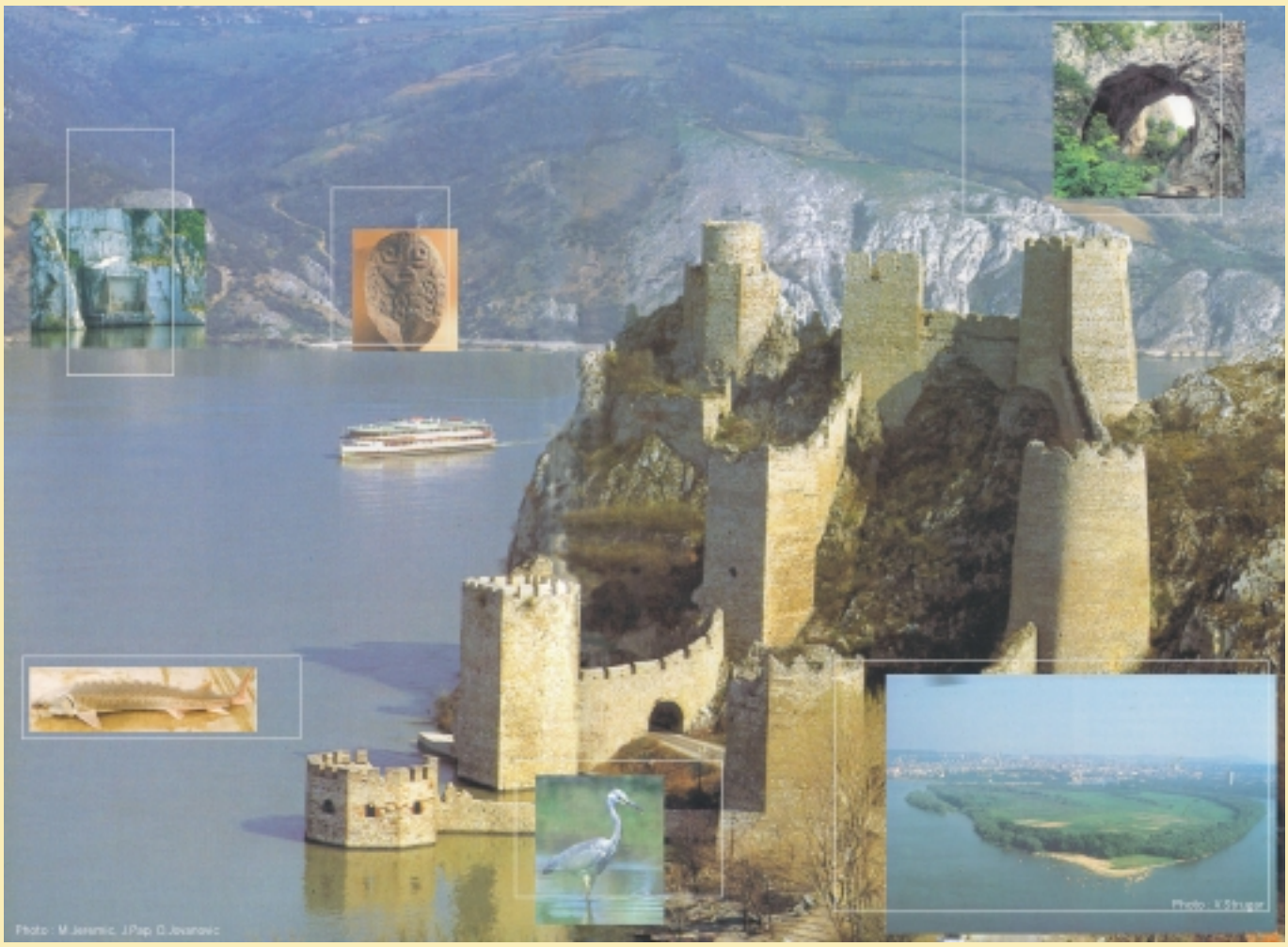
DANUBE POLLUTION REDUCTION PROGRAMME

NATIONAL REVIEWS 1998
FEDERAL REPUBLIC OF YUGOSLAVIA

TECHNICAL REPORTS

Part A: Social and Economic Analysis

Part B: Financing Mechanisms



FEDERAL MINISTRY FOR DEVELOPMENT, SCIENCE AND ENVIRONMENT

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 were 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 Reviews data which are 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 Reviews 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 **Yugoslavian National Reviews** were prepared under the supervision of the Country Programme Coordinator, **Mr. Zoran Cukic**. The authors of the respective parts of the report are:

- Part A: Social and Economic Analysis: **Mr. Miroslav Tanaskovic**
- Part B: Financing Mechanisms: **Mr. Milorad Filipovic**
- Part C: Water Quality: **Mr. Zoran Cukic**
- Part D: Water Environmental Engineering: **Mr. Milorad Miloradov**

The findings, interpretation and conclusions expressed in this publication are entirely those of the authors and should not be attributed in any manner to the UNDP/GEF and its affiliated organizations.

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Part A

Social and Economic Analysis in Relation to Impact of Water Pollution

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List of Abbreviations

AP	Autonomous Province
GNP	Gross National Product
DTD	Danube-Tisa-Danube
PE	Population equivalent
EU	European Union
F_j	River basin area in the FR of Yugoslavia
F_u	Total river basin area
HE	Hydro-electric power plant
Kosmet	AP Kosovo and Metohija
NP	National park
R	Republic
RWB	Republican Weather Bureau
RS	Republic of Serbia
RM	Republic of Montenegro
SFRY	Socialist Federal Republic of Yugoslavia
SR	Socialist Republic
FRY	Federal Republic of Yugoslavia
SRS	Socialist Republic of Serbia
TE	Thermal power plant
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNHCR	UN High Commissariat for Refugees
US$	American dollar

1. Summary

The riparian area of the Danube and its main tributaries is the most developed and most densely populated part of the FR of Yugoslavia (FRY). The most fertile farmland also lies along their banks. The major administrative, cultural and educational centers are also located in this area, in addition to the largest power-generating and industrial facilities and traffic corridors. Thus, the Danube corridor enjoys priority treatment in development plans.

The Danube corridor in the FR of Yugoslavia also abounds in world-renowned historical landmarks (Vinča, Lepenski Vir, the Trajan tablet, etc.) and nature reserves, being the habitats of rare, protected and endangered plant and animal species.

This area is also attractive for rest and recreation, but its potential has not yet been used for tourism.

The favorable natural factors for the anticipated development of the Danube corridor, on one side, and numerous natural, cultural and historical landmarks that must be protected and preserved, on the other, should be adjusted, while at the same time observing the basic principles of sustainable development.

For two millennia already, this area has been developed and changed according to the needs of the people which, at least up to now, have not been adjusted to the needs of protecting and preserving natural eco-systems. Despite their indisputably favorable socio-economic effects, the implementation of numerous, large-scale hydraulic engineering projects (regulation of river beds, construction of irrigation systems, embankments, dams, etc.) brought about changes in the natural biotope (draining of swampy and marshy areas, reduction of natural spawning grounds, blocking of fishways and the tracks of wild animals, deteriorating conditions for the survival of waterfowl and flood plain forests, etc.), thus generating adverse effects on the incidence and biodiversity of flora and fauna. These adverse effects were not offset in a satisfactory manner, that is, by adequate technical and other measures, because at the time the mentioned projects were carried out, ecological principles and the principles of sustainable development did not have such significance and applications as they have today.

These adverse effects were further enhanced, especially during the last three decades, by uncontrolled water pollution in the entire Danube River system; this trend is very sharp and arouses deep concern. Although the quality of the Danube in the FR of Yugoslavia is still tolerable, the state on its tributaries, including those formed in the territory of the FR of Yugoslavia (Velika Morava, Timok, Mlava, Pek), as well as on those coming from the neighboring countries (Tisa, Sava, Begej, Tamiš) is much worse and requires serious interventions.

The waters of the Danube and its tributaries are used for domestic and industrial water supply, irrigation, cooling of thermal power plants and the like, but pollution is increasingly limiting their use, in addition to increasing the complexity of drinking and industrial water preparations associated costs. The pollution of river water (Tisa) which can potentially be used for domestic water supply poses a serious problem in the region of northern Banat because ground water reserves, which must be used for water supply, are continuously declining.

The number and length of sections on which water cannot be used even for the irrigation of farmland is on an increase. This refers especially to the international watercourses which are heavily polluted already at the entry into the FR of Yugoslavia.

Due to their increased pollution during the past three decades, the use of water for water-related recreation has been significantly reduced due to health hazards and the appropriate warning of health services, so that the number and length of sections which are suitable for such purposes is continuously declining. In some towns (e.g. Zrenjanin), water for recreational purposes is secured by treatment of river water (Begej).

It must be noted that the quality of waters within the FR of Yugoslavia is somewhat better as compared to the period up to 1991, because industry operates at much reduced capacity (55%), as compared to 1991. Some improvements have also been observed in the international watercourses (especially those coming from neighboring Romania), probably for the same reason.

Wastewater treatment in the FR of Yugoslavia in general and in the Danube river system in particular is not satisfactory. Although the existing plants can treat about 14% of the total quantity of municipal wastewater, only 8-9% is treated. The situation concerning industrial waste is similar. The republican and municipal authorities wish to erect wastewater treatment plants in numerous settlements but the difficult economic situation poses an obstacle. Nevertheless, in the period 1991-1998, 5 treatment plants were erected.

Consequently, it can be stated in general that municipal and industrial wastes are discharged mostly without any advance treatment, or after minimum treatment, due to an insufficient number of treatment plants. On the other hand, many of the existing treatment plants are in poor condition and not efficient enough (due to worn-out equipment, the lack of spare parts and chemicals, insufficient funds for investment and current maintenance, inadequate training and low wages of plant personnel, etc.).

For these or similar reasons, there are greater accident pollution hazards which may endanger not only water-supply source areas, but also protected natural resources (Djerdap National Park, nature reserves), which are significant for the preservation of biodiversity, as well as for the regions proclaimed as biosphere reserves, the world's natural heritage and Ramsar regions, or those nominated for such status with international organizations.

In the Danube river basin, excluding the Autonomous Province Kosovo and Metohija (Kosmet), population growth is already negative and demographic research points to a decrease in the total number of inhabitants in the Danube river basin in the coming period. The first significant reason is a decrease in fertility, especially in rural settlements, and the second are intensive migrations of the population to cities. It is estimated that, due to these migrations, the share of urban population in the total population of the FR of Yugoslavia will increase from 51.9% to 67% of the total population in 2021. This increase (even by 45%) will be especially pronounced in the catchment area of the Morava and Sava, as well as in the Danube corridor, due to the attractiveness and wealth of these regions, as well as due to the fact that the Kosmet is located in the upper part of the catchment area (Kosmet is one of the most fertile regions in Europe).

It is expected that life expectancy at birth for infants born in 1996 will be 69.9 for men and 74.7 for women thanks to the improved standard of living and greater efficiency of medical services. It is also expected that the average age of the population and the share of elderly population in the total population will increase. Economic restructuring, the application of new technologies and land consolidation will bring about a change in the employee qualification structure; the number of employed in direct industrial and agricultural production will decrease in favor of the tertiary sector.

The quantities of surface water which are abstracted from the Danube river basin for domestic water supply will increase from 22% of the total current demand to 33% in 2021. An increase in surface water abstraction will be especially intensive in the case of industrial water supply, where it is expected that it will increase nearly 4.3 times. At the same time, ground water abstraction for irrigation of farmland will be discontinued and the total demand will be satisfied by using surface waters. Therefore, the total quantity of such waters will increase fivefold.

There is no doubt that wastewater discharge will increase in the same proportion. However, this will reduce the content of toxic and hazardous matter, as well as the intake of nutrients owing to an improved efficiency of the existing municipal and industrial wastewater treatment plants and the erection of new ones. It is expected that all settlements with more than 10,000 inhabitants will have

municipal wastewater treatment plants (i.e. biological treatment). The industries, whose wastewater are discharged directly into the recipients, will be provided with built-in facilities for full wastewater treatment, while those which discharge wastewater into the sewerage will have facilities for advance treatment so as not impair the efficiency of central municipal treatment plants.

The development of energy supply relies mostly on the reconstruction and extension of the existing facilities, as well as on the construction of new ones, especially of thermal power plants. The necessary quantities of cooling water for these and new industrial plants will be provided by surface water abstraction. According to the expert estimates, which are based on the number and rated power of the plants to be erected, the quantity of these waters will increase by about 40% up to 2021. Cooling water from these plants creates a hazard mostly to smaller watercourses due to the limited capacity of the recipient.

Today, there is not one river port which has equipment for the reception and treatment of bilge and oily waters. Since it is anticipated that river traffic will be intensified, it is necessary to provide such facilities in the major river ports.

The adoption of the regulations relating to the choice of sites for municipal waste landfills, as well as the measures for ground and surface water protection have imposed a practice in the design and construction of new waste landfills that ground water should be protected from pollution with a foil or clay layer, and that the filtrate should be returned to the waste disposal area or treated up to the degree which will not impair the quality of the recipient. Improvements in this area are also expected thanks to the adoption of the decrees on the closing down, reconstruction or displacement of waste landfills which especially affect the quality of surface and ground waters.

The development of tourism on the banks of the Danube depends also on the preservation of the quality of its water and natural eco-systems, as well as the attractiveness of the area and the amenities provided by tourist facilities and related infrastructure. Tourism, especially aquatic sports, poses a potential hazard to water quality since the quantities of wastewater discharged directly into the watercourse will increase with the construction of marinas and tourist complexes. Since such facilities are built on the most attractive sites, wastewater must be treated to a high degree so as not to impair the attractiveness of the area.

There is no doubt that the interest of the local population in water-related recreation will increase, so that the number of inhabitants potentially affected by health hazards will increase as well, unless the quality of river water is improved, especially from a microbiological aspect. Water quality must be significantly improved through coordinated action of all Danube countries, so that all potentials, which could be put in the service of sustainable development, would be used to the benefit of the population.

It is necessary to adjust the existing legislation and standards relating to water and environmental protection to the legislation of the European Union, including the existing institutional organization. At present, we are encountered with the overlapping of competences, parallelism and inadequately defined competences, not to mention inconsistent vertical and horizontal integration of the relevant state authorities and organizations.

It is also necessary to adopt effluent quality standards so as to protect especially those sectors of the watercourses which are intended for recreation and/or water supply. Although the “polluter pays” principle has already been incorporated into our legislation, its application has not made much progress. Thus, that care should be taken that this principle is strictly applied. The funds se raised should be used solely for water protection.

To provide for an adequate water management, timely response in accident situations and improvements in water protection, it is necessary to equip and train inspection services for emergency situations in a more adequate way. It is also necessary to speed up the preparation of the

water pollutant register for the purpose of water regime management. In addition, it is necessary to embark on the preparation of the water management information system so as to facilitate the collection, processing and dissemination of information, thus enabling the adoption of timely and expert decisions.

It is necessary to upgrade the education of the broadest sections of the population concerning the protection of water resources and rational use of water, as well as the education of all those employed in the water management sector, and especially those engaging in water control and the design, construction and maintenance of wastewater treatment plants with a view to improving the currently unsatisfactory situation.

It is also necessary to stop the further anthropogenic degradation of autochthonous eco-systems (draining and amelioration of marshy and swampy areas along the Danube and its tributaries) and, where possible, to provide a communication between the former river branches, old river beds and ponds with the existing watercourse, at least in the periods of high water.

2. Description of the State of the Danube Environment

The Danube, a holly river, is the cradle of European civilization, which is evidenced by numerous cultural and historical landmarks preserved on its banks and in the riparian area. This region has been continuously inhabited for 7,000 years already. In addition, for more than one thousand years, in the times of the Roman and Turkish empires, it was the dividing line between the civilizations.

The major monuments originate from the Neolithic (Starčevo, Vinča, Lepenski vir), Roman period (*Viminacium, Romuliana, Pontes* and *Sirmium* - one of the imperial seats in the period of tetrarchy) and Turkish rule (Smederevo, Kalemegdan, Golubac, Fetislam), as well as Austro-Hungarian rule (Petrovaradin). All these and many other smaller, yet not less significant, cultural landmarks are situated on the banks of the Danube and its tributaries.

The Velika Morava, Sava and Danube valleys are regarded as traffic corridors of international concern (for rail, road and water transport), linking Central Europe with South-Eastern Europe and the Near East.

The left bank of the Danube is fully protected by an embankment, in addition to a part of the right bank which is at a lower level, since these regions were often flooded in the past (the last big flood struck 40 years ago, when 2/3 of the area of Autonomous Province Vojvodina were flooded). The embankments also protect the hinterland from the tributaries since most cities lie in the river valleys, that is, in a floodable area.

After the construction of embankments and the rectification of the flow, the Danube and its tributaries were cut from the former branches, stagnant tributaries, swampy and marshy areas and ponds, which represented natural spawning grounds, resting places for migratory birds and habitats of numerous waterfowl, all of which had an adverse effect on the survival and number of some species. A part of these habitats has been converted into pasture and agricultural land.

The remaining floodable regions in the riparian area are also important as biofilters, especially for the removal of nutrients from water, but their surface has been significantly reduced due to hydraulic engineering and land improvement works. However, earth for the construction of embankments was excavated from the bed of high water, so that the new floodable region (so-called “kubici” in Serbian) also has the role of biofilters.

The quality of water in all, and especially in smaller, watercourses does not conform to the regulations, which has an adverse effect on hydrobions and especially on fish population. At times, in some sectors of smaller watercourses, it comes to fish pestilence, caused by accident water pollution or the lack of oxygen stemming from an unfavorable hydrological situation, high water temperatures and plenty of organic matter.

Air pollution in the largest urban and industrial centers, as well as in mining and smelting works, especially in the winter period and when weather conditions are unfavorable, exceeds the limits stipulated by the relevant regulations.

A large number of municipal waste landfills is not regulated at all, thus representing the source of contamination of the surrounding land and ground water. The situation is similar with respect to refuse dumps in mines, ash dumps of thermal power plants and industrial waste dumps. Surface lignite mines, quarries and other surface mines, where mineral raw materials are mined, are not adequately recultivated, which results in a lasting environmental degradation. Over the past years, however, the work has begun on the rehabilitation of such areas by technical and biological recultivation methods .

2.1. Water Resources

Of the total area of the FR of Yugoslavia, which amounts to 102,173 km^2, the Danube river basin covers about 88,919 km^2, or 87% of the state territory.

Annual rainfall in the Danube river basin in the FR of Yugoslavia is about 74.0 km^3 on the average; of this quantity about 23.5 km^3 runs off and the remainder of about 50.5 km^3 accounts for evapo-transpiration. There is also an annual inflow of about 154.5 km^3 in these regions, so that the total annual run-off of the Danube, at the exit from the FR of Yugoslavia, is about 178 km^3. The inequality of all basic components of the hydrological balances is very high as regards time and space.

Annual rainfall is the lowest in the north of the country, amounting up to 500 mm on the average, and the highest in the south-west, over 4500 mm on the average, but this water runs off into the Adriatic Sea.

During the vegetation period, rainfall in some regions is only about 28% of the annual average. It is thus necessary to supply agribusiness with additional water quantities by irrigation, while in other regions this amount is even 60%.

The map given in Annex A-7 shows Danube corridor and catchment areas of direct tributaries.

The characteristics of the flow of the Danube at the entry into FRY and in the cross-section on the border with Romania, as well as at the confluences of direct tributaries are given in Table 2.1.1.

Table 2.1.1. Characteristic flows on the Danube and its direct tributaries

River	Profile	Area (km^2)	Q_{min} 95% (m^3/s)	Q_{av} (m^3/s)	q_{min} ($l/s/km^2$)	q_{sr} ($l/s\ km^2$)
Danube	Bezdan	210,250	837.0	2,263	4.0	10.8
Danube	V. Gradište	570,375	1,800.0	5,466	3.2	9.6
Tisa	at the mouth	148,973	126.0	794	0.8	5.3
Tamiš	at the mouth	10,280	0.4	47	0.04	4.6
Sava	at the mouth	95,132	287.0	1,570	3.0	16.5
Morava	at the mouth	38,345	35.0	232	0.9	6.1
Mlava	at the mouth	1,886	0.7	12	0.4	6.4
Pek	at the mouth	1,233	0.6	9	0.5	7.3
Timok	at the mouth	4,510	1.2	31	0.3	6.9

The table points to a high differences between Q_{av} and $Q_{min\ 95\%}$ especially on smaller watercourses, where the ratio Q_{av} / Q_{min} ranges from 15 to 117.5. This provides ample evidence of the torrential nature of some watercourses and a need to protect the surrounding land and settlements from flood.

Table 2.1.2. shows the catchment areas of the main tributaries of the Danube river in FRY (*Fj*), as well as the entire river basin (*Fu*).

Table 2.1.2. Catchment areas of the direct tributaries of the Danube

River	Tisa	Sava	V. Morava	Mlava	Pek	Timok	Tamis
Fj (km^2)	8,994	31,046	37,269	1,886	1,233	4,215	1,107
Fu (km^2)	148,973	95,132	38,345	1,886	1,233	4,510	10,280
F_j/F_u(%)	6.0	32.6	97.2	100	100	93.5	10.8

As for the catchment area of the Tisa, only a very small part of it (about 6% of the total area) is in the FR of Yugoslavia, although the length of the course is about 163 km (15% of the total length of the course). As for the Tamiš, the situation is similar.

As for the Sava, only one-third of its catchment area is in the FR of Yugoslavia, while in the case of other watercourses, their catchment areas are entirely or mostly in the territory of the FR of Yugoslavia.

The construction of the Djerdap (Iron Gate) in-stream reservoirs accelerated the deposition of increased quantities of sediments. Input of sediments originated from territory of 570,000 km^2, in the Djerdap I in-stream reservoir, as well as the share of the Danube and its tributaries are shown in the following table:

Table 2.1.3. Input of sediments in Iron Gate I reservoir

River	Danube	Tisa	Sava	V.Morava	Mlava	Pek	Total
Sediment transport (10^6 t/year)	6.7	4.4	3.0	2.8	0.2	0.1	17.2
Share (%)	38.9	25.6	17.4	16.3	1.2	0.6	100

The share of the Danube, Tisa and Sava in the total input of sediments in the Djerdap impounding reservoir is over 80%, whereby the largest quantities of sediments stem from the territories of other countries (cross-boundary load). These deposits consist of inert particles on which organic matter (discharged into the watercourses or produced by them), as well as hazardous and toxic matter can be adsorbed. Due to a significant presence of hazardous and organic matter in deposited material, there is a greater pollution hazard to ground waters in the alluvions of the Danube and its tributaries. A somewhat different situation is with respect to the basic water-bearing complex in the territory of Vojvodina where, due to their very slow renewal and a high content of natural organics (humic and fulvic acids) which are hard to remove, they may appear as a limiting factor in the development of water supply in these regions.

Since the erection of the Djerdap I and II hydro-electric power plants, the flow regime on the Danube has been significantly changed throughout its; the downstream sections of the tributaries in this sector of the Danube are also influenced by back water. Water levels have also been raised by the impoundment of the Danube at Djerdap I (the depth of water at the dam is 42 m) and at Djerdap II (the depth of water at the dam is 19.5 m). As compared to the natural regime, the rates of flow have been especially changed in the Djerdap Gorge where, upstream from the mentioned dams, the velocity in the periods of low flow, is significantly decreased upstream from the dams, the flow regime has been changed in accordance with the power generation requirements.

In addition to its effects on the water regime, such a state has a great direct impact on ground waters in the alluvions, which are replenished with river water (over 90%). The retardation of the flow also affected the capacity of the watercourse to transport of ice, which may bring about the accumulation of icebergs.

It should be noted that the substantial potentials of ground water, which are mostly located by larger watercourses and which serve and will serve for domestic water supply, are exposed to direct qualitative and quantitative effects of surface waters from which they are replenished. It is estimated that in the FR of Yugoslavia there are potentially about 45 m^3/s of such waters. In addition, the source areas of karstic waters which are intended for domestic water supply are also exposed to a high influence of surface waters. It is estimated that there are potentially about 25 m^3/s of such waters.

In addition to the above, it is estimated that there are significant potentials for the replenishment of underground alluvial aquifers with an artificial infiltration of surface waters into the underground strata.

2.2. Biological Resources and Eco-Systems

The basic environmental protection strategy of the FRY provides for the protection of specified natural entities, species, eco-systems and other natural resources, and especially for the preservation of the biodiversity of genes, species and eco-systems. The preservation of natural resources provides potentialities for the further sustainable development of the economy, and especially for the development of ecological and hunting tourism, production of food having a high biological value, medicinal and aromatic herbs, in addition to picking wild fruits and gathering wildlife species. Today, 58 fish species, classified into 31 genera and 15 families, live in the Danube.

Within the Danube wtatershed in FRY, there is the majority of terrestrial habitats, ranging from running and stagnant freshwaters, through pit bogs and marches, bushy, grassy and forest habitats, as well as rocky, scree, sandy and glacier habitats, to agricultural and absolutely artificial habitats.

The Danube, its islands and the riparian zone in FRY are characterized by high biodiversity as regards species and eco-systems. Marshy and swampy eco-systems begin from Bezdan (the entry into FRY) and, with the residues of flood plain forests, extend up to the Djerdap Gorge. Various plant communities occur in succession, beginning with the marsh communities of water lily, blackcap, reed and sedge, marsh meadows, plant communities on sands and meadow communities on banks.

Forest vegetation consists of the communities of silky willow (*Salix alba*), black alder (*Alnus glutinosa*), elm-ash forests (*Ulmo – Fraxinetum*) and relict bay oak forests (*Quercus robur*), as well as the plantations of Euro-American poplar (*Populus euroamericana*). This phytocoenosis diversity is enriched with widely varied communities of Fruška Gora and Deliblatska peščara.

On the slopes of the Fruška Gora hills there are the communities of the mentioned flood plain forests, while in their higher parts there are communities of pure chestnut oak forests (*Quercetum petra*), mixed chestnut oak and yoke elm forests, pure yoke elm forests, pure and mixed communities of beech forests. Linden communities extend over an area of 6,000 ha, thus representing one of the largest complexes of this kind in Europe. There are more than 1,500 registered higher plant species, many of which being rare and endangered.

In the region of Deliblatska peščara there are characteristic plant communities, ranging from pioneer sand species on exposed sand, through steppe and pasture-steppe communities, to forest-steppe communities and various forms of forest communities. The flora of Deliblatska peščara consists of about 900 species. The autochthonous trees include: oak, linden (*Tilia parvifolia*), poplars, juniper (*Juniperus communis*), hawthorn (*Crategus monogyna*), purple fringe (*Cotinus coggygria*), spruce and the like, while the brought-in species include locust-tree (*Robinia pseudoacacia*), Baltic pine (*Pinus silvestris*) and black pine (*Pinus nigra*).

Due to its specific geologic structure and refugian features, the Djerdap Gorge is an extremely important center of plant diversity, especially dendroflora. The Djerdap flora comprises over 900 species of vascular flora and over 30 relict forest ecosystems, occurring most often in various combinations: beech, oak, ash (*Fraxinus ornus*), linden, walnut (*Juglausregia*), bastard elm (*Celtis australis*), blue ash (*Syringa vulgaris*), Montpellier maple (*Acer monsspensulanum*), purple fringe *(*Corylus colurna*)*, etc.

Protected Natural Resources in the Danube River Basin

In the Danube river basin, in the territory of the FR of Yugoslavia, there are 390 protected natural resources, covering an area of 634,815 ha, which accounts for about 7.14% of the river basin area. They include: 6 national parks, 64 nature reserves, 19 nature parks, 6 areas with specific features, 234 natural landmarks and 59 protected areas around stationary cultural landmarks.

Due to their extraordinary value, some of these natural resources in the Danube river basin have been proclaimed biosphere reserves and the world's natural heritage (UNESCO) or the areas protected under the Ramsar Convention, while other ones have been nominated for such status. The list of the proclaimed natural resources and the natural resources nominated for international status is given in Annex A-1.

Among the natural resources located on the Danube and its banks, whose area is over 1,000 ha, mention should be made of the following: national parks (Fruška Gora and Djerdap), nature reserves (Koviljsko-Petrovaradinski rit, Karadjordjevo, Deliblatska peščara) and nature parks (Gornje Podunavlje and Tikvara). These seven natural resources on the banks of the Danube extend over an area of 142,376 ha.

In the course of 1998, another 2 regions of special natural value on the Danube and its banks will be placed under protection:

1. Veliko ratno ostrvo and Malo ratno ostrvo (islands) near Belgrade and
2. Radujevac (17.5 km of the course of the Danube, from Djerdap II Hydro-electric Power Plant to the Bulgarian state border), as the only remaining spawning grounds of the Acipenseridae (which come from the Black Sea) in the territory of the FR of Yugoslavia.

The survey of natural resources having an area of over 1,000 ha, including their location, is given in a tabular form in Annex A-2, while the summary of natural resources by category, whose area is below 1,000 ha, is given in Annex A-3.

The Physical Plan of the Republic of Serbia anticipates the areas that will be placed under protection as natural resources up to 2010. Here mention should be made of the following larger complexes: Kučaj Mts with an area of c. 120,000 ha, Valjevo Mts with an area of c. 50,000 ha, Zlatar-Jadovnik Mts with an area of c. 40,000 ha, Mt Suva Planina with an area of c. 20,000 ha, Mt Golija with area of c. 80,000 ha, Zlatibor mountain with an area of c. 15,000 ha, as well as mountains ; Jastrebac, Rtanj, Deli Jovan, Goč-Željin-Stolovi.

The Physical Plan of the Republic of Montenegro anticipates the areas that will be placed under protection as natural resources in the coming period. Here mention should be made of the following larger areas: Prokletije of c. 14,000 ha, Mt Komovi of c. 21,000 ha, Mt Sinjajevina of c. 42,000 ha, Mts Maglić, Bioč and Volujak of c. 7,200 ha, Mt Ljubišnja of c. 7,800 ha and Mt Turjak of c. 14,600 ha, as well as Mts Visitor and Pridvorica of c. 34,800 ha.

As can be seen, it is a question of the mountain ranges which are situated in the Danube river basin but are distant from its main course. In the Danube river basin, the area of c. 550,000 ha will be put under protection, so that the total protected area will be over 1,150,000 ha, or about 13,1% of the total area of the Danube river basin in the FRY.

According to the Physical Plan of the Republic of Serbia up to 2021, it is expected that the protected areas of a special natural value will constitute more than 15% of the total area of the Danube river basin, while special attention will be devoted to the conservation of the watercourses and riparian zones (wetlands, swampy areas, natural lakes and ponds).

The map given in Annex A-4 shows all major natural resources in the Danube river basin which are protected or will be placed under protection in the coming period.

2.3. Human Impact

The valleys of the Danube, Sava, Morava and Tisa are the most densely populated regions in the FR of Yugoslavia and the regions with the most developed industry and energy supply. The major traffic and energy supply corridors also pass through them. In addition, all major cities lie on the banks of the Danube and its tributaries. All this brought about, and is still bringing about, great changes in the aquatic and riparian eco-systems in the area.

These changes are especially reflected in the deteriorating quality of river water, inadequacy of this water for domestic water supply, reduction of floodable regions, draining of marshes and swamps, worsening living conditions and degradation of the habitats of numerous plant and animal species, not to mention the reduction of fish population, extinction of some species and the emergence of new ones.

With the construction of the hydro-electric power plants on the Danube, the traditional pass of the Acipenseridae to the spawning grounds in the Djerdap Gorge has been cut, thus endangering the survival of these species.

Changes in Ichtyofauna in the Djerdap Region

The construction of the Djerdap I dam in 1971 brought about the formation of back water, stretching up to Novi Sad in the periods of low flow. In 1984, downstream from this dam, the Djerdap II dam was constructed. A change in the Danube water regime, caused by the construction of these dams, exerted a special influence on changes in ichthyofauna in the Djerdap region. Under the natural conditions, prevailing before the construction of the hydro-electric power system, there were 61 fish species from 13 families in the Danube, in the Djerdap region; today, however, the ichthyiofauna of Djerdap consists of 57 species from 13 families.

With the construction of the hydro-electric power system on the Danube, the pass of the Acipenseridae and herrings, coming from the Black Sea to the Danube for spawning, has been obstructed. Thus the spawning grounds of these rare and greatly endangered fish species are confined to the section of the Danube from the Djerdap II dam to the Yugoslav-Bulgarian state border, in the length of 17 km.

In the region of Djerdap, the following species of fishes are extinct:

Huso huso -great sturgeon
Acipenser nudiventris - bastard
Acipenser ruthenus - sterlet
Acipenser guldenstaedti colchicus
Acipenser sturio - *sturgeon*
Acipenser stellatus - starred sturgeon
Alosa pontica - black sea shad
Alosa caspia nordmani - caspian shad
Umbra krameri - mud minnow

and the following ones have appeared:

Ctenopharyngodon idella - grasscarp
Pseudorasbora parva - stone moroco
Hypophthalmichthys molitrix - silver carp
Arisththys nobilis - bighead
Mesogobius gymnotrachelus - caspian goad goby

To protect the endangered Acipenseridae, the fishing of these species should be reduced and put under strict control in the region of Radujevac (17 km of the course of the Danube, from Djerdap II to the Yugoslav-Bulgarian state border).

2.4. Key Issues of Environmental Degradation

The following factors have the greatest impact on the pollution of the Danube and degradation of its banks. They are listed with no regard to their order of significance:

- Untreated industrial wastewater from the industrial centers on its banks and especially from the industries of Novi Sad, Belgrade, Pančevo, Kovin, Smederevo and Prahovo.
- Municipal wastewater or effluents from the cities and settlements along the Danube: Apatin, Bačka Palanka, Novi Sad, Belgrade, Pančevo, Smederevo, Kovin, Golubac, Donji Milanovac, to Kladovo and Negotin.
- Drainage water from agricultural land polluted by agrochemicals which are specially used in Vojvodina.
- On the banks of the Danube and its tributaries, there is a great number of waste landfills and trash dumps which contain solid municipal waste and, not rarely, industrial waste.
- Surface and underground mining of mineral resources: marl, stone, gravel, sand, coal and other mineral raw materials, which significantly affect the eco-systems along the banks of the Danube and its course.
- The anthropogenic change of autochthonous eco-systems such as: draining and reclamation of marshes and swamps along the Danube (e.g. Bačko-Monoštorski rit, Negotinski rit – reclaimed c. 9,000 ha, or the Euro-American poplar plantations in Gornje Podunavlje, Tikvara, Koviljsko-Petrovaradinski rit, Belegiš, Pančevački rit).
- An insufficient number and inadequate equipping of inspection authorities, overlapping of the competencies of the inspection authorities and institutions, as well as the obsoleteness and ambiguity of some regulations.
- A chronic shortage of funds for environmental protection and specially for water protection control (quality monitoring, change of technology in the most critical industries, erection of municipal and industrial wastewater treatment plants).

3. Analysis and Projections of the Population and Water Sector: Relevant Demographic Characteristics

When speaking about the population living in the FR of Yugoslavia at present, we should always keep in mind the following facts:

The last census was conducted in 1991, but it was not quite successful, because most Albanians did not participate in it as they did not in previous Census in 1981. Thus, for Kosmet and some municipalities in southern Serbia it is possible only to make estimates, based on the 1981 census and the available, relatively reliable demographic data on the number of live-born infants and deceased in the region of Kosmet.

In the meantime, the former Yugoslavia disintegrated and there was a civil war in Croatia and Bosnia-Herzegovina which caused significant migrations from the war-ridden regions FRY. The migrations of members of other nationalities from the FRY to the newly formed mother countries were much less significant than the migrations of the Serbian and Montenegrin population, and members of other nationalities to FRY.

The precise number of the refugees who sought refuge in the FR of Yugoslavia is not known but, according to the estimates of the Committee for Refugees, the UNHCR, the Red Cross, etc., it ranges from 450,000 to 750,000 and includes all age groups. It is also unknown how many refugees will return to the regions from which they fled, and how many will remain to live in the FR of Yugoslavia and where. Some of these refugees immigrate into the developed countries, but there are also no precise data on their number.

In the period 1992-1994, due to the civil war in the neighbourhood and an extremely difficult economic situation, a considerable number (the exact one is unknown) of young, able-bodied and mostly highly educated people left the country, which affected the composition of population and which will also exert influence on the population trends in the future. It is impossible to estimate as to whether, when and how many of these persons will return to the FR of Yugoslavia.

During the last decade, the FR of Yugoslavia (excluding Kosmet) recorded a decrease in fertility; this trend is especially pronounced in Vojvodina.

The water to be used for domestic water supply and water supply in general is abstracted mostly (70%) from underground aquifers (including the alluvion) and to a much lesser degree from the watercourses and impounding reservoirs. In 1991, the total quantity of water abstracted for water supply from all sources amounted to about 964 x (10^6 m^3/year).

3.1. Present Situation

Due to the above mentioned reasons, the estimated number of inhabitants in 1997 is not given, since it is possible to make a big mistake; instead, only the official data based on the 1991 census are provided. The data on the sources of water supply and the quantities of abstracted and discharged water in that period were also used so as to enable the relevant comparisons and correlation of the data.

3.1.1. Population

Until the 1970s, the FR of Yugoslavia was a distinctly agricultural country dominated by rural population. Migrations from rural areas to larger industrial, administrative, educational and cultural centers began only with a more intensive urbanization and industrialization. According to the 1991 census, the FR Yugoslavia had 10,394,026 inhabitants, of whom 5,211,289 in urban settlements and 5,011,513 in rural settlements. In other words, 51.9% of the total population lived in cities and this was the first time that the size of urban population exceeded that of rural population.

The population density in the FR of Yugoslavia is 101.7 inhabitants per km^2 which is almost identical to the average population density in the Danube river basin - 101.4 inhabitants per km^2. In the settlement structure, cities accounted for 4.7% of the total number of settlements, villages for 70.8% and mixed settlements for 24.5%. There was a total of 2,871,278 households with 3.62 members per household on the average.

In 1996, life expectancy at birth was 69.9 years for men and 74.7 years for women, or 72.2 years on the average. That same year, the average age of population was 36.1 years (35.1 for men and 37.0 for women). The population aging index was 61.5% altogether and differed significantly by sex (53.7 for men and 69.7 for women).

The population in the Danube river basin constituted 86.7% of the total population of the FR of Yugoslavia, while the ratio of rural to urban population remained the same as in other parts of the country, outside the Danube river basin.

The overview of urban and rural population, based on the last census, by catchment area and in the FR of Yugoslavia as a whole is given in the following table:

Table 3.1.1.1. Population based on the 1991 census by catchment area and by type of settlement

Area – Catchment	Population (total)	Urban population	Rural population
FR Yugoslavia	10,322,902	5,311,389	5,011,513
Danube (total)	9,016,347	4,693,730	4,322,617
Tisa	809,755	466,764	342,991
Tamiš	41,338	8,321	33,017
Sava	1,354,592	475,341	879,251
V. Morava	4,018,047	1,763,708	2,254,339
Timok	229,350	112,956	116,394
Mlava	95,123	7,728	87,395
Pek	60,552	16,606	43,946
Danube corridor	2,407,590	1,842,306	565,284

The table shows that rural population dominates in the catchment areas of the Sava, Morava, Tamiš, Mlava and Pek, practically in central Serbia, Kosmet and a smaller part of Vojvodina. In the catchment area of the Timok (eastern Serbia), there is an equal number of urban and rural population, while only in the catchment area of the Tisa (central Vojvodina) and in the Danube corridor, urban population is distinctly dominant.

On the banks of the Danube there are 46 rural and urban settlements with 1,688,560 inhabitants (according to the 1991 census). The cities, including Belgrade, had 1,599,358 inhabitants, while the villages only 89,202 inhabitants. The significance of the Danube for the FRY and the urban development of its banks are clearly shown by the fact that every sixth inhabitant of the FR of Yugoslavia lives on the banks of the Danube. In other words, 30.1% of the total urban population of the FR of Yugoslavia lives in the cities on the Danube. Enclosed (Annexes) with this analysis is the list of settlements located on the banks of the Danube with the number of inhabitants in 1991, as well as projections of population for 2001, 2011 and 2021.

The map given in Annex A-8 presents all major settlements in the Danube river basin.

3.1.2. Area

The FR of Yugoslavia stretches between 41° 50 – 46°11 N and 18°26 – 23°00 E and covers an area of 102,173 km^2. It is administratively divided into two republics (Serbia and Montenegro) and within the Republic of Serbia there are two provinces: Vojvodina and Kosovo and Metohija. The FR of Yugoslavia has 210 municipalities (see Map A-8) of which the Republic of Serbia has 189, which are grouped into 29 districts, while the Republic of Montenegro has 21 municipalities, but they have not yet been grouped into districts. In the FR of Yugoslavia there are 7,394 settlements of which only 233 are urban. The areas of territorial units are shown in the following table:

Table 3.1.2.1. Areas of major administrative units

Administrative unit	Area (km^2)
FR Yugoslavia	102,173
Republic of Serbia	88,361
A.P. Vojvodina	21,506
A.P. Kosovo and Metohija	10,887
Central Serbia	55,968
Republic of Montenegro	13,812

The FR of Yugoslavia is predominantly a hilly-mountainous country, so that 63.3% of its territory belongs to this type of terrain. Nevertheless, the area of 63,190 km^2 (61.8% of the total area) is suitable for agricultural production. About 29.2% of the area of the Danube river basin is wooded, but the percent of wooded area decreases going from the South to the North.

The northern part of the country comprises a part of the Pannonian plain which is intersected by numerous watercourses (Tisa, Tamiš, Begej, Krivaja, Čik), canals of the Danube-Tisa-Danube (DTD) system, ponds and stagnant tributaries. Along all these rivers and canals there are embankments which protect the surrounding low-lying areas from flood and which considerably reduced the area of floodable and marshy areas and their role in the process of water self-purification.

A similar situation is in the valleys of larger rivers in central Serbia, where all major cities and significant industrial plants are located in the potentially floodable areas, which calls for the construction of embankments for flood control. The following table shows the length of embankments by catchment area and by river.

The length of these embankments, shown in the table, and their further construction point to the size and significance of the protected area, as well as to the fact that numerous inundation regions have been irreversibly lost. The map given in Annex A-9 shows all embankments in Danube catchment area.

Table 3.1.2.2. Embankments in the Danube river basin

River or catchment	Length of embankments (km)
river Danube	414.17
river Tisa	268.99
river Tamiš	118.80
remaining rivers in Vojvodina	367.64
channels of DTD system	231.00
Mlava and Pek catchment	108.90
Timok catcment	87.88
Sava catchment	771.00
Morava catchment	1,181.96
TOTAL	3,550.34

The Republic of Montenegro, western and eastern parts of the Republic of Serbia and part of Kosmet are hilly-mountainous regions with torrential watercourses so that, in addition to the construction of embankments, it was also undertaken to construct numerous multi-purpose reservoirs (flood control, water supply, increasing of low flow, irrigation, etc.). So far, within the Danube River Basin in FRY more than 130 of such reservoirs have been constructed. The catchment areas are clearly defined, except in the part of Vojvodina covered by the DTD canal system due to the specific mode of operation and the transfer of water from one catchment area to another, as required. The following table (see also Fig. A-7) shows the catchment areas of the Danube and its direct tributaries in the FRY and the population density in these regions.

Table 3.1.2.3. Population density by catchment area

Area – Catcment	Area (km^2)	Density (inhabitants per km^2)
Danube (total in FRY)	88,919	101.4
Tisa	8,994	90.0
Tamiš	1,107	37.3 (100.6)
Sava	31,046	43.6 (64.6)
Morava	37,269	107.8
Mlava	1,886	50.4
Pek	1,233	49.1
Timok	4,215	54.4
Danube corridor	3,169	759.7 (466,3)

The figures for the catchment areas of Tamiš, Sava and the direct catchment area of the Danube are given alternately, whereby those in the parentheses give the real population distribution. An extremely high population density in the direct catchment area of the Danube, i.e. in the Danube corridor, is artificial since City of Belgrade is located at the confluence of the Sava and Danube, and Pančevo town at the confluence of the Tamiš and Danube and, as agreed, the entire population of these two cities has been included in the Danube corridor following the sewage orientation. This led to the "depopulation" of the catchment areas of the Sava and Tamiš by about 650,000 and about 70,000 inhabitants respectively.

Central Serbia (the catchment area of the Velika Morava) and Vojvodina (the catchment areas of the Tisa and Tamiš) have a rather uniform population density, which is close to the average for the Danube river basin, while the Danube corridor distinguishes itself as the most densely populated part of the FR of Yugoslavia.

The actual population density in the catchment area of the Sava is 64.6 inhabitants/km^2, which is much below the average for the Danube river basin, but one must bear in mind that one part of the area (the upper course of the Drina river) is extremely rarely populated. In the catchment area of the Tamiš, including Pančevo, the population density reaches 100.6 inhabitants/km^2, which is about the average for the entire Danube river basin. The Danube corridor is the most densely populated part of the FR of Yugoslavia, but the actual population density following the population distribution (not sewage orientation) is not 759.7 inhabitants/km^2, but 466.3 inhabitants/km^2.

The lowest population density is recorded in eastern Serbia, in the catchment areas of the Mlava, Pek and Timok, since those are mostly hilly-mountainous regions, with low-productivity land, which is mostly wooded, and the only more significant arable land is located in the valley of these rivers.

3.1.3. Per Capita Income

Like in most countries, GNP differs significantly across the regions, depending on the level of industrial development and agricultural production. The north of the country (Vojvodina) is much more developed than the south (Kosmet) and south-west (Montenegro) part of Danube Basin.

Since the disintegration of the former Yugoslavia and the imposition of sanctions against the FR of Yugoslavia by the UN Security Council, a dramatic fall in output has been recorded in all economic sectors, including agriculture, but the hardest hit is industrial production. In the FRY, many enterprises stopped operating or reduced their activities to a minimum, which brought about an abrupt and dramatic fall in GNP. To gain a better insight into the global adverse effect of sanctions and the discontinuation of trade with the former Yugoslav republics, the following table shows the movement of total GNP (in US$ million) in the years before the sanctions, during the sanctions and after their formal lifting.

Table 3.1.3.1. Total GNP expressed in US$ 10^6

Year	1990	1991	1992	1993	1994	1995	1996	1997
FR Yugoslavia	28,390	25,754	18,696	13,169	13,862	14,681	15,548	16,699
R. of Montenegro	1,436	1,316	1,013	655	682	778	994	1,067
R. of Serbia	26,954	24,483	17,683	12,514	13,180	13,903	14,554	15,632
Vojvodina	8,367	7,814	5,562	3,832	4,001	4,248	4,497	4,831
Kosmet	1,400	1,280	963	737	757	816	999	954
Central Serbia	17,187	15,344	11,158	7,945	8,422	8,839	9,169	9,847

It is estimated that – should the current upward trend be continued - the 1990 GNP will be achieved only around 2005. The growth rate of GNP will depend on the pace of economic restructuring, the inflow of foreign capital (through credits and direct investments), ownership transformation and consolidation of the banking system.

In the FR of Yugoslavia, GNP is reported by territorial organization, that is, at the level of the republic, province, district and municipality, and not by catchment area, so that it is difficult to determine GNP by tributary of the Danube precisely. Thus, only an estimate can be given.

Average Per Capita Income

According to the data provided by the Federal Bureau for Development and Economic Policy, per capita GDP (social product) in the FR of Yugoslavia (in US$) for the period 1990-1997 is shown in the following table:

Table 3.1.3.2. Per capita GNP by administrative unit

Year	1990	1991	1992	1993	1994	1995	1996	1997
FR Yugoslavia	2,696	2,474	1,789	1,256	1,318	1,392	1,471	1,576
R. of Serbia	2,727	2,496	1,800	1,270	1,333	1,403	1,465	1,570
Vojvodina	4,083	3,882	2,771	1,915	2,005	2,134	2,267	2,445
Kosmet	705	650	480	361	364	386	413	436
Central Serbia	2,938	2,641	1,920	1,367	1,450	1,522	1,581	1,701
R. of Montenegro	2,230	2,136	1,629	1,045	1,081	1,225	1,553	1,659

The estimate of per capita GNP by catchment area is only tentative, since the relevant statistical data are not collected and processed by catchment area. According to the expert estimate, GNP in the Danube river basin amounts to about US$ 1,720, whereby one should bear in mind that it refers to the whole of Vojvodina, central Serbia, part of Montenegro and part of Kosmet (c. 50%).

In the catchment areas of the Tisa and Tamiš, GNP corresponds approximately to that in Vojvodina (US$ 2,455), whereby in the catchment area of the Tisa it is higher by US$ 50 due to its developed industry, while in the catchment area of the Tamiš, as a distinctly agricultural region, it is about US$ 90 below the average in the Vojvodina Province.

The catchment area of the Velika Morava covers central Serbia and a part of Kosmet and its GNP is estimated at about US$ 1,350. Per capita GNP in Kosmet is very low due to high population growth rate as well as a large number of enterprises does not operate or operates at much reduced capacity. Also, considerable part of economic activities is carried out within the “grey economy”.

It is estimated that GNP in the catchment area of the Sava, which includes a part of Vojvodina, part of Montenegro and the western part of central Serbia, amounts to US$ 1,760.

The catchment areas of the Mlava and Pek are very small and cover mostly underdeveloped municipalities, except Majdanpek, so that, according to the expert estimate, GNP in the catchment area of the Mlava does not exceed US$ 1,200, while in the catchment area of the Pek it is at the level of the republican average, about US$ 1,580.

In the catchment area of the Timok there is, among other settlements, the town of Bor with its large mining and industrial complex so that, according to the expert estimate, its GNP is US$ 1,800.

Minimum Monthly Wage

Economic recovery, after the formal lifting of sanctions, is progressing at a slow pace, which is also reflected in non-economic activities, so that the monthly receipts of the employed in this sector are very low. In 1997, the average monthly wage in the FR of Yugoslavia was only US$ 136.4, whereas the guaranteed minimum wage was only US$ 35.7. The official exchange rate of the dinar per US$ 1 for the past 8 years is shown in the following table:

Table 3.1.3.3. The average exchange rate of the dollar in 1990-1997

Year	1990	1991	1992	1993	1994	1995	1996	1997
Av. exch. rate of 1 US $	1.438	3.578	379.521	-	1.740	3.009	4.970	5.889

Due to extreme hyperinflation and multiple denomination in the course of 1993, it was not possible nor sensible to show the average exchange rate of the dollar for that year.

3.1.4. Domestic Water Demand

To meet the current water demands of households and a part of industry located within the cities, the quantity of 86.7 x 10^6 m^3/year is abstracted directly from the watercourse, 163.5 x 10^6 m^3/year from impounding reservoirs and 386.6 x 10^6 m^3/year from the alluvion. Water volume abstracted from other sources (karst, neogene and fracture aquifers, as well as the basic water-bearing stratum in Vojvodina) was 325.2 x 10^6 m^3/year. Water from the watercourse is also used for infiltration, i.e. the replenishment of certain ground-water sources, but there are no reliable data on the abstracted quantities.

In fact, about 71% of abstracted water for water supply depends to a significant extent, whether directly or indirectly, on surface water quality.

Statistical data for the entire territory of the FR of Yugoslavia for 1997 are still unavailable. Relevant research caried out in specified regions in the Republic of Serbia shows that water consumption rose by about 17% as compared to 1991, for which there are reliable data. In the Republic of Montenegro a more significant research on domestic water supply was conducted in 1995.

Within this analysis, an estimate of domestic water demand was also made. It was based on the size of the population in the FR of Yugoslavia, in the Danube river basin and by catchment area. The total loss of water from the water supply system is estimated at 30% of supplied water. The following table shows domestic water demands in 1991, based on the above mentioned research.

Table 3.1.4.1. Domestic water demands by catchment area (10^6 m^3/year)

Area - catchment	Urban	Rural	Total
FR Yugoslavia	440	120,5	560,5
Danube (total in FRY)	399	103,5	502,5
Sava River	41	20	61
Velika Morava River	160	57	217
Mlava River	1	1,5	2,5
Pek River	2	1	3
Timok River	10	2,5	12,5
Tisa River	40	8	48
Tamiš River	1	0,5	1,5
Danube Corridor	144	13	157

Numbers presented in previous table show the total volume of impounded water as well as the total volume of water delivered (estimated 30% of water loss is included) for water supply (households, public enterprises and institutions, commerce, etc.) trough central water supply systems (CWSS) or trough other sources for water supply (OWSS).

It should be noted that the cities, which dispose of large quantities of drinking water, use this water for purposes other than designated (garden watering, street washing, etc.), while other cities, during the critical summer months, have water restrictions, due mostly to insufficient water quantities in the source area. The data also point to very heavy losses of water from a large number of water supply systems.

The number of inhabitants and percent of population supplying trough central water supply systems and trough other sources for water supply, are presented by relevant catchment areas in the next table. It has to be point out that accuracy of data is $\pm$ 5%.

Table 3.1.4.2. Urban Population (in thousands) supplying from Central Water Supply Systems (CWSS) and through Other Water Supply Sources (OWSS)

Area – catchment	CWSS		OWSS		Total	
	number	%	number	%	number	%
FR Yugoslavia	4,375	83	936	17	5.311	100
Danube (total in FRY)	3.996	85	699	15	4.695	100
Sava River	423	89	52	11	475	100
Velika Morava River	1440	82	323	18	1.763	100
Mlava River	6	78	1,7	22	7,7	100
Pek River	15	90	1,6	10	16,6	100
Timok River	104	93	8	7	113	100
Tisa River	350	75	116	25	466	100
Tamiš River	8	96	0,3	4	8,3	100
Danube Corridor	1640	89	202	11	1.842	100

Annual Water Demand of Urban Population already connected to the Central Water Supply Systems in FRY is 407 million m^3, while in Danube catchment area it is 372 million m^3. Average specific water demand in FRY as well as in the Danube catchment area ranges from 250 to 260 l/cap./d.

Water Consumption of urban population in FRY and Danube catchment area is 279.5 million m^3 and 255 million m^3 respectively. Average specific Water Consumption in FRY as well as in the Danube catchment area ranges from 170 to 180 l/cap./d.

Water Demand of Urban Population connected to the Other Water Supply Sources is 27 million m^3 in Danube catchment area while it is 35.5 million m^3 in FRY. Total Water Consumption is 19 million m^3 within Danube catchment area while it is 25.5 million m^3 in FRY. Average specific Water Demand for this part of at whole population is 105 l/cap./d, while average specific Water Consumption reaches 75 l/cap./d.

Table 3.1.4.3. Rural Population (in thousands) supplying from Central Water Supply Systems (CWSS)* and through Other Water Supply Sources (OWSS)

Area - catchment	CWSS		OWSS		Total	
	number	%	number	%	number	%
FR Yugoslavia	2.469	49	2.542	51	5.011	100
Danube (total in FRY)	2.215	52	2.036	48	4.251	100
Sava River	360	41	519	59	879	100
Velika Morava River	1.026	46	1.228	54	2.254	100
Mlava River	27	31	60	69	87	100
Pek River	18	41	26	59	44	100
Timok River	78	67	38	33	116	100
Tisa River	206	60	137	40	343	100
Tamiš River	20	61	13	39	33	100
Danube Corridor	480	85	85	15	565	100

**In this case the term "Central Water Supply System" relates to the small local water supply systems supplying (usually by groundwater) more than 5 households as there aren't larger central water supply systems in given settlement. Most of these small local water supply systems are supplied with equipment for chlorination. Its are usually built by users. Water is free of charge so there is no reliable evidence of water consumption.*

It is estimated (on the base of capacities of these small local water supply systems) that specific Water Demand ranges from 100 to 110 l/cap./d while Water Consumption ranges from 75 to 80 l/cap./d (the average water loss in distribution systems is 25%).

Total Annual Water Demand of rural population connected to the other water supply sources is estimated to be 85 million m^3 and 94 million m^3 in Danube catchment area and FRY respectively. Corresponding Annual Water Consumption is 60.5 million m^3 and 67.5 million m^3 in Danube catchment area and FRY respectively.

The lowest water consumption (20-40 l/cap./d) is observed in population where Other Water Supply Sources prevails (wells, Norton pumps, springs etc). Total Annual Water Demand of this part of at whole population is estimated to be 18.5 million m^3 and 25.5 million m^3 in Danube catchment area and FRY respectively. The total Water Consumption is estimated to be equal to total Water Demand assuming there is no loss of water in distribution.

The Total Annual Water Demand (urban and rural) is estimated to be 502.5 million m^3 and 560.5 million m^3 in Danube catchment area and FRY respectively. Corresponding Total Annual Water Consumption is estimated to be 353 million m^3 and 398 million m^3 in Danube catchment area and FRY respectively.

Due to a specific way in which the urban and rural settlements in Vojvodina were built, as well as due to the depth of aquifers from which water is abstracted, a high share of population in these settlements is connected to a public water supply system. Kosmet is dominated by construction without a plan; moreover, there is an extremely high percentage of illicitly built detached houses in suburbs in which there is no adequate utility infrastructure. In some towns in central Serbia and in Kosmet, the existing capacities of source areas do not produce sufficient quantities of water even for households which are connected to public water supply systems, let alone for new users.

Rural settlements in Kosmet and the hilly-mountainous part of Serbia are scattered, grouped into *mahale* and hamlets, so that the population is mostly supplied with water from individual sources (wells or water supply systems serving several houses), since it would be very expensive and difficult to organize a central water supply under such circumstances.

3.1.5. Domestic Wastewater Production

Domestic wastewater production has been estimated on the basis of the hitherto research and quantities of water used to meet domestic water consumption.

The wastewater quantities produced by catchment area are the greatest at Velika Morava watershed and the Danube corridor. Somewhat lower values are recorded in the catchment area of the Sava and Tisa, while in other catchment areas the values are similar but relatively low.

Table 3.1.5.1. Domestic wastewater production in 1991

Area - catchment	Wastewater (10^6 m^3/year)
FR Yugoslavia	323
Danube (total in FRY)	285
Sava River	36
Velika Morava River	130
Mlava River	1,5
Pek River	2
Timok River	7
Tisa River	24
Tamiš River	0.5
Danube Corridor	84

The construction of sewerage does not accompany the pace of water supply in cities, while in rural settlements it is practically nonexistent. A relatively small proportion of urban population is connected to the sewerage and such a state differs across the regions in FRY, depending on the time and degree of urbanization.

Table 3.1.5.2. Urban population (in thousands) connected to the Central Sewage Systems (CSS) and urban population (in thousands) using Other Option for Wastewater Disposal (OWD)

Area - catchment	CSS		OWD		Total	
	number	%	number	%	number	%
FR Yugoslavia	3,187	60	2,124	40	5,311	100
Danube (total in FRY)	2,977	63	1,718	37	4,695	100
Sava River	280	59	195	41	475	100
Velika Morava River	1.013	57	750	43	1.763	100
Mlava River	3	39	4.7	61	7.7	100
Pek River	9	54	7.6	46	16,6	100
Timok River	69	61	52	39	113	100
Tisa River	186	40	280	60	466	100
Tamiš River	3	36	5.3	64	8.3	100
Danube Corridor	1.334	73	508	27	1.842	100

The term “other options” in this case (i.e. for urban areas) means disposal of wastewater into septic tanks or into the ground (abandoned wells).

The domestic wastewater production of urban population connected to the central sewage systems is estimated to be 152 million m^3 and 163 million m^3 in Danube catchment area and FRY respectively.

Average specific domestic wastewater production is estimated to be 140 l/cap./d.

The annual domestic wastewater production of the part of urban population using other options for disposal of wastewater is estimated to be 67 million m^3 and 81 million m^3 for the Danube catchment area and for FRY respectively. The average domestic wastewater production is around 105 l/cap./d.

In general, there aren't sewage systems in villages. Wastewater is usually disposes into septic tanks or into the ground(abandoned wells). There aren't reliable data on water consumption in these settlements as well as on the wastewater production. It is roughly estimated that the annual domestic wastewater production in villages reaches 66.5 million m^3 and 78.5 million m^3 in Danube catchment area and in FRY respectively. The average specific domestic wastewater production is estimated to be 43 l/cap./d.

In the past, sewage disposal systems in towns were constructed according to the combined drainage system, while today they are constructed according to the separate drainage system. The length of the combined drainage system is about 2,050 km (this system is dominant in Vojvodina), the length of the sewage disposal system (separate system) is about 3,630 km, and the length of surface-water drainage system is 958 km. The separate drainage system is dominant in central Serbia, which accounts for 3/4 of such a system, that is, this type of sewerage in settlements.

Of the total population in Serbia, a relatively high share of urban and rural population uses septic tanks for domestic waste discharge. In most cases, those are permeable pits whose use brings about an intensive, especially microbiological, contamination of the first water-bearing stratum. This problem is especially acute in Vojvodina.

After the construction of a central water supply, a number of wells in rural settlements, throughout the Republic, was converted into septic tanks, which only decreases the degree of ground water contamination, because the pollutant is discharged directly into the water-bearing stratum.

Table 3.1.5.3. Share of total population which discharges WW into septic tanks

Area	% of population
Vojvodina	56.7
Central Serbia	33.2
Kosmet	13.8

Septic tanks are used mostly in Vojvodina, where they are the dominant method of wastewater disposal, since the geographic characteristics (flat land, the lack of an appropriate recipient) and the time when these settlements were built (a few hundred years ago) conditioned such a method of domestic wastewater discharge.

It must be noted that in the Republic of Serbia there are 9 small municipalities in which there is absolutely no sewerage, so that wastewater is discharged solely into septic tanks.

3.2. Projections for Planning Horizons 2010 and 2020

The projections of population trends, raw and drinking water demands, as well as the quantities of domestic wastewater discharge have been taken, with appropriate adjustments, from the Water Economics Plan the Republic of Serbia (draft) and the Water Economics Plan of the Republic of Montenegro (draft). Adjustments were needed because the Water Economics Plans are based on territorial units (municipalities, districts) which do not coincide with the catchment areas.

3.2.1. Population

The projections of population in the settlements of the FR of Yugoslavia and the Danube river basin are based on the projections of population in municipalities by type of settlement up to 2021. Thereafter, it was assumed that the share of population in the settlements in the Danube river basin up to 2021 would be identical to the share of each settlement in the total urban population (if it is the question of a town) or total rural population (if it is the question of a village) of a municipality at the time of the 1991 census.

In advancing hypotheses, it was proceeded from the assumption that fertility would continue to decline. To a greater o lesser degree, such a trend has been recorded in the entire Yugoslav territory over the past 3-4 decades.

The projection of urban and rural population by catchment area and in the FR of Yugoslavia as a whole for 2011 is given in the following table.

Table 3.2.1.1. Population based on the projection for 2011 by catchment area and type of settlement

Area – catchment	Population (total)	Urban population	Rural population
FR Yugoslavia	10,766,201	6,514,407	4,251,794
Danube (total in FRY)	8,995,523	5,513,109	3,482,414
Sava River	1,287,494	594,394	693,100
Velika Morava River	4,209,955	2,331,163	1,878,792
Mlava River	77,323	10,019	67,304
Pek River	53,959	20,711	33,248
Timok River	196,374	128,582	67,792
Tisa River	729,076	476,951	252,125
Tamiš River	36,218	9,346	26,872
Danube Corridor	2,405,124	1,941,943	463,181

It is expected that the population in the territory of the FR of Yugoslavia will increase by about 430,000 people. However, this increase will not be achieved in the Danube river basin, but in the regions within the catchment areas of the Adriatic and Aegean Seas. In the Danube river basin, the size of the population will remain the same, i.e. a slight decline is expected by, say, 20,000. Only in the catchment of the Morava, the population will increase by 200,000, since it also includes a part of Kosmet, while in all other catchment areas a more or less pronounced depopulation is expected.

Due to migrations from rural areas to towns, urban population will increase in the entire Danube river basin by about 820,000 people or, in other words, the share of people living in towns will reach 61.2%. At the same time, rural population will decrease, especially in the hilly-mountainous regions of the Republic of Serbia.

It is anticipated that the highest percentage decline of rural population will be recorded in central Serbia, in the catchment area of the Timok - 42.2%, while in the catchment areas of the Pek and Mlava will be somewhat lower - 25.7% and 22.4% respectively. In Vojvodina, depopulation will especially continue in the catchment area of the Tisa, both due to migrations from villages to towns, as well as due to a significant decrease in natural population increment. Rural population in the area of the catchment area of the Tisa will be reduced by about 26.5%. It is held that the outflow will be especially pronounced in small rural settlements, so that one part of them in eastern Serbia will die out.

Thus, the fertility rate by 2021 in the Danube municipalities, located in the territory of Vojvodina, would be 1.35 children per woman on the average, in Central Serbia 1.4, in Kosovo and Metohija 2.23 and in Montenegro 1.65.

As for mortality, it has been assumed that a period of stagnation with respect to life expectancy (between 1991 and 2001) will be followed by the period of a slow decrease in mortality by age group.

In general, migrations would tend mostly towards Vojvodina and Central Serbia, so that these regions will become immigration ones once again (in the period 1981-1991, they had a negative migration balance), while the population of the municipalities in Montenegro and Kosovo and Metohija forming part of the Danube river basin would remain to be emigrant one. The projection of urban and rural populations by catchment area and in the FR of Yugoslavia as a whole for 2021 is given in the following table:

Table 3.2.1.2. Projection of the population for 2021 by catchment area and by type of settlement

Area – catchment	Population (total)	Urban population	Rural population
FR Yugoslavia	10,736,908	7,097,647	3,639,261
Danube (total in FRY)	8,781,610	5,879,675	2,891,935
Sava River	1,219,023	641,496	567,527
Velika Morava River	4,197,060	2,591,005	1,606,055
Mlava River	68,678	12,339	56,339
Pek River	49,661	22,247	27,414
Timok River	180,125	129,875	50,250
Tisa River	687,215	488,925	198,290
Tamiš River	33,833	10,857	22,976
Danube Corridor	2,346,015	1,982,931	363,084

The provision of the anticipated preconditions would lead to a moderate depopulation in the catchment of the Danube, so that in 2021 the population would be reduced by about 250,000 persons as compared to 1991 (it would decrease from 9,016,000 to 8,782,000). Depopulation trends would be recorded in the catchment areas of all tributaries of the Danube, so that at the end of the projection period the population would decrease at all places as compared to the 1991 census. The only exception would be the catchment area of the Morava, where the population would increase as compared to the size in 1991. However, this region would also record a decrease in its population, but only after 2010. Such trend would be the result of a relatively intensive growth of the population in the settlements in the catchment area of the Morava, in the territory of Kosovo and Metohija; in the period 1991-2021, this population would increase by nearly 45% (from 1,004,000 to 1,442,000). In the other part of the catchment area of the Morava, depopulation trends would also be recorded.

The statement about a decline of the population refers exclusively to rural population, while urban population would be continuously increasing. Whereas in 1991, 4.7 million or 52% of the total population of the Danube river basin lived in cities, in 2021, according projections, nearly 5.9 million people or 67% of the total population of this region would live in cities. At the same time, the number of inhabitants of other settlements would decline from 4.3 to 2.8 million.

3.2.2. Domestic Water Demand

Bearing in mind an increase in the living standards of the population, both in rural and urban households, it is estimated that the total volume of imponded water will increase significantly. The survey of estimated domestic water demands is given in the following table.

Table 3.2.2.1. Estimated domestic water demands in 2010 (10^6 m^3/year)

Area - catchment	Urban	Rural	Total
FR Yugoslavia	625	203	828
Danube (total in FRY)	522	178	700
Sava River	56	37	93
Velika Morava River	218	93	311
Mlava River	1	3	4
Pek River	2	2	4
Timok River	12	4	16
Tisa River	45	14	59
Tamiš River	1	2	3
Danube Corridor	188	23	211

However, if one bears in mind depopulation processes and reduced losses of water in the network, it is projected that total water demands will not increase in some catchment areas, especially not in rural areas.

The urban population, number and percentage, planed to be supplied trough central water supply systems and trough other sources for water supply, are all presented by relevant catchment areas in the table as follows.

Table 3.2.2.2. Urban population (in thousands) planned to be connected to the Central Water Supply Systems (CWSS) and urban population (in thousands) planned to be supplied from Other Water Supply Sources (OWSS) in the horizon 2010

Area – catchment	CWSS		OWSS		Total	
	number	%	number	%	number	%
FR Yugoslavia	5.667	87	936	17	6.514	100
Danube (total in FRY)	4.933.7	89.5	619.3	10,5	5.513	100
Sava River	552	93	52	11	594	100
Velika Morava River	2028	87	303	13	2.331	100
Mlava River	8	82	2	18	10	100
Pek River	19	93	2	7	21	100
Timok River	116	95	13	5	129	100
Tisa River	396	83	81	25	477	100
Tamiš River	8.7	97	0.3	3	9	100
Danube Corridor	1.806	93	136	7	1.942	100

It is estimated that the total Water Demand of Urban Population planned to be supplied from the Central Water Supply Systems (CWSS) in the horizon 2010 would be 495 million m^3 and 569 million m^3 in Danube catchment area and FRY respectively. Corresponding Water Consumption would be 369 million m^3 and 424 million m^3 in Danube catchment area and FRY respectively.

Average specific Water Demand and specific Water Consumption would be 275 l/cap./d and 205 l/cap./d respectively. The water loss in distribution is estimated to be 25%.

It is estimated that Total Water Demand of Urban Population which will be supplied trough other water supply sources (OWSS) in the horizon 2010 would be 36.5 million m^3 and 55.5 million m^3 in Danube catchment area and FRY respectively. Corresponding Water Consumption would be 29.4 million m^3 and 44.4 million m^3 in Danube catchment area and FRY respectively.

Average specific Water Demand and specific Water Consumption will be 162 l/cap./d and 130 l/cap./d respectively. It is estimated that water loss in distribution would be 20%.

Table 3.2.2.3. Rural Population (in thousands) planned to be supplied from Central Water Supply Systems (CWSS)* and rural population (in thousands) which will use Other Water Supply Sources (OWSS) in 2010

Area – catchment	CWSS		OWSS		Total	
	number	%	number	%	number	%
FR Yugoslavia	2,168	51	2,084	49	4,252	100
Danube (total in FRY)	2,013	58	1,469	42	3,482	100
Sava River	325	47	368	53	693	100
Velika Morava River	977	52	902	48	1,879	100
Mlava River	30	45	37	55	67	100
Pek River	16	48	17	52	33	100
Timok River	50	74	18	26	68	100
Tisa River	184	73	68	27	252	100
Tamiš River	19	71	8	29	27	100
Danube Corridor	412	89	51	11	463	100

**In this case the Term "Central Water Supply System" relates to the small local water supply systems supplying more than 5 households.*

Annual Water Demand of rural population which will be connected to the local water supply systems in the horizon 2010 is estimated to be 145,5 million m^3 and 157 million m^3 in Danube catchment area and FRY respectively. Corresponding Annual Water Consumption will be 116 million m^3 and 126 million m^3 in Danube catchment area and FRY respectively.

It is estimated that the specific water demand of this part of population in the year 2010 will be 198 l/cap./d. Assuming the water loss within local water supply systems would be 20% the corresponding specific water consumption will reach 158 l/cap./d.

The specific water consumption of rural population which will use other water supply sources is estimated to range from 40 to 75 l/cap./d (in average 60 l/cap./d). The water loss in this case is usually very low so water consumption is almost equal to the water demand.

The Annual Water Demand as well as the annual Water Consumption of rural population which will use individual water supply in the horizon 2010 is expected to be 32 million m^3 and 45.5 million m^3 in Danube catchment area and in FRY respectively.

In urban settlements, it is not expected that water demands will rise more significantly, while in rural areas such an increase will be about 50%. In these calculations no distinction has been made between catchment areas or the size of rural and urban settlements. Growing demand will be satisfied mostly by the construction of new impounding reservoirs and replenishment of the existing ground-water sources by spreading basins (wherever possible) and through connections with regional water supply systems.

In the period 2010-2020, water demand will continue to rise, while consumption will rise at a somewhat slower rate than in the preceding period. A difference in specific consumption between urban and rural population will continue to decrease. The estimated domestic water demands in 2020 are shown in the following table, although the demands for such a distant time horizon cannot be determined quite precisely.

Table 3.2.2.4. Estimated domestic water demands in 2020 in ($10^6 m^3$/year)

Area - catchment	Urban	Rural	Total
FR Yugoslavia	748	211	959
Danube (total in FRY)	623	180	803
Sava River	69	37	106
Velika Morava River	278	97	375
Mlava River	1	3	4
Pek River	3	3	6
Timok River	14	4	18
Tisa River	53	15	68
Tamiš River	1	2	3
Danube Corridor	204	29	233

As already mentioned, the abstraction of water from the existing and new sources (mostly from impounding reservoirs) will secure the necessary quantities of water for domestic water supply. The share of surface water in the total quantity of abstracted water, i.e. supplied water, will continuously increase.

Annual Water Demand of Urban Population which will be connected (up to 2020) to the Central Water Supply Systems would be 598 million m^3 and 706 million m^3 in Danube catchment area and in FRY respectively. Corresponding Water Consumption would be 490 million m^3 and 578 million m^3 in Danube catchment area and in FRY respectively.

Average specific water demand in FRY as well as in the Danube catchment area is expected to be 293 l/cap./d. Assuming the water loss will be 18 %, the corresponding average specific Water Consumption would be 240 l/cap./d.

A part of Urban Population will be still supplied trough other water supply sources (OWSS) in the year 2020. Annual Water Demand of this part of Urban Population would be 25 million m^3 and 42.5 million m^3 in Danube catchment area in FRY respectively. Assuming the water loss will be 17%, corresponding Water Consumption would be 20.5 million m^3 and 35 million m^3 in Danube catchment area and in FRY respectively.

Table 3.2.2.5. Urban Population (in 000) planned to be connected to the Central Water Supply Systems (CWSS) and urban population (in 000) planned to be supplied from Other Water Supply Sources (OWSS) in 2020

Area – catchment	CWSS		OWSS		Total	
	number	%	number	%	number	%
FR Yugoslavia	6,601	93	497	7	7,098	100
Danube (total in FRY)	5,595.2	95,2	284.8	4.8	5,880	100
Sava River	623	97	19	3	642	100
Velika Morava River	2,435	94	156	6	2,591	100
Mlava River	10.8	90	1.2	10	12	100
Pek River	21,6	98	0,4	7	22	100
Timok River	126	97	4	3	130	100
Tisa River	445	91	44	9	489	100
Tamiš River	10.8	98	0,2	2	11	100
Danube Corridor	1,923	97	60	3	1,983	100

It is expected that the average specific Water Demand for this part of whole population will be 235 l/cap./d, while the average specific Water Consumption will be 195 l/cap./d.

Table 3.2.2.6. Rural Population (in 000) planned to be supplied from Central Water Supply Systems (CWSS) and Rural Population (in 000) planned to be supplied from Other Water Supply Sources (OWSS) in 2020

Area - catchment	CWSS		OWSS		Total	
	number	%	number	%	number	%
FR Yugoslavia	2,147	59	1,492	41	3,639	100
Danube (total in FRY)	1,882.7	65	1,009,3	35	2,892	100
Sava River	329	58	239	42	568	100
Velika Morava River	964	60	642	40	1,606	100
Mlava River	29.7	53	26,3	47	56	100
Pek River	14,6	52	13,4	48	28	100
Timok River	41	82	9	18	50	100
Tisa River	156	79	42	21	198	100
Tamiš River	18.4	80	4.6	20	23	100
Danube Corridor	330	91	33	9	363	100

It is expected that the average specific water demand of this part of population will be 235 l/cap./d in the year 2020. Assuming the water loss will be 17%, the corresponding Water Consumption would be 195 l/cap./d.

Total Annual Water Demand of rural population which will be connected to the local water supply systems is estimated to be 161.5 million m^3 and 184 million m^3 in Danube catchment area and FRY respectively. Corresponding Annual Water Consumption will be 134 million m^3 and 153 million m^3 in Danube catchment area and FRY respectively.

The specific Water Consumption of rural population which will use individual water supply sources is estimated to range from 45 to 75 l/cap./d (in average 60 l/cap./d). The water loss in this case is usually very low so water consumption is almost equal to the Water Demand.

The annual Water Demand as well as the annual Water Consumption of rural population which will use individual water supply is estimated to be 18.5 million m^3 and 27 million m^3 in Danube catchment area and FRY respectively.

3.2.3. Domestic Wastewater Production

It is reasonable to expect that a rise in the living standards will lead to an increased water consumption, that is, to larger wastewater production.

Bearing in mind population trends in specified catchment areas, it is expected that in the catchment areas of the Pek wastewater production will not increase, while wastewater production in the catchment areas of the Tamiš, Timok and Mlava will increase only slightly. The highest increase in domestic wastewater production is expected in the catchment area of the Morava and the Danube corridor. Domestic wastewater production in the coming period is shown in the following table.

Table 3.2.3.1. Domestic wastewater production in 2010 (10^6 m^3/year)

Area - catchment	Total
FR Yugoslavia	512
Danube (total in FRY)	436
Sava River	58
Velika Morava River	199
Mlava River	2
Pek River	2
Timok River	9
Tisa River	36
Tamiš River	1.5
Danube Corridor	128.5

Urban population in relevant catchment areas, in 10^3 and percentage, which well be connected to the CSS and OOWD is presented in the following table.

The domestic wastewater production of urban population which will be connected to the central sewage systems in the year 2010 is estimated to be 217.5 million m^3 and 245.5 million m^3 in Danube catchment area and FRY respectively. Average specific domestic wastewater production of urban population is estimated to be 164 l/cap./d.

The annual domestic wastewater production of the part of urban population using other options for disposal of wastewater (OOWD) in the year 2010 is estimated to be 100 million m^3 and 130 million m^3 for the Danube catchment area and for FRY respectively. The average specific domestic wastewater production would be 147 l/cap./d.

Table 3.2.3.2. Urban population (in 000) planned to be connected to the Central Sewage Systems (CSS) and urban population (in 000) which will use Other Option for Wastewater Discharge (OOWD) in the year 2010

Area – catchment	CSS		OO WD		Total	
	number	%	number	%	number	%
FR Yugoslavia	4,104	63	2,410	37	6,514	100
Danube (total in FRY)	3,635,8	66	1877.2	34	5,513	100
Sava River	368	62	226	38	594	100
Velika Morava River	1422	61	909	39	2,331	100
Mlava River	4	40	6	60	10	100
Pek River	11	56	10	44	21	100
Timok River	83	64	46	36	129	100
Tisa River	229	48	248	52	477	100
Tamiš River	3.8	40	5.2	60	9	100
Danube Corridor	1,515	78	427	22	1,942	100

It is expected that around 40% of rural population will dispose wastewater into the septic tanks up to the year 2010. It is roughly estimated that the annual domestic wastewater production in the villages will be 119 million m^3 and 137 million m^3 in Danube catchment area and in FRY respectively. The average specific domestic wastewater production in the year 2010 is estimated to be 85 l/cap./d and 88 l/cap./d in Danube catchment area and in FRY respectively.

An increase in domestic wastewater production will be somewhat slower in the period 2010-2021 than in the preceding period, since it is expected that water consumption will be more rational thanks, above all, the economic price and greater ecological awareness of a need to preserve the existing water resources. The survey of domestic wastewater production in 2020 is given in the table to follow.

Table 3.2.3.3. Domestic wastewater production in 2020 (10^6 m^3/year)

Area - catchment	Total
FR Yugoslavia	634
Danube (total in FRY)	529.5
Sava River	72
Velika Morava River	252
Mlava River	2.5
Pek River	3
Timok River	11
Tisa River	41
Tamiš River	1.5
Danube Corridor	146.5

For the horizon 2020 it is anticipated that wastewater production in the catchment area of the Tamiš will remain practically unchanged, as compared to 2010, while only a slight increase is expected in the catchment areas of the Timok, Mlava and Pek. Domestic wastewater production will continue to increase especially in the catchment area of the Morava, but the growth rate here is also decreasing since this area will also be affected by depopulation, albeit to a much lesser degree than other parts of the FR of Yugoslavia.

Table 3.2.3.4. Urban population (in 000) planned to be connected to the Central Sewage Systems (CSS) and urban population (in 000) which will use other options for wastewater discharge (OOWD) in the year 2020

Area – catchment	CSS		OO WD		Total	
	number	%	number	%	number	%
FR Yugoslavia	5,111	72	1,987	28	7,098	100
Danube (total in FRY)	4,369	74	1,511	26	5,880	100
Sava River	443	69	199	31	642	100
Velika Morava River	1840	71	751	29	2,591	100
Mlava River	6	50	6	50	12	100
Pek River	14	65	8	35	22	100
Timok River	91	70	39	30	130	100
Tisa River	284	58	205	42	489	100
Tamiš River	5	45	6	55	11	100
Danube Corridor	1,686	85	297	15	1,983	100

The domestic wastewater production of urban population which will be connected to the central sewage systems in the year 2020 is estimated to be 306 million m^3 and 358 million m^3 in Danube catchment area and FRY respectively. Average specific domestic wastewater production in the year 2020 is estimated to be 192 l/cap./d.

The annual domestic wastewater production of the part of urban population using other options for disposal of wastewater (OOWD) in the year 2020 is estimated to be 102 million m^3 and 132 million m^3 for the Danube watershed and for FRY respectively. It is expected that the average domestic wastewater production will be 179 l/cap./d.

It is expected that around 60% of rural population will dispose wastewater into the septic tanks up to the year 2020. It is roughly estimated that the annual domestic wastewater production in the villages will be 121.5 million m^3 and 144 million m^3 in Danube watershed and in FRY respectively. The average specific domestic wastewater production in the year 2020 is expected to be 85 l/cap./d and 115 l/cap./d in Danube watershed and in FRY respectively.

4. Actual and Future Population Potentially Affected by Water Pollution

The water quality of the Danube and its tributaries exerts influence on water quality in the alluvions, from where the largest quantity of water is abstracted for domestic and industrial water supply. Naturally, potentially most affected are the inhabitants of those settlements which are supplied with water directly from the river, and water treatment technology does not correspond to raw water quality. In summer, bathers and persons who engage in water-related recreation are also potentially affected, depending on the degree of microbiological contamination. Health hazards also exist when polluted river water is used for the watering of vegetables which are eaten in a raw state.

According to the results of all hitherto studies, microbiological surface-water contamination poses the most significant problem when such water is used for domestic water supply, foodstuffs industry or water-related recreation.

4.1. Actual and Future Population Potentially Affected by Health Hazards through Raw Water Quality Exceeding the Defined Quality Standards for Drinking Water

The national standard for the quality of raw water, which will be used for water supply, is set forth in the Water Classification Decree (Official Herald of the SRS, No. 5/68). In a way, this Decree is equivalent to the EU Directive (75/440/ECC).

Using the data on monitoring of water quality (Republican Weather Bureau of Serbia) for the period 1988-1997, it is possible to make needed comparison with II class of water (water that can be used for water supply after classical water treatment and desinfection) as well as with the quality of row water assigned for water supply as proscribed by EU regulations.

Water Quality of Tisa river along its course (163 km) trough FRY is out of the proposed II class. Now days there are 13 settlements with 117,940 inhabitants on the banks of Tisa river, but it is expected a decreasing of population up to 111,517 in the year 2021.

Water Quality of Tamiš river, coming from Romania, along its course (118 km) trough FRY is out of the proposed II class. Now days there are 12 settlements with 35,637 inhabitants on the banks of Tamiš river, but it is expected a decreasing of population up to 27,868 in the year 2021.

Now days there are 46 settlements with 1,688,560 inhabitants on the banks of Danube river. Water Quality of Danube river along its course (588 km) trough FRY is out of the proposed II class for the most of relevant water quality parameters.

Now days there are 19 settlements with 154,206 inhabitants on the banks of Sava river. Water Quality of Sava river along its course (207 km) trough FRY is out of the proposed II class during large part of the year.

Morava is the national river by its whole course (245.4 km). Now days there are 30 settlements (mostly small ones) with 89,480 inhabitants on the banks of Grand Morava river. Water Quality is out of proposed II class along at whole its watercourse.

Mlava river is the national river by its whole course (103 km). Water Quality is in accordance with proposed class in the upper part but it is out of proposed II class along lower part (57 km) of watercourse. Now days there are 15 smaller settlements with 20,251 inhabitants on the banks of lower part of Mlava river.

Pek river is the national river by its whole course (124.5 km). Now days there are 20 smaller settlements with 18,048 inhabitants on the banks of Pek river. Even in the upper part of watercourse the Water Quality of Pek river is out of proposed II class because of influence of mining activities.

Timok river located near the eastern State border is 80,0 km long. The lowest part (19 km) of Timok watercourse constitutes State border with Bulgaria. Now days there are 11 settlements with 9,871 inhabitants on the banks of this river. Water Quality of is out of proposed II along at whole watercourse.

Demographic analyses show that in this area, in the coming period, the number of inhabitants will rise only in settlements with more than 10,000 inhabitants, as well as in municipal centers, whereas in rural settlements and minor urban settlements it will decline.

The list of all settlements on the Danube and main tributaries, as well as the number of inhabitants in each settlement, including the projection of population for 1991-2021, is given in Annex A-5 to A-5.7

A similar situation prevails on the second tributaries of the Danube, as well as in the DTD system. Among larger second tributaries, an exception is the river Drina, the largest tributary of the Sava, whose water quality corresponds to the river water of class II. Only the source areas of minor watercourses have the water quality of classes I and II and can be used for domestic water supply after treatment based on conventional technologies. After passing by the first settlements or major industrial plants, the water quality of these watercourses also drops to class III or IV, i.e. the water quality of the watercourse is deteriorating because the quantity and composition of discharged wastewater exceed the recipient's self-purification capacity.

The watercourses coming from the neighboring countries (Tisa, Tamiš, Begej, Bosut, etc.) are polluted already at the entry into the FR of Yugoslavia (their quality is mostly of class IV and more seldom of class III), so that they are not used for domestic water supply but only for industrial purposes or, possibly, in agriculture. Due to such water quality in watercourses, the population of Vojvodina is supplied solely with ground water and is not directly affected by surface-water quality when water supply is in question.

The abstraction of water directly from the watercourse for domestic supply is practiced on the Sava (Barič and Belgrade), Danube (Vinča), Veliki Rzav (Arilje, Čačak, Lučani, Požega, G. Milanovac), Gradac (Valjevo), Banjska reka (Vranje) and Vlasina (Vlasotince). The Belgrade Water Authority, which operates the largest water supply system in the country, secures almost one-third of the capacity (c. 3 m^3/s) by abstracting water from the Sava. Water treatment is based on advanced technology (polyelectrolytes, ozone, activated carbon), so that the water is of very good quality.

This water is mixed in the water supply systems of Belgrade, Valjevo and Vranje with ground water from other sources. The rivers Rzav, Gradac, Vlasina and Banjska are pure mountain watercourses on which, upstream from the intake structure, there is no settlement or industry or, in other words, there are no pollutants that could impair water quality.

In the hilly-mountainous regions, on the head sides of the watercourses (whose water quality is of class I) numerous high dams and impounding reservoirs, each having the capacity from several tens of millions to several hundreds of millions of cubic meters, have been constructed. Those are multi-purpose reservoirs intended for domestic water supply, power generation, irrigation, flood control, etc. Underway is the construction of another four dams and multi-purpose reservoirs, which should supply with high-quality water those settlements which do not have enough water in source areas at present. Underway is also the preparation of design documentation for another few dams and impounding reservoirs.

In a large number of small settlements, especially in rural ones, the quality of drinking water is not satisfactory due to the absence of water treatment and casual disinfection, on one side, and worn-out piping and periodic supply interruptions, on the other.

Inadequate water quality in large municipal water supply systems in Vojvodina (Kikinda, Zrenjanin) stems from inferior raw-water quality (a high content of humic and fulvic acids), inadequate water treatment and disinfection.

The following table lists water supply systems in municipal centers in which, in 1997, microbiological inadequacy was higher than 5%, and physical and chemical inadequacy higher than 20%. All these settlements are located in the Danube river basin and, according to the WHO, such was supply systems are regarded as high-risk ones. Due to an extremely difficult economic situation in the country, there are no funds for a fast solution of this problem.

Table 4.1.1. Municipal water supply systems with the highest bacteriological, physical and chemical inadequacy in 1997.

Subotica	Mali Iđoš	Bačka Palanka	Zrenjanin
Novi Bečej	Kikinda	Senta	Novi Kneževac
Ada	Čoka	Alibunar	Opovo
Kovačica	Odžaci	Apatin	Kula
Srbobran	Beočin	Temerin	Titel
Bački Petrovac	Bačka Topola	Bač	Vrbas
Inđija	Šid	Vladimirci	Koceljeva
Mali Zvornik	Ljubovija	Batočina	Knić
Topola	Rekovac	Tutin	Ćićevac
Gadžin Han	Merošina	Svrljig	Kuršumlija
Žitora|a	Lebane	Sijerinska Banja	Crna Trava
Vučje	Vladičin Han	Prečevo	Obilić
Vitina	Mladenovac	Sopot	Grocka

Not one of the above mentioned towns uses water from the watercourse or impounding reservoir for domestic water supply; instead, they use ground water from different water-bearing strata. More than 50% of these settlements is located in Vojvodina. Most frequent causes of inadequate water quality are a higher content of iron, manganese and organic matter, the absence of residual chlorine, an increase in the total number of bacteria, in addition to a periodical presence of coliform bacteria, as well as a sporadically presence of *E. coli.*

Between 450,000 and 480,000 inhabitants are supplied with such water. It is impossible to determine their number more precisely, because the exact number of households connected to these water supply systems is not known.

It should be noted that 4 small municipalities in Serbia (Bojnik, Malo Crniće, Štimlje and Doljevac) do not have a central water supply system. According to the 1991 census, these settlements had 12,131 inhabitants. In 1996, the water supply system in Golubac (1995 inhabitants) was put out of use because of a constant health hazard. In all these settlements water is supplied from local and individual water supply sources.

The following table shows the number of hydric epidemics during the past seven years, as an illustration that a potential hazard turns periodically into an actual one.

Table 4.1.2. Hydric epidemics in the period 1991-1997

Year		Type of Contagious Disease						
		Hepatitis virus A	Shigellosis	Entero-colitis ac.	Typhus abd.	Hepatitis non A non B	Salmo-nellosis	Total
1991	No. of epidemics	2	1	3	-	-	-	6
	No. of diseased	127	116	86	-	-	-	309
1992	No. of epidemics	-	8	4	-	-	-	12
	No. of diseased	-	628	106	-	-	-	734
1993	No. of epidemics	1	1	3	-	-	-	5
	No. of diseased	23	613	152	-	-	-	788
1994	No. of epidemics	6	8	2	2	1	-	19
	No. of diseased	105	501	221	98	65	-	990
1995	No. of epidemics	1	3	8	1	-	-	13
	No. of diseased	7	122	639	48	-	-	816
1996	No. of epidemics	-	1	-	1	-	-	2
	No. of diseased	-	21	-	2	-	-	23
1997	No. of epidemics	1	1	2	1	-	1	6
	No. of diseased	11	10	83	15	-	16	135

In the period 1991-1997, 63 hydric epidemics and 3,793 diseased were recorded in the territory of the Republic of Serbia.

It can be observed that the number of hydric epidemics and the number of diseased were rising up to 1994, when it reached a maximum (19 epidemics, 988 diseased). Thereafter, the situation gradually improved but it is still not satisfactory. The greatest number of the diseased in one epidemic was recorded in 1993 and 613 diseased in the shigellosis epidemic. According to the number of epidemics and the number of diseased, the most frequent were shigellosis (23 epidemics and 2011 diseased) and enterocolitis (22 epidemics and 1,269 diseased) which accounted for more than 71% of recorded epidemics and 86% of all those diseased in epidemics.

The distinctive characteristic of the above mentioned epidemics is that they did not occur in large urban settlements (except for two) or, in other words, not in the settlements with a central water supply system, which is controlled by inspection authorities and health services.

Lučani had 4,130 inhabitants at the time of the epidemic in 1993 and 613 persons were diseased, i.e. 15% of total population, which points to the severity of this epidemic. In]uprija with 21,367 inhabitants 364 persons were diseased during the epidemic of enterocolitis in 1995. All other epidemics were recorded in rural settlements where there was no one to control water supply and where disinfection was not practiced, at least not on a regular basis.

It must also be noted that some of the diseased with slight symptoms do not go to the health service to seek help, so that the records are incomplete, especially in the case of entercolitis; thus, they represent only the tip of the iceberg.

An abrupt increase in the number of diseases was triggered to a significant extent by the sanctions of the UN Security Council, since it was impossible to purchase spare parts for the repair of plant and equipment, as well as disinfectants and other relevant chemicals, etc.

4.2. Actual and Future Population Potentially Affected by Health Hazards and Other Impacts on Welfare through Unsanitary Conditions in the Danube River System

A systematic quality control of the water of all major watercourses in the FR of Yugoslavia is carried out by the Republican Weather Bureau of Serbia and Montenegro. Water quality control of the rivers and canals in the Danube river basin is carried out at 148 hydrographic cross-sections. According to the results of this control - due to certain physical, chemical and microbiological properties - the water quality of the Danube, throughout its course in the FR of Yugoslavia, does not belong to class II. According to the national standards (Water Classification Decree, Official Herald of the SRS, No. 5/68 and the Decree on the Classification of Watercourses, Inter-Republic Waters and Coastal Sea Waters, Official Gazette of the SFRY, No. 6/78) this class also determines the quality of bathing water and the provisions are very similar to those of the relevant EU Directive (76/160/EEC).

According to the results of a perennial systematic water control of the Danube tributaries: Sava, Tisa, Danube-Tisa-Danube canal system, Velika Morava, Timok, Pek, Mlava Tamiš, the quality of their water does not correspond to the quality prescribed for bathing.

All the statements mention in the chapter 4.1, and given in Annex A-5 to A-5.7, concerning the settlements on the Danube river banks and its main tributaries can be applied here as the settlements are the same. Also, the II class of water is proposed for contact recreation.

Despite this, in all urban settlements on the banks of the Danube and its major tributaries (Sava, Tisa, Morava), there are some beaches with basic sanitary facilities (showers, WC, drinking water). In the largest cities, Belgrade, Novi Sad, Smederevo, Pozarevac, Šabac, Sremska Mitrovica, Užice, Čačak and Kraljevo, water quality on river beaches during the bathing season is monitored by the relevant Public Health Institutes.

Check samples are taken once a week, and the chemical and bacteriological parameters are determined, as specified by the above mentioned Decrees, under which the water of class II quality can also be used for bathing if the most probably number of coliform bacteria (MPN) per litre of water does not exceed 20,000. In determining the quality of water and its suitability for bathing, the number of fecal coliform bacteria and the presence of fecal Streptococci are also considered, as specified by (76/160/EEC); the latter is not stipulated by our regulations but it is absolutely justified from a professional viewpoint.

The results of these researches point to very frequent microbiological deviations, depending on wastewater flow and discharge. During the bathing season on the Danube, about 80% of the analyzed samples contains an increased MPN content or increased number of fecal Streptococci.

The situation is virtually identical on other tributaries, except the Sava where the situation is somewhat better, since overstepping is recorded in about 50% of samples. Thus, the water quality of the Sava belongs to class II-III; all other watercourses belong to class III or III-IV.

The Drina, the largest tributary of the Sava, is the watercourse whose water is within the limits of class II; it is used for bathing only in the lower course due to relatively cold water. Thanks to the quality and quantity of its water, the river Drina contributes to a significant extent to the improvement of the water quality of the Sava.

All smaller watercourses by which urban settlements are located are so polluted (mostly class III) that their water is not even used for irrigation, let alone for bathing. Although the quality of river water, i.e. the Danube and its tributaries, most often does not correspond to the class prescribed for bathing, on the river beaches of the above mentioned cities there are a few thousand bathers every day, especially in Novi Sad and Belgrade. Water-related recreational activities are carried out during the period of low water, when the impact of untreated wastewater from the settlements, industry and agriculture is most pronounced. Inferior water quality on river beaches is also influenced by their location, since they are often located in the center of the city or directly downstream from the settlement.

A difficult economic situation forces a great number of inhabitants to give up summer holidays and going to the seaside, in the mountains or to the spas. Thus, they spend their holidays on the banks of the nearest rivers, lakes and impounding reservoirs. There is no doubt that on the river beach this population is exposed to skin, ear and eye infection, as well as to mucous membrane and skin irritation due mostly to inferior water quality. Although there are no official health statistics, because it is difficult to separate the persons whose impaired health state is the result of bathing on a river beach from among the diseased with these symptoms; moreover, some of these persons do not seek help from health services.

There are also no data on dermatitis or allergic conditions caused by toxic cyanobacteria, although there are grounds for such reactions. Namely, the construction of the Djerdap II Hydroelectric Power Plant resulted in considerable backwater on the Danube and Sava which, coupled with a high nutrient content, is suited for eutrophication. Eutrophication occurs to a lesser or greater degree in all impounding reservoirs and artificial lakes which are used for recreation, as well as in reservoirs intended for water supply.

4.3. Description of Main Health Hazards through Water Pollution in the Danube River and Tributaries

Bearing in mind the facts presented in the publication "*Developing a healthy environment along the Danube River with the Strategic Action Plan"*, we provide here some additional facts which concern the FR of Yugoslavia, because in this publication the situation in our country is not described, and the presented facts refer to us only in part.

Methemoglobinemia in children in the FR of Yugoslavia occurs very rarely, because in Vojvodina, where the surface soil layer has a relatively high nitrate content, water is abstracted from the second water-bearing stratum, in the depth of 40-160 m. Nitrate content in water supply systems in rural areas also does not exceed 20 mg/l. An exception are isolated households or farms which abstract water from the first water-bearing stratum, but these are now a rarity. The quantity of mineral fertilizers used per unit of arable land in Vojvodina is greater than in any other part of the FR of Yugoslavia, but it is still modest as compared to the quantities used in other European countries.

The geochemical composition of the soil is the underlying cause of an increased arsenic content in the northernmost part of Vojvodina, so that its content in raw water in the water supply system in Subotica reaches 40 μg/l. After water treatment, its content in drinking water does not exceed 30 μg/l. Target epidemiological research has not been conducted and on the basis of the statistical data on morbidity and mortality it cannot be concluded that the cases of hyperpigmentation, hyperkeratosis or skin cancer in this region are more frequent.

In the northeastern part of the FR of Yugoslavia, that is, in northern and central Banat, they use ground water from the basic water-bearing stratum for water supply. This ground water has a high content of humin matter. Water in the water supply system is disinfected by chlorine which results in the occurrence of trihalomethane. The removal of humin matter or a shift to disinfection by chlorine dioxide are still not practiced due to the lack of funds. Over 100,000 inhabitants of Kikinda and Zrenjanin are supplied with such water from their water supply systems.

There are no data on the number of the diseased due to the use of fresh vegetables which were watered with water being microbiologically highly inadequate. Bearing in mind the degree of bacteriological inadequacy of water which is used in some regions for irrigation, such cases certainly exist, but the data are not available due to inadequate record-keeping.

Endemic nephritis (whose cause has not been determined), which was recorded in certain regions in the catchment areas of the Sava and Morava, caused a chronic renal insufficiency with the lethal outcome before the construction of a central water supply and the provision of adequate water quality in these regions. The number of the diseased in the endemic region has drastically declined over the past years.

During the period of sanctions imposed by the UN Security Council (1992-1994), the economic situation sharply deteriorated which had a direct impact on national diet, sanitary conditions and health state of the population. The death rate rose from 9.8 (in 1991) to 10.4 (1994) per 1,000 inhabitants; at the same time, the infant mortality rate rose from 20.9 to 23.7 per 1,000 live births.

On an increase were also the diseases linked to inadequate nutrition and water supply, as well as the diseases which always show an upward tendency in critical situations (tuberculosis, venereal diseases, mental disorders). The number of epidemics of contagious diseases was also on an increase, as was the number of the diseased and deceased in epidemics.

The number of epidemics and the number of diseased and deceased in epidemics, in the period 1991-1995, shown in the following table, reflect quite well the described situation. It should be noted that in the pre-sanction period contagious diseases were recording a downward tendency.

Table 4.3.1. Recorded epidemics of contagious diseases (without flue) in the period 1991-1995

Year	1991	1992	1993	1994	1995
No. of epidemics	205	259	254	318	396
No. of diseased in epidemics	4,168	5,783	7,693	5,915	6,850
No. of deceased in epidemics	2	19	22	22	29

An unfavorable situation, which was recorded in 1995, is the result of a slow recovery of the economy and, thus, medical services and other non-economic activities or, in other words, a difficult economic situation altogether. An increased number of epidemics in 1995 is also the result of an improved method of reporting and intensified measures of control which was less efficient in the period 1993-1994.

5. Analysis of the Economic Significance of the Danube River System and Impacts on Economic Activities

5.1. Actual Situation

The overview of the actual situation is based on available official data, as well as on the estimates of experts from the relevant institutions or ministries where there were no valid statistical data.

5.1.1. Abstraction of Raw Water from the Danube River System

The water demands of the population, industry and agriculture to a significant measure are met to a significant extent by abstraction of water from the Danube and its tributaries. If one also takes into account that the water is abstracted from the alluvion of these rivers, their quantity increases to over 80% of the total quantity of supplied water. In the coming period, according to the drafts of the Water Economics Plan of the Republic of Serbia and Water Economics Plan of the Republic of Montenegro, the abstraction of water from these sources will gradually increase and will practically become the only source of water supply for industry and agriculture.

5.1.1.1. Domestic Raw Water Demands

The total quantities of surface and ground water abstracted for water supply have been determined on the basis of the data provided by the "Jaroslav Černi" Water Management Institute, as well as the relevant estimates, while their percentage ratio is only provisional because the precise data are not available.

Table 5.1.1.1.1. Water quantities abstracted for water supply during 1997, by catchment area (10^6 m^3/year)

Area – catchment	Urban	Rural	Total
FR Yugoslavia	1,118	290	1,408
Danube (total in FRY)	987	246	1,233
Sava River	102	50	152
Velika Morava River	386	130	516
Mlava River	2	4	6
Pek River	4	2	6
Timok River	24	6	30
Tisa River	93	19	112
Tamiš River	2	2	4
Danube Corridor	374	33	407

Water quantities given in the previous table are total abstracted quantities assigned for water supply in urban and rural areas, including households, small industries, public institutions, commerce, water supply of livestock, etc) and water loss.

Of the total quantity of water abstracted for water supply in 1997, about 78% was abstracted from ground water, whereas only about 22% was abstracted directly from watercourses and impounding reservoirs. It should be noted that in the catchment areas of the rivers ; Tisa, Tamiš, Mlava and Pek only ground water is abstracted for domestic water supply, while more substantial quantities of water from watercourses and impounding reservoirs are abstracted in the catchment areas of the of Grand Morava River and Sava River.

5.1.1.2. Industrial/Mining Raw Water Demand

On the basis of the collected data on the actual state (capacities) and the observed tendencies, an estimate of the necessary quantities of water by catchment area for the specified users has been made. The quantities of water listed below refer only to the industrial objects which are not connected to the public water supply systems.

Table 5.1.1.2.1. Estimated quantity of water abstracted for industrial supply during 1997 in (10^6 m^3/year) and share (%) of surface water

Area - catchment	Industry	
FR Yugoslavia	928	65.8%
Danube (total in FRY)	770	59.4%
Sava River	305	70.0%
Velika Morava River	190	60.0%
Mlava River	5	90.0%
Pek River	10	95.0%
Timok River	35	65.0%
Tisa River	100	35.0%
Tamiš River	5	80.0%
Danube Corridor	120	70.0%

The above table shows the quantities of water required for industrial production, i.e. for technological processes and cooling of plants. The data on the quantities of water used for cooling could not be obtained because many of industrial plants do not operate or operate at reduced capacity, so that at this moment it is impossible to make an adequate estimate of these quantities.

Large quantities of surface water are abstracted for cooling of thermal power plants and they amount to c. 5.3 km^3/year.

5.1.1.3. Agricultural Raw Water Demands for Irrigation

In agricultural regions, there is a shortage of quality water for the irrigation of field crops. Parts of the existing system of canals are not sufficiently used due to a state of neglect and poor quality of water in them. A part of these canals has been converted into the sewers of the settlements and industry.

So far, a relatively small part of agricultural land (about 150,000 ha) in the Danube river basin was irrigated, i.e. only about 3% of total arable land. The area which is suitable for irrigation in this region covers c. 2,000,000 ha. It is evident that the land and water resources potentials are largely underused.

In 1997, field crops were also irrigated with ground water which was abstracted in the catchment area of the Tisa, but the data on the quantities of water could not be obtained from the competent institutions. As for the quantities of ground water abstracted so as to satisfy all demands (population, industry, irrigation) in northeastern Banat, it should be pointed out that the water table of the second water-bearing stratum fell at some points by 10 to 27 m during the past ten or so years.

Table 5.1.1.3.1. Estimated quantity of water abstracted for irrigation during 1997 (10^6 m^3/year)

Area - catchment	Irrigation
FR Yugoslavia	760
Danube (total in FRY)	565
Sava River	38
Velika Morava River	159
Mlava River	4
Pek River	0
Timok River	7
Tisa River	75
Tamiš River	20
Danube Corridor	262

5.1.2. Wastewater Discharge to the Danube River System

Wastewater, which is discharged into the Danube and its tributaries, stems (almost 90%) from the territory of the FR of Yugoslavia. The quantities of wastewater from the major sources and their present quality, as well as projections for the period up to 2020 are given in the subsequent sections.

5.1.2.1. Municipal Discharge

Municipal wastewater is treated in a relatively small number of settlements, mostly in settlements which are located by smaller watercourses. In the FR of Yugoslavia, municipal wastewater is treated in more than 40 urban settlements, mostly by biological treatment. The efficiency of treatment varies: in the case of mechanical treatment it is up to 40% and in the case of biological treatment up to 95%, depending on the maintenance of equipment. In the Danube river basin, there are 37 plants for treatment of municipal wastewater, their total capacity being c. 2,150,000 PE (in Vojvodina c. 570,000 PE and in central Serbia 1,578,000 PE). In addition to these central municipal treatment plants, there are treatment plants in some parts of urban settlements, in major tourist centres and facilities, as well as in weekend cottage complexes. Those are mostly small, biological treatment plants with the capacity of up to 500 PE. The quantities of municipal wastewater discharge in 1997 are shown in the following table.

Table 5.1.2.1.1. Municipal wastewater discharge (MWWD) in 1997 ($10^6 m^3$/year)

Area - catchment	MMWD	non-treated	mechan. treated	biolog. treated
FR Yugoslavia	951	87.8%	7.3%	4.9%
Danube (total in FRY)	833	86%	8%	6%
Sava River	103	90%	7%	3%
Velika Morava River	348	80%	12%	8%
Mlava River	4,5	100%	0%	0%
Pek River	4,5	100%	0%	0%
Timok River	21	100%	0%	0%
Tisa River	75	76%	14%	10%
Tamiš River	3	100%	0%	0%
Danube Corridor	274	93%	4%	3%

The table shows that virtually 1/3 of municipal wastewater stems from the settlements located in the Danube corridor (c. 40%), while the largest quantities are produced in the catchment area of the Morava, which is logical in view of the the number of inhabitants and industrial facilities in the settlements in this catchment area.

The following table shows the capacities and efficiency of municipal waste treatment plants in the settlements located in the Danube river system, based on the data for 1996.

Table 5.1.2.1.2. Municipal wastewater treatment plants (capacity, type and efficiency)

WWTP	Capacity (PE)	Type of Treatment	BOD_5 Removal Efficiency (%)
Velika Plana	35,000	Biological	90
Jagodina	89,000	Biological	95
Soko Banja	5,000	Biological	80
Bečej	45,000	Biological	90
Novi Bečej	2,000	Biological	30
Stara Moravica	10,000	Biological	87
Surdulica	30,000	Biological	60
Bač	13,000	Biological	No data
Kladovo	20,000	Biological	No data
Negotin	25,000	Biological	not in operation
Kikinda	60,000	Biological	90
Vršac	50,000	Biological	83
Sombor	180,000	Biological	95
Subotica	110,000	Biological	86
Požarevac	50,000	Biological	~ 65
Priština		Mechanical	not in operation
Dimitrovgrad	10,000	Biological	97
In|ija	5,000	Biological	No data
Blace	10,000	Biological	not in operation
Gornji Milanovac	100,000	Biological	90
Paraćin	35,000	Biological	85
Despotovac	5,000	Biological	90
Ruma	45,000	Biological	30
Požega	35,000	Biological	90
Vlasotince	15,000	Biological	No data
Kragujevac	250,000	Biological	95
Aran|elovac	25,000	Biological	95
Kopaonik	4,500	Biological	
Valjevo	110,000	Biological	under construction

Under construction are twenty or so municipal wastewater treatment plants, their total capacity being 2,000,000 PE. The degree of construction of these facilities varies from 10% to 60%. Design documentation is being prepared for another twenty or so municipal wastewater treatment plants.

5.1.2.2. Industrial/Mining/Shipping Discharge

A number of minor industrial plants located in urban environments discharges wastewater into the sewerage. Larger industrial plants are most often located outside the settlements, usually on the banks of rivers or in their immediate vicinity, which also refers to all mines. Wastewater from these facilities is discharged directly into watercourses and canals within the DTD system, with or without advance treatment. The table shows the quantities of industry and mining wastes discharged directly into watercourses in the course of 1997, in $10^6 m^3$/year.

For shipping discharge quantities there is no estimate nor is it possible to make one, because such quantities depend on the engagement of our river fleet, as well as on the number of structure of foreign vessels which are only in transit.

By far, the largest quantity of industry and mining wastewater is discharged into the Sava and its tributaries, due to a high specific consumption by the plants located in the river system. However, the catchment area of the Timok is especially affected by industrial and mining discharge, bearing in mind the composition of such water, the degree of treatment and the recipient's capacity.

Table 5.1.2.2.1. Industry and mining wastewater discharge in 1997, in $10^6 m^3$/year

Area - catchment	Industry and Mining
FR Yugoslavia	881
Danube (total in FRY)	731
Sava River	290
Velika Morava River	180
Mlava River	5
Pek River	9
Timok River	33
Tisa River	95
Tamiš River	5
Danube Corridor	114

In the Danube river basin there are about 120 industrial wastewater treatment plants, most of which provide only advance or minimal treatment so as to meet the requirements for waste discharge into the sewerage. Only twenty or so larger industrial plants located on the banks of the Danube and its tributaries have the facilities for full treatment of wastewater, but some of these plants operate only in part. Ten or so industrial wastewater treatment plants are under construction; the degree of construction is over 50%. For ten or so of them the design documentation is nearing completion.

5.1.2.3. Agricultural Discharge (Major Point Sources)

Cattle raising in the territory of the FR of Yugoslavia and in the Danube river system is carried out mostly in the private sector. Cattle and pig raising is carried out mostly on cooperative farms and in enterprises, while all large farms (with more than 5,000 porkers or 500 bullcalves) are exclusively in social ownership.

In the Danube river basin there are 100 cattle farms, each of them raising 1,000 heads of cattle on the average. They are less significant as point sources of water pollution due to a dry method of manure disposal. There are 130 pig farms, with about 1,200,000 porkers altogether and they represent the main point sources of surface and ground water pollution in the Danube river system and especially in Vojvodina (the catchment areas of Tisa, Tamiš and Sava).

On the farms having the capacity of up to 20,000 porkers, the combination of dry and wet manure disposal method is used, while on the farms having the capacity of over 20,000 porkers, the wet method is used. There is a total of 43 farms with the capacity of 10,000 or more porkers, of which 34 are located in Vojvodina.

Table 5.1.2.3.1. Capacity of farms and watercourses potentially affected by wastewater

Capacity (No. of fatlings)	Nearest Settlement	Affected Watercourse
35,000	Vrbas	canal DTD
20,000	Panonija	Krivaja-reserv. Zobnatica
21,000	Pobeda	Čik- reservoir Svetićevo
22,000	Kikinda	canal DTD
10,000	Sečanj	canal DTD
40,000 + 40,000	Bečej	Tisa (indirectly)
30,000	Čenej	canal DTD
18,000	Stara Pazova	Budovar-Danube
5,000	Titel	Tisa
17,000	Ada	Tisa
20,000	Farkaždin	Tamiš
9,000	Omoljica	Ponjavica
20,000	Pančevo	Nadela
10,000	Bavanište	reservoir Crna bara
13,000	Dolovo	reservoir Deliblato
17,000	Srbobran	Krivaja
19,000	Velika Plana	Velika Morava
15,000	Varvarin	Velika Morava
22,000	Petrovac na Mlavi	Mlava
35,000	Surčin	Sava
20,000	Obrenovac	Sava
12,000	Veliko Gradište	Danube
25,000	Padinska skela	Danube
20,000	Žitora|a	Južna Morava
15,000	Leskovac	Južna Morava
20,000	Zaječar	Timok

It is held that the equivalent organic load of one head of cattle equals the load of 30 PE and the load one pig to 5 PE, so that it can be concluded that the organic load on farms in the Danube river basin in the FR of Yugoslavia amounts to 9,000,000 PE. There is no doubt that only a part of this load enters into surface and ground waters.

Wastewater is discharged most often into lagoons or natural depressions and, after being stored for about 6 months, it is used for manuring agricultural land. Only a very small number of farms has facilities for technological waste treatment (aerators, separators, biological gas production) but their functioning is problematic.

A part of wastewater from farms penetrates into ground water by seepage through the soil; thus, the contamination of watercourses, hydro-melioration canals and impounding reservoirs is not rare.

The farms, which are located in the vicinity of sources of water supply or recreational zones, pose a special hazard.

The table 5.1.2.3.1 shows the largest pig farms which, due to their locations, pose a threat to the surface waters of rivers, canals and impounding reservoirs.

There are no precise data on the quantities of wastewater discharged from farms into lagoons. Likewise, it is impossible to estimate the quantity of such water which penetrated into the rivers and canals, since this occurs only in incident situations (when the lagoons are prepared for emptying and if a storm is accompanied by abundant rainfall).

The map given in Annex A-10 presents locations of all major pig farms in the Danube river basin.

5.1.3. Pollution of Aquatic Systems through Potential Soil and Ground Water Contamination

Soil, surface and ground water contamination occurs to a significant extent due to an inadequate collection and treatment of seepage water from solid municipal and industrial hazardous waste disposal areas, ash disposal areas of thermal power plants, mine dirt disposal areas and flotations.

It should be noted that the point sources of surface and ground water contamination in some parts of Vojvodina also include depressions into which drilling fluid from oil drill holes is discharged. Likewise, hazardous liquid waste storage facilities also pose a high potential risk (e.g. piralene-based transformer oil, slurry from industrial waste treatment plants) due to inadequate disposal and storage.

Although this Study does not dealt with them, it should be noted that an important role in surface and ground water contamination on high-quality soils is played by diffuse sources of contamination (prolonged careless application of mineral fertilizers, manure, plant protection chemicals and weed killers).

A combination of all of these factors led to the contamination of ground water, that is, the first water-bearing stratum in the entire territory of Vojvodina so that it cannot be used for domestic water supply.

5.1.3.1. Municipal Solid Waste Disposal

The problem of municipal waste management in the FR of Yugoslavia is very serious because, at present, there is no waste disposal area which conforms to sanitary criteria (Yugoslav or international) with respect to the selection of site, construction and method of use. Likewise, there is no primary selection or separation of secondary raw materials, so that municipal waste contains not only conventional domestic waste but also toxic waste.

Exactly 174 open municipal trash dumps are registered in FRY. Around 143 of its are located within the Danube watershed (Sava river watershed -20, Tisa river watershed -22, Tamiš river watershed -2, Timok river watershed -5, Mlava river watershed -4, Pek river watershed -3, Morava river watershed –61, Danube corridor -26).

Around 3.45 million m^3/y of municipal solid wastes are disposed in FRY. Of this quantity around 3.20 million m^3/y of municipal solid wastes are disposed within Danube watershed.

Only 3% of solid waste (mostly paper, iron and some other metals) recycles. It is estimated that additional 20-25% of solid waste burns down at open dumps because of self-ignition. The incineration and composting of municipal solid wastes are not practiced at all.

Municipal waste is most often disposed (45%) on trash dumps which do not even meet the basic sanitary criteria; on which there is no place for waste disposal any more or which should be closed down right away. According to the available capacity, 32% of the existing trash dumps could be used for another 5 years, and 20% of them even longer, if they are reconstructed in accordance with the sanitary criteria and legal provisions. Only 3% of waste landfills satisfies the basic environmental protection criteria (Kruševac, Sombor, Subotica and Trstenik).

The existing trash dumps (80% of them) are located in the immediate vicinity of the watercourses and, at times, on their very banks. Bearing in mind that it is the question of an alluvial soil and that no measures have been taken so as to prevent the seepage filtrate from penetrating into the soil, the result is a permanent direct or indirect soil and ground water contamination. In some municipalities, in the periods of high water, torrents carry trash down the watercourse, so that the consequences are apparent on a much broader area than the waste disposal one. A special problem is posed by the fact that some waste landfills are located on the banks of the rivers or impounding reservoirs which are the sources of water supply, thus creating an actual hazard to them from the penetration of pollutants (Kučevo).

On the banks of the Danube and smaller watercourses, its tributaries, there are larger municipal waste landfills, which are shown in the below given table, including the number of inhabitants served.

The capacity of these waste landfills has been estimated on the basis of the data provided by public utility enterprises, such as daily disposed waste quantities, duration of use, recycled waste and waste compaction method. It must be borne in mind that spontaneous self-incineration occurs quite often on many waste landfills, so that it is difficult to determine the quantity of disposed waste more precisely.

The following table provides the basic data on the waste landfills (trash dumps) which are located in the Danube corridor.

Table 5.1.3.1.1. Major municipal waste landfills (trash dumps) in the Danube corridor

Settlement	Catchment	Distance from Watercourse (m)	No. of inhabitants	Volume of Dump (m^3)
Apatin	Danube	about 600	19,000	136,800
Bačka Palanka	Danube	about 700	28,000	200,000
Batajnica (Belgrade)	Danube	about 1,500	400,000	960,000
Vinča (Belgrade)	Danube	about 800	1,000,000	2,900,000
Smederevo	Danube	about 1,200	66,500	466,800
Kovin	Danube	about 10	14,600	109,500
Veliko Gradište	Danube	about 900	6,700	53,600

On the tributaries of the Danube, the number of waste landfills on their banks or in immediate vicinity is much greater. Table 5.1.3.1.2. shows waste landfills (trash dumps) of specified settlements which, due to their position and area covered, represent the pollutants of the watercourse in whose catchment area they are located.

Table 5.1.3.1.2. Major municipal waste landfills (trash dumps) on the tributaries of the Danube

Settlement	Catchment	Distance from Watercourse (m)	No. of inhabitants	Volume of Dump (m^3)
Kučevo	Pek	about 50	5,500	41,800
Bečej	Tise	about 1,600	27,800	133,440
Novi Bečej	Tisa	about 1,500	16,400	113,160
Bor	Timok	about 1,000	44,200	334,500
Zaječar	Timok	about 1,200	42,850	325,660
Užice	Morava	about 1,000	57,300	481,500
Čačak	Morava	about 20	81,000	870,600
Kraljevo	Morava	about 30	60,400	630,000
Novi Pazar	Morava	about 10	53,700	420,850
Leskovac	Morava	about 1,000	67,600	616,512
Kos. Mitrovica	Morava	about 10	66,500	492,765
Priština	Morava	about 700	152,000	1,270,720
Pirot	Morava	on the river bank	43,800	394,200
Bajina Bašta	Sava	on the river bank	9,600	78,400
Prijepolje	Sava	on the river bank	16,480	131,840
Priboj	Sava	on the river bank	24,560	145,395
Valjevo	Sava	about 150	62,400	686,400
Lazarevac	Sava	about 600	22,700	129,390
Šabac	Sava	about 500	57,400	517,748
Sremska Mitrovica	Sava	on the river bank	66,500	340,560

As shown by the above data, some waste landfills are located on the very banks of the rivers, which carry away waste in the case of any more significant increase in their flow. After the recession of water, plastic packaging and other disposed material can be seen in the length of a few kilometers downstream from the disposal areas, on the banks and in willow groves.

In addition to municipal waste, in the majority of these waste landfills waste from industrial plants is disposed. Thus, apart from large organic pollution, the seepage filtrate also contains toxic matter.

The map given in the Annex A-11 shows locations of major municipal waste landfills in Danube corridor and catchment area. The situation in the rural area is identical, since the depressions, ravines and banks of minor torrential watercourses are used for uncontrolled trash and other waste disposal.

Such a way of trash dumping, as well as the use of mineral fertilizers and manure resulted in bacteriological and chemical contamination of the first water-bearing stratum so that in the whole of Vojvodina and in a large part of central Serbia and Kosmet this stratum cannot be used for domestic water supply.

5.1.3.2. Industrial/Mining/Hazardous Solid Waste Disposal

Hazardous waste produced in industrial plants is temporarily disposed within the enterprise, very often inadequately. One part of this waste is liquid so that it is stored in metal and plastic burrels, tanks and concrete pools. Solid waste is stored in plastic bags on concrete bases, often without a shed, or in improvised cassettes. The basic criteria of safe disposal are satisfied only by a small number of temporary storage facilities ("Prva petoletka" Trstenik, "Želvoz" Smederevo and "Namenska proizvodnja" Kragujevac).

Thermopower plants produce over 8,000,000 t/y of ash. Around 50 % of this quantity produces within Sava river watershed, 25 % within Grand Morava river watershed, 25 % within Danube Corridor. There aren't thermo power plants in other parts of FRY.

It is estimated that around 900,000 t/y of low toxic industrial solid wastes have been generated during the period 1994-97. (gypsum, "red" sludge, burned pyrite residues, etc.). Additional 900,000 t various industrial wastes, partly containing hazardous wastes, disposes on the municipal open dumps. Following the preliminary Inventory of hazardous wastes, around 250,000 t/y of hazardous wastes (as specified by the Basle Convention) are generated in FRY. Its are temporary disposed at the storages of industrial enterprises where its have been produced.

The Republican Weather Bureau of Serbia has prepared an Inventory of the dump sites that includes municipal, mixed and industrial dumps. At whole 243 sites are recognized (23 municipal, 105 mixed and 115 industrial dumps). There is no data on quantity of useless mining residues and flotation sludge originate from mining activities in the period 1994-97 because of unstable, periodically interrupted, production.

In the immediate vicinity of the banks of watercourses there are ash dumps of all thermal power plants (the capacity of each being a few million m^3), numerous flotation and other mine dirt dumps, as well as purple ore disposal areas. Overflow from these areas penetrated into the watercourses, while seepage water penetrates into the soil and contaminates ground water, so that the population in the neighboring settlements cannot even use the local sources of water (wells) for watering vegetables.

In the catchment area of the Sava there are ash dumps of the thermal power plants Pljevlja, Kolubara A, Nikola Tesla A and B; dirt disposal areas of the mines Mojkovac, Veliki majdan and Tornička bobija, and purple ore disposal areas in Loznica and Šabac. The major areas for the disposal of solid industry and mining waste in the catchment area of the Morava are the ash disposal areas of the thermal power plants Kosovo and Morava, dirt dumps of the mines Kišnica and Ajvalija, Bela stena, Baljevac, purple ore and mine dirt dumps of the Trepča Integrated Works.

The dirt dumps and flotation of the Majdanpek mine affect the Pek river. In the catchment area of the Timok there is a number of flotation dirt dumps of the Bor copper mine, as well as the dirt dumps of the Rgotina mine.

In the Danube corridor itself, there are the ash dumps of the thermal power plants Drmno and Kostolac, purple ore dump in Prahovo and slug dump in Smederevo. Underwater lignite mining from the Danube bed near Kovin has also begun, while on one of the Danube islands, about 20 km upstream from Djerdap Natural Park, there is dirt dump.

So far, there has been a number of incidents with the penetration of flotation dirt into the watercourses: Mojkovac-Tara (catchment area of the Sava), Valja Fondata-Porečka reka (Danube river system), Bor-Borska reka (catchment area of the Timok), which caused pestilence of hydrobions in the polluted watercourses and the suspension of water abstraction for the water supply of the settlements situated downstream from the place of accident.

Locations of all major industrial, ash and flotation dumps, already mentioned, are presented on the map in the Annex A-12.

5.1.4. Hydro-Power

Electric power industry is an extremely important economic sector, whose capacities have ensured an unhindered industrial development and the electrification of the whole country. Numerous enterprises specialize in the production of plant and equipment for power generation, transmission and use. Electric power industry is one of the most developed sectors in the country, employing about 60,000 workers (including power distribution). Otherwise, electric power is one of the major export items of the FR of Yugoslavia.

The hydroelectric power potential is the only renewable commercial source of electric power in the FR of Yugoslavia, and in the Danube river system about 56% of the total, technically usable hydro-potential has been utilized with respect to power, or about 58% with respect to energy. A considerable part of the unused hydro-potential cannot be considered as profitable on the basis of the energy supply and economic criteria. The other, smaller part cannot be used for ecological reasons (national parks, protected areas), as well as due to the vicinity of cities and infrastructure built in the river valleys.

There are also significant hydro-potentials on the Drina (to utilize them, it will be necessary to make appropriate arrangements with Bosnia-Herzegovina), on the Lim and in the catchment area of the Velika Morava. There are also numerous minor watercourses on which 10 MW hydro-electric power plants will be erected, in addition to multi-purpose water structures on which the erection of such plants is also possible.

So far, an area of c. 17,000 ha has been used for the construction of hydro-electric power plants (including the area of impounding reservoirs) and for thermal power plants, in addition to coal surface mining and ash and dirt dumps, covering about 10,000 ha.

The share of thermal power plants in surface and ground water contamination is not neglectable. For the cooling of the existing thermal power plants some 600,000 m^3 of water/h is abstracted from the watercourses, while about 7,000 m^3 of water/h is used for hydraulic transport of ash, most of which overflows or seeps into the watercourses, while the rest penetrates into ground water.

Power Plant Capacity and Annual Output

In the territory of the present-day FR of Yugoslavia, the construction of hydroelectric power plants began more than 100 years ago and was especially intensified during the past 40 years, when all major hydro-electric power plants (listed below) were erected.

The hydroelectric power plants in the Danube river basin in the FR of Yugoslavia, their rated power and average output are shown in the following table.

The table shows that a difference in the rated power of the power plants on the Sava and Danube is not great and that the Danube power plants (Djerdap I and II Hydro-electric Power Plants) generate more power than all other hydro-electric power plants taken together.

Annex A-6 shows all hydroelectric power plants on the Danube and its tributaries in the FR of Yugoslavia.

Table 5.1.4.1. Rated power and annual output of the hydro-electric power plants in FRY and the Danube river basin

Area - Catchment	No. of Power Plants	Rated Power (MW)	Annual Output (GWh/year)
FR Yugoslavia	23	2,996.3	11,069.3
Danube (total in FRY)	15	2,680.3	10,149.3
Sava River	8	1,159.0	2,983.0
Velika Morava River	5	255.5	579.7
Danube Corridor	2	1,265.8	6,586.6

Share in Total Output

The FR of Yugoslavia has significant deposits of lignite and subbituminous coal which are already used, but in the coming period their use for power generation will be intensified. Of the total power generated in the FR of Yugoslavia, 99% accounts for thermal and hydroelectric power plants in the Danube river basin. On the average, hydro-electric power plants generate 30% of power, while the rest is generated by thermal power plants. The output of hydro-electric power plants varies with the hydrologic situation in the river basin.

The share of power generated in thermal power plants will increase in the coming period, since a significant reconstruction and extension of the existing facilities (especially in Kosovo) is anticipated; underway is the erection of new plants (Kolubara B) as well.

Dams, Sluices and Fish Movement

With the erection of hydro-electric power plants on the Danube, the traditional migratory paths of the Acipenseridae coming from the Black Sea for spawning in the Djerdap Gorge have been blocked, thus endangering the survival of these species and prevented their passage upstream from Djerdap II Hydroelectric Power Plant. As for other hydro-electric power plants, the situation is identical but less alarming, since it is not the question of endangered and especially protected fish species; in addition, there are smaller tributaries which are now used by fish as spawning grounds.

The fishways also do not exist on the hitherto erected hydroelectric power plants in the FR of Yugoslavia, except for the Pirot hydroelectric power plant on the Visočica river. Thus, it would be necessary to erect “fish lifts” on the Djerdap II and II Hydro-electric Power Plants so as to enable access to the Acipenseridae from the Black Sea to natural spawning grounds in the Djerdap Gorge.

5.1.5. River Fisheries (Danube and Main Tributaries)

Fisheries in the Danube river basin in the FR of Yugoslavia include:

- Fish farming in various, specially built facilities or in natural waters and water structures (fish ponds).
- Fishing in open waters.
- Fish farming in the Danube river basin, in the territory of the FR of Yugoslavia, includes production in carp and trout ponds.
- Carp ponds in the Republic of Serbia cover an area of 10,954 ha (in the socially- and state-owned sector there are 27 carp ponds, covering an area of 10,829 ha, while private carp ponds cover an area of about 125 ha).

- Trout ponds in the Danube river basin in the FR of Yugoslavia are located in the hilly-mountainous regions of Serbia and Montenegro, mostly in the source areas of smaller rivers with high quality water, covering an area of 11.08 ha. In these ponds edible rainbow trout and its spat are reared.
- In the territory of the Republic of Serbia, trout ponds cover an area of 9.4 ha. The total area of trout ponds in the Danube river basin in the Republic of Montenegro covers 1.68 ha, of which 0.88 ha is in the socially (state) owned sector, and 18 fish ponds, covering an area of 0.8 ha, are in the private sector.

Catch, Fished Species and the Value of Catch

In carp ponds 9.080 tons of fish was produced (9,050 tons in state-owned ponds and about 30 tons, mostly spat, in private ponds). In carp ponds the following species are mostly produced: carp, grasscarp, bighead. Of the total output, 30% accounts for the production of spat and 70% for edible fish.

Carp ponds are mostly located in the region of the Autonomous Province of Vojvodina, while in the Republic of Montenegro there are no carp ponds. Carp ponds are supplied with water from the Danube and its tributaries so that the degree of water pollution influences the time of filling fish ponds, water quality in fish ponds and the tempo of fish growth. Likewise, when the water from the ponds is discharged, at the end of the season, a large quantity of organic matter enters into the watercourses, thus affecting the nutrient balance.

In Serbia there is an additional area of 3,720 ha for the reconstruction of carp ponds, in addition to an area of 5,185 ha for the reconstruction of new ponds. These areas are within the existing carp ponds.

The areas occupied by carp ponds in the Republic of Serbia are very small, as compared to the potentials of the soil, water supply and raw materials for feedeing, in addition to extremely favourable climatic characteristics of the region. In addition, the production per unit of area is unacceptably low and much below the production potentials of the ponds and yields achieved in the world, based on the similar semi-intensive type of aquaculture.

Trout ponds have a relatively high output per ha (over 200 t/ha).

In the coming period, it is planned to open new carp ponds in the above mentioned areas and increase output per unit of area so as to achieve the same output as in the developed countries, which will call for additional quantities of quality water but, in turn, will increase organic matter discharge.

In the region of the Republic of Montenegro, the annual production capacity of trout ponds is 1,105 tons of fish (output in the socially-owned sector is 255 tons, while the production capacity of private ponds is 850 tons of fish). In the Republic of Serbia, the production capacity of trout ponds is 2,510 tons of fish. These ponds have flowing water and are constructed on the source areas of the watercourses, thus increasing organic matter content in all rivers downstream from the fish ponds. In the initial stage of development is the cage system of fish farming in some multi-purpose reservoirs, which practically has the same impact on water quality as trout rearing in conventional fish ponds. An increase in organic matter content in these watercourses is significant, because on some of them there are impounding reservoirs which are also used for water supply or the construction of such reservoirs is planned.

The area of cyprinide and salmonide fish ponds and average annual production within FR Yugoslavia and Danube river basin is given in the folowing table.

Total production of freshwater fish in the territory of the FR of Yugoslavia, amounts to 12,695 tons of which carp production 9,080 tons and trout production 3,615 tons.

Table 5.1.5.1 Carp and trout ponds in the FR Yugoslavia and in the Danube river basin

Area - catchment	Carp ponds		Trout ponds	
	area(ha)	produc.(t/y)	area(ha)	produc.(t/y)
FR Yugoslavia	9,894	9,080	11.08	3,615
Danube (total in FRY)	9,894	9,080	9.60	2,510
Sava River	500	720	2.30	650
Grand Morava River	35	30	5.40	1,370
Mlava River	∅	∅	1.45	330
Pek River	∅	∅	∅	∅
Timok River	∅	∅	0.45	160
Tisa River	5,424	4,550	∅	∅
Tamiš River	1,960	1,850	∅	∅
Danube Corridor	1,975	1,930	∅	∅

In the Republic of Serbia, the Danube, Sava, Tisa and Tamiš have been designated as rivers for commercial fishing. The precise data on the catch from these rivers are not available and according to the estimates, the yearly catch on the Danube is about 380 tons, on the Sava 90 tons, on the river Tisa 160 tons and on the Tamiš 50 tons. On the rivers where commercial fishing is allowed, the yearly catch amounts to 680 tons of fish. Ten or so years ago, the catch was larger by about 70% but, with the deterioration of water quality, draining and blocking of fishways to natural spawning grounds, it was reduced to the present level although an increasing number of people is engaging in commercial fishing.

Each year, about 13,375 tons of fish is fished in the ponds and on open waters altogether.

In the watercourses designated for commercial fishing the catch includes: carp, bass, catfish, sterlet, pike and whitefish. More than 60% of the catch accounts for inferior quality whitefish, while the rest accounts for the mentioned quality species. On the lower course of the Danube, below the Djerdap II Hydro-electric Power Plant, it is possible to catch minor quantities of great sturgeon and starred sturgeon; world-reputed caviar, which is also produced here, is mostly exported. Before the construction of the Djerdap I and II Hydro-electric Power Plants, the catch of the Acipenseridae ranged from 12.7 to 22 tons a year, while during the past five years it did not exceed 5.5 tons a year. Not only the catch of the Acipenseridae declined, but also caviar production, thus incurring the loss of about US$ 200,000 each year.

In 1990, the Djerdap Fisheries near Kladovo embarked on the project of an artificial spawning of the Acipenseridae and reproduction of spat which, after reaching the length of 15 cm, is dropped into the Danube, thus contributing to the preservation of the species.

According to the expert estimates, the catch of fish on the rivers is at least 30% larger than stated because, due to a difficult economic situation, poaching and the grey economy are developed (engaging the inhabitants of the riparian settlements and owners of weekend cottages). In fact, most restaurants serving fish specialties are supplied with fish directly from fishermen and poachers and this quantity is not recorded, just like the fish sold on green markets and fishermen's marinas, outside specialized stores. In these cases, it is mostly the question of game fish species.

The average price of 1 kg of fish ranges from US$ 1 to 4.5, depending on the species, season, religious holidays and customs, so that the annual value of the catch is estimated at about US$ 25-30,000,000.

The Number of Fishing-Related Activities

It is difficult to define all fishing-related activities, as well as the exact number of people engaged in them, because such statistical data are not available.

In the Danube river basin, in the territory of the FR of Yugoslavia, some 3,400 persons are engaged in fisheries (commercial fishing and fish production. In the Republic of Serbia 970 persons are engaged in commercial fishing, while in freshwater fishing and carp and trout rearing in ponds in the Republic of Serbia and the Republic of Montenegro some 2,430 persons are engaged.

Plastic and metal boats are made mostly in industrial plants and shops, while wooden boats, fishing nets and other fishing gear are made and sold in small shops. The repair of engines, boats and fishing gear is also done in such facilities. Such facilities exist in all settlements on the Danube, Sava and Tisa. In major cities (Belgrade, Novi Sad, Pančevo, Smederevo, etc.) there are also marinas for the accommodation of boats. According to the expert estimates, 400-500 people engages professionally in these activites, while as many of them performs them as an additional job.

5.1.6. River Shipping

Before the imposition of sanctions, the Yugoslav river fleet ranked among the largest on the Danube. It transported cargo not only for Yugoslav clients but also for clients from other Danubian countries. Today, our fleet transports mostly mineral cargo, grains, oil and oil products by the Danube and its tributaries.

The total length of inland waterways in the FR of Yugoslavia is 1,513 km, but their potentials have not been adequately used. The system of inland waterways in the FR of Yugoslavia includes the rivers Danube (588 km), Sava (206 km), Tisa (168 km), navigable Begej (75 km), Velika Morava (3 km) and Tamiš (3 km), as well as the DTD system in Bačka and Banat, totalling 670 km. The greater part of the DTD canals (383 km) is navigable for vessels up to 1,000 DWT; 259 km are navigable for vessels up to 500 DWT, while 28 km are navigable only for vessels up to 200 DWT.

The map given in Annex A-13 presents the network of waterways in FRY.

Statistical data on carrying capacity and passenger transport by type of vessel (vessel-km/year, ton-km/year, passenger-km/year)

Since 1991, the passenger fleet of the FR of Yugoslavia has been practically nonexistent and the same can be said for regular passenger traffic. There are presently 8 passenger ships, with the carrying capacity of 500 passengers, on the rivers but regular passenger transport is not organized.

The data on the number of persons carried by foreign passenger ships through FRY do not exist.

A number of people lives on one bank and owns farmland, or has a job, in a settlement on the other bank of the Danube or one of its tributaries, but there is no bridge in the vicinity. Thus, the transport of people, farming machinery, passenger cars and smaller trucks is carried out by primitive ferries. According to the expert estimates, there are 40-50 of them on the Danube and its tributaries, but the data on the number of passengers and vehicles carried do not exist.

On the other hand, the merchant fleet is relatively large but its vessels are mostly old. At the end of 1996, our merchant fleet had 677 registered vessels but nearly 2/3 of them were older than 25 years. The following table shows the structure of our river fleet and the number of vessels by type.

Table 5.1.6.1. Types and number of vessels in the river fleet of the FRY at the end of 1996

Type of Vessel	No. of Vessels
Tugs	105
Pusher crafts	44
Self-propelled barges	70
Self-propelled tankers	5
Dumb barges	118
Dumb tankers	46
Pushed barges	240
Pushed tankers	49

The index of the physical volume of services rendered in cargo river transport in 1996 was 394 t/km (1.00 t/km of rail transport = 0.216 t/km of river transport).

Share (in %) of exports/imports achieved by carrying the goods by the Danube in total national imports/exports (in monetary units)

The data on the value of the goods carried by the Danube or its tributaries to be imported or exported do not exist. Likewise, the data on its share in the value of total Yugoslav imports and exports could not be obtained, because the statistics are not kept in such a way. In 1996, the foreign exchange earnings of river transport companies amounted to 1,365,000 dinars stemming from carrying the goods of domestic clients and 483,963,000 dinars for carrying the goods of foreign ones (US$ 1 = 4.7722 din.).

In 1996, cargo traffic in river ports stemming from export-import transactions was as follows: exports – 1,028,000 tons and imports 2,915,000 tons. Exports were dominated by grains (over 50%) while imports by oil and oil products 37%, iron and non-metal ores 25% and food products 10%.

The following table shows total cargo traffic (domestic, international and transit) in the river ports on the Danube, its tributaries and the DTD canals in 1997.

Table 5.1.6.2. Cargo traffic in the river ports of the FR of Yugoslavia in 1997, in thousands of tons

Cargo traffic	Danube	Tisa	Sava	Tamiš	V.Bački Canal (DTD)	M.Bački Canal (DTD)	Total
Total	13,194.092	268.879	1,736.315	36.487	33.131	39.885	15,308.789
Domestic traffic	l 3,032.969 u 1,910.185	l 101.529 u 133.568	l 299.165 u 1.294.358	l - u 1.777	l - u 29.867	l - u 39.085	l 3,433.663 u 3,408.840
International traffic	l 544.299 u 3,220.040	l 15.887 u 1.004	l 10.814 u 60.582	l 9.949 u 7.406	l 1.462 u 0.170	l - u 0.400	l 582.411 u 3,289,602
Transit	l 3,517.875 u 968.24	l - u -	l - u -	l - u -	l - u -	l - u -	l 3,517.875 u 968.724

***l.** = loading* ***u.** = unloading*

Table 5.1.6.2. shows cargo traffic (loading and unloading) on the Danube and its tributaries in domestic, transit and foreign trade in 1997. The data on the goods carried by our inland waterways by type and by quantity were not obtained, but only the summary data.

Major river ports (annual quantity based on the number of vessels or tons, etc., potential hazards)

The Danube belongs to international waterways and Tisa to inter-state ones, while the Sava, Begej, Tamiš, Velika Morava and the Danube-Tisa-Danube system are national waterways. These waterways are in a relatively good condition and are regularly maintained despite the shortage of funds for the reconstruction of some sectors, thus increasing navigation safety.

The FR of Yugoslavia has seven international river ports and all of them are on the Danube: Bačka Palanka, Novi Sad, Apatin, Belgrade, Pančevo, Smederevo and Prahovo. Not one of these ports has the facilities for receiving bilge or oily water from the berthed vessels. At the places designated for the transfer of oil and oil products there is no adequate protection in case of spillage, or the existing equipment is not properly used. Thus, on a few occasions larger quantities of oil or oil products were spilled and endangered downstream water intakes and protected natural resources.

The quantities of potentially hazardous goods which were unloaded and loaded in the Danube ports in the course of 1997, expressed in tons, are shown in the following table.

Table 5.1.6.3. Traffic of potentially hazardous goods in the largest ports on the Danube in 1997

Type of goods	Belgrade		Novi Sad		Pančevo		Smederevo		Prahovo	
	l.	u.	l.	u.	l.	u.	l.	u.	l.	u.
Fertilizers	-	-	-	-	1,721	-	-	-	-	1,721
Non-metals and minerals	6,546	786,674	1,323	235,470	2,121	129,017	2,510	3,331	-	-
Ores	-	-	-	-	-	-	-	-	1,790	-
Oil and Oil Products	-	336,387	190,793	114,617	543,306	215,584	-	84,847	-	33,993
Other Chemicals	-	-	-	-	-	-	-	-	1,082	1,586
Metals	-	-	-	-	-	-	7,054	-	-	-

***l.** = loading* ***u.** = unloading*

As shown in the table, the loading and unloading of minerals, crude non-metals, oil and oil products are dominant in the Danube ports. This type of cargo constitutes more than 95% of the total goods transported through our ports. The largest cargo traffic is in the Port of Belgrade. In 1997, cargo traffic through FRY, including traffic in transit, by our waterways totalled about 15,300,000 t.

5.1.7. Water Related Recreation/Tourism

After the years of decline and stagnation, tourism in the FR of Yugoslavia is again gaining in importance as an economic factor on the Danube, thanks to the preserved natural and ecologically valuable entities and numerous cultural and historical landmarks.

In 1996, the FR of Yugoslavia was visited by 162,000 foreign tourists and 139,000 tourists from the former Yugoslav republics, while the number of domestic tourists reached 2,554,000. There was a total of 12,249,000 bed-nights, of which 1,099,000 accounted for foreign tourists and tourists from the former Yugoslav republics, or about 9%. The majority of foreign tourists (the estimate is about 110,000) stayed on the banks of the Danube, since the administrative centre of the FR of Yugoslavia and the Republic of Serbia (Belgrade), and the administrative centre of the Autonomous Province of Vojvodina (Novi Sad) are located on the Danube and those are the most frequently visited cities in the FR of Yugoslavia. However, foreign tourists stayed in the Danube river basin only for a short time, because only about 266,000 bed-nights were recorded.

The dominant forms of tourism in the FR of Yugoslavia are seaside, health and high mountain tourism, while the Danube river basin is still not sufficiently used, especially in international tourism. By the strategy of tourism development, it is anticipated to promote river tourism, especially on the Danube, as one of the first priorities, and such a trend will continue in the coming period.

The Danube region (Podunavlje) has special potentials for the development of yachting, fishing, hunting, photo-safari and eco-tourism, as well as congress tourism. According to the Physical Plan of the Republic of Serbia, which proceeds from the preserved environmental values, plenty of cultural and historical landmarks from all period in history, numerous conserved natural resources and easy access, it is anticipated to develop attractive areas and build marinas, sports facilities, restaurants, bungalows and supporting facilities so as to promote this form of tourism. To this end, protection of the most attractive areas against uncontrolled urbanization is also anticipated.

On the Danube there is no organized passenger transport. At times, there are sight-seeing tours by smaller boats (carrying capacity 50-100 passengers) or one-day visits of the most significant cultural and historical landmarks and natural resources are organized.

Modern marinas on the Danube do not exist, but along all settlements there are more or less developed berthing places. They are also available in yachting clubs and parts of winter ports in the vicinity of large cities on the Danube, which meet minimum requirements for safe landing, berthing and stay of tourists. In the settlements along the Danube, the population is increasingly turning to the river as an attractive area for recreational activities, especially due to their diminished economic power. Therefore, it can be estimated that about 15% of population will be directly engaged in water-related recreation. Yachting is also becoming increasingly popular; thus, regattas on the Danube, Tisa and the channels within the DTD system are organized each year.

Only in Belgrade, there are about 25,000 boats and mini yachts for one-day cruises, and there is no village on the Danube in which there is no at least 10 or so boats. There is also a great number of persons going in for water sports (sailing, windsurfing, rowing, kayak, power-boating, sports fishing and the like). In the appropriate sports clubs there are over 50,000 members.

On the river banks and islands, there is a great number of official and wild beaches on which there can be a few thousand bathers (Štrand - Novi Sad, Lido - Belgrade). On the tributaries there are also numerous wild and official beaches (Užice, Kraljevo, Bečej, Titel). Numerous lakes in the riparian area, created by excavation of gravel or by damming the branches (Ada Ciganlija, Srebrno jezero, Belo Crkvanska jezera), and more or less developed, are also used for bathing or picnic. Each day, Ada Ciganlija accommodates some 70,000 bathers on the average, while on weekends there are even more than 100,000.

The quality of water on river beaches is often substandard, because the situation keeps changing. The situation is much better on the mentioned lakes in the riparian zone, where the degree of microbiological contamination is within the prescribed limits. With the exception of Ada Ciganlija, organic load on other lakes is lower, while the degree of self-purification is satisfactory on all lakes.

5.2. Projection of Expected Economic Significance/Impacts

The provision of sufficient quantities of quality water for water demands of the population, foodstuff industry and irrigation is imperative so as to enable the anticipated economic development and raise the standard of living. This also implies rational water consumption in all sectors, recirculation in industry and multi-purpose utilization of water. It is also necessary to introduce the economic price for abstracted water and discharged wastewater so as to induce the industries to take a more rational approach to the problem of water pollution and the preservation of water resources.

5.2.1. Projection of Abstraction of Raw Water

It is projected that all available quantities of ground water should be used for domestic water supply, as well as for the supply of those industries which require high-quality water, while the missing quantity would be provided from the protected surface-water source zones. Other consumers (industry and agriculture) have to shift to surface water. In some catchment areas, the quantities of ground water are very limited (e.g. the catchment area of the Tisa) and the quality of surface water is too bad that it cannot be used for domestic water supply.

For domestic water supply it will be necessary to provide the below given quantities of water.

Table 5.2.1.1. Estimated quantities of raw water which will be abstracted for water supply in 2010, by catchment area in ($10^6 m^3$/year), and share (%) of surface water.

Area – catchmant	Urban	surf. water	Rural	surf. water	Total	surf. water
FR Yugoslavia	1.342	27.4	481	0%	1.823	20.2%
Danube (total in FRY)	1183	29.8%	408	0%	1.591	22.2%
Sava River	128	20%	81	0%	209	12.2%
Velika Morava River	500	40%	220	0%	720	27.8%
Mlava River	2	0%	8	0%	10	0%
Pek River	5	95%	4	0%	9	52.8%
Timok River	28	65%	8	0%	36	50.6%
Tisa River	102	0%	30	0%	132	0%
Tamiš River	2	0%	3	0%	5	0%
Danube Corridor	416	25%	54	0%	470	22.1%

The Republic of Serbia opted for multi-purpose reservoirs as the source of water in the future, considering the growing demand for quality drinking water and insufficient ground-water reserves, especially in the central part of the country and in one part of Vojvodina. The abstraction of surface water will gradually increase in some catchment areas, but not in the catchment areas of the Tisa and Tamiš, where this water will still not be used for such a purpose. Of the above given quantities, about 25% will be provided from impounding reservoirs and watercourses, mostly in central Serbia.

The construction of multi-purpose reservoirs will also be continued in the period up to 2020, when about 33% of the required water quantities will be provided by abstraction from such reservoirs or from watercourses. In the catchment areas of the Tisa and Tamiš only ground water will be used for domestic water supply.

Table 5.2.1.2. Estimated quantities of raw water which will be abstracted for water supply in 2020, by catchment area ($10^6 m^3$/year)), and share (%) of surface water.

Area – catchmant	Urban	surf. water	Rural	surf. water	Total	surf. water
FR Yugoslavia	1.525	29.8%	520	0%	2.045	22.2%
Danube (total in FRY)	1.341	32.4%	441	0%	1.782	24.4%
Sava River	146	25%	88	0%	234	20.5%
Velika Morava River	591	45%	244	0%	835	31.8%
Mlava River	3	0%	8	0%	11	0%
Pek River	5	95%	4	0%	9	52.8%
Timok River	30	75%	8	0%	38	59.2%
Tisa River	111	0%	30	0%	141	0%
Tamiš River	3	0%	3	0%	5	0%
Danube Corridor	452	30%	56	0%	508	26.7%

In some alluvial source areas, ground-water sources will be artificially replenished in those parts in which the quality of surface water is satisfactory.

Table 5.2.1.3. Estimated water quantity which will be abstracted for industrial water supply in 2010, by catchment area ($10^6 m^3$/year) and share (%) of surface water

Area - catchment	Industry	
FR Yugoslavia	2,213	75%
Danube (total in FRY)	1,910	72%
Sava River	530	75%
Velika Morava River	520	65%
Mlava River	5	100%
Pek River	10	100%
Timok River	160	75%
Tisa River	120	40%
Tamiš River	5	80%
Danube Corridor	560	80%

In determining industrial water demands, it was proceeded from a hypothetic mean variation or, in other words, from a more moderate yet significant growth of industrial production which should provide for the prosperity of society as a whole, coupled with an appropriate environmental protection and the protection of water resources.

Industrial demands will be met mostly by abstraction of water from the alluvion or directly from the watercourse, while the quantities of water from water supply systems will be reduced. With the restructuring of industries, introduction of new technologies which require smaller quantities of water and the recirculation of water, the quantity of water per unit of product will be reduced, which should have a positive impact not only on the quality of water but also on the price of the product.

In addition to constructing new systems, the neglected irrigation systems will be upgraded and the economy of private farms within them will be improved through land consolidation and the provision of wide-range sprinklers.

Table 5.2.1.4. Estimated quantity of water which will be abstracted for irrigation in 2010, by catchment area ($10^6 m^3$/year)

Area - catchment	Irrigation
FR Yugoslavia	1,689
Danube (total in FRY)	1,375
Sava River	200
Velika Morava River	350
Mlava River	30
Pek River	0
Timok River	35
Tisa River	240
Tamiš River	70
Danube Corridor	450

As expected, it is anticipated to discontinue the abstraction of ground water for irrigation and shift to surface water from irrigation systems, which calls for the improvement of water quality in the ditches, as well as in the watercourses, whose water is used for the replenishment of irrigation systems. In some regions, new quantities of water will enable an intensive production of vegetable crops which bring in much larger profits than grains or industrial crops.

In the period 2010-2020, industrial water demands in the Danube river system will almost double or, more exactly, it is expected that industrial development will be more intensive than in the preceding decade.

Table 5.2.1.5. Estimated quantity of water which will be abstracted for industrial water demands in 2020, by catchment area ($10^6 m^3$/year)

Area - catchment	Industry
FR Yugoslavia	3,817
Danube (total in FRY)	3,280
Sava River	775
Velika Morava River	920
Mlava River	5
Pek River	10
Timok River	300
Tisa River	165
Tamiš River	5
Danube Corridor	1,100

During the observed period, almost 1/3 of water abstracted for industrial water demands in the FR of Yugoslavia will stem from the direct Danube river basin, while from the catchment areas of the Morava and Sava more than 50% of the required quantities will be abstracted. Such an increase will be partly the result of the anticipated the development of free trade zones in the riparian area of these rivers, which should spur economic development in the hinterland, thus becoming the

mainstay of industrial development of the Republic of Serbia. This will be contributed by a favourable geographic position (navigable inland waterways, good road and rail connections), availability of highly educated and qualified personnel, abundant energy supply, etc.

In the catchment areas of the Pek, Tamiš and Mlava, the industries will not require new quantities of water. Substantial additional quantities of water will be abstracted in the catchment area of the Timok, while in the catchment area of the Tisa a rise in consumption will be less pronounced.

Apart from electric power industry, the largest industrial consumers of water will continue to be chemical industry, pulp and paper industry and non-ferrous metallurgy, but it is expected that the share of foodstuffs industry in total water demands will significantly increase.

In the period up to 2020, irrigation will cover about 750,000 ha of the most fertile land (class I, II and IIIa suitability for irrigation) in the major agricultural regions, which also have a very favorable accumulated temperature and insolation for second crop, stubble crop, subsequent crop, as well as crop in rotation.

It is expected that in 2020 water consumption for irrigation will double as compared to 2010. In the region of Vojvodina and Pomoravlje two crops a year are expected and this can be achieved only by the provision of sufficient quantities of water. It is also expected that there will be a partial shift from the production of field crops to the production of industrial and vegetable crops which require larger quantities of water but also bring in larger profits.

Table 5.2.1.6. Estimated quantity of water which will be abstracted for irrigation in 2020 by catchment area ($10^6 m^3$/year)

Area – catchment	Irrigation
FR Yugoslavia	3,213
Danube (total in FRY)	2,699
Sava River	471
Velika Morava River	666
Mlava River	95
Pek River	0
Timok River	78
Tisa River	508
Tamiš River	170
Danube Corridor	711

Irrigation should ensure quality seeds, raw materials for foodstuffs industry and feed for increased livestock number, thus making use of comparative advantages of specified regions. The structure of food industry should aim for a higher degree of processing owing to the newly created resource base.

The highest increase in the quantities of irrigation water will be recorded in the catchment areas of Tisa, Tamiš and Grand Morava.

In the hilly-mountainous regions, irrigation should enable large-scale grape and fruit growing and specifically the development of organic agriculture (i.e. without the use of mineral fertilizers and plant protection chemicals) and production of food having a high biological value, which is profitable under such conditions.

In this period, the focus of attention will shift to a more intensive and more rational use of irrigation water.

5.2.2. Projection of Wastewater Discharge

The quantities of wastewater which will be discharged into the Danube and its tributaries in 2010 and 2020 will depend on the development level and type of industry, intensity of agricultural production and mining, as well as migrations of the population and its growing water demand.

Municipal Wastewater Discharge

It must be borne in mind that urban population in the Danube river basin and its tributaries will increase as will the share of urban population connected to the sewerage. At the same time, the number, capacity and efficiency of municipal wastewater treatment plants will also increase. The estimated quantity of municipal wastewater for specified time horizons is given in the following table.

Table 5.2.2.1. Quantities of municipal wastewater which will be discharged into watercourses in the coming period ($10^6 m^3$/year).

Area – catchment	2010	2020
FR Yugoslavia	1,367	1,532
Danube (total in FRY)	1,194	1,336
Sava River	157	175
Velika Morava River	540	626
Mlava River	8	8
Pek River	7	7
Timok River	27	28
Tisa River	99	106
Tamiš River	4	5
Danube Corridor	352	381

The quantities of municipal wastewater will slightly increase in the catchment areas of the Mlava, Pek and Tamiš, like in the case of domestic wastewater, while the highest increase in water quantity will be recorded in the catchment area of the Morava.

Industrial Wastewater Discharge

In considering industry and mining, it should be noted that industrial development in the coming period will be intensified, especially in the Danube corridor and the catchment areas of the Morava and Timok, in addition to the reconstruction of the existing industrial plants. Mining and processing in the existing metal and non-metal mines will be significantly increased. It is also anticipated to open new mining facilities for mineral raw materials which can be sold on the world market in various degrees of processing (basalt, boron).

Economic restructuring should bring about the opening of numerous smaller plants specializing in processing and finishing of products, thus increasing the employment of skilled personnel, decreasing imports of raw materials and increasing exports of semi-products and finished products which bring larger profits.

Table 5.2.2.2. Quantities of industrial and mining wastewater which will be discharged into watercourses, in 10^6 m^3/year

Area – catchment	2010	2020
FR Yugoslavia	2,063	3,458
Danube (total in FRY)	1,776	2,952
Sava River	493	697
Velika Morava River	484	828
Mlava River	5	5
Pek River	9	9
Timok River	149	270
Tisa River	110	148
Tamiš River	5	5
Danube Corridor	521	990

It should be noted that one part of the Danube corridor and the riparian zones of major waterways will be used for the establishment of free trade zones, including the erection of industrial plants which will discharge wastewater treaded in conformity with the EU standards. It is planned to promote the application of "wasteless technologies" in these zones.

It has already been said that the Danube corridor is regarded as one of the basic lines of development and, thus, the greatest quantity of water will be produced in this region both per unit of area and altogether. The catchment area of the Morava is the other line of development specified by the planning documents, so that the quantities of wastewater in the coming period will dramatically increase. A significant increase in the specific quantity of discharged wastewater per unit of catchment area will be recorded in the Timok and Sava but it will be less smaller than in the preceding catchment areas.

An increased production of wastewater from industrial plants is not expected only in the catchment areas of the Tamiš, Mlava and Pek, because industrial development will not be intensified.

Underway are the adjustment of the existing water protection and quality regulations and standards with the EU regulations, the introduction of effluent standards, the implementation of a stricter punitive policy so as to induce industrial enterprises to use water more rationally and introduce recirculation and a higher degree of wastewater treatment.

Discharge of Agricultural Wastewater (Irrigation and Farms)

It is estimated that about 15% of the water abstracted for irrigation today is returned, mostly through ground water. It is anticipated that in 2020 the quantity of water returned into watercourses will amount to about 5%.

A direct discharge of wastewater from farms into the watercourses in the Danube river basin, as concentrated pollutants, is not anticipated. Instead, it is anticipated to decrease the possibility of excess situations.

5.2.3. Projection of Other Major Impacts

The Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia adopts the Plan for the Protection of Waters Against Pollution on the basis of the Law on Waters. According to the Plan, it is necessary to determine the method of collecting, conveying and disposing sludge from industrial wastewater treatment plants.

This plan also anticipates the development of erosion-prone regions by constructing regulating structures, afforestation and other anti-erosion measures so as to reduce leaching, as well as the pollution and filling of the watercourse. By afforestation, forest land in the Republic of Serbia one should increase to over 40%, which is close to the optimal value, thus contributing to the improvement of the water regime.

In cooperation with other ministries and industrial groups, the Ministry of Environmental Protection of the Republic of Serbia will embark on the programme-based construction and equipping of appropriate industrial waste dumps, as well as specialized plants for the destruction of hazardous waste which cannot be recycled.

At the district level, it has been undertaken to upgrade municipal waste disposal areas, while at the same time coordinating the activities of the municipalities and industries in the catchment area relating to the protection of the watercourse and conservation of marshy habitats.

All these measures should contribute to the improvement of water quality and equalize the actual class with the prescribed one.

6. Analysis of the Relevant Legal and Institutional Framework and Its Adequacy for Sound Environmental Management of Water Resources and Eco-Systems

One of the pillars of the protection of water resources and environmental protection in general is the legal framework or, in other words, the regulation of this area and its institutional framework, i.e. the responsibilities of specified government bodies, institutions and other organizations with respect to the implementation of legal, planning and programme-related solutions.

6.1. Documentation and Short Analysis of the Relevant Legal Framework

The legal framework for environmental protection and the protection of water resources and eco-systems in an aquatic environment is created by federal and republican regulations. The federal and republican constitutions stipulate the responsibilities of the federal state and the republics concerning the environmental protection issues. The characteristic of the current legislation relating to this area is that in determining the terms of reference of the existing institutions in charge of environmental protection, one should bear in mind an entire complex of questions. These questions refer to property relations, management of public (socially owned) property, relations between the republican sovereignities and the competences of the federal state, the relationship of the legal system of the Federal Republic of Yugoslavia towards the legal system of the Socialist Federal Republic of Yugoslavia, the competences of the republics and the federal state in the area of international relations, as well as the problems relating to the organization of the executive branch of (federal) government.

The general characteristic of the legal system of the Federal Republic of Yugoslavia, which also exerts influence on environmental protection, is the maladjustment of its elements, i.e. the discrepancy between the republican constitutions and the federal constitution. The system provides for mechanisms for the removal of these discrepancies but so far they have not been sufficiently used. Therefore, it is reasonable to expect that these discrepancies of the system will be regulated in the future. This calls for coordinated activities of the republics, in which the systems of environmental protection have been fully developed, and the federation which is authorized to lay down the fundaments of the system of environmental protection. In addition, the federal state, as a legal entity in international law, has the right to conclude international treaties.

It should be pointed to the fact that numerous regulations relating to the problems considered within this project (especially the by-laws) were adopted a long time ago, that they were frequently amended and that it is necessary to revise them (if for no other reason than for the sake of transparency).

Constitutions

1. Constitution of the Federal Republic of Yugoslavia (Federal Government Gazette, No. 1/92);
2. Constitution of the Republic of Serbia (Sl. list RS, No. 1/90);
3. Constitution of the Republic of Montenegro.

Federal Level

1. **Low on Water Regime** (Federal Government Gazette No. 59/98)
   - Regulation on the Classification and Categorization of Ground-Water Reserves and Relevant Recording Keeping (Federal Government Gazette, No. 34/79);
   - Decree on the Classification of Waters of the Inter-Republic Watercourses, Inter-State Waters and Coastal Sea Waters (Federal Government Gazette, No. 6/78);
2. **Law on the Fundaments of Geological Issues of National Concern** (Federal Government Gazette, No. 63/90, Federal Government Gazette, No. 22/94, 28/96);
3. **Law on the Fundaments of Environmental Protection** (Federal Gov. Gazette, No. 24/98);
4. **Law on the Health-Related Adequacy of Foodstuffs and General-Purpose Goods** (Federal Government Gazette, No. 53/91, Federal Government Gazette, Nos. 24/94, 28/96);
   - Regulations on the Sampling Method and Methods of Laboratory Drinking Water Analysis (Federal Government Gazette, Nos. 55/78 and 55/85);
   - Regulations on Sanitary-Technical Measures for Drinking Water Protection (Sl. list FNRJ, Nos. 44/60, 11/62);
   - Regulations on Sanitary Adequacy of Drinking Water (Federal Government Gazette, Nos. 33/87 and 13/91);
5. **Low on Standardization** (Federal Government Gazette, No. 30/96);
   - Regulations on the Yugoslav Standards (JUS) for Water to be used in Analytical Laboratory Determination – JUS ISO 3696 (Federal Government Gazette, No. 54/94);
   - Regulations on the JUS for Testing of Industrial Wastewater – JUS ISO 3696 (Federal Government Gazette, No. 19/88);
   - Regulations on the JUS for Testing of Industrial Wastewater – JUS H.31.111; JUS H.31.117; JUS H.31.145; JUS H.31.149; JUS H.31.152; JUS H.31.160; JUS H.31.195; JUS H.31.196 (Federal Government Gazette, No. 84/97, 12/82);
   - Regulations on the JUS for Testing of Industrial Wastewater – JUS H 31.113; JUS H. 31.136; JUS H 31.137; JUS H. 31.165; JUS H.31.173; JUS H. 31.175 (Federal Government Gazette, No. 48/85);
   - Regulations on the JUS for Testing of Industrial Wastewater – JUS.H.31.135; JUS H.31.177; JUS H.31.178; JUS H.31.179; JUS H.31.180; JUS H.31.181 (Federal Government Gazette, No. 47/85);
   - Regulations on the JUS for Testing of Industrial Wastewater – JUS H.31.114; JUS.H.31.115; JUS.H.31.138; JUS H.31.139; JUS H.31.140; JUS H.31.141; JUS H.31.142; JUS H.31.144; JUS H.31.163; JUS H.31.190 (Federal Government Gazette, No. 47/85);
   - Regulations on the JUS for Testing of Industrial Wastewater – JUS H.31.100; JUS H.31.101; JUS H.31.102; JUS H.31.103; JUS H.31.104; JUS H.31.170; JUS H.31.171 (Federal Government Gazette, No. 55/83);
   - Regulations on the JUS for Water Quality – JUS ISO 5813; JUS ISO 5814; JUS ISO 5815; JUS ISO 6060; JUS ISO 7890-1; JUS ISO 7890-2; JUS ISO 8245; JUS ISO 8466-1 (Federal Government Gazette, No. 56/84);
   - Regulations on the JUS for Water Quality – JUS ISO 5664; JUS ISO 6595; JUS ISO 6778; JUS ISO 7150-1; JUS ISO 7150-2 (Federal Government Gazette, No. 56/84);

- Regulations on the JUS for Water Flow Measurement in Open Courses – JUS U.C5.080; JUS U.C5.090; JUS U.C5.092; JUS U.C5.094 (Federal Government Gazette, No. 54/94);
- Regulations on the JUS for Wastewater – JUS H.31.200; JUS H.31.201 (Federal Government Gazette, No. 1/92);
- Decision on the establishing of Yu standards for the environmental protection (Fed. Government Gazette No. 11/98)

6. **Law on the Protection Against Ionizing Radiation** (Federal Government Gazette, No. 46/90);
   - Decree on Maximum Concentrations of Radionuclides and Hazardous Matter in Inter-Republic Watercourses, Inter-State Waters and Waters of the Coastal Sea of Yugoslavia (Federal Government Gazette, No. 8/78);
   - Regulations on the Sites and Time Intervals of Systematic Testing of the Content of Radionuclides in the Environment, Early Detection and Reporting on Radioactive Contamination of the Environment (Federal Government Gazette, No. 84/91);
7. **Law on Hydrometeorological Issues of National Concern** (Federal Government Gazette, Nos. 18/88, 63/90).

Regulations of the Republic of Serbia

1. **Law on Waters** (Republic of Serbia Government Gazette, No. 46/91, 53/93, 48/94, 54/96)

   In the Republic of Serbia this Law regulates the protection of waters, protection against toxic effects of waters, utilization and management of waters as goods of common concern, conditions for and method of water management, water management organization and financing and supervision over the implementation of the Law. The provisions of this Law are applicable to surface and ground waters, including drinking water, thermal and mineral waters. The provisions of this Law are also applicable to border watercourses, watercourses intersected by the state border and inter-republic waters within the borders of the Republic of Serbia, unless a special law stipulates otherwise.

   One could pose the question what special law would regulate this issue in a different way. There are the complex of the questions relating to the watercourses which constitute the state border, or are intersected by the state border, as well as to the inter-republic waters within the borders of the Republic of Serbia been regulated by a federal law, this federal law could not be regarded as a special law in the sense of the mentioned provision of the republican Law.

   It is important to note that the Environmental Protection Law also has the provisions relating to water protection which are almost identical to those of the Law on the Waters. The reasons for this double regulation of one area of social relations, which brings about double (the water management department and the environmental protection department) competences with respect to the same issues, are not clear.

- Decree on Water Classification (Republic of Serbia Government Gazette, No. 5/68);
- Decree on the Categorization of Watercourses (Republic of Serbia Gov. Gazette, 5/68);
- Regulations on the Contents of Technical Documentation to be Submitted in the Procedure for Obtaining Water Management Consent and the Water Management Licence (Republic of Serbia Government Gazette, No. 3/78);
- Regulations on Hazardous Matter in Waters (Republic of Serbia Gov. Gazette, 31/82);

- Regulations on the Method of Determining and Maintaining the Zones and Belts for Sanitary Protection of Drinking Water Supply Facilities (Republic of Serbia Gov. Gazette, No. 33/78);
- Regulations on Drinking Water Standards (Republic of Serbia Gov. Gazette, No. 27/77);
- Regulations on the Method and Minimum Number of Wastewater Quality Tests (Republic of Serbia Government Gazette, Nos. 47/83, 13/84);
- Regulations on the Conditions to Be Satisfied by Enterprises and Other Legal Entities Carrying out Specific Surface and Ground Water Tests, and Wastewater Quality Tests (Republic of Serbia Government Gazette, Nos. 41/94, 47/94);
- Regulations on the Disinfection and Inspection of Drinking Water (Republic of Serbia Government Gazette, No. 60/81);
- Regulations on the Method and Procedure for Determining the Degree of Purification of Discharged Contaminated Water (Republic of Serbia Government Gazette, No. 9/67);

2. **The Law on the Use and Protection of Water Supply Sources** (Republic of Serbia Government Gazette, Nos. 27/77, 29/88);

   This Law ceased to be valid with the coming into force of the Law on Waters in 1989. In effect is only the annex to the Law "Description of the Water Supply Source Areas and the Fundaments of Long-Term Domestic and Industrial Water Supply in the Territory of the SRS Without the Provinces", pursuant to Article 135, Section 2 of the Law on Waters (Republic of Serbia Government Gazette, Nos. 35/94, 38/94, 25/96);
3. Regulations on the Conditions for Fluoration of Drinking Water (Republic of Serbia Government Gazette, No. /97);
4. **Law on Agricultural Land** (Republic of Serbia Gov. Gazette, Nos. 49/92, 53/93, 67/93)

   Among other things, the Law forbids the discharge and storing of hazardous and toxic matter on agricultural and in irrigation canals in the quantity which may impair and change the production capacity of agricultural land and irrigation water quality. The Ministry charged with agricultural issues, by agreement with the Ministry for Environmental Protection, determines the permissible quantities of hazardous and toxic matter in soil and irrigation water, as well as the methods of their testing (which is stipulated by the relevant by-laws), according to the programme adopted by the Government.

   - Regulations on the Permissible Quantities of Hazardous and Toxic Matter in Soil and Irrigation Water and the Methods of Their Testing (Republic of Serbia Government Gazette, No. 23/94);
5. **Law on Municipal Services** (Republic of Serbia Government Gazette, No. 44/89, Sluzbeni glasnik RS, Nos. 53/93, 67/93, 48/94);
6. **Law on Environment Protection** (Republic of Serbia Government Gazette, Nos. 66/91, 83/92, 48/94, 53/95);
   - Regulations on an Analysis of the Impacts of Structures and Works on the Environment (Sl, glasnik RS, No. 61/92);
   - Regulations on the Criteria for Determining the Site and Planning of Waste Disposal Areas (Republic of Serbia Government Gazette, No. 54/92);
   - Decree on Determining the Programme of Protection Against Ionizing Radiation (Republic of Serbia Government Gazette, No. 54/92);
   - Regulations on the Methods of Assessing the Hazards of Chemical Accidents and Environmental Pollution, Preparatory Measures and Measures for the Removal of Consequences (Republic of Serbia Government Gazette, No. 60/94);
   - Regulations on Handling the Wastes Having the Properties of Hazardous Matter (Republic of Serbia Government Gazette, No. 12/95);

7. **Law on the Physical Plan of the Republic of Serbia** (Republic of Serbia Government Gazette, No. 13/96);
8. **Law on Land and Settlement Planning and Developing** (Republic of Serbia Government Gazette, No. 44/95);
9. **Waste Management Law** (Republic of Serbia Government Gazette, Nos. 25/96, 26/96);
10. **Law on Geological Research** (Republic of Serbia Government Gazette, No. 44/95);
11. **Low on Mining** (Republic of Serbia Government Gazette, No. 44/95).

Regulations of the Republic of Montenegro

1. **Law on Waters** (Republic of Montenegro Government Gazette, No. 6/95);
   - Decree on Water Classification and Categorization (Republic of Montenegro Government Gazette, No. 14/96);
   - Regulations on the Contents and Methods of Keeping the Water Register and the Register of Surface and Ground Waters, Consumers and Pollutants, Torrents and Erosion-prone Regions and Water Structures and Plants (Republic of Montenegro Government Gazette, Nos. 5/96 and 19/96);
   - Decision on the Criteria, Amount and Mode of Payment of Compensation for Water Protection Against Pollution, Compensation for Material Extracted from the Watercourse and Compensation for the Utilization of Water Structures (Republic of Montenegro Government Gazette, No. 15/96);
   - Programme of Systematic Testing of the Quantity and Quality of Surface and Ground Waters for 1996 (Republic of Montenegro Government Gazette, No. 30/96);
   - Programme of Systematic Testing of Watwer Quality of Water at Water Structures (Sanitary Protection Zones) and Public Bathing-Places (Republic of Montenegro Government Gazette, No. 22/96);
2. **Law on the Environment** (Republic of Montenegro Government Gazette, No. 12/96);
   - Decree on the Assessment of Impacts on the Environment (Republic of Montenegro Government Gazette, No. 14/97);
   - Decree on the Establishment of the Public Institution - Centre for Ecotoxicological Research of Montenegro (Republic of Montenegro Government Gazette, No. 40/96).

6.2. Analysis of the Relevant Institutional Framework

The regulations cited in Section 6.1. as well as in other sections which do not refer directly to the issue under consideration, stipulate the competences, obligations and responsibilities of the relevant institutions. Their survey is given in further text.

Federal Level:

1. **Low on Water Regime** (Federal Government Gazette No. 59/98)

   Federal Government;
   Federal Ministry of Agriculture;
   Federal Ministry of Defence;
   Federal Hydrometheorological Institute;
   Republican Hydrometheorological Institute;
   Other competent bodies;
   Business organizations, public utility organizations, other legal entities.

- Regulations on the Classification and Categorization of Ground-Water Reserves and Relevant Record-Keeping (Republic of Serbia Government Gazette, No. 34/97);

  Business organizations;

2. Law on the Fundaments of Geologic Activity of National Concern (Federal Government Gazette, No. 63/90, Federal Government Gazette, Nos. 22/94, 28/96);

   Federal Assembly;

   Federal Government;

   Competent bodies;

   Federal institution in charge of geological issues;

   Federal Bureau of Informatics;

   Business and other organizations and other economic entities;

3. Law on the Fundaments of Environmental Protection (Federal Government Gazette, No. 24/98);

   Federal Government;

   Federal Ministry in charge of the environmental issues;

4. Law on Health-Related Adequacy of Foodstuffs and General-Purpose Goods (Federal Government Gazette, No. 53/91, Federal Government Gazette, No. 24/94, 28/96);

   Federal body for medical care;

   Federal body for agriculture;

   Federal Ministry of Defence;

   Business enterprises, government and other bodies;

5. Law on the Protection Against Ionizing Radiation (Federal Government Gazette, No. 46/96);

   Federal Government;

   Competent federal body;

   Legal entities;

6. Law on Hydrometeorological Issues of National Concern (Federal Government Gazette, Nos. 18/88, 63/90);

   Federal Assembly;

   Federal Government;

   Federal Hydrometheorological Institute;

   Federal Ministry of Defence;

   Federal body in charge of flight control;

   Republican Hydrometheorological Institute;

   Business organizations and scientific institutions.

Republic of Serbia:

Law on Waters (Republic of Serbia Government Gazette, Nos. 46/91, 53/93, 67/93, 48/94, 54/96);

National Assembly;

Government;

Ministry in charge of water management issues;

Ministry of charge of medical issues;

Ministry of Environment Protection;

Ministry of Transport;

Ministry in charge of geological issues;

Republican Weather Bureau;
Cities and municipalities;
"Srbijavode" Public Water Managemnt Enterprise;
Business enterprises, public utility enterprises and other legal entities;
Water resources cooperative (97,98).

Republic of Montenegro

Law on Waters (Republic of Montenegro Government Gazette, No. 6 /95);

National Assembly;
Government;
Ministry in charge of agricultural issues;
Ministry in charge of medical issues;
Ministry of Environment Protection;
Ministry of Transport;
Ministry in charge of geological issues;
Republican Weather Bureau;
Cities and municipalities;
Enterprises, public utility enterprises and other legal entities.

In accordance with legal powers and responsibilities, quality control of surface waters of inter-state and inter-republican watercourses, as well as watercourses intersected by the state border is performed by the Federal Weather Bureau, while the control of other watercourses is performed by the relevant republican weather bureaus. The programmes of systematic water quality control are adopted by the federal and republican governments each year. The mentioned weather bureaus also monitor water levels and flows on the rivers and maintain data bases on the quality of waters, water levels and flows.

Quality control of surface waters in the sectors of rivers and impounding reservoirs, which are used as the sources of water supply or bathing places, are carried out by the health service but not according to the mentioned Programme, but according to the programmes of the municipalities and towns on whose territory the water supply source or bathing places are located. In addition to the control of raw water intended for domestic water supply, the control of drinking water quality is also performed by regional public health institutes. The results of control are submitted to the inspection authorities and Republican Public Health Institute. The health service keeps evidence of all diseases caused by poor quality of drinking water.

Control of the composition of wastewater, as well as the assessment of their impact on the recipient are carried out by the enterprises and institutions authorized by the competent ministry, since they meet the requirements with respect to personnel, equipment and facilities. The results of such tests are submitted, apart from the client, to the Republican Weather Bureau which forms the appropriate data base.

When taking a decision on the building of structures which can have a negative impact on the environment (including waters) or human health to a greater extent, it is necessary to make the Assessment of the Impacts on the Environment which has to be approved by the Ministry of Environmental Protection. All conditions and measures relating to environmental protection set forth in this Assessment must be taken into account in the feasibility study and technical documents.

The quality standards for surface waters and waters intended for irrigation are jointly adopted by the ministries charged with the water management, agricultural, environmental and health issues, while drinking water standards are adopted by the Federal Ministry of Health.

Cooperation between the ministries is carried out through inter-departmental commissions which work jointly on the preparation of regulations and standards, water protection plans and the like, as well as through concerted efforts of inspection authorities of several ministries.

However, there is still no sufficient cooperation among the departments authorized for specified segments, because the terms of reference are not clearly defined, so that the activities of, say, 3 or 4 ministries overlap when water management is in question, since each is responsible for one segment (Ministry of Water Management – surface water quality, Ministry of Mining – ground water quality – Ministry of Health – drinking water and the Ministry for Municipal Services – the condition of plant and piping in water supply systems. The situation is similar with respect to chemical accidents caused by vessels in which the ministries of internal affairs, water management, health, environmental protection and transport are involved.

Cooperation among institutions and enterprises engaging in one of the water quality control segments i based on bilateral contracts, because not one institution disposes of complete personnel and equipment as to fully cover all forms of control (physical-chemical, chemical, microbiological, biological and radiological). So, for example, highly specialized research is conducted by the "Vinča" Nuclear Research Institute, "Siniša Stanković" Biological Research Institute, Institute of Virusology, etc.

The problem lies in the dissemination of information which is not satisfactory, both vertically (municipality. district, republic, federal state) and horizontally, between the ministries at the federal level or the level of constituent republics, because there is no appropriate information system. Likewise, there is no central register of water pollutants by catchment area so as to facilitate the work on water protection, but only partial registers by specified administrative units.

7. Description and Analysis of Actual Policies and Strategies

The FR of Yugoslavia and its constituent republics have adopted a number of documents relating to the policy and strategy by sectors which are directly linked to the protection and quality of water, and have implications for sustainable development and the preservation of biodiversity.

7.1. Actual Policies and Strategies

The major documents dealing with this issue are as follows:

1. Federal Republic of Yugoslavia
   - Environmental Protection Policy (Federal Government Gazette, No. 31/93);
   - Resolution on the Policy of Biodiversity Protection in the FRY (Federal Government Gazette, No. 22/96);
   - Economic Policy for 1998 (adopted at the 56th session of the Federal Government on 25 Dec. 1997);
   - Development Policy of the FRY and the Evaluation of Macroeconomic Tendencies up to 2005 (40th session of the Federal Government on 9 October, 1997);
   - Development Strategy of the Energy Supply of the FR Yugoslavia, 1997.
2. Republic of Serbia
   - Physical Plan of the Republic of Serbia (Republic of Serbia Government Gazette, No. 13/96);
   - Draft of the Water Economics Plan of Serbia, 1996.
3. Republic of Montenegro
   - Physical Plan of the Republic of Montenegro; (Republic of Montenegro Gov. Gazette No.)
   - Draft of the Water Economics Plan of Montenegro, 1998.

In all mentioned strategic documents it is stated that the development of individual economic sectors and the country as a whole should be adjusted to the requirements of environmental protection, while at the same time satisfying the need to improve the current state, especially in the area of water protection and water management in general.

It is insisted on so-called “sustainable development”, while emphasis is placed on the development of all social segments, coupled with the preservation of the existing natural and cultural values, as well as on the attainment of a more efficient protection and increased area under protection with a view to preserving biological diversity, health and welfare of the present and succeeding generations. We are the witnesses that the short-term planning documents are implemented either with a great delay, or in part, or are not implemented at all due to the lack of funds. Thus, it is all the more difficult to speak about strategic documents.

Bearing in mind that it is the question of long-term documents adopted during the past few years, it is difficult to project to what extent the spirit and provisions of these documents will be reflected in practice in the coming period. The projection is all the more difficult because the outer-war sanctions are still in force, the process of transition is at a halt, the already difficult economic position is deteriorating, the plants and technologies are becoming obsolete, foreign investments and credits are practically nonexistent, while domestic reserves are almost depleted.

If the FR of Yugoslavia joins the international financial flows soon, it can be expected that the greatest number of the strategic aims will be achieved, probably not within the anticipated time-limit, but certainly in the near future.

7.2. Sector Policies

Policy of state institutions as well as of local authorities concerning environmental protection (particularly concerning water protection) differs. It can be stated that environmental protection is not adequately treated in sector policies (particularly industry, mining and energy) Also, there is discrepancy between proclaimed policy and activities that are carry out for the purposes of protection of surface and ground water quality.

In general, policy of State institutions (Federal and Republican level) in the field of Water Pollution Control follows the conclusions of the Rio Declaration. Most of the relevant planning documents (Physical Plans, Water Plans, Water Pollution Control Plans, etc.) which are needed to realize proclaimed policy are adopted by Government. Even priorities and dynamic of activities are defined in above mentioned documents.

Governmental departments directly or indirectly responsible for the water pollution control as well as for the ambient water quality are very active in realization of proclaimed policy.

Republican Ministries of Agriculture, Forestry and Water Management have the various institutional tools for realization of proclaimed policy. The procedure for construction of new buildings, industrial capacities and other structures are precisely defined. All technical documents needed for construction of new capacities, but relevant for water use and protection, has to be approved by Ministry responsible for Water Pollution Control. There are also the Water inspectorate controlling the realization of water low in the practice.

In order to stimulate the construction of wastewater plants by Ministry responsible for Water Pollution Control has founded the incentive fund for financing (grants, soft loans) of the construction of wastewater treatment plants. Even though it has to be point out that the financing mechanisms are not fully developed so to be an incentive motive for improving of Water Pollution Control.

Principle “polluter pays” has been installed in the practice but it was not fully developed.

Ministries for Environment, Physical Planning and Civil Works are responsible for Environment Impact Assessment. All the investors are obliged by Environmental Low to make Environment Impact Assessment Study. The Study comprises design of all technical measures and activities needed for environment protection (including protection of waters). The investors have to carry out all designed technical measures and activities before the start of operation of given plant or structure.

There are some objective difficulties as well as subjective weakness which distressing and retarding realization of proclaimed policy. The Inspection, although consist of skilled trained personnel, is not numerous, underpay, unequipped and unmotivated for work. Invested Funds in environmental and water protection not always for designated purpose, but for protection of flood and inland water (construction of dams, embankments,) or for construction of water supply systems. Realization of many projects has been delayed, although project documentation has been elaborated, revised, and accepted, because of lack of financial resources. In the meantime projects are outdated and resources invested in elaboration of documentation is wasted many.

In the basic documents of the sectors which interest are not friendly with water protection policy, this matter is not highly ranged. Effectuation of water protection policy is obstructed, although this policy has been approved by authority, because our country and economy deal with difficulties caused by long lasting sanctions.

Annexes

Annex A-1 List of the Protected Natural Resources in the Danube River Basin with International Status

The natural resources of international concern in the territory of the FR of Yugoslavia, in the Danube river basin, which have been registered or nominated for itnernational status are as follows:

I World's Natural Heritage – UNESCO Programme

Registered:

- Durmitor National Park, area 33,895 ha

The following have been nominated for the UNESCO List of the World's Natural Heritage through the Yugoslav Commission for the UNESCO:

- Biogradska Gora National Park, area 5,400 ha
- Tara National Park, area 19,200 ha
- Djerdap National Park, area 63,680 ha
- Deliblatska Peščara Special Nature Reserve, area 35,000 ha
- Djavolja Varoš Nature Monument, area 64 ha.

II Bisophere Reserves – MAP Programme – UNESCO

Registered:

- Tara River Canyon, area 30,880 ha;

The following have been nominated through the Yugoslav Commission for UNESCO:

- Gornje Podunavlje Nature Park, area 10,000 ha;
- Obedska Bara Special Nature Reserve, area 9,820 ha;
- Deliblatska Peščara Special Nature Reserve, area 35,000 ha;
- Djerdap National Park, area 63,680 ha;
- Tara National Park, area 19,200 ha;
- Kučaj Mts, area 115,000 ha;
- Mountain Golija, area 75,000 ha;
- Mountain Stara Planina Nature Park, area 142,000 ha.

III Ramsar Regions

The following have been registered thus far as the regions of significance:

- Ludoško Jezero Special Nature Reserve, area 387 ha;
- Obedska Bara Special Nature Reserve, area 9,820 ha;
- Carska Bara Special Nature Reserve, 1,676 ha.

Another 40 marshy areas from the territory of the FR of Yugoslavia should be protected as the Ramsar regions in the course of 1998 and 1999. Thus, the following will be proposed:

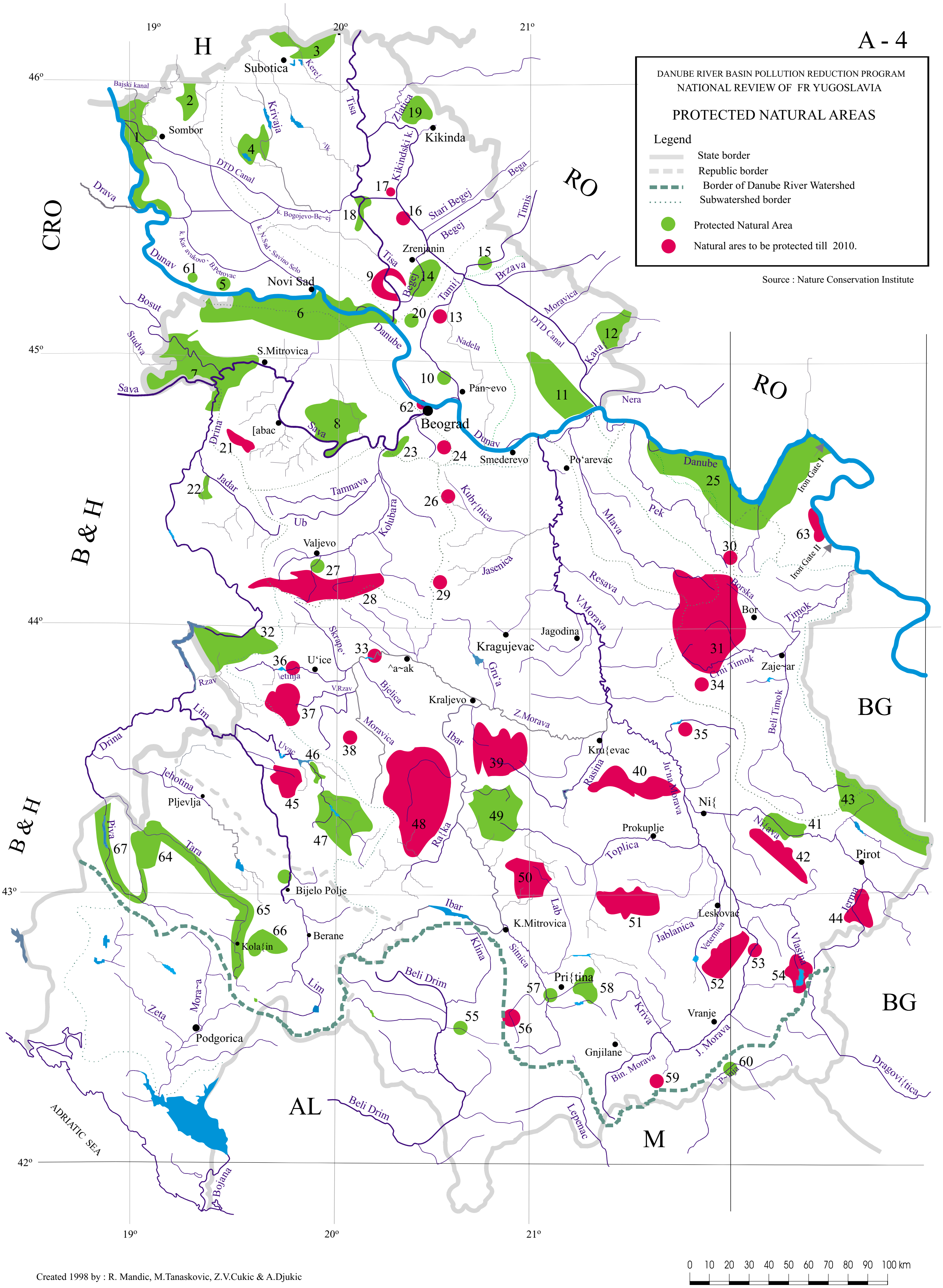
- Koviljsko-Petrovaradinski Rit Special Nature Reserve, area 4,840 ha;
- Gornje Podunavlje Nature Park, area 10,000 ha.
- Both regions are situated on the Danube and its banks.

Annex A-2 Natural Resources Larger than 1,000 ha in Area

Category (type) of Natural Resource	Name	Area (ha)	Community	Republic
NATIONAL PARK	Fruška gora	25,393	Novi Sad, S.Karlovci, Beočin, S.Mitrovica	Serbia
	Djerdap	63,680	Golubac, Majdanpek, Kladovo	Serbia
	Tara	19,200	Bajina Bašta	Serbia
	Kopaonik	11,800	Brus, Raška	Serbia
	Durmitor	33,895	Žabljak, Šavnik, Mojkovac, Pljevlja	Montenegro
	Biogradska gora	5,400	Kolašin,Mojkovac, Berane	Montenegro
SPECIAL NATURE RESERVE	Carska bara-Stari Begej	1,676	Zrenjanin	Serbia
	Pavlovića Brod - Klisura reke Uvac	2,717	Nova Varoš, Sjenica	Serbia
	Obedska bara	9,820	Pećinci	Serbia
	Deliblatska peščara	35,000	Vršac, Bela Crkva, Alibunar	Serbia
	Koviljsko-Petrovaradinski rit	4,840	Novi Sad	Serbia
	Karađorđevo	2,955	Bač,Bač. Palanka	Serbia
	Zobnatica	3,937	Bačka Topola	Serbia
	Dolina Pčinje	2,606	Bujanovac	Serbia
NATURE PARK	Stara planina	144,000	Pirot, Knjaževac,Zaječar	Serbia
	Sićevačka klisura	7,746	Niš	Serbia
	Grmija	1,167	Priština	Serbia
	Gornje Podunavlje	10,000	Apatin	Serbia
	Resava	10,000	Despotovac	Serbia
	Rajac	1,200	Ljig	Serbia
	Panonija	3,937	Bačka Topola	Serbia
	Subotičke šume	4,430	Subotica	Serbia
	Vršačke planine	4,177	Vršac	Serbia
	Sliv reke Tare	200,000	Kolašin, Mojkovac, Žabljak, Plužine, Pljevlja	Montenegro
	Kanjon Pive sa Komarnicom	10,260	Šavnik, Plužine	Montenegro
	Djalovića klisura	1,600	Bijelo Polje	Montenegro
TOTAL:	26	621,436		

Annex A-3 Natural Resources in the Danube River Basin with an Area Smaller than 1,000 ha

Category (type) of Natural Resource	No.	Area (ha)
NATURE RESERVE	58	5.079
AREA OF SPECIAL CHARACTERISTICS	6	2.062
NATURE PARK	7	1.975
NATURE MONUMENT (botanical)	184	748
NATURE MONUMENT (geological, hydrological)	50	563
RESERVE ENVIRONMENT OF IMMOBILE CULTURAL PROPERTIES	59	2.952
T O T A L :	364	13.379



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Annex A-4 Map of the Protected Natural Landmarks in the Danube River Basin Network of Protected Natural Areas in FR Yugoslavia

No.	Protected Natural Areas
1.	Gornje Podunavlje
2.	Subotičke Forests
3.	Palić – Ludoš - Selevenj
4.	Zobnatica
5.	Karađorđevo
6.	Fruška gora
7.	Bosutske šume – Zasavica
8.	Obedska bara
10.	Ponjavica
11.	Deliblatska peščara
12.	Vršačke Mounatins
14.	Carska bara - Stari Begej
15.	Park Hajdučica
18.	Park Sokolac, Novi Bečej
19.	Pašnjaci velike droplje
20.	Kovlijsko-petrovaradinski rit
22.	Tršić
23.	Orlača
25.	Djerdap
27.	Gradac
32.	Tara
41.	Sićevačka Gorge
43.	Stara planina
46.	Uvac
47.	Pešter
49.	Kopaonik
55.	Miruša
57.	Gazimestan
58.	Grmija
60.	Pčinja River Valley
61.	Tikvica
64.	Durmitor
65.	River Tara Watershed
66.	Biogradska gora

No.	Natural Areas Planned to be Protected till Year 2010
9.	Titelski breg
13.	Uzdinska Forest
16.	Rusanda
17.	Slano Kopovo
21.	Cer
24.	Avala
26.	Bukulja
28.	Valjevske Mountains
29.	Rudnik
30.	Deli Jovan
31.	Kučajske Mountains
33.	Ovčarsko-kablarska Gorge
34.	Rtanj
35.	Ozren
36.	Djetinja
37.	Zlatibor
38.	Mučanj
39.	Goč
40.	Jastrebac
42.	Suva planina
44.	Jerma
45.	Zlatar
48.	Golija
50.	Južni Kopaonik
51.	Radan
52.	Kukavica
53.	Grdelička Gorge
54.	Vlasina
56.	Lipovica
59.	Preševo
62.	Veliko ratno Island
63.	Radujevac
67.	River Tara Canyon
68	Djalovića Gorge

Annex A-5 Projection of the Population in the Settlements on the Danube River Banks

Settlements	YEAR			
	1991	2001	2011	2021
All Settlements on the Danube	**1,688,560**	**1,731,003**	**1,762,431**	**1,779,380**
Left Bank	**341,063**	**345,503**	**357,516**	**365,417**
Bezdan	5,472	4,723	3,846	2,887
Apatin	18,339	18,590	19,590	20,299
Bogojevo	2,301	2,037	1,740	1,375
Bačka Palanka	26,780	27,971	30,610	33,051
Čelarevo	5,011	4,392	3,674	2,797
Futog	16,048	16,353	16,903	17,245
Novi Sad	179,626	183,038	189,198	193,020
Pančevo	72,793	73,654	76,060	77,138
Kovin	13,669	13,924	15,230	17,106
Banatska Palanka	974	822	666	500
Right Bank	**1,347,497**	**1,385,500**	**1,404,915**	**1,413,963**
Neštin	1,002	878	735	559
Beočin	7,873	8,653	9,741	10,808
Čerević	2,510	2,429	2,171	1,754
Sremska Kamenica	7,955	8,106	8,379	8,548
Petrovaradin	11,285	11,499	11,886	12,126
Sremski Karlovci	7,534	7,376	7,546	7,658
Stari Slankamen	575	504	419	321
Surduk	1,253	1,289	1,223	1,034
Belegiš	2,605	2,681	2,543	2,149
Stari Banovci	4,033	4,150	3,937	3,327
Novi Banovci	6,354	6,539	6,203	5,242
Zemun	140,483	143,203	143,515	142,749
Belgrade	1,027,971	1,047,872	1,050,159	1,044,549
Vinča	5,213	6,197	6,851	6,983
Ritopek	2,163	2,571	2,843	2,897
Grocka	7,642	9,716	13,804	20,971
Brestovik	1,129	1,342	1,484	1,512
Smederevo	63,884	72,513	81,893	90,232
Kostolac	10,365	11,350	12,042	12,390
Ram	359	322	274	221
Veliko Gradište	5,973	7,306	8,950	10,878
Vinci	375	347	312	276
Golubac	1,995	1,847	1,661	1,466
Brnjica	531	492	442	390
Dobra	755	699	629	555
Boljetin	803	658	517	385
Donji Milanovac	3,338	3,856	4,212	4,334
Mosna	920	754	592	441
Tekija	1,129	954	752	543
Kladovo	9,626	10,777	11,929	12,746
Velika Vrbica	1,540	1,301	1,025	741
Korbovo	1,481	1,251	986	713
Milutinovac	275	232	183	132
Brza Palanka	1,557	1,743	1,929	2,062
Prahovo	2,296	1,875	1,443	1,041
Radujevac	2,715	2,217	1,706	1,231

Annex A-5.1. Projection of the Population in the Settlements on the Sava River Banks

Settlement	YEAR			
	1991	2001	2011	2021
All Settlements on the Sava	**154,206**	**165,302**	**180,489**	**196,305**
Left Bank	**50,505**	**51,385**	**53,619**	**55,657**
Boljevci	4,284	4,470	4,467	4,333
Progar	1,457	1,520	1,519	1,474
Grabovci	1,488	1,330	1,116	856
Jarak	2,256	2,032	1,715	1,319
Sremska Mitrovica	38,834	40,119	43,214	46,455
Sremska Rača	777	700	591	454
Jamena	1,399	1,214	997	766
Right Bank	**103,701**	**113,917**	**126,870**	**140,648**
Ostružnica	3,787	3,860	3,869	3,848
Umka	5,005	5,102	5,113	5,086
Barič	5,982	5,950	5,553	4,775
Zabrežje	2,852	2,837	2,647	2,277
Obrenovac	22,180	28,766	37,032	46,158
Debrc	890	823	742	657
Provo	2,721	2,515	2,267	2,008
Šabac	54,637	58,830	65,170	72,366
Drenovac	2,446	2,350	2,044	1,601
Zasavica I	864	778	657	505
Zasavica II	750	676	570	439
Ravnje	1,587	1,430	1,206	928

Annex A-5.2. Projection of the Population in the Settlements on the Grand Morava River

Settlement	YEAR			
	1991	2001	2011	2021
All Settlements on the Morava	**89,480**	**88,985**	**88,569**	**87,431**
Left Bank	**24,786**	**23,111**	**20,641**	**17,655**
Varvarin	2,306	2,075	1,841	1,612
Varvarin selo	1,899	1,708	1,516	1,328
Gornji Katun	1,642	1,477	1,311	1,148
Raševica	1,467	1,313	1,087	820
Jovac	1,499	1,371	1,163	912
Ostrikovac	697	637	541	424
Mijatovac	1,939	1,773	1,505	1,180
Ribare	3,259	2,973	2,502	1,934
Kočino selo	1,028	938	789	610
Staro selo	123	112	94	73
Veliko Orašje	2,636	2,353	1,960	1,497
Trnovče	1,272	1,136	946	722
Lipe	3,859	4,033	4,141	4,148
Šalinac	1,160	1,212	1,245	1,247
Right Bank	**64,694**	**65,874**	**67,928**	**69,776**
Donji Katun	1,190	1,071	950	832
Donje Vidovo	2,318	2,075	1,718	1,295
Čepure	882	789	654	493
Šavac	769	688	570	430
Paraćin	25,567	27,127	29,669	32,332
Juprija	21,367	22,806	24,676	26,515
Vlaška	856	783	664	521
Rajkinac	582	531	447	345
Vojska	1,345	1,167	946	706
Radošin	805	698	566	422
Novo selo	1,628	1,454	1,210	924
Donja livadica	2,582	2,305	1,920	1,466
Dragovac	1,166	1,059	952	845
Brežane	1,216	1,104	993	881
Batovac	920	836	751	667
Dubravica	1,521	1,381	1,242	1,102

Annex A-5.3. Projection of the Population in the Settlements on the Mlava River

Settlement	YEAR			
	1991	2001	2011	2021
All Settlements on the Mlava	**20,251**	**20,278**	**20,876**	**22,123**
Left Bank	**983**	**913**	**833**	**748**
Ribare	591	514	440	370
Nabrdje	392	399	393	378
Right Bank	**19,268**	**19,365**	**20,043**	**21,375**
Petrovac	7,728	8,472	10,019	12,339
Knežica	1,016	909	774	622
Kamenovo	1,227	1,097	935	751
Kalište	647	576	503	435
Batuša	781	695	607	525
Veliko Crniće	926	824	720	623
Salakovac	1,000	890	777	673
Malo Crniće	1,113	990	865	749
Trnjane	1,241	1,262	1,244	1,197
Bratinac	776	789	778	748
Babušinac	1,039	1,057	1,042	1,002
Maljurevac	668	679	670	644
Bradarac	1,106	1,125	1,109	1,067

Annex A-5.4. Projection of the Population in the Settlements on the Pek River

Settlement	YEAR			
	1991	2001	2011	2021
All Settlements on the Pek River	**18,048**	**16,878**	**15,972**	**15,346**
Left Bank	**7,316**	**6,546**	**5,630**	**4,589**
Debeli lug	507	401	294	188
Blagoev kamen	72	64	53	41
Neresnica	3,128	2,759	2,315	1,796
Kaona	937	826	693	538
Sena	354	312	262	203
Mišljenovac	711	627	526	408
Tribrode	655	635	606	577
Kusiće	952	923	881	838
Right Bank	**10,732**	**10,332**	**10,342**	**10,757**
Jasikovo	822	652	479	305
Leskovo	516	408	300	191
Kučevo	4,846	5,107	5,870	6,980
Lješnica	386	340	286	222
Srpce	293	258	217	168
Zelenik	327	288	242	188
Dušmanić	213	197	177	157
Klenje	655	606	545	481
Miljević	705	653	587	518
Šuvajić	423	392	352	311
Donja Kruševica	453	419	377	333
Braničevo	1,093	1,012	910	803

Annex A-5.5. Projection of the Population in the Settlements on the Timok River

Settlements	YEAR			
	1991	2001	2011	2021
All Settlements on the Timok River	**9,871**	**8,119**	**6,743**	**5,162**
Left Bank	**3,411**	**2,792**	**2,239**	**1,755**
Vražogrnac	1,645	1,294	987	723
Trnavac	570	448	342	251
Tabakovac	281	221	169	124
Rajac	599	543	485	430
Veljkovo	316	286	256	227
Right Bank	**6,460**	**5,327**	**4,504**	**3,407**
Veliki izvor	2,945	2,317	1,767	1,295
Gradskovo	947	745	568	416
Veliki Jasenovac	525	413	315	231
Crnomasnica	426	386	345	305
Zlokuće	994	901	805	713
Kovilovo	623	565	504	447

Annex A-5.6. Projection of the Population in the Settlements on the Tisa River

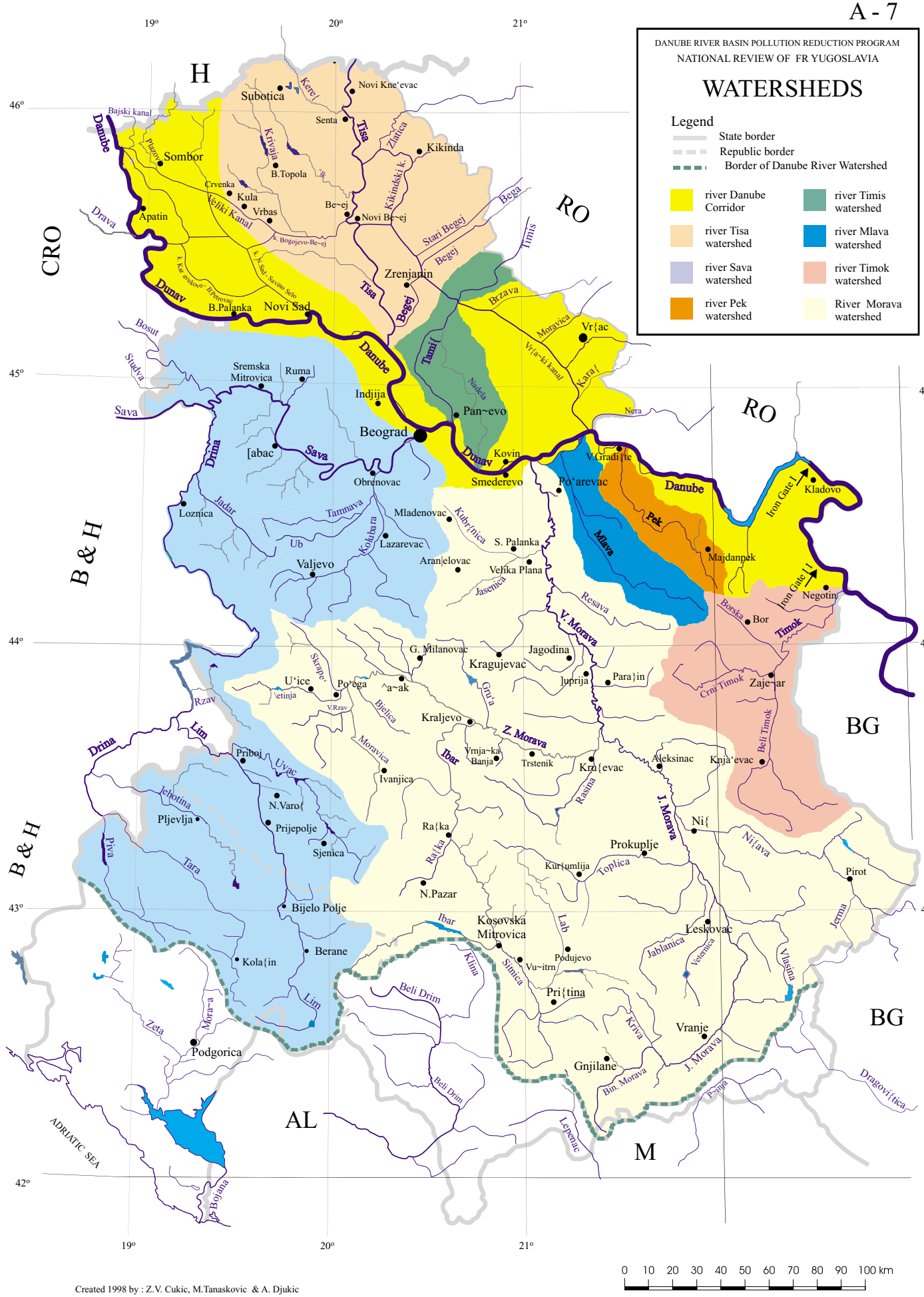
Settlement	YEAR			
	1991	2001	2011	2021
All Settlements on the Tisa River	**117,940**	**113,521**	**112,125**	**111,517**
Left Bank	**30,875**	**29,486**	**28,505**	**27,675**
Djala	1,072	831	656	505
Krstur	1,552	1,203	949	731
Novi Kneževac	8,062	7,781	8,022	8,415
Sanad	1,384	1,162	931	702
Novi Bečej	15,404	15,627	15,817	16,053
Taraš	1,174	995	735	438
Knićanin	2,227	1,887	1,395	831
Right Bank	**87,065**	**84,035**	**83,620**	**83,842**
Kanjiža	11,541	11,504	12,439	13,928
Senta	22,827	21,165	19,888	18,810
Ada	12,078	11,332	10,840	10,271
Bačko Petrovo selo	7,958	7,131	5,952	4,560
Bečej	26,634	26,883	27,854	28,709
Titel	6,007	6,020	6,647	7,564

Annex A-5.7. Projection of the Population in the Settlements on the Tamis River

Settlement	YEAR			
	1991	2001	2011	2021
All Settlements on the Tamiš	**35,637**	**33,395**	**31,165**	**27,868**
Left Bank	**17,994**	**16,386**	**14,133**	**10,357**
Boka	1,992	1,743	1,456	1,125
Tomaševac	1,904	1,815	1,728	1,615
Sefkerin	2,717	2,416	1,997	1,528
Idvor	1,308	1,179	1,080	993
Glogonj	3,475	3,185	2,716	2,103
Jabuka	6,598	6,048	5,156	3,993
Right Bank	**17,643**	**17,009**	**17,032**	**17,511**
Jaša Tomić	3,554	3,653	4,236	5,256
Sečanj	2,688	2,352	1,965	1,518
Orlovat	1,933	1,843	1,755	1,640
Čenta	3,001	2,861	2,724	2,546
Baranda	1,690	1,503	1,242	950
Opovo	4,777	4,797	5,110	5,601

Annex A-6 Hydro-Electric Power Plants on the Danube and in the River Basin

River	Name of Power Plant	Rated Power (MW)	Average Output (GWh/year)
Zapadna Morava	Ovčar Banja	6	31.8
Zapadna Morava	Medjuvršje	6	37.1
Drina	Zvornik	92.8	472.7
Drina	HE "Bajina Bašta"	364	1,610.3
Drina	RHE "Bajina Bašta"	614	-
Lim	Podpeć	54	200.0
Ibar	Gazivode	35	70.0
Uvac	Kokin Brod	22	62.2
Uvac	Uvac	36	74.0
Uvac	Bistrica	102.0	347.7
Vlasina	Vlasina	128.5	304.9
Visočica	Pirot	80	135.9
Danube	Djerdap I	1,057.8	5,296.6
Danube	Djerdap II	208	1,290.0
Piva	Piva	342	700.0



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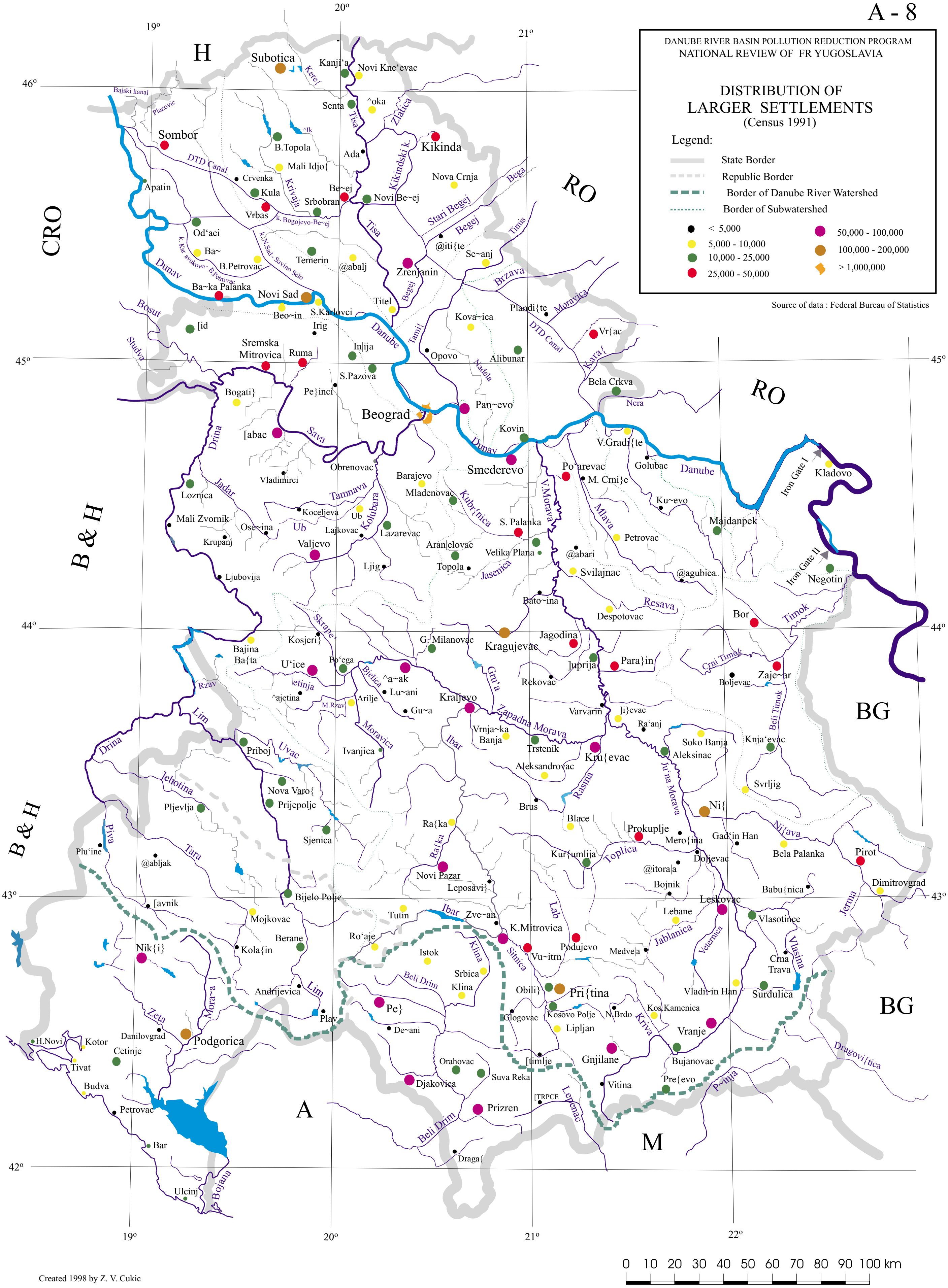

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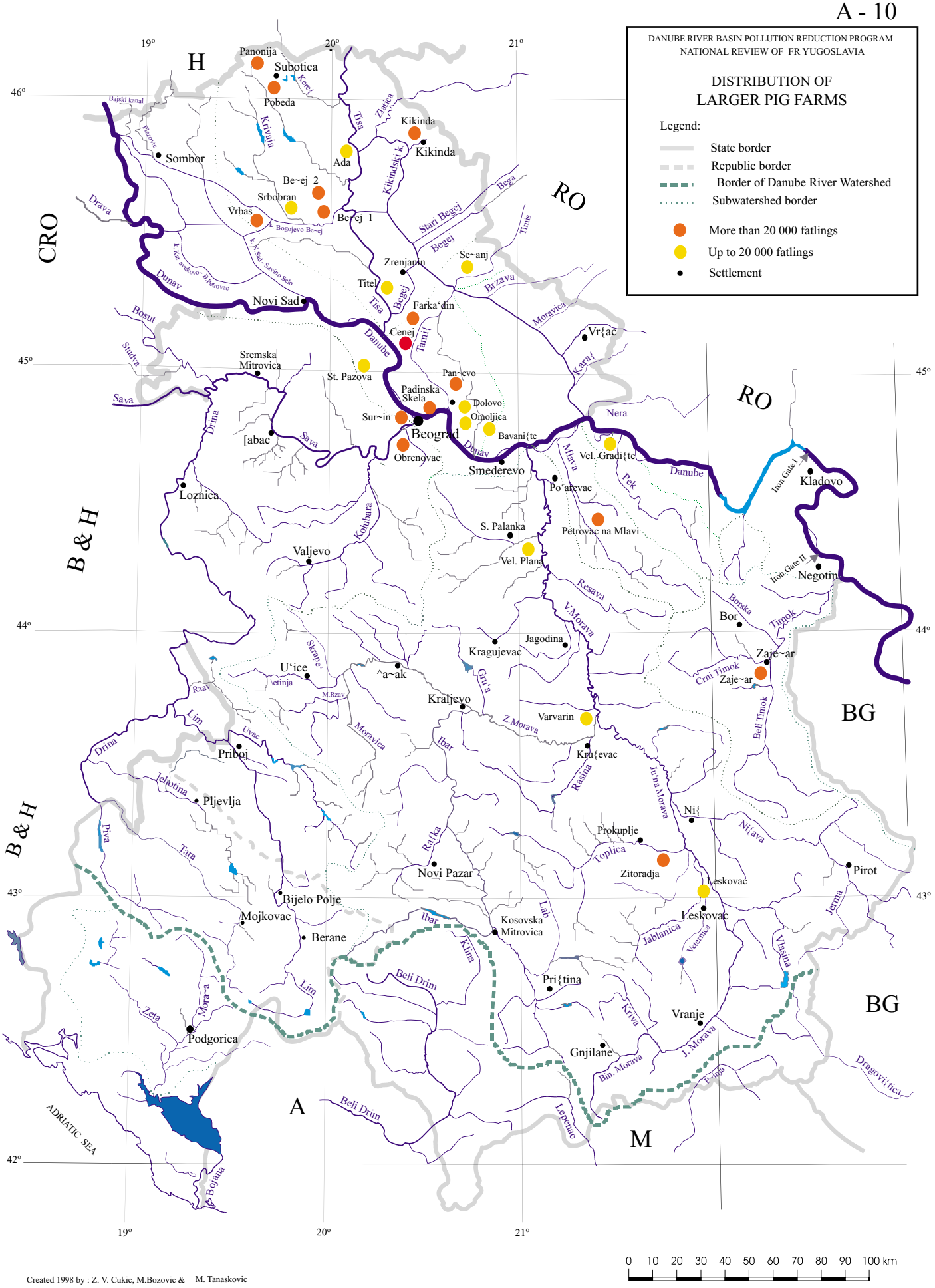

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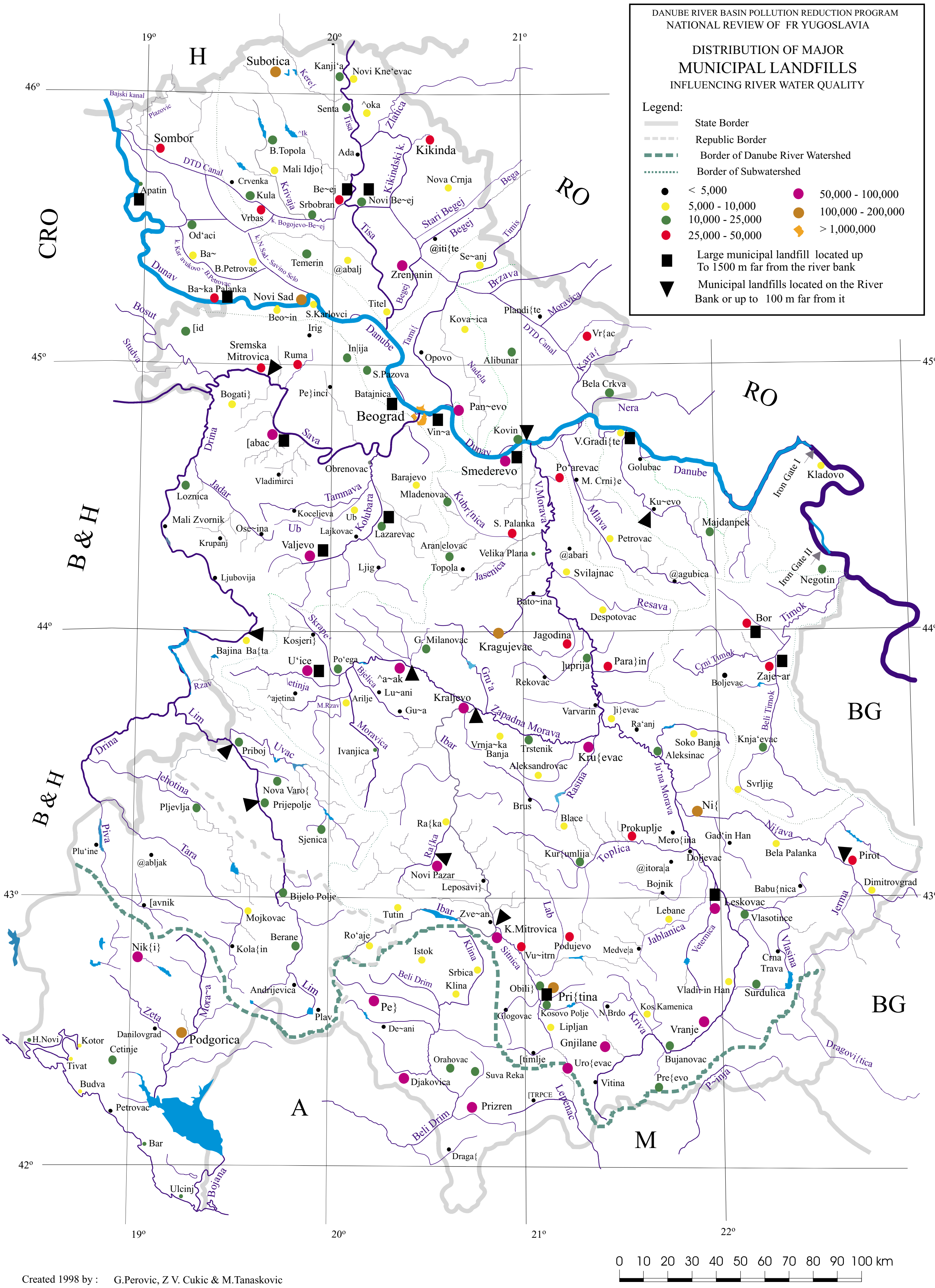

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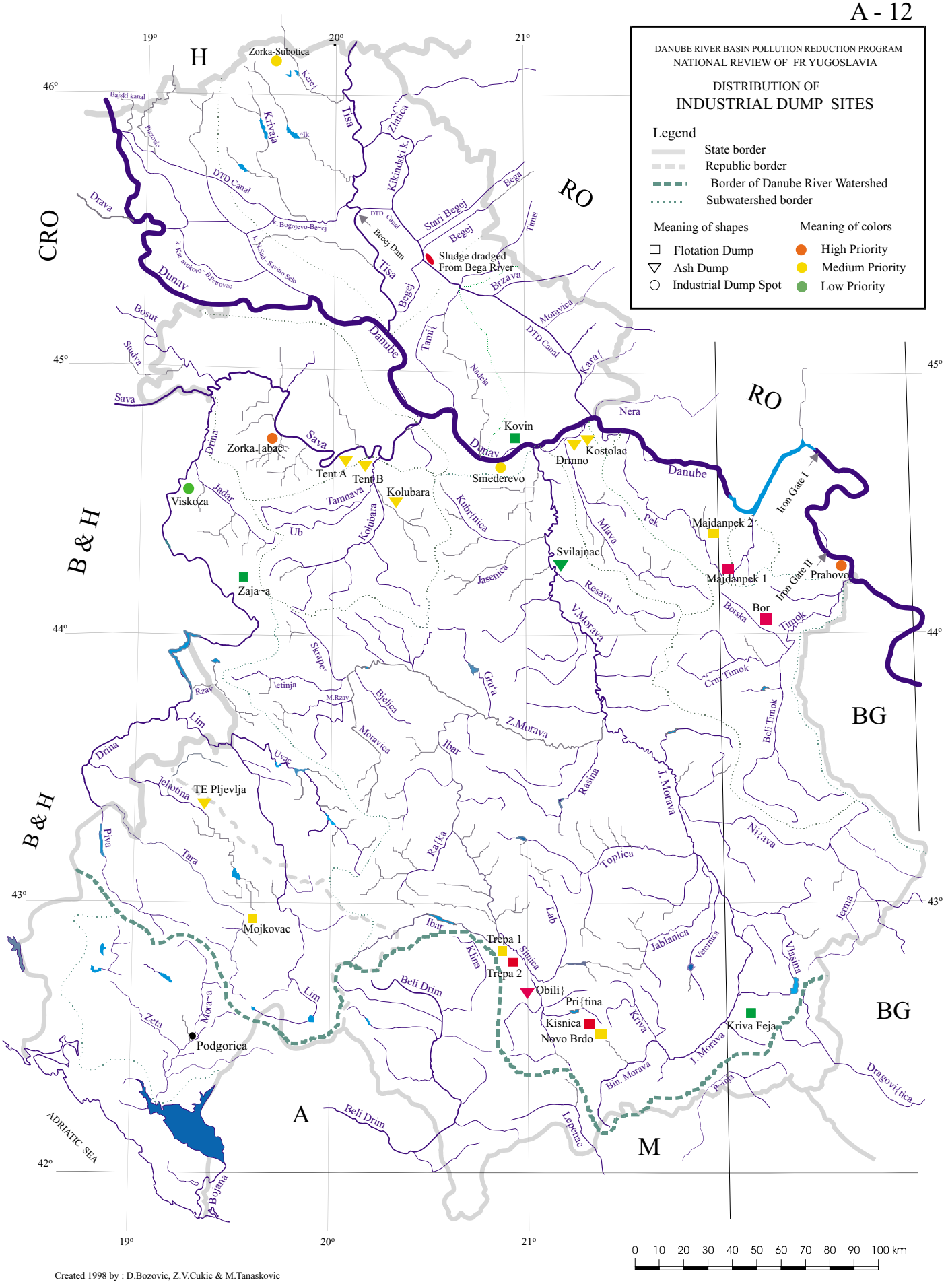

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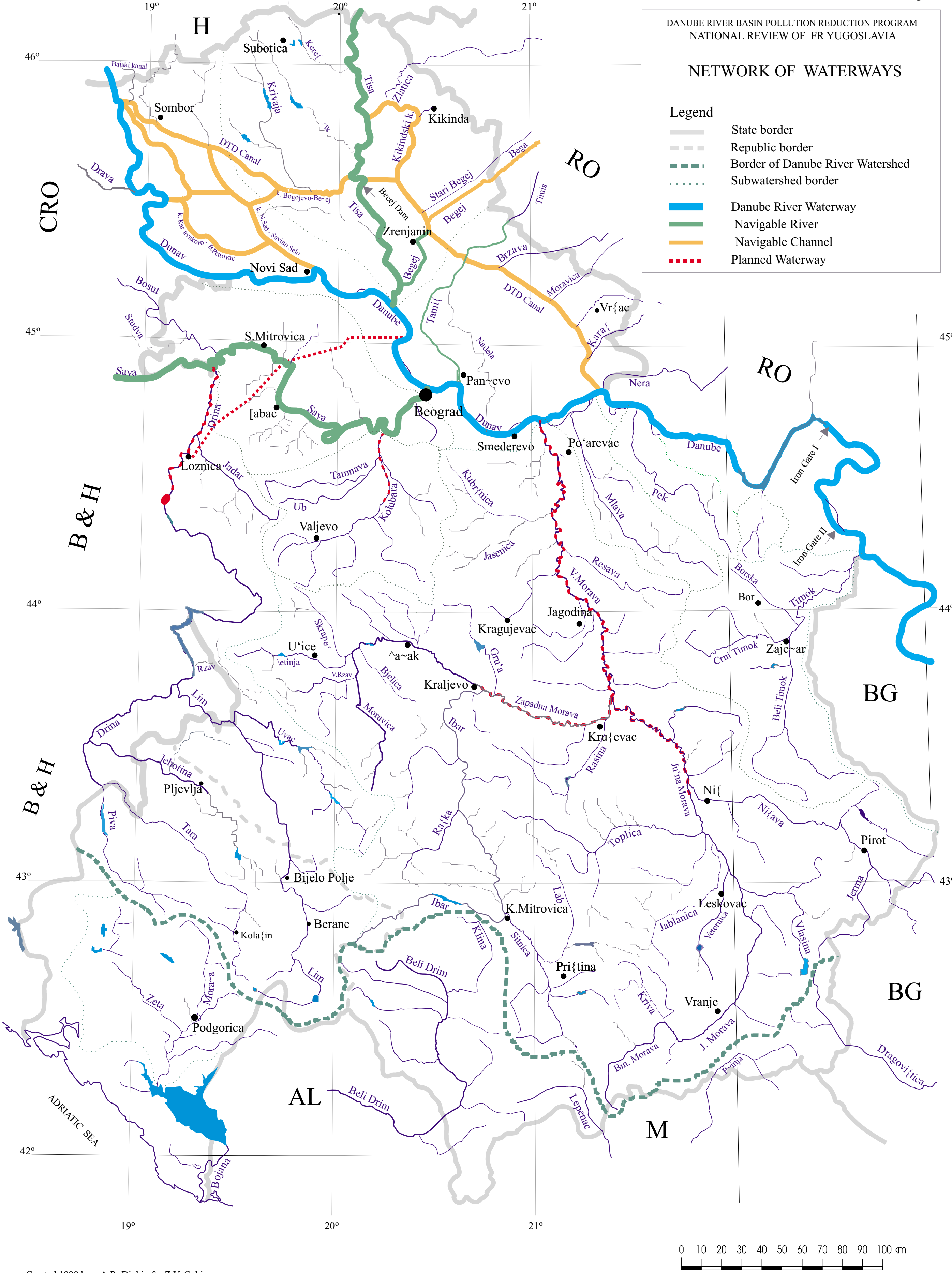

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Part B

Financing Mechanisms

Table of Contents

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List of Abbreviations

A.D.	Sharetolder Company
ALBA	ALBA - International Company - Federal Republic of Germany
BOT	Build - Operate - Transfer
BUIK	BUIK International Company - Republic of France
Art.	Article
YUD	Yugoslav Dinar (Yugoslav Currency)
d.w.	Drinking Water
EBRD	European Bank for Reconstruction and Development
ECU	European Currency Unit
FRY	Federal Republic of Yugoslavia
GEF	Global Ecological Fund
HS	Hydro System
JUBMES	Yugoslav Bank for International Economic Cooperation
KWh	Kilowatt hour
mill.	Million
m^3	Cubic meter
NBY	National Bank of Yugoslavia
NP	National Park
PPP	Polluter - pays - principle
RS	Republic of Serbia
USA	United States of America
SEW.	Sewage
SFRY	Socialist Federal Republic of Yugoslavia (Former Yugoslavia)
SOR	SOR International Company - Republic of France
UN	United Nations
$US	US Dollar
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNESCO	United Nations Organization for Education, Science and Culture
WWTP	Wastewater Treatment Plant
Službeni list	Gazette of Government

1. Summary

1. The mechanisms of financing the programmes and projects relating to water quality and water management improvement in the FR of Yugoslavia are defined by federal regulations and determined in greater detail by the member republics which are directly responsible for the financing of these programmes and projects. The ministries of agriculture, forestry and water management of the republics of Serbia and Montenegro directly recommend and implement the regulations dealing with this matter. The funds necessary for such purposes are collected in both republics in accordance with the decrees enacted by their governments. Funds are collected through republic budgets and transferred to the ministries of agriculture, forestry and water management. In the Republic of Serbia, these funds are directed to the Agrarian Budget and the Ministry manages the funds earmarked for capital projects relating to water quality improvement. In addition, the Government of the Republic of Serbia signs an agreement with the Public Water Management Enterprise "Srbijavode" which was founded by it, concerning the financing of water protection projects. Apart from these capital projects, "Srbijavode" Public Water Management Enterprise engages mostly in the maintenance of water management facilities and earns its income by collecting fees for the use of water management facilities and systems.
2. Besides the funds from the Agrarian Budget, the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia also obtains additional revenue defined by the Decree Setting the Fee for the Use of Waters and the Fee for the Protection of Waters, which is enacted by the Government of the Republic of Serbia and amended and adjusted when necessary. The Ministry uses a part of this revenue towards the construction of wastewater treatment plants or systems.

   Revenue is also obtained from the charges set for the use of surface, ground and mineral waters and the charges set for the protection of waters and collected from industries on account of discharged polluted water. 50% or 25% depending on the degree of pollution of the receiver increase the charges. Furthermore, the charge can be decreased by 15% to 30% if the payer of this charge treats the wastewater in the primary wastewater treatment plants prior to discharging it, or by 50% to 90% if the latter treats the wastewater in the secondary wastewater treatment plants prior to discharging it. The payers of this charge who have plants for the treatment of wastewater up to the quality set for the recipient are exempt from the payment of charges for the protection of waters.

   Besides these charges, there are also charges for discharging treated and untreated wastewater in artificial stream i.e. Canals. They are collected by "Srbijavode" Public Water Management Enterprise and used for the maintenance of canals and facilities on them. These charges are payable according to the quantity of wastewater discharged and degree of pollution, as determined by the Decree.
3. The policy of setting the price for the use of drinking water and the maintenance and construction of water treatment plants is within the competencies of town assemblies (local governments). The town public utility enterprises manage the systems for the collection and distribution of drinking water and wastewater collection and treatment facilities. The price of drinking water, maintenance of sewers and maintenance of wastewater treatment plants vary by towns and user category (households, service sector organizations, social welfare institutions, hospitals, and industries). Households pay the lowest price and industries the highest. The public utility enterprises and local governments, subject to the approval of the Ministry of Commerce of the republic concerned may change these prices. In view of the difficult public welfare and economic situation brought about by the introduction of the UN sanctions, these prices also have a social welfare dimension. That is also one of the important limiting factors to the participation of foreign private capital in the construction of these facilities.

Although the republic laws and regulations have determined the instruments and funds for the implementation of water protection projects and programmes, these funds are not being collected wholly because of the difficult economic and public welfare situation resulting the UN sanctions introduced against the FR of Yugoslavia. The industries are not paying on a regular basis and the collected charges for discharge wastewater from the industries and households cannot cover even the cost of regular maintenance of facilities. That is also one of the reasons why priority is given to the construction of town water supply facilities, whereas minimum funds are earmarked for the construction of wastewater treatment plants.

4. Measures and incentives for decreasing the pollution of the environment (including water pollution) have been incorporated in the Law on Tariffs, Law on Foreign Trade, Law on Free Zones, Law on Concessions, Corporation Profit Tax Law, Income Tax Law, Property Tax Law, Excise Tax Law, etc.
5. It is from the mentioned financing sources that the Ministry of Agriculture, Forestry and Water Management grants funds for the implementation of the Programme of Construction, Reconstruction, Upgrading and Maintenance of Facilities, and in the scope of that, also funds for the protection of water quality, on a non-repayable basis, up to 30% of the planned cost of capital projects in the current year, while 70% is provided by the developers. The funds allocated by the Ministry for such purposes amount to about US$ 10 million a year. A similar amount of money (about US$ 10 million) is provided for participation in water protection projects also by "Srbijavode" Public Water Management Enterprise.

   When competing for funds from the Ministry, the developers (industries, towns, etc.) have to present the following:

   a. Investment Programme and proof of availability of own funds;
   b. Explanation of the investment programme, drawings and specifications and water management authority's approval; and
   c. particulars in accordance with the Ministry's criteria. The Ministry and the developers concerned make agreements on the pooling of assets for joint financing, on the basis of which the Ministry renders the decisions on granting funds.

   Investments in water protection projects, involving mostly wastewater treatment projects in larger towns which are the hot spot, call for about 2.5 billion US $ in the next 10 years. The biggest investments are planned for big towns, such as Belgrade, Novi Sad and Niš.

   Because of low prices and charges for the use and discharge of wastewater, as well as the UN sanctions, the investment of foreign private capital, as well as modern methods of investing in these projects, are on the level of ideas and initial attempts for the time being. Positive examples are the preliminary agreements made by the Belgrade City Assembly with the foreign companies SOR, BUIK and ALBA concerning the construction of facilities and plants for water supply and wastewater treatment, on the basis of concessions, as well as the similar moves made by the Niš City Assembly. The granting of such concessions is subject to the approval of the Government of the Republic of Serbia, because foreign currency fond is centralized.

   With the lifting of sanctions and improvement of the living standard of population, it can be expected that the household voluntary tax will be re-introduced as a percentage of personal receipts, which used to be one of the chief sources of financing the operation and maintenance of town water supply facilities and sewers.

6. On the other hand, domestic banks are not participating in the financing of water protection projects because of their bad debts incurred in the past and absence of domestic savings, so that what is called for first is the financial rehabilitation of major domestic banks together with a change of their ownership structure and a greater participation foreign private capital in that process.

   Substantial foreign credits, as well as donations and technical assistance are essential for financing the water protection infrastructure projects.

   That is why it is being planned to establish the National Eco Foundation as a non-budgetary institution disposing of collected funds earmarked for the protection of environment waters, including funds of banks and industries and funds from foreign credits, for which foreign assistance is needed. It would also be necessary to eliminate in the years to come the disparity of prices, charges and tariffs for the use of water in towns and industries.

   Moreover, plans are being made for a consistent enforcement of the "polluter pays" principle and introduction of trading in pollution permits, where the permitted environmental pollution level would be set, provision of credits at lower interest rates, encouragement of donations or grants, introduction of ecological borders, provision of export credits for water protection equipment by donating countries, introduction of debt-equity swaps in the field of environmental protection, etc.

7. Because of sanctions, the FR of Yugoslavia was unable to use foreign credits and funds since 1991, either on a bilateral or multilateral basis, towards financing the water protection projects. It was not possible to utilize the credits extended by the World Bank for such purposes.

   In this horizon the national economy is weak to support serious action in Water Pollution Control initiated by the DRB Pollution Reduction Programme, so the improvement of the current situation and the acceleration of action planned by the National Action Plan, will greatly depend on international support and cooperation.

   The proposed investment portfolio covers the high priority projects, i.e. those dealing with big polluters in the Danube watershed. The proposed projects relate to the construction of the wastewater treatment plants, the construction of which has been started up or which are to be constructed in the period of the second phase of Strategic Action Plan for the Danube River Basin. The estimated cost of these projects is about 1350 million $US. Also, the several non-structural projects relate to water environmental sector are proposed for the cost of 7 million US $.

2. Legal Basis

2.1. Compilation of Relevant Laws and Regulations with Financial Relevance to Water Quality and Water Management Programmes and Projects

The relevant laws and regulations of importance for the financing of water quality improvement projects and water management programmes are as follows:

a. Federal Law on the Basic Principles of Environmental Protection (Fed. Gov. Gazette, No. 24/98);
b. Law on the Environmental Protection of the Republic of Serbia (Government of RS Gazette, Nos. 66/91 and 83/92);
c. Waters Law of the Republic of Serbia (Government of RS Gazette, Nos. 46/91, 53/93, 67/93, 48/94 and 54/96);
d. Annual Decrees setting the charges for the use of waters, charges for the protection of waters and charges for the material excavated from water courses (in 1997, Government of RS Gazette, No. 2/97);
e. Law on the Environmental Protection of the Republic of Montenegro (Službeni list Republike Crne Gore, No. 12/96);
f. Decree Setting the Charges and Method of Calculating and Paying Charges for Polluting the Environment (Službeni list Republike Crne Gore, No. 26/97).

Although the Federal Law on the Basic Principles of Environmental Protection also regulates the question of financing the projects relating to the protection of water quality and water management, this matter is dealt with in greater detail by republic regulations for which the republic ministries of agriculture, forestry and water management are directly responsible. In the Republic of Serbia, the Decree Forming the Government of the Republic of Serbia regulates the competencies between the Environmental Protection Fund of the Republic of Serbia and the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia in connection with programme and project financing. The Government of Serbia signs an agreement with Public Enterprise "Srbijavode" dealing with operation and maintenance of canals, embankments, flood defense, facilities, etc. as well as with investment preparation and execution. In the Republic of Montenegro, the Ministry of Agriculture, Forestry and Water Management directly conducts water resource policies.

On Federal level, some federal institutions have responsibilities in the field of water protection and management:

- Federal Ministry of Agriculture - in the matters relating to water regime*;
- Federal Ministry of Development, Science and Environmental Protection - in connection with cross-border water and sea pollution and international co-operation;
- Federal Institute of Hydrometheorology - hydrological observation, sailing safety, water pollution monitoring and annunciation, etc.

Note *: The Federal Government recently adopts the Law on the Water Regime (Federal Government Gazette No. 59/98)*

The water protection and management projects are financed from federal and republic budgets as well as from local municipal sources but only modest amounts of funds have been allocated for such purposes.

Pursuant to the Waters Law of the Republic of Serbia, a decree should be passed to set the charges for the use of surface, ground and mineral waters, protection of waters, incentives and exemption from charges.

Although the Law determines the funds and instruments for the implementation of Water Pollution Control programmes, the necessary funds are not be raised in the full amounts because of the current economic circumstances. The funds raised for the construction of wastewater treatment systems have been low particularly in the last few years.

2.2. Assessment of Main Deficiencies and Needs for Improvement

With regard to the provision of funds for financing the projects relating to the protection of waters against pollution, discrepancies still exist between the federal and republic competencies and regulations, as well inside the republics themselves. There is a disharmony of competencies between the republic and federal ministries concerning water protection (Republic Ministry of Agriculture, Forestry and Water Management), cross-border water and sea pollution (Federal Ministry of Development, Science and Environmental Protection), water regime (Federal Ministry of Agriculture) and protection against floods and accidents (Republic and Federal Ministry of Labor, Public Health and Social Policy).

The competencies of the republics and federation have been reconciled with the Constitution of the FR of Yugoslavia for two years now, so that it is expected that the adoption of constitutional competencies will be followed by the settlement of the issue of financing the protection of waters against pollution. This issue could have been dealt with more effectively by a special ministry of waters (on federal or republic levels) and by forming a water fund, as a non-budgetary institution.

Pursuant to the Adopted Resolution on Environmental Protection, plans are being made for securing funds from the federal budget, from a special item, at the rate of 0.1 to 0.3% of the gross natural product (GNP) of the FR of Yugoslavia until the year 2000 and from the collected charges for the use of natural resources, stamp duties, taxes and contributions and other sources, for environmental protection purposes.

The following should also be introduced: exemption from tax when domestic equipment, know-how and materials are used for water protection purposes; if its are not producing in the country, exemption from customs duty on the equipment, devices, chemicals, components, etc., imported for water protection purposes; if its are not producing in the country, higher export incentives for products and services that do not pollute the environment beyond permissible limits; making major direct foreign investments conditional on the use of domestic resources for environmental protection; technological markings for the products which are not harmful to the environment; elimination of the price disparity in the use of resources and inclusion of the cost of environmental protection in the product price; improvement of legislation by introducing the "polluter pays" principle and insurance against damage caused to the environment caused by the insured.

3. National Policy and Strategy for Funding of Water Sector Programmes and Projects

The leading ecological investment institution in the FR of Yugoslavia is the State with its executive bodies, Federal Ministry of Agriculture and Federal Ministry of Development, Science and Environment, on federal level, the Ministries of Agriculture, Forestry and Water Management on republic level, and the environmental protection on local level, if existent (Belgrade, Niš).

Pursuant to Article 22a of the Ministry Law, the Ministry of Environmental Protection of the Republic of Serbia has also duties relating to, among other things, to the following:

- System for the protection and improvement of the environment;
- Protection of nature;
- Determination and application of measures for the protection of natural entities of concern for the Republic;
- Protection of natural resources against pollution;
- Protection against hazardous and harmful materials in the course of their production, trading and storage;
- Preparation and co-ordination of programmes of co-operation in this area, as well as other duties determined by the Law.

The Law on Environmental Protection (Government of RS Gazette, No. 66/91 and 83/92), the enforcement of which is the responsibility of this Ministry, regulates the SYSTEM FOR THE PROTECTION AND IMPROVEMENT OF THE ENVIRONMENT which covers the protection against the DESTRUCTION AND DEGRADATION OF NATURAL VALUES. The latter protection relates, among other things, to waters (Articles 23-27), soil (Articles 28-31), forests (Articles 32-36), flora and fauna (Articles 37-40) and protected natural goods (Articles 41-61).

The option of the Ministry of Environmental Protection of the Republic of Serbia in the field of environmental protection management is based on the fact that the system of "direct regulations and controls" - which is based in the first place on legal norms and sanctions - has produced optimum results hardly anywhere in the world. Based on a comparative analysis of international experiences, it has been opted for the development of a combination of these systems and the system of economic instruments (the so-called mixed environmental protection systems).

Given the current circumstances, the State, i.e., the Ministry of Environmental Protection of the Republic of Serbia, has basically opted for the fostering of an ecologically acceptable conduct of industries on the basis of decreased costs (less so on the basis of increased income), with a concurrent application of a strict system of standards and norms, for the non-observance of which the industries are heavily fined in the form of compensation for damage done.

The Law on Environment of Republic of Montenegro Government is adjusted in accordance with the Declaration on Ecological State adopted by Republic Parliament in 1992. The Law is oriented not toward the protection of Environment but toward the sustainable use of natural resources as its are saved in the largest part of this Republic. The funding of the Water Environmental programmes is to be provided by the Republic Budget, municipalities, and private sector as well as by concessionaires.

4. National Sources, Instruments and Mechanisms for Funding of Water Quality and Water Management Programmes and Projects

4.1. Relevant Public Funding Sources and Instruments in Use

The principal sources for public financing of the investment programmes for improving the water quality and managing of water resources comprise of the following: funds from the Land Budget of the Ministry of Agriculture, Water Management and Forestry, provided from the compensations for the consumed water and compensations for the water abstraction and polluted water (instead of using the Republic Water Management Fund which was abolished in 1997). Via the department for water management of this Ministry the accumulated funds are being channeled for building of the infrastructure projects for water-supply, for the protection of water from industrial and public utilities pollution, cleaning of wastewater and water-collectors; Funds from the Public Water-management Enterprise "Srbijavode", founded by the government of the Republic of Serbia for the purpose of maintenance of the protection of buildings and systems for water-supply, drainage, flood protection etc. Funds of the Public water-supply enterprise “Srbijavode” are provided from charges for using services and buildings of this enterprise; Funds from the Ministry for the Environment Protection of the Republic of Serbia which are approved for these purposes; and Local Eco - Funds.

In the Republic of Montenegro the funds for these purposes are directly provided from the funds of the Ministry of Agriculture, Forestry and Water Management and Ministry of Environment.

4.1.1. Funds of Land Budget (former Water Management Fund) and Public Water Management Enterprise "Srbijavode"

a. In 1995, by means of the former Water Fund of the Republic of Serbia, i.e. via Programme for protection, improvement and consumption of water in 1995, the realized funds amounted to YUD 146,000,000 (i.e. 51 million $US as the exchange rate in 1995. was 1 $ US = 2.86 YUD). This sum has been spent for the following:
    1. Multipurpose accumulations,
    2. Regional hydrosystems,
    3. Regulations and dikes,
    4. Water supply,
    5. Protection of the water quality,
    6. Drainage system,
    7. Small accumulations,
    8. Anti-erosion works,
    9. Studies, researches, and design projects,
    10. Reserve funds for emergency.

    For the protection of the water quality, construction and upgrading of WWTP for urban or industrial wastewater, or pre-treatment wastewater in industries, the total sum spent in 1995 amounted to YUD 17,500,000 (6.1 million $US).

    In construction of the planned projects the Water Fund participated with non-repayable funds which amounted to 30 %, i.e., YUD 5,250,000 (2.3 million $ US), whereas the investors (cities or companies in charge of treatment or pre-treatment of industrial wastewater) participated with YUD 12,250,000 (4.3 million $ US).

In 1996, a total amount of YUD 200,000,000 (43 million $ US) was spent for the Programme for protection, improvement and water supply as well as for the Programme of maintenance of water management facilities.

According to the selected priorities, the non-repayable grants have been used for the following:

1. Multipurpose accumulations - up to 40% of preliminary estimates,
2. For regional hydrosystems - up to 90%
3. For regulations and dikes - up to 70%
4. For water supply - 30%
5. For the protection of water quality - 30%
6. For small accumulations - up to 50%
7. For studies and projects - 90-100%

The Water Fund has participated in the construction of the launched multipurpose accumulations and regional systems for water supply on the same level as in previous years (in 1992, 1993, 1994, and 1995). Those construction works had been started by former Regional, Provincial self-governing Interest Communities and Republic, to be followed up by the Province and Republic funds which are funded by several users or have started working on the basis of agreement with the Government of Serbia, or is regulated by a separate by-law. Out of YUD 200,000,000 (43 million $ US) the amount of YUD 10,600,000 (2.3 million $ US) has been used for the construction of buildings for the protection of water quality. The total value of works was YUD 35,340,000 (7.6 million $ US). The investors - cities and companies, provided 70% of the total estimated costs, i.e., YUD 24,740,000 (5.3 million $ US).

b. In 1997, instead of the Republic Fund for Waters, which was abolished, the Ministry of Agriculture, Forestry and Water Management planned and implemented the Programme for construction, reconstruction and maintenance of water management facilities in 1997. This Programme encompassed the continuity of the Water Fund activities, i.e., investments comprising:

   1. Dams and reservoirs,
   2. Regional hydrosystems,
   3. Regulations and dikes,
   4. Water supply,
   5. Protection of water quality,
   6. Drainage systems,
   7. Anti-erosion works,

   as well as production of the Study and projects, funds for the international cooperation and reserves.

   In 1997, the Republic (its Ministry) participated with non-repayable sum of YUD 31.400.000 (5.7 million $ US) for the protection of water quality, and the total value of investments for facilities amounted to YUD 97,505,000 (21 million $ US). The Ministry, as Fund did in the previous years, participated with 30%, whereas 70% was provided by the consumers - cities for devices used for treatment of all wastewater and owners (consumers) of treatment and pre-treatment of industrial wastewater.

c. In 1997, the Public water management enterprise "Srbijavode" realized 90% of the planned budget (distribution is given in the Table 4-1), which amounted to YUD 291,270,000 (63 million $ US). Out of the aforesaid sum they spent YUD 257,601,000 (47 million $ US).

Table 4-1 Distribution of overall Revenue and Investments of "Srbijavode" in 1997

No	SEPARATE REVENUES	Planned (% of Budget)	Ratio (%) Realized/Planned
1.	Charges for drainage	48,10	73,32
2.	Maintenance of water management facilities	22,00	86,88
3.	Public enterprise services for urgent situations	3,80	97,49
4.	Charges for using canals and other facilities	12,80	66,32
5.	Public authorizations	0,40	153,50
6.	Lumber product sales	1,82	42,37
7.	Other revenues (sales of grass, sand, etc.)	0,15	257,11
8.	Using of public buildings	0,62	79,03
9.	Using river banks and land	1,31	35,19
10.	Services - manufacture et al.	0,40	338,50
11.	Extraordinary and other revenues	8,60	222,30

These funds have been used for the following investments:

- Maintenance of flood defense facilities (dikes, watercourses, channels of major importance, locks in the Danube-Tisa-Danube Hydrosystem, and regulated watercourses)
- Maintenance of drainage systems
- Maintenance of the Danube-Tisa-Danube Hydrosystem
- Investment activities
- Afforesting programmes
- Other maintenance (rivers and canals beds, small and medium size hydro-systems, the launched irrigation systems, reservoirs and impoundments, weirs, gates and dams, flood defense structures, etc.) and activities (implementing of water protection measures; preparation of documents needed for investment, research grants, bilateral co-operation, etc.)

In the process of realization of its planned activities the enterprise of "Srbijavode" is facing the problem of large business enterprises not being able to meet the payment obligations. Therefore, a part of funding had to come from charges. These revenues are essential for the maintenance of investment activities, primarily for the prevention of polluting industrial water, supplying water for the most vital economy sectors, for producing the land registers of polluters, data bases of water polluters, for installing equipment for treatment of wastewater, for the study-research work, for production of a unique archive of technical data related to the international cooperation of the enterprise "Srbijavode" etc.

d. For 1998, the Ministry of Agriculture, Forestry and Water Management has produced a Programme for construction, reconstruction and maintenance of water management facilities. The estimated overall sum comes to YUD 592.000.000 (59 million $ US).

For the investments for the Protection of Water Quality the Ministry has anticipated the non-repayable contribution of YUD 47.900.000 (4,7 million $ US), which makes 30% of the total investment value of YUD 153.882.000 (15,3 million $ US), whereas 70% i.e., YUD 105.982.000 (10,5 million $ US) is to be financed by the consumers, municipalities and companies.

4.1.2. National Environmental Fund (Role, Structure and Responsibilities)

The budgetary Republic Environmental Fund was established in 1991 for the purpose of securing financial and other conditions for the incitement of the application of measures for prevention and rehabilitation in the scope of environmental protection.

The Fund is managed by the State, i.e., and the ministry responsible for environmental protection.

Money from the budget are directed to ecological projects by direct transfer, without loan-based financing of such projects. The ecological funds are an important mechanism for the financing of environmental protection. These chief levers of environmental protection financing have not realized the rule according to which they are capitalized (financed) on the basis of ecological taxes and charges, whereas the growing practice of their capitalization on the basis of privatization, donations and loans from international financial institutions, was lacking in the environmental protection financing system, in the FR of Yugoslavia and the Republic of Yugoslavia alike. The monies from these funds are used for the non-repayable financing of environmental protection, without any concession-based financing. Experience shows that strict project evaluation and financial discipline were lacking in their operation. Fund of the Ministry of Environmental Protection of the Republic of Serbia in 1997 amounted YUD 15,460,000 (2.85 million $ US).

Table 4-2 Structure of fund of the Ministry of Environmental Protection of the Republic of Serbia in the 1997 Fiscal Year

		Planned (% of Fund)
1.	Special purposes	22.1
2.	Funds for the preparation of spatial, protection and development plan for the Serbian National Parks Public Enterprise	0.3
3	Funds for organizations engaged in environmental protection towards performing tasks of concern to the Republic	18.6
4.	Participation in financing the work in national parks	2.9
5.	Funds spent on the rehabilitation of drying out forests in the National Parks Public Enterprise and other protected natural goods	0.3
6.	Funds for the preparation and implementation of the programmes and projects for the protection of natural goods and rare flora and fauna species	0.6
7.	Preparation of designs for the protection of regions for special purposes	0.3
8.	Preparation of designs for the protection of regions for special purposes	0.2
9.	Funds for capital projects and capital maintenance of facilities	45.1
10.	Republic Environmental Protection Fund	9.1
11.	Funds for the protection of ionizing radiation	0.5

Source : *The Ministry of Environmental Protection of the Republic of Serbia.*

In 1998, Fund (distribution is given in Table 4-3) of the Ministry of Environmental Protection of the Republic of Serbia amounted YUD 19,372,000 (1,937,200 US$)

Table 4-3 Funds of the Ministry of Environmental Protection of the Republic of Serbia in the 1998 Fiscal Year

	Planned (%)
1. Special purposes	15,30
2. Funds for the enforcement of the National Parks Law	4,23
3. Nature Protection Institute	20,65
4. Special account*	59,82

** The funds of the Recycling Agency got their own budget position for 1998, amounting to 985,000 YUD (98,500 US$).*
Source: *The Ministry of Environmental Protection of the Republic of Serbia.*

A special body has not been formed for the operation of the fund, to deal with its revenues and expenditures and distribution of its monies. Therefore, the republic budgetary fund for environmental protection has never been a legal entity with appropriate organizational structure. Pursuant to the 1998 Budget Law, it became a Special Account in the implementation of the State policy, which is geared to a gradual elimination of the fund-type financing of public services.

The Law on the Environment Protection (Government of RS Gazette, Nos. 66/91 and 83/92) has determined the sources of the fund. The following sources are determined by Article 88:

1. Charge for the pollution of natural resources
2. Republic budget funds collected from the sales tax on pesticides, detergents, plastic packaging and cigarettes, at the rate of 5%, and from the sales tax on coal, crude oil and oil products and motor vehicles, at the rate of 1%
3. Part of the funds from the estimated value of facilities and works in case of which an analysis of their effect on the environment is required, at the rate of 1%
4. Interest on the credits extended
5. Fines collected pursuant to this Law
6. Other sources

The Government sets the amount and the modality of calculating and paying of the funds stemming from collected charges for the pollution of natural goods. These funds may be pooled in accordance with common needs in the field of environmental protection and they are payable in a special account of the Ministry.

Besides the mentioned sources, the revenue of the Republic Environmental Protection Fund, or the Special Account now, also includes also 5% of the market price of the protected species collected and put on the market. Namely, what is involved are the wild plant and animal species of a commercial value, to which the principle of limited protection applies. They are collected and sold by individuals or businesses. However, if they are exploited excessively, a threat could be posed to their survival, so that pursuant to the Environmental Protection Law, the State sets limits on the collection in one year or places a ban on the collection in a region. According to some estimates, the Fund`s revenues on such grounds in 1997 totaled almost 3 million YUD (about 0,6 million $US).

The other non-budgetary source of funds is the mentioned one 1% of the estimated value of the facilities and works in case of which an analysis has to be made of their effect on the environment, which has been estimated at somewhat more than 2 million YUD (about 0,4 million $US) for 1997.

The financial management and administration of the fund are in the scope of the Minister's competencies exclusively and the money inflow is correlated with the inflow in the republic budget. The funds earmarked for environmental protection are paid in a transit account of the Ministry of Finance and then transferred to the Ministry of Environmental Protection. The inflow

of these funds in 1997 was 50% of the planned amount. Even those to which the 5% and 1% rates apply have to be paid in special accounts of the Ministry of Finances and then be transferred to the Ministry of Environmental Protection. The so-called "earmarked" financing of the fund revenues, as the basic postulate of such funds in the world, is evidently lacking, which makes up an obstruction to the financing of the environmental protection sector.

The types of financial assistance given by the fund boil down to non-repayable funds exclusively, regardless of whether they are used for the financing of given projects partly or wholly. Therefore, there are no mechanisms of the so-called soft or hard financing, and there is no issuance of credit guarantees. Although the Public Revenue and Expenditure Law allows the extension of credits for financing the environmental protection projects of public concern and it is also possible for the fund to generate revenue from interest on the credits extended, that is not made use of also because of the shortage of funds and inadequate institutional support.

The 1998, Law on the Budget of the Republic of Serbia (Government of RS Gazette, No. 60/97) made provisions for a strict financial discipline and centralization of public revenue. Namely, the revenue generated by the budget beneficiaries in conformity with special laws have to be paid in a single transit account of the Ministry of Finances, from where they are transferred to the beneficiaries for designated purposes. At the request of the authority responsible for the execution of budget, the beneficiaries of the budgetary funds have to present the necessary documents and data on the basis of which their expenditures are financed, which according to experience so far, has slowed down considerably the drawing of funds for such purposes which is low as it is. The budgetary inspectorate checks these transactions. The budgetary beneficiaries have to send reports on the execution of annual financial plans to the public revenue-auditing department of the Ministry of Finances. The revenues generated by these services have also to be declared together with reports.

Therefore, the Minister manages the fund and the Law provides that the funds earmarked for environmental protection may be used for the following purposes:

- monitoring the quality of the environment,
- co-financing the equipping of the professional and scientific institutions to which duties relating to environmental protection and of concern to the municipality or town have been assigned,
- co-financing the staff training in various establishments dealing with such areas of environmental protection as are of concern to the municipality or town concerned,
- extension of credits for capital projects intended to reduce the environmental pollution substantially,
- as incentives to the preparation of conceptual designs, scientific and applied research needs, studies, reports and working drawings,
- financing the non-governmental organizations in the drives for protection and rehabilitation of the environment (Foresters, Young Researchers, Anglers' Association, Hunters' Association, Inventors' Association, Red Cross, etc.),
- co-financing the publishing of books and periodicals and publicity campaigns relating to the protection and improvement of the environment, etc.

In 1997, several projects, designs and works in the field of water pollution control were co-financed by of Ministry of Environment Protection and the Ministry of Agriculture, Forestry and Water Management. Total amount spent was 1,5 million $ US.

The Government Accounts Department keeps the accounts associated with the fund operations. The procedures relating to transfers from the fund are tied to the Ministry Secretariat and the Ministry Secretary effects them at the Ministers instructions.

Applications for funds might be filed at any time and they were decided on the basis of the priorities set at the Ministry. Therefore, there was no public competition for the granting of funds.

The contents of the applications for funds have not been prescribed, so that in most cases, they do not include particulars about the applicant's credit rating and specifications, although they do include a description of the ecological problem to be dealt with, i.e., the project competing for financial support. The cost analysis is also lacking in most cases, which also goes for the financial plan and necessary permits or approvals.

The evaluation is carried out on the basis of criteria relating to the ecological importance of the project concerned and its adjustment to the national environmental protection policies and the operating plan for the current year on the basis of which the Ministry adopts the financial plan.

4.1.3. Local Eco Funds

The Law on the Territorial Organisation of the Republic of Serbia and Local Government (Government of RS Gazette, No. 47/91, 79/92 and 82/92) provides that for the purpose of looking after the direct interests of citizens, any municipality and/or town has to see to the protection and improvement of the environment and that it is entitled to the revenues determined by law (Articles 22 and 23 of the Law) for such purposes.

In view of such statutory grounds for raising special funds for environmental protection and its improvement, special environmental protection and improvement funds (so called Eco-funds) have been established in several Cities (e.g. Niš, Užice).

The decision to establish municipal, town, district and regional Eco-funds is conducive to the following: provision of earmarked funds for the programmes and projects of environmental protection; rational, scheduled and proper utilisation of funds from various sources for the programmes and projects of environmental protection and improvement; incitement of organisations and institutions to invest in solutions, programmes and projects relating to environmental protection and improvement, etc.

The monies for the formation of municipal funds are raised from the following:

- Charges for the use of town building land,
- Charges for the development of town building land,
- Charges for the use of communal goods of common concern,
- Part of the municipal/town revenue stemming from stay tax,
- Revenue from local taxes, such as those for using public area, keeping instruments for the games of chance, stagic music programmes, using free areas for camping, erecting tents and for other temporary purposes, keeping motor vehicles, trailers, etc.,
- Voluntary tax intended for financing environmental protection and improvement programmes;
- Budget,
- Donators, sponsors, contributions and other sources.

The Fund monies may be pooled with those of the various institutions, organisations and industries towards implementing programmes, performing tasks and satisfying common needs in the field of environmental protection.

4.1.4. Appraisal of the State of the System of Financing Environmental Protection and Need for Improvement

Generally speaking, on analysing the national strategy of financing the protection of the environment, it can be said that the FR of Yugoslavia has still not created the necessary legislative, institutional and other preconditions for the financing of environmental protection, including water protection, to be done in accordance with the "polluter pays principle". Consequently, industries and other polluters are not using their own funds towards financing the environmental protection projects, or are doing so to a negligible extent. Public expenditures on the provision of collective ecological services, such as those relating to clean water supply and wastewater treatment are not being financed from the charges collected from the beneficiaries, so that they cannot be associated with the industries directly. Neither is these expenditures "lightened" through the financial markets. Support in the form of commercial credits extended by banks to enterprises, buyers of enterprise shares or sale of bonds by local governments for public utility purposes, which are repayable from the charges collected from beneficiaries, are still lacking in the present system of financing this sector.

However, in the course of transformation into a market economy, many factors are limiting the application of the "polluter pays" principle and obstructing the introduction of an effective system of financing the protection of the environment, including water. That is why the "softening" of financing is allowed in the course of transformation for the purpose of prompting investment in the protection of waters. This calls for financing on more favourable terms than those on the market finance. Soft financing is permitted on the following three conditions: (1) that it is time-limited; (2) that it lessens grave and peculiar economic difficulties; and (3) that it is not conducive to trade and investment distortions. Neither is form of financing included in the environmental protection strategies on federal and republic levels.

According to the draft Strategy of Environmental Protection of the Republic of Serbia, the environmental protection projects which are going to be recommended for financing, can be divided into three broader categories, including:

- Paying-off projects or those which can generate enough funds to cover all costs on commercial terms and where financial risks are acceptable. Such self-financing projects will be denied the so-called "soft-financing";
- Projects which are of considerable benefit to the environment and water quality, but which do not pay off (e.g., removal of hazardous waste which is polluting the waters). As a rule, public sources of financing are necessary for such projects;
- Projects which pay off partly. The soft financing applies to such projects. For example, such projects whose revenues cover the operating costs and only partly the repayment of investment, following by those which will pay off only in the long run or when economic conditions improve and those with which the risk of inadequate returns is too high for commercial financing. The "softening" of financing terms for these projects is not unconditional. It is appropriate in two cases, i.e., in case of transitional limitations (e.g., a sudden decrease in output, enterprise restructuring and major government reforms) and in case of covering the ecological externalities (local or international ecological benefits not supported by sufficient financial returns).

The first of the mentioned categories of projects will be fostered to the maximum extent, because it is producing ecological benefit as the result of the financial investments made. The measures geared to the elimination of the three kinds of limitations will contribute to the promotion of such investment projects and they are as follows: (1) changing the unsuitable pricing policy (e.g., electric power subsidies, non-economical price of water, etc.), (2) improved application of the regulations governing the environmental protection and water protection, which would be encouraging for the branches inclined to investing in the preservation of resources and ecological improvement, and (3) raising funds for financing the small-scale investments.

The soft financing can be effected in various ways, including a reduction of interest rates, mixing non-repayable funds with loans, extending the grace period, extending the repayment term (maturity), variation of the size of loan (or its share in the total investment), lessening the credit risk or provision of share capital. These instruments are lacking in the national policy and strategy of environmental protection, which applies to the protection of water, too.

Donations (non-repayable loans) as a direct subsidy in the national strategy for the protection of the environment and water resources are used towards financing parts of projects. It is felt that they are inciting to the employment of national and institutional funds and those of co-financiers (foreign private capital, etc.).

Loans (from domestic and foreign sources), which besides the public sector budget are the most important instruments for financing ecological projects, have not been utilised. The chief source of long-term financing - loans extended by international financial institutions on more favourable terms than the commercial ones - were also not utilised towards financing environmental protection projects in the 1991-1998 period because of the UN sanctions against the FR of Yugoslavia.

In view of the imposed international isolation of the FR of Yugoslavia and the chronic shortage of domestic savings, the national policy and strategy of financing the programmes and projects of environmental protection, including the water protection segment, were not backed up by domestic credit lines. Consequently, neither were developed domestic institutions for issuing guarantees for the loans taken towards financing projects relating to the protection of the environment and waters, resulting in loss of the time necessary for developing an ecological infrastructure which is harmonised with European Union's one.

The ecological shares in the cost sense, which are an effective instrument in case of projects producing suitable returns, are also lacking in the national strategy of financing ecological projects, partly also because of the country's underdeveloped financial market. Namely, the model of ecological shares could have attracted private share capital, donations and loans for use towards financing the companies executing ecological capital projects, assuming, of course, that a propulsive economy is being developed and that domestic or foreign capital is available for such purposes.

The swap of debt for environmental protection, as a form of debt conversion introduced by the Paris Club member states in 1990 in the context of increasing the options for the rescheduling of external debts, was moved for in Yugoslavia by the Ministry of Environmental Protection of the Republic of Serbia, and it remains to be introduced after the sanctions are lifted.

Bilateral and multilateral donations as sources of technical assistance, staff training and investment support were also lacking because of sanctions. The same applies to the involvement of the international financial institutions of importance for the provision of funds from the international capital market.

The funds in the Global Ecological Fund (GEF), which was established in 1991 using the contributions made by donors in the scope of a pilot environmental programme, were also inaccessible to the FR of Yugoslavia. Consequently, they were not a component of the national strategy for the protection of the environment and waters. The access to these funds is very important for protection of the environment on national level.

Since the application of the "polluter pays" principle is a model which implies conditions of a developed market economy, an institutionally defined environmental protection policy and tendency of enterprises to act rationally from the aspect of minimised expenditures and maximised profits, it is partly clear why this principle was not invoked in the national strategy of financing the environmental protection programmes and projects. The behaviour of enterprises in the FR of Yugoslavia is not identical to that of the companies in developed countries. Besides the institutional limitations and an underdeveloped taxation system (e.g., slow introduction of the

value-added tax) in the FR of Yugoslavia, together with the accompanying developmental problems, the behaviour of enterprises brought about by the ownership structure and insensitivity to maximisation of profits, is not conducive to the behaviour expected in the hypothetical model of decreasing the marginal costs, which is the basic postulate of the ecological economics.

The alternative approach to the model of taxation of the polluters of the environment, which boils down to the concept of "permit trading" has not been resorted to so far in the national strategy of financing the environmental protection also because of the underdeveloped domestic financial market. Namely, the following essential conditions for the application of this model are lacking:

- Setting of the general permissible level of pollution of the environment (water, air, soil, etc.);
- Setting for individual firms/polluters the permissible rate of emission or dumping of waste in gaseous, liquid or solid form;
- An institutionally defined external role of the State in the protection and preservation of the environment;
- The consequences of economic activity and development affecting the level of degradation of the environment acquired the status of "goods" or "services" traded on the market in accordance with supply and demand.

4.2. Standardised Funding Mechanisms for Investments in Water Pollution Control

4.2.1. Typical Sources of Investment Money for Municipal Wastewater Treatment Plants

The funds for financing of building facilities and water pollution reduction are secured from the Land Budget of the Ministry of Agriculture, Fostering and Water Management and charges come from the charges for water use and charges for water and wastewater discharge to natural and artificial recipients. All of the above named sources participate with 30% of the total value in the approved operations; for the extremely undeveloped municipalities (determined by regulations) the Ministry participates with 40% of the grants; whereas 70% i.e., 60% of the total investment value is provided by the consumers (municipalities or companies).

The chief investors in construction of facilities or systems for wastewater collection, sewerage and treatment in cities or settlements are as follows: Utility funds, the Head Office for Urban Construction, City Funds for Construction or Municipal Authorities.

4.2.2. Typical Sources of Investment Money for Industrial Wastewater Treatment and Pre-treatment

The chief investors in building of facilities or systems for industrial wastewater treatment or pre-treatment, are companies, which are obliged or have to build those facilities. For industrial wastewater treatment the users of municipal installations are building facilities for pre-treatment in case of wastewater discharge into the municipal sewage which collect the wastewater to the municipal devices for treatment of wastewater, or to the collectors from which the wastewater is channelled to the recipient, river or lake. If the wastewater is directly discharged, the investor is obliged to treat the wastewater up to the level regulated by the Law on Water for the particular recipient.

It should be noted here that during previous years, due to the extreme shortage of investment funds, for these purposes were built facilities or systems for treatment of wastewater, i.e., for the protection of water quality (treatment devices), in order to protect the water collector wells, i.e., sources of drinking and other kind of water. At that time, by development of industry and other social activities, treatment of wastewater did not receive due attention which, eventually, resulted in degradation of quality of water resources, rivers, and lakes in comparison to the regulations stipulated by the Law on Water. The intention was to firstly protect water supply sources and to curb further degradation of quality of natural water by increasing the funds for water quality protection. Also, by further increase of investments, the quality of current and Lake Water should be brought to the desired level.

4.2.3. Patterns and Procedures for Municipal and Industrial Wastewater Treatment

All "producers" of wastewater can, according to the above stated procedure, use the Republic non-repayable funds amounting to 30% of the investment value. This applies to the solutions for agricultural wastewater treatment as well (farms, meatpacking industry, dairy industry, meat products industry, and others, except for the sugar refineries).

All owners of installations, state, social, and private have the same rights in reference to applying for receiving funds for building of facilities for industrial wastewater treatment.

As mentioned above, the grants for building of facilities and systems for treatment of all wastewater is provided by businesses and individuals producing wastewater, with the state subsidies which contribute 30% of the amount necessary for the project implementation.

Cities or towns which build systems for wastewater treatment provide their own funds from taxes (or municipal budgets) by means of institutions established at the level of a local community, municipality, or city, under different names (Building Fund, Public Utility Fund, Construction Land and Roads Fund, Head Office for Building etc.) and as main contractors they supply 70% (or 60%) of financial means for the relevant investment. Such investors can be main contractors or they can carry over the business to any other organisation, which has human resources and technological means to competently perform the work.

For the purpose of detailed data processing of applications for receiving grants for building facilities for wastewater treatment, the Ministry is asking the main contractors to submit all the necessary documents, and from the Municipal Assemblies it requires that during the procedure of producing proposals for the Ministry Programme they also submit the relevant data important for determining the facilities to be financed by the Ministry.

The main contractors in economy should submit:

a. the Investment Programme stating the total value amount;
b. the Outline of the Investment Programme (basic facility data; review of already performed actions; review of the remaining actions; the year of the Project launch; what would be accomplished with the allocated grants; the name of the documentation technical planner; the name of the technical documentation auditor; the number of water management approval and the name of the issuer; the number of building licence and the name of the issuer; the building preliminary estimates; the investment structure; financial construction; the deadline date);
c. (c) Enclosures (copy of Water Management approval; copy of the building permit; certificate - the investor's statement about the provision of his finances).

Municipalities should provide the following:

a. for facilities in the process of construction which receive the Ministry grants (preliminary cost, actions performed until the end of year, the rest of work to be completed; the plan from the Head Office for Building or a Public Utility Enterprise with the investment decision; the financial construction; building permit; Water Management approval);
b. for new facilities which are competing for the Ministry Programme (according to criteria from the Government Decision; analysis of the existing systems); (c) for the water-supply Programmes where Ministry provides support for local communities (based on the analysis of technical offices, the municipalities themselves give proposals for the priority local communities; technical documentation; readiness of the local community to participate in the building of the water supply system).

When competing for the Republic funds for these means the investors are required to furnish:

a. Full project documentation for implementation with a compulsory clause on the Project Reviewing.
   In addition to all law regulated licenses and agreements it is important to note that all the project documentation had to meet planning conditions given by the Ministry for Agriculture, Forestry and Water Management, which, upon the completion of the project and revision, issues the Water Management approval for construction of the facility.
b. Building construction permit.
c. Guarantee of funds for the construction of the facility.

It should be noted hereby that the investors bear the cost for the production of project documentation - until the moment of competing for the Republic funds (Ministry of Agriculture, Fostering and Water Management). However, when the investment is given the approval, the investor is, through the process of construction, being refunded for the incurred costs in the percentage that follows the whole investment process.

Usually, about 40% of total number of application are granted as it is presented in the table as follows:

Year	No. of applicants	No. of granted
1995	111	49
1996	135	57
1997	82	35
1998	112	51

As there have always been more applicants competing for the grants than the investment opportunities allowed, the selection of facilities has been carried out according to the following procedure:

- According to the Law on Water, the construction of facilities and systems for water treatment used to be funded by former Fund for Water. When competing for the grants the investors had to present a full project documentation, Water Management approval from the Ministry for Agriculture, Fostering and Water Management, building permit, the investment programme for the phase building (in case the facility cannot be completed in one year) and a proof of liquidity. Out of the received applications the Fund Expert Office gives a recommendation to the Fund Managing Board. The approved recommendations are then proceeded to the Government of Serbia for ratification;

- Since 1997, all businesses of the Fund for Water have become the responsibility of the Ministry for Agriculture, Fostering and Water Management. The elements necessary for submitting applications for using the grants for building facilities are the same as when the Fund for Water operated, with minor changes. The Ministry Expert Office compiles programme proposals, and the programmes are being ratified by the Government of Serbia.

On the basis of approved projects, the Ministry and the Investor conclude a Contract on pooling funds for a joint financing, and the Ministry brings a Decision on approval of the funds.

In practice, there are certain difficulties in implementation:

- due to the lack of finance;
- due to the complexity of ensuring the Ministry funds and because of the obstruction of certain organisations - taxpayers in the building process of pre-treatment of the industrial wastewater;
- due to the lack of understanding or misunderstanding the needs.

The Ministry participates in the financing of building facilities for pre-treatment of wastewater in the same way as in the building of Central Municipal WWTP.

4.3. Private Financing Models in Use

4.3.1. BOT (Build-Operate-Transfer)

On account of aggravating economic and social conditions in the FR of Yugoslavia, caused by the UN sanctions, in the field of financing investments in infrastructure, including the investments for water protection, there have not been private investments (neither public nor utility investments) during the period 1990 - 1997. The model BOT (build-operate-transfer) is still in the process of development.

4.3.2. Private Management of Services

Private management of services is just at the onset of development. On the level of FR of Yugoslavia and on the level of member Republics there have been no such deals. On the level of municipalities these models are just commencing.

4.3.3. Leasing Models

For investing in projects for the treatment of wastewater and water supply of the city of Niš there have been negotiations about foreign private investments in 1997. For 1997 and 1998, the City Assembly of Belgrade has concluded a Contract with French corporations SOR and BUIK for building the necessary missing facilities and devices for water supply, and with the German company ALBA for wastewater recycling on the basis of long-term joint investment and concessions for the period of 25 years.

4.3.4. Other financing Models

As one of the possible sources for financing investments for the protection of water in cities we can give the example of Belgrade, where the City Assembly has introduced a separate city tax of 3% on turnover of goods and services which is used for solving the utility problems, and a part of the revenues can be used for water protection. With the improvement of the standard of living we

anticipate wider use of self-imposed tax for resolving problems in water supply and treatment of water in urban areas and rural communities, by means of setting aside a certain percentage from the salaries.

4.3.5. Licensing and Monitoring of Privately Financed or Operated Services

It is necessary that the Government of Serbia ratify foreign direct investment agreement in the field of wastewater treatment and water supply as it is in charge of giving concessions.

Furthermore, apart from the sanctions, even greater obstacles for larger foreign investments for the protection of water are low tariffs and charges for water consumption, both in industry and for individual use. The prices are controlled by the Republic governments respectfully, in order to prevent further jeopardising of the standard of living. In case these tariffs and prices were to considerably increase, despite the fact that they are now freely formed, the Republic governments could bring them back to the previous level, and then put a tap on them.

4.4. Actual Water and Wastewater Tariffs

4.4.1. Actual Tariff Policies and Systems

The tariff policy for drinking water consumption and maintenance of water treatment systems is the responsibility of municipalities. As a rule, every municipality establishes Utility companies (organisation of collective interest) and they are in charge of the systems for preparation and distribution of drinking water as well as for devices for collecting and treatment of wastewater.

The utility companies are non-profit ones, i.e. they do not have funds for investment and development. That is why the prices, which are kept under control, have a social dimension. Drinking water and sewage tariffs differ from city to city as well as on the consumer category as it is presented in the next table.

Table 4-4 Statistical values of drinking water and sewage tariff (in $ US)

Tariff	Drinking Water		Sewage	
	Households	Industry	Households	Industry
Min.	0,039	0,067	0,008	0,009
Average	0,110	0,420	0,046	0,196
Max.	0,260	0,860	0,106	0,798

** The prices in 1997, from 76 settlements were analysed.*

This wide range of consumers comprises several categories (individuals, corporations, hospitals, schools, social welfare institutions, companies, and certain industries). The lowest tariff applies to individuals, and the highest is for industries. The utility organisation applies for the change of tariff, which is approved or refused by the city authorities, and the final decision and the Trade Ministry makes approval.

4.4.2. Level and Structure of Tariffs

The tarrifs for water use as well as for wastewater discharge in FRY were never established on the economy base so it had not covered real prise of investment, maintenance and operation of facilities. The shortage of money, particularly for investment, was refunded by the Budget or by municipal public loans (or grants). In the last two years there were some moves on the municipal

level to adjust the price of water to its real price but the current situation in economy was not a good frame to reach that goal. As it is presented above in the table 4-4, the overall price for both drinking water and sewage, paid by households in 1997 was in the range of 0.47 – 3.32 YUD/m^3 (0.047-0.332 $US/$m^3$). In average it was 1.56 YUD/m^3 (0.156 $US/$m^3$).

The overall price for both drinking water and sewage, paid by industry in 1997 was in the range of 0.76 – 16.6 YUD/m^3 (0.076-1.66 $US/$m^3$). In average it was 6.16 YUD/m^3 (0.616 $US/$m^3$).

These prices do not include charges for water abstraction and wastewater discharge, which are regulated by the Republic Governments. In the structure of the total cost paid by consumers only the price drinking water and price sewage are divided but no further structuring of the price is done. In general, 70 % of total price is used for maintenance, repair and operation, but 30% is used for investment.

4.4.3. Level and Structure of Cost

Level and Structure of Cost of drinking water production, and wastewater sewage and treatment, which are borne by utility companies in FRY, vary as it is presented in the table 4-4. These costs cover wages of the employees and routine maintenance of their infrastructure, which accounts for 50% of total cost. The other 50% of costs, should satisfy most of investment requirements.

4.4.4. Level of Actual Cost Coverage

In order to cover production and investment costs incurred by utility companies the price of drinking water and sewage system maintenance costs for citizens, should be about four times higher, and the price for industry about two times higher in comparison with 1997 price level. Although the parity of these prices was adjusted significantly in 1998, one of the most serious problems arises form failure to collect payments from customers in industry. The current water price level and cost coverage, is the major issue which curbs the interest of foreign direct investors and concessionaires.

Another possible source for cost-coverage comprises communal charges that can be channelled from the town budget to utility companies. However, long term solution could be made by price increases and ownership changes of utilities, as permitted by Law on communal services.

4.5. Actual System and Practice of Abstraction and Pollution Charges

The Ministry of Agriculture, Forestry and Water Management has additional revenues, outside the Land Budget, which are defined by the Statute on the tariffs for water consumption and tariffs for the protection of water (Government of RS Gazette, No. 2/97), which at the recommendation of the Ministry is drawn by the Government of the Republic of Serbia and which can be accordingly changed and co-ordinated. Through budget of the Republic, these revenues are directed towards the Ministry. The Ministry then uses the revenues for building of facilities or systems for wastewater treatment.

4.5.1. Charges for Water Abstraction (municipal, industrial, irrigation)

The Tariffs (prices in $ US are calculated following the 1997 exchange rate 1 $ US = 5.48 YUD) for using surface, ground and mineral water comprise of the following sections for which the users are charged:

1. For unprocessed water - YUD 0.027/m^3 ($US 0.049/$m^3$)
2. For producing of drinking water, assigned for sale to corporations and other legal entities- YUD 0.090/m^3 ($ US 0.016/m^3), but assigned for individuals - YUD 0.045/m^3 ($US 0.0082/$m^3$).

3. For producing of drinking water assigned for specific needs - YUD 0.075/m^3 ($US 0.0136/$m^3$).
4. From the mineral water manufacturers - YUD 0.040/m^3 ($ US 0.007) for each sold litre of mineral water.
5. For cold and warm-water fish ponds - 4% of the wholesale price for each kg of the sold fish.

The Public Electric Power Enterprise is charged for each kWh of the produced electric power at the hydroelectric power stations, 2,3% of the kWh price sold to consumers with a single tariff electric counter, and in thermo-electric power stations with a recycling cooling system 1,25% of the kWh selling price to consumers with a single tariff electric counter.

4.5.2. Charges for Wastewater Discharge (exceeding defined quality standards)

In the aforementioned Statute there are charges for the water protection, which are charged for:

1. Manufacture, refinement and transport of oil and oil derivatives, ferrous and non-ferrous metals, industry of paper and cellulose, meat-packing industry, pig farms, leather industry and car service businesses YUD 1,042/m^3 ($US 0.189/$m^3$) for discharged polluted wastewater.
2. Ship building, electric power industry, tire industry, thermoelectric power plants with the closed cooling system, food industry, metal industry, building industry YUD 0,625/m^3 ($US 0.113/$m^3$) of discharged water.
3. Lumber industry, non-metal manufacturing industry, production and processing of building material, and tobacco processing YUD 0,545/m^3 ($US 0.1/$m^3$) of discharged water.
4. Taxpayers who discharge wastewater into sewage systems YUD 0,040/m^3 ($US 0.007/$m^3$) of discharged water.
5. Other taxpayers YUD 0,290/m^3 ($US 0.053/$m^3$) of discharged water.
6. Thermoelectric power plants with an open cooling system for each kWh of the produced electric power 1,25% of the selling price to consumers with a single tariff electric counter.

The tariff for Art. 1 increases in accordance with the regulated class of recipient, such as:

1. For the first class recipient with 50%,
2. For the second class recipient with 25%.

In case the taxpayer discharging treated wastewater and if the treatment of wastewater is being continuously provided during the course of the whole year, the taxpayer is charged with:

1. 85% of the full Tariff for the protection of water if treatments of wastewater result in decreasing of the concentration of polluting substances for 50%, and which, according to the facility specification should be eliminated from the water;
2. 25% of the full Tariff for the protection of water if treatments of wastewater result in decreasing of the concentration of polluting substances for 70%, and which, according to the facility specification should be eliminated from the water;
3. 10% of the full Tariff for the protection of water if treatments of wastewater result in decreasing of the concentration of polluting substances for 85%, and which, according to the facility specification should be eliminated from the water.

Those taxpayers that have built in facilities for the treatment of wastewater are exempted from paying charges for the protection of water, provided that the quality of such water corresponds to the regulated class of water in the recipient at regular flow.

4.5.3. Other Relevant Charges, Penalties

There are separate charges for discharging treated and non-treated wastewater into the man-made channels. These charges are collected by the Public Water Management Enterprise "Srbijavode" and are used for maintenance (cleaning, dredging etc.) of canals and other facilities at the canals. The charges are paid according to the quantity of discharged water (pollution degree, based on the scheme defined by the Statute).

4.5.4. Assessment of Efficiency of Actual Practice

In 1997, the revenues from the Tariffs for water use and for the protection of water amounted to YUD 311,000,000 ($US 56,626.506). The same level of revenues are estimated for 1998. The legislator intends to direct all these revenues towards financing of building facilities and systems for treatment of wastewater. However, the revenues are partially set for the building of facilities for treatment of wastewater, and the rest is aimed for other water management investments. The Statute has been designed in such a way as to stimulate the taxpayers who produce wastewater to install the treatment systems, for that is more economical for them then to pay charges because they do not have the treatment systems.

Generally speaking, prices and charges for water consumption and discharge are very low and cannot cover the costs for renewal of the existing systems. Although these charges are not under direct control of the Government, there is a possibility that the Government assumes control over these prices in case they influence the fall of the standard of living. On the other hand, corporations do not fulfil their obligations or they refuse to pay the required charges for the consumed and discharged water, so that these debts are being paid via charges. Among others, this was one of the reasons the systems for the treatment of drinking water are being favoured for investments.

4.6. Economic and Financial Incentives For Pollution Reduction Measures

For the purpose of pollution reduction measures, in co-operation with the Federal Ministry for Development, Science and Environment it has been agreed that certain financial and economic incentives be introduced into the customs, foreign trade, the Law on duty-free zones, and the Law on concessions.

In the Law on customs there is a provision that companies and other organisations dealing with environmental protection and control of the environment quality should not pay customs for goods not manufactured in Yugoslavia, and which serves for those businesses. Also, the state agencies, companies and other organisations do not have to pay neither customs nor turnover taxes for equipment which is not produced in Yugoslavia, and which serves for the protection of environment. The requirements for gaining such benefits are defined by by-laws. The applicant should submit to the Federal Ministry for Development, Science and Environment a certificate that the goods are not produced in Yugoslavia (issued by the Economic Chamber of Yugoslavia) and based on the equipment description it shows the ecological purpose of the equipment in question.

With the aim of achieving durable society development in concordance with the needs and limitations of the environment, the Ministries for the Protection of Environment and Governments of the Republics have been active factors on the relation: economic policy - environmental policy.

One of the sectors of the national economic strategy in the protection of environment refers to introducing economic incentives in the economy jurisdiction with the aim of directing marketing dynamics and investments which are beneficial from the environmental point of view by using, among other things, fiscal mechanisms and initiatives. As a result of these activities a number of beneficial regulations related to the environmental protection have been adopted in the fiscal jurisdiction, which is considered to be the most effective instrument at the disposal of the state bodies. In the package of fiscal laws, investments in this field are given privileged treatment. For the purpose of improving the ecological situation, according to the Law on taxes and profits, taxpayers are given tax incentives in the form of a right to accelerated amortisation of fixed equipment serving for the prevention of air, water, and land pollution, noise reduction and energy saving, as well as for collecting and using waste as industrial raw materials and energy power.

An identical act has been provided in the Law on income tax, whereas in the part of the Law which determines the tax base it is stated that investing into equipment for the protection of environment, energy saving and irrigation is to be exempted from the income as a part of non-standard deduction. In the part of the Law which refers to the income tax for land register, it is not paid for the income from land with dikes, canals and locks, plants in forelands, trenches and other facilities made of earth for the protection from floods, for maintenance, irrigation or erosion protection, land whose exploitation is forbidden by law, land that is a part of protected environment and culture monuments.

In the part of Law which treats the issue of benefits in case of damages caused by higher forces, it has been stipulated that, in case of natural catastrophes, plant diseases and pests, or some other extraordinary events which the taxpayer was unable to prevent but which caused the loss of more than 25% of the average yield in the past three years in the county, the land profit tax shall be accordingly reduced.

According to the Law on property tax those tax payers who own facilities and land serving for the purpose of prevention of air, water, and land pollution, for noise reduction and who have facilities for the protection of farm land or woods in the vicinity of hydroelectric power plants, own facilities for the protection from harmful power of water, or have farm land which is reused for farming within 5 years, are to be exempted from paying taxes.

According to the Law on turnover tax, in the part referring to the tax exemption from paying taxes on turnover for services, services which contribute to the prevention of air, water, and land pollution, energy saving and noise reduction are exempted from taxes. The exemption also applies to products which are imported and which directly serve for the protection of environment and water, which are not produced in Yugoslavia. Furthermore, the exemption applies to the transfer of thermoinsulating material serving for the energy saving, then equipment, devices and parts that use the solar energy.

4.7. Quality and Capacity of the National Banking System for Funding of Larger Infrastructure Projects (especially water sector projects)

4.7.1. Brief Outline of the Banking Sector

Commercial banks in the FR Yugoslavia are founded according to the Law on Banks and Other Financial Organisations, and the National Bank of Yugoslavia controls and monitor the financial operations of banks according to the Law on National Bank of Yugoslavia. Since 1994 National Bank of Yugoslavia has been an independent institution. From then on, the NBY has tightened criteria for founding banks, financial discipline, operating of Yugoslav banks, so that until 1998 it has revoked working permit for seventeen commercial banks in the socially-owned and private sector, on account of not meeting business operation criteria, and especially because of overdrawn bank accounts.

The Law on Banks and Other Financial Organisations, when stipulating requirements for founding a bank does not make a difference between a legal entity and a natural person, or between a local and foreign person. When founding a bank for operating with foreign currencies and with abroad it is necessary to receive a foreign currency authorisation and to deposit $US 2-5 million at the National Bank of Yugoslavia.

A total of 106 commercial banks, 40 "old" ones and 66 new, have a working permit. All the banks have been founded as shareholding societies. According to the ownership structure there are a few forms of investing into the bank shares, however, the largest share in the shares capital still belong to the social assets (corporations with state and joint venture ownership). One of the most significant problems is that in most of the "old" banks the largest shareholders are at the same time the largest debtors, and they are managing banks.

The Law on Ownership Transformation has regulated the process of changing the bank ownership structure. Since 1989, according to the Law on Banks, banks have been founded as shareholding societies, i.e., the shareholders are also bank managers. Since then, apart from legal entities, natural persons could also become shareholders, although, at the beginning, with only a small part. The process of ownership changes in banking has been faster in new banks than in the so-called "old" ones where the internal ownership structure has been changing very slowly.

According to the ownership structure banks can be divided as follows: (a) banks in which the majority of shareholders are social-legal entities. In the total banking balance these banks participate with 81%; (b) banks in which the majority of shareholders are natural persons with a partial socially owned capital; (c) banks in which the shareholders are natural persons; (d) banks which the majority of state-owned capital; (e) banks which have the majority of foreign banks capital.

The Law on Ownership Transformation indirectly influences the bank status (Art. 7 point 3. of the Law), when in stating a transformation model proposes a debt conversion into creditors shares (with a discount). This makes it possible for regulating bank demands from companies. Banks are the largest company creditors, which enables banks to turn their demands into company shares thus becoming the owners of a part of company. Implementation of these options will depend on selling the shares on the secondary market of long-term stocks, which is still insufficiently developed.

The limitation of the process of ownership transformation of banks and corporations should be noted as well, because in the Law on Banks and Other Financial Organisations (Art. 26. of the Law) it has been stipulated that banks can invest in a company only 15% of the capital. However, shares of banks and corporations are rarely quoted at the stock exchange, so that it is still not possible to determine the real value of these shares. Also, present tax regulations do not instigate conversion of bank demands into shares.

In the commercial banks of FR Yugoslavia the losses of economic sector and the State from the previous period have been accumulating, so that our debt now amounts to $US 16 billion, out of which 10 billion $US makes a foreign debt, and some $US 6 billion makes the internal debt of State to the Yugoslav citizens on account of so-called the “old" foreign currency.

Towards the end of 1997, in the total balance of banks, some 73% refer to the foreign currency sub-balance (liabilities towards foreign demand and the old foreign currency savings of the population). About 26,2% represented the sub-balance in YUD (certain bank liabilities on the passive side).

The active capital side is largely uncertain. Because of instability and a large risk in collecting charges they need to write off up to 50% of the principal and interests, while interest rates are unbearably high. With compulsory buying of shares, which almost all banks require from a borrower, with a commission, the interest rates go as high as 17% per month. On the other side, banks have not regained the trust of population to save, so that the individual deposits are nearly non-existent in bank balances.

As for charging demands, principal demands at the end of 1997 (liquid, outstanding) make YUD 3,2 billion (about $US 600 million), of which the banks have written off 1,5 billion YUD. Due interest rates were YUD 8 billion, and YUD 4,5 billion have been written off as non-payable. In order to stay liquid, banks are forced to borrow money, and are thus losing their stand.

The YUD sub-balance is far smaller than the foreign currency, and it has been mainly formed since 1994, because the inflation of 1993 has almost wiped out the bank balances in YUD (active and passive balance). With the latest change of YUD rate of April 1, 1998, the balance relations have been significantly changed in favour of foreign currency sub-balance.

The overall position of banks in Yugoslavia, according to the business sheets, is unfavourable. The exceptions are private banks, which are basically healthy but have a small capital for any major investments. Among the large, "old" banks there are differences in the balance stands, however even the balances of banks with a somewhat better structure are mainly burdened with the so called "contaminated active" (foreign currency debts). In the six "old" banks (Beogradska banka, Investbanka, Beobanka, Jugobanka A.D., Vojvodjanska banka, and Montenegrobanka), the debt in foreign currency towards the Yugoslav nationals comes to 27%, and towards foreign partners over 50%. In the past, these banks were the leading investors of the infrastructure projects.

4.7.2. Shortcoming of the Banking System in Financing Larger Infrastructure Projects (especially water sector projects) - Availability of Long Term Loans

The structure of bank resource sources is very unfavourable. The largest part of the funds make the deposits at sight, which serve only for actual payments. The prevailing deposits are business sector assets, with a small scope of individuals' deposits, which should make the basic source of long-term loans. In the structure of the bank liabilities in YUD, according to the balance from 1997, the deposited money participated with only 8,5%. The largest part of these assets, about 54%, represented the deposits from businesses, but even they, at the beginning of 1998, were heading for a serious plunge. The deposits of the non-business sector participate with 24% in the bank deposits, state with 15%, and current accounts and individual savings with 7%. All these deposits have an exact purpose. The balance of deposits in the liabilities and double the amount in the active side in comparison to deposits in the passive balance point to a disharmony in the structure of the active side of YUD as compared to the passive side. For assets from the basic balance structure to be used for long-term loans, it is necessary to accomplish an appropriate liquidity in banks through the process of privatisation on the basis of foreign banks investments and financing of joint-venture banks.

4.7.3. Institutions with the Special Task of Financing: Infrastructure Projects of National Importance; Municipal Investments; Water Sector Investments

Long term bank deposits, meaning the long-term loans for financing the infrastructure projects are not available, so that such projects, including those in the area of protection of water are being financed via funds, i.e., budgets of the Republics. These funds mainly provide a part of funds for financing the infrastructure projects (30%-40%), whereas the investors provide the main part of the funds. The institutions in FR Yugoslavia which are dealing in financing of developmental and infrastructure projects in the Republics are: Fund for Development of the Republic of Serbia, Fund for Development of the Republic of Montenegro, Fund for Public Works of the Republic of Montenegro, as well as a separate Fund for the Protection of Water. All these funds have been founded as the budget, governmental institutions. On the level of urban areas, for the protection of water from polluting, the assets are formed within the City funds or companies who are interested in building such facilities.

The water management sector (former Fund for water) of the Ministry of Agriculture, Forestry and Water Management in the Republic of Serbia, provides the funds for financing building of facilities for the protection of water from the Land budget of the Ministry of Agriculture, Forestry and Water Management, and from the charges for consumption of water and charges for discharged and polluted water. For 1998, the Fund needs for financing of facilities for the protection of water quality have been estimated to be YUD 48 million ($US 4,8 million), which makes about 30% of the anticipated value for building of facilities for wastewater treatment in 1998.

4.7.4. Relevant Examples (type of project, investment volume, involved banks, private participation, etc.)

The assessment for investing in projects for water protection and building of facilities for water treatment in the next ten years shows that it would be necessary to provide some $US 2,5 billion. For 1998, for these purposes a budget of $US 15 million is planned by the Fund and investors (planning and building of facilities for treatment of wastewater in 17 cities and towns in the Republic of Serbia). The largest investments have been anticipated for Belgrade, Novi Sad, and Niš. However, bank assets are not involved in financing of these projects, and on account of the aforesaid reasons the assets of Yugoslav banks will not be available for these purposes for several years.

For the time being, the Belgrade City Assembly has contracted an agreement on building of necessary buildings, facilities for water supply with French companies SOR and BUIK and for treatment of wastewater and waste recycling with the Company “Alba”- Germany, on the basis of a long-term joint venture investment and concessions for the period of 25 years. In order for this contract to come into effect it is necessary for it to be ratified by the Government of the Republic of Serbia.

4.7.5. Assessment of Main Weaknesses and Needs for Improvement

The drawbacks of the banking system in FR Yugoslavia are reflected in a legacy of "old" banks on the basis of foreign currency sub-balance (DEM 6,8 foreign currency debt to population and foreign loan debts), which has left Yugoslav banks without capital for any long-term investments. Domestic savings practice can hardly be recovered because of mistrust of people in domestic banking system, while financial discipline with regards to settling of debts of businesses is inadequate because of weaknesses of judicial regulations and actions.

To rehabilitate the balance of the "old" large banks it would be necessary to undertake the process of bank (and business) reorganisation, including the process of privatisation, with the active involvement of foreign capital and founding of new foreign or joint-venture banks. This process has been slowed down mostly due to the rise of uncertainty because of the continued activity of "the outer wall" of sanctions of the international community.

The process of reorganisation and rehabilitation of banks in FR Yugoslavia is made even more difficult by the fact that neither the status of FR Yugoslavia has not been regulated in the international financial institutions nor the status of foreign debt.

According to the conceptual solution of the Federal Government the part in foreign currency sub-balance related to the deposited foreign currency savings of banks with the National Bank of Yugoslavia, is going to be transformed into state debts and covered by the federation liabilities with maturity and interest rate set by Law. The federal state and member republics will overtake servicing 85% of liabilities for deposited foreign currency savings, whereas banks will have to service 15% of liabilities. For their liabilities banks will be obliged to issue their stocks. In that way, a part of the foreign currency sub-balance will be rehabilitated, and one of the causes for high

interest rates and bank commissions will be eliminated, giving thus the opportunity for a larger degree of competitiveness on the banking market. The programme of restructuring and bank rehabilitation is going to encompass only the YUD sub-balance, which makes about 20% of the total balance sum of the largest "old" banks. It will eliminate the increase of outstanding loans by means of merging of interest rates, and following the consolidation foreign partners will be offered to invest in local banks, including sales of some parts of banks, which represent a complete system. Rehabilitation of the target group of banks will be performed by combination of centralized and decentralized method. The centralized mode of rehabilitation of the banks credit portfolio means moving of non-payable active capital of banks into the balance of Agency FR Yugoslavia for the purpose of insuring deposits and rehabilitation of banks. The Agency will manage the active capital, and thus will be encompassed only the items of foreign currency sub-balance (foreign currency credits approved before disintegration of former SFR Yugoslavia), as well as non-balance items.

Decentralized mode of rehabilitation of the credit portfolio means provision of additional funds, including the active role of state, when the banks will be responsible for taking care of troublesome loans, including prevention of privatization of large corporations before the bank creditor makes conversion of its demands into shares.

By accomplishing the desired competitive credit ratio, banks will once again become attractive and reliable for drawing foreign capital and finances from foreign banks on the basis of ownership.

In due process of bank system rehabilitation and privatization there would arise a possibility for financing long-term investments which would be partially used for financing the infrastructure projects, including the projects for the protection of water. However, this process requires considerable funds, especially credits from international financial institutions. As this process may take a long time, the long-term funds of Yugoslav banks will not be available for several years. That is why for financing of infrastructure projects in the field of water protection it is of utmost importance to receive larger foreign loans, non-repayable funds, and technical support.

5. International Assistance in Funding of Environmental/Water Sector Programmes and Projects

5.1. Documentation of National Policies and Decision Mechanisms for International Co-funding of Environmental and Especially Water Sector Programmes and Projects

It is in the interest of FR Yugoslavia to take part in the international cooperation in the area of protection and improvement of environment, primarily because of its position as a country with two long rivers, the Danube and Sava. Also, there is a will and need to get involved in the process of European integration and coordination of ecology criteria, regulations, and institutional organization in that field. Within the Working Community of Countries in the Danube Basin comprising of 10 subgroups, FR Yugoslavia (Serbia) presides over the Group for the protection of water, which is very important, having in mind the geographical position and specific interests it has as a country in the lower current of the Danube. The building of canal Rein-Mein-Danube, which is to connect the North and Black Sea, is going to influence the water resources and ecosystems of the whole Danube basin and will intensify cooperation with countries in the Danube basin.

The international cooperation is being carried out on bilateral, subregional, regional, and global levels. On the bilateral level, there is a cooperation with Hungary, Bulgaria, Romania, and Albania for the purpose of joint dealing with the problems regarding water currents. By cooperation with Greece, Serbia is involved in the work of joint commission for navigational route Danube-Vardar-Aegean Sea. On the sub-regional level the cooperation is implemented with groups of countries in reference to the protection and quality of Danube, Tisa, Mediterranean Sea, Balkan ecosystems and other regions with damaged environment.

The Programme agenda anticipates development of international cooperation and involvement of FR Yugoslavia in activities of European countries with reference to this field and in the work of appropriate specialized international organizations dealing with the protection of environment.

(1) International Projects of National Interest for Danube River

The institutional creditors: European Bank for Revival and Development contributes with its programmes for the protection of environment of the Danube basin together with the World Bank and European Community. It also finances the Cousteau Foundation, the final report under the title The Danube -To Whom and What for, as a part of programme Ecological Standard and Regulations in Western and Eastern Europe. In 1993, EBRD provided ECU 500,000 million for the plan of managing biosphere reserves in the Danube delta.

The European Community also participates in financing Ecological Programme for the Danube Basin through programmes such as CORINE, and it is in the interest of Yugoslavia to get involved in similar programmes.

(2) National Programmes of National Interest - Ecological Programme for Central and Eastern Europe

Within the scope of this general plan there are several actions. Some of them are in favor of marshlands, whereas others are particularly designed for the Danube and have the aim of encouraging integral long-term managing the marshlands, such as: assistance for the protection of the Danube delta, completion of inventory of marshes and identification of basic factors jeopardizing the survival of marshes, multilateral managing of marshes as a part of policy which considers various themes, e.g. managing of water and nature protection.

(3) Ecological Programme for Danube River Basin

It is a programme, which involves the governments of Germany, Austria, Bulgaria, Croatia, Hungary, Holland, Czech Republic, Slovakia, Slovenia, Ukraine, and FR Yugoslavia. Apart from them, there is the government of the U.S.A. and interstate organizations UNEP, UNDP, and European Commission for Europe. The Programme, defined after the Ministry Conference in Dobris in 1991, relates to the strategic integral managing of the Danube basin, which, in the initial three years, will apply only to ecological priorities. It is of vital interest for FRY to catch up with countries in the region and secure financial support for establishing a national register, enforce and harmonize the control system, analyze and manage the data, pre-investment studies, make plan drafts for creating a network to support this programme, and for these purposes it should turn to the institutional creditors: GEF, including the World Bank, EBRD, European Investment Bank, Nordic Investment Bank.

Furthermore, it is important for Yugoslavia to meet the second phase of the programme which includes implementation, investments, strengthening of institutions and development local human resources. The strategic plan of action for the Danube basin has four strategic goals: reduction of undesirable side-effects in the Danube basin, conservation and improvement of water quality in the Danube basin, establishing of monitoring systems for accidental pollution and development of regional cooperation related to the issue of managing the water. From the aforesaid, it is quite obvious that it is in the interest of Yugoslavia and neighboring countries that F.R.Y. be given back the place it used to have in the Danube cooperation, so that optimal results could achieved from investments.

(4) Non-Governmental Programmes

(a) Green Danube Project World Wide Found for Nature

Establishment of multilateral park in the central part of the Danube, including the Czech Republic, Slovakia, and Austria, is an activity worthy of national interests when having in mind the NGO cooperation. The same applies to the assessment of interest of the Drava National Park, which is bordering on Croatia, Hungary, and F.R.Y., as a project applying to the alluvial marsh of international interest.

(b) European Programme World Conservation Union

The activities of this organization which apply to the protection of biosphere reserves in the Danube delta. By involvement of our experts in the work of Pan European expert group for marshlands we would be able to receive scientific support for managing the European marshes. Activity on the protection of biodiversity in the F.R.Y. is also interesting for this programme.

(c) Danube – To Whom and What for

The Programme, among other things, applies to the formation of a green corridor along the Danube, international acknowledgement of certain marshes (UNESCO and Ramsar Convention) and is of interest to F.R.Y. The navigable and transport routes, preparation of strategic plan for organizing the transport, areas with power plants along the Danube, assessments of pollution of the Danube - all these are fields for potential cooperation and financial significance for financing the action of protection of the Danube environment. Thus, it would be prudent to candidate formulation of a National Plan for priority actions for the protection of the most important marshes in the F.R.Y., which would be led by the Ministry for the Protection of Environment along with technical support of the Ramsar Bureau.

5.2. Actual Financial Assistance from Bilateral and/or Multilateral Institutions

Since 1990, due to the UN sanctions, FR Yugoslavia has not received neither bilateral nor multilateral financial support for the projects related to the protection of environment, including the projects and programmes for water protection.

5.2.1. Completed and ongoing projects

5.2.2. Planned projects

(1) Projects Elaborated to the World Bank in 1991

Within the scope of international cooperation, in 1991, on the basis of a public bid the following projects were competing in the field of Water Supply and Water Pollution Control:

- Building of regional water system and facilities for processing drinking water for the towns of Leskovac, Lebane, Vlasotince, and Vučje, with total value of $US 50,000,000;
- Regional water system "Rovni", Valjevo. Facility for processing of drinking water "Pećine" with total value $US 7,000,000 Regional water system "Selova". Facility for processing of drinking water with total value $US 70,000,000;
- Water supply and water protection in the Municipality of Kikinda with total value of $US 41,500,000;
- Water supply and treatment of industrial water in Indjija, Stara Pazova, Nova Pazova with total value $US 10,000,000;
- Integral environmental protection of the coastal area of the Sava and Danube in Serbia with value $US 3,000,000, which was in 1991 done for the whole length of the Sava river and Japanese technical support was provided via World Bank in the amount of $US 380.000. It was similar with the project Water Supply and treatment of industrial wastewater in Belgrade when Japan provided $US 516,000 for technical support, through World Bank, and an integral project was prepared for the environmental protection of municipal area of Belgrade, with total value $US 380,000,000;
- Environmental protection of the valley of Pljevlja.

In the group of feasibility studies there was still actual project “Protection and Improvement of Environment in the Sava River Basin”, with value $US 3,000,000.

These are projects that still await implementation and which will be financed by the World Bank.

5.3. Centralised National Institution/Development or Promotion Bank for Handling International Funds

On the level of the Federal Republic of Yugoslavia, the following institutions have been formed for the purpose of collecting and allocating the foreign funds: the Yugoslav Bank for International Economic Cooperation (JUBMES), and YU-GARANT Bank. In former SFR Yugoslavia, JUMBES was founded as a bank, i.e., as a non-budget institution whose founding capital contributed former Yugoslav republics. In the former economic system, this bank used to insure export trade businesses from non-commercial risk. In the Federal Republic of Yugoslavia JUBMES is organized as a shareholding society according to the Law on Banks and Other Financial Organizations. JUBMES needs to operate in compliance with this Law, including submitting of a

deposit for foreign currency authorization in order to work with foreign banks and institutions. It now mainly deals with collecting of foreign funds for insuring export businesses from non-commercial risks. YU-GARANT Bank has been founded as a shareholders society whose main activity is encouraging all large export business deals and to give guarantees for them. However, neither of these banks, on the federal level, deals with collecting of foreign funds for financing of development and infrastructure investments, especially in the area of water protection, because during the sanctions it was impossible to operate such activities.

5.4. Assessment of Main Weaknesses and Needs for Improvement

Given the situation in the banking system of FR Yugoslavia, lack of funds for long-term crediting and absence of foreign loans for financing the infrastructure projects, as well as insufficient Republics' budget funds which are allocated for financing projects for the protection of water, there is a plan for establishing a National Ecology Fund on the federal level or on the level of member republics.

The National Ecology Fund would be founded as a non-budget institution, with a majority participation of the republics, which would manage the special-purpose funds for the protection of water and environment, funds of businesses and banks, and with foreign loan funds. The Fund would have the status of a legal entity; the auditing and managing board would cooperate with the Federal and Republic Ministries for the Protection of Environment in financing of infrastructure facilities, including the protection of water. For the purpose of founding and operation of this Fund it is necessary to provide foreign loans and technical support for several years.

Furthermore, in the coming years it is of great importance to eliminate the cost disparities and increase the tariffs and charges for consuming urban and industrial water, as the existing rates cannot cover the costs of processing drinking water and industrial wastewater. Up to now the price policy has been more in the function of keeping the low standard of living of population, which is the result of sanctions of international community against FR Yugoslavia. Even at such low tariffs and charges the industrial corporations did not regularly meet their obligations.

The lack of direct foreign investments in projects for the protection of water has to be eliminated through joint investments with foreign partners and concessions, and some positive moves can be seen on the example of Belgrade.

FR Yugoslavia is anxious to take part in international cooperation for protection and improvement of water quality, particularly in programmes and projects for the Danube River protection, in the fields of regional and sub-regional cooperation. Interest is shown by the neighboring countries and the countries in the Danube river basin to give back to FR Yugoslavia the place that belonged to it in the Danube River cooperation, so that optimum investment benefits can be achieved.

Due to UN Sanctions, FR Yugoslavia could not raise loans, bilateral or multilateral, after 1990, on account of environmental protection projects, water protection programmes and projects either. All this calls for urgent participation of FR Yugoslavia in international water projection projects and programmes, and granting of major funds by international institutions, including the World Bank.

6. Actual and Planned Public and Private Investment Portfolio for Water Quality and Water Management Programmes and Projects

6.1. Compilation of Actual and Planned Investment Portfolio

Considering the need for larger involvement and provision of funds for the protection of water quality, we hereby submit the relevant data on projects which have applied for receiving financial support at the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia, and they are incomplete or are still in the preparatory process. The projects apply to the building of systems or facilities for treatment of municipal wastewater.

	Municipality
1	Beograd
2	Nis
3	Novi Sad
4	Krusevac
5	Leskovac
6	Sremska Mitrovica
7	Bor
8	Sabac
9	Backa Topola
10	Vrbas

	Municipality
11	Zajecar
12	Valjevo
13	Inđija, St. i N. Pazova
14	Kikinda
15	Kovin
16	Kraljevo
17	Lazarevac
18	Loznica
19	Uzice

The total amount of investment following the submitted applications was 645,435 $ US.

7. Preparation of "Project Files" as Required for the Revision of the National Action Plan and the Elaboration of the Pollution Reduction Programme

7.1. Compilation of Adequate "Project Files" on the Basis Of "Standardised Formats"

Project files are compiled on the basis of “Standardized format” in Part C of National Review.

7.2. Review/Revision of the Elaborated "Project Files" on National Level (after National Planning Workshop)

Most of the project files elaborated by experts engaged in preparing of National Review are adopted at the National Planning Workshop. During the National Planning Workshop especial attention was given to the several project files as its are considered as the urgent ones :

I. Structural Projects

A. Municipal “Hot Spots”

A.1. City of Belgrade (Central WWTP and WWTP “Ostružnica”)

A.2. City of Novi Sad (Left Bank WWTP)

A.3. City of Niš WWTP

A.4. City of Priština WWTP

A.5. City of Zranjanin WWTP

A.6. City of Kruševac WWTP

A.7. City of Čačak WWTP

A.8. City of Šabac WWTP

A.9. City of Leskovac WWTP

A.10. City of Zaječar WWTP

A.11. City of Bor WWTP

A.12. City of Subotica WWTP uprgading

A.13. WWTP for Mojkovac and Kolašin towns (Tara Canyon UNESCO Heritage Protecton)

B. Agricultural “Hot Spots”

B.1. Pig farm “Farmacoop”- Vrbas

B.2. Pig farm “Neoplanta” - Čenej

B.3. Pig farm “D. Marković” - Obranovac

B.4. Pig farm “Zitoradja” - Zitoradja

B.5. Pig farm “Varvarin” – Varvarin

C. Industrial "Hot Spots"

C.1. RTB "Bor-Majdanpek"

C.2. Paper Industry "FOPA" – Vladičin Han

C.3. IHP "Prahovo"

C.4. HI "Zorka" – Šabac

C.5. Paper Industry "Lepenka" – Novi Kneževac

II Non-Structural Projects

D.1. Improvement of Yugoslav Legislature (Regulations, Criteria and Standards) on Water Pollution Control an harmonization with EU one

D.2. Development of Policy, Methodology and Instruments for Financing of Water Pollution Control

D.3. Using of Irrigation Canals in Vojvodina Region for the purpose of Pollution and Nutrients Reduction

D.4. The Afforesting for reduction of diffuse pollution

D.5. The Recultivation of Ash Dump Sites

D.6. Study on floodplains and its contribution in pollution retention and remoral

D.7. Rehabilitation of Wetlands along Danube, Tisa and Sava River

D.8. Establishing of Education Center for Farm and Agricultural Waste Management

D.9. Study of Iron Gate Reservoirs

D.10. The Improvement of Water Quality Monitoring

D.11. Study on Water Quality and Pollution Reduction in Tisa River Watershed

D.12. Simulation Model of Sava River Basin

D.13. Study and Research on the Processes for Nutrients Removal

7.3. Identification of Weaknesses and Proposals for Adequate Completion

Project files for structural Projects are made on the basis of data and documents 5 to 10 years old. Its have to be innovated and completed in accordance with changes happened during the given period.

Annexes

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Definition of Adequate Investment Portfolio

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Uredba o visini naknada, načinu obračuna i plaćanja naknada zbog zagađivanja životne sredine (Government of RCG Gazette, no. 26/97).

Uredba o visini naknade za korišćenje voda, naknade za zaštitu voda i naknade za izvađeni materijal iz vodotoka u 1997. godini (Government of RS Gazette", br. 2/97);

Vučić-Mileusnić V: "Ekonomija prirodnog kapitala" - Institut ekonomskih nauka: "Ekonomija prirodnog kapitala - vrednovanje i zaštita prirodnih resursa" - Beograd 1998;

Zakon o akcizama i porezu na promet Republike Srbije ("Sl.glasnik Republike Srbije" br. 42/98);

Zakon o bankama i drugim finansijskim organizacijama ("Sl.list SRJ" br. 32/93, 61/95);

Zakon o porezu na dobit korporacija Republike Srbije ("Sl.glasnik Republike Srbije" br. 42/98);

Zakon o porezu na dohodak građana Republike Srbije ("Sl.glasnik Republike Srbije" br. 42/98);

Zakon o porezu na imovinu Republike Srbije ("Sl.glasnik Republike Srbije" br. 42/98);

Zakon o svojinskoj transformaciji ("Sl.glasnik Republike Srbije" br. 32/97).

Zakon o teritorijalnoj organizaciji Republike Srbije i lokalnoj samoupravi ("Sl.glasnik Republike Srbije" br. 47/91, 79/92 i 82/92);

Završni račun Budžeta Republike Srbije - 1995, 1996 i 1997;

Završni račun JVP "Srbijavode" za 1997. godinu

Definition of Adequate Investment Portfolio

Table AD-4-1 Actual investment portfolio (Exchange rate $US 1 = 10 YUD)

Type/Name of Project or Program	Total Capital Requirements	Funding Period	National Funding Sources											International Funding		
			Equity	Environmental Fund	Water Management Fund	Public Loans			Public Grants			Comm. Bank Loans	Others	Organi-sations	Grant	Loan
						Central Budget	Regional Budget	Local Budget	Central Budget	Regional Budget	Local Budget					
1. Projekat sistema za tretman otpadnih voda za grad Beograd	2.730.000.000 YUD 273,000,000 UDS	(3 years)	-	1.090.400.000 YUD 109,040,000 $US	819.000.000 YUD 81,900,000 $US	-	-	-	-	778.050.000 YUD 77,805,000 $US	40.950.000 YUD 4,095,000 $US	-	-	-	-	-
2. Projekat za sistem za tretmana otpadnih voda za grad Nis	116.342.000 YUD 11,634,200 $US	(3 years)	-	46.536.800 YUD 4,653,680 $US	34.902.600 YUD 3,490,260 $US	-	-	-	-	33.157.470 YUD 3,315,747 $US	1.745.130 YUD 174,513 $US	-	-	-	-	-
3. Projekat za sistem za tretman otpadnih voda za grad Novi Sad	712.100.000 YUD 71,210,000 $US	(3 years)	-	284.840.000 YUD 28,484,000 $US	213.630.000 YUD 21,363,000 $US	-	-	-	-	202.948.500 YUD 20,294,850 $US	10.681.500 YUD 1,068,150 $US	-	-	-	-	-
4. Projekat za sistem za tretman otpadnih voda za grad Krusevac	220.000.000 YUD 22,000,000 $US	(3 years)	-	88.000.000 YUD 8,800,000 $US	66.000.000 YUD 6,600,000 $US	-	-	-	-	62.700.000 YUD 6,270,000 $US	3.300.000 YUD 330,000 $US	-	-	-	-	-
5. Projekat za sistem za tretman otpadnih voda za grad Leskovac	400.000.000 YUD 40,000,000 $US	(3 years)	-	160.000.000 YUD 16,000,000 $US	120.000.000 YUD 12,000,000 $US	-	-	-	-	114.000.000 YUD 11,400,000 $US	6.000.000 YUD 600,000 $US	-	-	-	-	-
6. Projekat za sistem za tretman otpadnih voda za grad Sremsku Mitrovicu	199.908.000 YUD 19,990,800 $US	(3 years)	-	79.963.200 YUD 7,996,320 $US	59.972.400 YUD 5,997,240 $US	-	-	-	-	56.973.780 YUD 5,697,378 $US	2.998.620 YUD 299,862 $US	-	-	-	-	-
7. Projekat za sistem za tretman otpadnih voda za grad Bor	65.000.000 YUD 6,500,000 $US	(3 years)	-	26.000.000 YUD 2,600,000 $US	19.500.000 YUD 1,950,000 $US	-	-	-	-	18.500.000 YUD 1,850,000 $US	975.000 YUD 97,500 $US	-	-	-	-	-
8. Projekat za sistem za tretman otpadnih voda za grad Sabac	343.600.000 YUD 34,360,000 $US	(3 years)	-	137.440.000 YUD 13,744,000 $US	103.080.000 YUD 10,308,000 $US	-	-	-	-	97.926.000 YUD 9,792,600 $US	5.154.000 YUD 515,400 $US	-	-	-	-	-
9. Projekat uredjaja za predtretman industrijskih otpadnih voda - hemijske industrije Zorka-Sabac	24.000.000 YUD 2,400,000 $US	(3 years)	-	9.600.000 YUD 960,000 $US	7.200.000 YUD 720,000 $US	-	-	-	-	6.840.000 YUD 684,000 $US	360.000 YUD 36,000 $US	-	-	-	-	-
Total	4.810.950.000 YUD 481,095,000 $US			1.922.780.000 YUD 192,278,000 $US	1.443.285.000 YUD 144,328,500 $US					1.371.095.600 YUD 137,109,560 $US	72.164.250 YUD 7,216,425 $US					