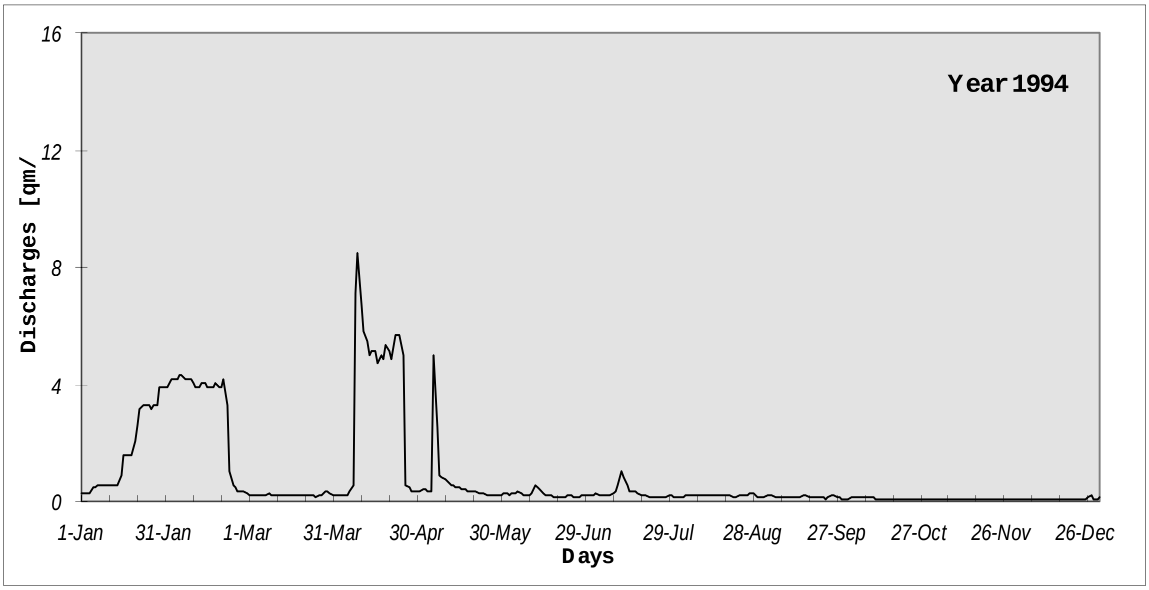
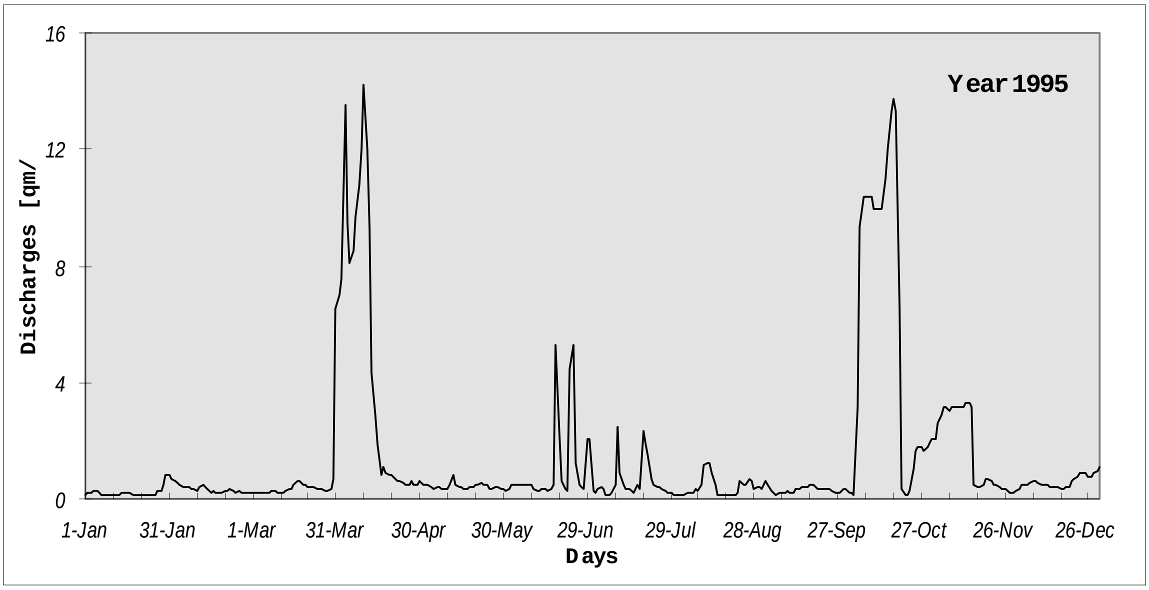


Figure 4.9.3 -14 Hydrograph of Golyama Reka River at the town of Strazhitza, Station 23150





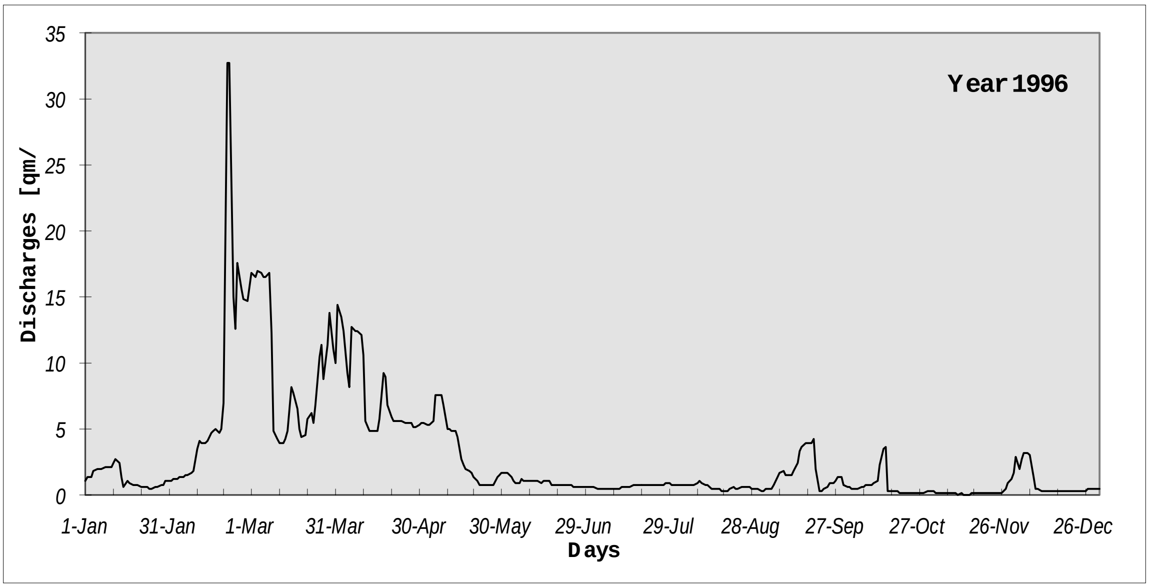
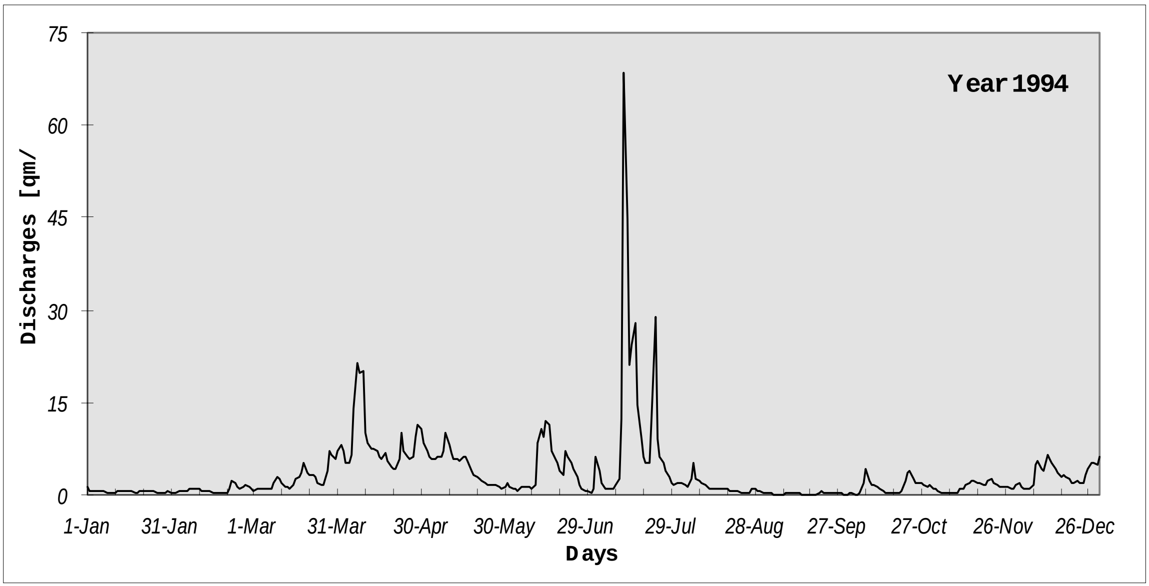
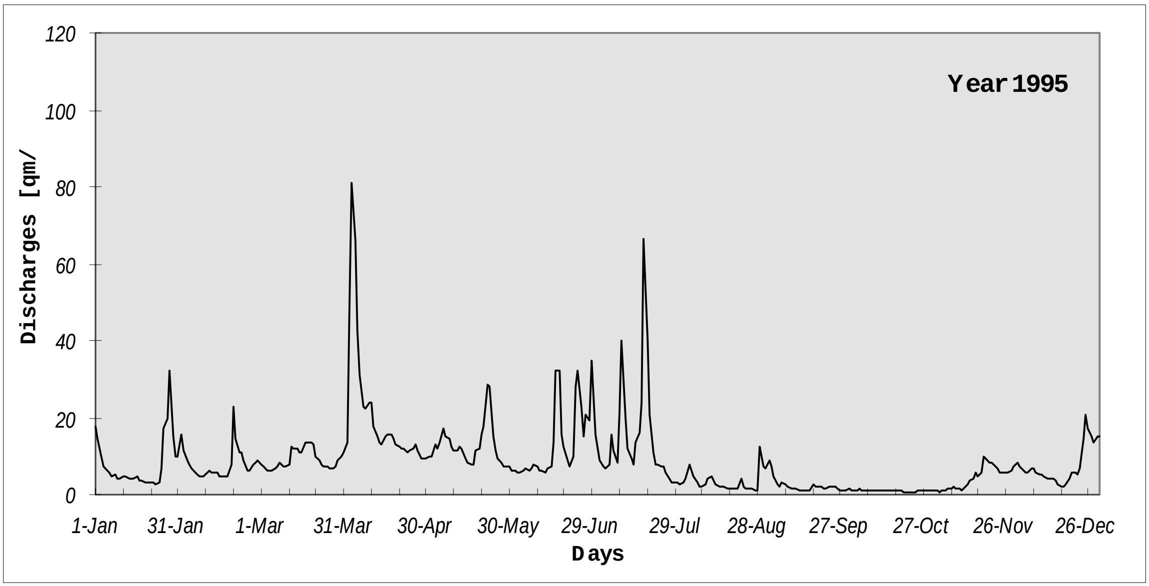


Figure 4.9.3 -15 Hydrograph of Rossitza River at the town of Sevlievo, Station 23500





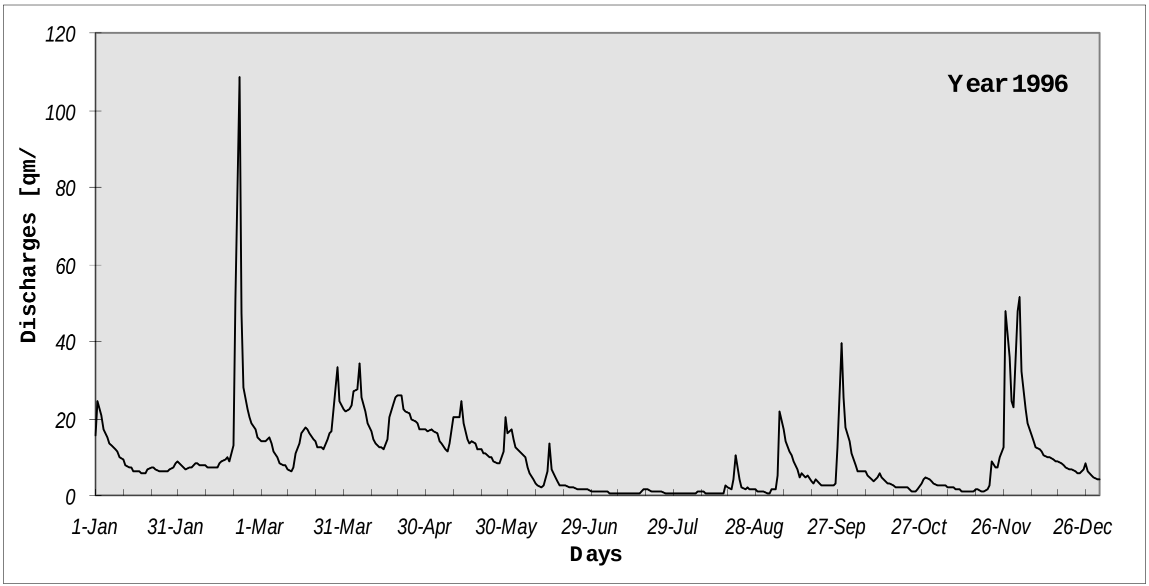
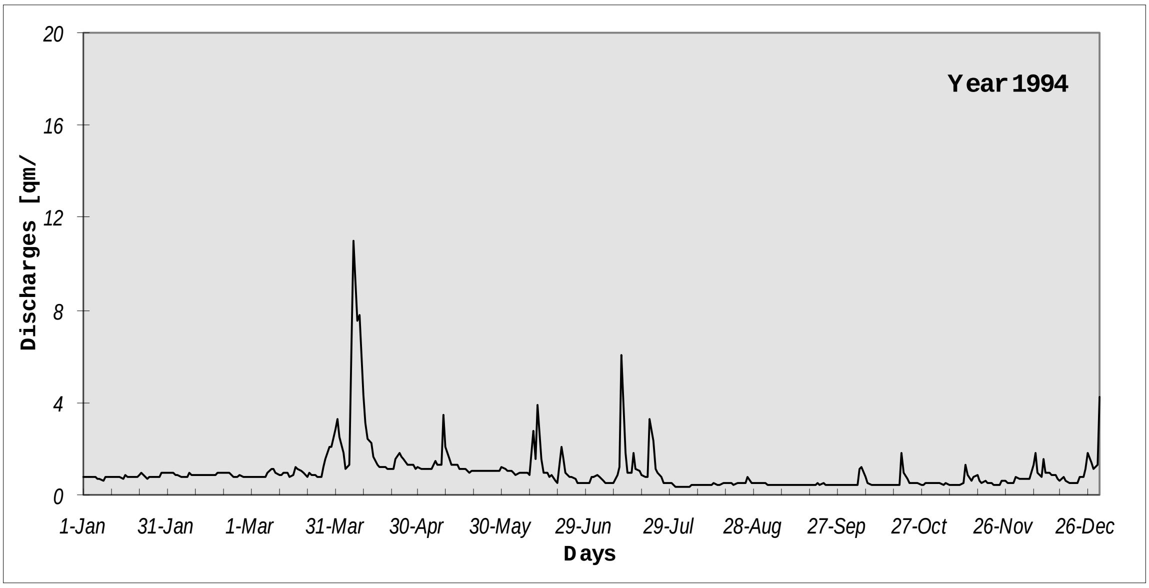
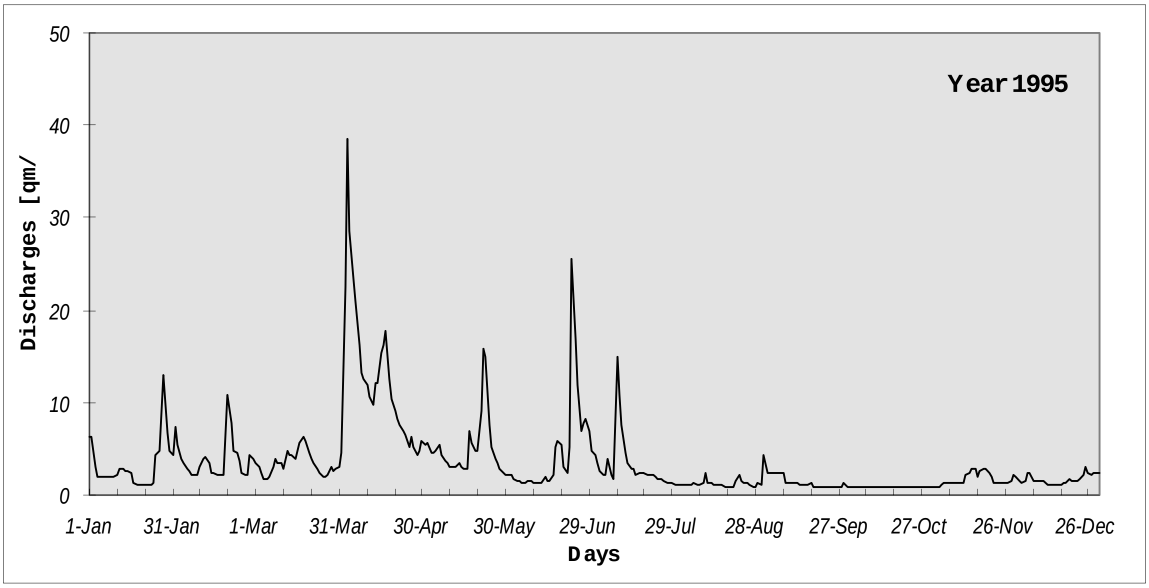


Figure 4.9.3 -16 Hydrograph of Yantra River at the town of Gabrovo, Station 23650





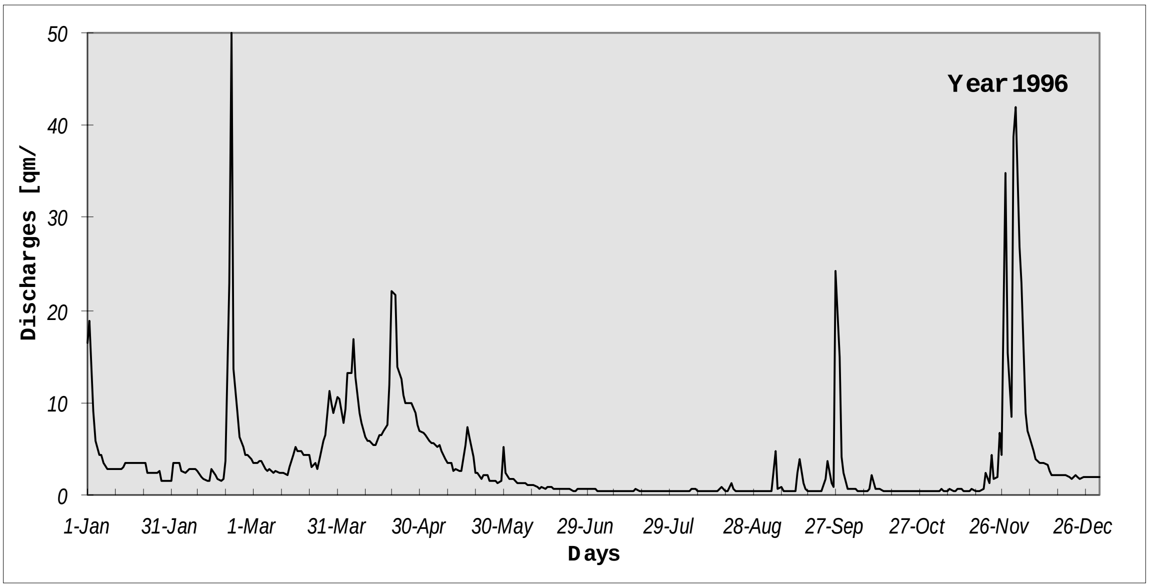
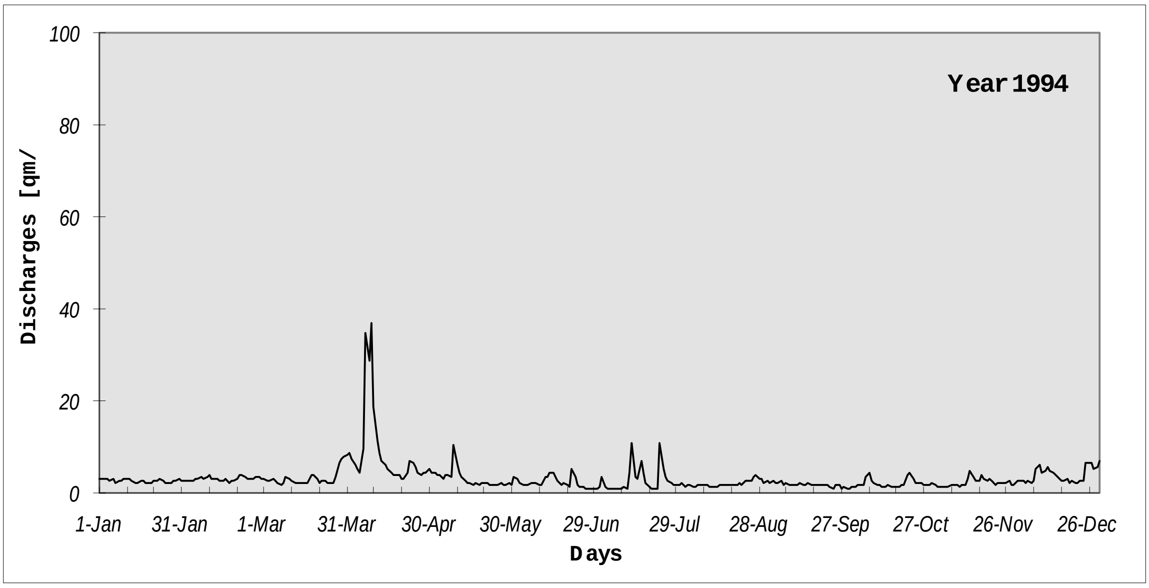
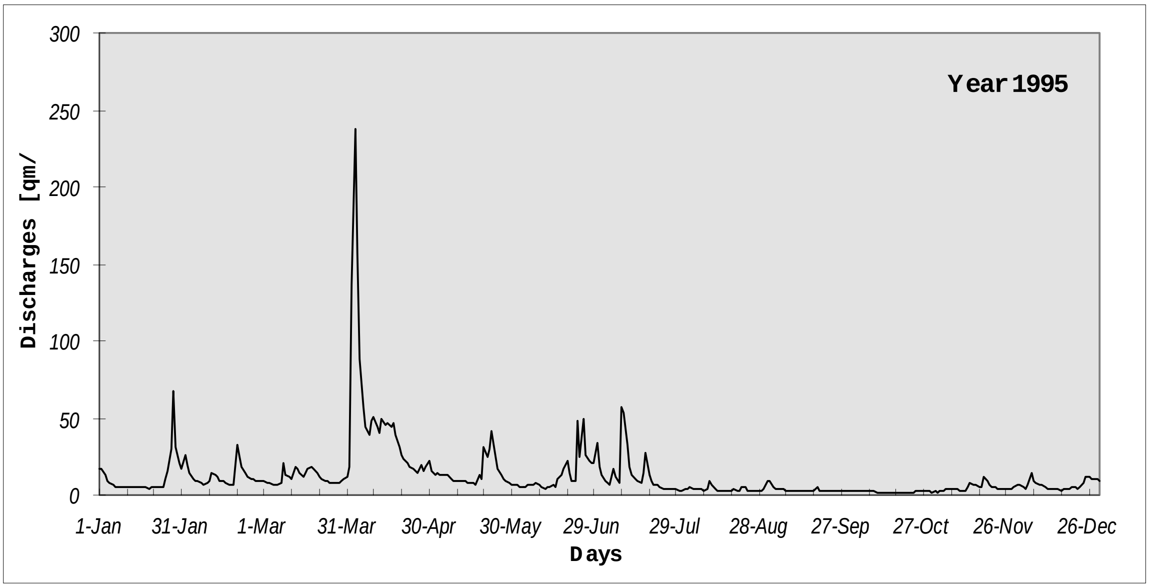


Figure 4.9.3 -17 Hydrograph of Yantra River at the town of Veliko Tarnovo, Station 23700





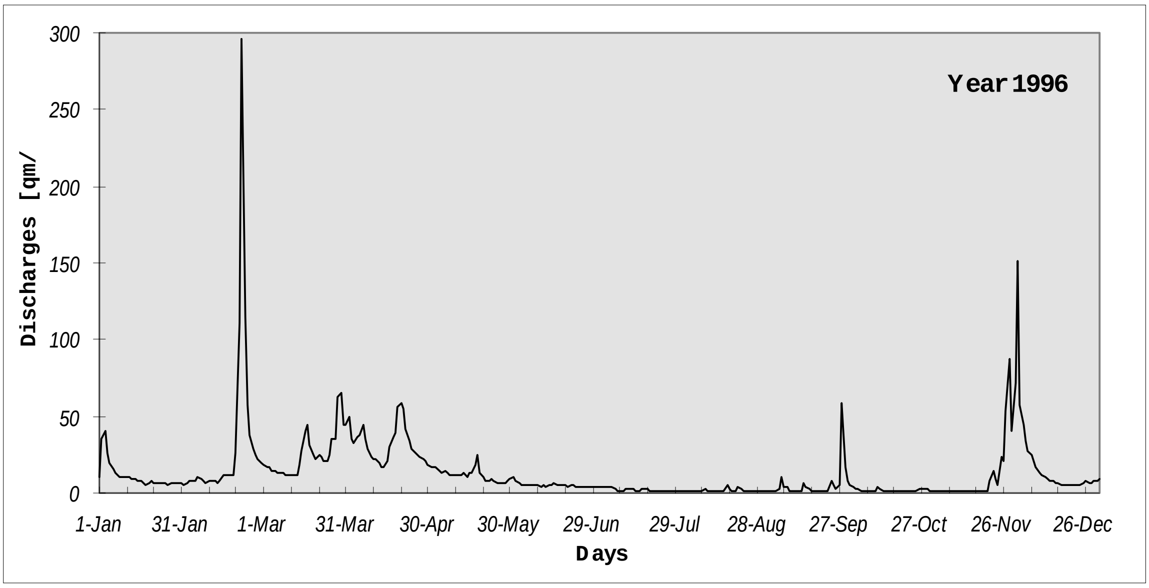
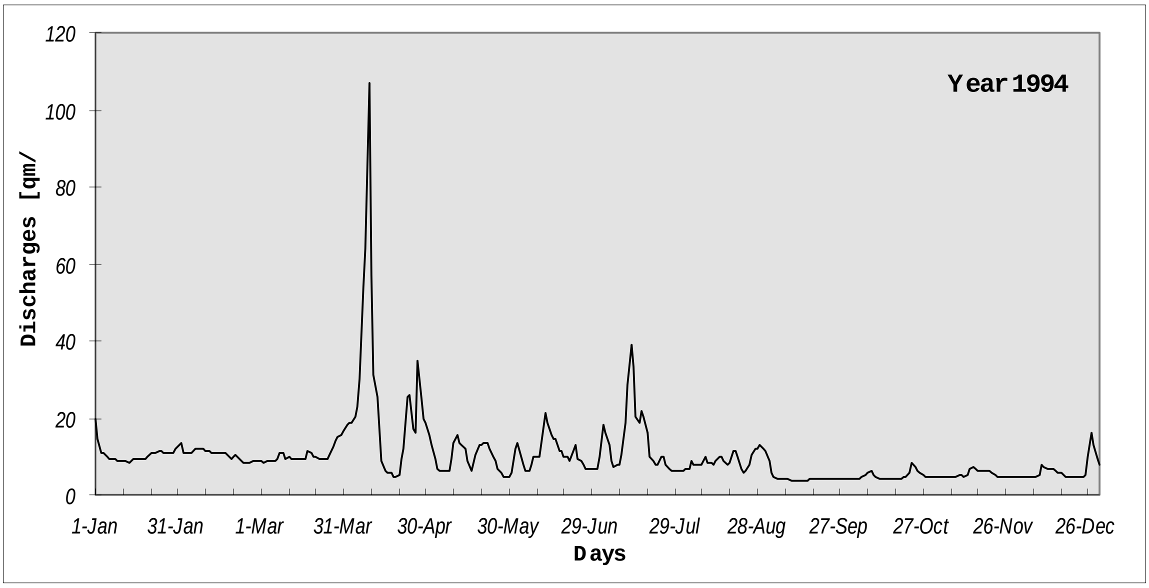
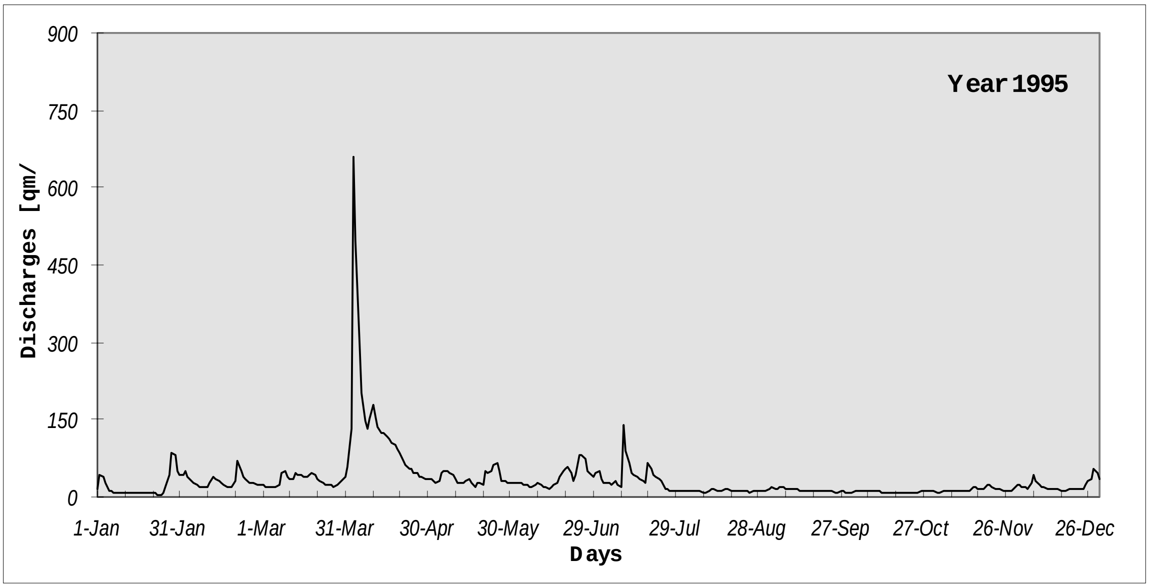


Figure 4.9.3 -18 Hydrograph of Yantra River at the town of Karantzi, Station 23850





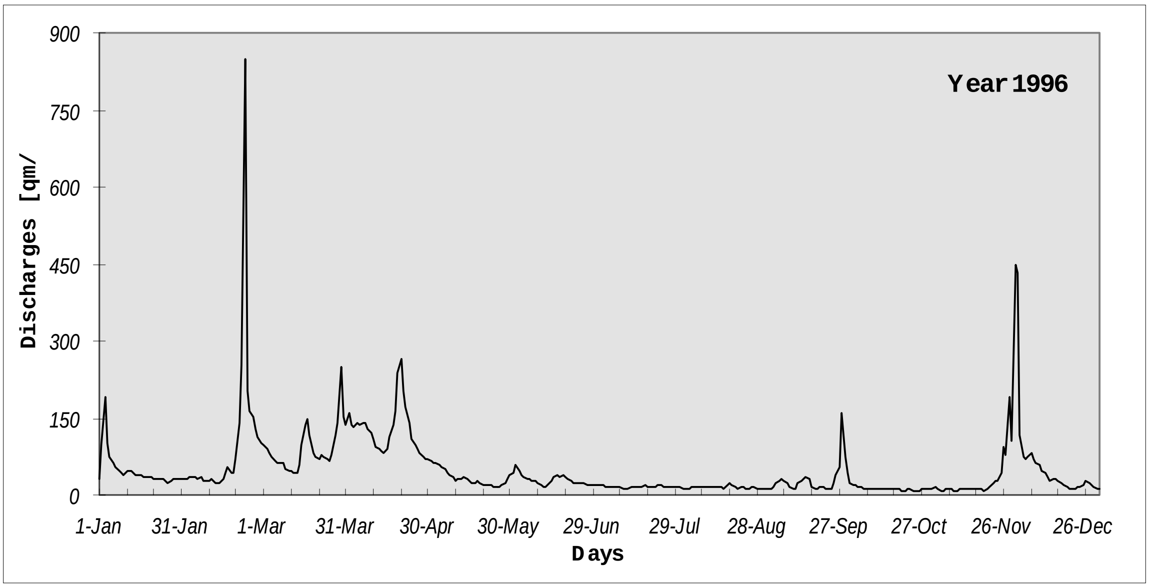
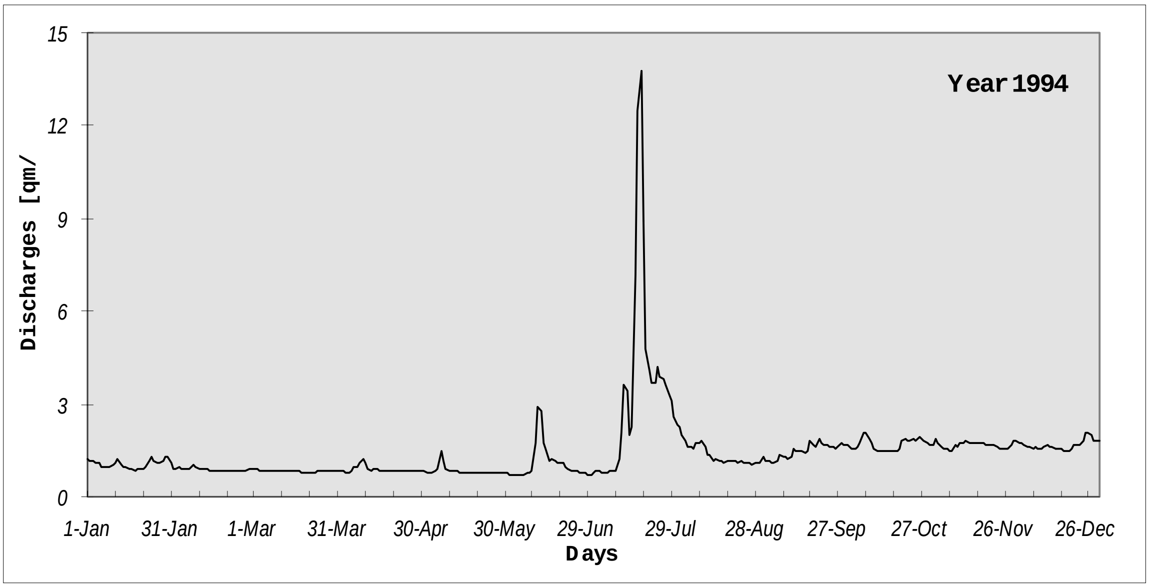
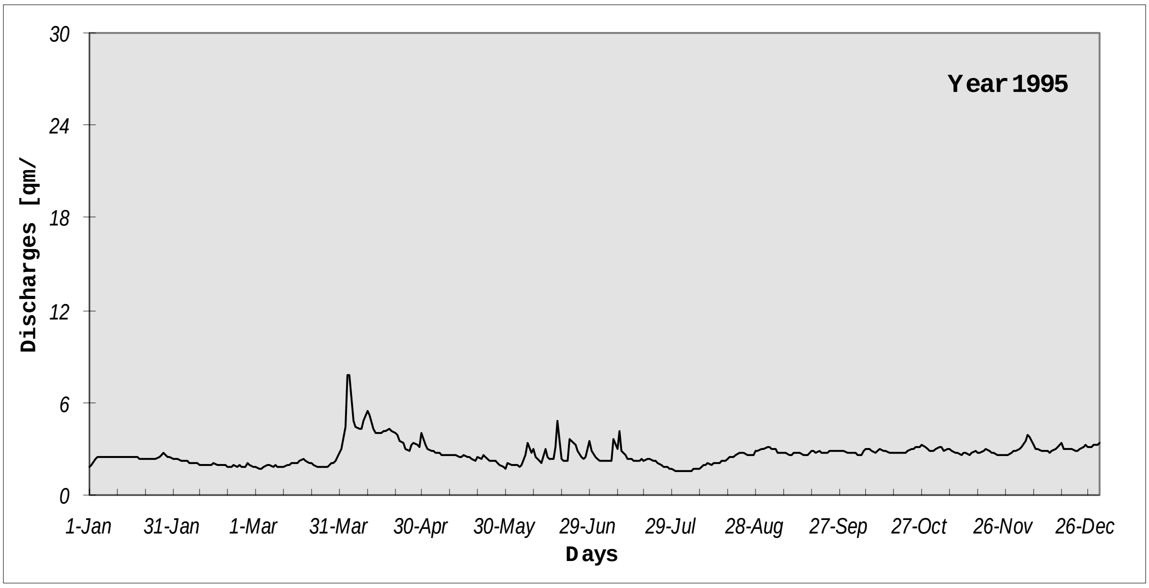


Figure 4.9.3 -19 Hydrograph of Cherni Lom River at Shirokovo village, Station 31550





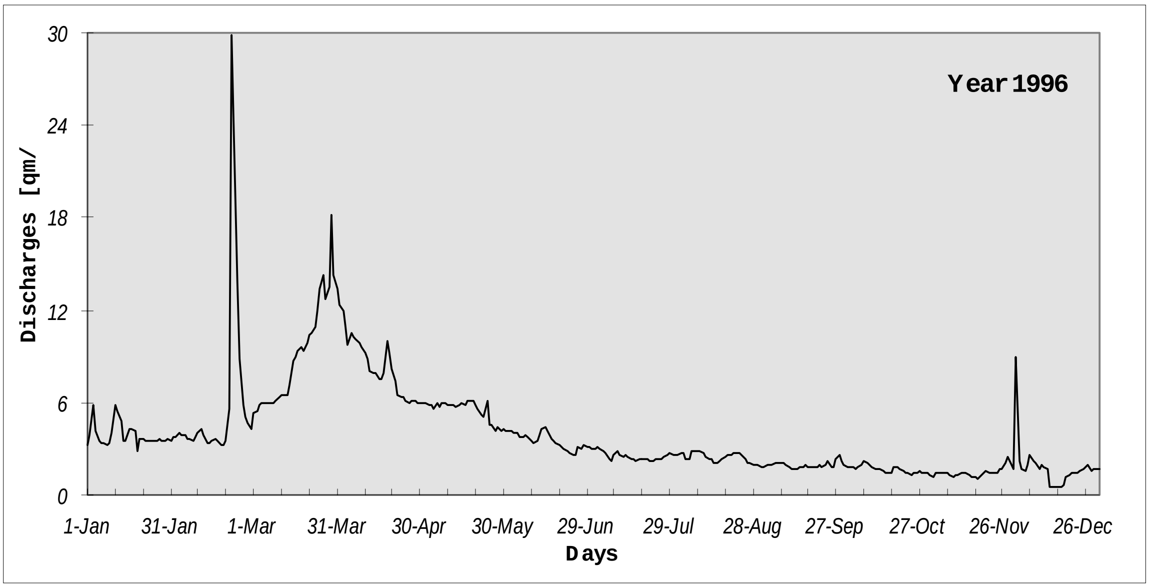
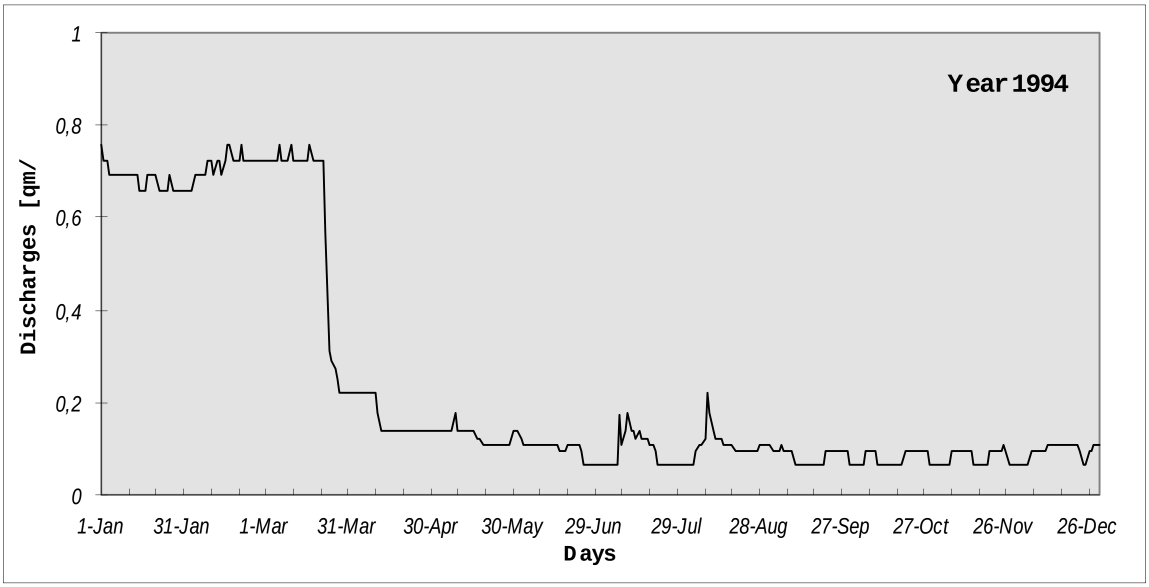
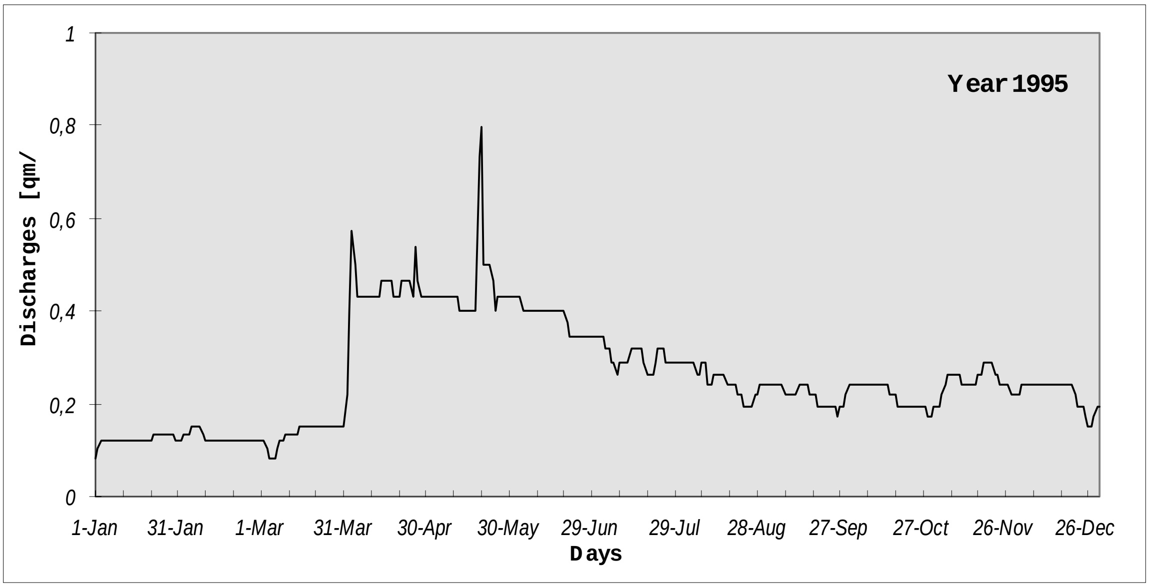


Figure 4.9.3 -20 Hydrograph of Rusenski Lom River at the town of Razgrad, Station 31700





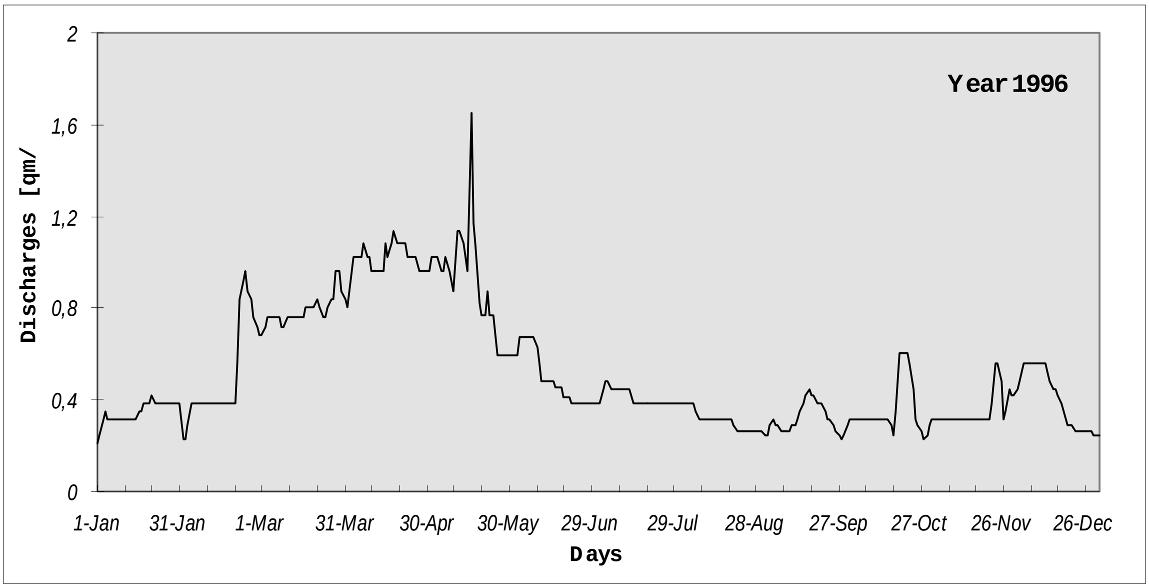
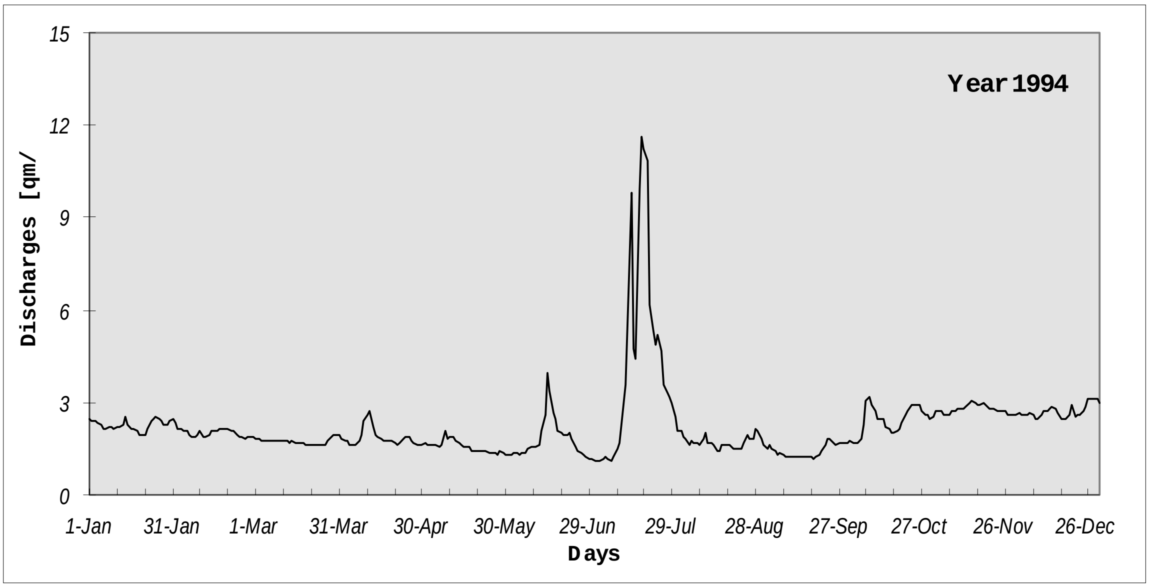
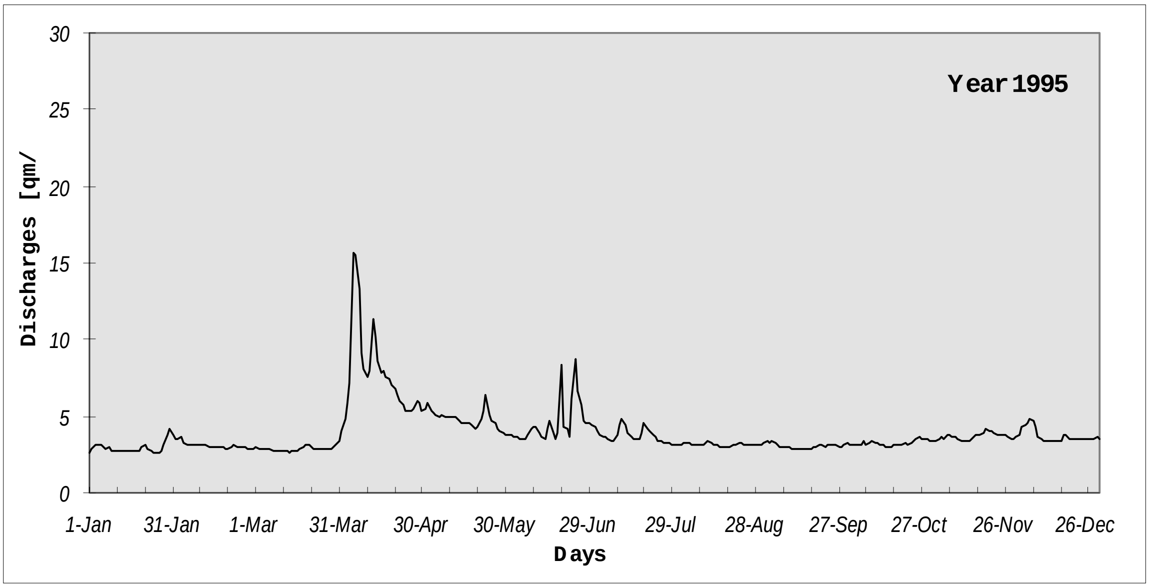


Figure 4.9.3 -21 Hydrograph of Rusenski Lom River at the town of Bozhichen, Station 31830





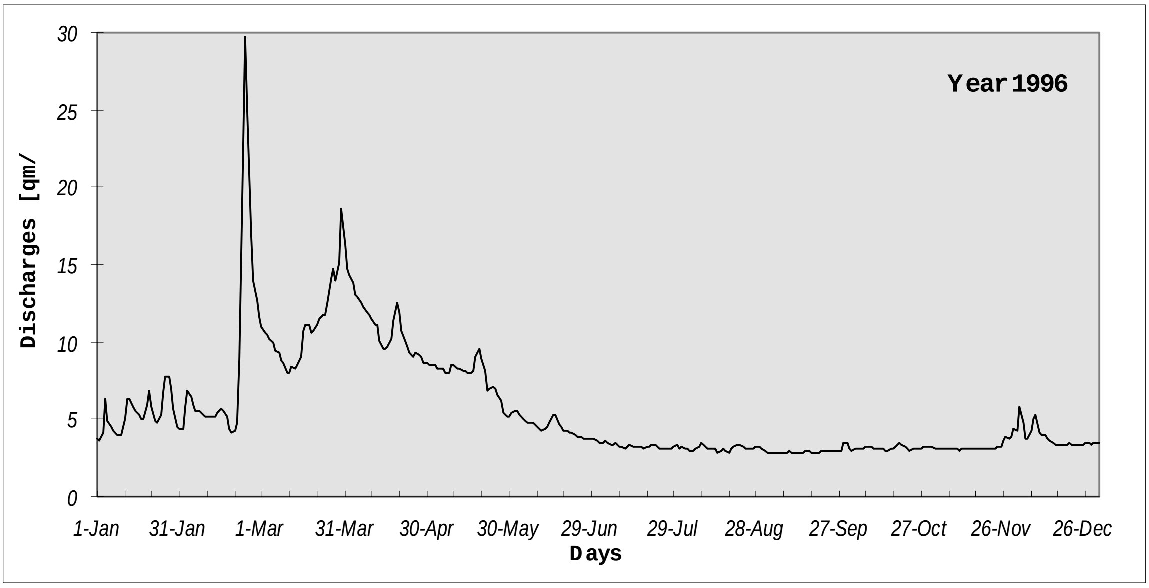
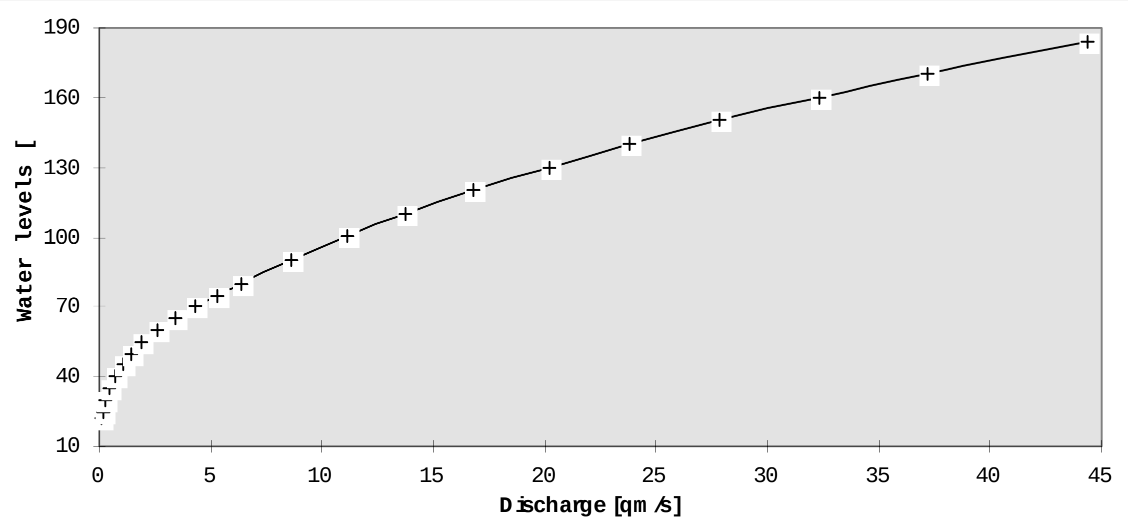
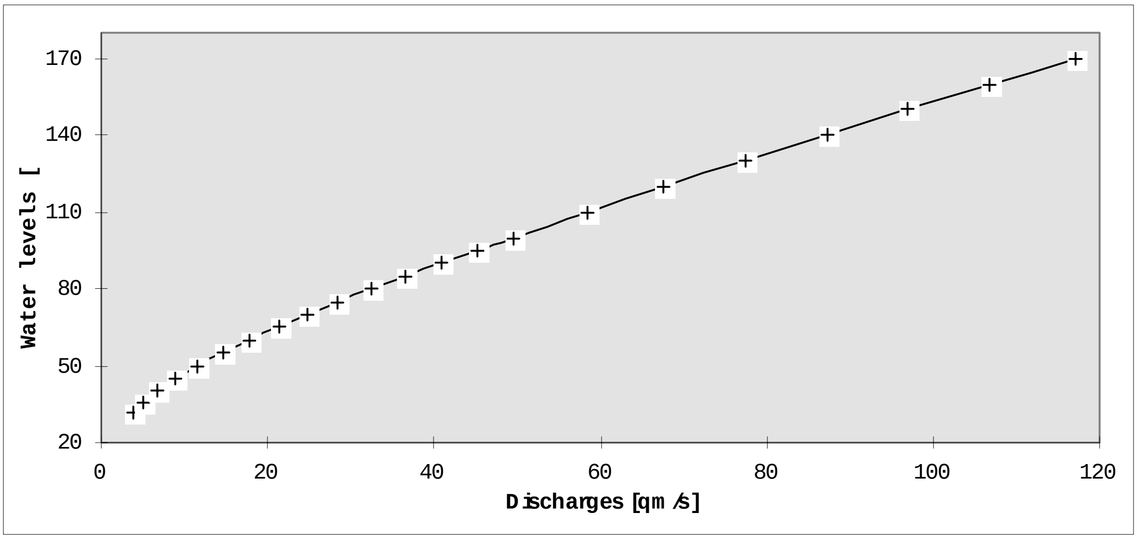


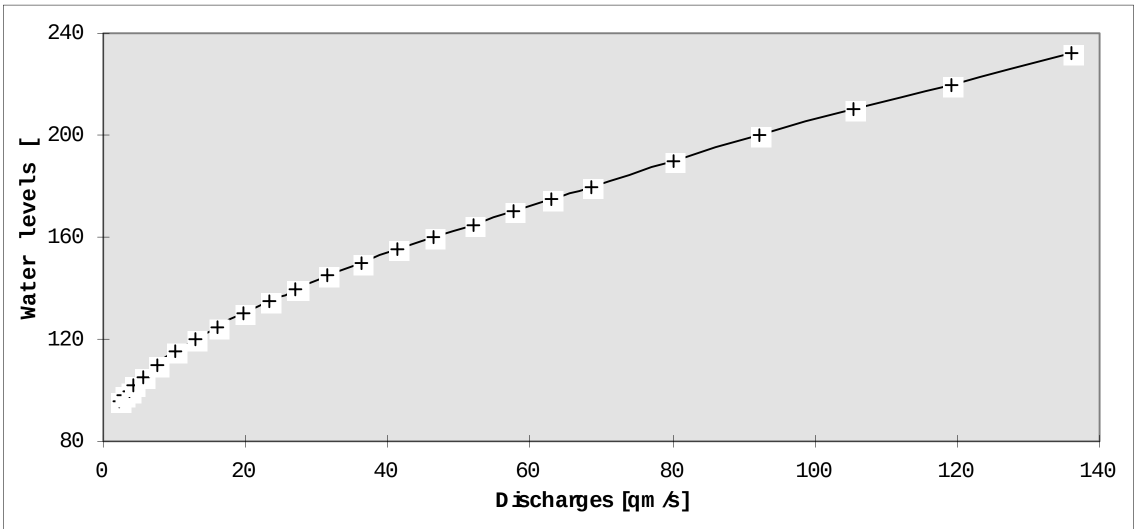
Figure 4.9.3-22 Rating curve of stations 16670, 16800, 16850 Ogosta River



Rating curve of station 16670, Ogosta River, village G. Genovo

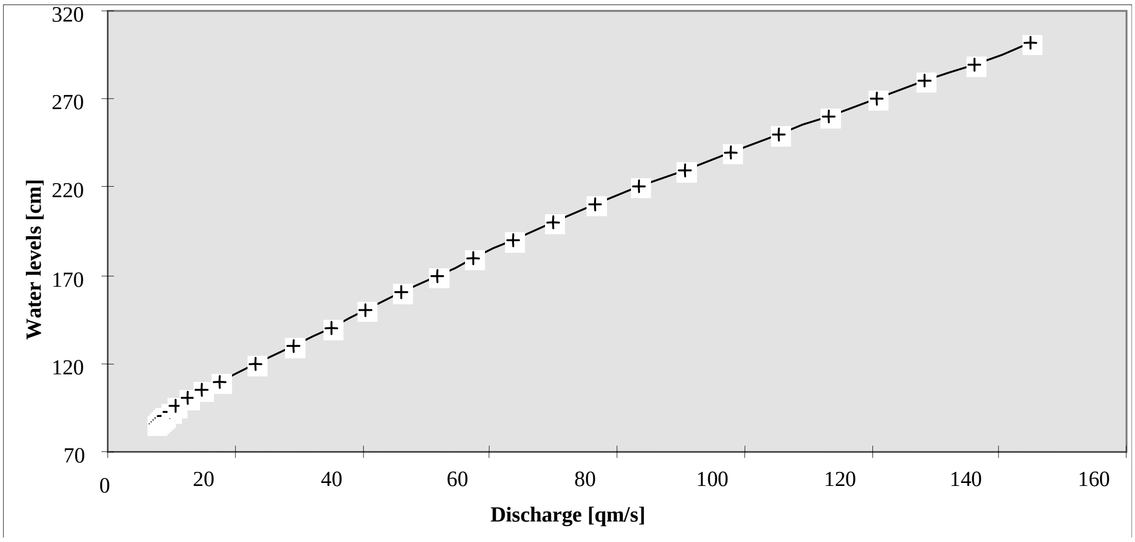


Rating curve of station 16800, Ogosta River, village Kobilyak

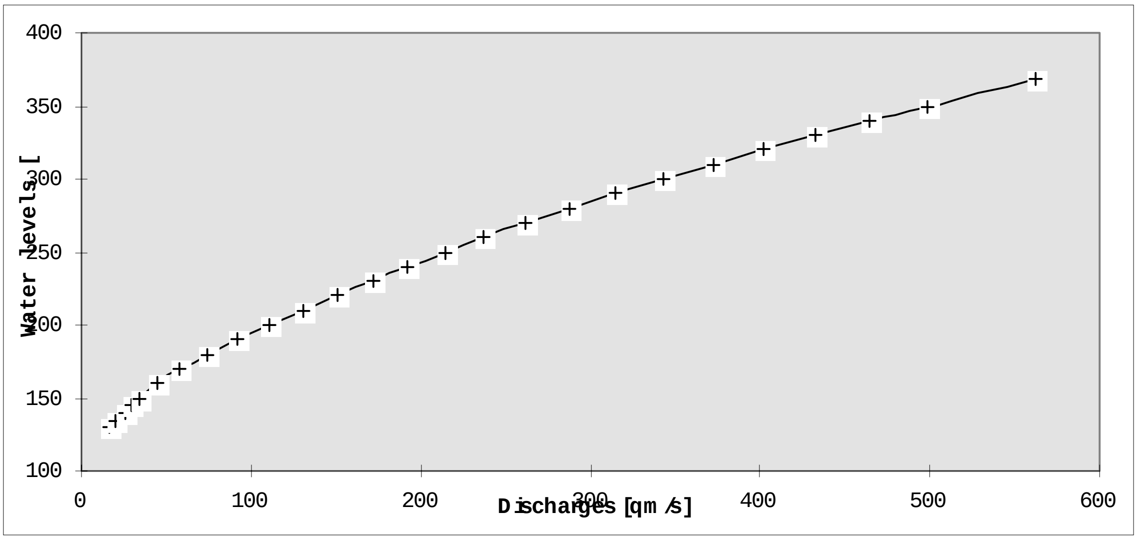


Rating curve of station 16850 Ogosta River, town Miziya

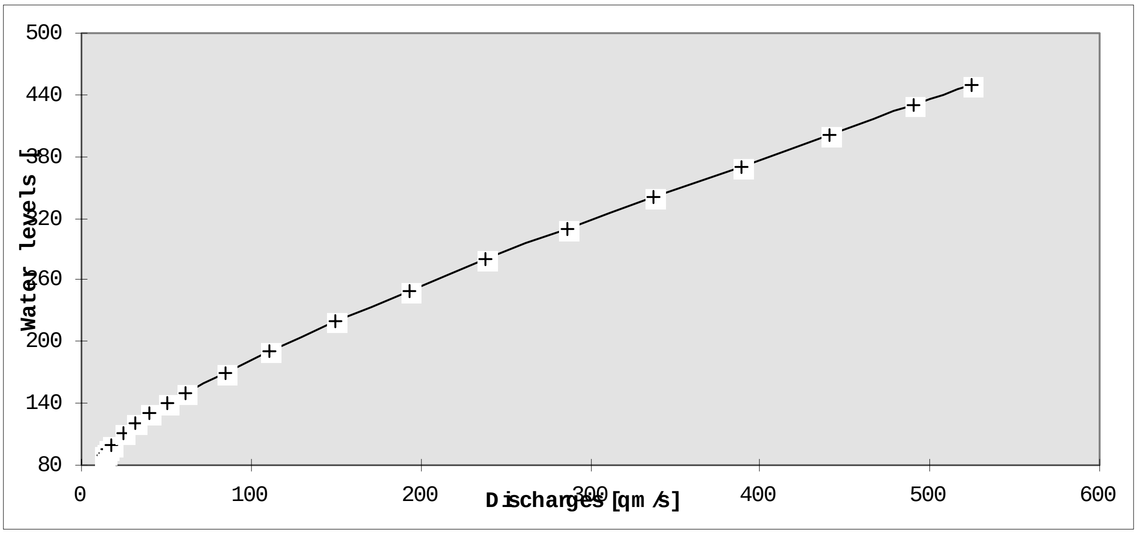
Figure 4.9.3-23 Rating curve of stations 18700, 18800, 18850 Iskar River



Rating curve of station 18700, Iskar River, town Novi Iskar

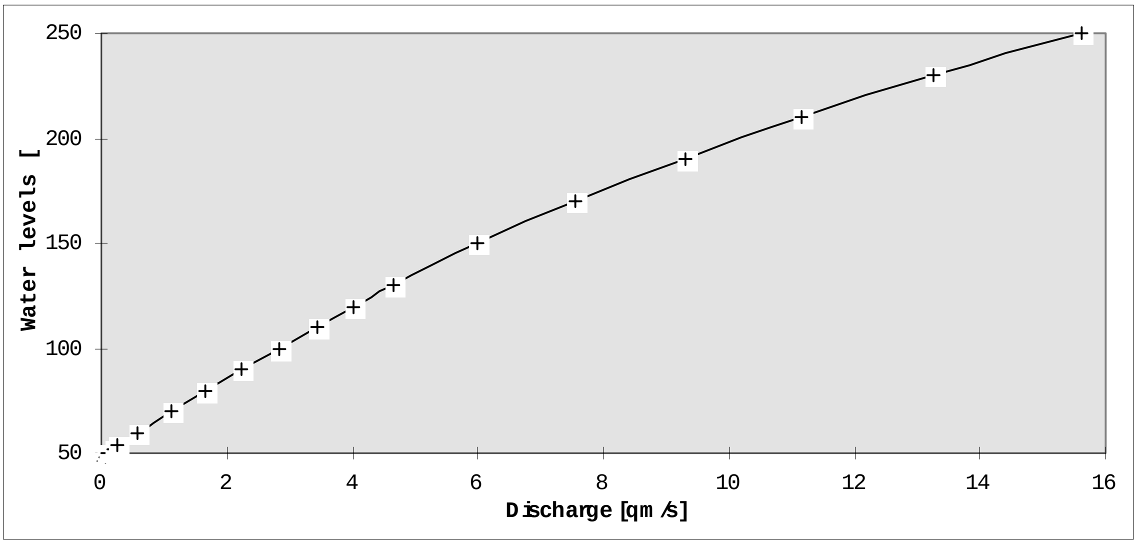


Rating curve of station 18800, Iskar River, village Kunino

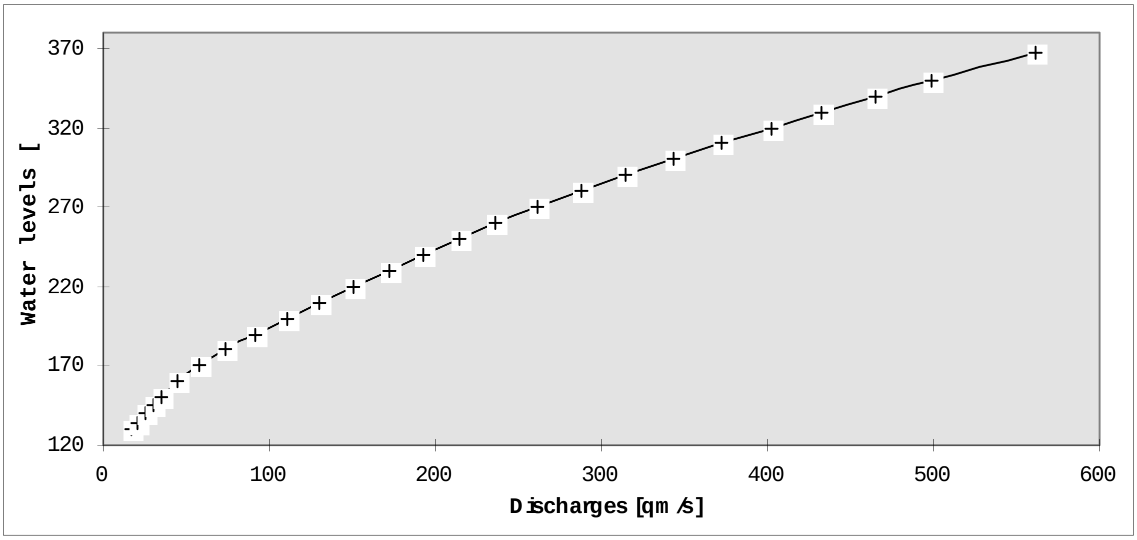


Rating curve of station 18850, Iskar River, village Oryahovitza

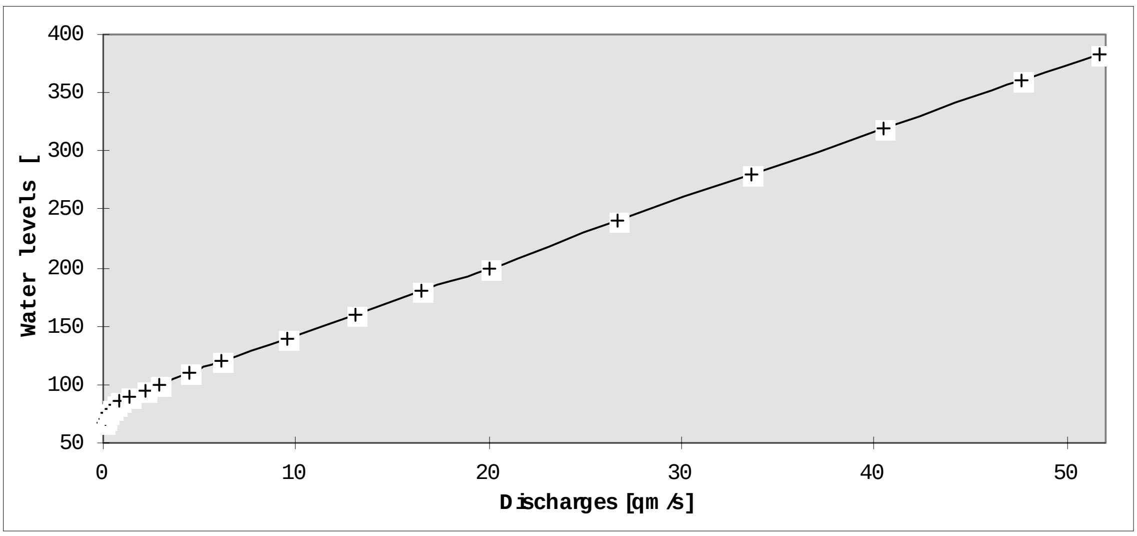
Figure 4.9.3-24 Rating curve of stations 17650, 17850 Skat River, 23150 Golyama River



Rating curve of station 17650, Skat River at village Nivyanin

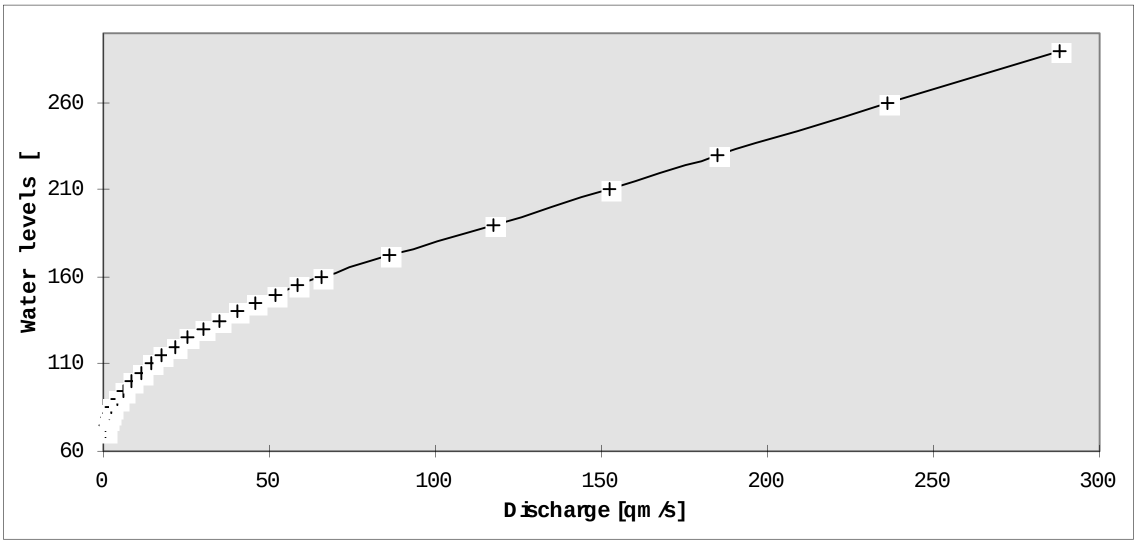


Rating curve of station 17850, Skat River at town Mizia

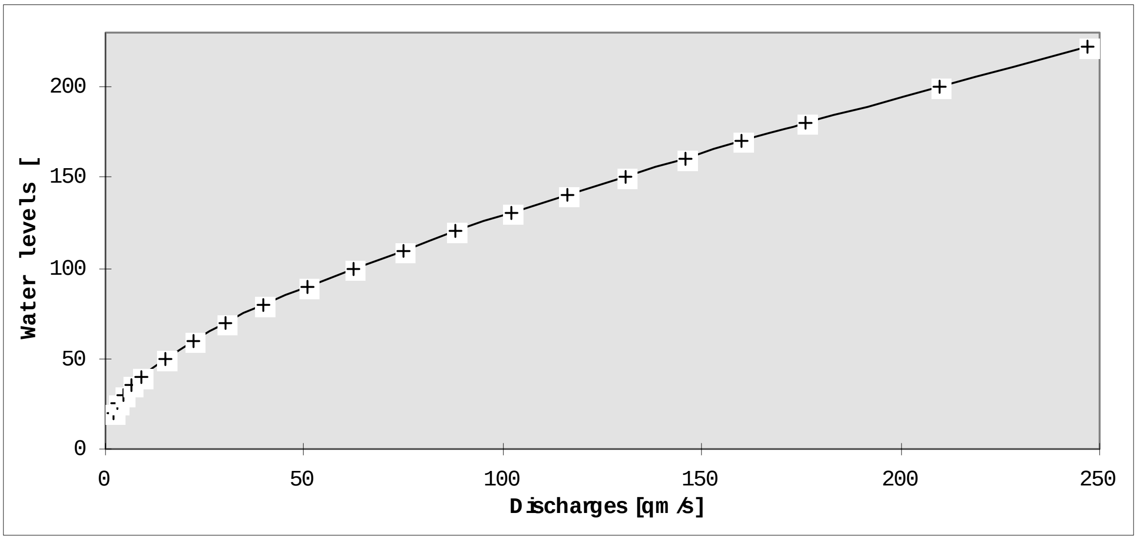


Rating curve of station 23150, Golyama Reka River at town Strajitza

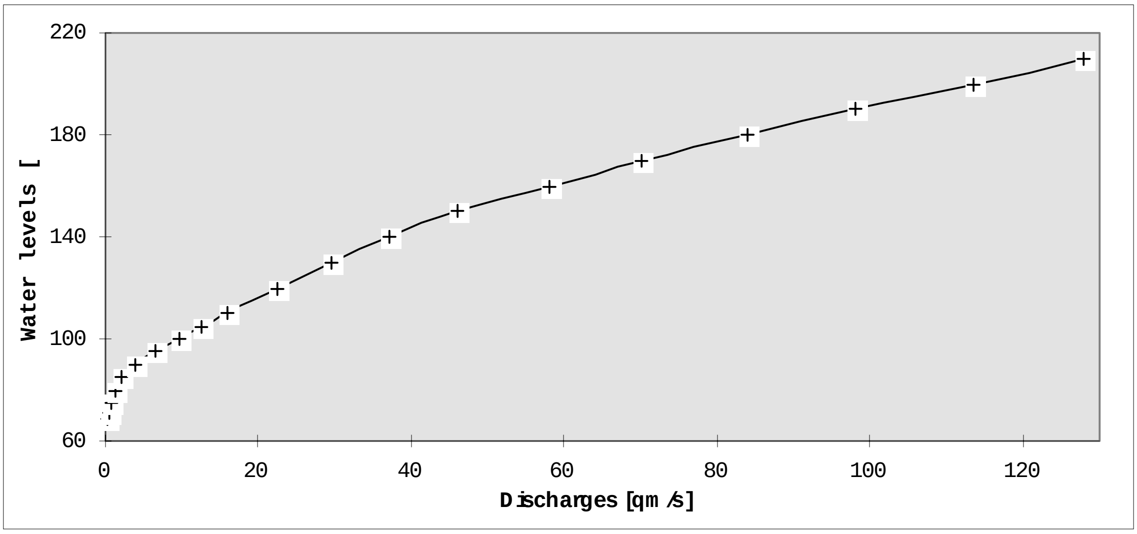
Figure 4.9.3-25 Rating curve of stations 21750, 21800 Vit River, 23500 Golyama River



Rating curve of station 21750, Vit River at village Sadovetz

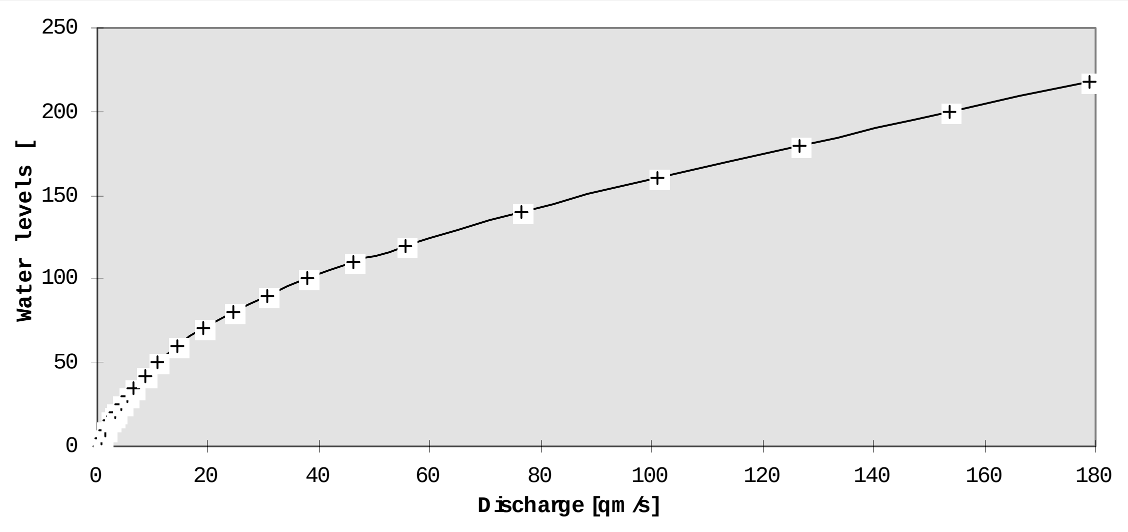


Rating curve of station 21800, Vit River at village Tarnyane

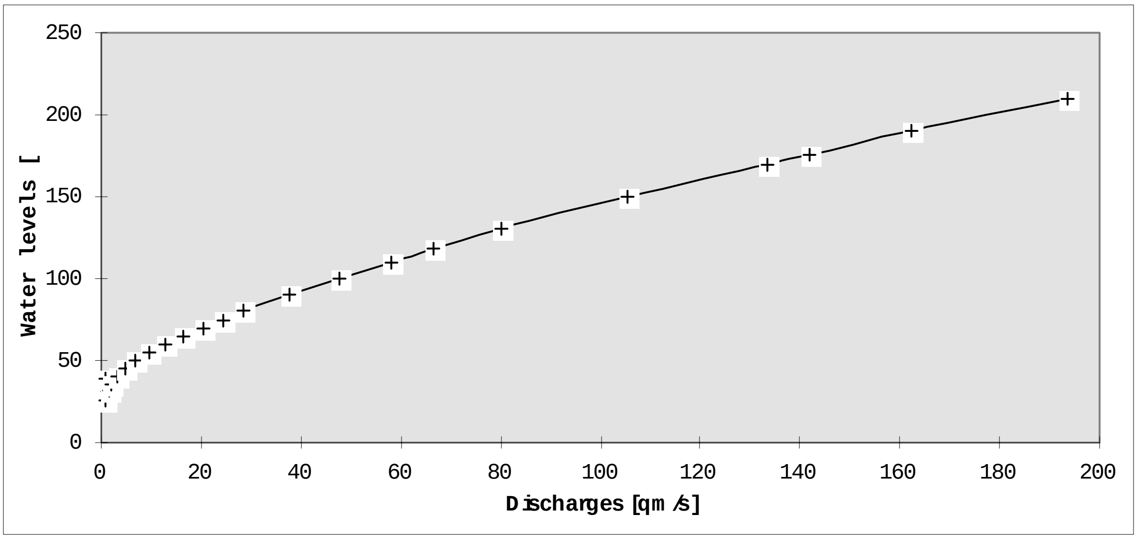


Rating curve of station 23500, Rositza River at town Sevlievo

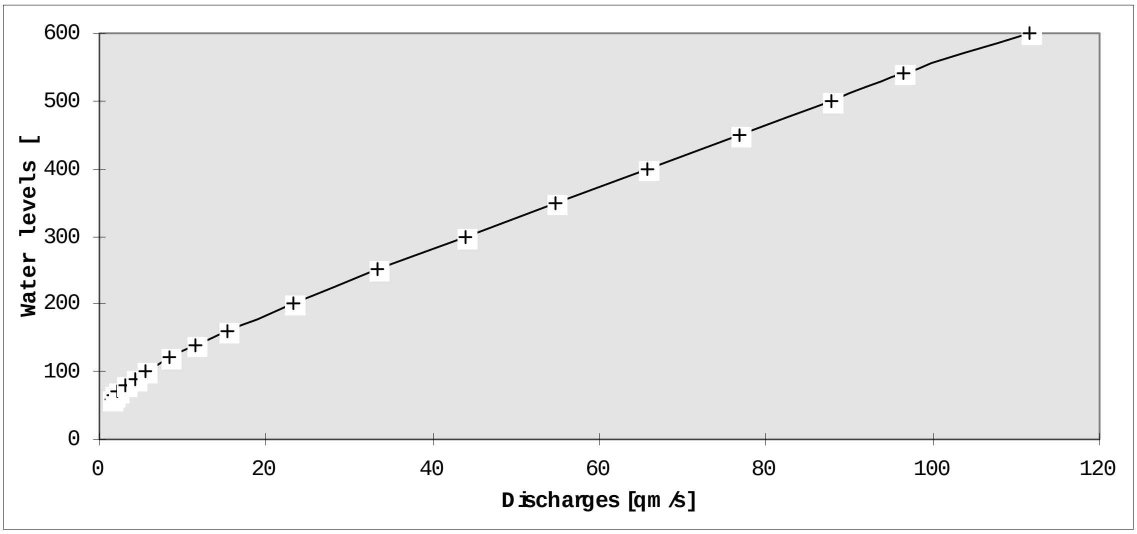
Figure 4.9.3-26 Rating curve of stations 22700, 22750, 22800 Ossam River



Rating curve of station 22700, Osam River, town Troyan

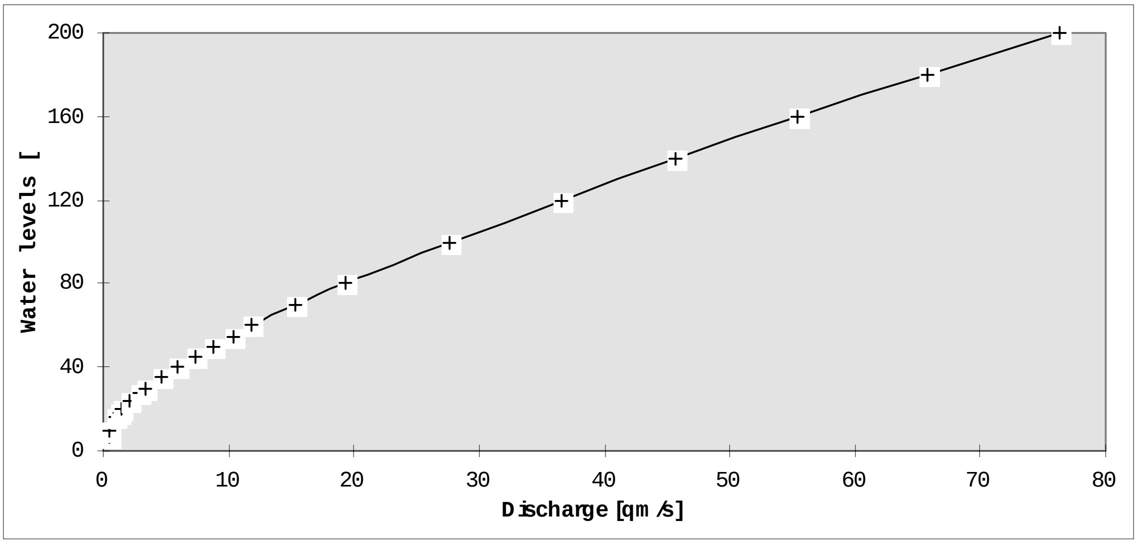


Rating curve of station 22750, Osam River, town Lovech

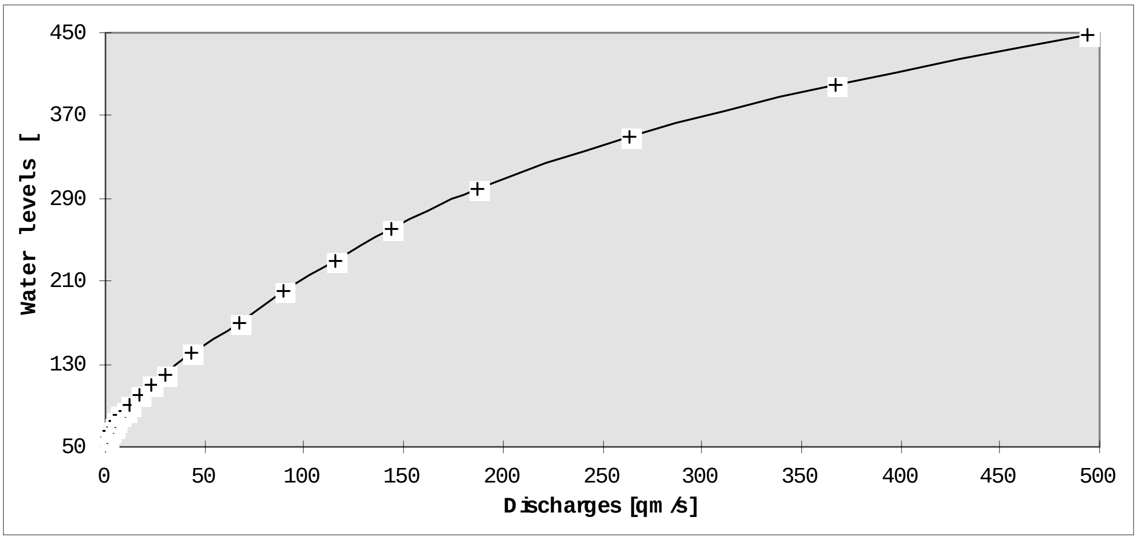


Rating curve of station 22750, Osam River, town Lovech

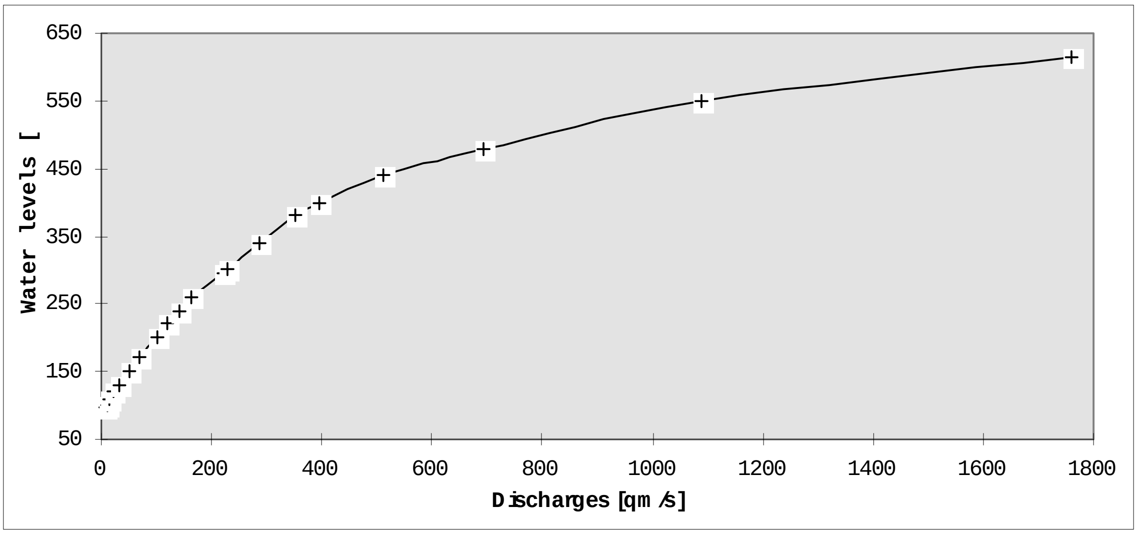
Figure 4.9.3-27 Rating curve of stations 23650, 23700, 23850 Yantra River



Rating curve of station 23650, Yantra River, town Gabrovo

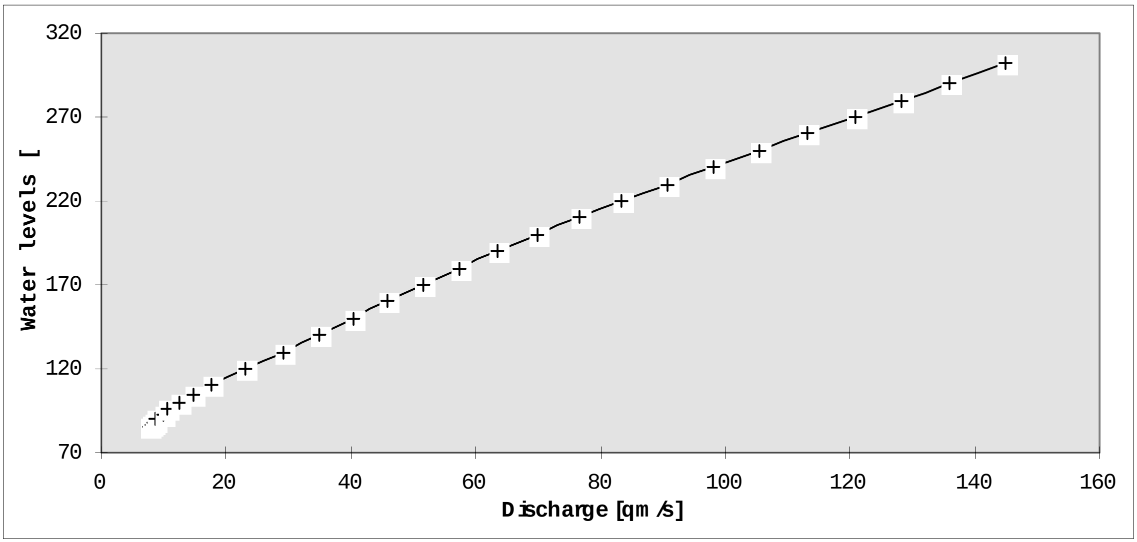


Rating curve of station 23700, Yantra River, town Tarnovo

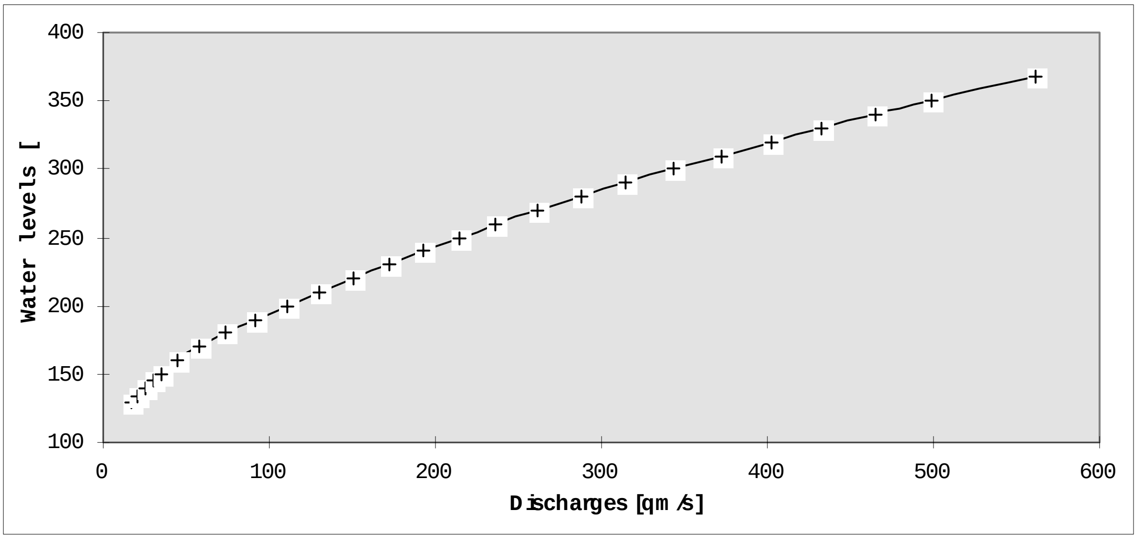


Rating curve of station 23850, Yantra River, village Karantzi

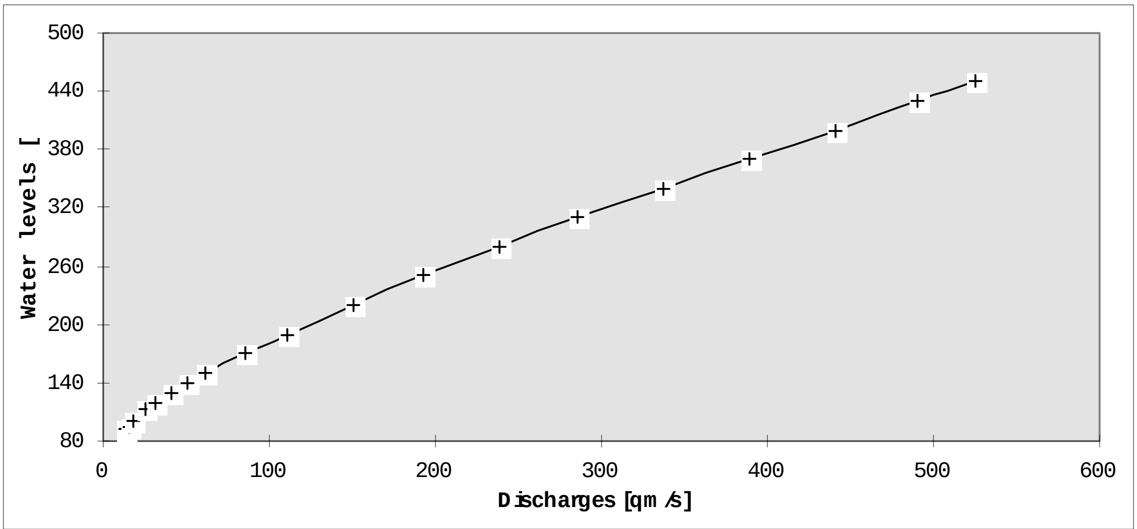
Figure 4.9.3-28 Rating curve of stations 31550, 31700, 31830 Russenski Lom & Tributaries



Rating curve of station 31550, Cherni Lom River at village Shirokovo



Rating curve of station 31700, Rusenski Lom River at Razgrad



Rating curve of station 31830, Rusenski Lom River at town Bojichen

Table 4.9.1-1 Discharge rating curves (1990 - 1996)

Novo Selo		Lom		Oryahovo		Svishtov		Russe		Silistra	
H	Q	H	Q	H	Q	H	Q	H	Q	H	Q
cm	*m^3/s*	*cm*	*m^3/s*	*cm*	*m^3/s*	*cm*	*m^3/s*	*cm*	*m^3/s*	*cm*	*m^3/s*
1	2	3	4	5	6	7	8	9	10	11	12
20	1834	80	2000	-30	2000	0	2006	-42	2000	-5	2000
40	2000	100	2174	0	2264	50	2543	0	2354	0	2044
60	2171	150	2637	50	2728	100	3111	50	2811	50	2550
80	2348	200	3131	100	3235	150	3710	100	3305	100	3097
100	2531	250	3656	150	3782	200	4339	150	3837	150	3682
150	3013	300	4214	200	4370	250	4999	200	4406	200	4305
200	3530	350	4803	250	4998	300	5690	250	5012	250	4964
250	4081	400	5423	300	5665	350	6411	300	5654	300	5657
300	4665	450	6076	350	6371	400	7164	350	6333	350	6384
350	5282	500	6760	400	7116	450	7946	400	7048	400	7144
400	5930	550	7476	450	7900	500	8760	450	7799	450	7935
450	6609	600	8223	500	8723	550	9604	500	8586	500	8756
500	7320	650	9002	550	9583	600	10479	550	9408	550	9608
550	8060	700	9813	600	10482	650	11384	600	10265	600	10489
600	8830	750	10655	650	11418	700	12320	650	11158	650	11399
650	9629	800	11530	700	12392	750	13287	700	12085	700	12337
700	10457	850	12435	750	13403	800	14284	750	13047	750	13303
750	11314	900	13373	800	14452			800	14044	800	14295
800	12198	932	14000								
850	13111										
900	14051										

Table 4.9.2-2 Duration curves for the borders of the Bulgarian Section

HM Station	Novo selo - km.833.6				Silistra - km.375.5			
Duration	Q[1]	Q	Q	R[2]	Q	Q	Q	R
T [days]	m^3/s	m^3/s	m^3/s	kg/s	m^3/s	m^3/s	m^3/s	kg/s
Period	*1941- 1980*	*1981- 1996*	*1994-1996*	*1994-1995*	*1941- 1980*	*1981- 1996*	*1994-1996*	*1994-1995*
1.	10583.	10366.	9955.	906.	11091.	10468.	10237.	3699.
2.	10526.	10156.	9581.	462.	11067.	10422.	10196.	2734.
5.	10348.	9747.	9273.	419.	10899.	10161.	10032.	2149.
10.	10033.	9406.	9042.	394.	10653.	9771.	9866.	1812.
20.	9425.	8686.	8471.	355.	10202.	9283.	9223.	1518.
30.	8945.	8014.	7726.	306.	9735.	8616.	8457.	1349.
40.	8515.	7444.	7295.	285.	9349.	8097.	7981.	1195.
60.	7683.	6702.	6945.	245.	8615.	7342.	7589.	1029.
90.	6855.	5865.	6131.	183.	7738.	6486.	6610.	896.
120.	6098.	5208.	5602.	134.	6890.	5722.	6031.	791.
150.	5375.	4486.	4541.	101.	6012.	4981.	4930.	552.
180.	4648.	3839.	3919.	71.	5200.	4269.	4202.	404.
210.	3921.	3360.	3484.	58.	4418.	3715.	3920.	277.
240.	3320.	2963.	3129.	50.	3722.	3344.	3590.	204.
270.	2912.	2669.	2954.	43.	3225.	3072.	3374.	150.
300.	2699.	2535.	2838.	36.	3003.	2906.	3249.	114.
330.	2619.	2526.	2793.	36.	2948.	2835.	3247.	108.
365.	2596.	2526.	2793.	36.	2934.	2835.	3247.	108.

[1] Runoff in [m^3/s]
[2] Suspended Sediment Load in [kg/s]

Table 4.9.3-1 Monthly runoff discharges for the Bulgarian section of the Danube River

HMS Novo selo **km 833.6**

Month	1	2	3	4	5	6	7	8	9	10	11	12
Monthly Water Discharges Q [m^3/s]												
Minimum												
1994	5637	4226	5025	5351	4674	4790	2827	2180	2494	2326	2773	2711
1995	2944	4868	4694	6169	6130	6353	3547	2833	3447	2778	2608	3557
1996	4557	2769	2879	7102	5885	3517	3240	3114	3162	4157	3942	5619
Mean												
1994	7927	5554	5810	7852	6735	5859	3638	2528	3141	2890	3669	3330
1995	4643	6738	7063	7958	7606	7448	6128	3391	5716	3736	3984	4725
1996	7594	4791	4801	8982	7784	5186	4799	3579	5641	6546	6073	7554
Maximum												
1994	9303	6728	6728	10393	9791	6879	4801	3238	4063	3861	4403	4895
1995	6908	8902	8825	9777	8548	8934	9059	4092	6798	5582	6287	9043
1996	9794	6527	7355	10172	9664	7978	6039	4344	8037	8671	8763	9311

HMS Silistra **km.375.5**

Month	1	2	3	4	5	6	7	8	9	10	11	12
Monthly Water Discharges Q [m^3/s]												
Minimum												
1994	7360	5143	5065	6171	5665	5831	3605	2471	2855	2836	2779	3259
1995	3274	3993	6353	7016	7530	7386	4674	3242	3567	3327	3125	4329
1996	6385	4235	4400	7300	7807	4049	4118	3632	3599	5405	5036	7109
Mean												
1994	8905	6470	6183	7866	8002	6423	4303	2799	3161	3209	3665	3719
1995	4674	6642	7427	8354	8319	7993	7058	3696	5575	4378	3952	4893
1996	8729	5516	5398	9926	8720	6161	5045	3811	5297	6975	6336	8220
Maximum												
1994	9518	7141	6774	10102	10552	7079	5692	3509	3595	3692	4155	4296
1995	6084	7763	8389	9381	9097	8817	8633	4495	6723	6312	6071	7002
1996	10174	7285	6693	10779	9585	8424	5522	4164	7596	8268	7596	9289

Table 4.9.3-2 Maximum discharges

No.	Station	River, gauging station Location	Basin area [km^2]	Discharges [m^3/s] occurring once for the period [years]:				
				5	10	20	30	50
1	16670	Ogosta, G.Genovo	350.0	190	230	290	310	350
2	16800	Ogosta, Kobilyak	2250.0	445	550	660	720	820
3	16850	Ogosta, Mizia	3112.0	490	645	740	820	920
4	17650	Skat, Nivyanin	252.0	70	110	150	180	225
5	17850	Skat, Mizia	1035.0	140	210	280	350	420
6	18700	Iskar, NovyIskar	3662.0	315	415	510	570	650
7	18800	Iskar, Kunino	6697.0	640	760	870	930	1000
8	18850	Iskar, Oryahovitza	8366.0	720	870	740	1120	1240
9	21750	Vit, Sadovetz	1750.0	365	450	540	590	650
10	21800	Vit, Tarnyane	2236.0	400	530	750	840	950
11	22700	Osam, Troyan	458.1	415	580	760	880	1050
12	22750	Osam, Lovech	908.5	345	480	630	730	850
13	22800	Osam, Izgrev	2154.0	245	310	375	410	455
14	23150	Golyamareka, Strajitza	605.0	90	115	155	180	215
15	23500	Rositza, Sevlievo	958.0	550	790	1025	1180	1400
16	23650	Yantra, Gabrovo	282.1	185	265	345	410	485
17	23700	Yantra, Cholakovtzy	1289.0	600	810	1060	1170	1340
18	23850	Yantra, Karantzy	6860.0	1030	1360	1700	1950	2250
19	31550	Cherni Lom, Shirokovo	1383.0	65	90	120	145	175
20	31700	Bely Lom, Razgrad	378.0	30	57	90	120	160
21	31830	Rusensky Lom, Bojichen	2800.0	60	88	120	145	180

4.9.3-3 Monthly and annual mean discharges

Station		Months												Annual
No.	Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	mean
16670	94	1.169	1.574	2.321	8.894	8.916	.859	2.714	.319	.212	.406	.560	.667	2.388
16670	95	5.765	2.829	3.523	11.897	9.192	3.073	1.288	1.568	1.451	.833	1.713	21.184	5.390
16670	96	7.495	6.904	12.233	15.212	7.120	1.324	.249	.306	3.380	4.047	7.162	11.275	6.385
16800	94	3.581	3.507	3.635	7.597	13.323	4.814	8.608	4.902	6.249	5.632	5.993	5.593	6.141
16800	95	10.038	10.372	9.051	29.826	29.685	15.482	5.849	5.376	4.978	4.700	6.680	13.079	12.084
16800	96	27.281	23.890	26.082	45.078	34.682	6.982	4.657	4.290	11.013	7.260	6.625	13.085	17.544
16850	94	4.891	4.885	5.249	14.026	21.513	5.078	9.551	4.836	6.568	4.287	4.324	4.261	7.476
16850	95	9.584	11.614	8.122	28.027	30.407	16.246	5.929	5.122	5.338	5.113	6.276	11.774	11.943
16850	96	29.849	21.033	23.791	49.409	38.621	4.419	3.640	2.530	7.506	6.630	4.763	7.576	16.625
17650	94	.054	.054	.054	.057	.188	.070	.065	.026	.000	.000	.000	.000	.047
17650	95	.249	.241	.111	1.270	.577	.386	.214	.197	.085	.011	.014	.111	.288
17650	96	.267	1.669	1.896	1.310	.645	.328	.039	.027	.047	.047	.033	.152	.533
17850	94	.860	.815	.879	.653	.775	.240	.194	.136	.140	.441	.472	.759	.530
17850	95	2.432	1.461	1.007	2.634	.958	.610	.844	.436	.460	.456	.514	.847	1.052
17850	96	1.537	2.298	2.788	4.482	1.839	.646	.351	.422	.584	.595	.538	.741	1.395
18700	94	11.665	11.139	11.457	16.158	17.265	11.740	11.385	9.734	9.495	10.314	10.047	9.090	11.625
18700	95	9.936	11.331	10.291	14.183	22.500	13.445	10.800	9.254	10.546	10.038	12.298	15.143	12.489
18700	96	15.692	28.900	25.364	46.442	28.161	11.541	8.810	9.598	14.809	11.780	13.119	18.682	19.334
18800	94	23.701	23.340	25.711	51.970	50.983	27.717	30.849	18.144	15.485	18.932	20.290	17.640	27.074
18800	95	29.163	38.664	32.397	77.061	85.117	50.228	26.990	20.367	20.431	19.487	29.145	62.676	40.961
18800	96	47.528	140.670	63.650	159.565	90.718	29.314	18.852	17.264	28.063	27.244	33.647	61.718	59.381
18850	94	20.068	19.901	22.581	44.428	47.255	25.361	25.579	15.273	13.767	16.762	19.088	17.936	24.015
18850	95	27.857	36.777	33.430	76.775	86.624	55.470	32.963	21.715	22.728	19.785	27.220	44.024	40.422
18850	96	44.997	78.726	61.523	135.522	85.654	31.296	15.939	15.409	29.968	27.281	31.185	48.110	50.242
21750	94	.460	.497	.544	4.439	4.791	1.796	7.967	1.390	.946	.578	.848	.614	2.086
21750	95	4.105	3.659	2.725	20.058	23.198	14.512	5.296	1.156	.938	.635	4.950	6.882	7.343
21750	96	6.441	14.315	13.663	31.687	14.755	2.391	1.714	1.693	7.103	5.862	3.507	8.129	9.223
21800	94	.750	.613	.432	4.131	4.019	2.669	10.062	.339	.339	.434	.833	.857	2.137
21800	95	5.625	3.343	1.268	26.371	25.485	13.851	5.870	.865	1.712	1.372	7.197	11.280	8.691
21800	96	8.698	19.522	18.783	44.054	22.921	3.926	2.418	3.754	10.494	9.673	8.038	13.975	13.793
22700	94	.653	.648	2.455	10.034	5.773	3.178	9.941	2.538	.576	.805	.632	1.499	3.245
22700	95	3.564	5.038	6.037	17.621	14.932	12.247	12.313	2.915	2.115	.807	3.133	6.855	7.300
22700	96	5.670	7.640	5.920	17.026	10.115	3.058	1.001	.662	3.263	2.245	5.191	7.612	5.759
22750	94	1.066	1.193	3.451	12.093	7.065	5.435	11.789	2.756	.828	1.205	1.205	2.079	4.197
22750	95	6.368	8.191	10.378	29.911	22.931	17.391	18.470	6.844	4.126	1.718	5.686	12.461	12.047
22750	96	10.988	17.299	13.361	29.806	15.752	4.908	1.937	1.130	4.781	3.298	7.536	9.598	9.974
22800	94	1.083	.813	1.450	10.766	5.794	2.431	10.340	1.454	.345	1.571	1.597	2.763	3.384
22800	95	7.021	8.055	8.548	28.586	19.778	11.016	16.244	5.465	4.056	2.933	5.778	10.498	10.668
22800	96	10.088	15.904	17.943	27.006	14.993	5.107	2.218	2.276	4.024	4.579	5.345	11.214	10.023
23150	94	1.709	3.255	.211	3.491	.628	.241	.284	.191	.145	.092	.072	.080	.846
23150	95	.227	.339	.333	4.912	.429	1.006	.627	.410	.315	5.704	1.709	.585	1.385
23150	96	1.265	8.113	9.425	7.812	3.372	.923	.655	.611	1.640	.657	.243	.878	2.941
23500	94	.549	.819	2.502	8.473	4.855	3.996	10.738	1.269	.228	1.292	1.248	3.358	3.295
23500	95	7.878	7.968	9.073	21.070	12.489	13.441	14.385	3.255	2.453	.981	4.294	7.528	8.724
23500	96	9.640	17.013	14.437	20.475	14.372	4.840	.827	1.501	8.191	4.261	7.190	12.516	9.558
23650	94	.771	.846	.982	2.659	1.259	1.099	1.110	.449	.437	.570	.555	1.000	.977
23650	95	3.262	3.805	3.438	12.542	5.135	4.592	3.288	1.167	1.445	.788	1.634	1.686	3.547
23650	96	4.145	5.846	4.464	10.111	3.740	.900	.515	.519	2.508	.585	4.362	5.641	3.590
23700	94	2.599	3.052	3.082	8.975	3.054	2.236	2.676	1.959	1.793	2.100	2.233	3.864	3.129
23700	95	11.365	12.280	11.441	48.716	14.093	13.348	13.966	3.644	3.230	2.048	4.594	6.455	12.038
23700	96	11.026	31.269	25.404	31.930	11.975	4.856	2.124	1.575	5.322	2.050	12.094	17.527	12.992
23850	94	10.537	10.485	10.211	24.291	9.928	10.630	13.426	8.707	4.452	4.894	5.264	6.328	9.911
23850	95	19.158	30.875	31.575	136.587	37.278	36.687	37.723	11.507	12.992	9.614	13.734	22.085	33.155
23850	96	46.782	96.714	89.665	126.791	33.384	28.479	16.215	14.404	28.670	12.269	42.372	49.986	48.464
31550	94	1.060	.876	.828	.872	.825	1.081	3.408	1.400	1.479	1.698	1.679	1.684	1.413
31550	95	2.396	2.021	1.958	4.185	2.514	2.626	2.344	2.187	2.785	2.840	2.784	3.094	2.645
31550	96	3.848	6.064	9.197	8.345	5.479	3.492	2.542	2.423	1.952	1.648	1.463	1.752	4.008
31700	94	.683	.712	.615	.170	.129	.102	.095	.105	.085	.077	.080	.095	.243
31700	95	.121	.126	.132	.434	.452	.386	.302	.249	.218	.217	.247	.220	.259
31700	96	.344	.497	.788	1.009	.902	.494	.408	.306	.314	.352	.350	.398	.513
31830	94	2.270	2.018	1.746	1.864	1.562	1.805	4.175	1.729	1.427	2.402	2.761	2.714	2.210
31830	95	2.934	3.083	2.863	7.622	4.842	4.513	3.776	3.139	3.045	3.262	3.686	3.727	3.872
31830	96	5.346	8.697	11.119	10.997	7.682	4.486	3.286	3.126	2.942	3.130	3.234	3.805	5.640

Table 4.9.3-4 Monthly and annual minimum discharges

Station		Months												Annual
No.	Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	min.
16670	94	.759	.819	1.080	2.210	1.166	.436	.360	.068	.054	.061	.477	.477	.054
16670	95	1.679	1.345	1.707	3.051	3.368	.737	.379	.737	.687	.600	.533	2.467	.379
16670	96	1.906	1.799	9.608	8.649	2.589	.504	.119	.143	.504	3.062	3.928	6.175	.119
16800	94	3.400	3.400	3.400	4.300	4.949	4.300	4.300	4.300	4.800	5.170	5.579	5.579	3.400
16800	95	6.920	9.665	7.863	10.133	17.200	6.699	4.400	4.400	4.400	4.400	5.150	6.699	4.400
16800	96	16.598	14.699	7.969	17.899	11.649	4.793	4.118	3.799	4.449	5.900	5.519	6.699	3.799
16850	94	4.574	4.350	5.199	4.501	5.432	4.300	4.219	4.219	4.219	4.219	4.219	4.199	4.199
16850	95	4.300	10.100	6.500	11.158	15.823	7.099	5.099	5.000	5.000	4.900	5.300	5.300	4.300
16850	96	13.845	11.500	5.917	32.462	6.750	3.049	3.049	2.000	2.000	4.300	3.599	5.085	2.000
17650	94	.054	.054	.054	.048	.048	.054	.054	.000	.000	.000	.000	.000	.000
17650	95	.000	.079	.079	.142	.185	.224	.104	.142	.012	.012	.012	.016	.000
17650	96	.155	.009	.688	.052	.469	.028	.028	.017	.014	.021	.014	.017	.009
17850	94	.680	.680	.680	.500	.185	.129	.119	.119	.122	.144	.439	.439	.119
17850	95	1.090	.854	.680	.928	.670	.510	.389	.396	.403	.432	.454	.469	.389
17850	96	.419	.850	1.231	2.309	.981	.357	.289	.280	.324	.395	.395	.487	.280
18700	94	10.133	9.800	10.133	9.800	10.388	9.871	9.600	8.399	8.399	8.600	8.199	7.800	7.800
18700	95	7.800	9.291	8.800	9.873	10.611	8.737	7.863	7.510	9.483	7.800	9.600	11.117	7.510
18700	96	13.000	13.000	15.997	30.249	12.399	8.300	7.650	7.650	9.461	10.699	9.461	10.699	7.650
18800	94	21.559	22.300	22.300	25.700	24.000	22.300	20.500	15.000	15.000	15.000	16.000	15.000	15.000
18800	95	18.500	27.937	26.314	41.299	41.299	29.633	20.588	18.500	19.555	16.899	18.500	27.937	16.899
18800	96	23.655	30.732	44.799	118.718	40.523	20.200	16.799	16.799	20.200	21.921	21.921	30.732	16.799
18850	94	17.520	18.559	19.600	21.200	22.600	19.398	17.659	13.500	13.500	13.500	16.227	16.227	13.500
18850	95	17.899	26.916	28.216	42.945	45.249	38.446	21.963	17.700	18.399	18.399	19.200	26.457	17.700
18850	96	32.098	24.860	42.432	97.739	44.400	20.259	13.750	13.000	16.510	23.448	20.860	29.678	13.000
21750	94	.460	.460	.460	.419	.289	.200	.189	.720	.439	.439	.500	.439	.189
21750	95	.479	.819	1.016	3.450	4.542	2.802	1.053	.460	.565	.500	.585	.899	.460
21750	96	1.969	1.700	6.748	17.700	2.597	.699	.973	.699	.699	2.994	1.100	1.950	.699
21800	94	.460	.460	.421	.460	.460	.319	.319	.319	.319	.329	.469	.469	.319
21800	95	.920	.469	.469	3.637	3.637	.509	.400	.400	.509	.509	1.887	1.887	.400
21800	96	2.599	3.200	7.171	26.648	7.171	2.321	2.000	2.522	3.275	5.385	3.000	5.385	2.000
22700	94	.389	.349	.459	3.000	1.330	.970	1.090	.859	.389	.389	.389	.464	.349
22700	95	1.393	2.780	3.844	4.793	4.598	3.844	3.660	1.393	.579	.579	.579	1.680	.579
22700	96	2.779	2.779	3.250	6.903	4.919	.950	.620	.519	.519	.950	.620	1.450	.519
22750	94	.920	1.000	1.100	5.627	1.491	1.354	1.049	.899	.680	.776	.760	.899	.680
22750	95	.899	4.991	8.700	10.800	11.356	8.199	8.199	2.586	2.025	1.200	1.200	3.900	.899
22750	96	5.400	6.238	6.599	15.734	6.599	2.079	1.301	.699	.699	1.419	1.758	2.619	.699
22800	94	.726	.709	.814	2.180	1.250	1.117	1.117	.318	.200	.509	.211	1.600	.200
22800	95	3.650	5.500	5.500	8.000	8.568	4.351	5.630	3.307	2.991	2.599	2.599	3.400	2.599
22800	96	5.542	4.199	8.300	17.173	6.626	3.200	1.399	1.399	1.720	3.970	3.970	4.953	1.399
23150	94	.224	.322	.169	.185	.185	.153	.127	.153	.079	.075	.059	.068	.059
23150	95	.104	.226	.187	.448	.300	.249	.154	.134	.134	.125	.226	.249	.104
23150	96	.514	.986	3.879	4.823	.693	.805	.693	.335	.335	.100	.050	.290	.050
23500	94	.319	.259	.774	4.293	1.125	.439	.379	.319	.119	.119	.159	.870	.119
23500	95	2.520	4.738	6.250	9.528	6.642	5.500	2.779	1.049	1.049	.562	.680	2.052	.562
23500	96	5.800	6.616	5.542	12.050	8.427	1.138	.392	.349	.553	1.138	1.138	3.900	.349
23650	94	.615	.759	.686	1.090	.959	.479	.479	.360	.400	.400	.439	.479	.360
23650	95	1.090	1.916	1.763	2.920	2.079	1.200	1.052	.817	.817	.759	.759	1.052	.759
23650	96	1.480	1.480	2.079	5.386	1.340	.541	.464	.400	.431	.500	.500	1.700	.400
23700	94	1.500	1.799	1.200	2.360	.855	.489	.389	.409	.519	.259	.699	1.210	.259
23700	95	2.650	6.250	4.800	8.332	6.040	3.700	3.015	1.914	2.039	1.600	1.748	2.252	1.600
23700	96	3.089	3.673	8.756	16.368	5.776	2.969	1.115	1.000	1.050	1.435	1.200	4.380	1.000
23850	94	8.399	8.399	8.399	4.591	4.591	4.591	5.750	5.297	3.650	4.059	4.306	4.443	3.650
23850	95	5.500	17.500	18.390	33.152	18.537	16.250	11.000	9.000	7.622	6.989	9.372	11.909	5.500
23850	96	22.500	22.500	40.849	69.000	14.115	15.359	10.578	9.420	11.157	7.659	8.252	11.157	7.659
31550	94	.851	.814	.797	.797	.741	.720	.737	1.030	1.118	1.460	1.431	1.460	.720
31550	95	1.750	1.796	1.649	2.676	1.730	1.850	1.549	1.549	2.600	2.528	2.576	2.747	1.549
31550	96	2.262	3.204	5.306	5.959	4.118	2.525	2.031	1.861	1.669	1.225	1.000	.500	.500
31700	94	.628	.660	.219	.140	.109	.065	.065	.065	.065	.065	.065	.065	.065
31700	95	.079	.119	.079	.150	.372	.344	.264	.195	.172	.172	.172	.150	.079
31700	96	.195	.213	.680	.759	.591	.379	.379	.242	.230	.230	.314	.242	.195
31830	94	1.975	1.833	1.600	1.600	1.287	1.174	1.100	1.408	1.167	1.693	2.500	2.500	1.100
31830	95	2.589	2.830	2.640	3.185	3.735	3.455	3.171	2.940	2.849	3.002	3.405	3.405	2.589
31830	96	3.572	4.130	7.977	8.600	5.159	3.649	3.100	2.799	2.799	3.000	3.019	3.267	2.799

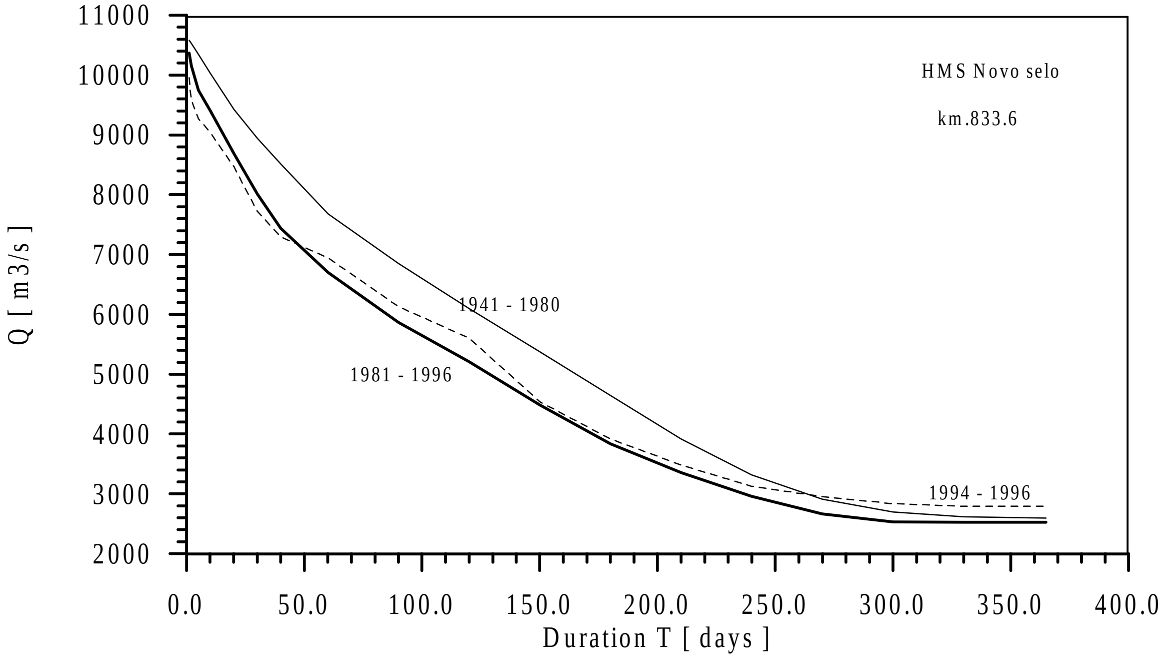
Table 4.9.3-5 Monthly and annual maximum discharges

Station No	Year	Months												Annual max.
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
16670	94	2.430	4.246	4.246	23.899	18.854	1.436	16.465	1.013	.436	1.166	.708	2.013	23.899
16670	95	11.800	6.013	5.393	44.400	19.426	5.599	5.599	8.665	6.013	1.200	5.190	42.281	44.400
16670	96	21.600	11.596	17.809	27.799	14.284	3.572	.504	.504	15.826	6.620	12.102	13.989	27.799
16800	94	5.300	3.799	4.300	37.740	64.800	7.057	19.237	9.484	14.449	6.449	6.920	6.000	64.800
16800	95	40.570	12.100	12.100	97.000	81.230	27.396	6.699	6.699	6.699	5.150	11.050	39.119	97.000
16800	96	40.799	50.479	40.799	62.020	117.000	25.502	5.900	4.793	60.201	12.240	11.649	24.799	117.000
16850	94	6.550	5.547	5.349	85.000	85.000	7.960	30.767	9.993	21.226	4.501	5.118	4.383	85.000
16850	95	59.849	17.291	14.699	136.000	116.592	28.880	7.945	5.300	6.500	5.300	9.121	43.500	136.000
16850	96	57.500	53.099	42.272	74.000	72.900	10.453	4.750	3.049	52.000	19.700	7.599	18.237	74.000
17650	94	.054	.054	.054	.100	4.800	.313	.192	.062	.000	.000	.000	.000	4.800
17650	95	8.364	.975	.224	23.950	4.806	.897	.400	.224	.185	.012	.028	.560	23.950
17650	96	.677	14.800	11.250	11.750	1.154	1.154	.133	.039	.297	.211	.175	1.294	14.800
17850	94	1.274	.930	1.178	1.090	2.890	4.400	3.135	3.635	.155	.540	.525	1.007	4.400
17850	95	7.845	4.101	1.421	13.199	1.320	.800	2.201	.555	.612	.612	.839	2.081	13.199
17850	96	2.245	9.850	9.676	9.733	9.050	.981	.427	.574	1.110	1.110	1.189	2.750	9.850
18700	94	14.266	12.600	18.633	62.799	45.027	17.250	25.274	10.913	10.646	25.770	13.413	10.388	62.799
18700	95	17.700	16.237	12.279	30.500	129.550	44.934	31.577	29.193	18.850	13.770	28.101	36.450	129.550
18700	96	24.600	145.000	59.920	79.348	47.116	18.799	14.371	17.700	61.761	16.560	36.121	55.721	145.000
18800	94	33.319	31.441	33.319	172.000	118.000	57.799	63.386	25.700	16.000	25.700	22.300	22.300	172.000
18800	95	53.700	56.732	66.783	271.062	541.000	111.000	43.491	23.299	27.937	19.555	74.114	223.312	541.000
18800	96	111.000	562.000	167.625	236.699	241.500	52.177	21.921	20.200	44.799	34.599	91.900	130.500	562.000
18850	94	22.920	21.841	27.250	156.000	137.199	50.402	41.200	19.398	14.770	18.801	22.600	18.801	156.000
18850	95	82.915	50.461	50.461	224.000	368.000	102.138	71.199	25.100	33.709	22.557	57.592	126.000	368.000
18850	96	69.165	525.000	144.569	190.054	150.000	50.500	20.259	22.116	110.500	50.500	92.708	102.813	525.000
21750	94	.460	.665	.665	23.399	18.600	32.865	59.500	3.167	1.960	1.009	1.793	2.609	59.500
21750	95	51.062	10.981	4.112	129.000	261.000	74.095	33.479	5.243	3.317	3.471	14.563	23.200	261.000
21750	96	18.600	161.500	86.000	58.627	47.000	7.330	3.352	3.750	47.000	16.297	19.177	68.500	161.500
21800	94	1.649	.680	.460	30.195	21.786	26.601	75.000	.469	.340	.919	2.141	1.483	75.000
21800	95	59.987	10.948	2.855	147.535	267.500	68.831	31.757	3.250	4.094	2.524	21.500	37.200	267.500
21800	96	23.212	160.000	85.529	77.596	48.295	11.386	2.748	5.385	48.295	22.000	35.513	57.589	160.000
22700	94	1.199	2.264	5.590	30.399	14.610	21.611	77.000	69.679	.859	3.791	1.207	5.590	77.000
22700	95	17.645	11.280	10.528	86.106	126.500	179.000	121.278	13.709	10.165	1.115	10.899	24.500	179.000
22700	96	24.399	86.400	18.690	37.099	30.650	10.920	5.400	1.736	26.416	6.387	45.200	53.799	86.400
22750	94	1.802	1.991	8.114	27.600	17.715	21.254	74.000	32.737	1.491	6.849	2.849	5.925	74.000
22750	95	41.724	13.699	13.699	119.199	127.706	49.535	142.000	38.000	13.699	2.586	13.699	36.119	142.000
22750	96	31.930	133.500	43.478	55.864	28.350	18.814	12.850	1.726	37.599	8.000	49.572	66.400	133.500
22800	94	2.180	1.001	2.180	42.000	16.049	10.500	69.400	12.761	.621	3.053	2.263	3.650	69.400
22800	95	25.127	18.162	12.218	111.500	90.522	37.203	85.883	29.290	7.300	3.691	14.762	33.500	111.500
22800	96	41.799	96.500	52.624	44.000	25.213	17.173	3.409	2.779	26.932	9.300	11.476	52.599	96.500
23150	94	3.873	4.300	.349	8.899	6.178	.624	1.099	.295	.204	.127	.127	.224	8.899
23150	95	.986	.737	1.090	16.000	1.090	6.192	3.461	1.382	.639	14.649	3.319	1.090	16.000
23150	96	2.886	51.700	17.546	14.969	7.512	1.696	.925	1.069	4.188	3.724	2.309	3.230	51.700
23500	94	1.279	2.520	7.498	28.000	11.250	21.987	134.000	5.887	.645	5.095	2.520	12.500	134.000
23500	95	49.305	27.000	14.373	165.351	46.000	85.032	212.000	29.550	10.087	1.539	10.664	22.161	212.000
23500	96	34.241	166.000	44.046	37.991	43.112	15.850	1.960	13.276	58.000	15.197	119.000	73.000	166.000
23650	94	.916	.916	2.121	12.479	4.308	8.125	7.497	.759	.479	2.303	1.289	6.629	12.479
23650	95	15.399	11.850	6.470	47.900	22.602	30.184	17.724	3.359	5.386	.920	4.349	4.349	47.900
23650	96	20.922	60.481	12.517	22.576	7.896	1.763	.590	1.763	28.571	2.484	67.500	47.599	67.500
23700	94	3.470	4.949	9.775	49.500	14.699	16.850	21.332	4.711	3.799	6.510	5.150	10.159	49.500
23700	95	98.500	48.700	26.399	506.000	47.959	79.695	135.432	13.704	17.500	3.700	16.658	17.899	506.000
23700	96	55.766	494.000	84.497	71.532	35.677	8.295	5.060	12.607	89.204	5.776	273.064	256.885	494.000
23850	94	21.120	14.521	16.262	145.000	19.648	22.871	40.381	12.823	12.024	8.694	7.300	18.828	145.000
23850	95	97.000	83.475	63.536	692.000	70.642	92.677	201.437	16.250	21.147	12.885	25.984	56.226	692.000
23850	96	222.199	1760.00	285.000	285.000	69.000	64.140	21.122	22.696	181.654	25.967	738.465	692.000	1760.00
31550	94	1.402	1.030	.947	1.292	1.643	3.415	15.050	2.455	1.903	2.116	1.871	2.116	15.050
31550	95	2.852	2.406	2.406	9.600	4.011	6.193	5.182	3.005	3.250	3.318	3.250	3.950	9.600
31550	96	7.400	31.399	20.341	12.424	6.432	4.461	3.300	2.977	3.065	2.327	2.819	10.798	31.399
31700	94	.787	.819	1.279	.330	.176	.140	1.879	.219	.122	.109	.109	.109	1.879
31700	95	.134	.150	.150	1.134	2.430	.684	.400	.877	.239	.239	.317	.239	2.430
31700	96	.415	1.020	1.078	1.259	9.154	.718	.479	.384	.554	.600	.600	.554	9.154
31830	94	2.620	2.420	1.975	2.893	4.400	4.400	12.800	2.250	1.896	3.200	3.099	3.099	12.800
31830	95	4.253	3.679	3.185	16.500	7.032	11.334	5.004	3.405	3.405	3.660	4.138	4.895	16.500
31830	96	7.977	31.299	19.660	15.287	9.725	5.510	3.689	3.500	3.577	3.514	4.506	6.300	31.299

Table 4.9.3-6 Flow duration, discharges occurring for at least the duration period number of days

Station No	Duration period in days													
	1	3	5	9	20	45	80	130	182	235	285	320	345	362	365/366
16670	39.777	27.411	19.258	13.420	7.828	5.483	3.162	2.256	1.304	.696	.475	.377	.342	.304	.275
16800	78.695	43.486	30.514	25.520	19.588	14.732	9.579	6.848	5.418	4.654	4.031	3.826	3.689	3.675	3.591
16850	86.429	54.737	37.205	26.851	19.908	14.283	9.243	6.494	5.634	5.136	4.696	4.493	4.357	4.276	3.997
17650	9.340	5.169	2.120	1.078	.503	.340	.219	.143	.098	.059	.041	.027	.025	.025	.023
17850	8.060	6.656	4.048	2.635	1.674	1.336	1.115	.854	.693	.595	.541	.474	.462	.439	.424
18700	101.335	63.371	46.340	35.903	27.001	21.844	18.766	16.510	15.030	14.153	13.381	12.655	12.290	11.896	11.372
18800	358.469	265.432	160.246	116.092	81.498	59.109	42.795	34.327	28.260	24.298	21.442	19.950	19.141	18.690	18.307
18850	273.805	216.303	143.944	105.578	73.306	53.835	40.861	32.351	25.590	21.336	17.695	14.893	13.665	13.004	12.518
21750	118.757	74.071	42.763	26.435	15.001	9.214	5.163	3.422	2.447	1.727	1.352	1.141	1.078	1.004	.951
21800	129.995	87.470	53.278	34.279	19.168	11.772	6.502	4.553	3.435	2.647	2.155	1.848	1.729	1.607	1.547
22700	87.124	52.861	30.696	20.171	12.461	7.873	4.620	2.985	1.964	1.313	1.059	.920	.816	.724	.687
22750	108.105	66.935	39.689	27.958	18.182	12.328	7.636	4.954	3.384	2.366	1.872	1.546	1.403	1.264	1.158
22800	111.816	70.069	42.636	29.564	19.041	12.759	8.041	5.674	4.553	3.655	3.109	2.686	2.443	2.243	2.164
23150	27.814	15.021	9.011	5.736	3.107	1.995	1.198	.843	.637	.467	.373	.312	.288	.260	.238
23500	116.585	61.821	34.889	21.973	12.883	8.189	4.936	3.083	1.878	1.162	.827	.641	.520	.442	.415
23650	68.418	29.744	15.884	10.249	6.300	4.460	3.000	2.284	1.793	1.526	1.373	1.228	1.120	1.081	1.033
23700	205.425	112.571	50.555	32.758	19.330	12.996	8.876	6.400	4.620	3.596	3.109	2.678	2.431	2.249	2.039
23850	499.213	325.308	158.996	100.610	61.487	41.088	28.851	21.558	17.061	14.300	12.988	11.893	11.369	10.947	10.528
31550	18.403	13.780	8.346	6.460	4.701	3.592	2.837	2.433	2.016	1.741	1.540	1.348	1.241	1.145	1.098
31700	2.696	1.409	1.092	.918	.772	.637	.469	.370	.293	.244	.215	.191	.180	.164	.153
31830	22.970	17.559	11.498	9.194	7.368	5.918	4.690	3.925	3.407	3.118	2.874	2.631	2.503	2.384	2.264

Figure 4.10-1 Danube River at the Bulgarian sector. Flow duration curves



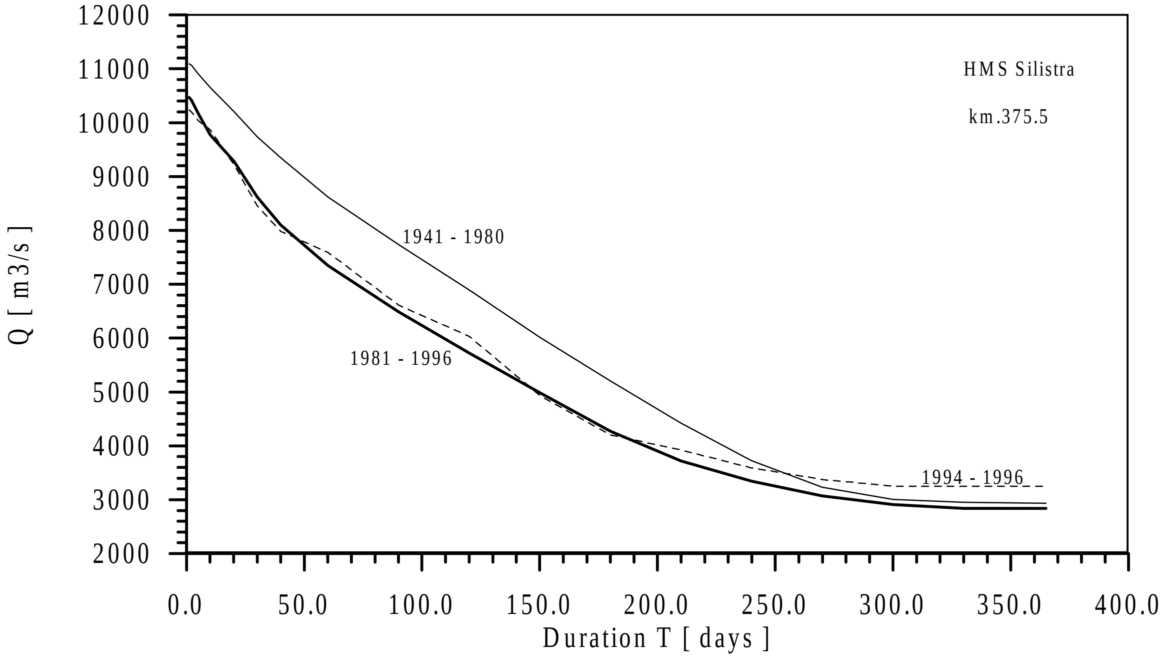


Figure 4.10-2 Danube River at the Bulgarian sector. Duration curves

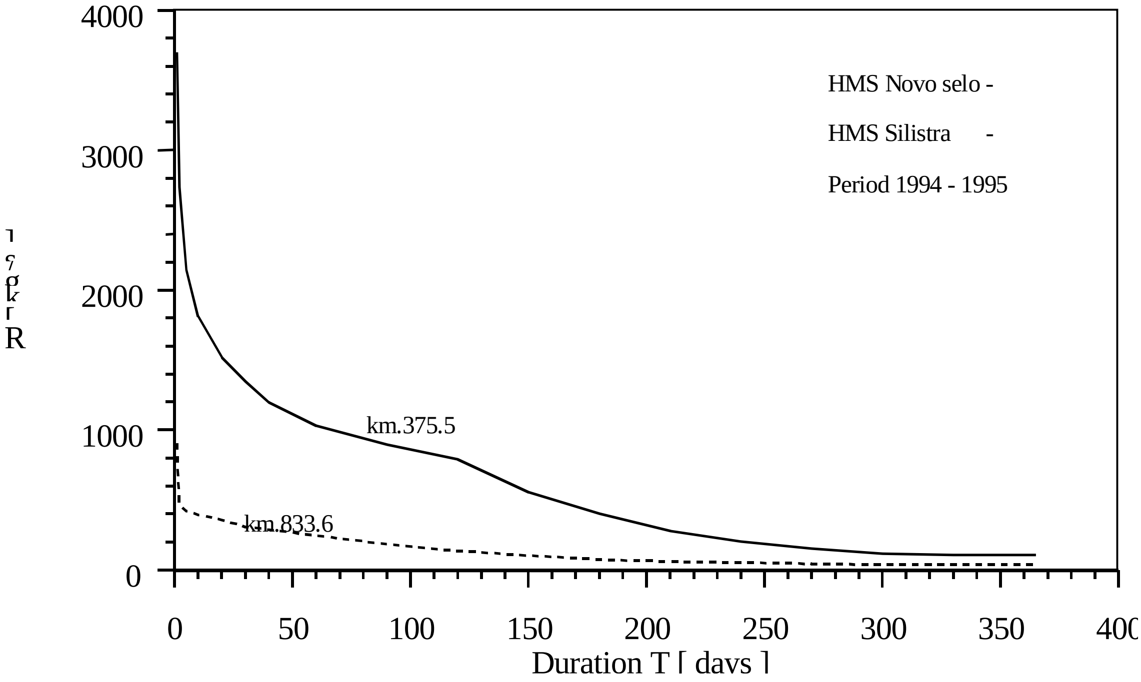


Figure 4.10-3 Hydrographs of the Danube River daily discharges

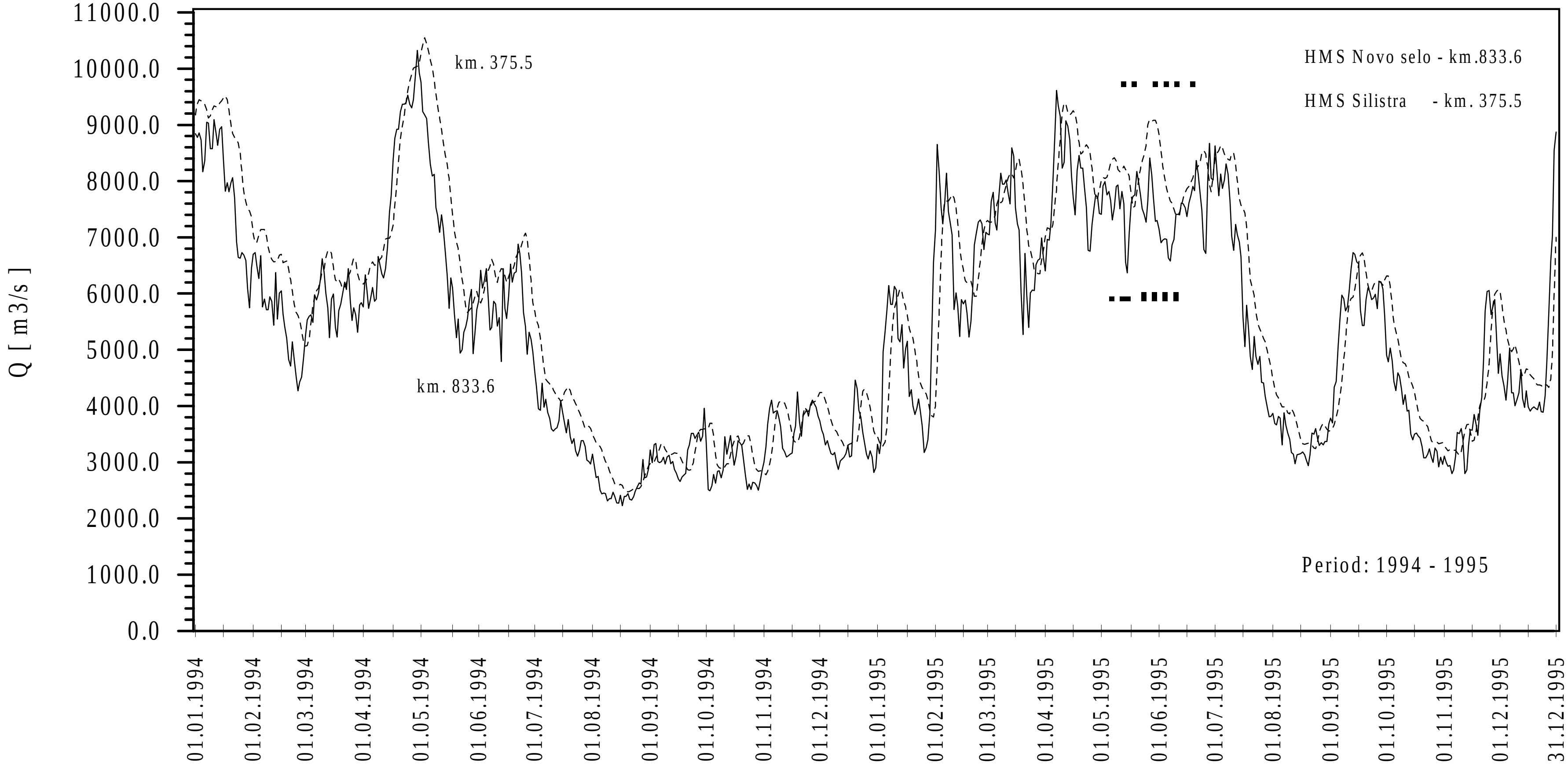


Figure 4.10-4 Hydrographs of the Danube River suspended sediment daily discharges

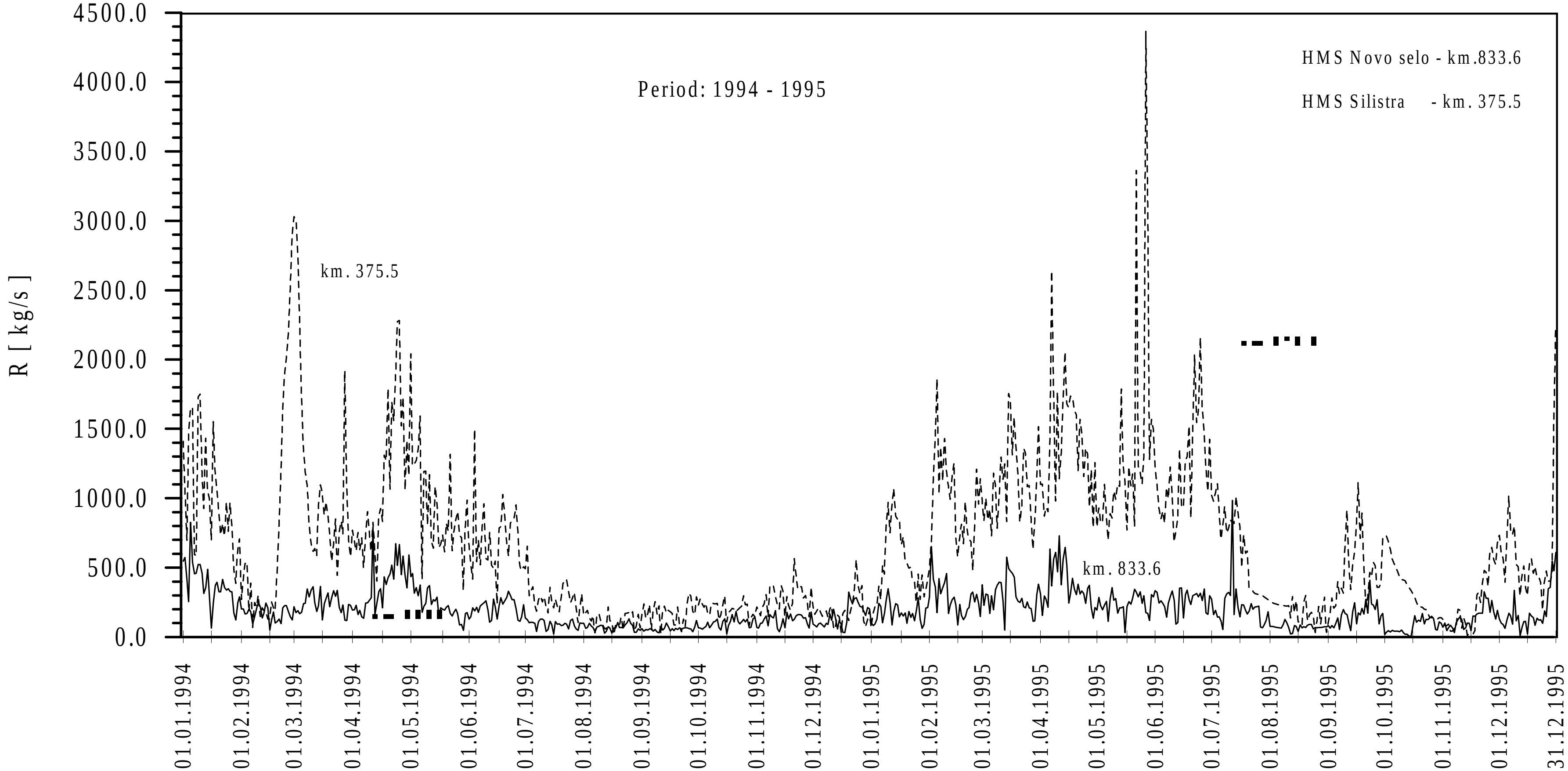


Figure Figure 4.10-5 Erosion intensity at the Bulgarian bank (EC PHARE Project 1997)

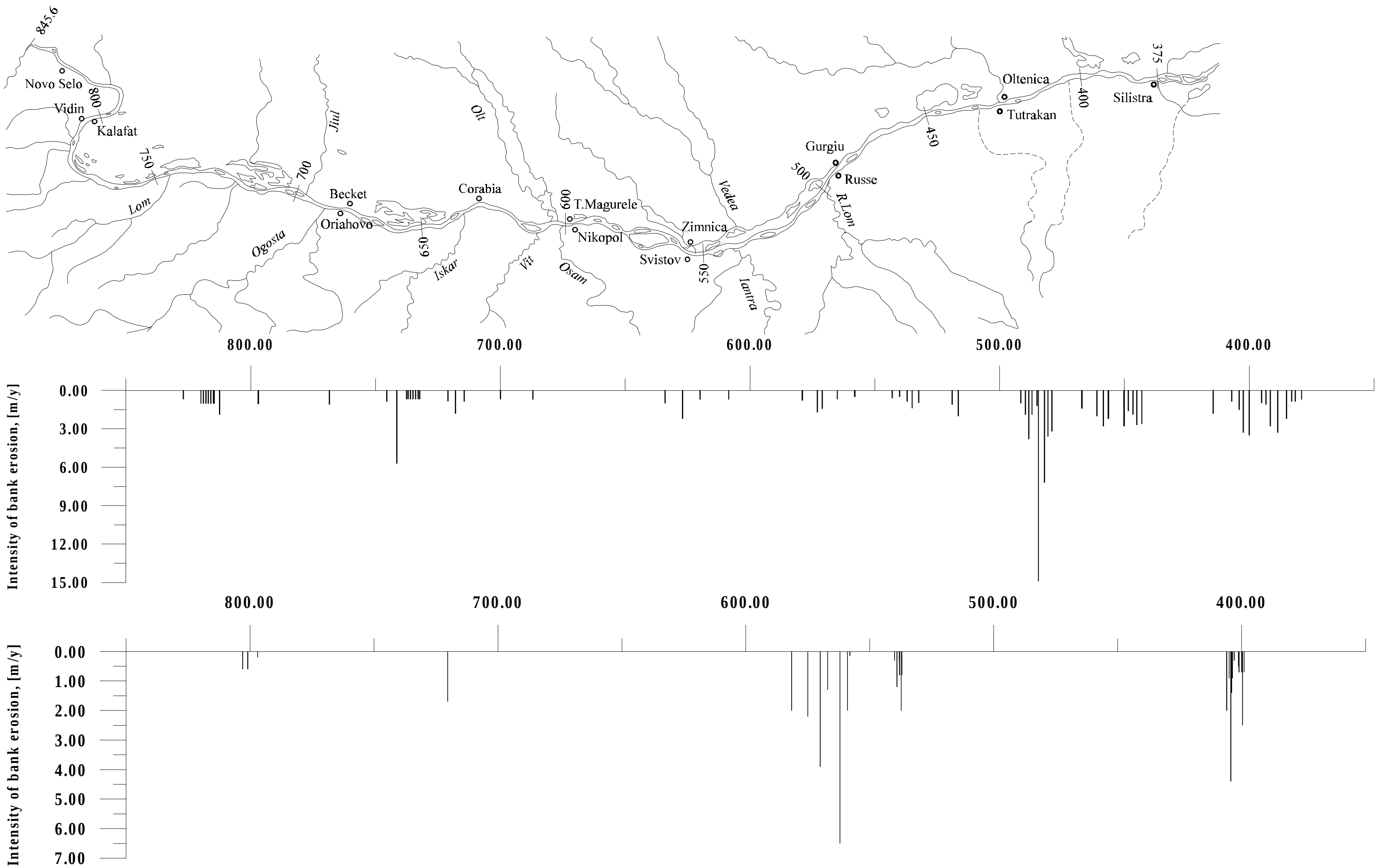
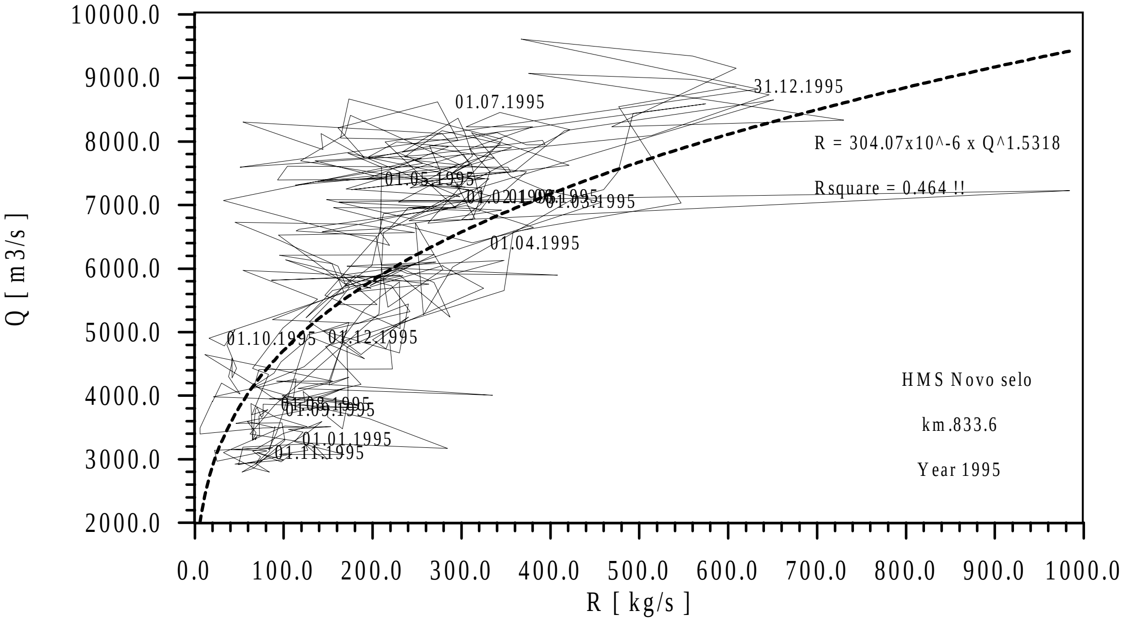


Figure 4.10-6 Suspended sediment rating curves in the Bulgarian sector of the Danube River



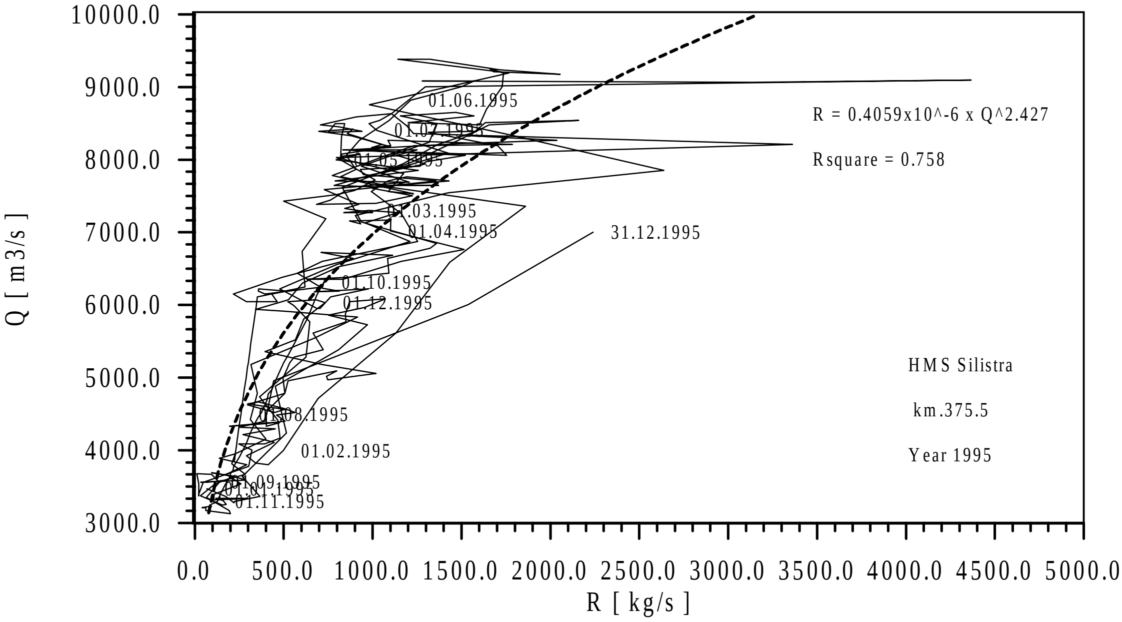


Table 4.10-1 Suspended sediment discharges for the Bulgarian section of the Danube River

HMS Novo selo km.833.6

Month	1	2	3	4	5	6	7	8	9	10	11	12
Monthly Suspended Sediment Load R [kg /s]												
Minimum												
1994	63.	49.	118.	134.	47.	106.	22.	27.	30.	21.	38.	31.
1995	62.	86.	51.	135.	32.	93.	54.	22.	45.	6.	32.	11.
Mean												
1994	377.	168.	242.	367.	234.	211.	92.	70.	59.	99.	122.	151.
1995	170.	277.	297.	373.	238.	261.	218.	72.	161.	74.	138.	179.
Maximum												
1994	827.	246.	364.	791.	456.	329.	138.	132.	118.	184.	189.	323.
1995	348.	651.	575.	730.	356.	355.	984.	126.	408.	168.	325.	609.

HMS Silistra km.375.5

Month	1	2	3	4	5	6	7	8	9	10	11	12
Monthly Suspended Sediment Load R [kg /s]												
Minimum												
1994	386.	69.	445.	402.	336.	238.	104.	17.	20.	82.	143.	32.
1995	67.	478.	630.	789.	698.	685.	269.	32.	103.	128.	12.	194.
Mean												
1994	1018.	730.	1144.	1114.	940.	691.	292.	120.	172.	202.	283.	194.
1995	521.	981.	1109.	1400.	1331.	1210.	648.	190.	475.	341.	233.	602.
Maximum												
1994	1750.	2897.	3031.	2283.	2041.	1496.	653.	215.	315.	298.	565.	559.
1995	1071.	1860.	1754.	2638.	4367.	2159.	1105.	299.	1112.	727.	680.	2241.

Annex 4a

Data on Water and Sediment Discharge and Water Quality

Contents

Table 4.8-1

Data on water and sediment discharge and water quality, Ogosta River, Gavril Genovo Village

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals	
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	#######	**4,07**	**0,075**	1,64		2.6	1,52	0,04	0.08					
2	#######	**17,82**	**0,630**	0,90		2.3	0,79	0,01	0,10					
3	#######	**1,25**	**0,015**	1,45		3,80	1,21	0.02	0.22		<0.001	0.01	0.06	<0.002
4	#######	**0,82**	**0,010**	1,62		5,04	1,48	0.03	0.11					
5	#######	**0,82**	**0,010**	1,19		5,30	1.02	0,02	0.15					
6	#######	**0,11**	**0,001**	2,80		6,98	2,04	0,04	0,72		<0.001	0.004	0.002	<0.002
7	#######	**0,52**	**0,006**	1,57		5.6	1,21	0.01	0,35					
8	#######	**0,56**	**0,006**	1,87		6.5	1,52	0.01	0,34		0.002	0.02	0.12	0.01
9	**#######**	**1,08**	**0,004**	**1,26**		**4,54**	**0,93**	**0,02**	**0,32**					
10	**#######**	**10,38**	**0,300**	**0,71**	**0,03**	**3,05**	**0,53**	**0,02**	**0,16**	**0,03**				
11	**#######**	**0,56**	**0,005**	**1,65**	**0,01**	**5,93**	**1,32**	**0,01**	**0,33**	**0,01**				
12	**#######**	**0,52**	**0,006**	**1,48**	**0,02**	**5,65**	**1,29**	**0,01**	**0,18**	**0,02**				
13	#######	**6,38**	**0,048**	1,38		2,00	1.36	0.01	0.01					
14	#######	**3,21**	**0,025**	0,61		2.81	0.50	0.02	0,09					
15	#######	**3,21**	**0,025**	1,39		2.8	1.26	0.05	0,08		0.001	0.006		
16	#######	**34,30**	**0,940**	0,69		2,04	0,62	0,06	0.01					
17	#######	**9,60**	**0,070**	1,35		2.9	1,22	0.01	0,12					
18	#######	**2,61**	**0,025**	1,37		2.4	1.32	0,02	0.03			0,006	<0.01	
19	#######	**0,57**	**0,010**	2,04		5,20	1,68	0,03	0,33					
20	#######	**1,20**	**0,018**	1,34		5,00	1.10	0.02	0,22					
21	#######	**2,20**	**0,020**	1,08		2.3	0.98	0.02	0,08			0.002	<0.01	0.02
22	#######	**0,91**	**0,015**	1,48		4,40	1,18	0,03	0,27					
23	#######	**0,91**	**0,015**	1,42		4,70	1,24	0,03	0.15			0.003		
24	**#######**	**2,47**	**0,020**	**1,16**		**3,86**	**1,06**	**0,02**	**0,08**					
25	**#######**	**18,71**	**0,180**	**0,84**	**0,04**	**2,58**	**0,53**	**0,01**	**0,30**	**0,04**				
26	**#######**	**1,12**	**0,015**	**1,72**	**0,03**	**5,07**	**1,53**	**0,03**	**0,16**	**0,03**				
27	**#######**	**1,60**	**0,019**	**1,44**	**0,03**	**4,82**	**1,23**	**0,03**	**0,18**	**0,03**				
28	#######	**7,53**		1,30		2.8	1.11	0,04	0.15			0.002	<0.01	<0.002
29	#######	**8,65**		1,09		2.2	0.93	0,03	0,13			0.002		
30	#######	**11,35**		1,11		2,86	0.98	0,01	0,12					0.06
31	#######	**17,47**		0,95		2.7	0.84	0,01	0.10			0.001		0.03
32	#######	**11,10**		0,95		3,43	0,91	0,01	0.03					
33	#######	**3,23**		1,22		3.1	1,13	0.03	0.06					
34	#######	**5,73**		0,90		3.1	0.78	0.02	0.10				<0.01	<0.002
35	**#######**	**4,69**		**1,70**	**0,01**	**4,43**	**1,46**	**0,02**	**0,22**	**0,01**				
36	**#######**	**10,35**		**0,85**	**0,03**	**3,52**	**0,76**	**0,01**	**0,09**	**0,03**				
37	**#######**	**0,22**		**2,93**	**0,02**	**6,44**	**2,19**	**0,05**	**0,69**	**0,02**				
38	**#######**	**7,96**		**0,61**	**0,01**	**2,25**	**0,42**	**0,02**	**0,17**	**0,01**				
39	#######	**19,90**		0,80		3.0	0,71	0,01	0,08					<0.002
40	#######	**10,00**		0,79		2.1	0,68	0,01	0,10					
41	#######	**18,10**		1,12		2.3	1.05	0.01	0,06					<0.002
42	#######	**7,88**		0,85		2.2	0,75	0.06	0.04					
43	#######	**0,55**		1,26		5,00	1,00	0.05	0,21					
44	#######	**1,40**		0,86		2.4	0,82	0.01	0.03					
45	#######	**0,60**		1,22		4,70	0.98	0,04	0,20					
46	#######	**2,00**		1,16		2.2	1.02	0,02	0.12					
47	#######	**2,40**		1,20		2,40	1,11	0.01	0,08					
48	**#######**	**2,00**		1,43	**0,02**	**2,42**	**1,34**	**0,01**	**0,08**	**0,02**				
49	**#######**	**4,65**		1,05	**0,01**	**4,34**	**0,86**	**0,02**	**0,17**	**0,01**				
50	**#######**	**5,45**		1,01	**0,01**	**3,42**	**0,88**	**0,02**	**0,11**	**0,01**				
51	**#######**	**2,20**		1,31	**0,02**	**2,67**	**1,21**	**0,01**	**0,09**	**0,02**				

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-2

Data on water and sediment discharge and water quality, Ogosta River, Kobiliak Village

Number	Date month/ date/year	Water Discharge m3/s	Sediment Discharge kg/s	Total N mg/l	Total P mg/l	BOD5 mg/l	Fractions of N and P N-NO3 mg/l	N-NO2 mg/l	N-NH4 mg/l	P-PO4 mg/l	Cd mg/l	Pb mg/l	Concentration of heavy metals As mg/l	Cu mg/l
-														
1	05.01.94	3,50	0,03	18,86		7,10	7.1	0,06	11,70					
2	02.02.94	3,50	0,03	18,76		7,50	7,65	0,07	11,04					
3	05.04.94	5,82	0,07	9,03		3.6	4,66	0,05	4.32					
4	10.05.94	56,67	5,02	1,50		2,30	1,27	0,02	0,21					
5	01.06.94	4,95	0,05	8,42		9.5	3.27	0,05	5,10		<0.001	0.01	0.03	<0.002
6	05.07.94	4,62	0,05	10,14		10,00	4,96	0,04	5.14					
7	09.08.94	4,95	0,05	10,48		8,10	3,28	0.1	7.1					
8	05.09.94	11,45	0,25	5,76		6.1	1.42	0.1	4.24		<0.001	0.005	<0.001	<0.002
9	02.11.94	5,58	0,08	8,40		9.3	4,40	0,03	3,97					
10	01.12.94	5,58	0,08	8,58		8.1	4.7	0,02	3,86		0.004	0.02	0.044	0.01
11	01.02.94	3,80	0,03	18,44	0,12	8,77	7,42	0,13	10,89	0,12				
12	03.05.94	7,25	0,03	7,81	0,07	6,04	4,31	0,04	3,46	0,07				
13	02.08.94	7,64	0,12	8,30	0,05	5,99	4,94	0,03	3,33	0,05				
14	01.11.94	5,58	0,08	9,63	0,10	7,16	5,55	0,02	4,07	0,10				
15	03.01.95	8,54	0,15	6,99		3.0	2.14	0.15	4.7					
16	07.02.95	10,37	0,20	3,92		3.92	2,39	0.03	1.5					
17	07.03.95	10,13	0,20	4,07		4.2	2.4	0,01	1,66		0.001			
18	05.04.95	69,54	6,80	1,95		2.10	1,14	0.02	0.79					
19	08.05.95	24,30	0,90	2,24		3,00	1,24	0,03	0,97					
20	05.06.95	24,30	0,90	2,43		3.5	1.32	0,02	1,09		<0.001	0.008	<0.001	<0.002
21	03.07.95	5,92	0,10	8,81		2.8	4,38	0.09	4.34					
22	03.08.95	5,92	0,10	9,95		3.0	4,26	0.09	5.6					
23	04.09.95	5,15	0,09	8,13		3.3	4,57	0.05	3.51			0.002	<0.001	0.03
24	04.10.95	4,77	0,08	9,91		6,12	5,42	0.05	4,44					
25	06.11.95	5,53	0,10	9,16		4.8	4,79	0.25	4,12			0.002		
26	20.02.95	9,90	0,19	5,90	0,08	6,52	3,37	0,16	2,38	0,08				
27	03.05.95	18,58	0,50	1,98	0,15	2,47	1,81	0,03	0,14	0,15				
28	08.08.95	5,15	0,09	9,65	0,10	5,29	4,97	0,05	4,63	0,10				
29	13.11.95	5,15	0,09	9,14	0,12	4,72	4,65	0,05	4,44	0,12				
30	08.01.96	35,86		2,67		2,40	1.84	0,02	0.81			0.003	<0.001	<0.002

Table 4.8-2

Data on water and sediment discharge and water quality, Ogosta River, Kobiliak Village

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals	
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
31	06.02.96	**21,30**		3,35		3.1	1.56	0.04	1.75			0.002		
32	04.03.96	**31,58**		2,19		2,86	1.4	0.02	0.77					
33	01.04.96	**39,96**		1,86		2,24	1.42	0,02	0.42			0.002		0.01
34	06.05.96	**34,91**		2,35		2,35	2.14	0.03	0.18					
35	04.06.96	**7,53**		5,83		3.8	2,94	0,08	2,81					0.01
36	01.10.96	**12,24**		4,31		3.2	3,32	0.09	0,90					<0.002
37	04.11.96	**6,29**		7,98		3.1	4.89	0,04	3,05					<0.002
38	**23.02.96**	**43,43**		**1,75**	**0,32**	**2,22**	**1,48**	**0,02**	**0,25**	**0,32**				
39	**07.05.96**	**34,91**		**1,97**	**0,27**	**2,65**	**1,60**	**0,05**	**0,32**	**0,27**				
40	**12.08.96**	**4,45**		**11,15**	**0,09**	**6,17**	**5,98**	**0,05**	**5,12**	**0,09**				
41	**25.11.96**	**6,29**		**8,22**	**0,08**	**5,22**	**3,59**	**0,16**	**4,47**	**0,08**				
42	06.01.97	**32,50**		3,13		2.8	2.0	0.03	1,10					
43	02.04.97	**46,50**		1,58		2,50	0.8	0.04	0.74					
44	06.05.97	**14,00**		2,80		3.3	2,30	0.04	0.46					0.01
45	03.06.97	**14,70**		2,70		3.4	1.92	0,04	0.74					
46	02.07.97	**9,25**		3,98		4,50	3,00	0,05	0,93					
47	03.09.97	**6,00**		7,06		3.5	3,94	0.06	3,06					
48	07.10.97	**5,00**		7,83		4,90	4,44	0.09	3.3					
49	05.11.97	**11,70**		3,00		4.6	1.90	0.02	1.08					
50	03.12.97	**11,70**		3,27		4,45	2,15	0,02	1,10					

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-3

Data on water and sediment discharge and water quality, Skat River, Nivianin Village

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	15.03.94	**0,055**		2,87	0,01	2.3	2,22	0,02	0.63	0,01							
2	03.06.94	**0,070**		1,94	0,01	4.5	1,43	0,02	0.49	0,01							
3	07.12.94	**0,020**		4,29	0,01	6,33	3,89	0.045	0.35	0,01	<0.001	<0.001		0.006	<0.005	0.027	0.017
4	**01.02.94**	**0,055**		**2,67**	**0,01**	**3,52**	**2,10**	**0,02**	**0,55**	**0,01**							
5	**03.05.94**	**0,062**		**1,76**	**0,03**	**3,10**	**1,20**	**0,04**	**0,52**	**0,03**							
6	**02.08.94**	**0,062**		**2,08**	**0,01**	**3,10**	**1,44**	**0,06**	**0,58**	**0,01**							
7	**01.11.94**	**0,075**		**1,42**	**0,01**	**2,90**	**1,25**	**0,07**	**0,11**	**0,01**							
8	16.03.95	**0,105**		1,51	0,01	5.1	1,34	0.014	0.16	0,01	0.001				0.087		0.071
9	05.06.95	**0,621**		0,98	0,04	2.8	0,68	0.043	0.26	0,04		0.006	0.007			0.429	0.019
10	07.09.95	**0,185**		2,15	0,02	1.65	1,48	0.021	0.65	0,02		0.006		0.003		0.059	
11	01.12.95	**0,016**		4,19	0,02	6,70	4,02	0.009	0.16	0,02	0.002	0.002			0.012	0.180	
12	**20.02.95**	**0,143**		**2,13**	**0,01**	**4,47**	**1,92**	**0,06**	**0,15**	**0,01**							
13	**03.05.95**	**0,353**		**1,19**	**0,01**	**3,10**	**0,98**	**0,03**	**0,18**	**0,01**							
14	**08.08.95**	**0,225**		**1,49**	**0,02**	**3,30**	**1,43**	**0,04**	**0,02**	**0,02**							
15	**13.11.95**	**0,012**		**4,22**	**0,02**	**7,01**	**4,12**	**0,07**	**0,03**	**0,02**							
16	05.03.96	**1,057**		2,33	0,04	2,60	2	0.030	0.30	0,04						0.41	
17	04.06.96	**0,580**		4,91	0,02	3.4	4,55	0.03	0.33	0,02						0.014	
18	**25.02.96**	**3,617**		**5,12**	**0,03**	**6,34**	**5,08**	**0,02**	**0,01**	**0,03**							
19	**07.05.96**	**0,763**		**3,23**	**0,01**	**2,86**	**3,03**	**0,04**	**0,16**	**0,01**							
20	**12.08.96**	**0,028**		**3,95**	**0,01**	**6,54**	**3,50**	**0,02**	**0,43**	**0,01**							
21	**25.11.96**	**0,040**		**3,40**	**0,01**	**5,22**	**3,02**	**0,04**	**0,34**	**0,01**							
22	04.06.97	**0,300**		5,37	0,02	3	5,10	0.04	0.23	0,02							
23	11.09.97	**0,270**		2,67	0,05	2.2	2,44	0.02	0.21	0,05						0.053	
24	04.12.97	**0,260**		13,81	0,02	0.9	13.6	0.01	0,20	0,02						0.052	
25	**05.02.97**	**0,190**		**2,39**	**0,03**	**3,28**	**2,01**	**0,05**	**0,33**	**0,03**							
26	**28.05.97**	**0,240**		**2,23**	**0,02**	**3,06**	**1,87**	**0,06**	**0,30**	**0,02**							
27	**12.08.97**	**0,380**		**1,46**	**0,02**	**2,88**	**1,16**	**0,04**	**0,26**	**0,02**							
28	**12.11.97**	**0,240**		**2,05**	**0,03**	**3,26**	**1,64**	**0,05**	**0,36**	**0,03**							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-4

Data on water and sediment discharge and water quality, Skat River, Mizia Town

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	12.01.94	**0,79**	**0,006**	7,44	0,08	3.5	6.8	0,035	0,60	0,08							
2	03.02.94	**0,79**	**0,006**	7,91	0,06	4.8	7.3	0,031	0,58	0,06							
3	09.03.94	**0,85**	**0,007**	7,48	0,05	3.7	7,00	0,030	0,45	0,05							
4	06.04.94	**0,85**	**0,007**	7,35	0,09	2.5	6,87	0,033	0.45	0,09	<0.001	0.02		<0.01	<0.005	<0.01	<0.01
5	12.05.94	**0,35**	**0,002**	5,35	0,08	5.4	4,45	0,040	0.86	0,08	0.001	0.01		<0.01	<0.005	0.03	<0.01
6	15.06.94	**0,23**	**0,001**	3,94	0,17	10,94	3,32	0,060	0.56	0,17							
7	07.07.94	**0,13**	**0,001**	4,02	0,02	12,92	2,90	0,120	1,00	0,02	0,001	0,001		0,047	0,005		0.01
8	09.11.94	**0,48**	**0,004**	5,37	0,06	8.70	4,89	0,030	0,45	0,06	0.002	0.004		<0.002	0.013	0.011	0.043
9	07.12.94	**0,76**	**0,007**	6,64	0,03	4.3	6,05	0.05	0.54	0,03	<0.001	<0.001		<0.002	<0.005	<0.001	<0.005
10	**03.02.94**	**0,85**	**0,007**	**6,78**	**0,20**	**5,38**	**6,10**	**0,021**	**0,66**	**0,20**							
11	**05.05.94**	**0,60**	**0,004**	**6,62**	**0,17**	**5,21**	**6,22**	**0,040**	**0,36**	**0,17**							
12	**04.08.94**	**0,14**	**0,001**	**6,58**	**0,05**	**12,65**	**2,84**	**0,186**	**3,55**	**0,05**							
13	**03.11.94**	**0,48**	**0,004**	**6,25**	**0,03**	**8,89**	**3,25**	**0,043**	**2,96**	**0,03**							
14	09.02.95	**1,60**		8,33	0,17	4.2	7,99	0,017	0,32	0,17	<0.001	<0.001		<0.002	<0.005	0.055	<0.005
15	16.03.95	**1,12**		7,93	0,25	6.1	7,54	0.026	0.36	0,25	0.002				0.014		
16	12.04.95	**1,96**		8,39	0,30	5.8	8,22	0,009	0,16	0,30							
17	10.05.95	**1,22**		7,88	0,39	6.7	7,60	0.038	0,24	0,39							
18	05.06.95	**0,63**		7,22	0,66	4.9	6,45	0.091	0.68	0,66		0.016	0.001			0.132	0.02
19	05.07.95	**0,98**		8,42	0,68	6.2	7,32	0.039	1.06	0,68							
20	03.08.95	**0,46**		5,23	0,54	3.6	4,66	0,042	0,53	0,54							
21	13.09.95	**0,45**		5,13	0,45	3,94	4,52	0.069	0.54	0,45		0.006		0.006		0.009	
22	11.10.95	**0,45**		4,73	0,41	3.6	4,11	0.018	0,60	0,41							
23	15.11.95	**0,46**		4,18	0,31	5.4	3,65	0,049	0,48	0,31				0.002		0.038	
24	05.12.95	**0,76**		3,46	0,05	5.8	3,11	0,034	0,32	0,05						0.022	
25	**22.02.95**	**1,09**		**4,21**	**0,34**	**2,12**	**3,92**	**0,052**	**0,23**	**0,34**							
26	**05.05.95**	**1,12**		**6,03**	**0,36**	**2,77**	**5,76**	**0,018**	**0,25**	**0,36**							
27	**10.08.95**	**0,42**		**4,17**	**0,03**	**6,41**	**3,56**	**0,040**	**0,57**	**0,03**							
28	**15.11.95**	**0,46**		**4,41**	**0,05**	**4,89**	**3,83**	**0,042**	**0,54**	**0,05**							
29	10.01.96	**1,85**		8,31	0,30	4.4	7,97	0,043	0,30	0,30							
30	08.02.96	**0,91**		7,83	0,27	6,30	7,45	0.033	0.35	0,27					0.044	0.015	
31	14.03.96	**1,32**		8,61	0,13	4.1	8,43	0.03	0.15	0,13						0.033	
32	04.04.96	**4,18**		11,40	0,32	5,38	11,02	0.072	0.31	0,32						0.02	
33	08.05.96	**1,90**		9,03	0,28	3.7	8,78	0.06	0.19	0,28						0.025	
34	04.06.96	**0,91**		10,68	0,23	6,17	10.3	0.04	0,34	0,23							
35	16.10.96	**0,49**		4,76	0,22	5,70	4,28	0,034	0.45	0,22						0.027	
36	**25.02.96**	**9,01**		**12,69**	**0,67**	**8,76**	**12,50**	**0,161**	**0,03**	**0,67**							

Table 4.8-4

Data on water and sediment discharge and water quality, Skat River, Mizia Town

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
37	**10.05.96**	**1,70**		**8,30**	**0,48**	**4,32**	**7,84**	**0,092**	**0,37**	**0,48**							
38	**14.08.96**	**0,47**		**4,73**	**0,02**	**4,45**	**4,14**	**0,037**	**0,55**	**0,02**							
39	**26.11.96**	**0,64**		**6,68**	**0,04**	**3,86**	**6,02**	**0,045**	**0,61**	**0,04**							
40	16.01.97	**0,68**		7,12	0,16	4,20	6,80	0.02	0,30	0,16						0.027	
41	07.05.97	**1,07**		6,27	0,09	2.9	6,10	0.04	0.13	0,09				0.007		0.004	
42	04.06.97	**2,44**		2,81	0,27	3.2	2,47	0.04	0,30	0,27				0.022		0.015	
43	08.07.97	**0,22**		6,06	0,01	10,88	5,44	0.11	0,51	0,01		0.001		0.004		0.019	
44	05.08.97	**0,30**		5,19	0,06	8,68	4,80	0.03	0.36	0,06						0.015	
45	04.09.97	**0,30**		5,19	0,06	9,00	5,00	0.01	0.18	0,06						0.021	
46	02.10.97	**0,14**		9,57	0,01	13,50	8,90	0,130	0,54	0,01						0.019	
47	05.11.97	**0,55**		4,69	0,10	5,12	4.5	0.02	0.17	0,10						0.017	
48	04.12.97	**1,30**		8,16	0,34	4,44	7,88	0.02	0.26	0,34						0.032	
49	**05.02.97**	**0,72**		**4,94**	**0,10**	**5,65**	**4,44**	**0,042**	**0,46**	**0,10**							
50	**30.05.97**	**1,66**		**5,77**	**0,30**	**2,82**	**5,64**	**0,018**	**0,11**	**0,30**							
51	**12.08.97**	**0,64**		**4,75**	**0,12**	**6,24**	**4,21**	**0,040**	**0,50**	**0,12**							
52	**20.11.97**	**1,07**		**6,23**	**0,25**	**3,52**	**5,63**	**0,026**	**0,57**	**0,25**							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-5

Data on water and sediment discharge and water quality, Ogosta River, Mizia Town

Number	Date	Water	Sediment	Total	Total	Fractions of N and P							Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
1	12.01.94	**5,05**	**0,02**	8,20	0,09	6,40	7,5	0,06	0,64	0,09							
2	03.02.94	**5,05**	**0,02**	9,43	0,07	6,20	8.7	0,08	0,65	0,07							
3	09.03.94	**5,22**	**0,02**	7,72	0,01	5,80	7,1	0,02	0,60	0,01							
4	06.04.94	**6,03**	**0,03**	7,19	0,08	5,20	6,8	0.08	0.31	0,08	<0.002	0.01		<0.01	<0.005	0.02	<0.01
5	12.05.94	**35,13**	**3,40**	3,63	0,01	3,30	3,0	0,12	0.51	0,01	<0.001	0.03		<0.01	<0.005	0.03	<0.01
6	15.06.94	**5,43**	**0,02**	7,39	0,08	5,91	6,9	0,06	0,43	0,08							
7	07.07.94	**4,30**	**0,02**	5,48	0,00	6.24	4,0	0,08	1,40	0,00	0,001	0,003		.044	.005		0.01
8	09.11.94	**4,22**	**0,02**	10,03	0,06	6.90	8,9	0.035	1.09	0,06	0.002	0.009		<0.002	<0.005	0.009	<0.005
9	07.12.94	**4,22**	**0,02**	9,73	0,03	7,10	8,7	0.056	0.97	0,03	<0.001	<0.001		<0.002	<0.005	<0.001	<0.005
10	09.02.95	**11,16**	**0,09**	7,00	0,07	3,30	5,6	0.067	1.33	0,07	<0.001	0.002		<0.002	0.011	0.018	<0.005
11	16.03.95	**6,89**	**0,04**	7,93	0,26	8,40	6,4	0.059	1.47	0,26		0.002			0.063	0.02	0,093
12	12.04.95	**25,50**	**1,60**	3,75	0,11	4,30	3,2	0.071	0.48	0,11							
13	10.05.95	**24,73**	**0,40**	4,14	0,20	2,10	3,5	0.23	0.41	0,20							
14	05.06.95	**27,16**	**0,50**	3,63	0,23	3,90	3,2	0.098	0.33	0,23	0.001	0.003	0.001				0.020
15	05.07.95	**6,37**	**0,04**	6,89	0,29	4.7	6,3	0.022	0.57	0,29							
16	05.08.95	**5,20**	**0,03**	7,75	0,11	4,00	6,9	0,07	0.78	0,11							
17	12.09.95	**5,30**	**0,03**	7,36	0,36	5,10	7,0	0.061	0.30	0,36		0.006		0.007		0.007	
18	11.10.95	**5,00**	**0,03**	7,94	0,93	4.7	7,3	0,02	0,62	0,93							
19	15.11.95	**5,30**	**0,03**	8,82	0,56	4.9	7,1	0.143	1.58	0,56						0.023	
20	05.12.95	**6,50**	**0,04**	8,46	0,08	9,00	6,5	0.076	1.88	0,08	0.005					0.025	
21	10.01.96	**41,25**	**1,10**	3,42	0,20	3,00	3,0	0.073	0.35	0,20						0.057	
22	08.02.96	**16,71**	**0,15**	9,97	0,35	3.7	8.3	0.038	1.63	0,35				0.003	0.037	0.019	
23	14.03.96	**13,85**	**0,05**	5,74	0,32	2.6	4,4	0.06	1,28	0,32				0.002		0.038	
24	04.04.96	**36,40**	**0,45**	3,46	0,15	2.8	3,1	0.072	0.29	0,15						0.034	
25	08.05.96	**40,26**	**0,70**	3,57	0,18	2,00	2,9	0.09	0.58	0,18						0.068	
26	04.06.96	**6,33**	**0,05**	8,93	0,18	4,40	8.7	0.034	0,20	0,18							
27	16.10.96	**5,91**	**0,05**	8,95	0,15	4,80	7,9	0,05	1,00	0,15				0.002		0.03	
28	16.01.97	**32,50**		4,27	0,06	2,00	3,9	0.03	0,34	0,06						0.023	
29	07.05.97	**46,50**		3,53	0,03	3.5	3,4	0.05	0.08	0,03				0.009		0.009	
30	04.06.97	**14,00**		4,75	0,21	2.5	4,6	0.05	0,10	0,21						0.024	
31	08.07.97	**14,70**		5,22	0,13	3,00	4,7	0,05	0,45	0,13		0.001		0.008		0.05	
32	05.08.97	**9,25**		7,73	0,16	3,96	6,9	0.07	0,80	0,16				0.002		0.007	
33	04.09.97	**6,00**		8,24	0,15	4,50	7,3	0,06	0,88	0,15						0.023	
34	02.10.97	**5,00**		11,55	0,10	5,20	10.9	0,07	0,58	0,10						0.021	
35	05.11.97	**11,70**		5,12	0,20	3,61	4.8	0,03	0,29	0,20						0.015	
36	04.12.97	**11,70**		5,13	0,19	3,70	4,9	0.03	0,20	0,19						0.023	

Table 4.8-6

Data on water and sediment discharge and water quality, Iskar River, Novi Iskar Town

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
1	25.01.94	11,53	0,53	7,68	0,52	11,60	2.03	0,036	5.61	0,52							
2	21.02.94	11,21	0,50	8,57	0,49	11,77	2,91	0,037	5,62	0,49	0,003	<0.02		0.03	0,006	0.35	
3	08.03.94	11,21	0,50	7,50	0,49	11,56	3,02	0,038	4,44	0,49	0,004	0,020		0.01	0,008	0.08	
4	13.04.94	13,41	1,08	5,52	0,41	9,68	1.53	0,034	3.96	0,41							
5	25.05.94	12,23	0,80	9,78	0,38	10,01	3,03	0,040	6.71	0,38				<0.01			
6	15.06.94	13,41	1,08	5,76	0,35	9,77	1,04	0,041	4.68	0,35				<0.01			
7	19.07.94	11,22	0,57	6,06	0,39	10,22	2,29	0,042	3,73	0,39				<0.01	<0.003		<0.002
8	22.08.94	9,00	0,21	6,85	0,49	14,44	3,54	0,043	3.27	0,49				<0.01	<0.003		<0.002
9	19.09.94	9,60	0,22	6,58	0,49	13,66	2,49	0,042	4.05	0,49				<0.01	<0.003		<0.002
10	04.10.94	10,13	0,23	6,66	0,29	12,54	2,87	0,045	3.74	0,29				<0.01	<0.003		<0.002
11	10.11.94	10,39	0,24	6,40	0,39	12,44	1,36	0,046	4.99	0,39	0,002	0.02		0.03	<0.003	0.04	<0.002
12	20.12.94	8,60	0,20	8,16	0,29	14,44	3,43	0,047	4,68	0,29				<0.01			<0.002
13	09.03.94	11,97	0,57	7,69	0,39	10,12	4,40	0,031	3,25	0,39							
14	10.05.94	32,39	7,00	4,74	0,10	9,82	2,48	0,009	2,25	0,10							
15	19.05.94	9,60	0,22	10,98	0,29	16,46	4,88	0,023	6,08	0,29							
16	21.11.94	10,13	0,23	8,79	0,43	12,42	4,32	0,028	4,44	0,43							
17	17.01.95	9,00		9,75	0,36	14,11	2,38	0,040	7,33	0,36	0.001	0.02		0.02	0.028	0.04	0.01
18	21.02.95	11,40		10,24	0,49	10,55	3,80	0,049	6.39	0,49				<0.01			<0.002
19	27.03.95	9,60		11,10	0,29	13,87	4,91	0.270	5.92	0,29				<0.01`			<0.002
20	03.04.95	15,75		6,88	0,11	8,88	1.564	0,019	5.30	0,11				<0.01			<0.002
21	09.05.95	17,22		6,57	0,10	8,43	1.334	0.165	5.07	0,10	0.01	<0.02		<0.01	<0.003	<0.004	0.02
22	14.06.95	12,37		5,60	0,20	10,21	1.196	0.120	4,28	0,20				<0.01			<0.002
23	10.07.95	11,98		11,04	0,36	10,61	6,41	0.114	4.52	0,36		<0.02		0.05		0.05	<0.002
24	07.08.95	8,92		10,53	0,29	14,86	3,23	0.180	7,12	0,29		<0.02		0.03		<0.004	<0.002
25	13.09.95	10,13		9,95	0,20	13,02	4,44	0.024	5,49	0,20	0,001	<0.02		0.06		0.59	
26	03.10.95	12,28		6,89	0,17	10,33	2,32	0.054	4.52	0,17				<0.01			
27	02.11.95	10,13		10,59	0,20	12,82	4,14	0.060	6.39	0,20	0.004			0.01		0.06	
28	05.12.95	13,47		10,10	0,11	10,03	4,04	0.138	5.92	0,11				<0.01			<0.002
29	06.03.95	10,13		12,58	0,38	11,42	6,17	0,012	6,40	0,38							
30	16.05.95	11,98		9,43	0,30	10,56	3,73	0,038	5,66	0,30							
31	11.08.95	8,92		10,68	0,18	14,22	3,75	0,046	6,88	0,18							
32	21.11.95	12,87		8,33	0,12	12,01	3,56	0,028	4,74	0,12							
33	16.01.96	13,20		8,71	0,08	9,64	4,48	0.114	4,12	0,08				<0.01			<0.002
34	26.02.96	38,87		3,73	0,06	7,23	0.623	0,016	3,09	0,06	0.003	<0.02		0.02		0.004	<0.002
35	22.03.96	22,09		5,08	0,07	8,44	0.598	0,029	4,45	0,07				<0.01			<0.002
36	09.05.96	38,32		4,67	0,05	7,55	0.874	0,018	3,78	0,05				<0.01			<0.002
37	28.10.96	11,49		12,42	0,20	10,42	6,21	0.186	6,02	0,20				<0.01			<0.002

Table 4.8-6

Data on water and sediment discharge and water quality, Iskar River, Novi Iskar Town

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
38	25.11.96	29,65		5,62	0,12	7,65	1.591	0.114	3,91	0,12				<0.01			<0.002
39	16.12.96	14,37		9,30	0,29	9,01	2,79	0.120	6.39	0,29				<0.01			<0.002
40	01.03.96	27,86		6,46	0,07	7,68	2,24	0,012	4,21	0,07							
41	10.05.96	42,70		4,01	0,05	4,35	1,68	0,006	2,32	0,05							
42	03.08.96	8,30		12,15	0,28	10,44	4,67	0,018	7,46	0,28							
43	18.11.96	10,70		10,92	0,47	12,56	5,66	0,034	5,23	0,47							
44	13.01.97	26,70		4,28	0,29	8,04	0.506	0,021	3,75	0,29				<0.01			<0.002
45	28.02.97	22,70		5,92	0,13	8,34	0.598	0,023	5.30	0,13				<0.01			<0.002
46	05.03.97	17,80		6,21	0,10	9,12	0.805	0.180	5.22	0,10				<0.01			<0.002
47	24.04.97	64,70		4,13	0,10	7,21	1.702	0.072	2,36	0,10				<0.01			<0.002
48	06.05.97	24,80		5,73	0,13	7,67	1.366	0.102	4,26	0,13				<0.01			<0.002
49	08.07.97	12,60		8,27	0,91	9,76	3,64	0,030	4,60	0,91	0.001	0.016		0.057	0.007	0.191	
50	20.08.97	13,20		9,81	0,85	9,61	3,30	0,041	6,47	0,85		0.002		0.016	0.006	0.072	0.011
51	10.09.97	14,00		8,06	0,72	8.4	2,60	0,031	5,43	0,72		0.004		0.008	0.003	0.127	0.008
52	08.10.97	14,30		5,72	1,82	6.4	3.59	0,034	2.10	1,82							
53	11.11.97	15,80		5,20	0,59	6,22	2.78	0,130	2.29	0,59							
54	12.12.97	17,80		5,02	0,09	9.1	1.95	0,110	2.96	0,09	0.001	0.007		0.004	0.003	0.065	0.002
55	05.02.97	15,50		8,50	0,33	6,00	3,44	0,078	4,98	0,33							
56	21.05.97	19,00		9,16	0,16	4,40	4,73	0,064	4,37	0,16							
57	14.08.97	14,30		11,45	0,44	8,58	6,04	0,094	5,32	0,44							
58	11.11.97	15,80		10,63	0,31	6,03	5,64	0,060	4,93	0,31							

Table 4.8-7

Data on water and sediment discharge and water quality, Iskar River, Kunino Village

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	15.03.94	**22,30**	**0,37**	3,27	0,26	3,1	2,50	0,032	0.74	0,26							
2	17.06.94	**34,26**	**1,75**	2,69	0,18	3,0	2,18	0,057	0.45	0,18							
3	01.12.94	**20,50**	**0,27**	4,31	0,21	3,8	2,34	0,048	1.92	0,21	0.002	0.019		<0.002	<0.005	0.879	0.018
4	09.03.95	**33,22**		2,43	0,22	3,6	1,84	0.063	0.53	0,22	0.004	0.01		0.01	0.083	0.284	0,020
5	01.06.95	**50,89**		1,97	0,35	3.4	1,62	0.106	0,24	0,35	0.002	0.027	0.001			0.150	0.021
6	12.09.95	**20,59**		3,82	1,43	3.9	2,66	0.046	1,11	1,43	0.006	0.039		0.034		0.199	0.006
7	13.12.95	**29,63**		4,70	0,41	8.9	3,21	0.038	1.45	0,41	0.001	0.001				0.333	
8	10.06.96	**30,73**		2,18	0,54	3.6	2,00	0.058	0.12	0,54				0.063		0.157	
9	09.06.97	**95,00**		2,06	0,16	2,9	1.8	0.06	0,20	0,16							
10	09.09.97	**20,00**		3,02	0,55	3,0	2,68	0.07	0.27	0,55		0.002		0.002		0.142	
11	03.12.97	**39,50**		2,38	0,22	3,4	1.7	0.07	0.61	0,22		0.004		0.024		0.406	

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-8

Data on water and sediment discharge and water quality, Iskar River, Oryahovitza Village

Number	Date	Water	Sediment	Total	Total	Fractions of N and P							Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	01.03.94	**19,60**	**0,10**	4,69	0,03	5.68	4.37	0,050	0,27	0,03							
2	01.06.94	**23,93**	**0,87**	2,86	0,05	9,77	2.33	0,034	0.50	0,05							
3	01.09.94	**14,10**	**0,12**	7,14	0,04	15,43	6,71	0,060	0.37	0,04							
4	01.12.94	**17,66**	**0,33**	5,56	0,03	12,12	5.20	0.052	0.31	0,03							
5	**05.02.94**	**19,60**	**19,60**	**4,88**	**0,03**	**12,04**	**4,56**	**0,044**	**0,28**	**0,03**							
6	**12.05.94**	**80,54**	**8,60**	**0,96**	**0,12**	**3,26**	**0,70**	**0,028**	**0,23**	**0,12**							
7	**11.08.94**	**16,60**	**0,25**	**5,29**	**0,08**	**12,61**	**4,45**	**0,081**	**0,76**	**0,08**							
8	**15.11.94**	**22,60**	**0,74**	**2,70**	**0,12**	**13,75**	**2,32**	**0,076**	**0,30**	**0,12**							
9	01.03.95	**48,21**	**1,82**	3,75	0,06	5,61	3,38	0,034	0,34	0,06							
10	01.06.95	**55,47**	**2,50**	3,28	0,06	2.71	3.02	0.026	0.23	0,06							
11	05.09.95	**25,10**	**0,22**	3,70	0,02	7,72	3,44	0,028	0.23	0,02							
12	01.12.95	**28,25**	**0,32**	4,70	0,06	7.60	3.25	0.098	1,35	0,06							
13	**10.02.95**	**26,92**	**0,27**	**3,43**	**0,05**	**9,44**	**2,55**	**0,037**	**0,85**	**0,05**							
14	**09.05.95**	**80,61**	**7,00**	**1,28**	**0,15**	**3,58**	**1,04**	**0,018**	**0,22**	**0,15**							
15	**04.08.95**	**22,56**	**0,16**	**3,25**	**0,11**	**13,10**	**2,78**	**0,055**	**0,41**	**0,11**							
16	**17.11.95**	**28,25**	**0,32**	**3,00**	**0,10**	**6,85**	**2,49**	**0,077**	**0,43**	**0,10**							
17	04.03.96	**65,83**	**3,00**	3,57	0,08	5.33	3,33	0.045	0,20	0,08							
18	11.06.96	**31,40**	**0,40**	3,01	0,06	6.27	2,82	0.024	0.17	0,06							
19	03.12.96	**102,81**	**23,00**	1,21	0,17	8.26	0,99	0,031	0,19	0,17							
20	**12.02.96**	**35,74**	**0,80**	**2,69**	**0,07**	**5,88**	**2,22**	**0,034**	**0,43**	**0,07**							
21	**25.05.96**	**54,71**	**2,60**	**2,68**	**0,05**	**3,86**	**2,38**	**0,023**	**0,28**	**0,05**							
22	**16.08.96**	**13,75**	**0,22**	**7,71**	**0,19**	**15,03**	**6,31**	**0,089**	**0,77**	**0,19**							
23	**03.12.96**	**102,81**	**23,00**	**1,06**	**0,16**	**3,76**	**0,87**	**0,017**	**0,17**	**0,16**							
24	08.07.97	**34,50**		4,39	0,30	4,42	3.81	0.021	0,56	0,30							
25	02.09.97	**24,70**		3,27	0,28	3,95	3.11	0.012	0.15	0,28							
26	03.12.97	**39,57**		3,30	0,18	2.65	3.11	0.042	0.15	0,31							
27	**05.02.97**	**31,40**		**3,40**	**0,08**	**2,88**	**3,23**	**0,034**	**0,14**	**0,08**							
28	**28.05.97**	**49,50**		**3,42**	**0,06**	**4,23**	**2,98**	**0,025**	**0,41**	**0,06**							
29	**12.08.97**	**93,00**		**1,63**	**0,18**	**5,46**	**1,43**	**0,023**	**0,18**	**0,18**							
30	**12.11.97**	**24,00**		**3,66**	**0,08**	**8,04**	**3,40**	**0,028**	**0,23**	**0,08**							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-9

Data on water and sediment discharge and water quality, Vit River, Sadovetz Village

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	09.03.94	**0,66**		1,67	0,007	4.6	1.16	0,009	0,50	0,007							
2	14.06.94	**1,25**		1,35	0,003	2.05	1,25	0,010	0.09	0,003							
3	06.12.94	**0,50**		1,52	0,007	5,47	1.28	0.008	0.23	0,007							
4	14.03.95	**3,15**		1,78	0,007	1.70	1.56	0.022	0.20	0,007							
5	20.06.95	**39,59**		1,04	0,013	1.29	0.95	0.018	0,07	0,013							
6	12.09.95	**0,65**		2,07	0,007	4,69	1,52	0.008	0.54	0,007							
7	19.12.95	**0,90**		2,70	0,003	3,62	1.63	0.020	1.05	0,003							
8	12.03.96	**6,75**		2,24	0,010	1.69	1,95	0.031	0.26	0,010							
9	18.06.96	**2,60**		1,92	0,017	3.14	1.74	0.017	0,16	0,017							
10	10.12.96	**5,88**		1,36	0,026	1.85	1.25	0.011	0.10	0,026							
11	15.07.97	**2,08**		2,20	0,010	2.7	2.06	0.02	0.12	0,010							
12	09.09.97	**3,75**		1,80	0,020	2.7	1,66	0.017	0.12	0,020							
13	08.12.97	**5,10**		1,59	0,013	1,86	1.44	0.010	0,14	0,013							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-10

Data on water and sediment discharge and water quality, Vit River, Yassen Village

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	09.03.94	**0,42**	**0,004**	3,52	0,005	4.1	3.11	0,065	0.34	0,005							
2	14.06.94	**0,46**	**0,025**	3,67	0,003	6,57	3,29	0,057	0..32	0,003							
3	06.09.94	**0,34**	**0,003**	4,08	0,003	8,20	3,60	0.025	0.45	0,003							
4	06.12.94	**0,66**	**0,005**	3,00	0,010	5,75	2.62	0,070	0.31	0,010							
5	**04.02.94**	**0,68**	**0,006**	**2,33**	**0,007**	**5,26**	**1,91**	**0,073**	**0,35**	**0,007**							
6	**06.05.94**	**0,68**	**0,025**	**2,06**	**0,007**	**4,72**	**1,67**	**0,061**	**0,33**	**0,007**							
7	**05.08.94**	**0,34**	**0,003**	**3,90**	**0,006**	**7,90**	**3,45**	**0,043**	**0,40**	**0,006**							
8	**04.11.94**	**0,47**	**0,004**	**2,71**	**0,005**	**6,48**	**2,34**	**0,067**	**0,30**	**0,005**							
9	14.03.95	**1,60**	**0,020**	2,88	0,003	2,44	2.54	0.026	0,31	0,003							
10	20.06.95	**28,24**	**0,450**	1,41	0,016	1.06	0.95	0.020	0.44	0,016							
11	12.09.95	**0,85**	**0,020**	3,43	0,010	3,72	2,48	0.019	0.93	0,010							
12	19.12.95	**4,55**	**0,030**	2,63	0,013	1.74	2.39	0.023	0,22	0,013							
13	**14.02.95**	**1,60**	**0,020**	**2,97**	**0,008**	**2,61**	**2,68**	**0,032**	**0,26**	**0,008**							
14	**10.05.95**	**11,60**	**0,100**	**1,68**	**0,012**	**1,65**	**1,52**	**0,019**	**0,14**	**0,012**							
15	**07.11.95**	**3,25**	**0,020**	**1,73**	**0,004**	**2,12**	**1,46**	**0,030**	**0,24**	**0,004**							
16	**28.11.95**	**8,06**	**0,060**	**1,66**	**0,007**	**1,99**	**1,49**	**0,012**	**0,16**	**0,007**							
17	12.03.96	**10,27**	**0,080**	1,53	0,003	1.87	1,31	0.013	0.21	0,003							
18	18.06.96	**3,00**	**0,020**	2,63	0,003	4.03	2.33	0.039	0,26	0,003							
19	10.12.96	**12,54**	**0,100**	2,03	0,033	1.47	1.87	0.016	0.14	0,033							
20	**13.02.96**	**5,00**	**0,035**	**1,96**	**0,003**	**1,96**	**1,67**	**0,037**	**0,25**	**0,003**							
21	**14.05.96**	**33,61**	**0,320**	**0,77**	**0,010**	**1,20**	**0,64**	**0,013**	**0,11**	**0,010**							
22	**08.08.96**	**3,28**	**0,020**	**2,53**	**0,004**	**2,07**	**2,23**	**0,047**	**0,26**	**0,004**							
23	**11.11.96**	**3,28**	**0,020**	**2,35**	**0,003**	**2,23**	**2,02**	**0,045**	**0,29**	**0,003**							
24	03.07.97	**6,70**		2,14	0,010	3.5	1,50	0,023	0.62	0,010		0,002		0.007	0.005	0.617	
25	09.09.97	**6,60**		1,67	0,010	3.8	1.40	0.029	0,24	0,010							
26	08.12.97	**9,65**		1,88	0,016	1.0	1.77	0.012	0.10	0,016							
27	**05.02.97**	**5,30**		**1,80**	**0,009**	**1,74**	**1,52**	**0,035**	**0,24**	**0,009**							
28	**20.05.97**	**10,30**		**1,62**	**0,003**	**1,69**	**1,45**	**0,016**	**0,15**	**0,003**							
29	**12.08.97**	**30,80**		**0,95**	**0,017**	**1,22**	**0,82**	**0,012**	**0,12**	**0,017**							
30	**12.11.97**	**3,00**		**2,6**	**0,004**	**4,28**	**2,33**	**0,040**	**0,23**	**0,004**							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-11

Data on water and sediment discharge and water quality, Ossam River, Troyan Town

Number	Date month/ date/year	Water Discharge	Sediment Discharge	Total N	Total P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
							Fractions of N and P						Concentration of heavy metals				
-		m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	18.01.94	**0,39**	**0,001**	3,87	0,90	71,10	1,06	0,062	2.75	0,90							
2	09.02.94	**0,64**	**0,002**	3,67	0,84	68.4	1,04	0,052	2.58	0,84							
3	15.03.94	**3,00**	**0,022**	1,43	0,30	13,60	0.48	0,042	0.91	0,30							
4	12.04.94	**9,59**	**0,550**	1,73	0,23	5.0	0.99	0,026	0.71	0,23							
5	10.05.94	**10,68**	**0,780**	0,97	0,15	4.27	0.50	0,022	0.45	0,15							
6	21.06.94	**4,50**	**0,055**	1,17	0,40	10,20	0,73	0.036	0.40	0,40							
7	12.07.94	**8,19**	**0,280**	1,50	0,55	7,60	0,76	0.049	0,69	0,55							
8	09.08.94	**2,81**	**0,020**	2,07	0,24	12.5	1.26	0.060	0.75	0,24							
9	14.09.94	**0,55**	**0,001**	4,43	0,71	62.8	1,19	0,055	3,18	0,71							
10	11.10.94	**0,75**	**0,002**	3,07	0,67	30.6	0,98	0,052	2.04	0,67							
11	08.11.94	**0,39**	**0,001**	5,30	1,28	53.5	1,29	0,067	3.94	1,28							
12	20.12.94	**1,45**	**0,007**	2,87	1,64	47.2	0.79	0.056	2,02	1,64	<0.0001	<0.001		0.017	0.0020	0.041	
13	**07.02.94**	**0,39**	**0,001**	**4,16**	**0,86**	**57,10**	**1,06**	**0,067**	**3,03**	**0,86**							
14	**09.05.94**	**9,95**	**0,630**	**1,28**	**0,18**	**5,08**	**0,62**	**0,025**	**0,63**	**0,18**							
15	**08.08.94**	**4,21**	**0,047**	**2,17**	**0,40**	**10,33**	**0,73**	**0,041**	**1,40**	**0,40**							
16	**09.11.94**	**0,39**	**0,001**	**3,73**	**1,14**	**59,10**	**1,08**	**0,063**	**2,59**	**1,14**							
17	17.01.95	**1,39**		2,07	0,68	28.3	0,88	0.046	1.14	0,68							
18	07.02.95	**2,95**		3,13	0,45	16.4	1.75	0.040	1,34	0,45							
19	21.03.95	**8,80**		1,80	0,15	5.02	0.95	0.014	0,84	0,15	0.001	0.0107		0.017	0.0036	0.0480	
20	11.04.95	**12,06**		1,02	0,16	4.96	0,51	0,012	0.50	0,16							
21	09.05.95	**13,29**		1,23	0,18	4,37	0.68	0.010	0.54	0,18							
22	13.06.95	**4,03**		2,15	0,48	5.25	0.64	0.036	1.47	0,48							
23	11.07.95	**17,65**		0,98	0,16	3.76	0,46	0.017	0.50	0,16							
24	08.08.95	**3,12**		2,26	0,47	13,66	0.78	0.031	1.45	0,47							
25	26.09.95	**1,25**		2,73	0,67	23,80	0,86	0,043	1,83	0,67							
26	10.10.95	**0,85**		3,31	0,83	31,90	0,69	0,060	2.56	0,83							
27	08.11.95	**0,85**		3,96	1,05	37.8	0.69	0.060	3.21	1,05							
28	12.12.95	**2,13**		2,42	0,46	19.8	0.97	0.043	1.41	0,46	<0.001	<0.01		<0.01	<0.005	0.12	
29	**13.02.95**	**4,41**		**1,83**	**0,39**	**9,65**	**0,67**	**0,009**	**1,15**	**0,39**							
30	**11.05.95**	**12,47**		**1,08**	**0,13**	**4,85**	**0,54**	**0,015**	**0,52**	**0,13**							
31	**14.08.95**	**2,95**		**2,02**	**0,50**	**12,15**	**0,64**	**0,055**	**1,32**	**0,50**							
32	**27.11.95**	**2,45**		**2,29**	**0,58**	**13,09**	**0,78**	**0,046**	**1,46**	**0,58**							
33	09.01.96	**5,16**		2,24	0,39	5.6	1.24	0.018	0,98	0,39							
34	06.02.96	**4,46**		2,15	0,35	7.66	1.05	0,041	1.06	0,35							
35	09.04.96	**11,24**		1,45	0,13	6.83	1.03	0.016	0.40	0,13							
36	07.05.96	**10,60**		0,78	0,08	5.97	0.53	0.020	0.23	0,08							

Table 4.8-11

Data on water and sediment discharge and water quality, Ossam River, Troyan Town

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
37	25.06.96	**1,59**		1,21	0,24	18,70	0.38	0.082	0.75	0,24	<0.001	0.02		<0.01	<0.005	0.03	
38	08.10.96	**1,06**		2,07	0,71	28.0	0,96	0,050	1,06	0,71							
39	12.11.96	**1,31**		1,74	0,65	12.1	0.19	0.041	1,51	0,65							
40	17.12.96	**2,82**		1,94	0,13	12.5	0.76	0.034	1,15	0,13	<0.001	<0.01		0.01	<0.005	0.06	
41	**16.02.96**	**3,18**		0,81	0,44	13,89	0,42	0,070	0,32	0,440							
42	**15.05.96**	**9,69**		1,20	0,13	5,08	0,58	0,026	0,59	0,13							
43	**07.08.96**	**0,52**		4,79	0,85	43,10	1,18	0,054	3,56	0,85							
44	**21.11.96**	**7,34**		1,92	0,72	8,16	0,39	0,015	1,51	0,72							
45	12.08.97	**17,13**		0,90	0,29	3.2	0.70	0,031	0.17	0,29							
46	16.09.97	**2,84**		1,00	0,20	11.7	0.34	0.040	0.62	0,20	<0.001	<0.01		<0.01	<0.005	0.04	
47	18.11.97	**4,57**		0,77	0,11	8.6	0.39	0.029	0.35	0,11							
48	03.12.97	**26,80**		0,94	0,09	6.32	0.63	0.015	0.29	0,09							
49	**05.02.97**	**1,80**		**2,89**	**0,64**	**16,00**	**0,96**	**0,049**	**1,88**	**0,64**							
50	**28.05.97**	**9,45**		**1,07**	**0,16**	**5,45**	**0,60**	**0,024**	**0,45**	**0,16**							
51	**12.08.97**	**17,50**		**1,17**	**0,13**	**3,97**	**0,45**	**0,013**	**0,31**	**0,13**							
52	**12.11.97**	**7,06**		**1,21**	**0,3**	**8,43**	**0,41**	**0,035**	**0,76**	**0,30**							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-12

Data on water and sediment discharge and water quality, Ossam River, Lovetch Town

Number	Date	Water	Sediment	Total	Total	Fractions of N and P							Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	18.01.94	**1,03**	**0,02**	2,64	0,12	24.6	0.21	0,032	2.4	0,12							
2	09.02.94	**1,63**	**0,02**	3,09	0,23	23.8	0,29	0,036	2,76	0,23							
3	15.03.94	**5,63**	**0,11**	2,85	0,10	22.7	0.88	0,046	1.92	0,10							
4	12.04.94	**12,68**	**0,42**	1,45	0,08	5.25	0.95	0,087	0,41	0,08							
5	10.05.94	**12,10**	**0,38**	1,46	0,06	7.51	0.99	0,076	0,39	0,06							
6	21.06.94	**4,25**	**0,06**	1,78	0,13	10.5	0,68	0.093	1.01	0,13							
7	12.07.94	**10,45**	**0,50**	2,66	0,05	9.53	1.54	0.148	0.97	0,05							
8	09.08.94	**3,87**	**0,24**	3,20	0,32	6.40	1.32	0.060	1,82	0,32							
9	14.09.94	**0,80**	**0,01**	4,19	0,07	29,25	0.35	0,030	3.81	0,07							
10	11.10.94	**1,05**	**0,02**	4,03	0,10	24,90	0.46	0.290	3.28	0,10							
11	08.11.94	**0,80**	**0,01**	5,20	0,09	25,42	0,22	0.030	4.95	0,09							
12	20.12.94	**0,90**	**0,01**	3,93	0,08	24,12	0,29	0.039	3.60	0,08							
13	**07.02.94**	**1,03**	**0,02**	**2,40**	**0,09**	**25,60**	**0,34**	**0,034**	**2,03**	**0,09**							
14	**09.05.94**	**11,54**	**0,36**	**2,06**	**0,03**	**3,09**	**1,67**	**0,061**	**0,33**	**0,03**							
15	**08.08.94**	**5,48**	**0,49**	**1,62**	**0,34**	**5,70**	**0,58**	**0,048**	**0,99**	**0,34**							
16	**09.11.94**	**0,80**	**0,01**	**4,29**	**0,05**	**29,40**	**0,20**	**0,026**	**4,06**	**0,05**							
17	17.01.95	**1,78**	**0,04**	3,02	0,13	21,77	0,27	0,039	2.71	0,13							
18	07.02.95	**5,39**	**0,23**	3,64	0,41	4.62	2.54	0.041	1.06	0,41							
19	21.03.95	**13,10**	**0,50**	2,25	0,03	4.9	1.18	0.040	1.03	0,03	0.0028	0.0076		0.015	0.0110	0.0650	
20	11.04.95	**22,78**	**0,50**	2,67	0,02	2.37	1.87	0.042	0.76	0,02							
21	09.05.95	**20,40**	**0,50**	1,49	0,01	3.24	0.79	0.039	0.66	0,01							
22	13.06.95	**8,70**	**0,22**	2,35	0,03	2.85	1.18	0.166	1.00	0,03							
23	11.07.95	**41,73**	**10,00**	1,97	0,02	3.12	1.08	0.054	0.84	0,02							
24	08.08.95	**8,20**	**0,20**	2,62	0,02	6,67	1.84	0.156	0.62	0,02							
25	26.09.95	**2,59**	**0,08**	4,09	0,15	12,85	1.66	0.069	2,36	0,15							
26	08.11.95	**2,03**	**0,05**	3,92	0,09	14,26	1,01	0.038	2.87	0,09							
27	12.12.95	**7,20**	**0,16**	2,94	0,39	9.24	1.52	0.044	1.38	0,39							
28	**13.02.95**	**7,69**	**0,18**	**2,36**	**0,42**	**6,68**	**1,42**	**0,050**	**0,89**	**0,42**							
29	**11.05.95**	**20,40**	**0,50**	**1,36**	**0,01**	**2,93**	**0,98**	**0,035**	**0,34**	**0,01**							
30	**14.08.95**	**5,80**	**0,12**	**1,60**	**0,31**	**4,89**	**0,64**	**0,049**	**0,91**	**0,31**							
31	**27.11.95**	**3,90**	**0,09**	**2,62**	**0,28**	**8,15**	**0,81**	**0,041**	**1,77**	**0,28**							
32	09.01.96	**11,92**		3,17	0,02	5.85	2.03	0,104	1.04	0,02							
33	06.02.96	**11,36**		3,15	0,02	5.33	2.28	0,096	0.77	0,02							
34	09.04.96	**22,70**		2,04	0,02	3.49	1.62	0.024	0.40	0,02							
35	07.05.96	**15,74**		1,71	0,02	4.62	1.07	0.043	0.60	0,02							
36	25.06.96	**2,08**		2,12	0,10	13,00	1.31	0,042	0.77	0,10							

Table 4.8-12

Data on water and sediment discharge and water quality, Ossam River, Lovetch Town

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
37	08.10.96	**2,62**		2,16	0,20	2.36	1.11	0.078	0.97	0,20							
38	12.11.96	**2,62**		2,30	0,24	5.46	1.06	0.047	1.19	0,24							
39	17.12.96	**4,43**		2,92	0,14	5.17	1.23	0.034	1,66	0,14							
40	**19.02.96**	**10,80**		**2,18**	**0,01**	**8,78**	**1,65**	**0,095**	**0,43**	**0,01**							
41	**16.05.96**	**14,99**		**1,73**	**0,02**	**4,36**	**1,28**	**0,077**	**0,37**	**0,02**							
42	**21.08.96**	**1,73**		**3,23**	**0,19**	**22,46**	**0,31**	**0,035**	**2,89**	**0,19**							
43	**22.11.96**	**13,56**		**1,87**	**0,02**	**4,65**	**1,39**	**0,066**	**0,41**	**0,02**							
44	12.08.97	**22,55**		1,02	0,06	2.8	0.79	0.033	0.20	0,06							
45	16.09.97	**3,05**		3,02	0,30	13,09	0.39	0,045	2,58	0,30							
46	18.11.97	**6,35**		1,15	0,34	5.06	0.64	0.071	0.44	0,34							
47	03.12.97	**33,60**		1,22	0,02	2.27	0.65	0,033	0.54	0,02							
48	**05.02.97**	**1,75**		**3,25**	**0,13**	**22,44**	**0,26**	**0,033**	**2,96**	**0,13**							
49	**28.05.97**	**9,10**		**2,03**	**0,08**	**6,25**	**1,38**	**0,108**	**0,54**	**0,08**							
50	**12.08.97**	**25,90**		**1,21**	**0,02**	**3,08**	**0,88**	**0,028**	**0,3**	**0,02**							
51	**12.11.97**	**4,15**		**2,5**	**0,32**	**10,96**	**0,77**	**0,048**	**1,68**	**0,32**							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-13

Data on water and sediment discharge and water quality, Ossam River, Izgrev Village

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	07.02.94	0,86	0,03	3,71	0,14	19,03	1,37	0,019	2,31	0,14							
2	09.05.94	10,69	2,95	2,25	0,04	3,91	1,92	0,007	0,33	0,04							
3	08.08.94	6,34	0,35	2,03	0,03	4,74	1,59	0,041	0,40	0,03							
4	09.11.94	1,07	0,04	2,79	0,12	21,64	1,21	0,024	1,56	0,12							
5	13.02.95	5,83	0,9	1,72	0,04	4,89	1,34	0,037	0,34	0,04							
6	11.05.95	16,46	3,3	3,21	0,03	3,54	2,68	0,012	0,52	0,03							
7	14.08.95	5,90	1	1,87	0,05	7,01	1,46	0,055	0,36	0,05							
8	27.11.95	4,76	0,12	1,97	0,04	5,05	1,49	0,052	0,43	0,04							
9	19.02.96	6,82	0,12	1,83	0,07	4,97	1,44	0,070	0,32	0,07							
10	16.05.96	17,56	2,07	2,68	0,02	3,76	2,38	0,037	0,26	0,02							
11	21.08.96	2,65	0,09	2,55	0,09	12,54	1,23	0,027	1,29	0,09							
12	22.11.96	11,10	0,53	2,32	0,04	3,88	2,02	0,006	0,30	0,04							
13	05.02.97	7,50		2,04	0,03	5,32	1,66	0,045	0,33	0,03							
14	28.05.97	9,46		2,44	0,05	4,22	1,77	0,018	0,35	0,05							
15	12.08.97	34,20		3,26	0,03	5,05	3,02	0,012	0,23	0,03							
16	12.11.97	4,82		2,02	0,05	5,15	1,56	0,045	0,41	0,05							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-14

Data on water and sediment discharge and water quality, Rossitza River, Sevlievo Town

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	15.03.94	**1,05**	**0,005**	1,70	0,07	16,00	0.53	0,029	1.14	0,07				<0.01	<0.005	<0.01	
2	20.04.94	**4,69**	**0,120**	1,87	0,03	4,48	0.52	0.031	1.32	0,03				<0.01	<0.005	<0.01	
3	04.05.94	**6,28**	**0,250**	1,58	0,02	4,54	0.45	0,054	1.08	0,02				<0.01	<0.005		
4	02.06.94	**1,23**	**0,005**	1,63	0,06	10,55	0,50	0.017	1.11	0,06				<0.01	<0.005	<0.01	
5	23.08.94	**0,50**	**0,002**	7,91	0,04	8.92	0.15	0.054	7.71	0,04				<0.01	<0.005	<0.01	
6	06.09.94	**0,16**	**0,000**	10,13	0,07	14.7	0.26	0.029	9.84	0,07				<0.01	<0.005	<0.01	
7	02.12.94	**2,05**	**0,007**	3,13	0,03	5.34	0.6	0.038	2.49	0,03		0.024				0.017	
8	**09.02.94**	**0,87**	**0,004**	**5,69**	**0,12**	**13,36**	**0,34**	**0,041**	**5,31**	**0,12**							
9	**16.05.94**	**6,28**	**0,250**	**1,80**	**0,03**	**4,90**	**0,84**	**0,061**	**0,90**	**0,03**							
10	**15.08.94**	**1,02**	**0,005**	**1,57**	**0,05**	**12,78**	**0,45**	**0,025**	**1,09**	**0,05**							
11	**07.11.94**	**0,18**	**0,001**	**8,99**	**0,09**	**15,12**	**0,36**	**0,038**	**8,59**	**0,09**							
12	27.02.95	**7,98**		1,98	0,02	4.8	1,44	0.015	0.52	0,02	0.005	0.0041		0.009	0.025	0.017	
13	14.03.95	**11,87**		1,50	0,02	2.9	0.86	0.016	0.62	0,02	<0.001	<0.01		<0.01	<0.005	<0.01	
14	26.04.95	**11,87**		2,65	0,02	3.28	2,03	0,023	0,60	0,02	<0.001	<0.01		<0.01	<0.005	<0.01	
15	09.05.95	**14,37**		2,12	0,02	3.2	1.63	0.007	0,48	0,02	<0.001	<0.01		<0.01	<0.005	<0.01	
16	13.06.95	**5,87**		0,95	0,03	5.4	0.07	0,055	0.82	0,03	<0.001	<0.01		<0.01	<0.005	<0.01	
17	11.07.95	**39,80**		1,33	0,04	5.9	1,04	0.09	0.20	0,04	<0.001	<0.01		,<0.01	<0.005	<0.01	
18	08.08.95	**2,28**		0,87	0,02	5,93	0.29	0.05	0.53	0,02							
19	01.09.95	**6,64**		1,53	0,01	3.86	1,02	0.03	0.48	0,01		<0.01		<0.01	<0.005	<0.01	
20	17.10.95	**1,28**		6,25	0,06	7.52	0.32	0,028	5.9	0,06	0.002	0.01		0.01	0.01	0.01	
21	12.12.95	**4,37**		1,65	0,04	5.06	0,86	0,063	0.73	0,04							
22	**23.02.95**	**10,66**		**2,29**	**0,03**	**4,21**	**1,56**	**0,046**	**0,68**	**0,03**							
23	**15.05.95**	**9,53**		**2,04**	**0,03**	**3,90**	**1,46**	**0,064**	**0,52**	**0,03**							
24	**01.08.95**	**2,78**		**1,56**	**0,04**	**5,65**	**0,65**	**0,056**	**0,85**	**0,04**							
25	**22.11.95**	**8,47**		**2,00**	**0,05**	**4,31**	**1,45**	**0,061**	**0,49**	**0,05**							
26	09.01.96	**11,28**		2,26	0,01	4,78	1,89	0,033	0.34	0,01	0.001	0.01		0.01	0.005	0.01	
27	09.04.96	**18,48**		2,68	0,08	12.4	2,27	0,017	0.39	0,08							
28	02.05.96	**17,16**		0,63	0,06	6.45	0.19	0,021	0.42	0,06	0.001	0.01		0.01	0.005	0.13	
29	27.06.96	**1,42**		1,28	0,05	8,12	.069	0.16	1,05	0,05	0.001	0.01		0.01	0.005	0.01	
30	01.10.96	**13,91**		1,07	0,01	2.58	0.48	0,029	0,56	0,01							
31	26.11.96	**12,65**		2,91	0,03	8.65	2,18	0,036	0.69	0,03	0.001	0.01		0.01	0.005	0.03	
32	12.12.96	**9,67**		2,12	0,04	6.84	0.72	0,035	1.36	0,04	0.001	0.01		0.01	0.005	0.02	
33	**27.02.96**	**18,48**		**2,52**	**0,01**	**7,22**	**2,16**	**0,024**	**0,34**	**0,01**							
34	**20.05.96**	**12,05**		**2,81**	**0,01**	**4,02**	**2,24**	**0,035**	**0,53**	**0,01**							
35	**19.08.96**	**1,57**		**1,58**	**0,04**	**7,96**	**0,53**	**0,034**	**1,02**	**0,04**							
36	**10.11.96**	**1,42**		**1,61**	**0,04**	**8,12**	**0,49**	**0,037**	**1,08**	**0,04**							

Table 4.8-14

Data on water and sediment discharge and water quality, Rossitza River, Sevlievo Town

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
37	09.01.97	**5,90**		1,64	0,02	4,43	0.87	0.009	0,76	0,02	0.001	0.01		0.01	0.005	0.02	
38	26.02.97	**3,50**		3,49	0,04	8.0	0,83	0,060	2.6	0,04	<0.001	<0.01		<0.01	<0.005	0.06	
39	25.03.97	**7,80**		5,35	0,01	7.67	4,54	0,054	0.76	0,01	0.001	0.01		0.01	0.005	0.03	
40	22.04.97	**65,90**		0,38	0,01	8,33	0.24	0.027	0,11	0,01	<0.001	<0.01		<0.01	<0.005	<0.01	
41	27.05.97	**8,40**		5,73	0,03	5.6	4,70	0.03	1.0	0,03	<0.001	<0.01		<0.01	<0.005	<0.01	
42	27.11.97	**7,80**		1,95	0,02	9.8	1,32	0.078	0.55	0,02	<0.001	<0.01		0.02	<0.005	0.15	
43	**05.02.97**	**7,20**		**1,83**	**0,01**	**4,43**	**1,21**	**0,069**	**0,55**	**0,01**							
44	**28.05.97**	**11,00**		**2,18**	**0,02**	**4,00**	**1,77**	**0,032**	**0,38**	**0,02**							
45	**12.08.97**	**29,00**		**1,56**	**0,04**	**7,56**	**1,32**	**0,018**	**0,22**	**0,04**							
46	**12.11.97**	**8,40**		**4,89**	**0,02**	**4,62**	**4,38**	**0,074**	**0,44**	**0,02**							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-15

Data on water and sediment discharge and water quality, Yantra River, Gabrovo Town

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	07.03.94	**0,76**		9,23	0,09	19,70	1.07	0,040	8.12	0,09				<0.01	<0.005	<0.01	
2	12.04.94	**3,12**		4,61	0,07	8,76	0,64	0,021	3,95	0,07							
3	21.06.94	**2,12**		5,58	0,11	10,34	2.1	0,027	3.45	0,11				<0.01	<0.005	<0.01	
4	27.07.94	**0,76**		7,26	0,07	14,32	1,83	0,041	5,39	0,07							
5	23.08.94	**0,48**		6,27	0,06	34,00	1.23	0,045	4.99	0,06				<0.01	<0.005	<0.01	
6	07.09.94	**0,44**		6,28	0,06	30,00	0.29	0.038	5.95	0,06		<0.01		<0.01	<0.005	<0.01	
7	12.10.94	**0,44**		12,44	0,05	16.3	1,10	0,044	11.3	0,05	<0.001	<0.01		<0.01	<0.005	<0.01	
8	01.11.94	**0,48**		11,39	0,21	51.8	0.25	0.038	11.1	0,21							
9	23.11.94	**0,44**		6,62	0,04	17.2	1,23	0.035	5.35	0,04							
10	**09.02.94**	**0,84**		**6,26**	**0,07**	**17,22**	**1,01**	**0,040**	**5,21**	**0,07**							
11	**17.05.94**	**1,13**		**5,45**	**0,10**	**14,65**	**0,92**	**0,035**	**4,49**	**0,10**							
12	**16.08.94**	**0,44**		**7,38**	**0,03**	**35,64**	**1,24**	**0,048**	**6,09**	**0,05**							
13	**08.11.94**	**0,44**		**7,00**	**0,07**	**39,20**	**1,18**	**0,042**	**5,78**	**0,07**							
14	24.01.95	**1,29**		7,75	0,08	20.8	0,88	0.08	6.79	0,08	<0.001	<0.01		<0.01	<0.005	<0.01	
15	09.03.95	**3,84**		9,00	0,12	9.1	0.50	0.095	8.4	0,12	0.001	0.0001		0.026	0.008	0.026	
16	19.04.95	**12,50**		3,83	0,03	9.47	0.52	0,009	3.3	0,03	<0.001	<0.01		<0.01	<0.005	<0.01	
17	04.05.95	**4,61**		5,17	0,09	7.2	0.69	0.04	4,44	0,09	<0.001	0.01		0.021	0.084	0.010	
18	01.06.95	**2,08**		3,55	0,10	5.6	0,74	0,029	2.78	0,10	<0.001	<0.01		<0.01	<0.005	<0.01	
19	27.07.95	**1,48**		5,21	0,04	14,06	0,84	0,032	4,34	0,04		<0.01		<0.01	<0.005	<0.01	
20	28.08.95	**0,92**		5,93	0,07	11.2	0,69	0,035	5.2	0,07				<0.01			
21	26.09.95	**0,92**		4,21	0,07	18.0	0.66	0,037	3.51	0,07	0.01	0.01		0.01	0.01	0.01	
22	05.10.95	**0,82**		6,13	0,04	16,80	1,21	0,039	4,88	0,04							
23	06.12.95	**2,48**		4,93	0,11	10,35	0,70	0,021	4,21	0,11	0.001	0.01		0.01	0.007	0.06	
24	**23.02.95**	**4,61**		**3,61**	**0,09**	**8,64**	**0,61**	**0,015**	**2,98**	**0,09**							
25	**15.05.95**	**3,14**		**4,34**	**0,13**	**8,85**	**0,47**	**0,021**	**3,85**	**0,13**							
26	**01.08.95**	**1,05**		**5,39**	**0,06**	**14,34**	**0,89**	**0,036**	**4,46**	**0,06**							
27	**22.11.95**	**1,92**		**4,85**	**0,07**	**12,55**	**0,81**	**0,032**	**4,00**	**0,07**							
28	03.01.96	**9,08**		2,75	0,05	10.7	0,47	0,013	2,27	0,05							
29	03.04.96	**9,38**		4,05	0,05	6,12	0.73	0.015	3.3	0,05							
30	02.05.96	**6,47**		2,52	0,07	7.85	0.21	0,012	2.3	0,07	0.001	0.01		0.01	0.005	0.08	
31	27.06.96	**0,59**		3,97	0,03	35,95	1,06	0.085	2.82	0,03	0.001	0.03		0.01	0.005	0.03	
32	22.10.96	**0,50**		5,98	0,03	33,20	0.46	0.048	5,47	0,03	<0.001	<0.01		<0.01	<0.005	0.03	
33	13.11.96	**0,54**		5,96	0,02	28,87	0.47	0,047	5,44	0,02	<0.001	<0.01		<0.01	<0.005	0.11	
34	03.12.96	**23,00**		1,67	0,04	4.78	1.36	0.024	0.29	0,04	<0.001	<0.01		0.03	0.010	0.20	
35	**27.02.96**	**4,35**		**3,63**	**0,08**	**7,12**	**0,59**	**0,017**	**3,02**	**0,08**							
36	**20.06.96**	**2,48**		**5,30**	**0,10**	**9,65**	**0,84**	**0,027**	**4,43**	**0,10**							

Table 4.8-15

Data on water and sediment discharge and water quality, Yantra River, Gabrovo Town

Number	Date month/ date/year	Water Discharge m3/s	Sediment Discharge kg/s	Total N mg/l	Total P mg/l	BOD5 mg/l	Fractions of N and P: N-NO3 mg/l	N-NO2 mg/l	N-NH4 mg/l	P-PO4 mg/l	Concentration of heavy metals: Cd mg/l	Pb mg/l	As mg/l	Cu mg/l	Ni mg/l	Zn mg/l	Cr mg/l
-																	
37	**19.08.96**	**0,50**		**5,68**	**0,04**	38.7	**0,47**	**0,045**	**5,16**	**0,04**							
38	**28.11.96**	**15,40**		**2,46**	**0,03**	**5,44**	**0,44**	**0,008**	**2,01**	**0,03**							
39	23.01.97	**4,80**		3,59	0,05	5,00	0,57	0.016	3,00	0,05	0.001	0.01		0.01	0.005	0.02	
40	06.02.97	**1,75**		5,75	0,05	17,50	0,80	0,034	4,92	0,05	<0.001	<0.01		<0.01	<0.005	0.03	
41	18.03.97	**3,80**		4,24	0,04	9,54	1.01	0,020	3,21	0,04		0.03		0.01	0.005	0.03	
42	01.04.97	**5,80**		7,21	0,02	10.9	0.7	0,013	6.5	0,02	<0.001	<0.01		<0.01	<0.005	0.01	
43	20.05.97	**3,20**		11,38	0,07	9,80	0.46	0,023	10.9	0,07	<0.001	<0.01		0.01	0.01	0.02	
44	19.06.97	**1,90**		11,87	0,26	12,82	0.44	0,031	11.4	0,06	<0.001	<0.01		<0.01	<0.005	0.02	
45	29.08.97	**1,35**		5,39	0,12	33.0	0,70	0,034	4,66	0,12	<0.001	0.01		<0.01	<0.005	<0.01	
46	18.11.97	**3,45**		8,44	0,18	7,88	0.83	0.012	7.6	0,18	<0.001	<0.01		<0.01	<0.005	0.06	
47	02.12.97	**9,15**		2,74	0,17	5,78	0,41	0,011	2,32	0,17	<0.001	<0.01		<0.01	<0.005	0.08	
48	**05.02.97**	**2,80**		4,41	0,10	9,43	0,71	0,025	4,11	0,10							
49	**02.06.97**	**3,40**		**4,34**	**0,12**	**7,80**	**0,65**	**0,018**	**3,67**	**0,12**							
50	**12.08.97**	**3,43**		**4,09**	**0,11**	**7,65**	**0,61**	**0,016**	**3,46**	**0,11**							
51	**16.12.97**	**4,10**		**3,83**	**0,08**	**6,56**	**0,59**	**0,014**	**3,23**	**0,08**							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-16

Data on water and sediment discharge and water quality, Yantra River, Cholakovtzi Village

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	09.03.94	**2,00**	**0,043**	4,20	0,05	9.06	1,88	0,017	2.3	0,05				<0.01	<0.005	<0.01	
2	12.04.94	**11,13**	**0,320**	2,57	0,01	3,44	2,20	0.028	0.34	0,01				<0.01	<0.005	<0.01	
3	15.06.94	**4,20**	**0,072**	2,55	0,06	4,54	1.63	0.069	0.85	0,06				<0.01	<0.005	<0.01	
4	18.08.94	**1,72**	**0,039**	2,42	0,02	4.7	1,56	0.033	0.83	0,02							
5	**09.02.94**	**3,47**	**0,064**	**2,54**	**0,08**	**4,73**	**1,91**	**0,055**	**0,58**	**0,08**							
6	**16.05.94**	**2,00**	**0,043**	**2,74**	**0,05**	**8,01**	**1,73**	**0,040**	**0,97**	**0,05**							
7	**15.08.94**	**1,90**	**0,041**	**2,41**	**0,06**	**6,82**	**1,45**	**0,053**	**0,91**	**0,06**							
8	**07.11.94**	**1,80**	**0,040**	**2,39**	**0,07**	**7,44**	**1,57**	**0,033**	**0,79**	**0,07**							
9	**23.02.95**	**13,74**		**2,23**	**0,01**	**4,72**	**1,88**	**0,032**	**0,32**	**0,01**							
10	**15.05.95**	**8,17**		**3,21**	**0,01**	**4,50**	**2,68**	**0,021**	**0,51**	**0,01**							
11	**11.08.95**	**3,02**		**2,97**	**0,05**	**5,22**	**2,19**	**0,003**	**0,78**	**0,05**							
12	**02.12.95**	**5,90**		**2,14**	**0,04**	**4,26**	**1,49**	**0,046**	**0,61**	**0,04**							
13	**27.02.96**	**24,63**		**3,78**	**0,01**	**5,12**	**3,48**	**0,019**	**0,28**	**0,01**							
14	**20.05.96**	**10,64**		**3,95**	**0,04**	**3,56**	**3,53**	**0,034**	**0,39**	**0,04**							
15	**19.08.96**	**1,44**		**2,62**	**0,04**	**8,23**	**1,26**	**0,095**	**1,26**	**0,04**							
16	**28.11.96**	**87,62**		**1,03**	**0,01**	**6,66**	**0,81**	**0,011**	**0,21**	**0,01**							
17	**05.02.97**	**7,55**		**3,05**	**0,02**	**4,00**	**2,43**	**0,061**	**0,56**	**0,02**							
18	**02.06.97**	**12,20**		**2,39**	**0,01**	**4,23**	**2,11**	**0,031**	**0,25**	**0,01**							
19	**12.08.97**	**2,20**		**2,94**	**0,04**	**6,96**	**1,88**	**0,028**	**1,03**	**0,04**							
20	**17.12.97**	**7,50**		**2,91**	**0,02**	**3,89**	**2,27**	**0,063**	**0,58**	**0,02**							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-17

Data on water and sediment discharge and water quality, Yantra River, Samovodene Village

Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
09.03.94	**3,15**		3,31	0,08	13,46	0.92	0,08	2.31	0,08				<0.01	<0.005	<0.01	
17.04.94	**22,63**		2,35	0,11	8.9	1,39	0,04	0,92	0..11							
10.05.94	**148,71**		1,62	0,10	16,40	0.56	0.06	1.00	0,10							
01.06.94	**14,35**		0,71	0,12	12.8	0.33	0,02	0,36	0,12				<0.01	<0.005	<0.01	
13.08.94	**2,72**		2,28	0,14	11,94	0,76	0,08	1.44	0,14							
06.10.94	**3,37**		3,02	0,08	13.3	0,75	0,07	2,20	0,08		<0.01		<0.01	<0.005	<0.01	
01.12.94	**1,78**		3,95	0,06	16,70	0.82	0.11	3.02	0,06		0.009				0.019	
17.01.95	**4,06**		4,26	0,05	11.7	0,74	0.03	3.49	0,05	<0.001	<0.01		<0.01	<0.005	<0.01	
16.03.95	**9,57**		1,12	0,40	5.6	0,59	0,04	0.49	0,04	<0.001	<0.01		0.025	0.0042	0.031	
12.04.95	**21,28**		1,61	0,11	15.9	0.88	0,05	0.68	0,11	<0.001	<0.01		<0.01	<0.005	<0.01	
17.05.95	**13,46**		1,26	0,13	3.06	0.79	0.05	0,42	0,13	<0.001	<0.01		<0.01	<0.005	<0.01	
25.07.95	**7,56**		1,80	0,06	4.0	0.94	0,05	0.81	0,06	<0.001	<0.01		<0.01	<0.005	<0.01	
24.08.95	**7,97**		1,66	0,08	4.28	0,71	0.06	0,89	0,08		<0.01		<0.01			
21.09.95	**4,70**		9,91	0,07	10,21	7.7	0.06	2,15	0,07							
19.12.95	**6,03**		2,02	0,03	6.34	0,66	0,05	1.31	0,05	0.001	0.01		0.01	0.005	0.13	
03.01.96	**42,15**		2,71	0,06	5.22	1.75	0,02	0.94	0,06							
13.03.96	**12,40**		1,03	0,03	3.72	0,48	0,04	0,51	0,03							
24.04.96	**30,52**		0,62	0,11	10.9	0.37	0.01	0.24	0,11							
07.05.96	**14,52**		0,73	0,09	9.25	0.42	0.03	0.28	0,09	0.001	0.01		0.01	0.005	0.16	
18.06.96	**5,24**		2,32	0,06	7,82	0,69	0,07	1,56	0,06	<0.001	0.03		<0.01	<0.005	0.03	
09.10.96	**1,99**		3,53	0,06	15,68	0,78	0,14	2,61	0,06	<0.001	<0.01		<0.01	0.006	0.28	
20.11.96	**2,19**		1,61	0,09	14,45	0.58	0,09	0.94	0,04	0.001	0.01		0.01		0.02	
10.12.96	**12,40**		0,48	0,09	3,89	0.43	0.03	.020	0,09	0.001	0.01		0.01	0.005	0.03	
28.01.97	**11,23**		1,06	0,09	4,01	0,55	0.02	0,49	0,09	0.01	0.01		0.01	0.005	0.03	
12.02.97	**5,93**		2,66	0,08	7.66	0,71	0,05	1,90	0,08	<0.001	<0.01		<0.01	<0.005	<0.01	
19.03.97	**7,99**		1,60	0,06	4,40	0,69	0,05	0.86	0,06	0.001	0.01		0.01	0.005	0.03	
06.05.97	**22,20**		1,49	0,12	11.9	1.15	0,03	0,31	0,12	<0.001	<0.01		<0.01	<0.005	0.01	
12.06.97	**11,45**		1,01	0,13	3.5	0.49	0,03	0.49	0,13	<0.001	<0.01		<0.01	<0.005	0.02	
19.08.97	**5,72**		2,50	0,06	8,32	0,72	0.08	1,70	0,06	<0.001	<0.01		<0.01	<0.005	0.01	
03.12.97	**12,91**		1,04	0,10	4,04	0,55	0,04	0,45	0,10							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-18

Data on water and sediment discharge and water quality, Yantra River, Karantzi Village

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	24.03.94	**9,61**	**1,18**	4,51	0,07	10.8	0.65	0,099	3.76	0,07				<0.01	<0.005	<0.01	
2	14.07.94	**38,77**	**8,50**	3,66	0,04	3,91	2,21	0,032	1.42	0,04							
3	08.09.94	**3,95**	**0,15**	3,87	0,09	15.9	0.44	0.16	3.27	0,09		<0.01		<0.01	<0.005	<0.01	
4	01.12.94	**4,92**	**0,22**	2,89	0,04	16.7	0.64	0.13	2.12	0,04		0.016				0.050	
5	**10.02.94**	**11,32**	**4,40**	**2,65**	**0,06**	**7,90**	**0,84**	**0,088**	**1,72**	**0,06**							
6	**17.05.94**	**6,28**	**0,57**	**3,26**	**0,10**	**13,23**	**0,69**	**0,140**	**2,43**	**0,10**							
7	**16.08.94**	**9,85**	**1,20**	**2,23**	**0,03**	**8,64**	**0,64**	**0,021**	**1,56**	**0,03**							
8	**08.11.94**	**4,75**	**0,21**	**2,80**	**0,07**	**14,94**	**0,68**	**0,030**	**2,09**	**0,07**							
9	17.01.95	**5,96**	**0,53**	3,65	0,03	13,60	1.83	0.04	1.78	0,03	<0.001	<0.01		<0.01	<0.005	<0.01	
10	01.03.95	**23,80**	**4,65**	3,55	0,03	6.28	2.64	0.02	0.89	0,03	0.0005	0.0017		0.002	0.003	0.004	
11	29.06.95	**45,10**	**23,50**	2,04	0,09	4.32	1,66	0.07	0.31	0,09		<0.01		<0.01			
12	21.09.95	**13,40**	**2,00**	2,37	0,03	16.8	1,18	0,072	1.12	0,03							
13	19.12.95	**12,39**	**1,78**	3,43	0,04	7.5	2.36	0.08	0.99	0,04	0.001	0.01		0.04	0.005	0.04	
14	**23.02.95**	**39,00**	**15,00**	**2,49**	**0,03**	**4,16**	**1,88**	**0,035**	**0,58**	**0,03**							
15	**16.05.95**	**33,15**	**10,10**	**2,49**	**0,04**	**5,00**	**1,80**	**0,037**	**0,65**	**0,04**							
16	**02.08.95**	**10,16**	**1,30**	**3,41**	**0,05**	**8,48**	**0,91**	**0,091**	**2,41**	**0,05**							
17	**23.11.95**	**16,97**	**2,88**	**3,40**	**0,05**	**7,34**	**1,65**	**0,072**	**1,68**	**0,05**							
18	18.06.96	**37,27**	**19,60**	2,44	0,01	3.34	2,12	0.015	0.3	0,01	<0.001	0.02		0.01	<0.005	<0.01	
19	21.11.96	**16,00**	**8,10**	2,29	0,04	4.94	1,75	0.01	0.53	0,04	0.01	0.01		0.01		0.03	
20	**28.02.96**	**113,93**	**54,00**	**0,99**	**0,01**	**9,78**	**0,66**	**0,009**	**0,32**	**0,01**							
21	**21.05.96**	**20,35**	**11,50**	**3,80**	**0,04**	**5,45**	**2,53**	**0,065**	**1,20**	**0,04**							
22	**20.08.96**	**14,73**	**7,50**	**3,10**	**0,04**	**7,68**	**1,23**	**0,078**	**1,79**	**0,04**							
23	**29.11.96**	**105,33**	**134,00**	**1,19**	**0,01**	**10,22**	**0,81**	**0,009**	**0,37**	**0,01**							
24	19.03.97	**22,00**		3,01	0.0.3	8.94	2.19	0.042	0.78	0.0.3		0.01		0.01	0.006	0.02	
25	06.05.97	**68,50**		3,39	0,02	7.0	3.11	0.048	0.23	0,02	<0.001	<0.01		<0.01	<0.005	0.01	
26	12.06.97	**48,20**		1,56	0,07	6,54	0.94	0.09	0.53	0,07	<0.001	<0.01		<0.01	<0.005	0.03	
27	19.08.97	**33,00**		2,79	0,04	4,80	1.8	0.34	0,65	0,04	<0.001	0.01		<0.01	<0.005	0.02	
28	04.12.97	**51,00**		1,84	0,03	7.88	1,45	0.19	0.2	0,03	<0.001	0.02		<0.01	<0.005	0.01	
29	**05.02.97**	**17,60**		**3,43**	0,05	**5,98**	**1,87**	**0,076**	**1,84**	**0,05**							
30	**03.06.97**	**37,50**		**3,44**	**0,01**	**4,44**	**2,57**	**0,015**	**0,85**	**0,01**							
31	**11.08.97**	**42,00**		**1,98**	**0,01**	**4,07**	**1,43**	**0,012**	**0,54**	**0,01**							
32	**12.11.97**	**42,00**		**1,87**	**0,01**	**3,76**	**1,35**	**0,014**	**0,51**	**0,01**							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-19

Summary of simultaneous data on water and sediment discharge and water quality

Iantra river, Varbitza village

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	22.03.94	**3,33**		5,12	0,07	48,3	1,07	0,03	4,02	0,07				<0.01	<0.005	<0.01	
2	27.04.94	**5,94**		6,98	0,05	160,0	0,58	0,10	6,30	0,05							
3	17.05.94	**2,53**		6,71	0,11	47,7	0,47	0,04	6,20	0,11				<0.01	<0.005		
4	24.06.94	**2,53**		6,72	0,16	18,1	0,39	0,09	6,24	0,16	0.0052	0.0072		0.031	0.0052	0.030	
5	01.07.94	**1,25**		8,82	0,16	18,1	0,39	0,19	8,24	0,16	0.0018	0.0072		0.031	0.0052	0.030	<0.01
6	29.08.94	**3,90**		6,59	0,12	68,6	0,36	0,06	6,17	0,12		<0.01		<0.01	<0.005	<0.01	<0.01
7	21.09.94	**2,22**		6,46	0,17	159,0	0,38	0,07	6,01	0,17							
8	04.10.94	**2,65**		12,44	0,14	137,0	0,46	0,08	11,90	0,14		<0.01		<0.01	<0.005	<0.01	
9	15.11.94	**4,78**		6,70	0,09	132,0	1,34	0,06	5,30	0,09				<0.01	<0.005	<0.01	
10	01.12.94	**3,65**		3,49	0,06	160,0	0,40	0,15	2,94	0,06		0.018				0.024	
11	27.02.95	**11,74**		1,52	0,01	22,9	0,30	0,03	1,23	0,01	0.0003	0.01		0.018	<0.005	0.016	
12	15.03.95	**18,73**		1,66	0,01	9,4	0,75	0,04	0,87	0,01	0.0001	0.01		0.054	0.0029	<0.01	
13	12.04.95	**55,16**		1,53	0,01	7,6	0,58	0,02	0,93	0,01	<0.001	<0.01		<0.01	<0.005	<0.01	
14	25.05.95	**31,08**		0,76	0,02	8,4	0,31	0,04	0,41	0,02	<0.001	<0.01		<0.01	<0.005	<0.01	
15	20.06.95	**27,66**		3,72	0,02	7,6	0,59	0,05	3,08	0,02	<0.001	<0.01		<0.01	<0.005	<0.01	
16	05.07.95	**9,80**		1,29	0,06	6,9	0,32	0,10	0,87	0,06	<0.001	<0.01		<0.01	<0.005	<0.01	
17	29.08.95	**3,33**		2,54	0,06	38,6	0,35	0,09	2,10	0,06							
18	07.09.95	**4,88**		3,06	0,04	30,8	0,53	0,07	2,46	0,04		<0.01		<0.01	<0.005	<0.01	
19	10.10.95	**3,13**		8,79	0,06	155,0	1,87	0,05	6,87	0,06							
20	13.12.95	**5,62**		5,03	0,04	8,3	2,65	0,12	2,26	0,04							
21	16.01.96	**10,16**		3,68	0,03	11,0	1,86	0,03	1,79	0,03							
22	28.03.96	**76,91**		2,17	0,01	5,1	0,83	0,03	1,31	0,01							
23	17.04.96	**45,90**		2,91	0,03	7,9	1,67	0,06	1,18	0,03							
24	14.05.96	**13,43**		5,47	0,05	6,8	3,34	0,08	2,05	0,05	<0.001	0.02		<0.01	<0.005	0.01	
25	20.06.96	**5,72**		2,09	0,06	35,0	1,15	0,05	0,89	0,06	<0.001	0.02		<0.01	<0.005	0.01	
26	15.10.96	**2,58**		1,29	0,07	17,6	0,27	0,05	0,97	0,07	<0.001	<0.01		<0.01	<0.005	0.04	
27	20.11.96	**2,81**		3,62	0,04	15,5	0,49	0,06	3,07	0,04	0.001	0.01		0.01		0.07	
28	11.12.96	**13,13**		1,13	0,03	9,4	0,64	0,05	0,44	0,03	0.001	0.01		0.01	0.005	0.03	
29	15.01.97	**14,64**		2,70	0,03	9,6	2,19	0,04	0,47	0,03	0.001	0.01		0.01	0.005	0.01	
30	12.02.97	**7,04**		4,00	0,02	13,0	3,63	0,06	0,31	0,02	<0.001	<0.01		<0.01	<0.005	<0.01	
31	26.03.97	**23,45**		6,52	0,02	9,9	5,40	0,02	1,10	0,02	0.001	0.01		0.01	0.005	0.01	
32	15.04.97	**105,37**		1,57	0,01	6,3	0,69	0,02	0,86	0,01	<0.001	<0.01		<0.01	<0.005	0.02	
33	13.05.97	**13,48**		3,20	0,03	10,8	2,20	0,10	0,90	0,03	<0.001	<0.01		<0.01	<0.005	0.01	
34	17.06.97	**9,97**		1,83	0,02	20,4	0,65	0,08	1,10	0,02							
35	02.07.97	**6,70**		4,60	0,08	53,8	2,18	0,08	2,34	0,08	<0.001	<0.01		0.01	<0.005	0.05	
36	06.08.97	**6,70**		2,63	0,05	6,5	2,00	0,11	0,52	0,05	<0.001	<0.01		<0.01	<0.005	0.02	
37	03.12.97	**15,50**		3,56	0,04	9,4	1,90	0,10	1,56	0,04	<0.001	<0.01		<0.01	<0.005	0.01	

Source: *National Center for Envieronment and Sustainable Development* - plain type

National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-20

Data on water and sediment discharge and water quality, Beli Lom River, Razgrad Town

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	12.01.94	**1,06**		9,16	0,14	12,50	5,23	0,03	3.9	0,14							
2	08.02.94	**1,06**		9,50	0,15	12,00	5,70	0,03	3,77	0,15							
3	09.03.94	**1,09**		11,25	0,06	13	5.8	0,050	5,40	0,06							
4	11.04.94	**0,59**		9,28	0,39	15	3.8	0,08	5.4	0,39							
5	10.05.94	**0,55**		12,22	0,48	13,00	6.6	0,08	5,54	0,48							
6	14.06.94	**0,48**		6,97	0,65	18	1.1	0,11	5,76	0,65							
7	12.07.94	**0,55**		6,86	0,40	12	1.1	0.1	5,66	0,40							
8	09.08.94	**0,49**		10,67	0,59	23,20	4.7	0.1	5,87	0,59							
9	21.09.94	**0,44**		12,35	0,74	28	6,97	0,08	5.3	0,74							
10	11.10.94	**0,44**		11,68	0,70	18	7,98	0,10	3.6	0,70							
11	04.11.94	**0,44**		13,73	0,69	24	8,14	0,09	5,50	0,69							
12	07.12.94	**0,46**		13,38	0,78	23,0	7,21	0,07	6.1	0,78							
13	**09.02.94**	**1,09**		**9,39**	**0,09**	**7,04**	**5,70**	**0,02**	**3,66**	**0,09**							
14	**27.05.94**	**0,48**		**13,90**	**0,72**	**23. 11**	**8,32**	**0,10**	**5,48**	**0,72**							
15	**10.08.94**	**0,59**		**15,10**	**0,55**	**16,05**	**9,63**	**0,08**	**5,40**	**0,55**							
16	**10.11.94**	**0,46**		**12,75**	**0,69**	**27,43**	**7,33**	**0,08**	**5,34**	**0,69**							
17	17.01.95	**0,49**		10,38	0,75	19,50	6,30	0.18	3.9	0,75							
18	15.02.95	**0,49**		12,99	0,59	16.5	6.7	0,09	6,20	0,59							
19	14.03.95	**0,51**		13,06	0,43	26	6.48	0,08	6.5	0,43							
20	04.04.95	**0,95**		11,53	0,26	12	7	0,03	4.5	0,26							
21	02.05.95	**0,80**		9,84	0,24	13.5	5,00	0,04	4.8	0,24							
22	06.06.95	**0,77**		9,97	0,46	17.5	5,20	0,04	4,73	0,46							
23	04.07.95	**0,71**		8,54	0,42	18,50	5.3	0,04	3.2	0,42							
24	01.08.95	**0,66**		15,66	0,45	8.5	10.7	0,06	4,90	0,45							
25	12.09.95	**0,59**		12,74	0,46	12.5	7.7	0,06	4,98	0,46							
26	03.10.95	**0,61**		11,43	0,39	15	6.7	0,06	4,67	0,39							
27	14.11.95	**0,61**		14,60	0,42	14,50	10	0,06	4,54	0,42							
28	19.12.95	**0,61**		8,96	0,55	16	6	0,06	2.9	0,55							
29	**23.02.95**	**0,49**		**17,35**	**0,68**	**26,45**	**11,88**	**0,08**	**5,39**	**0,68**							
30	**28.05.95**	**0,80**		**9,62**	**0,22**	**13,66**	**5,01**	**0,07**	**4,54**	**0,22**							
31	**30.08.95**	**0,61**		**13,14**	**0,49**	**17,34**	**8,21**	**0,06**	**4,87**	**0,49**							
32	**01.11.95**	**0,57**		**10,06**	**0,56**	**18,96**	**9,66**	**0,06**	**5,34**	**0,56**							
33	26.02.96	**1,21**		8,38	0,05	12.5	4,60	0,03	3,75	0,05							
34	19.03.96	**1,17**		8,70	0,21	8.8	4,88	0,02	3.8	0,21							
35	28.04.96	**1,33**		6,64	0,17	15	4,12	0,02	2,50	0,17							
36	14.05.96	**1,39**		10,12	0,18	16	8.2	0,02	1.9	0,18							
37	11.06.96	**0,85**		14,16	0,15	18,00	10.9	0,06	3.2	0,15							
38	**28.02.96**	**1,09**		**8,55**	**0,10**	**12,23**	**4,66**	**0,02**	**3,87**	**0,10**							
39	**21.05.96**	**1,14**		**7,05**	**0,10**	**10,56**	**4,34**	**0,02**	**3,69**	**0,10**							
40	**20.08.96**	**0,65**		**10,49**	**0,44**	**15,45**	**5,54**	**0,06**	**4,88**	**0,44**							
41	**29.11.96**	**0,79**		**9,5**	**0,20**	**13,03**	**5,11**	**0,05**	**4,34**	**0,20**							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-21

Data on water and sediment discharge and water quality, Popovska River, Popovo Town

No	Sample point	Name	Date	Time	Q	t°C	pH	DO	DO	Cond.	BOD_5	COD Mn	COD Cr	DS	SS	Cl	SO_4	NH_4 N	NO_2 N	NO_3 N	PO_4	Fe	Mn	Ca	Mg	Hard
	No			hour	m3/s			mg/l	%	µS/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mgeq/l
120	30018362	Popovska after Popovo	18.01.94	11:00		6.0	7.8	5.0	40.1	976	27.9	17.7		588	54	38.4		4.1	0.6	2.8	1.4	0.1				
121	30018362	Popovska after Popovo	08.02.94	14:50		7.6	7.4	2.9	34	956	79.4	57.1		612	240	51.8		9.8	0.4	1.7	0.57	0.03				
122	30018362	Popovska after Popovo	30.03.94	09:40		7.2	7.5	6.4	51	941	25.7	21.8		572	44	25.9		4.7	0.51	3.9	1.5	0.39				
123	30018362		26.04.94	12:50		16.2	7.5	4.0	39	895	25.2	26.5		546	107	46		6.2	0.514	0.1	2.0	1.63				
124	30018362		17.05.94	14:50		22.3	7.9	2.7	30	885	40.9	31.9		524	120	55.7		13.2	0.03	0.06	3.2	0.19				
125	30018362		01.06.94	10:00		15.2	7.1	5.6	60	898	48	40.5		555	76	46.1		11.9	0.333	1.1	2.6	0.16				
126	30018362		28.07.94	11:00		20.0	7.5	8.4	98.8	916	11.0	18.6		550	28	88.3		7.6	0.270	0.65	1.1	0.01				
127	30018362		15.08.94	14:00		25.0	8.05	5.2	64.1	637	4.1	12.9		392	19	34.0		5.1	0.020	0.5	0.7	0.16				
128	30018362		22.09.94	11:30		16.3	7.7	3.0	31.1	856	33.7	26.1		539	65	26.1		12.7	0.216	1.3	2.8	0.50				
129	30018362		13.10.94	12:35		15.0	7.5	1.9	19.5	932	68.9	51.2		602	72	50.6		7.3	0.048	0.6	1.5	<0.05				
130	30018362		01.11.94	12:35		13.9	7.53	1.6	16.0	855	51.3	37.8		642	91	49.7		8.0	0.050	<0.1	17.5	<0.05				
131	30018362		06.12.94	10:30		4.2	7.45	3.3	36.0	952	60.2	39.6		600	91	54.3		5.0	0.750	1.4	2.3	0.56				
132	30018362		18.01.95	11:45		5.6	8.12	2.8	25.0	963	64.4	47.5		597	123	37.7		6.0	1.200	1.2	4.74	0.29				
133	30018362		28.02.95	11:20		9.8	7.05	4.2	35.0	954	36.4	28.0		560	97	46.9		<.04	0.280	0.6	7.2	0.62				
134	30018362		16.03.95	11:00		7.6	7.45	4.8	43.0	930	23.4	27.2		582	333	43.2		4.2	0.700	2.6	3.6	0.02				
135	30018362		12.04.95	12:15		8.8	7.02	11.7	100.	905	14.1	20.0		590	33	37.0		1.0	0.262	5.7	3.2	<0.05				
136	30018362		03.05.95	13:40		11.1	7.32	6.2	54.0	948	96.0	45.1		306	28	42.3		11.6	0.077	0.9	7.5	<0.05				
137	30018362		07.06.95	10:40		18.2	7.66	1.1	11.0	786	75.8	45.1		501	208	41.9		4.7	0.174	1.8	4.7	0.30				
138	30018362		28.07.95	14:20		21.7	6.55	2.7	37.0	816	47.3	24.3		491	91	37.2		12.0	0.025	0.2	1.8	0.16				
139	30018362		08.08.95	10:20		19.9	7.54	3.7	43.0	690	22.3	31.4		428	110	25.1		7.0	0.189	0.1	5.1	0.05				
140	30018362		26.09.95	12:45		16.8	7.47	3.3	35.0	838	57.4	44.0		506	119	48.7		8.1	0.158	1.2	2.1	0.89				
141	30018362		12.10.95	13:00		16.0	7.44	1.1	11.0	1004	114.4	64.0		601	112	50.4		16.0	0.024	<0.1	2.5	<0.05				
142	30018362		02.11.95	13:10		13.4	7.6.	3.6	34.0	835	134	73.3		521	246	27.4		7.8	.041	<0.1	0.8	1.1				
143	30018362		05.12.95	12:30		4.8	7.66	9.1	77.0	793	17.8	27.7		517	103	37.2		4.3	0.158	<0.1	1.3	0.01				
144	30018362		23.01.96	14:00		5.1	7.76	5.2	45.0	907	64.1	48.4		590	112	38.9		15.1	0.593	3.8	5.1	0.04				
145	30018362		22.02.96	11:40		5.0	6.99	10.5	86.0	360	24.3	41.2		311	946	14.2		2.5	0.107	0.2	0.9	<0.05				
146	30018362		26.03.96	10:50		6.1	7.45	6.9	58	826		14.4		642	43	27.7		7.1	1.149	2.6	2.6	0.36				
147	30018362		25.04.96	11:40		12.1	7.94	2.0	27.0	926	11.3	20.0		568	40	37.8		4.3	1.612	5.7	3.1	<0.05				
148	30018362		27.06.96	13:00		20.9	7.67	3.6	45.0	808	15.1	16.7		480	48	41.2		4.1	0.027	<0.1	116.3	0.26				
149	30018362		17.10.96	12:45		15.2	7.81	4.7	48.0	742	13.7	30.0		434	159	32.6		2.1	0.137	0.3	1.6	0.18				
150	30018362		26.11.96	13:00		9.4	7.49	5.8	52.0	872	29.5	30.0		566	46	39.1		5.5	2.459	<.02	3.4	0.16				
151	30018362		10.12.96	11:00		8.0	7.87	9.0	74.0	801.0	6.6	8.2		482	68	35.3		1.8	0.531	0.7	1.9	0.09				
152	30018362		13.03.97	12:40		9.0	8.15	4.3	38.0	887	31.6	24.0		547	84	34.4		6.2	0.345	0.9	2.8	0.22				
153	30018362		17.04.97	15:00		9.4	7.97	8.3	73.0	828	19.8	17.3		573	135	32.6		1.8	0.197	1.2	1.2	0.28				
154	30018362		08.05.97	13:30		17.0	8.04	1.9	23.0	493	7.8	14.7		523	36	35.4		5.8	1.025	<.02	2.9	0.07				
155	30018362		26.06.97	10:00		17.2	8.08	4.5	47.0	765	9.1	22.0		444	145	41.9		1.3	1.375	<.02	1.4	0.15				
156	30018362		09.07.97	12:30		19.0	8.13	3.7	42.0	816	8.0	15.4		492	77	35.3		4.2	0.437	1.4	2.0	0.20				
157	30018362		21.08.97	11:10		17.6	7.83	4.7	47.0	804	4.8	12.2		500	27	30.7		2.1	1.134	0.6	1.9	0.13				
158	30018362		23.09.97	13:20		15.1	7.76	4.9	48.0	732.0	9.4	18.0		412	75	27.9		5.0	0.213	1.9	2.6	0.24				
159	30018362		05.11.97	13:00		7.9	7.86	7.6	66.0	835	17.4	18.8		569	49	35.3		2.6	0.143	1.9	1.1	0.16				
160	30018362		16.12.97	11:10		1.9	7.81	15.5	100	797	8.5	24.7		475	325	29.8		1.6	0.165	2.4	1.4	0.24				
161	30018056	Tcherni Lom at Kardam	18.01.94	12:30		4.0	7.5	9.3	70.8	780	39.6	16.4		524	58	38.4		3.2	0.25	1.7	0.8	0.12				
162	30018056	Tcherni Lom at Kardam	08.02.94	15:00		7.0	7.6	3.8	43	875	43.7	48.9		534	112	39.4		8.8	0.3	2.3	0.5	<0.0				
163	30018056	Tcherni Lom at Kardam	30.03.94	10:00		5.5	7.3	9.4	80	782	14	17.3		478	70	33.6		1.8	0.14	9.2	0.5	<0.0				
164	30018056		26.04.94	13:40		15.1	7.7	1.8	18	802	22.8	21.2		539	79	33.6		1.4	0.199	0.7	1.4	<0.05				
165	30018056		17.05.94	14:40		23.5	7.6	1.1	10.0	784	18.1	18		458	84	40.3		5.3	0.308	<0.1	1.5	0.05				
166	30018056		01.06.94	10:10		15.7		6.91	19	719	25.2	24.2		500	75	40.3		8.6	0.228	0.9	1.9	0.21				
167	30018056		28.07.94	13:00		20.0	7.5	4.1	69.8	679	7.7	13.7		429	54	32.2		3.3	0.179	0.54	0.4	0.16				
168	30018056		15.08.94	12:30		21.0	8.05	5.6	64.5	647	2.8	11.0		378	18	36.8		3.2	0.016	0.4	1.1	0.22				
169	30018056		22.09.94	11:50		17.5	7.4	0.9	9.5	753	33.9	20.0		473	21	37.9		11.6	0.029	1.8	2.6	0.49				
170	30018056		13.10.94	12:00		12.0	7.55	1.9	18.2	834	43.1	24.0		511	50	34.9		7.2	0.167	0.9	2.4	<0.05				
171	30018056		01.11.94	12:55		13.1	7.63	1.0	10.0	780	37.2	20.0		542	47	38.6		5.5	0.200	<0.1	9.5	0.24				
172	30018056		06.12.94	11:00		4.8	7.45	3.6	38.0	910	30.2	24.2		570	78	46.9		5.5	0.600	2.5	2.5	<0.05				
173	30018056		18.01.95	12:15		3.0	8.03	6.4	50.0	915	18.4	25.5		594	17	31.3		0.5	0.360	0.3	2.64	0.17				

Table 4.8-21

Data on water and sediment discharge and water quality, Popovska River, Popovo Town

No	Sample point	Name	Date	Time	Q	t°C	pH	DO	DO	Cond.	BOD_5	COD Mn	COD Cr	DS	SS	Cl	SO_4	NH_4 N	NO_2 N	NO_3 N	PO_4	Fe	*Mn*	Ca	Mg	Hard
	No			hour	m3/s			mg/l	%	µS/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mgeq/l
174	*30018056*		*28.02.95*	*11:30*		*8.9*	*7.21*	*7.4*	*66.0*	*868*	*12.6*	*14.5*		*524*	*65*	*41.4*		*<.04*	*0.480*	*0.8*	*3.4*	*<0.05*				
175	*30018056*		*16.03.95*	*11:15*		*5.1*	*7.86*	*6.7*	*55.0*	*871*	*19.1*	*15.2*		*556*	*41*	*49.7*		*2.8*	*0.400*	*1.2*	*3.5*	*0.07*				
176	*30018056*		*12.04.95*	*12:30*		*7.3*	*7.72*	*12.3*	*100.*	*638*	*6.1*	*11.4*		*479*	*146*	*22.5*		*1.0*	*0.064*	*4.3*	*0.5*	*0.13*				
177	*30018056*		*03.05.95*	*14:00*		*12.1*	*8.06*	*6.7*	*66.0*	*728*	*7.9*	*13.7*		*260.0*	*29.0*	*30.6*		*2.8*	*0.178*	*2.5*	*2.1*	*0.14*				
178	*30018056*		*07.06.95*	*10:50*		*18.3*	*7.66*	*0.8*	*9.0*	*806*	*24.3*	*24.0*		*509*	*108*	*53.1*		*1.8*	*0.039*	*1.3*	*2.0*	*0.16*				
179	*30018056*		*28.07.95*	*14:00*		*22.5*	*7.52*	*1.7*	*19.1*	*817*	*17.3*	*15.8*		*496*	*38*	*38.2*		*7.0*	*0.586*	*0.5*	*1.6*	*0.12*				
180	*30018056*		*08.08.95*	*10:35*		*19.4*	*7.28*	*1.4*	*16.0*	*657*	*34.6*	*36.3*		*406*	*153*	*34.4*		*5.2*	*0.192*	*<0.1*	*4.6*	*<0.05*				
181	*30018056*		*26.09.95*	*12:30*		*16.2*	*7.42*	*0.5*	*3.0*	*886*	*64.6*	*47.2*		*530*	*92*	*47.8*		*7.6*	*0.137*	*1.6*	*2.4*	*0.18*				
182	*30018056*		*12.10.95*	*13:15*		*15.0*	*7.43*	*0.6*	*5.0*	*828*	*24.1*	*21.4*		*491*	*30*	*35.4*		*10.6*	*0.306*	*<0.1*	*1.9*	*<0.05*				
183	*30018056*		*02.11.95*	*13:30*		*12.9*	*7.62*	*2.8*	*27.0*	*812*	*37.9*	*33.9*		*498*	*139*	*36.3*		*8.8*	*0.814*	*1.1*	*0.7*	*0.1*				
184	*30018056*		*05.12.95*	*12:50*		*5.1*	*7.99*	*10.3*	*78.0*	*775*	*18.9*	*21.6*		*516*	*112*	*37.2*		*4.7*	*0.097*	*1.7*	*1.3*	*<0.05*				
185	*30018056*		*23.01.96*	*14:40*		*2.6*	*8.03*	*10.5*	*77.0*	*828*	*18.5*	*11.7*		*576*	*34*	*23.9*		*3.4*	*0.258*	*7.3*	*1.6*	*<0.05*				
186	*30018056*		*22.02.96*	*12:00*		*4.3*	*7.29*	*10.9*	*89.0*	*341*	*21.9*	*33.3*		*298*	*945*	*18.6*		*2.3*	*0.087*	*0.1*	*0.8*	*<0.05*				
187	*30018056*		*26.03.96*	*11:10*		*5.6*	*8.02*	*10.1*	*86.0*	*567*		*18.2*		*405*	*396*	*16.6*		*2.0*	*0.067*	*3.6*	*0.5*	*0.42*				
188	*30018056*		*25.04.96*	*12:30*		*11.2*	*8.35*	*6.4*	*75.0*	*677*	*4.3*	*10.7*		*399*	*123*	*32.3*		*1.7*	*0.183*	*5.8*	*0.7*	*<0.05*				
189	*30018056*		*27.06.96*	*12:50*		*21.3*	*7.63*	*1.1*	*11.0*	*779*	*7.9*	*14.7*		*466*	*38*	*39.1*		*3.7*	*0.279*	*<0.1*	*91.3*	*0.18*				
190	*30018056*		*17.10.96*	*13:10*		*15.0*	*7.80*	*5.5*	*58.0*	*745*	*16.9*	*27.7*		*423*	*226*	*31.6*		*2.3*	*0.131*	*0.9*	*1.0*	*0.18*				
191	*30018056*		*26.11.96*	*13:30*		*6.6*	*7.67*	*10.0*	*83.0*	*756*	*11.0*	*15.0*		*541*	*45*	*34.4*		*1.8*	*0.179*	*2.0*	*1.6*	*0.19*				
192	*30018056*		*10.12.96*	*11:30*		*6.6*	*8.20*	*10.9*	*95.0*	*680.0*	*3.2*	*6.4*		*446*	*60*			*1.1*	*0.206*	*2.2*	*0.9*	*0.17*				
193	*30018056*		*13.03.97*	*12:30*		*7.3*	*8.24*	*9.0*	*77.0*	*736*	*7.2*	*7.5*		*415*	*119*	*30.7*		*0.9*	*0.112*	*<.02*	*0.6*	*0.31*				
194	*30018056*		*17.04.97*	*15:20*		*5.5*	*8.65*	*14.0*	*100*	*524*	*3.6*	*14.7*		*374*	*499*	*22.3*		*1.1*	*0.055*	*1.8*	*4.4*	*0.74*				
195	*30018056*		*08.05.97*	*13:50*		*13.7*	*8.55*	*7.2*	*77.0*	*692*	*3.4*	*9.9*		*424*	*112*	*22.3*		*1.8*	*0.147*	*0.8*	*0.9*	*0.21*				
196	*30018056*		*26.06.97*	*10:15*		*17.6*	*8.26*	*4.7*	*51.0*	*693*	*5.7*	*17.8*		*369*	*265*	*31.6*		*1.2*	*0.165*	*0.9*	*0.9*	*0.39*				
197	*30018056*		*09.07.97*	*13:00*		*19.0*	*8.19*	*4.4*	*52.0*	*783*	*5.0*	*11.7*		*514*	*43*	*34.4*		*2.1*	*0.359*	*1.9*	*1.5*	*0.20*				
198	*30018056*		*21.08.97*	*11:25*		*17.2*	*7.93*	*4.5*	*46.0*	*748*	*3.8*	*9.3*		*470*	*13*	*28.8*		*1.1*	*0.838*	*0.7*	*1.1*	*0.18*				
199	*30018056*		*23.09.97*	*13:40*		*14.6*	*7.71*	*5.1*	*49.0*	*672.0*	*6.2*	*14.5*		*400*	*56*	*26.0*		*2.3*	*0.170*	*1.9*	*1.6*	*0.25*				
200	*30018056*		*05.11.97*	*13:20*		*6.9*	*7.98*	*9.4*	*80.0*	*810*	*13.2*	*15.3*		*552*	*37*	*32.6*		*2.3*	*0.105*	*1.4*	*0.7*	*0.16*				
201	*30018056*		*16.12.97*	*11:50*		*1.4*	*7.91*	*10.9*	*79.0*	*528*	*17.3*	*32.7*		*348*	*739*	*19.2*		*1.2*	*0.069*	*2.1*	*0.5*	*0.61*				

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-22

Data on water and sediment discharge, Cherni Lom River, Kardam Village

No	Sample point	Name	Date	Time	Q	t°C	pH	DO	DO	Cond.	BOD_5	COD Mn	COD Cr	DS	SS	Cl	SO_4	NH_4 N	NO_2 N	NO_3 N	PO_4	Fe	*Mn*	Ca	Mg	Hard
	No			hour	m3/s			mg/l	%	µS/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mgeq/l
161	30018056	ni Lom at K	18.01.94	12:30		4.0	7.5	9.3	70.8	780	39.6	16.4		524	58	38.4		3.2	0.25	1.7	0.8	0.12				
162	30018056	ni Lom at K	08.02.94	15:00		7.0	7.6	3.8	43	875	43.7	48.9		534	112	39.4		8.8	0.3	2.3	0.5	<0.0				
163	30018056	ni Lom at K	30.03.94	10:00		5.5	7.3	9.4	80	782	14	17.3		478	70	33.6		1.8	0.14	9.2	0.5	<0.0				
164	30018056		26.04.94	13:40		15.1	7.7	1.8	18	802	22.8	21.2		539	79	33.6		1.4	0.199	0.7	1.4	<0.05				
165	30018056		17.05.94	14:40		23.5	7.6	1.1	10.0	784	18.1	18		458	84	40.3		5.3	0.308	<0.1	1.5	0.05				
166	30018056		01.06.94	10:10		15.7		6.91	19	719	25.2	24.2		500	75	40.3		8.6	0.228	0.9	1.9	0.21				
167	30018056		28.07.94	13:00		20.0	7.5	4.1	69.8	679	7.7	13.7		429	54	32.2		3.3	0.179	0.54	0.4	0.16				
168	30018056		15.08.94	12:30		21.0	8.05	5.6	64.5	647	2.8	11.0		378	18	36.8		3.2	0.016	0.4	1.1	0.22				
169	30018056		22.09.94	11:50		17.5	7.4	0.9	9.5	753	33.9	20.0		473	21	37.9		11.6	0.029	1.8	2.6	0.49				
170	30018056		13.10.94	12:00		12.0	7.55	1.9	18.2	834	43.1	24.0		511	50	34.9		7.2	0.167	0.9	2.4	<0.05				
171	30018056		01.11.94	12:55		13.1	7.63	1.0	10.0	780	37.2	20.0		542	47	38.6		5.5	0.200	<0.1	9.5	0.24				
172	30018056		06.12.94	11:00		4.8	7.45	3.6	38.0	910	30.2	24.2		570	78	46.9		5.5	0.600	2.5	2.5	<0.05				
173	30018056		18.01.95	12:15		3.0	8.03	6.4	50.0	915	18.4	25.5		594	17	31.3		0.5	0.360	0.3	2.64	0.17				
174	30018056		28.02.95	11:30		8.9	7.21	7.4	66.0	868	12.6	14.5		524	65	41.4		<.04	0.480	0.8	3.4	<0.05				
175	30018056		16.03.95	11:15		5.1	7.86	6.7	55.0	871	19.1	15.2		556	41	49.7		2.8	0.400	1.2	3.5	0.07				
176	30018056		12.04.95	12:30		7.3	7.72	12.3	100.	638	6.1	11.4		479	146	22.5		1.0	0.064	4.3	0.5	0.13				
177	30018056		03.05.95	14:00		12.1	8.06	6.7	66.0	728	7.9	13.7		260.0	29.0	30.6		2.8	0.178	2.5	2.1	0.14				
178	30018056		07.06.95	10:50		18.3	7.66	0.8	9.0	806	24.3	24.0		509	108	53.1		1.8	0.039	1.3	2.0	0.16				
179	30018056		28.07.95	14:00		22.5	7.52	1.7	19.1	817	17.3	15.8		496	38	38.2		7.0	0.586	0.5	1.6	0.12				
180	30018056		08.08.95	10:35		19.4	7.28	1.4	16.0	657	34.6	36.3		406	153	34.4		5.2	0.192	<0.1	4.6	<0.05				
181	30018056		26.09.95	12:30		16.2	7.42	0.5	3.0	886	64.6	47.2		530	92	47.8		7.6	0.137	1.6	2.4	0.18				
182	30018056		12.10.95	13:15		15.0	7.43	0.6	5.0	828	24.1	21.4		491	30	35.4		10.6	0.306	<0.1	1.9	<0.05				
183	30018056		02.11.95	13:30		12.9	7.62	2.8	27.0	812	37.9	33.9		498	139	36.3		8.8	0.814	1.1	0.7	0.1				
184	30018056		05.12.95	12:50		5.1	7.99	10.3	78.0	775	18.9	21.6		516	112	37.2		4.7	0.097	1.7	1.3	<0.05				
185	30018056		23.01.96	14:40		2.6	8.03	10.5	77.0	828	18.5	11.7		576	34	23.9		3.4	0.258	7.3	1.6	<0.05				
186	30018056		22.02.96	12:00		4.3	7.29	10.9	89.0	341	21.9	33.3		298	945	18.6		2.3	0.087	0.1	0.8	<0.05				
187	30018056		26.03.96	11:10		5.6	8.02	10.1	86.0	567		18.2		405	396	16.6		2.0	0.067	3.6	0.5	0.42				
188	30018056		25.04.96	12:30		11.2	8.35	6.4	75.0	677	4.3	10.7		399	123	32.3		1.7	0.183	5.8	0.7	<0.05				
189	30018056		27.06.96	12:50		21.3	7.63	1.1	11.0	779	7.9	14.7		466	38	39.1		3.7	0.279	<0.1	91.3	0.18				
190	30018056		17.10.96	13:10		15.0	7.80	5.5	58.0	745	16.9	27.7		423	226	31.6		2.3	0.131	0.9	1.0	0.18				
191	30018056		26.11.96	13:30		6.6	7.67	10.0	83.0	756	11.0	15.0		541	45	34.4		1.8	0.179	2.0	1.6	0.19				
192	30018056		10.12.96	11:30		6.6	8.20	10.9	95.0	680.0	3.2	6.4		446	60			1.1	0.206	2.2	0.9	0.17				
193	30018056		13.03.97	12:30		7.3	8.24	9.0	77.0	736	7.2	7.5		415	119	30.7		0.9	0.112	<.02	0.6	0.31				
194	30018056		17.04.97	15:20		5.5	8.65	14.0	100	524	3.6	14.7		374	499	22.3		1.1	0.055	1.8	4.4	0.74				
195	30018056		08.05.97	13:50		13.7	8.55	7.2	77.0	692	3.4	9.9		424	112	22.3		1.8	0.147	0.8	0.9	0.21				
196	30018056		26.06.97	10:15		17.6	8.26	4.7	51.0	693	5.7	17.8		369	265	31.6		1.2	0.165	0.9	0.9	0.39				
197	30018056		09.07.97	13:00		19.0	8.19	4.4	52.0	783	5.0	11.7		514	43	34.4		2.1	0.359	1.9	1.5	0.20				
198	30018056		21.08.97	11:25		17.2	7.93	4.5	46.0	748	3.8	9.3		470	13	28.8		1.1	0.838	0.7	1.1	0.18				
199	30018056		23.09.97	13:40		14.6	7.71	5.1	49.0	672.0	6.2	14.5		400	56	26.0		2.3	0.170	1.9	1.6	0.25				
200	30018056		05.11.97	13:20		6.9	7.98	9.4	80.0	810	13.2	15.3		552	37	32.6		2.3	0.105	1.4	0.7	0.16				
201	30018056		16.12.97	11:50		1.4	7.91	10.9	79.0	528	17.3	32.7		348	739	19.2		1.2	0.069	2.1	0.5	0.61				

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-23

Data on water and sediment discharge, Cherni Lom River, Shirokovo Village

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	15.03.94	**0,82**		6,29	0,49	6.3	6,00	0.09	0,20	0,49							
2	07.06.94	**0,74**		5,14	0,20	6,5	4,80	0.14	0,20	0,20							
3	05.07.94	**0,81**		5,73	0,33	7,0	5,50	0.03	0,20	0,33							
4	02.08.94	**2,25**		3,61	0,20	6.5	3.4	0.06	0.15	0,20							
5	13.09.94	**1,49**		5,44	0,29	6,2	5,19	0,06	0.19	0,29							
6	04.10.94	**1,55**		5,17	0,25	6,0	4,87	0,07	0.23	0,25							
7	20.03.95	**2,22**		4,24	0,07	5,5	4,00	0.11	0.13	0,07							
8	11.04.95	**5,42**		6,56	0,10	3.5	6.3	0,09	0.17	0,10							
9	10.05.95	**2,55**		4,68	0,04	6.5	4.4	0.08	0,20	0,04							
10	13.06.95	**2,12**		5,70	0,07	3.5	5.4	0.12	0,18	0,07							
11	11.07.95	**4,12**		5,84	0,08	4,1	5.4	0.14	0,30	0,08							
12	08.08.95	**1,66**		5,69	0,25	4,0	5.1	0.14	0.45	0,25							
13	18.09.95	**2,85**		7,41	0,14	4.5	7.1	0.15	0,16	0,14							
14	11.10.95	**2,72**		4,90	0,08	7.5	4,53	0.06	0.31	0,08							
15	07.11.95	**3,00**		5,65	0,08	4.5	5.4	0,10	0,15	0,08							
16	11.12.95	**2,85**		6,21	0,06	3,0	5.74	0.11	0.36	0,06							
17	20.02.96	**3,50**		8,34	0,09	4.7	8,00	0.07	0.27	0,09							
18	12.03.96	**6,53**		6,10	0,02	4.5	5.9	0.05	0,15	0,02							
19	14.05.96	**5,87**		6,35	0,01	4,6	6,10	0.08	0.17	0,01							
20	19.06.96	**3,25**		5,47	0,03	4.5	5,00	0.12	0.35	0,03							
21	10.06.97			6,43	0,03	5.5	6.2	0.13	0.1	0,03							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-24

Data on water and sediment discharge, Russenski Lom River, Bassarbovo Village

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s	kg/s	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	10.01.94	**2,13**	**0,20**	7,97	0,68	9.5	7	0.07	0.9	0,68							
2	15.02.94	**2,05**	**0,18**	7,58	1,50	10,5	6.63	0,05	0,90	1,50							
3	15.03.94	**1,74**	**0,15**	7,93	0,70	15.5	7.6	0.13	0.2	0,70							
4	18.04.94	**1,77**	**0,15**	8,68	0,68	8.5	7.7	0.06	0,92	0,68							
5	17.05.94	**1,55**	**0,12**	7,87	1,30	12	6.8	0.09	0,98	1,30							
6	07.06.94	**1,38**	**0,10**	6,96	1,11	15	5.9	0.05	1,01	1,11							
7	05.07.94	**1,17**	**0,08**	7,48	0,68	16,0	6.0	0,10	1,38	0,68							
8	02.08.94	**2,05**	**0,18**	6,86	0,50	12	5.9	0.06	0,90	0,50							
9	13.09.94	**1,24**	**0,08**	4,56	0,68	16	3,14	0,09	1,33	0,68							
10	04.10.94	**1,69**	**0,14**	5,15	0,85	14,8	4,64	0.05	0.46	0,85							
11	03.11.94	**2,70**	**0,32**	6,12	0,36	11	5.9	0.03	0.19	0,36							
12	20.12.94	**2,60**	**0,29**	6,28	0,36	7.5	4.4	0,08	1.8	0,36							
13	**09.02.94**	**1,94**	**0,17**	**5,99**	**0,58**	**13,9**	**5,43**	**0,04**	**0,52**	**0,58**							
14	**26.05.94**	**1,35**	**0,10**	**6,18**	**0,72**	**15,6**	**5,05**	**0,08**	**1,05**	**0,72**							
15	**12.08.94**	**1,69**	**0,14**	**6,38**	**0,85**	**14,8**	**5,34**	**0,07**	**0,97**	**0,85**							
16	**09.11.94**	**2,70**	**0,32**	**6,90**	**0,45**	**8,2**	**5,94**	**0,08**	**0,88**	**0,45**							
17	03.01.95	**3,19**	**0,35**	6,16	0,32	8.8	5.2	0,06	0,90	0,32							
18	08.02.95	**3,12**	**0,32**	7,26	0,26	9.5	6.4	0,06	0.8	0,26							
19	20.03.95	**3,12**	**0,32**	6,71	0,36	8.2	5.8	0.11	0,80	0,36							
20	11.04.95	**7,51**	**2,80**	7,24	0,17	8	6.7	0,09	0.45	0,17							
21	10.05.95	**4,90**	**0,87**	7,31	0,52	7,4	7	0.09	0.22	0,52							
22	13.06.95	**3,70**	**0,47**	8,35	0,29	12	7.6	0,05	0.7	0,29							
23	11.07.95	**4,42**	**0,70**	5,59	0,95	7,5	5.2	0.09	0.3	0,95							
24	08.08.95	**3,17**	**0,35**	8,11	0,38	4.5	7.7	0.08	0.33	0,38							
25	18.09.95	**2,89**	**0,27**	9,44	0,39	11.5	9	0.04	0.4	0,39							
26	11.10.95	**3,28**	**0,37**	3,86	0,42	10	3.5	0,05	0.31	0,42							
27	07.11.95	**3,77**	**0,50**	6,17	0,33	11.5	5.4	0.08	0,69	0,33							
28	11.12.95	**3,46**	**0,42**	5,07	0,15	7.5	4.37	0.09	0.61	0,15							
29	**22.02.95**	**3,12**	**0,32**	**7,45**	**0,66**	**7,9**	**6,62**	**0,06**	**0,77**	**0,66**							
30	**02.05.95**	**4,06**	**0,57**	**6,87**	**0,91**	**7,7**	**6,13**	**0,06**	**0,68**	**0,91**							
31	**12.08.95**	**3,35**	**0,40**	**9,79**	**0,79**	**7,8**	**8,94**	**0,06**	**0,79**	**0,79**							
32	**09.11.95**	**2,89**	**0,45**	**7,56**	**0,75**	**7,9**	**6,65**	**0,07**	**0,84**	**0,75**							
33	20.02.96	**4,24**		8,17	1,63	9.5	7.4	0.12	0,65	1,63							
34	12.03.96	**8,42**		8,98	0,17	12	7.8	0.08	1.1	0,17							
35	02.04.96	**14,38**		11,70	0,05	11	11	0,10	0,60	0,05							
36	14.05.96	**8,15**		9,30	0,07	6,7	9,00	0.09	0.21	0,07							
37	19.06.96	**4,29**		8,30	0,96	12.5	7.8	0,07	0.43	0,96							
38	**28.02.96**	**12,61**		**10,34**	**0,16**	**11,2**	**9,68**	**0,10**	**0,56**	**0,16**							
39	**21.05.96**	**8,15**		**8,58**	**0,23**	**6,8**	**7,77**	**0,06**	**0,75**	**0,23**							
40	**20.08.96**	**3,25**		**7,27**	**0,72**	**8,0**	**6,42**	**0,06**	**0,79**	**0,72**							
41	**29.11.96**	**3,91**		**6,61**	**0,75**	**7,0**	**5,88**	**0,05**	**0,68**	**0,75**							
42	10.06.97			7,17	0,09	9.0	6.9	0.07	0.2	0,09							
43	10.12.97			8,40	0,01	10.5	7.90	0,10	0.40	0,01							

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-25

Danube River - Silistra

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	04.01.94			2,02	0,10	2.4	1.8	0.09	0.13	0,10							
2	01.02.94	**7065**		2,22	0,10	3.3	2.1	0.05	0.07	0,10							
3	22.03.94	**6115**		1,91	0,08	2.5	1.8	0.04	0.07	0,08							
4	01.06.94	**5915**		2,09	0,10	3,0	2.0	0.03	0.06	0,10							
5	06.09.94	**3240**		1,06	0,08	3.8	1,0	0.04	0.02	0,08							
6	15.12.94	**3260**		1,86	0,05	3.6	1.8	0,04	0,02	0,05							
7	07.03.95	**7690**		3,24	0,04	3,0	3,0	0.06	0.18	0,04							
8	01.06.95	**8815**		1,59	0,02	2,0	1.4	0.02	0.17	0,02							
9	05.09.95	**3945**		1,18	0,02	3.2	1,1	0.01	0.07	0,02							
10	14.12.95	**4565**		1,18	0,02	3.2	1,1	0.01	0.07	0,02							
11	05.03.96	**6015**		2,64	0,02	4.5	2.2	0.03	0.41	0,02							
12	05.06.96	**8005**		2,66	0,02	4.2	2,2	0.02	0.44	0,02							
13	10.12.96	**8755**		1,46	0,02	2.5	1.2	0.05	0.21	0,02							
14	17.06.97	**5935**		1,54	0,03	3,0	1.2	0.01	0.33	0,03	<0.001	<0.02	<0.001	<0.01	<0.005	<0.01	
15	22.07.97	**6805**		1,34	0,01	2.7	1.1	0.01	0.23	0,01	<0.001	<0.02	<0.001	<0.01	<0.005	<0.01	
16	19.08.97	**6920**		1,32	0,01	3.8	1,2	0.01	0.11	0,01	<0.001	<0.02	<0.001	<0.01	<0.005	<0.01	
17	16.09.97	**4270**		1,28	0,01	3.6	1,0	0,01	0.27	0,01	<0.001	<0.02	<0.001	<0.01	<0.005	<0.01	
18	15.10.97	**3955**		1,04	0,01	4,9	0,7	0,02	0.30	0,01	<0.001	<0.02	<0.001	<0.01	<0.005	<0.01	

Source: *National Center for Envieronment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-26

Danube River - Novo Selo

Number	Date	Water	Sediment	Total	Total		Fractions of N and P						Concentration of heavy metals				
	month/	Discharge	Discharge	N	P	BOD5	N-NO3	N-NO2	N-NH4	P-PO4	Cd	Pb	As	Cu	Ni	Zn	Cr
-	date/year	m3/s		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	01.03.94	**5265**		0,65		7.4	0.55	0,02	0,08								
2	05.04.94	**5920**		1,31		2.9	1.21	0,02	0.08								
3	05.05.94	**8740**		1,10		2.4	0.94	0.04	0.12								
4	01.06.94	**5880**		1,42		3.9	0.83	0.07	0,52		<0.001	<0.02	<0.001	<0.002	<0.005		
5	05.07.94	**4400**		0,78		2.9	0,70	0.04	0.04								
6	04.08.94	**2745**		0,53		1.8	0.46	0.01	0.06								
7	06.09.94	**2990**		1,98		1.4	1.41	0.06	0.51								
8	01.11.94	**3000**		0,65		1.4	0.36	0.03	0.26								
9	07.12.94	**3150**		1,86		3.0	1,60	0.02	0.24		<0.001	<0.02	<0.001	<0.002	<0.005	<0.01	<0.005
10	03.01.95	**3415**		1,01		2.6	0.96	0.04	0.01								
11	07.02.95	**8140**		0,77		2.6	0.66	0.05	0.06								
12	06.03.95	**7130**		1,72		1.2	1.56	0.04	0.12		<0.001	<0.02		<0.002	<0.005	<0.01	<0.005
13	04.04.95	**7255**		1,79		2,7	1.68	0.02	0.09								
14	08.05.95	**7525**		2,19		5.6	2.14	0.01	0.04								
15	05.06.95	**6965**		1,66		2.8	1.56	0.02	0.08								
16	03.07.95	**7745**		1,29		2.4	1.14	0.02	0.13								
17	01.08.95	**3868**		1,40		3.0	1.36	0.02	0.02								
18	01.08.95	**3868**		1,29		2.2	1.20	0.05	0.04								
19	04.09.95	**4435**		1,24		4.0	1.14	0.01	0.09								
20	03.10.95	**5035**		0,46		5.0	0.38	0.03	0,05								
21	06.11.95	**2860**		1,16		3.2	1.02	0.06	0.08								
22	08.01.96	**9265**		1,77		2.2	1.72	0,01	0.04		<0.001	<0.02	<0.001	<0.002			
23	15.02.96	**8965**		1,53		2.2	1.44	0,01	0.08								
24	15.02.96	**6175**		1,41		2.0	1.36	0.01	0.04								
25	04.03.96	**4500**		1,84		1.8	1.40	0.01	0.43								
26	01.04.96	**7355**		1,74		3.2	1,20	0.02	0.52								
27	07.05.96	**7770**		1,09		3.5	0.92	0.07	0,10								
28	04.06.96	**9230**		1,19		2.8	1.08	0,01	0.10								
29	01.10.96	**8070**		1,13		2.1	0.92	0.09	0.12								
30	04.11.96	**6365**		2,91		2.5	2.85	0,01	0.05								
31	15.01.97	**7160**		1,04		2.2	0,90	0.02	0.12								
32	01.04.97	**5440**		1,21		3.3	1.15	0.01	0,05								
33	05.05.97	**7880**		1,74		2.8	1.37	0.02	0.35								
34	02.06.97	**6250**		1,55		2.5	1.32	0.03	0.2								
35	01.07.97	**5550**		1,34		2.4	1.12	0.00	0.22								
36	02.09.97	**3590**		0,95		2.8	0.6	0.03	0.32								
37	06.10.97	**2870**		1,53		4.4	1.08	0.03	0.42								
38	04.11.97	**3365**		1,11		2.9	1.08	0,02	0.01								
39	02.12.97	**4400**		2,83			2.52	0.02	0.29								

Source: *National Center for Envierionment and Sustainable Development* - plain type
National Institute for Meteorology and Hydrology - **bold type**

Table 4.8-27

Average and extreme data

No	River Basin	River	Mesurment point	Q min	Q max	Q mean	BOD5 min	BOD5 max	BOD5 mean	N-NO3 min	N-NO3 max	N-NO3 mean	N-NO2 min	N-NO2 max	N-NO2 mean	N-NH4 min	N-NH4 max	N-NH4 mean	P-PO4 min	P-PO4 max	P-PO4 mean
					m3/sec			mg/l			mg/l			mg/l			mg/l			mg/l	
1		Ogosta	Gavril Genovo	0,11	34,3	5,74	2	6,98	3,65	0,5	2,19	1,09	0,01	0,06	0,02	0,01	0,72	0,16	0,01	0,04	0,02
2		Ogosta	Kobiliak	3,5	69,54	15,48	2,1	10	4,63	0,8	7,65	3,37	0,01	0,16	0,06	0,18	11,7	3,58	0,05	0,32	0,13
3	Ogosta	Ogosta	Mizia	5	46,5	14,33	2,1	9	4,52	3	10,9	5,48	0,02	0,23	0,07	0,08	1,63	0,7	0,01	0,93	0,18
4		Skat	Nivianin	0,02	3,617	0,36	0,9	6,7	3,77	0,68	13,6	2,8	0,009	0,07	0,04	0,01	0,65	0,3	0,01	0,05	0,02
5		Skat	Mizia	0,13	9,01	1,06	2,5	13,5	5,74	2,47	12,5	5,98	0,009	0,186	0,05	0,11	3,55	0,54	0,01	0,67	0,21
6		Iskar	Novi Iskar town	8,3	64,7	16,36	4,35	16,46	10,12	0,506	6,41	3,05	0,012	0,27	0,08	2,1	7,46	4,81	0,05	1,82	0,32
7	Iskar	Iskar	Kunino village	20	95	36,06	2,9	8,9	3,87	1,62	3,21	2,23	0,032	0,106	0,06	0,12	1,92	0,69	0,16	1,43	0,41
8		Iskar	Oryahovitza	13,75	102,8	41,12	2,65	15,43	7,38	0,7	6,71	3,09	0,012	0,089	0,04	0,15	1,35	0,37	0,02	0,31	0,11
9	Vit	Vit	Sadovetz	0,5	39,59	5,6	1,7	5,47	2,87	0,95	2,06	1,5	0,008	0,031	0,015	0,09	1,05	0,28	0,003	0,026	0,011
10		Vit	Yassen village	0,34	33,61	6,9	1	8,2	3,28	0,64	3,6	2,01	0,012	0,07	0,034	0,1	0,62	0,29	0,003	0,017	0,008
11		Ossam	Troyan town	0,39	26,8	5,67	3,2	71,1	18,93	0,19	1,75	0,77	0,009	0,082	0,039	0,23	3,94	1,29	0,13	1,64	0,473
12	Ossam	Ossam	Lovech town	0,8	33,6	9,15	2,27	29,4	10,54	0,21	2,54	1,02	0,03	0,148	0,062	0,2	4,95	1,46	0,01	0,42	0,13
13		Ossam	Izgrev	0,86	34,2	9,13	3,54	21,64	7,17	1,21	3,02	1,76	0,006	0,07	0,032	0,23	2,31	0,61	0,02	0,14	0,055
14		Yantra	Gabrovo town	0,44	23	3,43	4,78	39,2	15,85	0,41	1,83	0,78	0,009	0,095	0,032	0,29	11,4	4,9	0,02	0,18	0,075
15		Yantra	Cholakovtzi	1,44	87,62	10,64	3,44	9,06	5,5	0,81	3,53	2	0,011	0,095	0,039	0,21	1,26	0,72	0,01	0,08	0,035
16		Yantra	Samovodene	1,78	148,7	15,67	3,5	16,7	8,98	0,33	7,7	0,96	0,01	0,11	0,05	0,02	3,49	1,18	0,03	0,14	0,08
17	Yantra	Yantra	Varbitza	1,25	105,4	15,61	5,1	160	40,33	0,27	5,4	1,22	0,02	0,19	0,07	0,44	11,9	2,84	0,01	0,17	0,06
18		Yantra	Karantzi	3,95	113,9	29,96	3,34	14,94	8,14	0,44	2,57	1,52	0,01	0,14	0,07	0,2	3,76	1,23	0,01	0,1	0,04
19		Rossitza	Sevlievo town	0,16	65,9	9,46	2,9	16	6,92	0,07	4,7	1,19	0,007	0,078	0,042	0,2	9,84	1,5	0,01	0,12	0,04
20		Beli Lom	Razgrad town	0,44	1,39	0,74	7,04	27,43	16,42	1,1	11,88	6,46	0,02	0,11	0,06	1,9	6,5	4,62	0,05	0,78	0,41
21	Russenski	Cherni Lom	Kardam	-	-	-	2,8	64,6		0,1	9,2		0,016	0,838		0,04	11,6		0,4	91,3	
22	Lom	Cherni Lom	Shirokovo	0,74	6,53	2,82	3	7,5	5,19	3,4	8	5,44	0,03	0,15	0,1	0,1	0,45	0,22	0,01	0,49	0,14
23		Russenski	Bassarbovo	1,17	14,38	3,83	4,5	16	10,29	3,5	11	6,58	0,04	0,13	0,07	0,19	1,33	0,71	0,05	1,5	0,57
24		Popovska	Popovo town	-	-	-	3,2	134		0,02	9,2		0,016	2,459		0,04	16		0,5	116,3	
25	Danube	Danube	Silistra	3240	8815	5957	2	4,9	3,29	0,7	3	1,55	0,01	0,09	0,03	0,02	0,44	0,18	0,01	0,1	0,04
26		Danube	Novo Selo	2745	9230	5757	1,2	5	2,89	0,36	2,85	1,18	0,01	0,09	0,03	0,01	0,52	0,16	-	-	-

Table 4.12-4

Data for the water quantity and quality at the 22 discharge point along the joint Romanian- Bulgarian section of the Danube river (Q95 river low flow, 1986-1993)

No	Measurment point	Danube river				Wastewater discharge		after 50 m
		Water flow	Velocity	Latitude	Depth	Quantity	BOD5	BOD5
		m3/s	m/s	m	m	m3/s	mg/l	mg/l
1	Timok R. estuary	4158	0.800	496	8.100	0.100	15.60	3.314
2	Vidin town	4140	0.805	640	5.560	0.599	106.00	3.826
3	Voinishka R. estuary	4130	0.810	915	4.590	1.000	12.00	3.464
4	Archar R. estuary	4120	0.815	868	5.380	2.010	15.30	3.657
5	Lom R. estuary	4100	0.820	716	6.790	7.962	193.00	19.606
6	Tzibritza R. estuary	4130	0.830	1040	3.680	2.060	7.400	4.169
7	Kozludui town	4160	0.900	674	2.590	0.099	144.00	3.871
8	Jui R. estuary-left side	4180	0.920	700	2.590	175.000	18.00	3.738
9	Ogosta R. estuary	4200	1.000	1190	2.740	25.210	74.00	20.801
10	Oriahovo town	4250	1.050	646	5.840	0.074	135.00	5.129
11	Iskar R. estuary	4600	0.950	845	3.380	56.900	25.00	14.399
12	Vit R. estuary	4590	0.930	802	3.890	17.050	125.00	20.287
13	Olt R estuary-left side	4580	0.920	845	3.700	125.000	12.00	5.2511
14	Ossam R. estuary	4570	0.900	893	4.220	17.000	26.000	8.882
15	Nikopol town	4560	0.850	674	7.430	0.082	99.50	5.251
16	Turno Magurele town-l.	4550	0.950	840	3.600	0.500	18.00	5.046
17	Swistov town	4500	0.800	823	5.640	0.182	216.00	4.356
18	Yantra R. estuary	4480	0.750	1272	2.260	49.230	16.50	9.330
19	Russe town	4460	0.730	767	6.090	0.483	94.00	10.612
20	Tutrakan town	4400	0.950	632	6.790	0.930	162.00	3.696
21	Ardjesh R. estury-l.s.	4380	0.953	632	6.790	75.000	20.00	3.400
22	Silistra town	4360	0.955	733	6.320	0.497	119.00	3.932

Source: Environmental assessment and Protection of the water bodies, 1995

Annex 5

Brief Overview of Legal and Institutional Framework for Water Quality Control

Figure 5-1 Water management structure (according to The Water Law in force since 1969)

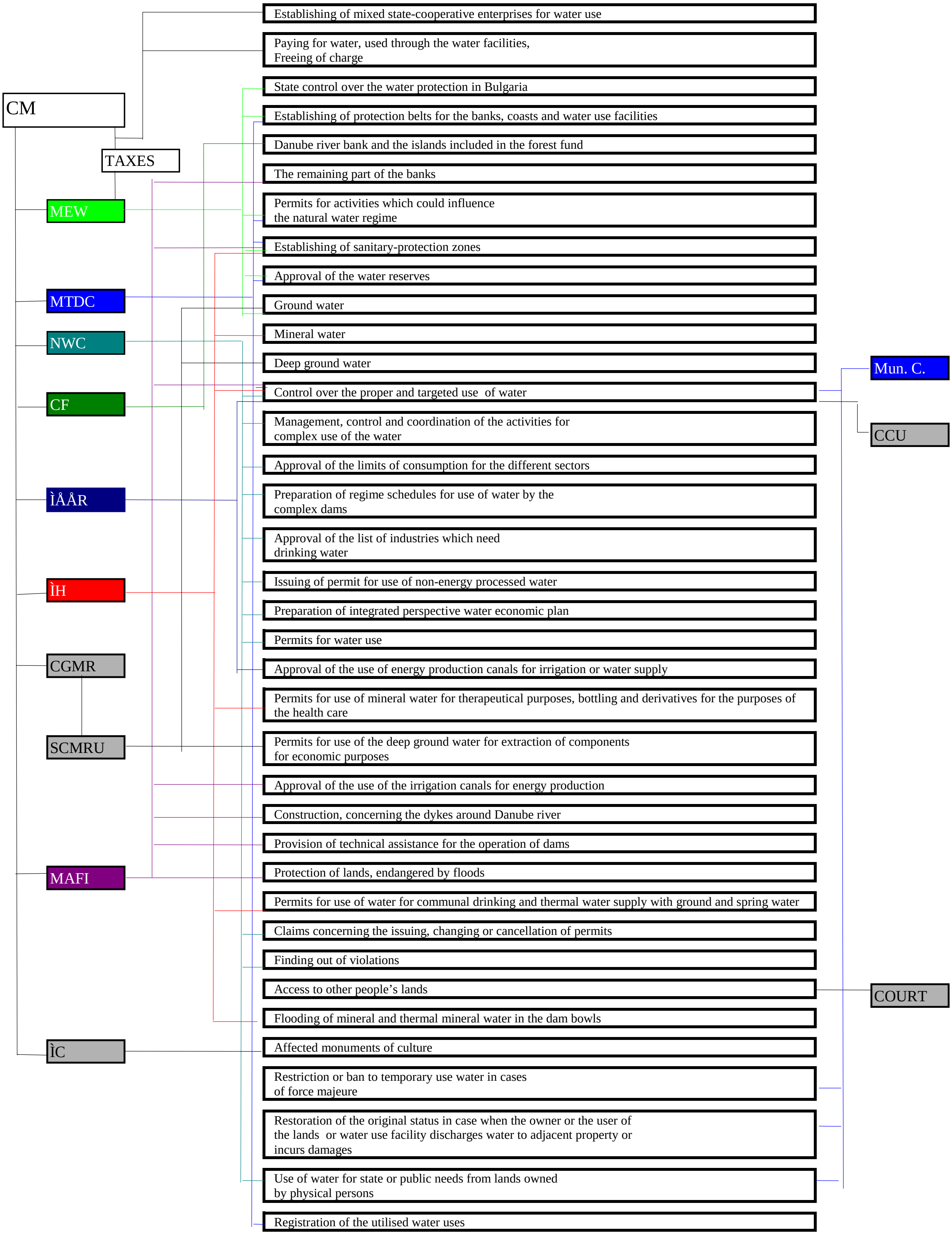


Figure 5-2 Organization of the water management (according to the Decree of Council of Ministers No. 202 from 1992)

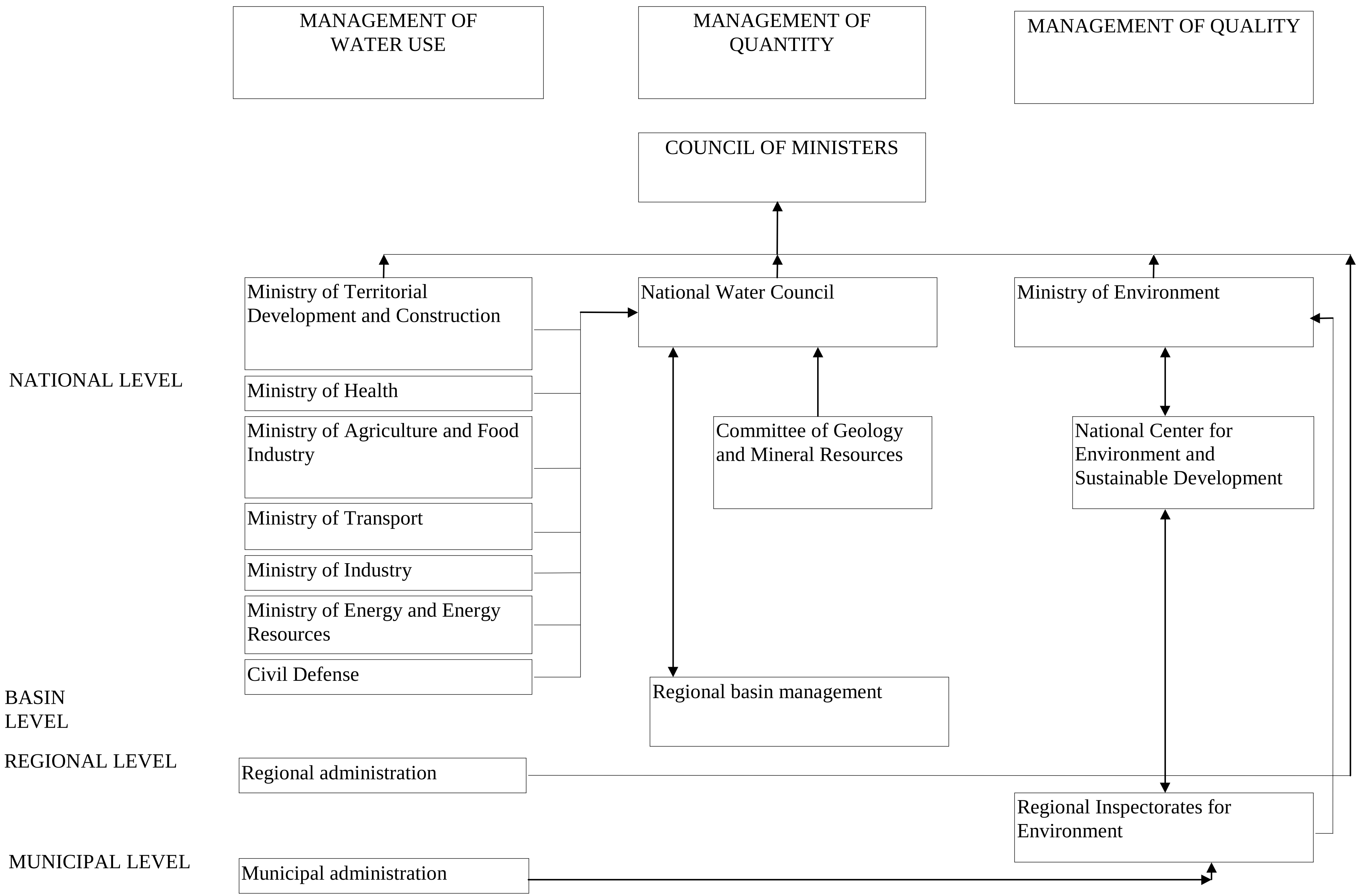
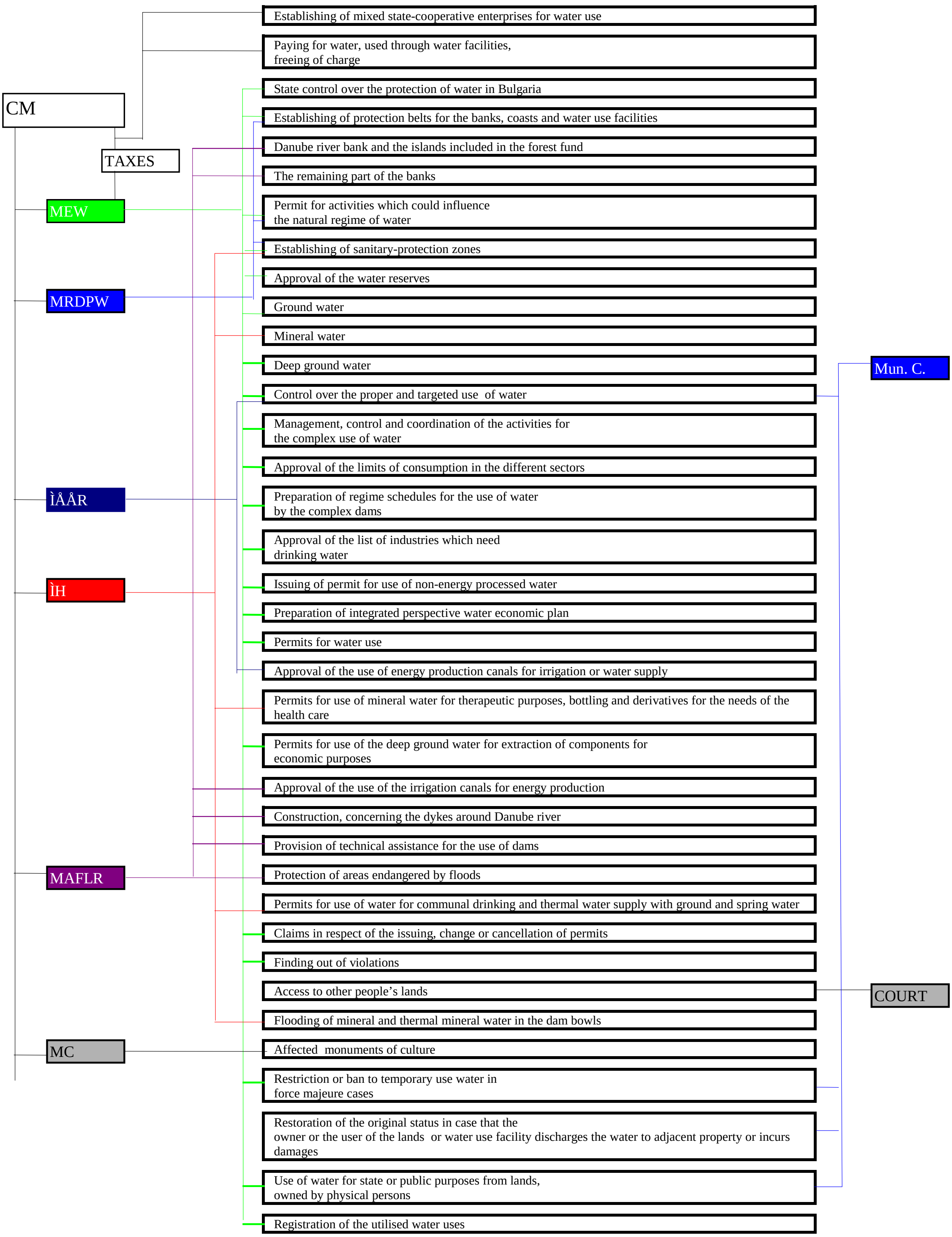


Figure 5-3 **Water management structure (according to the Water Law in force from 1969 and the Decree of the Council of Ministers No. 278 From 1997)**

STRUCTURE OF THE WATER MANAGEMENT ACCORDING TO THE WATER LAW IN FORCE FROM 1969 AND THE DECREE OF THE CM No. 278 FROM 1997



Annex 6

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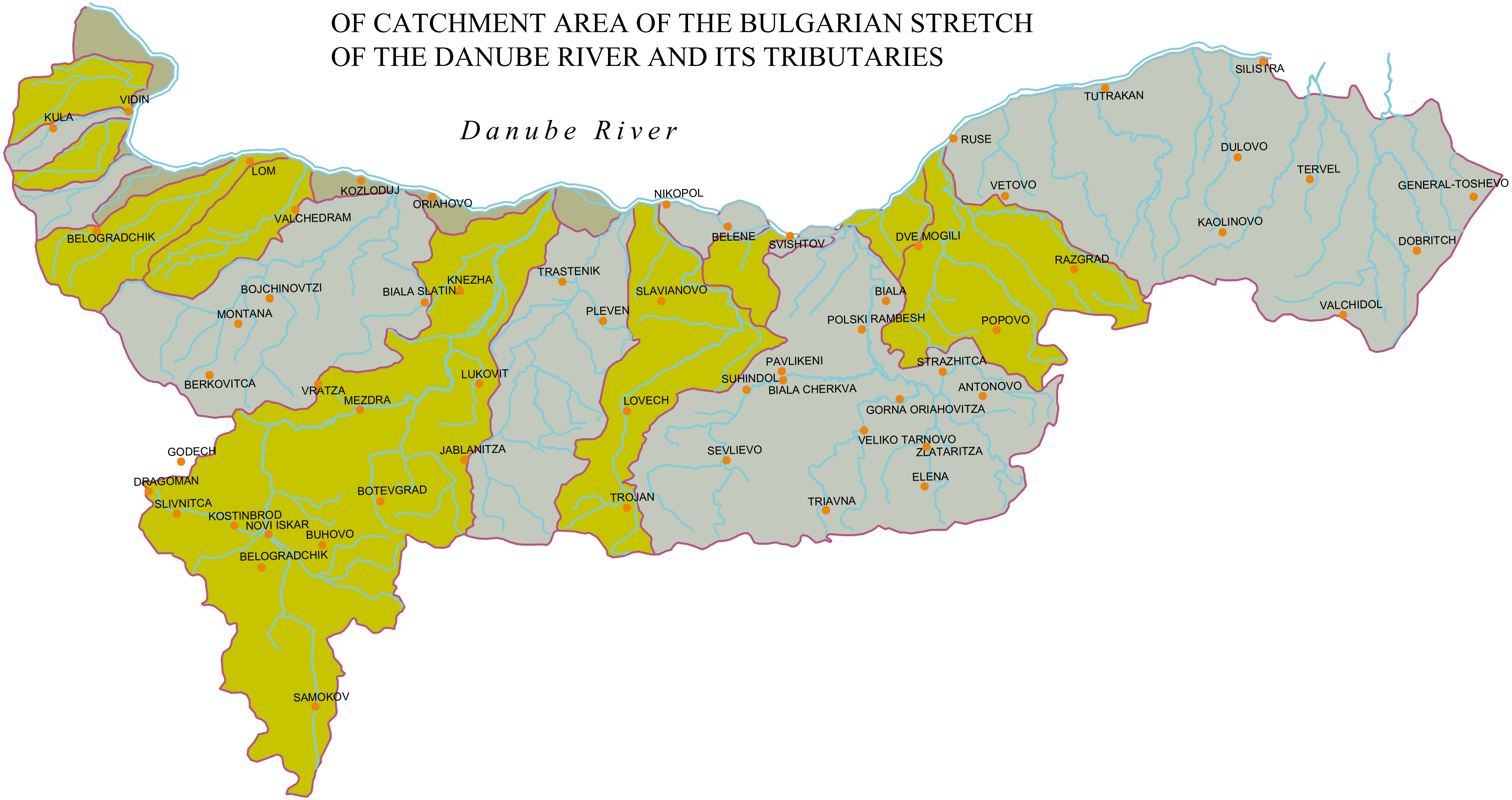
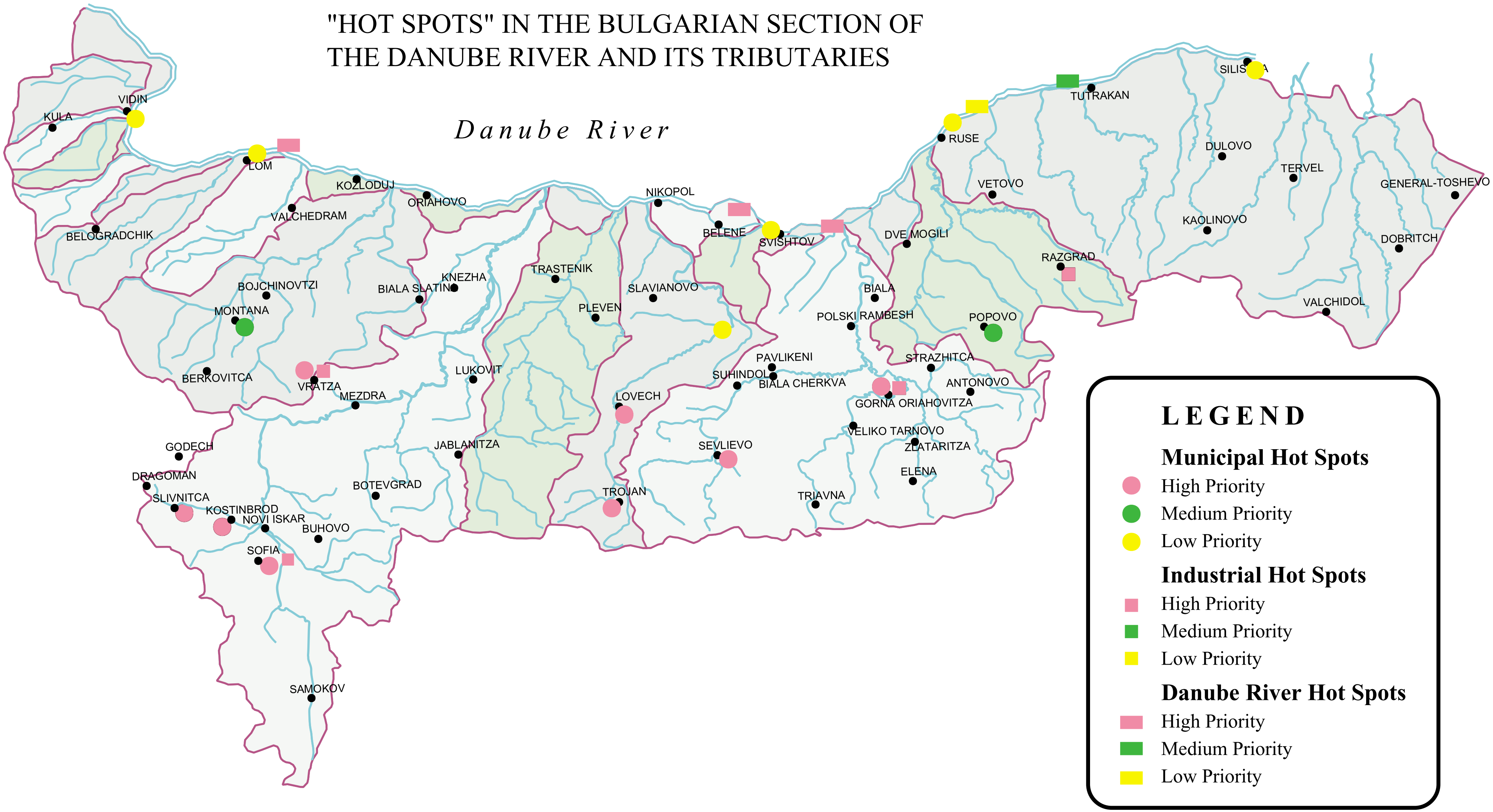
Maps

MAP C6-1
OF CATCHMENT AREA OF THE BULGARIAN STRETCH
OF THE DANUBE RIVER AND ITS TRIBUTARIES



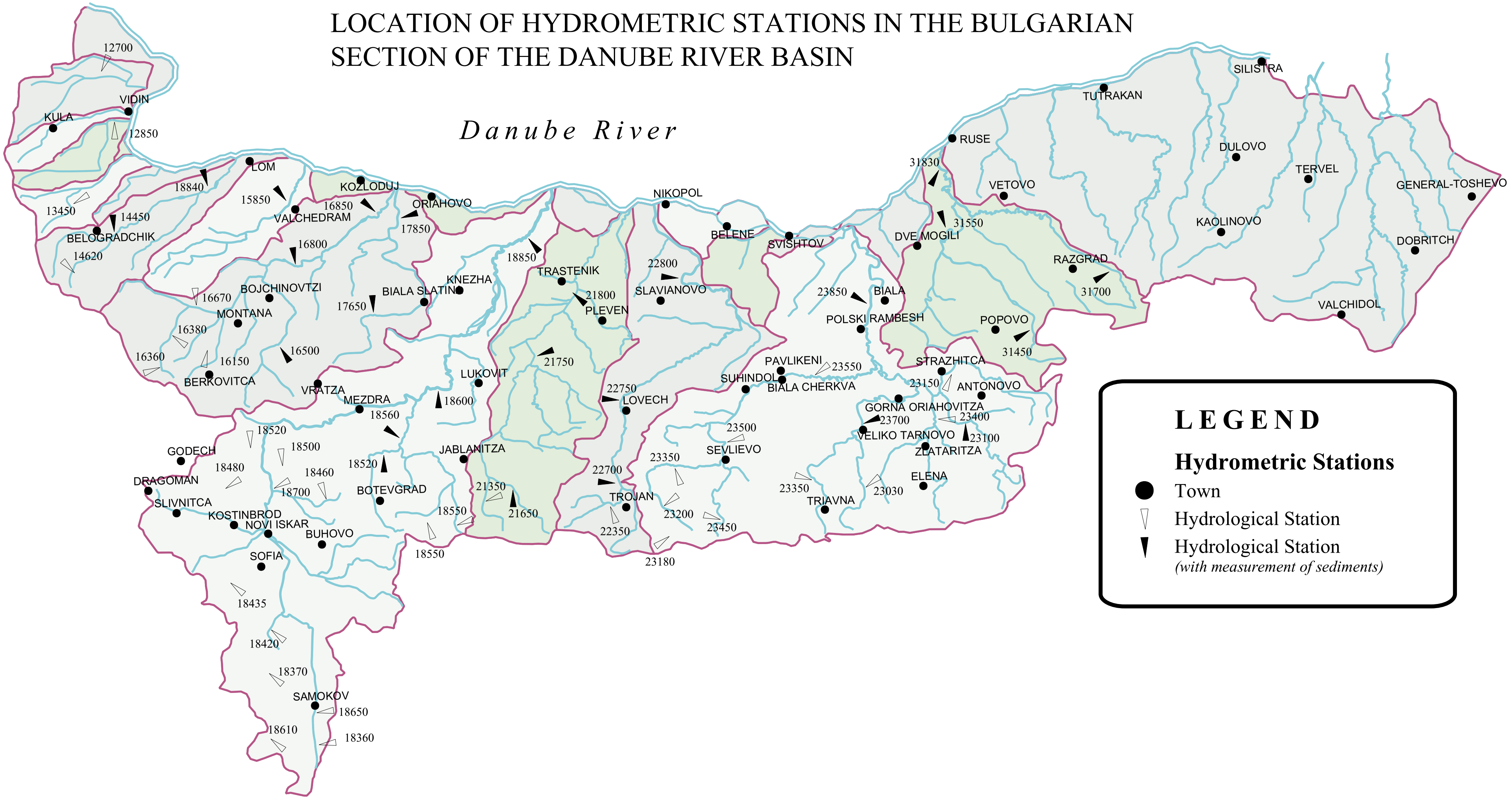
MAP C6-2

"HOT SPOTS" IN THE BULGARIAN SECTION OF THE DANUBE RIVER AND ITS TRIBUTARIES

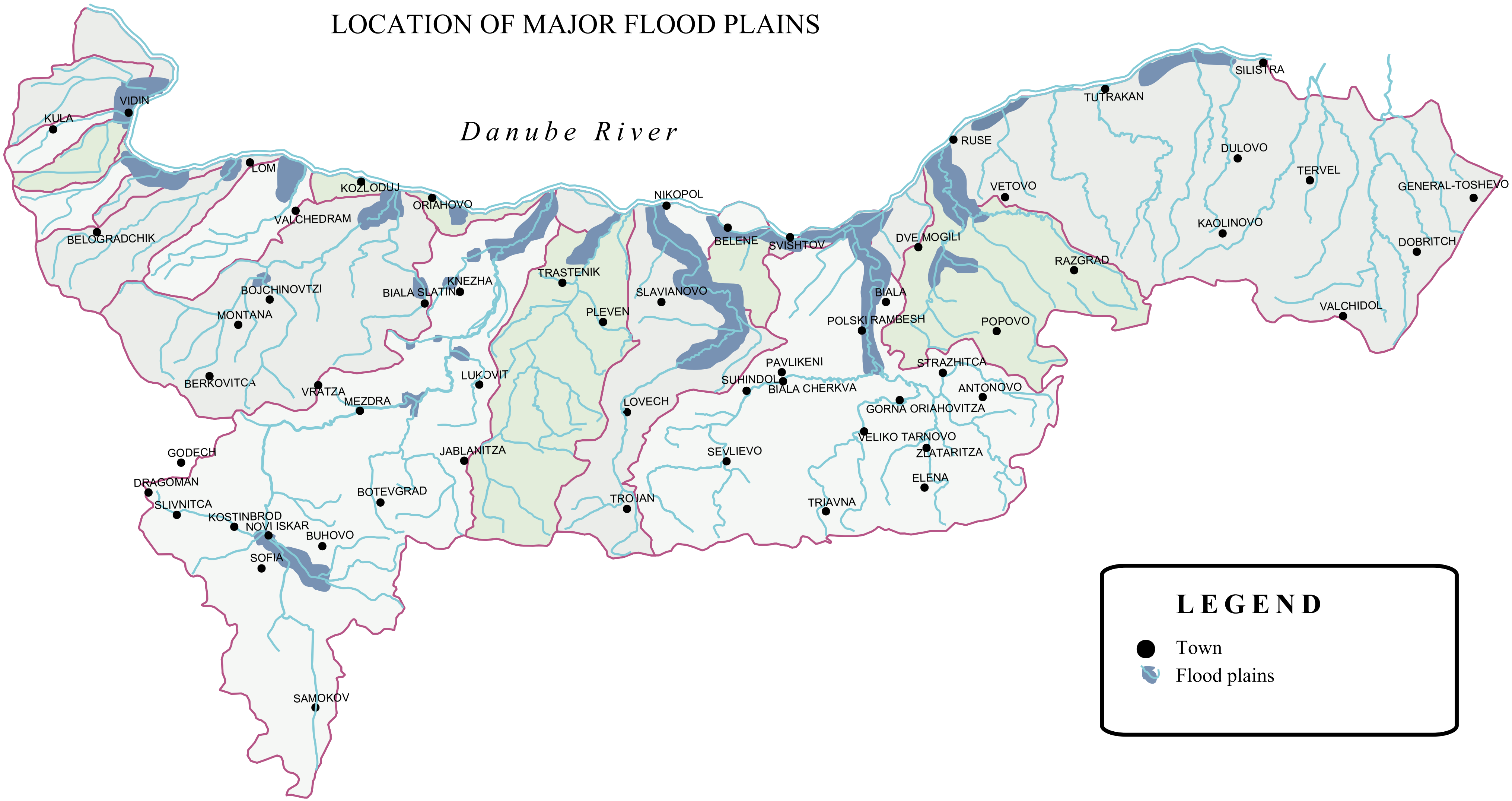


MAP C6-3

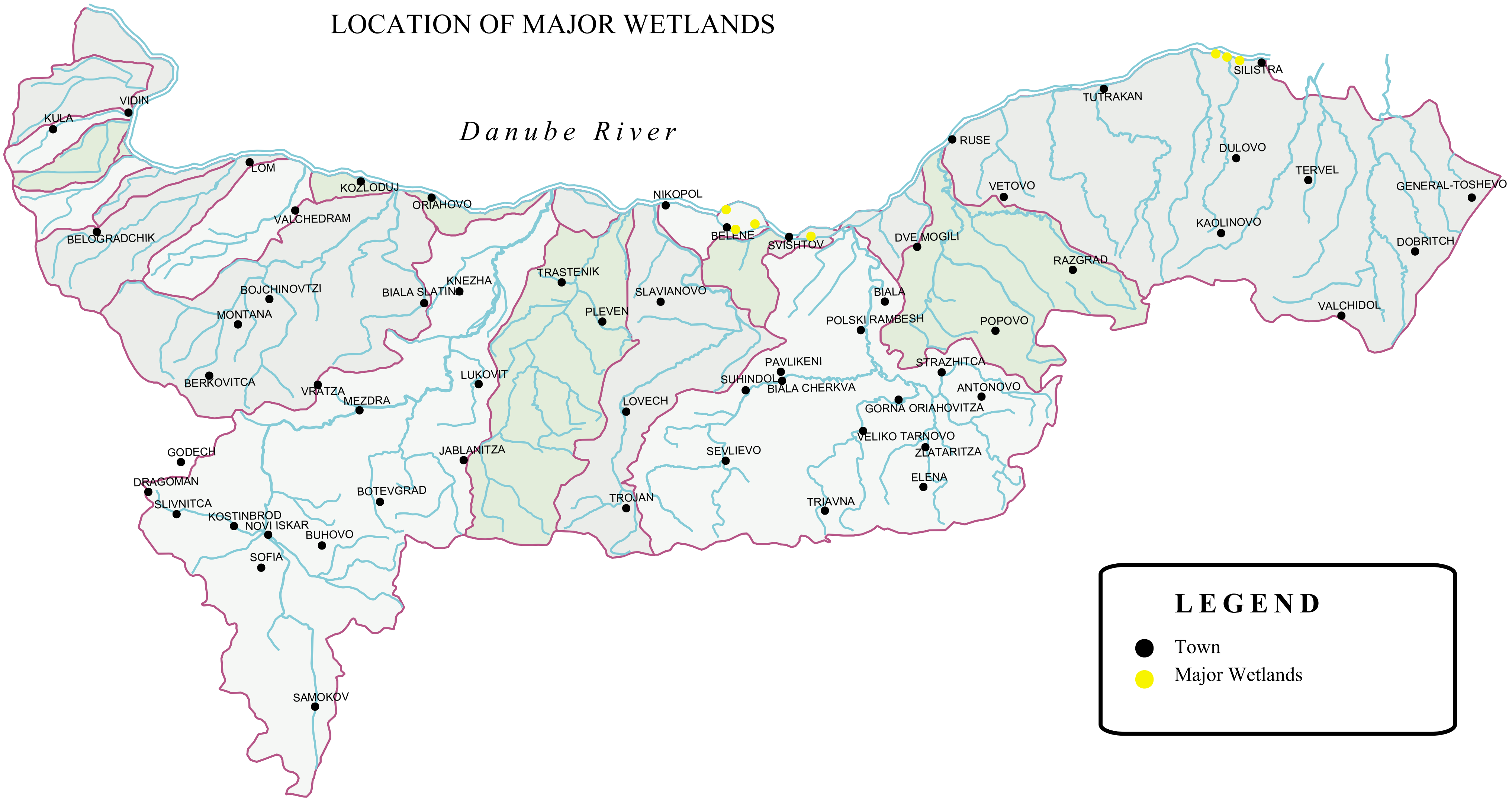
LOCATION OF HYDROMETRIC STATIONS IN THE BULGARIAN SECTION OF THE DANUBE RIVER BASIN



MAP C6-4
LOCATION OF MAJOR FLOOD PLAINS



MAP C6-5
LOCATION OF MAJOR WETLANDS



MAP C6-6

LOCATION OF ALL WATER QUALITY MONITORING STATIONS

LEGEND

Eastern Zone
includes the Russenski Lom River basin and Dobrudja Rivers

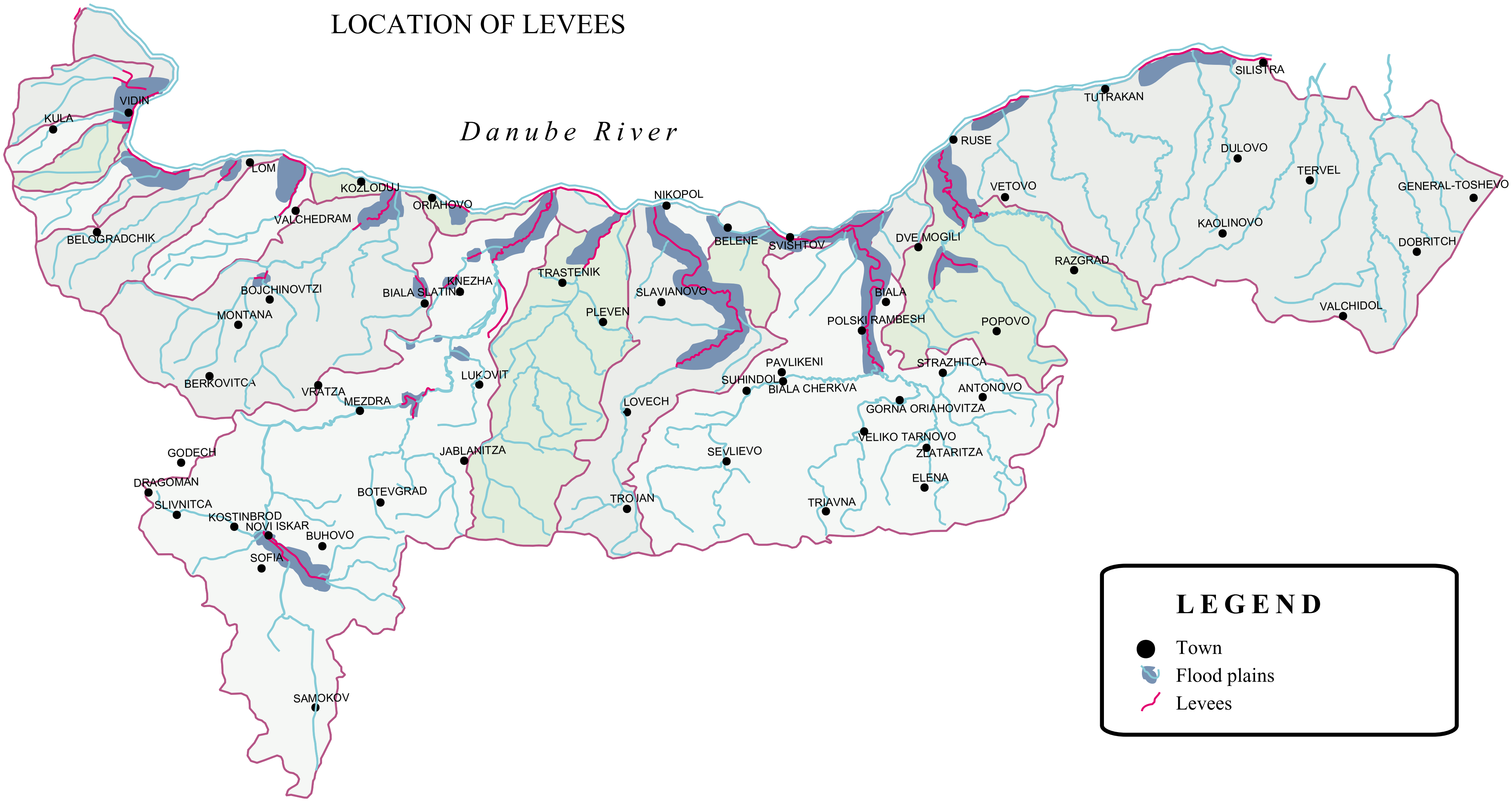
Central Zone
includes the Vit, Ossam & Yantra River basins

Western Zone
includes the Ogosta & Iskar River basins and the western rivers

Groundwater Monitoring Stations

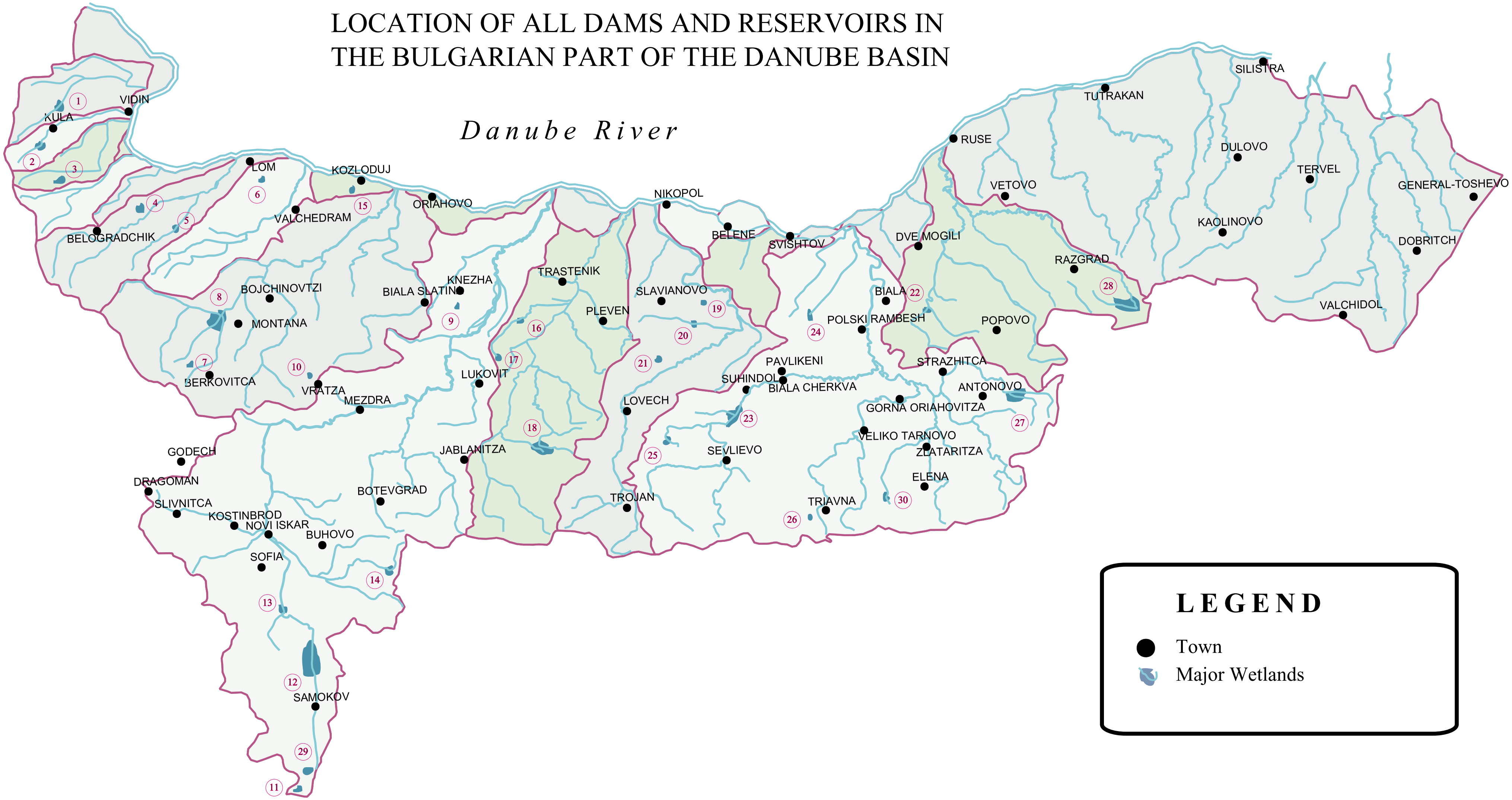
Hydrochemical Stations

MAP C6-7
LOCATION OF LEVEES



MAP C6-8

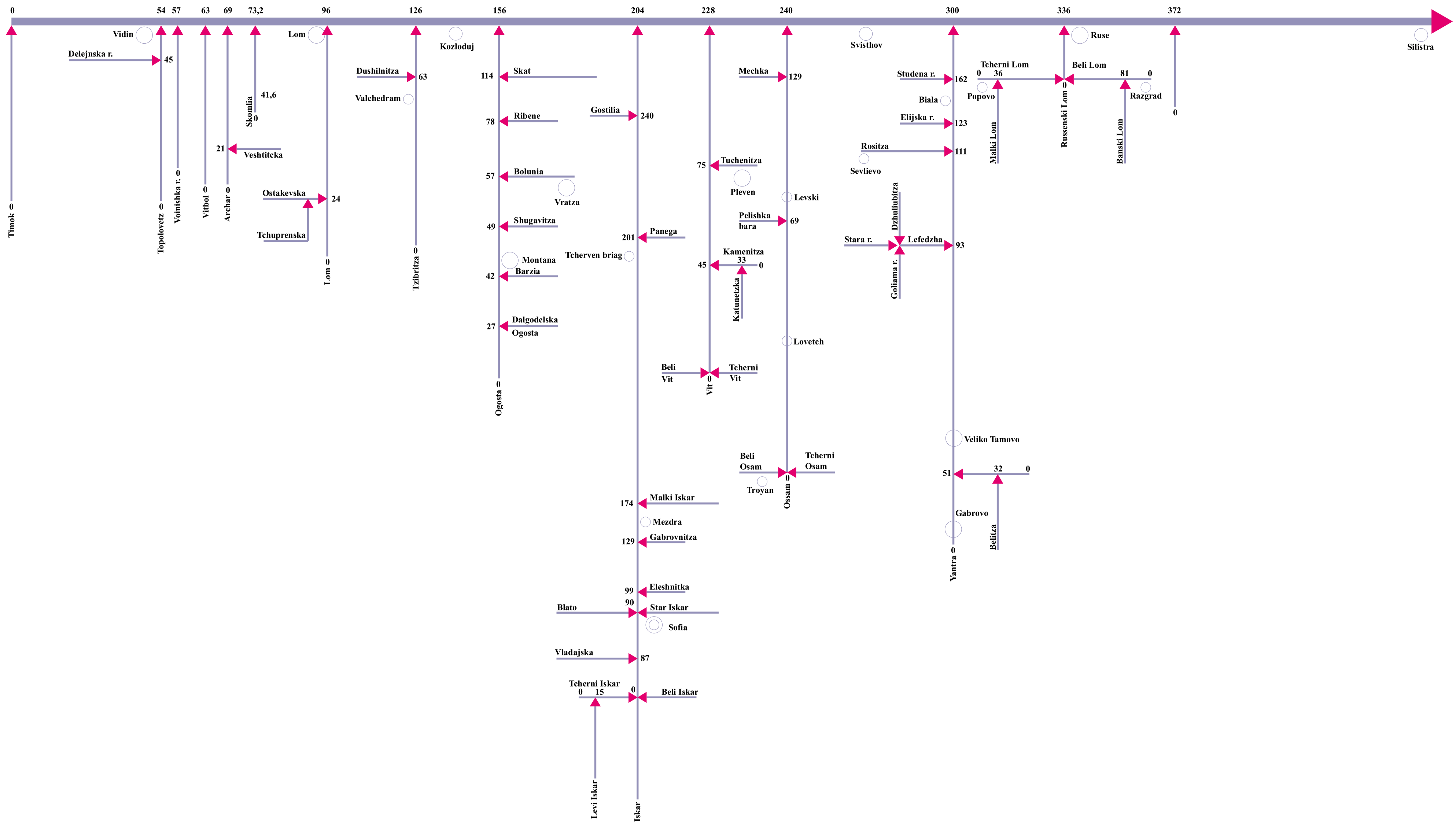
LOCATION OF ALL DAMS AND RESERVOIRS IN THE BULGARIAN PART OF THE DANUBE BASIN



MAP C6-9

A DIAGRAM OF THE RIVER NETWORK

CATCHMENT AREA OF THE BULGARIAN STRETCH
OF THE DANUBE RIVER AND ITS TRIBUTARIES



Part D

Water Environmental Engineering

Table of Contents

Annexes

List of Tables

List of Figures

List of Abbreviations on Water Environmental Engineering and Water Quality

AMNPED	Administration for Maintenance of Navigation Passes and Exploration of the Danube
BDS	Bulgarian State Standard
BGL	Bulgarian lev
BOD_5	Biochemical Oxygen Demand
CM	Consul of Ministers
CMEA	Committee of Mutual Economic Assistance
COD	Chemical Oxygen Demand
DDT	1,2 dichlorodiphenyltrichloethane
DEPA	Danish Environmental Protection Agency
DM	Germany Mark
EC	European Communities
ECE	Economical Commission for Europe
EIA	Environmental Impact Assessment
EMIS	Emission Expert Group
EPDRB	Environmental Program for the Danube River Basin
EU	European Union
FAO	Food an Agriculture organization
FIDIC	Federation internationale des ingenieurs - conseils
GIS	Geographic Information System
GLP	Good Laboratory Practice
ha	Hectar
HCH	Hexachlorocyclohexane
IWWTP	Industrial Waste Water Treatment Plant
LTP	Local Treatment Plant
m3/day	cubic meters per day
m^{33}/s	Cubic meters per second

MAC	Maximum Admissible Concentration
MF	Ministry of finance
mg/l	milligram per liter
MH	Ministry of Health
MLIM	Monitoring, Laboratory Information Management
MOEW	Ministry of Environment and Waters
MRDPW	Ministry of Regional Development and Public Work
MSW	Municipal Solid Wastes
MWWTP	Municipally Waste Water Treatment Plant
NECSD	National Center for Environment and Sustainable Development
NGO	Non Governmental Organization
NIMBY	Not In My Back Yard
NSEM	National System for Environmental Monitoring
OECD	Organization for economic co-operation and development
PHARE	Poland and Hungary Assistance and Reconstruction of Economy
Qav	Average flow
REWI	Regional Environment and Waters Inspectorate
SAF	Sugar and Alcohol Factory
SS	Suspended Solids
T/a	Ton/annum
T/y	Ton per year
TEF	Thousand Population Equivalents
TN	Total Nitrogen
TP	Total Phosphorus
USEPA	United States, Environmental Professional Agency
WWF	World Wild Fund
WWTP	Waste Water Treatment Plant

Glossary on Water Environmental Engineering

Agrochemicals	All chemicals used in agriculture (pesticides, herbicides, fertilizers, etc.)
Best Available Techniques (BAT)	Latest stage of development (state of the art) of processes emphasizing the use of non-waste technology, of facilities or of methods of operation which indicate the practical suitability of a particular measure for limiting discharges, emissions and waste. It is applied to industrial and other point sources of pollution
Best Environmental Practice (BEP)	Application of the most appropriate combination of sectoral environmental control strategies and measures. It is applied to non-point sources of pollution such as agriculture
Biodiversity	The sum total of different species of flora and fauna in a given region, area or habitat.
Biochemical Oxygen Demand (BOD)	Biochemical Oxygen Demand - measure of oxygen required to breakdown all organic material in a water body
Catchment	The area of the drainage basin of a river
Chemical Oxygen Demand (COD)	Chemical Oxygen Demand- A measure of the quantity of oxygen used in the chemical oxidation of compounds in a specified time, at a specified temperature and under specified conditions.
Debt	A sum of money or other property owed by one person or organization to another
Debt for nature/environment swap	A debt reduction technique in which there is the exchange by a debtor country of parts of its external debts for environmental or nature protection improvements
Denitrification	The process whereby nitrate is successively reduced to nitrogen, facilitated by bacteria in the presence of a carbon source and other nutrients
Discharge	The flow rate of a fluid at a given instant expressed as volume per unit of time (see stream discharge)
Ecosystem	A natural unit consisting of living and non-living parts interacting with each other, formed by the organisms of a natural community and their environment
Emission	Release of substances from a source
Emission limit	A numerical limit set on the emissions of a substance from a source
Fertilizer	Any substance containing calcium, nitrogen, phosphorus, potassium and micro compounds used on land to enhance the growth of vegetation. It may include livestock manure, the residues from fish farm and sewage sludge. A component necessary for plant growth
Generic Waste	Shall be waste generated following use of products from numerous sources throughout the country and whose characteristics require special management

Groundwater	Water contained in the pores and fissures of aquifers. All subsurface water.
Gross Domestic Product	A measure of the total flow of goods and services produced by the residents within the country over a specified period, normally a year
Hazardous Substances	Substances which have adverse impacts on living organisms, e.g. toxic, carcinogenic, mutagenic, teratogenic, harmful for the environment
Hazardous Wastes	Shall be the waste whose composition , quantity and properties create risks to human health and the environment and is defined as such under the Convention for Control of Transboundary Movement of Hazardous Waste and its Disposal
Hot Spot	A local land area, stretch of surface water or specific aquifer which is subject to excessive pollution and which requires specific action to prevent or reduce the degradation caused
Industrial Waste	Shall be the waste formed as a result of industrial activities , crafts and services by natural and legal persons
Integrated Water Management	A participatory planning, decision making and implementation process that takes into account the specific water quality and quantity requirements of all users and uses
Landfill	Engineering disposal of solid waste materials at land based sites
Mineral oil	Products of fossil hydrocarbons
Pesticide	Substance that kills organisms injurious to man or to the plants and animals upon which he depends for food, fibre and shelter
Pollution	The discharge, directly or indirectly, of compounds from sources into the environment in such quantity as to pose risks to human health, living resources or to aquatic ecosystems, damage to amenities, or interference with other legitimate uses of water
Refuse sites	Non-Engineering disposal of solid waste materials at land based sites
Revenues	Cross income accruing to a firm through the sale of its output
Stakeholder	A person who holds a sum of money deposited by the buyer in a transfer of ownership of land or a building; the deposit will be paid to the seller only if the buyer agree, and vice versa. Or a person, organization or subgroup of an organization that have a common interest in a project or activity
Toxic substance	Substances which cause harm to living organisms
Tributary	A river Which ultimately flows into the Danube River
Water Quality Standard	The requirements which must be fulfilled by a given environment or part thereof (e.g. air, surface water, groundwater)

1. Summary

1.1. National Targets and Instruments for Water Pollution Reduction

Bulgarian rivers in the Danube River basin differ significantly concerning their flows as well as the level of contamination. That is related with the negative impact from all kind of anthropogenic activities within the catchment area. Many of the rivers are being contaminated in their up stream part having as main polluting sources municipal wastewater discharges, wastewater from breeding farms and industrial wastewater. The lack of municipal wastewater treatment plants or their inefficient functioning aggravates additionally the water quality of the receiving bodies.

The assessment of current status of the surface river water quality is carried out in accordance with the regulatory requirements on surface water categorization.

General characteristics on the surface water quality reduced to the final points of the main river courses show an improvement of the basic indices. The forecasted general decrease of concentrations has been confirmed regardless of the relative unfavorable hydrological conditions especially in 1993 and 1994. The continuing decrease of BOD_5 and nitrate Nitrogen indicates a quite limited impact of the agriculture to the river basins environment compared to the previous years. More significant variations from the standard requirements have been detected for Yantra River concerning BOD_5.

The overall improvement of the surface water quality in the area is due to the decline of the industrial production and ceasing of several production activities, the reduced use of fertilizers in agriculture, the reducing of the number of breeding farms with intensive stock - breeding and other economic changes related to the transition.

The water quality in the Bulgarian section of Danube River is determined mainly by the water coming from the up and the middle stream parts of the river, by the contribution of Bulgarian and Romanian tributaries and by the direct discharges to the river. In 1994 the water quality was monitored in 20 station along the river course controlling 32 indices. Generally water quality meets the standards for III category receiving body except for Suspended Solids (SS) and ammonia Nitrogen for some of the stations.

Based on the analysis of the data on the contamination of the main rivers for the dryness period (almost identical to the crucial one) in the 5 years the following general conclusions can be made:

- A trend towards contamination decrease compared to 1990 can be identified. It is mainly due to the overall decline of industrial output in the last years. At the same time at a number of monitoring points values exceeding the standard requirements have been detected, such as the Iskar River downstream Kurilo, the Ossam River downstream Trojan and Lovech, the Yantra River downstream Gabrovo and Varbitsa. These data indicate that close to those points potential “Hot Spots” must be identified within the main rivers of the studied catchment areas
- Certain trend towards increase of some pollution indices can also be observed in 1994-1995 compared to the previous years in the following stations: the Vit River at Gulyantsi, the Iskar river at Samokov, the Yantra Ruver at Gabrowo and Varbitsa which is relate to the growth of the industrial production and the critical dryness in 1994.

Proceeding from the analysis the efforts for the next years must be orientated towards a staged realization of water evacuation activities, wastewater treatment and restriction of municipal and industrial wastewater discharges from the biggest pollution sources situated upstream the Hot Spots in the river basin.

Impact of Municipal Wastewater Discharges to the River Basins

One of the main polluting sources of the water is in the Danube river basin twelve WWTPs, which are in operation, four are currently under construction and for thirteen there are final designs already elaborated, but due to lack of resources and change of the balance among quantity to quality indices and they are still not under implementation. All these plants need updating of in accordance with the current conditions.

The situation with regard to municipal wastewater discharges presents a set of particular problems. The sewage systems of the towns in Bulgaria are of the mixed type collecting domestic, industrial and rainfall water together. Wastewater from household and industrial activities are directly discharged into the sewage system. Wastewater from industrial enterprises differs in content from the municipal and has to pass through local treatment plants so that the specific contaminants can be removed. The degree of local treatment depends on the initial concentrations and on the standards for discharge into the municipal sewage systems.

Currently in the country and in particular in the Danube River basin the completion of sewerage networks varies from 15 to 90%. It is imminent the completing of main sewerage collectors in big towns and cities like Sofia, Pleven, etc. where their lack does not permit to reach the existent capacity of the municipal WWTP.

The basic problems in sewerage and WWTP sector are:

- The realization of sewerage networks requires great investments including the substitution of the street pavement
- Study and re-designing of the existing WWTPs is needed
- Post-treatment of Nitrogen and Phosphorus is not resolved technologically excluding WWTP of Samokov
- In some of the WWTP, the equipment is morally and physically antiquated
- In general the sludge treatment is a problem which needs solution both for the existing as well as for the newly designed plants
- Power consumption is generally very high except for WWTPs in Sofia and Gabrovo

The reasons for these problems could be summarized as follows:

- Unreliable equipment and out-dated technologies
- Insufficient financial resources for building and extension of WWTPs
- Lack of initiative for introducing of new up-to-date technologies and machinery for WWTPs
- Unsatisfactory maintenance of WWTPs. Low level of automation and high dependency on subjective factors.
- Imperfect legal and regulatory basis, lack of permitting system, provisional permits, etc.

Impact of Agriculture on the River Basins

The breeding farm complexes and the exceeded fertilizer use are the main reasons for contamination with nitrates and phosphates. Fertilizers have been overused in large scales in the beginning of 80’s, which has lead to contamination of ground water. Since 1989 the fertilizer use declines sharply, mainly due to the elevated prices and decreased agricultural activities. In the beginning of 1990 there were about 5,00- breeding farms, but their number decreased rapidly. The number of the big pig-breeding farms, which represents the most significant pollution source, in 1994 has diminished from 400 to 100. Only 40 of them dispose of wastewater treatment facilities. Water quality data relevant to nitrate values shows that contamination caused by agriculture is significantly decreased.

According to the structure of the plants grown, the harvest obtained and the available information on nutrient reserves of the soils in order to provide a normal vegetation of the agricultural plants currently are necessary 307,504 T Nitrogen, 228,444 T P_2O_5 and 84,940 T K_2O.

The necessity of intensive usage of pesticides in the Danube region is doubtless. It is imposed mainly by the requirements of the market production costs, satisfying the market demands in relation to quantity and quality of the products, etc. In case of normal technology of plant protection in our country, 35-40% of total yield is protected from full destruction. Pesticide usage protects up to 100% of the production for the greatest part of the crops grown in the Danube region (potatoes, tobacco, and sugar beet, many of the vegetables, vineyard and orchard products.) The technological system in agriculture at the present stage has no alternative, concerning the pesticides usage. The problems in this direction are particularly complex and difficult to be solved. They are connected with the achievement of ecologically admissible and close to the optimal intensity of structure of the used pesticides and with the achievement of the economical limits for pesticide usage as well.

Impact of the Industries to the River Basins

The basic polluters discharging heavy metals and other toxic substances are the industries, where from time to time occur accidental releases as well. In the Danube River basin there are more than 130 significant industries representing practically all the industrial branches.

The industrial enterprises discharge annually about 200 million cubic meters of wastewater. These quantities vary form several hundred cubic meters per day to several hundred thousand cubic meters per day (e.g. Kremikovtsi). The pollutants vary in wide range - SS, BOD_5, COD, NO_3, heavy metals, etc.

Since 1994 the bigger part of the industries has worked either with reduced production capacity or completely ceased their operation activities. Water quality has improved correspondingly but not due to the application of up-to-date low water use or waste-less technologies.

Apart of the direct discharges of industrial wastewater into sewerage or surface water body, considerable threat for pollution present also the hazardous waste generation and management. At the territory of the Danube River basin there are more 200 sources generating hazardous wastes. The total amount of hazardous wastes generated from the area in 1994 is 496,512 T/y. From the top 30 hazardous waste generators in the country 13 are located within the Danube River basin.

Considerable amount of sources in each river basin generates small quantities of so called “generic wastes”. Generic wastes are those, which are typically generated in small quantities by many sources, have points of generation that are unclear or unknown, or have other characteristics that necessitate special consideration in the waste management system. Typical examples for generic wastes are pesticides, spent motor oils, emulsions from flotation of waste streams containing petroleum products, residues from oil traps, wastes from small heating installations and others. The total amount of generated generic wastes for the Danube River area for 1994 is 213,681 T/y or 43% from the total generation.

Impact of the Municipal Refuse Sites on the River Basins

At the present there are 230 registered municipal refuse sites in operation in Danube River basin. 38 of them belong to settlements with population more than 10 000. The total amount of accumulated waste is 1 947 265 tons. Most of the municipal refuse sites are not controlled and can be regarded as open dunghills. There are very few which can be considered as municipal refuse sites which meet the technical and the environmental requirements.

Taking in consideration the high designing and construction costs of the landfills which meet the technical and the environmental requirements, the difficulties with assignment of new sites for landfills, it is very important to consolidate the municipal refuse sites and to develop several regional landfills serving several municipalities and settlements.

Bulgaria Environmental Strategy Study developed in 1992 by experts from the Ministry of Environment and Waters and the World Bank includes the following priorities in water management:

a. reduction of industrial contamination, especially of the toxic substances e.g. heavy metals;
b. completion of the municipal wastewater treatment plants (WWTP s) with advanced stage of construction, modernization of existing municipal and stock-breeding WWTP s;
c. construction of municipal WWTP s in towns with developed sewerage system.

The priorities in the field of potable water supply are directed to finding additional water supply sources and increasing of the wastewater treatment capacities in Sofia, solving the problems with the inadequate pricing and use of the water resources, as well as the problems with the old water supply infrastructure.

Bulgaria Environmental Strategy Study Update and Follow-Up from 1994 emphasizes on water contamination problems and more specific on nitrates, heavy metals and toxic organic substances in potable water. Recommendations are made on revision of the standards for wastewater discharge, development of permission system, revision of the fee system and introduction of environmental audit for the main sources of contamination.

All projects for Strategy for water resources management in Bulgaria include the priority for water qualities. This priority will be the most important in the future for the development of National programme on waters. This will let to establish on national level a plan for water quality in Bulgaria.

The priority of water quality guarantees:

- stable water resources management
- cover of the water needs of the water and terrestrial ecosystems and their stability

The achievement till 2020 of qualities of surface waters on Bulgarian territory meeting the standards for pure and slightly contaminated waters is possible by means of providing investment opportunities and respecting the following main principles during the realization of water protection activities.

The areas with high contamination of the main river valleys, will form the base for designing and realization of water protection activities till 2020 as follows:

- Yantra river below the town of Gorna Oriahovitza
- Ossam river below the town of Troyan
- Yantra river below the town of Gabrovo
- Russenski Lom river below the town of Razgrad
- Ossam river below the town of Lovetch
- Ogosta river below the town of Vratza
- Iskar river below the town of Novi Iskar
- Rossitza river below the town of Sevlievo
- Yantra river below the town of Veliko Tarnovo

1.2. Measures for Reduction of Water Pollution

The measures for water pollution reduction could be summarized as follows:

- Accelerated investments for construction of sewerage networks and completion of the main sewers leading to the WWTP.
- Construction of MWWTP on a phased basis - in the most contaminated sections of the rivers and completing initially the mechanical stage of the water treatment together with the corresponding sludge treatment. Priority should be given to cities with more completed sewerage network (e.g. Gorna Orjahovitsa, Lovech, etc.)
- Development of WWTP for breeding farms and industries discharging directly into the surface water
- realization of LTP for industries discharging to municipal sewers
- Rehabilitation, extension and updating of the existing WWTP. Improvement of their maintenance (e.g. Vratsa, Sofia, Razgrad).
- Reduction of the number of MSW landfills and development of units on regional or local basis
- Monitoring and development of methodology to assess the impact of the non-point sources to the river basins
- Elaboration of requirements for reporting and tracking of the generation of generic wastes
- Development of an inventory of the historically damaged industrial sites and overall assessment of the costs needed for their rehabilitation, including performance of risk assessment and prioritization of the problems
- The forecasted economic growth of the industry require technological improvement of the production processes implementing closed water cycles, secondary use of wastewater in order to minimize the quantity and to improve the quality. Reduction of toxic and heavy metal emissions originated by industries using “best available techniques” and win-win practices”.
- Setting up of national requirements and norms on water quality, harmonized with those of EU. The achievement of that will ensure better environmental conditions, good protection of the human health and creation of optimum conditions for the existence of aquatic and land sensitive environments.

Activities on renewing and upgrading of the existing legislation in water protection field have been strongly implemented in last years. Ministry of Environment and Water is preparing a draft law on water based on the approach for integrated and sustainable water resources management. Water is considered as a limited resource with certain capability of recovery. Water use priorities are: water supply from water supply network, agriculture, fishery, industry, power production, etc. Water management is decentralized on a river basin basis. Implementation of a pilot project has been started for Yantra River basin. Adoption and enforcement of this act are very important for implementation of a contemporary approach, which will lead to integrated sustainable management of water resources in Bulgaria.

It is developed a normative base approximated with this in EC countries. It is also developed draft legislative regulations for determining standards for quality of the surface and groundwater.

At present for estimation of the ground water pollution as a base for comparison is being used Bulgarian Sanitary - Hygienic Standard BDS 2823-83 “Water for drinking purposes”, which qualifies natural water according to its adjustment to drinking water supply. It is recommended to implement a system for estimation of soil and groundwater pollution from industrial sites similar to the existing, so called Dutch List.

The defined Hot Spots reflect the most urgent needs for improvement and cover 15 point sources of contamination. The rest of the MWWTP should be considered in a later stage, but it shows that in Bulgaria there is still a good field improvement in the future.

Projects listed by priority, corresponding to the up-dated "Hot Spots" addressed to water pollution reduction from municipal wastewater discharges are provided below as follows:

Municipal Hot Spots

High Priority

- Hot Spot No. 1- MWWTP Gorna Oriahovitza and Liaskovetz -Yantra River Basin, Yantra River
- Hot Spot No. 2- MWWTP Troyan - Ossam River Basin, Ossam River
- Hot Spot No. 3- MWWTP Lovetch - Ossam River Basin, Ossam River
- Hot Spot No. 4- MWWTP Vratza- *rehabilitation and expansion* - Ogosta River Basin, Dabnika Leva River
- Hot Spot No. 5- MWWTP Sofia - *rehabilitation and expansion* - Iskar River Basin, Iskar River
- Hot Spot No. 6- MWWTP Sevlievo - Yantra River Basin, Rossitza River

Medium Priority

- Hot Spot No. 1- MWWTP Montana - Ogosta River Basin, Ogosta River
- Hot Spot No. 2- MWWTP Popovo - Russenski Lom River Basin, Popovska River
- Hot Spot No. 3- MWWT for a group of small towns - Slivnitza, Kostinbrod and Bojurishte - Iskar River Basin/Blato river basin/

Low Priority

- Hot Spot No. 1- MWWTP Russe - Danube River
- Hot Spot No. 2- MWWTP Levski - Ossam River
- Hot Spot No. 3- MWWTP Svishtov - Danube River
- Hot Spot No. 4- MWTP Vidin - Danube River
- Hot Spot No. 5- MWWTP Lom - Danube River
- Hot Spot No. 6- MWWTP Silistra - Danube River

The current level of impacting the water as a result of agricultural activities marks the need as soon as possible to plan projects for the future in order to facilitate the completion of the reform and to achieve a normal level of agricultural production limiting the pollution potential.

In co-operation with the Bulgarian Committee of Forests and a local NGOs, WWT under its "Green Danube" programme is carrying out a floodplain forest restoration project for the complex of Bulgarian Danube River islands. The project involves eliminating non-native monoculture plantation trees and re-establishing natural forest conditions. Despite past human disturbance, the islands, which range in size from few hectares up to 2,000 ha, contain important reserves of threatened biodiversity. In addition to small stands of old oaks on drier ground and white willow in the wet areas, the islands host large colonies of nesting herons and is a breeding site for endangered White-tailed Eagle. Co-operation between WWT, government officials, and local communities and organizations will ensure long-term preservation of this important floodplain habitat.

The following areas of interest, defined as Hot Spots along the Danube River course can be pointed out:

- The Danube River bed from km 844 to km 347 is subject to intensive erosion processes which necessitates regular bathymetric survey.
- The Danube River bank at Long Tzibritza Section (km 710) being subject to intensive erosion needs urgent fortification.
- The Danube River Bank at km 542 to km 536 – Yantra River estuary being subject to intensive erosion urgently requires fortification.
- Restoration of the water regime of the wetlands Persin and Vardin.
- Restoration of the biodiversity in the Belene Island.

Currently there are several on-going projects dealing with pollution reduction from industries funded by foreign or local financial sources. Typical examples are the following projects:

- A study is carried out under an EC PHARE project for studying the possibilities of treatment of the industrial wastewater with those of the municipality of Sevlievo. The title is **“Clean Technologies and industrial waste management”**. It is financed completely by PHARE programme.
- Another on-going project is **“Clean Technologies in Bulgarian Tannery Sector”**. It is carried out in accordance with a co-ordinated plan for implementation of “clean technologies” and development of demonstration projects in the tannery sector in Bulgaria. The project includes study and assessment of the needs of two tanneries - “Prista” in Russe and “Sevko” in Sevlievo as well as delivery of equipment. It is funded by DEPA - Danish Environmental Protection Agency.
- **Sevlievo-Tannery ”Sevko” (Yantra River Basin). -** Currently a project for technological rehabilitation is under execution which aims reduction of emission loads of $N\text{-}NH_4$, S^{-2}, SO_4 and Cr^{+6}. EC PHARE, the National Environmental Protection Fund and the National Eco Trust Fund finance the construction of LTP for industrial wastewater pre-treatment.
- In regard to the hazardous wastes a project titled “Incineration Plant for special Hospital Waste, Sofia”, is under performance. It is financed by DEPA.

Planned Projects for development of IWWTP by priorities and defined as Hot Spots are as follows:

High Priority

- Hot Spot No. 1- IWWTP for Sugar and alcohol factory Gorna Oriahovitza -Yantra River Basin, Yantra River
- Hot Spot No. 2- IWWTP for Fertilizer plant “Chimco” Vratza - Ogosta River Basin, Ogosta River
- Hot Spot No. 3- IWWTP for Pharmaceutics plant “Antibiotic” Razgrad - Russenski Lom River Basin, Beli Lom River

Medium Priority

- Hot Spot No. 1- IWWTP - rehabilitation and updating - for Metallurgical plant Kremikovtzi - Iskar River Basin, Lessnovska river

Low Priority

- Hot Spot No. 1- IWWTP for Elatzite Mining - Iskar River Basin, Malak Iskar River

Examples of on-going projects on solid waste management and reduction the impact of solid waste landfills are the following ones:

Pilot projects for separated collection of recyclable components of municipal solid wastes at the territory of Veliko Turnovo and Vratsa. They used to be apart of the project **"Solid Waste Management Policy - Phase I"**, financed by USEPA.

Currently a **"National Demonstration Project for Solid Waste Management Policy - Phase II"** is under development. It is financed by USEPA.

During the last few months as a part of the National Waste Recycling Strategy is carried out **"Waste Characterization Trial of Sofia Solid Wastes"**. It is still not completed and is funded by EU PHARE Programme.

Other on-going project is "**Construction of New Sanitary Landfill and Implementation of Remedial Actions at an Existing Dump Site for the Municipalities of Vratsa and Mezdra"** financed By DEPA.

Some Municipal administrations try to solve the problem themselves financing the designing and construction of new landfills. Examples in this regard are Sevlievo and Tutrakan.

1.3. Expected Regional and Transboundary Effects of Actual and Planned Measures

The comparative analysis of the results of the samples of the two frontier points on the Danube river (Novo Selo, km. 833) and Silistra (km. 375) indicate that no significant differences exist in the examined quality characteristics of the Danubian water. This once again shows that the contribution of the Bulgarian tributaries is insignificant and that the basic quality content of the Danube River water is determined above the Bulgarian section.

Due to its geographic characteristics of the Bulgarian part of the Danube River basin, there is no Transboundary effects caused by contamination of our local rivers. Only few small rivers of the Nishava catchment area rise at our territory and after that leave to Yugoslavia and Timok is the opposite case, it rises and has the catchment area almost totally in Yugoslavian territory and only in the end it becomes to be a borderline river among the two countries. In the discharging points of our rivers into Danube River adverse and polluting effects have not been observed. The pollution along the Danube River course itself has only a local effect and practically insignificant impact. Erosion problems at the Bulgarian bank of the Danube River are caused due to the "Iron Gate" I and II.

The ongoing and the planned projects and activities for water pollution reduction are of local concern relevant to the respective catchment area. They are also addressed to prevent pollution in order to reduce the risk of uncontrolled or emergency releases of pollutants. Some of them must be considered also as pilot or demonstration projects.

2. National Targets and Instruments for Reduction of Water Pollution

2.1. Actual State of and Foreseeable Trends in Water Management With Respect to Water Pollution Control

Bulgarian rivers in the Danube River basin differ significantly concerning their flows as well as the level of contamination. That is related with the negative impact from all kind of anthropogenic activities within the catchment area. Many of the rivers are being contaminated in their up stream part having as main polluting sources municipal wastewater discharges, wastewater from breeding farms and industrial wastewater. The lack of municipal wastewater treatment plants or their inefficient functioning aggravates additionally the water quality of the receiving bodies.

The assessment of current status of the surface river water quality is carried out in accordance with the regulatory requirements on surface water categorization.

Status of the Surface Water Quality for the Period 1990-1995

A trend towards improvement of the water quality is being observed in the rivers from the Danube River basin: Ogosta, Iskar, Ossam and Russenski Lom.

General characteristics on the surface water quality reduced to the final points of the main river courses show an improvement of the basic indices. The forecasted general decrease of concentrations has been confirmed regardless of the relative unfavorable hydrological conditions especially in 1993 and 1994. The continuing decrease of BOD_5 and nitrate Nitrogen indicates a quite limited impact of the agriculture to the river basins environment compared to the previous years. More significant variations from the standard requirements have been detected for Yantra River concerning BOD_5.

Some considerable deviations from the established levels have been registered along the river courses for certain parameters. For example in 1994 high values of ammonia Nitrogen above Maximum Admissible Concentration (MAC) were registered at the stations of Kobilyak (Ogosta River) - 5 times above MAC, Kardam (Cherni Lom River) - 4.5 times, Pisanets (Beli Lom River) - 3 times, Gulyantsi (Vit River), Troyan (Ossam River), Gabrovo, Varbitsa, Draganovo (Yantra river), etc. When refer to MAC it is the concentration required by Regulation No.7 (See Annex in part “B”: Water Quality). All these exceeding values here and below reflect an absolute maximum detected during monitoring and do not represent a constant state of the rivers above the limits. The level of nitrate Nitrogen does not exceed the water quality norms in average per annum for most of the monitoring stations.

The dynamics of the oxygen indices shows problematic points and sections with constantly low content of dissolved oxygen: Kubratovo, Kurilo (Iskar River), Bivolare (Vit River), Troyan (Ossam River), Samovodene, Draganovo (Yantra River), Kardam (Cherni Lom River), Razgrad (Beli Lom River) and others. At most of these points the values of BOD_5 as a criterion for contamination with biodegradable organics persistently exceed MAC for the relevant category: Varbitsa, Draganovo (Yantra River) - 11 times, Kobilyak (Ogosta River) - 5 times, Kardam (Cherni Lom River), Kurilo (Iskar River) - 4 times, etc.

Extremely high values of oil products have been determined at Kubratovo, Kurilo (Iskar River) - 18 times, Gabrovo, Samovodene, Draganovo (Yantra River) and others.

The overall improvement of the surface water quality in the area is due to the decline of the industrial production and ceasing of several production activities, the reduced use of fertilizers in agriculture, the reducing of the number of breeding farms with intensive stock - breeding and other economic changes related to the transition.

The water quality in the Bulgarian section of Danube River is determined mainly by the water coming from the up and the middle stream parts of the river, by the contribution of Bulgarian and Romanian tributaries and by the direct discharges to the river. In 1994 the water quality was monitored in 20 station along the river course controlling 32 indices. Generally water quality meets the standards for III category receiving body except for Suspended Solids (SS) and ammonia Nitrogen for some of the stations.

Heavy metals are within the limits established by the norms and only in the section after Tutrakan to Silistra sporadic exceeding of admissible concentrations of Manganese are observed. A general trend for a slight improvement of the Danube River has been detected regardless of the relative growth of the industry and agriculture production in the country in 1994-1995.

General Conclusions on Surface Water Quality for the Period 1990-1995

Based on the analysis of the data on the contamination of the main rivers for the dryness period (almost identical to the crucial one) in the 5 years the following general conclusions can be made:

- A trend to contamination decrease compared to 1990 can be identified. It is mainly due to the overall decline of industrial output in the last years. At the same time at a number of monitoring points values exceeding the standard requirements have been detected, such as the Iskar River downstream Kurilo, the Ossam River downstream Trojan and Lovech, the Yantra River downstream Gabrovo and Varbitsa. These data indicate that close to those points potential “Hot Spots” must be identified within the main rivers of the studied catchment areas
- Certain trend towards increase of some pollution indices can also be observed in 1994-1995 compared to the previous years in the following stations: the Vit River at Gulyantsi, the Iskar river at Samokov, the Yantra Ruver at Gabrowo and Varbitsa which is related to the growth of the industrial production and the critical dryness in 1994.

Proceeding from the analysis the efforts for the next years must be orientated towards a staged realization of water evacuation activities, wastewater treatment and restriction of municipal and industrial wastewater discharges from the biggest pollution sources situated upstream the Hot Spots in the river basin.

Impact of Municipal Wastewater Discharges to the River Basins

One of the main polluting sources of the water is the Municipal wastewater discharges. In the Danube river basin twelve WWTPs are in operation, four are currently under construction and for thirteen there are final designs already elaborated, but due to lack of resources and change of the balance among quantity to quality indices and they are still not under implementation. All these plants need updating of in accordance with the current conditions.

The situation with regard to municipal wastewater discharges presents a set of particular problems. The sewage systems of the towns in Bulgaria are of the mixed type collecting domestic, industrial and rainfall water together. Wastewater from household and industrial activities is directly discharged into the sewage system. Wastewater from industrial enterprises differs in content from the municipal and has to pass through local treatment plants so that the specific contaminants can be removed. The degree of local treatment depends on the initial concentrations and on the standards for discharge into the municipal sewage systems.

Currently in the country and in particular in the Danube River basin the completion of sewerage networks varies from 15 to 90%. It is imminent the completing of main sewerage collectors in big towns and cities like Sofia, Pleven, etc. where their lack does not permit to reach the existent capacity of the municipal WWTP.

The basic problems in sewerage and MWWTP sector are:

- The realization of sewerage networks requires great investments including the substitution of the street pavement
- Study and re-designing of the existing WWTP is needed
- Post-treatment of Nitrogen and Phosphorus is not resolved technologically excluding WWTP of Samokov
- In some of the WWTP, the equipment is morally and physically antiquated
- In general the sludge treatment is a problem which needs solution both for the existing as well as for the newly designed plants
- Power consumption is generally very high except for WWTP in Sofia and Gabrovo

The reasons for these problems could be summarized as follows:

- Unreliable equipment and out-dated technologies
- Insufficient financial resources for building and extension of WWTP
- Lack of initiative for introducing of new up-to-date technologies and machinery for WWTP
- Unsatisfactory maintenance of WWTP. Low level of automation and high dependency on subjective factors.
- Imperfect legal and regulatory basis, lack of permitting system, provisional permits, etc.

The greater part of the industrial enterprises using the municipal sewage systems on the territory of the Danube basin either has no local treatment facilities or does not operate them properly. For most of the towns it is necessary to further develop the municipal sewage systems and construct new and duplicate collectors, so that the design loading of the WWRP can be reached.

The operation of the existing WWTP proves that, the facilities perform their functions although with a lower effect than the assumed one in the designs and with a greater electronic power consumption in comparison to the modern plants.

There is a need of elaboration and implementation on a national and local level a strategic action plan or programme reducing the discharge wastewater in the Danube River basin and to improve water quality. Priority steps should be taken in a strategic programme to ensure the effect of the existing WWTP and to construct new ones.

Impact of Agriculture on the River Basins

The breeding farm complexes and the exceeded fertilizer use are the main reasons for contamination with nitrates and phosphates. Fertilizers have been overused in large scales in the beginning of 80’s, which has lead to contamination of ground water. Since 1989 the fertilizer use declines sharply, mainly due to the elevated prices and decreased agricultural activities. In the beginning of 1990 there were about 5,00- breeding farms, but their number decreased rapidly. The number of the big pig-breeding farms, which represents the most significant pollution source, in 1994 has diminished from 400 to 100. Only 40 of them dispose of wastewater treatment facilities. Water quality data relevant to nitrate values shows that contamination caused by agriculture is significantly decreased.

According to the structure of the plants grown, the harvest obtained and the available information on nutrient reserves of the soils in order to provide a normal vegetation of the agricultural plants currently are necessary 307,504 T Nitrogen, 228,444 T P_2O_5 and 84,940 T K_2O.

The real use in the country is considerably lower as shown in Table 2.1. - 1

Table 2.1.-1 Fertilizer use in Bulgaria for the period 1995-1997

Year	Total fertilizers T/a	Nitrogen T/a	P_2O_5 T/a	K_2O T/a
Need	620,888	307,504	228,444	84,940
1995	142,127	129,545	12,426	156
1996	164,894	151,883	12,824	187
1997	198,228	179,538	16,826	1,864

Real interest present also the used amounts of fertilizer per Decar (0.1 ha) in kg summarized in the Table 2.1.- 2.

Table 2.1-2 Fertilizer use in kg per Decar (0.1 ha)

Year	Total Fertilizers	Nitrogen	P_2O_5	K_2O
1981	22. 698	10.994	9.016	2.684
1995	3. 069	2.760	0.268	0.003
1996	3.561	3.236	0.276	0.003
1997	4.276	3.877	0.363	0.04

The necessity of intensive usage of pesticides in the Danube region is doubtless. It is imposed mainly by the requirements of the market production costs, satisfying the market demands in relation to quantity and quality of the products, etc. In case of normal technology of plant protection in our country, 35-40% of total yield is protected from full destruction. Pesticide usage protects up to 100% of the production for the greatest part of the crops grown in the Danube region (potatoes, tobacco, and sugar beet, many of the vegetables, vineyard and orchard products.) The technological system in agriculture at the present stage has no alternative, concerning the pesticides usage. The problems in this direction are particularly complex and difficult to be solved. They are connected with the achievement of ecologically admissible and close to the optimal intensity of structure of the used pesticides, and with the achievement of the economical limits for pesticide usage as well.

Impact of the Industries to the River Basins

The basic polluters discharging heavy metals and other toxic substances are the industries, where from time to time occur accidental releases as well. In the Danube River basin there are more than 130 significant industries representing practically all the industrial branches.

The industrial enterprises discharge annually about 200 million cubic meters of wastewater. These quantities vary form several hundred cubic meters per day to several hundred thousand cubic meters per day (e.g. Kremikovtsi). The pollutants vary in wide range - SS, BOD5, COD, NO3, heavy metals, etc.

Since 1994 the bigger part of the industries have worked either with reduced production capacity or completely ceased their operation activities. Water quality has improved correspondingly but not due to the application of up-to-date low water use or waste-less technologies.

Apart of the direct discharges of industrial wastewater into sewerage or surface water body, considerable threat for pollution presents also the hazardous waste generation and management. At the territory of the Danube River basin there are more 200 sources generating hazardous wastes. The total amount of hazardous wastes generated from the area in 1994 is 496,512 T/y. From the top 30 hazardous waste generators in the country 13 are located within the Danube River basin.

Considerable amount of sources in each river basin generates small quantities of so called “generic wastes”. Generic wastes are these which are typically generated in small quantities by many sources, have points of generation that are unclear or unknown, or have other characteristics that necessitate special consideration in the waste management system. Typical examples for generic wastes are pesticides, spent motor oils, emulsions from flotation of waste streams containing petroleum products, residues from oil traps, wastes from small heating installations and others. The total amount of generated generic wastes for the Danube River area for 1994 is 213,681 T/y or 43% from the total generation.

Impact of the Municipal Refuse Sites on the River Basins

At present there are 230 registered municipal refuse sites in operation in Danube River basin. 38 of them belong to settlements with population more than 10 000. The total amount of accumulated waste is 1 947 265 tons. Most of the municipal refuse sites are not controlled and can be regarded as open dumpsites. There are very few, which can be considered as municipal refuse sites which meet the technical and the environmental requirements.

Taking in consideration the high designing and construction costs of the landfills which meet the technical and the environmental requirements, the difficulties with assignment of new sites for landfills, it is very important to consolidate the municipal refuse sites and to develop several regional landfills serving several municipalities and settlements.

Bulgaria has faced considerable economic difficulties since 1991, marked by a sharp decline in total output and value-added and a dramatic rise in unemployment.

Bulgaria’s economic situation at the outset of the reforms was more difficult than in other transitional economies. Its high dependence on trade with the former Soviet Union and the other CMEA countries - 70 percent of foreign trade - left it extremely vulnerable as CMEA trading arrangements broke down.

The slight growth of the economy in 1994 and 1995, caused by the positive impact of the realized export was blocked in 1996 due to the total absence of structural reforms in the economy so necessary to support the transformation process towards a market economy. As a result of that the economy crisis led in the beginning of 1997 to a hyperinflation which most dramatic peak was in February and March 1997. As a result of that the Socialist Party Government had to resign and after elections a new Government led by the Unified Democratic Forces came to power. The new Government has taken the following measures till now:

1. Since July 1-st has been introduced a “Currency Board” fixing the BG Leva (BGL) to the German Mark (DM) - 1,000 BGL = 1 DM in co-ordination with the International Monetary Board
2. Adoption of a restrictive fiscal policy in accordance with the requirements of the Currency Board
3. Reforms in the financial sector and upgrading of the banking system
4. Acceleration of the privatization process
5. Promotion of foreign investments
6. Almost total liberalization of the prices

There was a significant overall improvement in water quality in most river basins. In particular water pollution caused by agriculture appears to have fallen markedly.

As in many other transitional economies, budgetary funds for environmental protection are very limited. The MOEW relies heavily on pollution fines, with revenue earmarked for the National and Municipal Environmental Protection Funds.

In early 1994 World Bank has assisted MOEW in the development of a concept for a proposal for debt-for-environment-swap. As a result of the implementation of the concept and following the agreement among Swiss and Bulgarian governments, in 1997 was created the National Eco Thrust Fund.

Summarizing trends in water quality is more difficult because of the greater number of monitoring points and the wide variety of indicators of water quality.

2.2. National Targets for Water Pollution Reduction

Bulgaria Environmental Strategy Study developed in 1992 by experts from the Ministry of Environment and Waters and the World Bank includes the following priorities in water management:

a. reduction of industrial contamination, especially of the toxic substances e.g. heavy metals;
b. completion of the municipal wastewater treatment plants (WWTP s) with advanced stage of construction, modernization of existing municipal and stock-breeding WWTP s;
c. construction of municipal WWTP s in towns with developed sewerage system.

The priorities in the field of potable water supply are directed to finding additional water supply sources and increasing of the wastewater treatment capacities in Sofia, solving the problems with the inadequate pricing and use of the water resources, as well as the problems with the old water supply infrastructure.

Bulgaria Environmental Strategy Study Update and Follow-Up from 1994 emphasizes on water contamination problems and more specific on nitrates, heavy metals and toxic organic substances in potable water. Recommendations are made on revision of the standards for wastewater discharge, development of permission system, revision of the fee system and introduction of environmental audit for the main sources of contamination.

All projects for Strategy for water resources management in Bulgaria include the priority for water qualities. This priority will be the most important in future for the development of National programme on waters. This will let to establish on national level a plan for water quality in Bulgaria.

The priority of water quality guarantees:

- stable water resources management
- cover of the water needs of the water and terrestrial ecosystems and their stability

The achievement till 2020 of qualities of surface waters on Bulgarian territory meeting the standards for pure and slightly contaminated waters is possible by means of providing investment opportunities and respecting the following main principles during the realization of water protection activities.

The areas with high contamination of the main river valleys, will form the base for designing and realization of water protection activities till 2020 as follows:

- Yantra river below the town of Gorna Oriahovitza
- Ossam river below the town of Troyan
- Yantra river below the town of Gabrovo
- Russenski Lom river below the town of Razgrad
- Ossam river below the town of Lovetch
- Ogosta river below the town of Vratza
- Iskar river below the town of Novi Iskar
- Rossitza river below the town of Sevlievo
- Yantra river below the town of Veliko Tarnovo

Measures for Water Pollution Reduction

The measures for water pollution reduction could be summarized as follows:

- Accelerated investments for construction of sewerage networks and completion of the main sewers leading to the WWTP.
- Construction of MWWTP on a phased basis - in the most contaminated sections of the rivers and completing initially the mechanical stage of the water treatment together with the corresponding sludge treatment. Priority should be given to cities with more completed sewerage network (e.g. Gorna Orjahovitsa, Lovech, etc.)
- Development of WWTP for breeding farms and industries discharging directly into the surface water
- realization of LTP for industries discharging to municipal sewers
- Rehabilitation, extension and updating of the existing WWTP. Improvement of their maintenance (e.g. Vratsa, Sofia, Razgrad).
- Reduction of the number of MSW landfills and development of units on regional or local basis
- Monitoring and development of methodology to assess the impact of the non-point sources to the river basins
- Elaboration of requirements for reporting and tracking of the generation of generic wastes
- Development of an inventory of the historically damaged industrial sites and overall assessment of the costs needed for their rehabilitation, including performance of risk assessment and prioritization of the problems
- The forecasted economic growth of the industry require technological improvement of the production processes implementing closed water cycles, secondary use of wastewater in order to minimize the quantity and to improve the quality. Reduction of toxic and heavy metal emissions originated by industries using "best available techniques" and win-win practices".
- Setting up of national requirements and norms on water quality, harmonized with those of EU. The achievement of that will ensure better environmental conditions, good protection of the human health and creation of optimum conditions for the existence of aquatic and land sensitive environments.

The approach applied to address these general measures for water pollution reduction is to define and prioritize a number of “hot spots” and based on that to set up a package of priority environmental projects. As pointed in part “B”-Water Quality, the following hot spots have been outlined:

Municipal Hot Spots

High Priority

- Hot Spot No. 1- MWWTP Gorna Oriahovitza and Liaskovetz -Yantra River Basin, Yantra River
- Hot Spot No. 2- MWWTP Troyan - Ossam River Basin, Ossam River
- Hot Spot No. 3- MWWTP Lovetch - Ossam River Basin, Ossam River
- Hot Spot No. 4- MWWTP Vratza- *rehabilitation and expansion* - Ogosta River Basin, Dabnika Leva River
- Hot Spot No. 5- MWWTP Sofia - *rehabilitation and expansion* - Iskar River Basin, Iskar River
- Hot Spot No. 6- MWWTP Sevlievo - Yantra River Basin, Rossitza River

Medium Priority

- Hot Spot No. 1- MWWTP Montana - Ogosta River Basin, Ogosta River
- Hot Spot No. 2- MWWTP Popovo - Russenski Lom River Basin, Popovska River
- Hot Spot No. 3- MWWT for a group of small towns - Slivnitza, Kostinbrod and Bojurishte - Iskar River Basin/Blato river basin

Low Priority

- Hot Spot No. 1- MWWTP Russe - Danube River
- Hot Spot No. 2- MWWTP Levski - Ossam River
- Hot Spot No. 3- MWWTP Svishtov - Danube River
- Hot Spot No. 4- MWTP Vidin - Danube River
- Hot Spot No. 5- MWWTP Lom - Danube River
- Hot Spot No. 6- MWWTP Silistra - Danube River

Agricultural Hot Spots

No ranking of agricultural hot spots has been developed given the stage of the agricultural reform in the country dealing with ownership of the land and undeclared future plans of the new owners. Nevertheless many of them continue to be a source of pollution through their accumulated past environmental burdens (i.e. discharge ponds, lagoons etc.).

The more significant animal-breeding farms which could be taken into consideration as “Hot Spots” in the **Ogosta river** catchment are as follows:

- Pig farm, Studeno Buche village,
- Military animal-breeding complex Vratza

The more significant animal-breeding farms in the catchment of the Iskar River are as follows:

- Inter co-operative enterprise "Pig complex", Knezha.

The more significant animal-breeding farms identified as “Hot Spots” in the Yantra River basin are as follows:

- Pig-breeding farm in the village of Samovodene.
- Pig breeding farm "Geran"- town of Liaskovetz.

Industrial Hot Spots

High Priority

- Hot Spot No. 1- IWWTP for Sugar and alcohol factory Gorna Oriahovitza -Yantra River Basin, Yantra River
- Hot Spot No. 2- IWWTP for Fertilizer plant “Chimco” Vratza - Ogosta River Basin, Ogosta River
- Hot Spot No. 3- IWWTP for Pharmaceutics plant “Antibiotic” Razgrad - Russenski Lom River Basin, Beli Lom River

Medium Priority

- Hot Spot No. 1- IWWTP - rehabilitation and updating - for Metallurgical plant Kremikovtzi - Iskar River Basin, Lessnovska river

Low Priority

- Hot Spot No. 1- IWWTP for Elatzite Mining - Iskar River Basin, Malak Iskar River

Additionally due to the problems with the erosion of the Danube coast and health risk considerations additional “hot spots” have been added as follows:

- The Danube River bed from km 844 to km 347 is subject to intensive erosion processes which necessitates regular bathymetric survey.
- The Danube River bank at Long Tzibritza Section (km 710) being subject to intensive erosion needs urgent fortification.
- The Danube River Bank at km 542 to km 536 – Yantra River estuary being subject to intensive erosion urgently requires fortification.
- Restoration of the water regime of the wetlands Persin and Vardin.
- Restoration of the biodiversity in the Belene Island.

Activities on renewing and upgrading of the existing legislation in water protection field have been strongly implemented in last years. Ministry of Environment and Water is preparing a draft law on water based on the approach for integrated and sustainable water resources management. Water is considered as a limited resource with certain capability of recovery. Water use priorities are: water supply from water supply network, agriculture, fishery, industry, power production, etc. Water management is decentralized on a river basin basis. Implementation of a pilot project has been started for Yantra River basin. Adoption and enforcement of this act are very important for implementation of a contemporary approach, which will lead to integrated sustainable management of water resources in Bulgaria.

A normative base approximated with this in EC countries is developed. Draft legislative regulations for determining standards for quality of the surface and groundwater is also developed.

At present for estimation of the ground water pollution as a base for comparison is being used Bulgarian Sanitary - Hygienic Standard BDS 2823-83 “Water for drinking purposes”, which qualifies natural water according to its adjustment to drinking water supply. It is recommended to implement a system for estimation of soil and groundwater pollution from industrial sites similar to the existing, so called Dutch List.

2.3. Technical Regulations and Guidelines

In Bulgarian legislation the water resources protection and their complex management and use are generally regulated currently by the Water Act from 1969. Water protection from pollution is also regulated by the Law for Prevention of Air, Waters and Soils Against Pollution adopted in 1963 and the corresponding regulations for its enforcement.

The various aspects of water protection and management are settled by different regulations:

- Regulation No 7 from 1968 specifies the standard requirements for the different (three) categories of surface water streams and basins (according to the European standards 5 categories of water intakes are distinguished)
- Regulation No 8 from 1986 specifies the requirements for discharge into the Black Sea and the parameters and standards for the determination of the quality of coastal marine waters;
- Regulation No 2 from 1978 specifies the admissible limits for industrial wastewater discharge into the municipal sewerage systems of municipalities without WWTP.
- The permit from the relevant water company is required for the discharge of wastewater in conformity to Regulation No 9 (1987) of the MRDPW;
- According to the Regulation for economic sanctions for air, water and soil pollution from 1978 which has been revised, updated and adopted by government decree No 24 from 04.02.1993, fines and sanctions are imposed for pollution exceeding the admissible limits. The fine amount is determined on the basis of the mass and toxicity of the discharged pollutants.

The sanctions are distributed according to the Environmental Protection Act in the National Environmental Protection Fund (70%) and the Municipal Environmental Protection Funds (30%) and may be used only for financial support of environment protection activities.

Ambient, emission and performance standards are under revision and elaboration and linked to an enforceable regulatory framework. Technical assistance and training in water quality dispersion modeling will be required if, as planned industrial pollution permits are introduced and industrial emission limits are to be differentiated according to local water pollution levels.

In order to improve the enforcement of the regulations, particular emphasis has been given to the development of an efficient monitoring system combined with improvements in the collection dissemination of environmental data. A National System for Ecological Monitoring and Environmental Information (NSEM) has been created and funded initially from the state budget.

Constrains on future budgetary spending imply that NSEM must gradually become less dependent on the state budget over time. For this purpose, it is recommended that a stable mechanism for ensuring adequate finance for the monitoring and information system be established by progressively increasing NSEM’ s revenue from charges and service fees.

Within NSEM an application of hydro-biological monitoring system has started normal operation which gradually will cover all the river basins in the country. By means of the established biotic index and some basic biological parameters a biological assessment of the water quality could be possible to be provided.

The level of pollution fines does not reflect pollution abatement costs and has declined in real terms since 1989 as a consequence of inflation. Nonetheless, the system of fines and proposed pollution fees is a step towards implementation of the “polluter pays” principle. Enforcement of these penalties is hampered by the general economic decline, the grim financial situation of the worst polluters, and concerns about unemployment.

2.4. Expected Impacts of EU-Directives to Water Pollution Control

Below in Table 2.4. - 1 is provided a comparative legal analysis among existing Bulgarian and European legislation concerning environmental activities and Regulators.

Table 2.4.-1 Comparison of Bulgarian and European Environmental Legislation

European Environmental Legislation	Bulgarian Legislation
I. Council Directive 86/280/EEC of 12 June 1986 on limit values and quality objectives for discharges of certain dangerous substances included in List 1 of the Annex to Directive 76/464/EEC of 4 May 1976 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community	Regulation No. 7 of 8 August 1986 for indicators and Standards for Determining the Quality of Following Surface waters
Requirements	**Requirements**
Maximum admissible emissions are determined using the following criteria: Type of dangerous substance Average time value (daily or monthly) The limit values are determined on the base of gram substance and also on the base of its concentration Type of the industrial plant is of very big importance * Annex to the Directive 76/464/EEC contains two Lists of different families and groups of substances in hazardous wastes regarding the opportunity to convert rapidly into substances, which are biologically harmless.	The indicators and standards are applied for flowing surface waters, lakes and storage reservoirs, coastal seawaters, and groundwater. They are determined on the base of following criteria: Type of the indicators (total 86 numbers) divided into four groups: General physical and inorganic chemical indicators - General indicators of organic pollutant - Indicators of organic substances of industrial origin biological indicators Unit of measure (mg/cubic dm) Category of the water concerning water use I. Category - waters intended for the abstraction of drinking water, industrial water, and bathing water II. Category - waters intended for the abstraction of watering of animals, aquatic sport, and fish-breeding III. Category - waters intended for the abstraction of irrigation
II. Council Directive 91/271/EEC of 21 May 1991 concerning urban water treatment	Regulation No. 7 of 8 August 1986 for indicators and Standards for Determining the Quality of Following Surface waters
Requirements	**Requirements**
They are differentiated into four sections: Sewerage systems 1. Urban wastewater treatment 2. Industrial wastewater Reference methods for monitoring and evaluation of results The requirements described in the tables 1 and 2 of the Directive are of very big importance. They contains four main indexes: Observed indexes 3. concentration in mg/liter 4. minimal decreasing percentage recommendations on methods and means of their fulfillment	The requirements are stated in Section I

III. Council Directive 75/440/EEC of 16 June 1975 concerning the quality required of surface water intended for the abstraction of drinking water in the Member States	Regulation No. 7 of 8 August 1986 for indicators and Standards for Determining the Quality of Following Surface waters and Bulgarian State Standard 2823-83-Drinking water
Requirements	**Requirements**
The Annex of the Directive contains the parameters of the surface water intended for the abstraction of drinking water	The requirements are stated in Section I
IV. Council Directive 76/160/EEC of 8 December 1975 concerning the quality of bathing water	There is no direct homologue Bulgarian regulation.
Requirements:	**Requirements:**
Annex of the Directive contains the following requirements to the different microbiological parameters: Quantity in 100 milliliters or liters 5. Guide and mandatory values 6. Minimum sampling frequency The methods of analysis and inspection	Regulation No. 7 of 8 August 1986 for indicators and Standards for Determining the Quality of Following Surface waters as described in Section I and Regulation No. 8/86 on indicators and standards for determining the quality of coastal sea waters. In Directive 8/86 are stated 18 indicators which are divided into four groups: General physical and inorganic chemical indicators 7. General indicators for organic pollutants 8. Indicators for organic matter of industrial origin Micro-biological indicators The quality is determined on the base of unit of measurement mg/cubic dm; water use area, and sanitary protection zone
V. Council Directive 78/659/EEC on the quality of fresh waters needing protection or improvement in order to support fish life	Regulation No. 7 of 8 August 1986 for indicators and Standards for Determining the Quality of Following Surface waters
Requirements:	**Requirements:**
In the Annex I of the Directive there is a list of parameters where: The fresh waters are differentiated into Salmonid waters and Cyprinid waters and the guide and mandatory values are mentioned The methods of analysis and inspection Minimum sampling frequency The way of fulfillment of the observations	Requirements are stated in Section 1. Regulation No. 8/86 on indicators and standards for determining the quality of coastal sea waters. Requirements as described in Section 4.
In the Annex II of the Directive are described the admissible concentrations of zinc and soluble copper in mg/liter in the contents of the Salmonid waters and Cyprinid waters	Requirements are stated in Section I. In parallel with the coastal sea water protection a human health and normal development of the fisheries is under control. NOTE: Standards for admissible concentrations of dangerous substances in the soil are stated in Regulation No. 3 /79. The Regulation for lead, copper and zinc in soil is determined in accordance with active reaction of the soil (pH) in water suspension.

Conclusions

In current Bulgarian legislation there is no specification about different types of waters, subject of control and inspection. Despite considerably large number of indicators, included in Regulation No. 7/86 about the quality of the surface waters the lack of important elements is determined, subject of monitoring. There are no established average time limit (e.g. one week or one month) and quantity threshold for hazardous waste generation. These indicators are of great importance for determination of the water quality, as well as the type of the industrial plant or process, which causes contamination of water.

There is no legalization specifically related to the urban wastewater treatment, quality of the bathing waters and fresh waters, needed for fish breeding, etc.

In current Bulgarian legislation is not included as requirement to consider the reduction of the concentration of the pollutants , i.e. the treatment efficiency in percents. It is a very important issue to impose proper sanctions for water contamination.

Recommendations for Improvement of the Existing Legislation

A more detailed specification in Bulgarian legislation related to the different types of waters, subject of control by the Inspection authorities is needed.

In the legislation is necessary to be considered the mass of the polluting substances, as well as the treatment efficiency.

Establishing of guide and mandatory values of the different biological and microbiological indicators.

Average time limit (daily, weekly or monthly) to determine the quantitative thresholds for pollution with hazardous wastes must be included as a criterion for admissible standards in Bulgarian legislation.

Note: Comparison of the concrete admissible parameters included in Bulgarian and EU regulations is provided in Annex C-1.

2.5. Law and Practice on Water Pollution Control

According to the existing regulatory system several kinds of licenses are planned: for wastewater discharge, for various kind of water consumption, for complex use of reservoirs and dike construction, for hydrogeological explorations and drill wells, for river bed construction, inlets, outlets, etc.

At present preparatory measures are envisaged for the entire renovation of the regulatory system, for waters in particular, in order to meet the requirements of the new economic conditions and policy.

A new Water Act is under preparation and it will regulate all water resources aspects from qualitative and quantitative point of view.

The new Water Act presumes that water quality management will be performed on the basis of projects for perspective categorization of water streams and basins.

A regional administrative Agencies for River Basin Management with a consulting body “River Basin council” will be established for co-ordination of the interests of local consumers and administration with the state policy for management, distribution and protection of waters.

An extremely important feature of the new legal system is the introduction of a new system of taxes and fines for wastewater discharge. The physical and juridical persons discharging wastewater conformable to the emission standards.

The updating of the system or control of emissions and monitoring of surface and ground water quality is considered to be of great significance by the legal system.

A very serious problem that has to be solved by the new Water Act is the introduction of the “self monitoring” principle. It means that the polluters must assure with its own financial resources and facilities continuous control of the discharged wastewater and the reliability of the accumulated data.

A set of supporting regulations are planned to be prepared too (see Annex 2), that are based on the new principles for water protection. The basic principles and objectives that have to be followed and achieved are discussed bellow.

Regulation on parameters and standards for water quality indices of surface water streams and basins. A new classification system will be developed with parameters and standards corresponding to these accepted in ECE and adapted for Bulgarian conditions.

Regulation for water quality requirements intended for the main types of water consumption, which will introduce differentiated for water quality depending on the case in particular - drinking water supply, irrigation, recreation and fish breeding. The requirements and standards are borrowed mainly from the EC.

Regulation for parameters and standards for the admissible limits of pollution of wastewater discharged from different industrial and other activities discharged into water streams and basins. The differentiated emission standards will correspond to the average world level of the industrial technologies and the methods and facilities for wastewater treatment. There are no such emission standards in Bulgaria so far and their enforcement will contribute to the improving of the activities for water protection.

Regulation for parameters and standards for the admissible contaminant content in industrial wastewater, discharged into the sewer systems of settlements. The development of the standards in this regulation has been performed by using the experience of the European countries and it will replace the existing till now Regulation No 2 that has displayed a series of shortcomings.

The individual emission restrictions and requirements towards wastewater discharged into the different water intakes, will be established for each case in particular by the discharge licenses issued from the executive bodies of the Ministry of Environment. For this purpose a new improved system for issuing of wastewater discharge licenses is impending to be developed and applied.

3. Actual and Planned Projects and Policy Measures for Reduction of Water Pollution

3.1. Reduction of Water Pollution from Municipalities

As mentioned above in Section 2, municipal discharges of wastewater are among the principle sources of contamination for the river basins. In the Danube River area there are 38 settlements with population above 10,000 inhabitants. At the same time within the area 12 MWWTPs are in operation (Sofia, Pleven, Veliko Turnovo, Gabrovo, Vratsa, Razgrad, Varshets, Dobrich, Botevgrad, Pravets, Elin Pelin, Borovets) 4 are under construction (Borovets, Troyan, Strazhitsa, Samokov) and for 13 there are final designs completed (Gorna Oryahovitza, Popovo, Lovech, Montana, Sevlievo, Cherven Bryag, Levski, Pavlikeni, Berkovitca, Mezdra, Belogradchik, Silistra, Etropole), but due to lack of financing no activities are undertaken for their construction. In total that means 29 plants, which shows that for at least 9 towns new designs will be needed (see Figure 3.1.-1). It is important to note that for the plants already designed, an evaluation of the existing documents will be needed as well as for those under construction. It is very probable to be necessary to re-design some of them in order to up-date them to the current conditions and newer treatment concepts.

The defined Hot Spots reflect the most urgent needs for improvement and cover 15 point sources of contamination. The rest of the MWWTPs should be considered in a later stage, but it shows that in Bulgaria there is still a good field improvement in the future.

As an example of on-going project that solves specific problem identified previously as Hot Spot we can give the following one:

Russe - West Industrial Zone (Danube River Basin) - The main sewer collector is under construction and the completion of the Pumping station is ongoing too, with the financial support of the National Eco Trust Fund.

Other projects listed by priority, corresponding to the up-dated “Hot Spots” addressed to water pollution reduction from municipal wastewater discharges are provided below in Fig. 3.1.-2 as follows:

Figure 3.1.-1 Municipal hot spots

No	Name	River Basin	River	Priority
1	MWWTP-Gorna Oriahovitza and Liaskovetz	Yantra River Basin	Yantra River	High
2	MWWTP-Troyan	Ossam River Basin	Ossam River	High
3	MWWTP-Lovetch	Ossam River Basin	Ossam River	High
4	MWWTP-Vratza	Ogosta River Basin	Debnika Leva River	High
5	MWWTP-Sofia	Iskar River Basin	Iskar River	High
6	MWWTP-Sevlievo	Yantra River Basin	Rossitza River	High
7	MWWTP-Montana	Ogosta River Basin	Ogosta River	Medium
8	MWWTP-Popovo	Rusenski Lom River Basin	Popovska River	Medium
9	MWWTP-Slivnitza, Kostinbrod, Bojurishte	Iskar River Basin	Blato River	Medium

No	Name	River Basin	River	Priority
10	MWWTP-Russe		Danube River	Low
11	MWWTP-Levski	Ossam River Basin	Ossam River	Low
12	MWWTP-Svishtov		Danube River	Low
13	MWWTP-Vidin		Danube River	Low
14	MWWTP-Lom		Danube River	Low
15	MWWTP-Silistra		Danube River	Low

Summarized data on these projects is provided in Table 3.1 - 2.

Table 3.1-2 Summary of recommended projects for municipal hot spots

Hot Spot Name, River & Location 1	Parameters & Values which Define the Problem 2	Ranking of the Problem 3	Name & Type of Project (Structural or Non-structural) 4	Project Strategy & Targets 5	Parameters & Values which Define Project Benefits 6	Project Beneficiaries 7
Gorna Oryahovitza & Lyaskovets Location-Yantra River Basin	Total population 49 800 ; G.Oriahovitza - 96 % sewered, Liaskovetz- 68% sewered; Qav = 50 920 m3/day; raw water load= 407 TEGW; BOD = 8921 t/a; COD=20 430 t/a; TN=502 t/a; TP= 50 t/a;	High priority project	Municipal Waste Water Treatment Plant -Gorna Oryahovitza & Lyaskovets Structural project	Addressed to a Hot Spot and solves a problem in a contaminated river section	Remaining Pollution: BOD_5=465t/a; COD=1060t/a; TN=372 t/a; TP=37 t/a;	Municipalities of Gorna Oryahovitsa and Lyaskovets
Troyan Location-Osam River Basin; Beli Osam Sub-basin	Total population 24 721; 80 % sewered; Qav = 28 200 m3/day; raw water load - 94 TEGW; BOD =2 059 t/a; COD =4 460 t/a; ÒN=298 t/a; ÒP=35 t/a;	High Priority Project	Municipal Waste Water Treatment Plant for Troyan Structural project	Addressed to a Hot Spot and solves a problem in a contaminated river section	Remaining Pollution: BOD_5=219 t/a; COD=464 t/a; TN=219 t/a; TP=22 t/a;	Municipality of Troyan

Hot Spot Name, River & Location 1	Parameters & Values which Define the Problem 2	Ranking of the Problem 3	Name & Type of Project (Structural or Non-structural) 4	Project Strategy & Targets 5	Parameters & Values which Define Project Benefits 6	Project Beneficiaries 7
Lovetch Location-Osam River Basin	Total Population 47 477; 55 % sewered; Qav = 29 600 m3/day; raw water load- 79 TEGW; BOD = 1729 t/a; COD = 4220 t/a; TN=454 t/a; TP=30 t/a	High priority project	Municipal Waste Water Treatment Plant for Lovech	Addressed to a Hot Spot and solves a problem in a contaminated river section	Remaining Pollution: BOD_5=347 t/a; COD=798 t/a; TN=277 t/a; TP=28 t/a;	Municipality of Lovetch
Vratza Location-Ogosta River Basin; Leva River Sub-basin; Botunya River	Total population 76 576 ; 80 % sewered; Qav = 47 400 m3/day; raw water load- 142 TEGW; BOD=1 019 t/a; COD=2 100 t/a; TN=352 t/a; TP=46 t/a;	Medium Priority Project	Municipal Waste Water Treatment Plant for Vratza Structural Project	Addressed to a Hot Spot and solves a problem in a contaminated river section	Remaining Pollution: BOD_5=237 t/a; COD=474 t/a; TN=221 t/a; TP=24 t/a;	Municipality of Vratza
Sofia Location- Iskar River Basin	Total population 1 116 823 ; 87 % sewered; Qav=642 200 m3/day; raw water load- 1 270 TEGW; BOD=9 929 t/a; COD=20 550 t/a; TN=3 156 t/a; TP=834 t/a;	Low Priority Project	Municipal Waste Water Treatment Plant for Sofia Structural Project	Addressed to a Hot Spot and solves a problem in a contaminated river section	Remaining Pollution: BOD_5=4 106 t/a; COD=8 499 t/a; TN=3 011 t/a; TP=205 t/a;	Municipality of Sofia

Hot Spot Name, River & Location 1	Parameters & Values which Define the Problem 2	Ranking of the Problem 3	Name & Type of Project (Structural or Non-structural) 4	Project Strategy & Targets 5	Parameters & Values which Define Project Benefits 6	Project Beneficiaries 7
Sevlievo Location-Yantra River Basin; Rossitza River Sub-basin	Total population 25 435 ; 80 % sewered; Qav = 14 800 m3/day; raw water load -54 TEGW; BOD =1188 t/a; COD = 2 280 t/a; TN= 184 t/a; TP= 26 t/a .	Medium Priority Project	Municipal Waste Water Treatment Plant for Sevlievo Structural Project	Addressed to a Hot Spot and solves a problem in a contaminated river section	Remaining Pollution: BOD_5=110 t/a; COD=218 t/a; TN=102 t/a; TP=11 t/a;	Municipality of Sevlievo
Sevlievo Location-Yantra River Basin; Rossitza River Sub-basin	Total population 25 435 ; 80 % sewered; Qav = 14 800 m3/day; raw water load -54 TEGW; BOD =1188 t/a; COD = 2 280 t/a; TN= 184 t/a; TP= 26 t/a .	Medium Priority Project	Municipal Waste Water Treatment Plant for Sevlievo Structural Project	Addressed to a Hot Spot and solves a problem in a contaminated river section	Remaining Pollution: BOD_5=110 t/a; COD=218 t/a; TN=102 t/a; TP=11 t/a;	Municipality of Sevlievo
Montana Location-Ogosta River Basin	Total population 52 670 cap; 90 % sewered; Qav = 29 800m3/day; raw water load- 124 TEGW; BOD = 2 719 t/a; COD=6 120 t/a; TN=446 t/a; TP =65 t/a	Medium Priority Project	Municipal Waste Water Treatment Plant for Montana Structural Project	Addressed to a Hot Spot and solves a problem in a contaminated river section	Remaining Pollution: BOD_5=246 t/a; COD=543 t/a; TN=246 t/a; TP=43 t/a;	Municipality of Montana

Hot Spot Name, River & Location 1	Parameters & Values which Define the Problem 2	Ranking of the Problem 3	Name & Type of Project (Structural or Non-structural) 4	Project Strategy & Targets 5	Parameters & Values which Define Project Benefits 6	Project Beneficiaries 7
Popovo Location-Russenski Lom River Basin, Cherni Lom Sub-basin, Popowska River	Total population 19 873; 95 % sewered; Qav=14 500 m3/day; raw water load- 60 TEGW BOD =1 323 t/a; COD=2 779 t/a; TN=138 t/a; TP= 31 t/a;	Low Priority Project	Municipal Waste Water Treatment Plant for Popovo Structural Project	Addressed to a Hot Spot and solves a problem in a contaminated river section	Remaining Pollution: BOD_5=88 t/a; COD=188 t/a; TN=88 t/a; TP=6 t/a;	Municipality of Popovo
Russe Location-Danube River	Total population 168 051 ; 78 % sewered; Qav = 245 200 m3/day; raw water load - 1022 TEGW; BOD = 22 375 t/a; COD=50 210 t/a; TN=2 884 t/a; TP= 483 t/a;	Low Priority Project	Municipal Waste Water Treatment Plant for Russe Structural Project	Prevention from direct contamination of Danube river	Remaining Pollution: BOD_5=10 069 t/a; COD=22 594 t/a; TN=2163 t/a; TP=121 t/a;	Municipality of Russe
Svishtov Location-Danube River	Total population 32 411 ; 86 % sewered; Qav=15 100 m3/day; raw water load- 55 TEGW Qav = 15 100 m3/day BOD =1 488 t/a; COD=3 512 t/a; TN= 226 t/a; TP=5 mg/l, 28 t/a;	Low Priority Project	Municipal Waste Water Treatment Plant for Svishtov Structural Project	Prevention from direct contamination of Danube river	Remaining Pollution: BOD_5=670 t/a; COD=1 580 t/a; TN=170 t/a; TP=7 t/a;	Municipality of Svishtov

Hot Spot Name, River & Location 1	Parameters & Values which Define the Problem 2	Ranking of the Problem 3	Name & Type of Project (Structural or Non-structural) 4	Project Strategy & Targets 5	Parameters & Values which Define Project Benefits 6	Project Beneficiaries 7
Silistra Location-Danube River	Total population 47 530 ; 70 % sewered; Qav =12 850 m3/day; raw water load- 43 TEGW; BOD=938 t/a; COD=2 157 t/a; TN =84 t/a; TP =16 t/a;	Low Priority Project	Municipal Waste Water Treatment Plant for Silistra Structural Project	Prevention from direct contamination of Danube river	Remaining Pollution: BOD_5=422 t/a; COD=971 t/a; TN=63 t/a; TP=4 t/a;	Municipality of Silistra

3.2. Reduction of Water Pollution from Agriculture

3.2.1. Prevention of Pollution from Agricultural Point Sources

In order to ensure efficient measures towards water pollution reduction originated by agriculture it will be necessary to combine activities which have been performed in the past with new practices in order to provide sufficient amount of agricultural products with good quality and at the same time with a minimum negative impact to the environment.

Currently under preparation is a Law on Fertilizing and the expectations are that it will set up the frame for a reasonable level of agrochemical use combining the needs to keep the land fertility together with the necessary environmental protection.

During the last decades the objective was to enlarge the agricultural farms and to build large breeding farms that permit involvement of industrial methods for their operation. In 80's practically all cattle breeding farms disposed of tanks for liquid manure with retention capacities 3 to 6 months, permitting the use of the liquid manure when appropriate out of wintertime. For the pig farms in 80's the usual treatment of the wastewater generated was mechanical treatment consisting of fine screen, hydro sieve and primary settling tank for the water, composting and digestion for the primary sludge and storing 3-6 months the treated water in lagoons in order to use it as liquid manure. Experts from the National Institute on Soils "N. Pushkarov" have been elaborating a specific technology for liquid manuring during ploughing famous in Bulgaria as "liquid ploughing". Nowadays the majority of these facilities are out of use given the sharp decline in the agriculture production and the on-going reform. It is obvious that maybe these very large installations will not be really suitable under the new conditions, but the expertise that exists in this field should be considered and used for the future projects.

The more significant animal-breeding farms identified as "Hot Spots" in the Ogosta River catchment are as follows:

- **Pig farm, Studeno Buche village,** owned by "Agropromstroy" Montana. The capacity of the farm is 20000 equivalent animals (of 100 kg.). There is a functioning treatment plant consisting of mechanical treatment and open precipitation ponds, which need reconstruction and updating. It has been privatized in 1994, but regardless of the assumed engagements by the owner, the necessary measures for reaching the effluent standards have not been carried out.
- **Military animal-breeding complex Vratza,** The complex is property of the Ministry of Defense. Wastewater is discharged without treatment. It is necessary to construct a WWTP.

The more significant animal-breeding farms in the catchment of the Iskar River are as follows:

- Inter co-operative enterprise "Pig complex", Knezha. In the reviewed period the number of animals varies widely. There is a mechanical treatment facility, whose treatment effect is insufficient. It is necessary to construct a biological treatment facility.

The more significant animal-breeding farms identified as "Hot Spots" in the Yantra River basin are as follows:

- **Pig-breeding farm in the village of Samovodene.** The wastewater after settling tanks is discharged in the Yantra River and pollutes it. Due to this reason a fine has been imposed by the relevant authorities.
- **Pig breeding farm "Geran"- town of Liaskovetz.** Wastewater after precipitation is discharged in the Yantra River and pollutes it, so they also pay a monetary fine imposed by the controlling authorities.

By the date of preparation of the report there were no data available on the capacities of these farms, sufficient to provide ranking or to quantify the benefits, not to fill in project files either.

3.2.2. Prevention of Pollution from Agricultural Non-Point Sources

The transition period had been marked by a very sharp decline in fertilizer use. For the last years (1994 - 1997) the total amount of used fertilizers decreased 5 times compared to 1980 - 1981. In fact current use corresponds to the levels of 1960. The decrease is relatively not very big for Nitrogen fertilizers - 3.39 times. At the same time phosphorus fertilizer use has decline 25 times and it use is currently simply symbolic. Potassium fertilizers almost are not in use - their main use is in green housing. Currently a total misbalance in fertilizer use is presented. The ratio N:P:K=1:0.07:0.002 is extremely unfavorable. This high reduction and unbalanced Nitrogen use is one of the main reason for decrease of production of the main plants during the last years.

Characteristic feature of the transition period for both elements Phosphorus and Potassium is that the national balance is very negative (till 1990 negative values have been observed only on Potassium). It means that every year with the plant production thousands tons of microelements are taken out of the soil.

		Nitrogen T tons	P_2O_5 T. tons	K_2O T. tons
1994	Taken out with plants	196	85	185
	Introduced by fertilizers	203	15	2,5
	Balance	+9	- 70	- 275
1995	Taken out with plants	228	100	275
	Introduced by fertilizers	129	12	0,2
	Balance	- 99	- 88	- 275
1996	Taken out with plants	120	70	211
	Introduced by fertilizers	151	13	0,2
	Balance	+31	- 57	- 211

Examples for projects carried out in this field are the following ones:

Under the EPDRB there are such examples for the evaluation of the non-point pollution as the **“Integrated Regional Environmental Study”**, EC PHARE, May 1994,

Applied Research Programme **- "Nutrient Balances for Danube Countries",** EC PHARE, 1996, where internationally acknowledged estimation methodologies are used.

A pilot project **"Agroecology", water quality in the catchment of the Yantra River, Parvomaitzi village"** for determining the non-point pollution of ground waters and soils, including pollution from agricultural sources in the period 1993-1996 in the catchment of the Yantra River at the village of Parvomaitzi is being executed.

Table 3.2.1-1 Fertilizers used in the area of Danube River Basin

Year	N - (tons)		N - kg/ha	P_2O_5 - (tons)		P_2O_5 - kg/ha	K_2O - (tons)		K_2O - kg/ha
	Used	Need	Used	Used	Need	Used	Used	Need	Used
1981	515833		10.99	423180		9.016	125978		2.684
1995	129545	307504	2.760	12426	228444	0.268	156	84940	0.003
1996	151883	307504	3.236	12824	228444	0.276	187	84940	0.003
1997	179538	307504	3.877	16828	228444	0.363	1864	84940	0.04

The total amount of the applied fertilizers in the agriculture of the region shows that in the last years the applied quantities are much below the needed amounts. It is not probable that considering the current conditions, agriculture causes considerable pollution in the area.

Table 3.2.1 - 2 shows the trends in pesticide use and presents the prognosis quantities to be used by the year 2005. This prognosis is based on scientific prediction of the biological plant protection method, which will be more widely used in the future, the culture-economic method (crop varieties resistant to diseases and pests), designing adequate crop-rotations and strict observation of the crops cultivation technology, including plant protection based on prognoses development of pests, and the implementation of the economical hazard threshold. The national prognosis for plant protection is taken into account.

Table 3.2.1-2 Trends in Pesticide Use

Groups of crops	Pesticides per 1 hectare as active substance				Area (ha)
	Required by Technology	Applied in 1993	Prognosis for		
			Year 2000	Year 2005	
Wheat, barley, etc.	3.160	1.065	2.840	2.530	1,078,000
Maize	4.632	3.451	4.245	4.175	385,000
Soybeans	6.620	2.622	5.860	5.450	12,000
Beans and other legumes	3.465	5.192	3.240	3.150	41,000
Sunflower	3.765	1.954	3.340	3.225	285,000
Sugar beet	12.480	10.261	11.540	11.350	21,000
Tobacco	7.790	2.661	7.450	7.235	7,000
Potatoes	16.050	1.773	13.340	12.846	20,500

Groups of crops	Pesticides per 1 hectare as active substance				Area (ha)
	Required by Technology	Applied in 1993	Prognosis for		
			Year 2000	Year 2005	
Other vegetables	12.630	1.913	11.420	11.150	50,000
Alfalfa	1.540	1.936	1.450	1.382	151,000
Stone fruits	16.340	6.549	14.250	14.025	46,000
Pome fruits	14.300	1.656	12.430	12.126	7,000
Vineyards	16.680	15.691	15.840	15.435	60,000

The Bulgarian part of the Danube River basin comprises 54.3% of the agricultural lands of the country, about 3 208 000 hectares, 24.6% of which being uncultivated and 75.4% - cultivated land area. The fields (areas in crops) and perennial plants (orchards, bacciferous plants and vineyards) with total area of 2 168 000 hectares are subjected to intense plant protection by treating with pesticides. The structure of the cultivated land area includes cornfields (86.3%), perennial plants (4.8%) and natural meadows (8.9%). Pesticides are mostly applied on fields with industrial crops and vegetables.

The registration procedure in Bulgaria has been in operation since 1964 and has been regularly improved according to international standards.

A special unit in the Ministry of Agriculture, National Service for Plant Protection, is responsible for pre-market evaluation of efficacy of any pesticide, based on field trials performed in Bulgaria. The final decision for pesticide registration is made by the Ministry of Health based on risk assessment for humans and the environment, prepared by its expert body, the Council of Toxicology. Besides the members from the Ministry of Health this Council also includes experts from the Ministry of Agriculture, Ministry of Environment, and Ministry of Internal Affairs.

The list of registered pesticides is issued every year by the Ministry of Agriculture after approval by the Ministry of Health. In 1993 the list included about 647 formulated products based on 170 active ingredients, insecticides, fungicides and herbicides. The Ministry of Health is authorized to ban or restrict the use of a pesticide if adverse health effects for human health or for the environment are found.

Data requirements for pesticide registration introduced since 1989 are in accordance with internationally agreed guidelines such as the FAO guidelines on basic registration criteria and Requirements. A full data package is required. Summaries and evaluations submitted by the producers are used as additional sources of information. Efficacy trials performed in Bulgaria are required for any pesticide before placing it on the market.

The evaluation of the submitted data is based on consideration of results, certified have been obtained in compliance with OECD GLP principles.

Bulgaria developed its own classification of pesticides by hazard, taking into account not only acute affects (oral, dermal and inhalatory toxicity) but also skin and eye irritation, sensitization, long-term effects (mutagenicity, teratogenicity, carcinogenicity), as well as some environmental criteria such as persistence and mobility in soil and bio-accumulation via foot chain.

According to this classification pesticides are divided into four groups:

- Extremely hazardous - can not be registered
- Highly hazardous - can be registered for professional use only
- Moderately hazardous - can be registered for use by certified operators
- Slightly hazardous - can be registered for public use

Only registered pesticides can be imported and distributed in Bulgaria. No data are available on unauthorized usage of pesticides.

One of the early actions of the regulatory authority included the bans of organochlorine insecticides such as DDT, aldrin, dieldrin, endrin and HCH (α, β and δ) in 1969. In 1985 toxaphene (camphechlor) was banned.

The economic reforms in 90s have resulted in novel problems in pesticide regulation. Previously, a centralized trade organization functioned as the main national focus for pesticide import and distribution. After decentralization, responsibilities for import and distribution of pesticides have been dispersed among a number of small units, many of which lack the required experience. A large part of the farming population has insufficient education and training in plant protection. To cope with the increased potential hazards associated with pesticide use in Bulgaria, the system for registration and classification has been revised.

New rules and criteria were introduced in Bulgaria in 1991 and all existing pesticides have been re-evaluated. The registered pesticides have been classified into three use categories: for use only by professionally trained operators; for use only by persons with certificate of having passed a training course in the pesticide use; for free use. Many pesticides were banned or severely restricted. In the list of banned pesticides in 1991 have been included heptachlor and lindane (γ-HCH).

In 1972-1975 a comprehensive study on persistent pesticide residues in soils with analysis of 650 soil samples from 14 regions of the country has been carried out in Bulgaria HCH-α and γ were found in more than 90% of the samples varying from 0.004 to 0.028 mg/kg. DDT and its main metabolite DDE were determined in almost 100% of the samples ranging between 0.012 and 0.54 mg/kg depending on the pesticide use in the respective regions.

During the same period waters from almost all ponds (total of 19), major rivers (Iskar, Maritza, Struma, etc.) as well as ground water from 9 regions have been analyzed for residues of HCH (α and γ), DDT and metabolites, aldrin, dieldrin, heptachlor (incl. heptachlorepoxide). Residues of aldrin, dieldrin, heptachlor and heptachlorepoxide were not found in any sample. All studied samples showed a presence of α and γ HCH and DDT and/or metabolites.

In the period 1990-1996 there are surveys for pesticides residues only in Danube River and its tributaries mainly in the framework of international environmental programmes for Danube River. DDT and HCH (α and β) were not found in the Bulgarian tributaries of Danube. Only lindane has been identified in 3 points ranging 0.006-0.008 μg/l. The fact that DDT (and its metabolites) and HCH (α and β) are not detected in the recent studies is a logical sequence of their 30-year period of ban. The presence of lindane more likely depends on its migration capacity due to its weakest adsorption ability and highest volatility if compared with the other persistent organochlorine pesticides as well as on its use in neighbor countries.

Use of biopesticides still represent a small percentage (about 3.8%) of total pesticide use in Bulgaria. The majority of biopesticides are based on *Bacillus thuringensis.* Due to their relatively high prices in comparison with agrochemicals their use is only supplementary in wheat, maize, cotton, sugar beet, rice, horticulture, fruit production and forestry.

The part of the treated areas varies mainly depending on the climatic conditions, provoking different degrees of development of the diseases, pests and weeds. The application of pesticides after 1990 has been decreased with about 50%. This is not due to changes in the technological normalization, which begun in 1995, accompanied by significant structural changes of areas and production. Under these conditions, the definition of the economic parameters, underlying the application of pesticides in the Danube region is based on three main groups of factors:

- The first group of factors defines relatively stable structures and dimensions of the areas with essential agricultural crops and yield from them;
- The second group of factors defines the intensity and structure of applied pesticides per unit area;
- The third group of factors comprises the economic effect and the necessity of pesticides application, related to the technology, genetic adaptability of the varieties, pesticide costs and costs for the treatment, etc.

The crops structure and yield per unit area in the Danube region are permanently determined by particular soil, climatic and geographical features, connected with the national agrarian and economical structure.

The economic science and practice affirm particular levels of the so called “economic thresholds for pesticide usage”, reflecting the maximal, economically permissible levels and structures of pesticides costs. They are related to the research for ecologically sound production and the nutritional standards for humans and animals, with the equilibrium of the ecosystems, etc. The entire and concrete economical concept for solution of the problems within the frames of the economical threshold for pesticides usage should be developed in further tasks.

Within the frames of the present task, the following limits are presented:

- The economical threshold for pesticide usage in the Danube region is connected with the average application of 4.539 kg pure substance per hectare. This level is in co-ordination with the areas and yields of the crops, the level of technology, possible accounting for the present natural and other resources and is imposed by the market criteria for costs recovery.
- The economical threshold for the costs per kg of applied pesticides in terms of pure substance is about 13-15 USD. In practice, the prices for the pesticides rose during the last years with the tendency to get equal to the international ones. At the same time the production prices also varied. The ratios of the price changes in country are very unfavorable, as the prices of the production are increased about 5-7 times and the prices of the pesticides - 40-70 times and more.
- There exists a real danger for total crush of the material basis and the organization of plant protection, concerning the technical equipment, organizational-economic structures, etc. A number of juridical and other decisions are necessary to stop this tendency.
- A whole new strategy for plant protection with pesticides has to be developed within the framework of the management of the production potential of agrarian - ecological system and ecological structure. The agrarian-economical science has a significant potential in this direction.

The measures necessary to regulate the pesticide use as well as to reduce the negative impact to the environment and the human health can be summarized as follows:

- Implementation of adequate crop rotation. The succession of time and place of cultivation of crops supports the protection against weeds, pests and some diseases, which contaminants accumulate in the soil. The implementation of an adequate, scientifically based crop - rotation will assist to restrict the land areas, where the application of chemical preparations is necessary.
- Application of the biological method for protection against pests on cultivated plants.

- The higher prices of the pesticides on the Bulgarian market will help actively to restrict their application. The implementation of the economic hazard threshold practice will be inevitable.
- Use of pesticides with higher technological effectiveness and applied in smaller quantities per unit area.
- Application of an integrated system for plant protection (Integrated Pest Management), using all available method, starting with the use of varieties of crops resistant to pests and diseases (culture-economic method), effective soil treatment during crops vegetation according scientifically based technologies of the particular production, the application of biological agents, and chemical plant protection products only in case extremity, will play a very significant role in the future protection of agricultural crops against diseases, insects and weeds.

In addition, it is important to be underlined that due to the extremely high decrease in agricultural production, the farming activities do not present currently a threat to the environment. At the same time with the completion of the reform and the expected production increase Bulgaria should be able to solve the problems raised by the intensive agricultural production.

Now it is a very appropriate time to develop a set of projects, dealing with clarification of the dispersed sources of contamination by one side and planning of remedial measures such as implementation of forest shelter belts on rover banks along the water courses to reduce nutrient run-off and reduce erosion from arable lands. Realization of permanent monitoring and development of methodology for assessment of the non-point sources is needed to be provided.

Finally, it is necessary to admit that the existing expertise in the country could be used for the purpose. In the University on Agriculture in Plovdiv students receive classes on Agroecology and also in Plovdiv Agroecological Center has been created, which works in close co-operation with the university.

3.2.3. Reduction of Water Pollution through Improved Land Management

The current level of impacting the water as a result of agricultural activities marks the need as soon as possible to plan projects for the future in order to facilitate the completion of the reform and to achieve a normal level of agricultural production limiting the pollution potential.

In co-operation with the Bulgarian Committee of Forests and a local NGOs, WWF (World Wide Fund for Nature) under its “Green Danube” programmes is carrying out a floodplain forest restoration project for the complex of Bulgarian Danube River islands. The project involves eliminating non-native monoculture plantation trees and re-establishing natural forest conditions. Despite past human disturbance, the islands, which range in size from few hectares up to 2000 ha, contain important reserves of threatened biodiversity. In addition to small stands of old oaks on drier ground and white willow in the wet areas, the islands host large colonies of nesting herons and is a breeding site for endangered White-tailed Eagle. Co-operation between WWF, government officials, and local communities and organizations will ensure long-term preservation of this important floodplain habitat.

The following areas of interest, defined as Hot Spots along the Danube River course can be pointed out:

- The Danube River bed from km 844 to km 347 is subject to intensive erosion processes, which necessitates regular bathymetric survey.
- The Danube River bank at Long Tzibritza Section (km 710) being subject to intensive erosion needs urgent fortification.

- The Danube River Bank at km 542 to km 536 – Yantra River estuary being subject to intensive erosion urgently requires fortification.
- Restoration of the water regime of the wetlands Persin and Vardin.
- Restoration of the biodiversity in the Belene Island.

To the moment of completion of the report there were no available data in order to define projects or to complete project file for the “Hot Spots” mentioned above.

Table 3.2.1-3 Summary of recommended projects for agricultural hot spots

Hot Spot Name, River & Location* 1	Parameters & Values which Define the Problem* 2	Ranking of the Problem* 3	Name & Type of Project (Structural or Non-structural) 4	Project Strategy & Targets 5	Parameters & Values which Define Project Benefits 6	Project Beneficiaries 7

** Information for columns 1, 2 and 3 should be provided by the water quality data expert (see chapter C2)*

3.3. Reduction of Water Pollution from Industries

When we analyze the on-going and the planned projects for pollution reduction from industrial discharges, we should consider both possibilities - to introduce new technologies in order to prevent and minimize the pollution discharge from industries as well as the need of construction of new treatment facilities. The aim of the companies, which become to be private ones, is to implement a “cleaner technologies” using “win-win approach” by means of:

- Introducing in the industries water and product recycling and dry technologies;
- Construction of treatment facilities for biggest industrial discharges.

Currently there are several on-going projects dealing with pollution reduction from industries funded by foreign or local financial sources. Typical examples are the following projects:

- A study is carried out under an EC PHARE project for studying the possibilities of treatment of the industrial wastewater with those of the municipality of Sevlievo. The title is **“Clean Technologies and Industrial Waste Management”**. It is financed completely by PHARE programme.
- Another on-going project is **“Clean Technologies in Bulgarian Tannery Sector”**. It is carried out in accordance with a co-ordinated plan for implementation of “clean technologies” and development of demonstration projects in the tannery sector in Bulgaria. The project includes study and assessment of the needs of two tanneries - “Prista” in Russe and “Sevko” in Sevlievo as well as delivery of equipment. It is funded by DEPA - Danish Environmental Protection Agency.
- **Sevlievo-Tannery ”Sevko” (Yantra River Basin). -** Currently a project for technological rehabilitation is under execution which aims reduction of emission loads of $N\text{-}NH_4$, S^{-2}, SO_4 and Cr^{+6}. EC PHARE, the National Environmental Protection Fund and the National Eco Trust Fund finance the construction of LTP for industrial wastewater pre-treatment.
- In regard to the hazardous wastes a project titled **“Incineration Plant for Special Hospital Waste, Sofia”**, is under performance. It is financed by DEPA.

Planned Projects for development of IWWTP by priorities and defined as Hot Spots specified in Fig. 3.3.- 1 as follows:

Figure 3.3.-1 Industrial Hot Spots

No	Name	River Basin	River	Priority
1	IWWTP-Gorna Oriahovitza	Yantra River Basin	Yantra River	High
2	IWWTP for Fertilizer plant “Chimko”-Vratza	Ogosta River Basin	Ogosta River	High
3	IWWTP for Pharmaceutical plant ”Antibiotic” Razgrad	Rusenski Lom River Basin	Beli Lom River	High
4	IWWTP-for Metallurgical plant Kremikovtsi	Iskar River Basin	Lessnovska River	Medium
5	IWWTP- for Elatsite Mining	Iskar River Basin	Malak Iskar River	Low

Apart of the direct wastewater discharges from industries both into municipal sewers and to surface water bodies, significant threat for contamination of the river basins poses the hazardous waste generation and management. Within the limits of the Bulgarian part of Danube River basin there are more than 200 sources generating hazardous wastes. The total amount of hazardous waste generated within the Danube River basin for 1994 is 496,512 T/y. From the top 30 biggest hazardous generators in the country 13 are located in the Danube River catchment area. Their generation for 1994 is in total 193,716 T/y, which is 39% of the total generation for the area.

The top generators in the area based on 1994 data are:

Kremikovtsi	-	Iskar River Basin
MWWTP, Sofia	-	Iskar River Basin
Vidachim, Vidin	-	Danube River
Zaharni Zavodi, Gorna Oryahovitsa	-	Yantra River Basin
Sevko, sevlievo	-	Rositsa River, Yantra Basin
MWWTP, Pleven	-	Vit River Basin
Antibiotic, Razgrad	-	Beli Lom River, Russenski Lom Basin
Mediket, Sofia	-	Iskar River Basin
Plama, Pleven	-	Vit River Basin
MWWTP, Vratsa	-	Dabnika River, Ogosta Basin
Velur, Lovech	-	Osam River Basin
Sofarma, Sofia	-	Iskar River Basin
Osam, Lovech	-	Osam River Basin

If national authorities concentrate their efforts to implement strict generator requirements to the top hazardous waste generators and implement a complex of measures such as issuing of permits, application of strict waste management standards, bans for landfilling of certain wastes it will create the necessary conditions to make the industries working in this direction, both implementing waste minimization techniques and development new waste management capacities. These are all potential projects in the field.

Several facilities in each river basin generate small quantities of generic waste types. Generic wastes are those which typically are generated in small quantities by many sources, have points of generation that are unclear or unknown, or have other characteristics that necessitate special consideration in the management system. Typical example for generic wastes are pesticides, spent motor oils, emulsions from flotation of wastewater containing petroleum products, residues from oil traps, wastes from small heating installations, etc. and must be considered as non-point sources. The amount of generic hazardous wastes generated at the territory of the Danube River basin is 213,681 T/y or 43 % of the total amount of hazardous waste generated.

It is important to note, however, that the data on generic waste are based on estimates and may have relatively high uncertainty. The generic waste sources are also more widely distributed and managed than the industrial waste sources, covered by waste cards, which makes regulation and enforcement over them potentially more difficult. That is the reason to propose to develop a project specially addressed to the issue dealing both with the implementation of more efficient tracking system as well as to the optimum management options.

The assessment of historical environmental damages is a problem that the Bulgarian Government should face specially in the context of the on-going privatization process. Currently “Technical Guidelines for Assessment of Historical Environmental Damages Caused by Industrial Sites” have been elaborated. It is necessary to perform a comprehensive study on the locations and the magnitude of the problem within the Danube River area, ranking and prioritizing the related sites.

Some of the Danube River ports exercise administrative, economic and technical problems within the transition period (Lom, Russe), which affects the activities for control and pollution prevention of the Danube River.

The pollution sources in this case can be summarized as follows:

- oil products, spent motor oils, container residues, wastewater generated by means of ship washing
- domestic wastewater originated by the ships
- residues generated by cleaning of the ships including
- pollutants remaining from the ship cargo

The transport traffic along the river is directly related to the water pollution. It is a really interesting fact, that in the last years the traffic has increased but the amounts of ballast and wastewater and wastes submitted by the ships to the port authorities for treatment in the specialized installations decreases (see Part A: "Social and Economic Analysis in Relation to Impact of Water Pollution")

It leads to the conclusion, that the rising of the fees for the treatment of the ballast and wastewater in the last few years is one of the reasons for the reduction in their quantity. It seems obvious, that the control at the ports is insufficient and most probably some of the natatory vessels Pollute the river discharging illegally their wastewater directly into the river.

3.4. Reduction of Water Pollution from Dump Sites

Examples of on-going projects on solid waste management and reduction the impact of solid waste landfills are the following ones:

Pilot projects for separated collection of recyclable components of municipal solid wastes at the territory of Veliko Turnovo and Vratsa. They used to be a part of the project **"Solid Waste Management Policy - Phase I"**, financed by USEPA.

Currently a **"National Demonstration Project for Solid Waste Management Policy - Phase II"** is under development. It is financed by USEPA.

During the last few months as a part of the National Waste Recycling Strategy **"Waste Characterization Trial of Sofia Solid Wastes"** is carried out. It is still not completed and is funded by EU PHARE Programmes.

Other on-going project is "**Construction of New Sanitary Landfill and Implementation of Remedial Actions at an Existing Dumpsite for the Municipalities of Vratsa and Mezdra"** financed By DEPA.

Some municipal administrations try to solve the problem themselves financing the designing and construction of new landfills. Examples in this regard are Sevlievo and Tutrakan.

Currently in the Danube River basin about 230 municipal dumpsites and landfills are in operation. 38 from them provide service to towns with population above 10,000 inhabitants. There are 1,947,265 T of accumulated municipal solid wastes in the area. Big part of them is not controlled and in fact they are open dumpsites. Only few facilities can be really considered as engineered landfills.

Part of them have expired their capacity, others are improperly located (e.g. close to the rivers), or do not dispose of suitable isolation liners, drainage system, water collection pit. Municipalities exercise serious difficulties in terms of control and proper maintenance. In some cases industrial wastes are also dumped.

The current difficulties and the level of performance of these services lead to the conclusion that municipal, industrial or hazardous waste landfills pose considerable risks to the human health and the environment. The risks increase given the number of floods and land slicing phenomena occurring in the country recently.

There is a need of construction of up-to-date deposition sites for wastes, classified and separated by waste types, with treatment facilities for their drainage waters, lining and insulating layers, and relevant monitoring system (e.g. Piezometric well to control impact to the ground water)

Considering that investment and operation costs for a new landfill, which meets all the technical and environmental requirements, are very high currently and limitations in obtaining new terrains for such a purpose due to the increasing NIMBY syndrome, it becomes to be obvious that the only way to solve the problem in an environmentally-sound manner is to reduce the total number of dump sites, respectively landfills and to create units that serve several villages or municipalities on local or regional basis.

Currently the industrial non - hazardous wastes are dumped in a way that generally poses a threat of contamination for the soils, ground water and surface water. The bigger industrial plants usually accumulate their wastes on-site without any measures for control or environmentally - sound management. Sometimes these wastes are shipped to the Municipal solid waste landfills.

3.5. Special Policy Measures

Special policy measures are necessary for improvement of the integrated water resources management. Below is provided a brief overview of the basic policy measures and steps addressed to support water pollution reduction.

As an example of non-structural projects covering institutional aspects the following one can be mentioned:

“Basin Councils in Bulgaria and in particular Pilot Basin Council for Yantra River Basin” - The Project is ongoing. It started in 1997 and is financed by EU PHARE Programme

Institutions

Until recently the National Council on Water had been the main body, dealing with water resources management. The Council included 12 members, representatives of the main categories water of consumers. All water consumers except households had to obtain a permission for water use by the Council. In details the Council had distributed the water from 22 dams. The Committee of Geology had estimated the groundwater resources.

Recently the National Councils on Water and the Committee of Geology has been incorporated in the Ministry of Environment and Water and in this way their functions were combined with usual responsibilities of MOEW: to be responsible for water quality management; to establish draft laws and Regulations, to set up the levels of fees and sanctions; to monitor water quality and revise EIA s. In this way almost all issues on water management are concentrated in one institution.

Ministry of Health establishes the drinking water standards and monitors the relevant parameters

Ministry of Regional Development and Public Works constructs and manages water supply systems, municipal wastewater treatment plants and collector systems.

The municipalities are responsible for public affairs, including water resources management and water use infrastructure, as well as for co-operation with central bodies for enforcement and compliance with the legislation. Independent local companies on water supply manage water supply system, estimate the prices, discharging and treatment of the sewer water.

Regulatory Instruments and Compliance with Legislation

Currently a system for issuing of permits for discharging of the wastewater exists on the base of one relatively old law. The negotiations for permit issuing are led by representatives of the relative plants and Regional Environmental and Water Inspectorate (REWI).

All water flow passed through wastewater treatment facility has to meet the standards for environmental quality of the water, stated in the permit for the relevant water receiving body. But since these standards are not realistic, enforcement and compliance with the legislation are not effective. In many plants there is no primary treatment of wastewater and it is discharged directly into the municipal sewerage system.

REWIs monitor and control the compliance with the legislation. Usually the big industries are inspected twice a year. It is obvious that there is no practice for industrial sources of pollution to monitor and report the results themselves; in many plants the required equipment is not available.

MOEW develops a new system for permit issuing based on the standards for treated industrial wastewater and treated water from municipal wastewater treatment plants, as well as for quality and classification of the receiving rivers. The standards are developed in such way that they correspond to the EC requirements and standards. Since for the enforcement a period of about 10 years is needed the ministry intend to establish interim standard limits. The enforcement activities depend on the adoption of the new Water Act.

REWIs impose fines for industrial wastewater, which does not meet the standards for environmental quality; the violations are ascertained through comparison of the water quality of the upper stream and down stream from the discharging point. The fines are charged in accordance with the pollutant, concentration and amount of the discharged water, as the last five years the fine amounts have been increased 10 times.

Economic Instruments

All consumers pay fee for drinking water. In 1991 the unified national price system was abolished and since that time each water supply company has determined its own fee rate in accordance with the municipality approval. In last years the drinking water price varies from 250 to 450 BGL/m3 (0.15-0.30 USD). This represents increasing by 4 times for households and by 3 times for the industry, including inflation. Usually the fees cover only the operational and maintenance cost. Although the national regulations recommend implementation of amounts, to cover operational and maintenance costs, depreciation costs, and to bring some profit, the municipalities do not desire to impose so higher fees. It is not widely used practice to measure the water flow passing through the water supply system for drinking water by means of water measuring devices, It is not used in all cities and villages. The municipalities set up fees for industrial wastewater, but there is no legislative for control of the performance. No fee for municipal wastewater treatment is established.

No fees are paid for water pumping by own water sources and wells. The fees on irrigation are nominal, although the water very often is pumped from lowlands and therefore energy is consuming.

To encourage projects for pollution control, equipment for pollution control and other environmental equipment can be exempted of custom duties but only after approval from MEW, Ministry of Industry, Ministry of Finance. Reduced custom duties are approved for equipment for wastewater treatment and monitoring.

Financing of the Infrastructure

Designs for wastewater (discharging and treatment) during many years have been financed by state budget. Now they are additionally supplemented by both National and Municipal Environmental Protection Funds. Collected fines for industrial wastewater releases, go directly to the funds. More and more finance resources are allocated for projects for water management, but they are still insignificant in comparison with water supply and sewerage needs. For implementation of water projects a foreign loans are used, but against this practice a certain opposition exists, due to high interest rates for equalization with inflation.

MEW has suggested to be implemented payment for wastewater treatment by the population, and imposed fees for water pollution with the purpose for financing of the wastewater treatment facilities. The fees will be estimated per cubic meter used clean water and differentiated according to the consumer in dependence on quality of the released wastewater. In this way the water resources protection, recycling and improvement of water quality will be encouraged. The resources, which will go into the funds for environmental protection, will be used purposefully for construction of municipal wastewater treatment plants. This proposal met an objection by the other ministries, especially by the MRDPW, which thinks that the proposed fees will result unfavorably on the collection of the consumer fees.

In regard with improvement of the water supply infrastructure, World Bank has approved a loan of USD 98 million. In addition to this amount resources from state budget will be added and the total amount will rise to USD 132 million. In the moment negotiations are being led on some loan conditions.

Environmental Monitoring and Information

All main river basins are covered by the surface water-monitoring web. Monitoring is being made at 331 points: 275 at in-country rivers, 21 at Danube River, 24 at the Black Sea coast and 11 at the lakes. The samples are analyzed by 33 parameters every month. The results are published every quarter and summarized in annual report. Monitoring of the groundwater is made at 276 points. Since 1992 the responsibility for monitoring of all surface and groundwater has been undertaken by MEW.

The existing system for permit issuing, as well as standard limits for quality of the water released by the industrial plants is ineffective; they must become key measures for control of the released industrial wastewater. MOEW develops specific for the sector standards for wastewater, approximated to the EC requirements and standards. REWI attaches EIA by contracting of conditions for permit issuing for new plants, which meet the expected specific for the sector standards. Considering the long period needed for complete enforcement of these standards, the key for success is interim standards and time schedule for stage by stage enforcement of the standards. The big plants have to implement the practice of self-monitoring and to report the results themselves.

The price reform for water supply and wastewater treatment is going step by step in the right direction, as more successful is the reform on water supply. The fees have not still covered all costs, including capital costs. Increasing of the consumer fees and enforcement of the fees for wastewater releases are very important stages to encourage the rational water supply and adequate financing and infrastructure. Bulgaria has to think about the issue related to enforcement of fees for water-use by surface and groundwater sources.

MEW has performed a detailed draft law for water, based on the approach for integrated and sustainable management of water supply and wastewater treatment. Water is considered as limited resource with certain extent of recovery; water use priorities are: water supply from water supply network, agriculture, fishery, industry, power production, etc. Water management is decentralized on a river basin level: implementation of pilot project has been started for Yantra River basin. Approval and enforcement of this low is important for adopting of a contemporary approach, which will bring to integrated and sustainable management of the water resources in Bulgaria.

Table 3.3-1 Summary of recommended projects for industrial hot spots

Hot Spot Name, River & Location*	Parameters & Values which Define the Problem*	Ranking of the Problem*	Name & Type of Project (Structural or Non-structural)	Project Strategy & Targets	Parameters & Values which Define Project Benefits	Project Beneficiaries
Gorna Oriahovitza-“Sugar and Alcohol Factory” (SAF) Location-Yantra River Basin	Qav=1 532 520 m3/a BOD=6 800 t/a; TN = 300 t/a; TP = 0.55 t/a; SS =4 100 t/a;	High Priority Project	Industrial Waste Water Treatment Plant for SAF Structural Project	Addressed to Hot Spot Solves a problem in contaminated river section	BOD=340 t/a; TN=120 t/a; TP=0.03 t/a; SS=205 t/a;	Gorna Oriahovitza-“Sugar and Alcohol Factory” (SAF)
Vratza “Himco” Location-Ogosta River Basin; Dubnica River Sub-basin; Lewa River	Qav =4 642 800 m3/a; BOD=25 t/a; TN = 242.3 t/a; TP=3.6 t/a SS =119.6 t/a; .	High Priority Project	Industrial Waste Water Treatment Plant for Himco	Addressed to Hot Spot Solves a problem in contaminated river section	BOD=2.59 t/a; TN=157.5 t/a; TP=0.36 t/a; SS=11.96 t/a;	Vratza “Himco”
“Antibiotic” Location-Russenski Lom River Basin	Qav =1 892 200 m3/a; BOD=261 t/a; TN=19 t/a; TP=1.89 t/a; SS=238 t/a;	High Prioryty Project	Industrial Waste Water Treatment Plant for Antibiotic	Addressed to Hot Spot Solves a problem in contaminated river section	BOD=7.83 t/a; TN=2.85 t/a; TP=0.09 t/a; SS=11.9 t/a;	“Antibiotic”

Hot Spot Name, River & Location*	Parameters & Values which Define the Problem*	Ranking of the Problem*	Name & Type of Project (Structural or Non-structural)	Project Strategy & Targets	Parameters & Values which Define Project Benefits	Project Beneficiaries
“Kremikovtsi” Location- Iskar River Basin; Lesnovska River Sub-Basin	Qav=47 304 000 m3/a; BOD=126 t/a; SS=260 t/a;	Medium Priority Project	Industrial Waste Water Treatment Plant for Kremikovtsi	Addressed to Hot Spot Solves a problem in contaminated river section	BOD=12.6 t/a; SS=26 t/a;	“Kremikovtsi”
“Elatzite”-Minning Location- Iskar River Basin;Malak Iskar Sub-Basin; Negrashtitza River	Qav=6 818 083 m3/a	Low Priority Project	Industrial Waste Water Treatment Plant for Elatzite	Addressed to Hot Spot Solves a problem in contaminated river section		“Elatzite”-Minning

4. Expected Effects of Current and Planned Projects and Policy Measures

The basic macroeconomic indices that characterize the current conditions as well as the trends in the development of Bulgarian economy from the beginning of the 90’s demonstrate a serious decline of the Gross Domestic Product (about 45%). Macroeconomic picture becomes to be even harder due to the weight of the internal and external debt, inflation and the financial system status. The sharp decrease of the investment activities is marked by a very restricted volume of real investments, which impedes the development of the structural reform. The investment activities of the state within the state budget are about 2-3%. The share of the investment loans is low and the debts of the industries, which have reached extremely high levels, block their activities.

In total the registered decline in production output for the period 1989-1996 is about 50%. The dimensions of this decline for the so called high water consuming industrial sectors, which require considerable amounts of water, excluding the food industry, is relatively inferior compared to the average of the industry (among 22% to 38%, for food industry - 65%).

In the agriculture - the other important economy sector, - significant user of water for its production activities, the decline of the production output in 1996 compared to 1989 is about 30% approximately equal for plant production and live stock breeding.

Total capacity of high water consuming industrial production was 65.5% of the total capacity of industrial production in 1995, while in 1989 this capacity represented 68.1 %. A comparison between these data and the capacity of the water used by them shows that the water use has decreased with more than 20%.

Reconstructing of the economy is necessary to be addressed mainly to the heavy industry (ore-extraction and ore processing), which are the biggest water user and its replacement with light industry, which is not polluting or less polluting. Appearance of contradictions between economic, social or environmental fields is inescapable, especially when the available resources for softening of the social and environmental damages are limited. In these cases many plants will continue operating, despite the pollution they cause, since social (and economic for many production processes) price for their close down is too high. It is necessary to organize better maintenance of the capacity and implementation of new technological solutions, including reduction of water quantity used. In long term period, however it is needed to stimulate implementation of production processes, which are environmentally friendly.

As a forecast the following main parameters are shown for industry development. Total for the industry positive growth trends are shown by periods, as follows:

1997 - 2000	3.7%
2000 - 2010	3.6%
2010 - 2020	2.7%

Observing high water consuming sub-sectors of the industry, the forecasted trends of product variations are as follows:

Table 4 .-1 Forecasted trends of product variations

Sub-sectors	Average annual trends of growth		
	1997 - 2000	2000 - 2010	2010 - 2020
1. Electricity and heating production	4.1%	3.0%	1.9%
2. Coal industry	4.0%	2.8%	2.0%
3. Ferrous metallurgy	3.6%	3.9%	2.5%
4. Non-ferrous metallurgy	3.3%	1.4%	1.1%
5. Chemical industry	4.0%	3.7%	3.5%
6. Cellulose -Paper industry	4.3%	3.5%	2.8%
7. Food industry	4.0%	4.2%	3.9%

More optimistic are the forecast trends for the period till 2000. By the end of 2000 even according to these values the production will have reached less than 70% of the level of the total production produced by the industry in 1985; electricity and heating production is about 85%, coal industry - 90%, ferrous industry - 65%, food industry 40%.

The following conclusion can be made: the forecasted dynamics is the minimum required in regard with the surviving of the Bulgarian economy.

4.1. Reduction of Nutrient Emissions

In Table 4.1.-1 the expected amounts of nutrient reduction expected from the planned projects for water pollution reduction from Municipal wastewater discharges and Industrial wastewater discharges are summarized:

Table 4.1.-1 Expected amounts of nutrient emissions

No	Name of WWTP	River basin	Reduction of BOD_5- T/a	Reduction of N - T/a	Reduction of P - T/a
Municipal Wastewater Treatment Plants (MWWTP)					
1.	MWWTP G. Oryahovitsa	Yantra River	8,456	130	13
2.	MWWTP Troyan	Ossam River	1,840	80	13
3.	MWWTP Lovech	Ossam River	1,382	177	2
4.	MWWTP Vratsa	Ogosta River	782	131	22
5.	MWWTP Sofia	Iskar River	5,823	145	629
6.	MWWTP Sevlievo	Yantra River	1,078	82	15
7.	MWWTP Montana	Ogosta River	2,473	200	22
8.	MWWTP Popovo	Russenski Lom	1,235	50	25
9.	MWWTP Russe	Danube River	12,306	716	362
10.	MWWTP Svishtov	Danube River	818	56	21
11	MWWTP Levski	Osam River	1,127	152	9.8
12.	MWWTP Silistra	Danube River	516	22	12
	Total:		**37,836**	**1,941**	**1,146**
Industrial Wastewater Treatment Plant (IWWTP)					
1.	IWWTP Sugar Factory G. Oryahovitsa	Yantra River	6,460	180	0.5
2.	Chimko Vratsa	Ogosta River	22	85	3
3.	Antibiotic Razgrad	Russenski Lom	253	16	2
4.	Kremikovtsi Sofia	Iskar River	113	-	-
5.	Elatzite -Med*	Iskar River			
	Total:		**6,848**	**281**	**5.5**
	Grand Total:		**44,685**	**2,221**	**1,151.3**

* *Elatzite -Med project provides reduction of other pollutants as follows:*
SO_4=4.432 t/a; Mn= 918 t/a; Fe= 638t/a; Cu=885 t/a

The data currently available do not permit to quantify the nutrient emissions reduction result of planned projects for water pollution reduction caused by agriculture.

4.2. Hazardous Substances

Data on hazardous waste generation shows that both the top industrial generators and the generic waste generation are responsible for 82 % of the total generation in the area. If implement the proposed projects and if assume 80% of efficiency in total, it means that more than 65% of the generated hazardous wastes will not represent the current problem.

As mentioned before currently there are about 230 municipal dumpsites under operation within the Danube River area. If we assume that the existing about 40 relatively big towns (above 10,000 inhabitants) will also in the future maintain their own landfills it is obvious that the resting about 190 dump sites should be reduced as a number, creating regional landfills which will serve a group of villages. If we reduce the total number with at least 50%, applying up-to-date landfilling designs and technologies, the positive impact towards the water pollution will be more than 50%.

4.3. Microbiological Contamination

The review of data related to microbiological contamination shows that the information currently collected is very insufficient and does not permit to assess the magnitude of the problem. Such a problem appears to exist because sporadic microbiological contamination of drinking water is proven by the analyses of the health authorities. Taking into consideration the fact that not all of the WWTPs provide disinfection as required, it seems that the this is a real problem.

There are two ways to study and to improve the situation. First to assure collection of relevant data within the National Monitoring System and to study the real state of the river basins. Second to study the current conditions of the disinfection units of the existing plants and to introduce the necessary improvements both to the existing as well as to the designed WWTP.

The existing information on microbiological contamination does not permit to quantify the effects of the on going or planned projects.

4.4. Adverse Environmental Effects

The comparative analysis of the results of the samples of the two frontier points on the Danube River (Novo Selo, km. 833) and Silistra (km. 375) indicate that no significant differences exist in the examined quality characteristics of the Danubian water. This once again shows that the contribution of the Bulgarian tributaries is insignificant and that the basic quality content of the Danube River water is determined above the Bulgarian section.

Due to its geographic characteristics of the Bulgarian part of the Danube River basin, there is no Transboundary effects caused by contamination of our local rivers. Only few small rivers of the Nishava catchment area rise at our territory and after that leave to Yugoslavia and Timok is the opposite case, it rises and has the catchment area almost totally in Yugoslavian territory and only in the end it becomes to be a borderline river among the two countries. In the discharging points of our rivers into Danube River adverse and polluting effects have not been observed. The pollution along the Danube River course itself has only a local effect and practically insignificant impact. Erosion problems at the Bulgarian bank of the Danube River are caused due to the “Iron Gate” I and II.

The ongoing and the planned projects and activities for water pollution reduction are of local concern relevant to the respective catchment area. They are also addressed to prevent pollution in order to reduce the risk of uncontrolled or emergency releases of pollutants. Some of them must be considered also as pilot or demonstration projects.

5. Cost Estimation of Programmes and Projects

Table 5.1.-1 summarizes the cost elements of some of the planned projects. The costs are provided in USD and are updated to 1998. The exchanging rate is 1770 BGL for 1 USD.

Table 5.1.-1 Cost estimate of planned projects

No	Project	River Basin	Investment USD	O&M costs USD
Municipal Wastewater Treatment Plants (MWWTP)				
1	MWWTP Gorna Oriahovitza	Yantra River	30,666,900	1,970,116
2	MWWTP Troyan	Ossam River	16,983,450	1,091,058
3	MWWTP Lovetch	Ossam River	17,826,600	1,145,224
4	MWWTP Vratza	Ogosta River	7,588,350	1,145,224
5	MWWTP Sofia	Iskar River	105,816,150	6,797,886
6	MWWTP Sevlievo	Yantra River	8,913,300	572,612
7	MWWTP Montana	Ogosta River	17,947,050	1,152,967
8	MWWTP Popovo	Russenski Lom	8,733,450	561,058
9	MWWTP Russe	Danube River	87,708,040	9,218,294
10	MWWTP Svishtov	Danube River	5,401,760	567,736
11	MWWTP Levski	Osam River	10,260,630	978,615
12	MWWTP Silistra	Danube River	4,596,200	483,070
	Total:		**322,441,880**	**25,026,125**
Industrial Wastewater Treatment Plants (IWWTP)				
1	IWWTP Sugar Factory G. Oryahovitca	Yantra River	3,233,617	306,504
2	Chimko Vratsa	Ogosta River	7,149,912	663,920
3	Antibiotic Razgrad	Russenski Lom	4,484,514	397,362
4	Kremikovtsi Sofia	Iskar River	72,848,160	6,764,472
5	Elatzite-Med	Iskar River	8,181,840	831,820
	Total:		**95,898,043**	**8,964,078**
	Grand Total		**418,339,923**	**33,990,203**

6. Planning and Implementing Capacities

6.1. Planning Capacities

Bulgarian environmental institutions are technically strong but analytically and managerially weak. Currently in the country exist a number of state, municipal and private companies, public authorities, research institutes and NGOs capable to undertake project preparation in the field of water pollution reduction. The main problem is that only few of them are really capable to prepare project documents for bankable projects according to “Best available techniques” and “Best environmental practice”.

During many years the entire investment process in Bulgaria was carried out meeting the requirements of the “Statute-Book on large-scale Construction”, which is still valid. This statute reflected the conditions of the centralized planning economy. Nowadays many investment projects financed by international agencies meet the requirements of FIDIC regulations. At the same time during many years the decision making process has not been supported by cost-to-benefit analysis that proves the sustainability of the planned project. Implementation of decision support systems for controlling emissions and water quality through evaluating the economic, financial, institutional, and other aspects in order to assure the sustainability of all planned projects and activities.

It is very important for Bulgarian firms to have access to the western experience. The most smooth and successful way is a common participation in projects. Bulgarian companies are useful with their good technical skills and local knowledge which in combination with good western expertise can lead to extremely positive results.

Based on this it is obvious that there is a good field for co-operation with external expertise.

6.2. Implementing Capacities

6.2.1. Implementing Capacities for Structural Projects

In Bulgaria exist a number of construction firms capable to carry out quite sophisticated hydro-technical or civil construction projects. There are also private firms, which are good and strong enough to perform such type of works. Some of them perform works abroad and the quality of the works performed by them has proven their high professional capabilities.

Two major problems, which create obstacles, can be identified - insufficient funding for water pollution projects. That restricts the market and impedes the companies to up-date their construction equipment and currently it represents a problem - outdated building equipment. The second problem deals with the approximation of the investment process to the European standards. Co-operation with foreign companies especially in “turn-key” projects may help the Bulgarian constructing firms to get more familiar with the western construction standards and specially with FIDIC rules.

In Bulgaria equipment for water treatment and pumping is produced too. Local production cannot cover all the demands of the market from the one side and cannot compete in quality comparing with the imported equipment from another.

Exchange of technologies and equipment, creating joint ventures and common participation in projects could be beneficial to both foreign companies and local Bulgarian producers. Identification and performance of such pilot project or projects is very important. Bulgarian companies need to have positive examples of projects started from the concept and finalized with the implementation.

6.2.2. Implementing Capacities for Non-structural Projects

There is a good field for co-operation in non-structural projects. Possible areas of collaboration could be acquisition to the European standards, providing technical assistance for updating of regulations and construction statute and harmonization of the local requirements to the FIDIC ones. Also the harmonization of the local “water” legislation to the European directives is a potential field of common work.

Organization of training courses on institutional aspects, seminars and workshops on specific topics for all stakeholders in the water pollution reduction process could be very beneficial.

Procurement of “know-how” or advanced technologies is another field that could have prospective future.

Other potential fields of co-operation are all activities dealing with establishment of pro-active public dialogue. Improvement of the capabilities of the state institutions is to initiate such a dialogue, public and information campaigns, public discussions, surveying of the public opinion, etc. Work with the NGO s in order to clarify their role as an intermediator among the state and the public. Involvement of branch industrial organizations as representatives of the industries and ensuring a wide participation of all stakeholders in finding solutions to environmental problems based on voluntary agreements.

Annexes

1 Comparison of Limit Values for Discharging of Waste Waters in Surface Water Bodies among Bulgarian and European Legislation

2 Bulgarian Legislative Documents Planned for Adoption in the Water Sector

3 Bibliography

Annex 1

Comparison of Limit Values for Discharging of Waste Waters in Surface Water Bodies among Bulgarian and European Legislation

Table 1: Comparison of limit values for discharging of wastewaters in surface water bodies among Bulgarian and European legislation

		BULGARIAN LEGISLATION							EUROPEAN COMMUNITY LEGISLATION					
No.	Parameter	Unit	I	II	III	IV	Vº		76/160	76/464	78/659		86/280	91/271
							wua	spz			Salmonid* water	Cyprinid* water	-	-
1.	Tempera-ture	ºC	should not exceed by 3 ºC the mean temperature of the season						-		ºC ºC 10 ºC	3 ºC 28 ºC 10 ºC		
2.	Colour	degrees	20º	without noticeable additional colouring	without noticeable additional colouring				no abnormal change in colour					
3.	Odour	force	2	3	3		The intensity of odours unusual in seawater should not exceed the threshold of percentation							
4.	Active reaction	pH	6.5-8.5	6.0-8.5	6.0-9.0	6.5-9.0	-		6.0-9.0		6.0-9.0	6.0-9.0	-	-
5.	Dissolved oxigen-saturation	%	75	40	20	-	-		80 - 120		-		-	-
6.	Electro-conductivity	mS	700	1300	1600	-	-		-	-	-		-	-
7.	Dissolved oxygen	mg/l	6	4	2	-	-				50% ^{3} 9 100^{3} 7	50% ^{3}7	-	-

		BULGARIAN LEGISLATION							EUROPEAN COMMUNITY LEGISLATION					
No.	Parameter	Unit	I	II	III	IV	V°		76/160	76/464	78/659		86/280	91/271
							wua	spz			Salmonid* water	Cyprinid* water	-	-
8.	Dissolved substances	mg/l	700	1000	1500	-	-		-	-	-		-	
9.	Suspended solids	mg/l	30	50	100	<500	-				£ 25	£ 25		35
10.	Hardness	mgeqv/l	7	10	14	-	-		-	-	-		-	-
11.	Chlorides	mg/l	200	300	400	-	-		-	-	-		-	-
12.	Sulphates	mg/l	200	300	400	-	-		-	-	-		-	-
13.	H_2S	mg/l	not admissible		0.1	<0.1	-		-	-	-		-	-
14.	Total Iron Fe	mg/l	0.5	1.5	5	<10	<0.1	<0.5	-	-	-		-	-
15.	Mn /total/	mg/l	0.1	0.3	0.8	-	-		-	-	-		-	-
16.	Ammonia NH_4	mg/l	0.1	2.0	5		<0.05	<0.01	-	-	£1	£1	-	-
17.	Nitrogen (NO_2)	mg/l	0.002	0.04	0.06	-	<0.02	<0.02	-	-	£ 0.01	£ 0.03	-	-
18.	Nitrogen (NO_3)	mg/l	5	10	20	-	<1.0	<1.0	-	-	-		-	-
19.	Total Nitrogen	mg/l	-	-	-	-	-		-					15
20.	Ammonia NH_3	mgl	-	-	-	-	-		-	-	£ 0.025	£ 0.025	-	-
21.	Nitrogen Kjeldahl	mg/l	-	-	-	-	-		-	-	-		-	-
22.	Phosphates /PO_4/	mg/l	0.2	1.0	2	-	-		-	-	-		-	-

		BULGARIAN LEGISLATION							EUROPEAN COMMUNITY LEGISLATION					
No.	Parameter	Unit	I	II	III	IV	V°		76/160	76/464	78/659		86/280	91/271
							wua	spz			Salmonid* water	Cyprinid* water	-	-
23.	Total Phosphorus I	mg/	0.4	2.0	3	-	<0.1	<0.1	-	-	-		-	2
24.	Selenium Se	mg/l	0.01	0.01	0.01	-	-		-	-	-		-	-
25.	Beryllium Be	mg/l	0.0002	0.0002	0.002	-	-		-	-	-		-	-
26	Vanadium V	mg/l	0.1	0.01	1	-	-		-	-	-		-	-
27.	Molybde-num Mo	mg/l	0.5	0.05	3	-	-		-	-	-		-	-
28.	Barium Ba	mg/l	1	1	4	-	-		-	-	-		-	-
29.	Boron B	mg/l	not admissible		1	-	-		-	-	-		-	-
30.	Silver Ag	mg/l	0.01	0.01	0.01	-	-		-	-	-		-	-
31.	Uranium U	mg/l	0.6	0.6	0.6	-	-		-	-	-		-	-
32.	Radium Ra 226	mBk/l	150	150	150	-	-		-	-	-		-	-
33.	Organic Suspended Solids	mg/l	5	15	25	-	-			-	-		-	
34.	Oxidizability /permanganate/	mg/l	10	30	40	-	<10	-	-					
35.	COD /bichromate/	mg/l	25	70	100	-	<25	-						125
36.	BOD_5	mg/l	5	15	25	-	<5	-	-	-	£3	£6	-	25

		BULGARIAN LEGISLATION							EUROPEAN COMMUNITY LEGISLATION					
No.	Parameter	Unit	I	II	III	IV	V°		76/160	76/464	78/659		86/280	91/271
							wua	spz			Salmonid* water	Cyprinid* water	-	-
37.	Mineral oils	mg/l	absen-ce	0.3	0.5	<50	<0.05	<0.1	no film visible on the surface of water and no odour		3	3	-	-
38.	Surface active substances reacting with methylene blue	mg/l	0.5	1	3	-	<0.1	<0.5	£ 0.3	-	-		-	-
39.	Phenols	mg/l	0.01	0.05	0.1	0.001 - 0.01 (2)	0.001	0.001	£ 0.005	-	2	2		
40.	Transpa-rency						30 sm Snelen scale	no require-ments	1 m Seochl's disk	-				
41.	Tarry residues and floating materials						absence	absence	absence					
42.	Pesticides	mg/l	(3)						-	-				

		BULGARIAN LEGISLATION							EUROPEAN COMMUNITY LEGISLATION					
No.	Parameter	Unit	I	II	III	IV	Vº		76/160	76/464	78/659		86/280	91/271
							wua	spz			Salmonid* water	Cyprinid* water	-	-
43.	Heavy metals : Arsenic As Cadmium Cd Chrome VI Cr VI Lead Pb Mercury Hg	mg/l	0.02 0.005 0.02 0.02 0.0002	0.05 0.01 0.05 0.05 0.001	0.2 0.03 0.1 0.2 0.03	<0.5 <0.1 <0.5 <1.0 -	<0.05 <0.005 - <0.01 <0.001	<0.05 <0.005 - <0.05 <0.001						
44.	Cyanides	mg/l	absence	0.5	1.0	<0.5	<0.05	<0.05	-					
45.	Total Phosphorus	mg/l					<0.1	<0.1	-	-	-			2
46.	Microbiological:													
	Total coliforms		<0.1 cm^3	<0.1 cm^3	<0.001 cm^3	-	-		500 /100ml	-	-			
	Faecal coliforms		<1.0 cm^3	<1.0 cm^3	<0.01 cm^3	-	-							
	Faecal streptococi		-	-	-	-	100/l	no require-ments	100 /100 ml					
47	Total residual chlorine	mg/l	absence	0.05	0.1	<2.0	-		-	-	£0.005	£ 0.005		

		BULGARIAN LEGISLATION							EUROPEAN COMMUNITY LEGISLATION					
No.	Parameter	Unit	I	II	III	IV	V°		76/160	76/464	78/659		86/280	91/271
							wua	spz			Salmonid* water	Cyprinid* water	-	-
48.	Total Zinc Zn	mg/l	1	5	10	<10	<0.01	<0.01	-		£0.3	£1.0		
49	Dissolved Copper Cu	mg/l	0.05	0.1	0.5	<0.8	<0.01	<0.01	-	-	£0.04	£0.04		
50.	Carbon Tetra-chloride	mg/l	-	-	-	absence	-		-	-			1.5	
51.	Chloro-metanes	mg/l				absence							3	

The Bulgarian Legislation concerning wastewater discharges is based on a category of the water receiving body. Limit values are determined corresponding to the category of the water receiving body where the wastewater will be discharged. The categorization is made as follows:
I - I Category - wastewater is discharged to waters intended for the abstraction of drinking water, industrial water, and bathing water
II - II Category - wastewater is discharged to waters intended for the abstraction of watering of animals, aquatic sport, and fish breeding
III - III Category - wastewater is discharged to waters intended for the abstraction of irrigation
We referred to Category IV and V as follows:
IV - IV Category - wastewater is discharged to municipal sewerage system
V - V Category - wastewater is discharged to Black Sea

76/160 - Council Directive 76/160/EEC of 8 December 1975 concerning the quality of bathing water
76/464 - Council Directive 73/464/EEC of 4 May 1976 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community
78/659 - Council Directive 78/659/EEC of 18 July 1978 on the quality of fresh waters needing protection or improvement in order to support fish life
86/280 - Council Directive 86/280/EEC of 12 June 1986 on limit values and quality objectives for discharges of certain dangerous substances included in List I of the Annex to Directive 76/467/EEC
91/271 - Council Directive 91/271/EEC of 12 May 1991 concerning urban waste water treatment

° Parameters and standards of the Bulgarian Regulation No.8 are subdivided for "wua"-water use area and "spz" - sanitary protection zone.
* According to Council Directive 78/659/EEC the temperature limits on the thermal discharge are determined by different scales.
[1] The 10 °C temperatures limit applies only to breeding period of species which need cold water for reproduction and only to waters which may contain such species.
[2] The maximum concentration can vary between the pointed range depending on the category of the water receiving body
3 - Limit values for pesticides in Bulgaria are specified for different type of trading names commonly used for these purposes.

Note: Comparison is related only to overlapping parameters.

Annex 2

Bulgarian Legislative Documents Planned for Adoption in the Water Sector

Table 2: Bulgarian legislative documents planned for adoption in the water sector

Title of normative document	Concerned directives of EU	Status of normative document	Responsible body	Degree of compliance of the particular norm to the relevant EU directives
1.Law for waters	European Community water policy COM(96)59; COM(97)49 and COM(97)614	project	MOEW, MH, CM, MAFLR, MRDPW	almost complete
2.Regulation for indicators and norms for contents of harmful substances in the industrial waste waters, discharge into the sewerage system of the settlement	COM(97)6/4; 96(61)EEC	project	MOEW, MRDPW	partial
3.Regulations for permitting regime for using and ejection of waste waters into the water stream and basins and appropriation of individually emission restrictions of the point source pollution.	COM(97)614; 76(464)EEC; 82(176); 83(513); 84(419); 86(280); 91(271)EEC		MOEW	complete
4.Regulation for determination to the amount and sequence for levy of fee “Water use”.	COM(96)59; COM(97)49; COM(97)614	project	MOEW, MF	partial
5.Regulation for the sequence for levy and lay out of the resources by fund “Water resources”	COM(97)614	project	MOEW, MF	partial
6.Regulation for alternation of Regulation No.8 for indicators and norms for determination the quality of the coastal sea waters	76(160)EEC; 91(271)EEC; COM(97)614	project	MOEW, MH	almost complete
7.Regulation on the functions and the obligations on the entities related to water resources management based on the river basin principle	COM(97)614 final	project	MOEW,	almost complete

Title of normative document	Concerned directives of EU	Status of normative document	Responsible body	Degree of compliance of the particular norm to the relevant EU directives
8. Regulation for the requirements for permissible contents of harmful substances in the waste waters by the settlements water-treatment plant and from different kinds of industrial works, discharging in the water streams and basins	91(271)EEC; 76/464; 82/176; 84/491;86(280); 96(61)EEC	Project	MOEW	almost complete
9.Regulation for investigations, using and protection of underground water	91(676); 80(778); 80(68)EEC	Project	MOEW	almost complete
10.Additional to the regulation for the sanctions on the Black sea	COM(97)614	Project	MOEW	complete
11.Regulations for indicators and norms for determination the quality of surface water streams and basins	91(676)EEC; COM(97)614 final		MOEW	complete
12.Requirements to the water quality, intended for different water uses: potable and sanitary water supply; fishery; recreation and irrigation	80(778)EEC; 91(676); 76(161)EEC; COM(97)49; COM(97)614		MOEW	complete

Annex 3

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