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# ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE DEVELOPMENT IN YUGOSLAVIA

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## ABSTRACT

All problems have happened in Yugoslavia in last decade have not destroyed wishes to work, to invent and create in field of the environmental protection. This statement gives short survey of experiences in field of the environmental protection and sustainable development in Yugoslavia. The main objective is to emphasize the importance of sustainable development with its four components - economic, environmental, social and cultural. Having in mind that environmental protection is not job taker but a job maker that activity must take priority in near and further future. We wish to point very important role of international cooperation on the way of sustainable development on the Balkan.

Key words: environment, sustainable development, environmental management, international cooperation

## Introduction

Development based on irresponsible use of natural resources is unsustainable because it is detrimental to the environment. Besides human lives, a threat is posed also to the flora and fauna, and many natural ecosystems and human habitats have been degraded. The pollution of the environment has resulted in changes of a global character, such as: destruction of the stratospheric ozone layer; global climate changes; pollution of international rivers, lakes and seas; destruction of biological diversity and global destruction of forests.

A sustainable development adjusted to nature's needs and limitations, calls for a linkage between its four components economic, environmental, social and cultural, at all levels of the society in line with international cooperation.

Environmental protection has given many years now in priority activities of recent civilization together with peace, economy growth, social justice, human rights and democracy.

In the developed world priority is given to the environmental protection, since that is conducive to the improvement of living conditions and higher employment rates at a

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relatively low cost. From the modern view of point environmental protection is not job taker but a job maker.

#### Geographical Position of FR Yugoslavia and Social and Political System

The Federal Republic of Yugoslavia is dominantly Balkan country located on the central part of Balkan Peninsula. It is also Mediterranean country with about 300 km of coastal area of the Adriatic Sea, Danube Basin country with 588 km of the Danube River on its territory and Central Europe Country with its north part.

Having in mind geomorphological characteristics there are three macroregions: flatland Pannonian Plain on the North, hilly-mountainous in central part of state and Adriatic coast in Montenegro.

FR Yugoslavia consists of two republics - Serbia and Montenegro. Serbia incorporates two autonomous provinces - Vojvodina on the North and Kosovo and Metohija on the South which is under interim administration of United Nations from the middle of 1999.

Yugoslavia is parliamentary Republic. According to the Constitution of the Federal Republic of Yugoslavia, proclaimed on 27<sup>th</sup> April 1992, the Federal Parliament consists of the Chamber of Citizens and Chamber of Republics. The Federal Parliament is responsible for adoption of federal laws including ratification of international conventions and agreements.

#### *A Short Historical Review*<sup>(6)</sup>

From the seventh century, the Slavic peoples began to establish their first States in the territory of today's Serbia (Raška) and Montenegro (Duklja, Zeta). At the beginning of the ninth century, Raška and Zeta in turn represented two centers of the early-feudal state. Full unity and Stefan Nemanja achieved independence of the Serbian State by the end of the twelfth century with the capital in Raška. Under the Nemanjić dynasty the Serbian State became territorially and militarily the biggest power in the Balkan region, and its ruler Dušan was crowned the Emperor of Serbs and Greeks in 1346. The empire spread from the Danube to the Aegean and Black Seas.

At the end of the fourteenth century, the empire fell apart following the attacks by the Ottoman Turks and the Serbian population moved towards north and west.

After the struggle, which lasted several centuries, Serbia and Montenegro liberated themselves from the Turkish rule and at the Berlin Congress in 1878 they were constituted as the 32<sup>nd</sup> and 33<sup>rd</sup> independent states in the world. The states of the Balkan alliance - Serbia, Bulgaria, Montenegro and Greece defeated Turkey in the Balkan Wars in 1912 and 1913 and expelled it from almost the whole Balkan region.

The assassination of the Austrian heir to the throne in 1914 in Sarajevo served to the Austro-Hungarian monarchy as a pretext for declaring war against Serbia. Thus broke out World War I. After the collapse of the Austro-Hungarian Empire the Slavic peoples, who lived in the region of the Habsburg monarchy, established the State of Slovenes, Croats and Serbs in that territory, which united on 1 December 1918 with Serbia and Montenegro into one state with the name The Kingdom of Serbs, Croats and Slovenes. The Kingdom of Serbs, Croats and Slovenes, inheriting the international-legal personality from the Kingdom of Serbia and the Kingdom of Montenegro, continued the membership in international organizations as well as in all international treaties which Serbia and Montenegro had acceded to.

In 1929, the Kingdom of Serbs, Croats and Slovenes changed its name and become the Kingdom of Yugoslavia.

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At the beginning of World War II, in March 1941, due to demonstrations in Belgrade in which people refused to join the tripartite treaty, the Axis powers bombed Belgrade and occupied Yugoslavia from 1941 to 1945.

After World War II, the Yugoslav state continued at first with the name the Democratic Federal Yugoslavia - DFY, then Federal People's Republic of Yugoslavia - FPRY, and then the Socialist Federal Republic of Yugoslavia - SFRY. The SFRY had six republics: Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro and Macedonia. Serbia incorporates two autonomous provinces: Vojvodina and Kosovo and Metohija.

On 27 April 1992, after secession by other former Yugoslav Republics, Serbia and Montenegro decided to remain in the Federal Republic of Yugoslavia. The FRY consists of two republics - Serbia and Montenegro. Serbia incorporates two autonomous provinces Vojvodina to the north and Kosovo and Metohija to the South.

On June 10, 1999, after two and half months of the NATO bombing, the UN Security Council adopted Resolution 1244 which provides for the establishment of the interim administration for Kosovo with recognition of FR of Yugoslavia is sovereignty and territorial integrity. Currently, the territory of Kosovo and Metohija is under the civil authority of the UN Interim Administration Mission in Kosovo (UNMIK) and under the military authority of the Kosovo Force (KFOR).

### *Institutional and Organizational Frame*

#### **Legislation relating to the Environment**

Environmental protection has been regulated so far by a large number of federal, republic and municipal regulations, making these matters not sufficiently harmonized, inexplicit and inconsistent. The approach to the regulation of environmental protection has resulted in partial solutions and lack of coordination in this area. The system of legislation in the field of protection of the environment in Yugoslavia comprises a large number of laws and regulations enacted on all levels. Main postulates are given in Constitution of the Federal Republic of Yugoslavia. On the Constitution base Federal Parliament adopted in 1998 the Federal Law on the Principles of Protecting the Environment.

Two resolutions have been adopted on federal level: Resolution on the Policy of Protecting the Environment in the FR of Yugoslavia and Resolution on the Policy of Preserving Biodiversity in the FR of Yugoslavia.

Besides that, Yugoslavia has ratified 61 international conventions and thus undertaken to perform the duties set out in them in connection with the environment.

In Serbia, the Environmental Protection Law from 1991 regulates the following matters: measures of protection in planning and construction, protection of the air, water, soil, forests and natural goods, noise, ionizing radiation and hazardous waste control, environmental impact assessment, financing of protection and inspection. In Montenegro Environmental Law from 1996 is mostly similar.

There are laws and regulations on the federal and/or republic level which regulated some parts of the environmental protection such as: waste and dangerous materials; nature protection; health and quality of food products; land, soil and forests; flora and fauna; hunting and fishery; land use management and construction; dangerous and radioactive materials and ionizing radiation; natural and other disasters; taxes, compensations; organizational regulation; delicts; other regulation.

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### **Decision-making Competences**

Despite the many laws and regulations, the environment is not treated satisfactorily in Yugoslavia. The provisions of existing laws are not sufficiently harmonized either horizontally (between sectors) or vertically (from municipality, regions, republics to federal level). Further, the competences of the federal and republic authorities coincide and overlap in this area. What is also lacking is a consistent approach to environmental protection on a national level. The legislation is not rounded off in this area, so that there are no provisions that would allow the federal government to take greater action in extraordinary circumstances towards eliminating or at least lessening the consequences of such circumstances. There are legal gaps in the regulation of the protection of some parts of the environment, which should be otherwise regulated uniformly. The adjustment of federal laws to the Yugoslav Constitution calls for federal supervision and qualified personnel (inspectors), as well as additional funds.

### **The Economy and Environment**

The economic instruments of environmental protection are just budding. The existing laws and regulations are of a restrictive character mostly and cannot be regarded as economic instruments. The whole system rests on principles that are inconsistent with a free-market economy.

The economic mechanisms in the field of protection and improvement of the environment relate to the following: compensation for the use of natural resources, taxes, insurance, premiums, voluntary contributions, credits and other economic forms of fostering the protection or limiting the degradation of the environment.

The sole comprehensive attempt at creating an effective system of financing the environmental protection in the FR of Yugoslavia was the adoption of the Environmental Protection Law in Serbia. However, although this law clearly specifies the sources of financing the environmental protection, such a system has not been established even few years after the adoption of that law. Instead of direct allocation to a special account for environmental protection purposes, funds are credited to the Budget of the Republic of Serbia, from which they are distributed for certain purposes. This method is contrary to what is being done in developed countries, where the financial resources going towards environmental protection are credited to fully independent special environmental funds.

### **Science, education and Information Technology in Field of Environmental Protection**

Science and technology have been used for a long time in Yugoslavia as a means of achieving a high economic growth rate, largely disregarding in the process the efficiency and economy of production and protection of natural resources and the environment. Some of the existing equipment and products are not up to the environmental protection requirements. The developers are motivated for the improvement of equipment, products and services and scientific and technological innovations for the environmental protection purposes. The information technology basis for intensive use of scientific, technological and business information in the protection of the environment has not been sufficiently developed yet.

The Plant Gene Bank of Yugoslavia has been founded as a federal institution for the purpose of improvement of the raw material base in Yugoslavia. Its purpose will be the

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collection, classification, characterization and evaluation of plant genetic resources of Yugoslavia and exchanging with related foreign institutions.

Despite the considerable efforts made in the field of environmental protection, education is not adequately organized and program directed. The training of staff for integral protection and improvement of the environment is also insufficient.

In the field of dissemination of information about and popularization of protection of the environment, activities were aimed at exhibitions in the country and abroad, contacts with representatives of the media, ecological movements, non governmental organizations, sponsoring certain periodicals and other publications, staging conferences, etc.

There is no integral national information system for the environment, regardless of certain activities, and its establishment is imperative for the implementation of a successful environmental protection policy.

Further, neither is the national statistical methodology adjusted to the collection of data relevant to this field, so that there is no information about the contribution made by the industries and population towards environmental protection.

The utilization of foreign information systems, data banks and commercial on-line information services, has been suspended since the middle of 1992. This doesn't apply to the utilization of the INFOTERRA international information system for the environment and access to certain on-line information services (Internet etc.) through the scientific institutions or on personal base.

### **International Cooperation in the Field of Environmental Protection**

Besides peace, economic growth, social justice and democracy, also the protection and improvement of the environment have been one of the international community's priorities for quite a number of years now.

Since the environmental problems recognize no state boundaries, international cooperation in the field of environmental protection is growing from one day to another, in terms of importance and intensity alike.

For the purpose of resolving the accumulated environmental problems, people have organized themselves on all levels. In the United Nations framework, the problems relating to the protection and improvement of the environment are dealt with by its organs and institutions, as well as by other organizations that are associated with United Nations.

### **Regional and bilateral cooperation is also practiced increasingly in the field of environmental protection**

Particular attention is paid to protection of the environment by many international organizations and institutions in the scope of scientific and technological cooperation and international trade. Also major international financial institutions are showing interest in this area.

Official cooperation in field of environmental protection on government level has been suspended since the middle of 1992 until beginning of 2001. Even so, contacts have been maintained on expert level and cooperation has been going on with non-governmental organizations. In view of the fact that the Yugoslavia was highly active in the field of environmental protection it would be reasonable to expect that this area will continue to be an important element working in favour of country's integration into the international trends.

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## State of the Environment in Yugoslavia

State of the environment has been monitored in Yugoslavia for many years now. Monitoring methods of the environment are not fully harmonized but it is possible to assess the state of the environment and compare it with other regions on the Balkan and Europe or other parts of the Earth Planet as a whole.

The development of Yugoslavia was accompanied with environmental pollution, but generally looking the environment until NATO bombing in 1999 was less degraded than in the countries of Western, Central and Eastern Europe.

NATO bombing of the Federal Republic of Yugoslavia from March 24 to June 10, 1999, caused humanitarian, economic, health as well as environmental catastrophe. NATO bombing heavily degraded the environment with immediately regionally and long terms locally consequences. Without sanitation and clean up activities broad territory should be contaminated.

Having in mind that financial resources of the Federal Republic of Yugoslavia are limited it is clear that environmental protection is not possible without international support.

### *Demographic Development and Urbanization*

Population of the Federal Republic of Yugoslavia estimates about 10,5 million in 1999. Having in mind that Yugoslavia covers territory of 102,173 sq. km it means that there are 96 inhabitants per 1 sq. km. The average natural growth of population has been decreasing since the fifties continuously. It can be seen that the share of the economically active population in the total one is decreasing (from 44.7% in 1981 to 43.9% in 1991). The emigration of university-educated people and scientists is producing a negative impact on development as a whole and also on environmental protection.

Chief demographic movements in Yugoslavia are characterized by migrations (frequent and unbridled) resulting from large-scale urbanization and industrialization. The consequence of that was an excessive concentration of population in urban areas and depopulation in other regions, causing disproportion of regional development in the country.

Because of the mentioned changes, rise was given to changes in the distribution of the population living in towns and other settlements. However, people are abandoning agriculture as an economic activity at a higher rate than at which they are moving into towns (Table 1).

**Table 1 Shares of agricultural and urban populations in the total population (%)**

	1971	1981	1991
Agricultural population	37,6	22,7	16,7
Urban population	34,7	44,6	51,2

Villages are being depopulated, the number of mixed households is increasing and an urban-rural continuum is seen around towns and along lines of communication.

The uneven distribution of settlements results from their being grouped around major towns along the rivers Sava, Danube and Morava, and on the Adriatic Coast. The population of major towns is continuing to grow, in consequence of which the population of smaller settlements is stagnating or diminishing.

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Such an unfavourable spatial distribution of economic activities and population is causing the living conditions to deteriorate in urban settlements and underdeveloped regions alike. The wars in Yugoslavia's near neighbourhood caused many people to seek refuge in the FR of Yugoslavia. From mid-1991, the number of refugees kept growing continuously, so that there are about 700.000 of them in Yugoslavia at present. From mid-1999 there are more than 300.000 internally displaced people from Kosovo and Metohija.

### *Economic Development*

The first half of the nineties was very difficult for economy of FR Yugoslavia. The international community faced the country with enormous difficulties resulting from disintegration of the former Yugoslavia, war in its near neighbourhood and the blockade imposed. An additional limitation was posed by the fact that these very adverse economic conditions emerged after 10 years of diminishing economic activity.

Domestic output decreased dramatically because of the loss of foreign markets, discontinued current and capital transactions with foreign parties and decreased domestic market.

Enormous difficulties in all areas of economic and social development culminated during 79 days of NATO bombing on Yugoslavia in mid-1999. First assessment shows that material damages exceeded one hundred billion US dollars. Destruction of economic and infrastructure facilities resulting in a negative growth rate of -23,2 % and a decline in per capita national income to 1.338 US \$ from 1.742 in 1998 and unemployment rate of 24,6%.

Having in mind that economic development has direct impact on the environment it is following short review of the main economic activities.

### **Agriculture**

The agricultural land and its quality make Yugoslavia a country with substantial agricultural potentialities. According to the data for 1997, the agricultural land of the FR of Yugoslavia totalled 6.217 thous. hectares, of which 4.839 thous. hectares were accounted for by cultivable area (arable fields and gardens 3.696 thous. ha, orchards 266 thous. ha, vineyards 85 thous. ha, meadows 792 thous. ha, pastures 1.342 thous. ha, and ponds, reed fields and fish farms 36 thous. ha).

The best soils (first class without or with slight limitations for intensive crop farming) spread on an area of more than a million hectares, while the soils in more than 5.3 million hectares of land are suitable for the grasses and forests.

### **Forestry**

Forestland spreads on altogether 3 337 700 hectares in Yugoslavia, while 2 858 000 hectares are actually under forests. The forests cover about 28 percent of the total territory of Yugoslavia (the average for Europe is 29 percent) and area under timber is 0.27 ha per inhabitant (14th in Europe).

The relative area under timber in the Federal Republic of Yugoslavia varies greatly, being the highest in the hilly and mountainous regions and in the coastal belt of the Montenegrin coast. Pure stands of deciduous species are the most represented.

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The total volume of wood has been estimated at 306.688.700 cu.m, of which 64 percent are in socially owned forests and 36 percent in the private sector ones.

The annual wood volume increment in the forests is 7.619.000 cu.m. In view of the annual cut which amounts to 3.426.000 cu.m or 45 percent of the annual volume increment, it can be concluded that the growing stock is managed properly.

### **Water Management**

Yugoslavia is relatively poor in water, particularly with regard to the water formed in its own territory because about 84% of the available water comes from Yugoslavia's neighbouring countries. In addition, because of the uneven spatial and temporal (annual and seasonal) distribution of rainfall and outflow, as well as the fact that the distribution of water resources is in inverse proportion to demand in water, the water management situation is a very unfavourable one.

The average annual quantity of available surface water (local and transit) in Yugoslavia is about 1.500 cu.m per inhabitant, which is insufficient because a region is considered to have enough local water if the annual availability is 3.000 cu.m per inhabitant. The yearly groundwater reserves total about 244 cu.m per inhabitant.

There are also about 500 registered mineral and thermo-mineral water springs, while the number of unregistered ones is much bigger. The importance of these springs is growing because the water yielded by them is being increasingly used for medical and recreational purposes and in agriculture (warm waters).

Yugoslavia has various natural lakes. Because of their attractiveness and abundant flora and fauna, some of them are under state protection.

Among the artificial lakes prevail the river water storages for electric power generation and water supply. The hydroelectric potential is utilized at the rate of 60 %.

The waters and watercourses are used for electric power generation, navigation, supplying settlements, industries and mines with water, irrigation, fish farming and recreation.

Industries and mines are the biggest consumers of water (more than 90 percent of the total quantity of water caught), whereas only 3–4 percent is reused several times, although conditions exist for this percentage to be higher.

Settlements are supplied with treated groundwater mostly (70% of the needs), although also the surface waters are being increasingly used for such purposes, with the construction of water storages.

In view of the area of land under cultivation and available resources, the quantity of water used for irrigation is a small one. The area of irrigated land amounts to only 4 % of the total area of land under cultivation.

### **Industry**

The industrial output kept decreasing sharply in the 1991–1993 period in almost all segments, as the result of the country's political and economic circumstances. In 1994, it was on the same level as in 1993 and grows up until NATO bombing in 1999. The same also applies to the social product, labour productivity and investment in the industrial sector.

Many negative impacts of industrial development on the environment so far resulted from rapid industrialization. The heaviest impacts were produced by the following: import of the so-called "dirty" technologies from developed countries; poor technological discipline; low



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waste utilization rate; inadequate implementation of the policy geared to the fostering of the technologies which are acceptable to the environment (alternative energy sources, the so-called "soft" technologies, low waste or waste-free processes, etc.), all in the scope of a tenable development; insufficient share of research and innovation in the environmental protection effort; inadequate personnel training in the highly polluting branches of the industry (power generation, metallurgy, chemicals, etc.); and non-existence of a sustainable environmental policy in the industrial sector.

The major polluters of the environment are industrial facilities, boiler plants, heating fuels, manufacturing plants, iron & steel plants, cement plants and chemical plants. Each of them emits also the pollutants typical of it.

The main polluters of water are the wastewater generated in mines and manufacturing industries, i.e., chemical and petrochemical, ferrous and non-ferrous, paper and pulp, food and textile industries.

Land is threatened by industrial sources directly, by occupation of area, dumping of raw material and dirt, etc., and indirectly, by polluted air or water.

### **Energy Supply**

The generation, processing and consumption of all kinds of energy are the activities which contribute the most to degradation of the environment. The air pollution by sulphur dioxide, nitrogen oxides, carbon monoxide, carbon dioxide and various particles results largely from the use of poor quality fuels and poor or inadequate maintenance of the emission-control equipment. It has been estimated that thermal power stations and home heating facilities account for about 40 percent of the air pollution.

In their operation, thermal power stations generate 6–8 million tones of ashes a year. These stations also pollute the water by emitting waste substances and cause problems relating to the storage of solid and hazardous waste, emit carbon oxides in a considerable quantity, etc. The open-pit mines now spread on more than 11.000 ha, of which about 2.000 (18%) have been recultivated.

The construction of hydroelectric power stations causes physical and biological changes in rivers (affecting flow velocity, erosive characteristics, temperature and quality of water, oxygen content, groundwater regime, etc.).

Measures for limiting the emission of sulphur dioxide have not been applied in the thermal power stations so far. It should be necessary in the future to estimate the effect on the environment of each power station and install appropriate equipment for desulphurization and in some cases, also for denitrification.

The best recommendation for the purpose of complying with international codes of practices in the field of power generation is to be up to the standards for sulphur dioxide, nitrogen oxides, particles, carbon dioxide, lead, ozone and methane-free hydrocarbons.

### **Transport**

Because of its favourable geographical position, all kinds of transport are practiced in Yugoslavia. In 1998, the length of roads in Yugoslavia totalled 50.497 km, and that of railways 4.069 km, of which 1.384 km are electrified. The length of the international waterway in the Yugoslav part of the Adriatic Sea is 122 km, and the ports of Bar, Budva, Kotor and Herceg Novi are ports for international transport. The inland waterways consisting of rivers and canals total 1.419 km in length. There are five airports for public transport and 24 airfields for sporting and other purposes.

The transport system causes changes to the environment in more than one way. The means of transport emit a large quantity of pollutants into the atmosphere. The construction of roads, railways and ancillary facilities causes the natural hydraulic water regime to change and takes large areas of land. The dumping of waste (metals, plastics, used oil) by those involved in transport poses a complex problem which is affecting the environment in more than one way. Means of transport are big generators of noise, especially in settlements, and of vibrations which cause damage to the surrounding ground. The transport of hazardous materials also constitutes a hazard to the environment. The construction of roads and railways spoils the landscape and ecological equilibrium. They often go across fertile land and through forests.

## **Main Environmental Problems and Environmental Management in Yugoslavia**

### *Air Pollution*

The quality of air is checked by monitoring the emission of sulphur dioxide and nitrogen oxides, as well as by systematic monitoring of the concentration of polluting substances.

The rate of emission of pollutants into the atmosphere is quite high; despite the country's relatively low attained development level. This is so because of irrational use of energy, incompetent system management, low efficiency of devices and their short service life (Table 2).

**Table 2 Anthropogenic SO<sub>x</sub> and NO<sub>x</sub> emissions (thousands of tons per year)**

	1980	1985	1990	1995	1996	1997	1998
Sox	406	478	508	462	434	522	521
Nox	47	58	66	59	57	66	66

\* This balance sheet has been prepared for stationary sources only  
Source: Federal Hydrometeorological Office.

The sources of air pollution are thermal power stations, district heating stations, boiler plants, home heating appliances, motor vehicles and industrial plants and installations. Greatest contribution was made by the power generation and transport sectors.

Systematic monitoring of the concentration of polluting substances applies to the following: sulphur dioxide, nitrogen oxides, carbon monoxide, suspended particles, precipitated substances, ground level ozone, specific pollutants: hydrocarbons, heavy metals, hydrogen sulphide, hydrogen chloride, hydrogen fluoride, etc., specific pollution of industrial origin and motor vehicle exhaust gasses.

Analyses show that with regard to chief pollutants, the quality of air is up to set standards, except in industrial centres. As for specific polluting substances, as well as heavy metals in the air in settlements, there have been cases in which the minimum concentrations were exceeded.

### *Water Pollution*

The quality of water in Yugoslavia is unsatisfactory, partly because of the polluted water flowing into the country and partly because of domestic improper water management and modest of waters in some parts.

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The quality of surface waters and groundwater is checked by hydrometeorological institutions (monitoring of hydrological, physical, chemical, biological and bacteriological characteristics of water) and health care institutions (checking the hygienic state of drinking water). Appraisals of the quality of water resources of Yugoslavia are made on the basis of testing the waters of importance for the country.

The quality of water in most rivers usually is Class II, whereas Class III prevails now. Examples of very clean water, Class I and I/II, are very rare.

A systematic testing program covers the quality of water in 33 water storages. As for hazardous substances, iron, manganese and six-valence chromium have found in a considerable concentration in the deeper layers of water in almost all water storages.

The quality of spring water is tested once yearly in the low water level season – from May to September. A high iron and manganese content was found in almost all springs, whereas ammonia and suspended matter were found in a few cases only.

Analyses have shown that groundwater may not be used for water supply purposes without being processed beforehand, which obligatorily includes demanganization and also aeration in many parts of country. The groundwater from the alluvium around the rivers Velika Morava and Kolubara and in Posavina may not be used for water supply purposes.

### *Threat to Soil*

The biggest threat to soil in Yugoslavia is posed by the following: open-pit coal and other mines, dumps of various materials, polluted waste waters, heavy metals, radioactive substances, soil acidulation and salinization, all kinds of settlements, big sports facilities, airports, factories, roads and railways and chemicals used in excessive quantity.

The biggest portion of degraded soil is accounted for by the production and processing of non-ferrous metal, 53 percent, followed by coal mining, 40 percent. Of the total degraded area in Yugoslavia, 96 percent is in Serbia and 4 percent in Montenegro. The share of the area with degraded soil in the total area of Yugoslavia is 0.25 percent.

The soil is polluted also by uncontrolled use of fertilizers. The rate of fertilizer consumption in Yugoslavia is among the lowest in Europe, i.e., and about 100 kg/ha on average. There is a big difference in its use between the so called social and private sector. In some regions, agricultural soil is managed by excessive use of fertilizers and in other ones, by their insufficient use. The pesticide consumption rate is 6.6–23.4 kg/ha in crop growing and 22.2–107.3 kg/ha in fruit and vine growing.

### *Threat to Forests*

Forests are exposed to many harmful factors that are causing their deterioration and withering away. The most important of these factors are the following ones: poor stand conditions extreme temperatures (frost and draught), forest fires attacks by insects and polluted air. The causes of destruction of forests in Yugoslavia are similar to those in most European countries: various plant diseases, insects, forest fires, unauthorised felling, forest dieback, natural disasters, etc.

### *Threat to Fragile Ecosystems*

Many mountain, forest, fresh water and seawater ecosystems in Yugoslavia are characterized by fragility, authenticity and high irreversibility. The main types of ecosystem

fragility are as follows: systems of inland water habitats (ecosystems); "insular" land ecosystems (unique, rare, peculiar isolated); land naturally unstable ecosystems influenced by natural and induced successions (sandy land, mountain steppes, etc.); forest climatogenic ecosystems; underground ecosystems; and sea littoral ecosystems. Modern science and the environmental protection doctrine attach great importance to the fragile ecosystems, since because of their low resistivity, they suffer big and often irreversible alterations in consequence of negative anthropogenic actions. Economic development trends indicate that the pressure on fragile ecosystems will continue to grow. Thus, in view of that and because they invariably make up the vital frame for a high biodiversity, special attention should be paid to fragile ecosystems.

### *Threat to Protected Natural Heritage*

Many valuable natural sites and species in Yugoslavia have been protected (Table 3).

**Table 3 Protected Natural Objects**

	Yugoslavia	Montenegro	Serbia
Internationally protected areas	7	4	3
National parks	9	4	5
Regional parks	16	–	16
Splendid areas	26	4	22
Reservations of nature	89	7	82
Nature monuments	307	51	256
Nature rarities			
Protected animal species		314	427
Protected plant species		52	251

Source: Nature protection offices and ministries of Serbia and Montenegro and

The following are included in the UNESCO World Natural Heritage List: Durmitor National Park with a part of the Tara Canyon, Kotor and Risan Bay, and the River Tara Basin entered in the network of world's biosphere reservations.

Four localities, Skadarsko Jezero, Obedska Bara, Ludosko Jezero, Carska Bara - Stari Begej (swamps), have been registered as localities of international importance pursuant to the Ramsar "Convention on Swamps of International Importance, Particularly as Swamp Bird Habitats".

The flora and fauna of many areas under protection is threatened in consequence of irrational use of natural and biological resources. More than 1.600 species of international importance live in the FR Yugoslavia.

National parks in Yugoslavia are mountains Fruska Gora, Biogradska Gora, Durmitor, Lovcen, Tara, Kopaonik, Sara and lakes Skadar and Djerdap. They total about 250.225 ha in area.

### *Threat to Protected Cultural Monuments*

As an area in which various cultures and religions mixed in the past, Yugoslavia abounds in very valuable cultural monuments dating back to various periods – from the prehistoric, Greek, Roman, Byzantine and early Christian periods to Renaissance and Baroque in which

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the medieval architecture was at its peak. Some of the most valuable buildings (Stari Ras with Sopocani, Studenica Monastery Complex, Kotor old town core) are on the List of Cultural Heritage. Because of the disastrous earthquake in 1979, Kotor is included also in the List of Threatened World Heritage.

According to the Spatial Plan of Serbia, of the 2 075 immovable goods protected under law, 779 have been categorized, including 197 as goods of exceptional importance (Category I) and 582 of great importance (Category II).

As for Montenegro, according to the information supplied by that republic's Institute for the Protection of Cultural Monuments, there were 369 protected immovable cultural monuments there in 1994. There were 37 Category I monuments, 37 Category II ones and 201 Category III ones.

In Montenegro, there are 14 old towns and fortresses, 42 archeological monuments, 18 fortifications, 195 monuments of sacral architecture and 75 of profane architecture, in addition to 12 memorials and 12 monuments of traditional architecture. In Serbia, there are 680 cultural monuments, 23 spatial cultural and historical entities, 43 archeological finds and 33 categorized historical sights.

The unsuitable distribution of industrial and tourist facilities, roads and railways, and the non-controlled development of towns and other settlements, have posed a great threat to historical entities, landscape areas and buildings.

### *Solid Waste*

Solid waste includes waste from households, industries and public buildings (with the exception of hospital waste), street waste and some kinds of industrial waste, which are not hazardous (ashes and other non-toxic industrial waste). The quantity of waste in towns is 0.4–1.5 kg/inhabitant/day and in Yugoslavia as a whole 0.6 kg/inhabitant/day.

Based on the production and consumption of raw materials, it has been estimated that power stations turn out yearly about eight million tones of ashes and more than 900.000 tones of low-toxicity industrial waste.

In consequence of the sanctions imposed on to Yugoslavia, the risk of chemical accidents has increased because of the inadequate conservation of the non-operating plants, lack of funds and spares for refitting and the risk of stoppage or non-controlled operation.

Municipal waste also contains hazardous materials that are disposed of without control (storage batteries, pesticides, film developers, household chemicals, solvents, paints and other coatings, etc.).

About 50 percent of the total quantity of waste in Yugoslavia is disposed of in an organized manner (about 90% in Belgrade). Municipal waste is disposed of in an inadequate manner, which boils down to dumping in open dumps. Many of the dumps in Yugoslavia are topped with layers of soil.

The waste dumps are not provided with systems for the protection of groundwater from pollution and for degassing, they are without enough chemicals for sanitary neutralization of waste, water and electricity, as well as without other means of protection (against fire, etc.). Most public utility enterprises don't have suitable motor vehicles, so that solid waste tends to fall out of them, forming waste deposits on and around roads (the main cause of the frequent blockage of sewers) and rivers.

Attention is paid to the utilization of waste as an important internal reserve for supplying the industries with secondary raw materials. The methods of collecting, treating and

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processing waste iron & steel and paper are technologically more advanced than those relating to the other waste (glass, plastics, rubber, textile, etc.).

### *Hazardous Waste*

Dangerous waste can be explosive, flammable, self-igniting, oxidizing, poisonous, corrosive, toxic, ecotoxic, etc.

An inventory of hazardous material has been made for Yugoslavia and it was found that more than 200.000 tones of hazardous waste are generated every year (mixtures of waste oil and water and hydrocarbons and water, and emulsions; waste mineral oils; waste from the surface treatment of metals, plastics, paper, wood and leather; waste generated in the production and use of solvents, inks, dyes, pigments, paints, varnishes, resins, latex, and glues; residual waste from the refining, distillation and other pyrolytic processes; waste from medical establishments; waste resulting from the use of pesticides and cyanide-containing substances; explosive waste which is not covered by other regulations; pharmaceutical waste, etc.

According to composition, the highest output is in the hazardous waste containing oils and emulsions (more than 140.000 tones a year). According to the state of aggregation, the highest output is in liquid hazardous waste (about 170.000 tones a year).

The annual output is as follows: about 80.000 tones of ecotoxic substances, 70.000 tones of flammable liquids, 50.000 tones of toxic materials causing acute poisoning, 15.000 tones of corrosive substances, etc.

Many enterprises dump their hazardous waste on the existing municipal dumps, while others keep them on their own grounds in improper storage facilities or those kept under control. Some of them have recycling treatment.

### *Hazardous Substances and Chemical Accidents*

Before the sanctions were introduced, the quantity of hazardous substances generated in Yugoslavia was estimated at about 8 million tones a year. There are more than 800.000 tones of hazardous substances in installations and storage facilities every day.

The following localities have been identified as possible venues of industrial accidents of concern to the whole country, which could affect also areas outside Yugoslavia: Subotica (Zorka-Holding – fertilizers, inorganic acids, Azotara – nitrogen-containing and complex fertilizers), Pancevo (Refinery – oil products, HIP Azotara – fertilizers, HIP Petrohemija – petrochemicals and chlorine), Belgrade (Prva iskra, Baric – primary chemicals), Sabac (HI Zorka – fertilizers, PVC, pesticides), Prahovo (IHP Prahovo – fertilizers, inorganic salts) and Bar (Port of Bar – chemical and petrochemical storage facilities). NATO had bombed some of the named facilities during aggression in 1999.

### *Storage and Processing of Radioactive Waste*

Radioactive waste is generated in Yugoslavia by two research nuclear generators, isotope producing laboratories, several research laboratories which are using radioisotopes and nuclear medicine establishments, as well as in the dismantling of enclosed industrial or medical radioactive sources, dismantling of radioactive sources in the environment, etc.

The radioactive material generated by the nuclear reactors in the Vinca Nuclear Science Institute, as well as the radioactive waste resulting from the application of radioisotopes for

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industrial, medical and research purposes outside Vinca, are temporarily stored on the Vinca Institute's grounds. They are stored in such a way that they don't pose a threat to the population and environment, and up to the non-accident storage requirements. From the aspect of protection of the population against radiation, the safety parameters for the storage of radioactive waste are as required by regulations.

### *Ionizing and Non-ionizing Radiation*

Radioactivity in the environment is systematically tested on various samples (air, precipitation, soil, plants, river and drinking water, and food). Hydrometeorological stations (11-altogether) meter radioactivity and precipitation daily. The Dr D.Karajovic Occupational Medicine and Radiological Protection Institute of Belgrade continuously meters the absorbed doses of gamma radiation in the air at quite a number of metering points. The Vinca Nuclear Science Institute also meters radiation at three metering points.

In view of Yugoslavia's geographical position, particular importance is attached to the problem relating to protection from ionizing radiation resulting from the construction of nuclear power stations in the Danube watershed. In 1986, there were 39 nuclear reactors for power generation in Yugoslavia's neighbourhood.

### *Noise*

The sources of noise are means of transport (they account for more than 80% of total noise), certain plants and building machines, lifts, fans, etc., as well as changed purpose of buildings (residential into workshops or catering facilities), and the like. The problem of noise is mostly of a local character, so that settlements and residential areas in the vicinity of airports, roads and railways and industrial zones are affected by it the most.

### *Health of the Population*

The most serious health problem relates to the presence of antibiotics in the food that children most frequently eat (eggs, milk, chocolate, meat), which is resulting in increasing resistance of bacteria to some antibiotics. Besides that, children are becoming increasingly sensitive to the antibiotics they have never been taking before.

The presence of pesticides and heavy metals in quantities greater than permitted was registered in a small number of food samples, but it should be borne in mind that heavy metals are cumulative, so that in the long-run, they can be detrimental to the health of the population.

The incidence of bronchial asthma has increased because of the pollutants in the air. The incidence of malignant diseases has also increased. Although genetic factors and state of the immune defense system play an important role in the genesis of malignant diseases, the presence of and exposure to cancerogenic substances in the environment are regarded as key reasons for the increasing incidence of these diseases.

## **Global Problems of the Environment**

Environmental pollution has also resulted in changes of a global character. In Yugoslavia particular importance have been given to depletion of the stratospheric ozone layer;

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climatic changes; reduction of trans-border air pollution: protection of international rivers, lakes and sea; and protection of biodiversity.

### *Depletion of the Stratospheric Ozone Layer*

In view of the effect of intensified ultra violet radiation on the health of people and on the flora and fauna and in wishing to prevent the ozone layer to be destroyed further, the international community adopted the Vienna Convention on the Protection of the Ozone Layer in 1985, and in 1987, it adopted the Montreal Protocol on Substances Deleterious to the Ozone Layer, which was amended few times for the purpose of shortening the time limit for the full utilization of certain substances.

The FR of Yugoslavia ranks among the developing countries whose estimated yearly consumption of controlled substances is less than 0.3 kg per capita, meeting thus the requirements for the utilization of funds from the Global Environmental Facility (GEF) which was established by developed countries with a view to helping the developing countries to lessen the financial burden resulting from changing to the technologies which do not cause damage to the ozone layer.

### *Climatic Changes*

The global heating up of the atmosphere over the last 135 years has resulted in an increase of the global air temperature. Extreme climatic anomalies and meteorological phenomena whose destructive effect caused huge damage in many parts of the world characterized the last decades. The long, hot summers in Europe in last few years resulted in forest fires and it caused enormous damage to agricultural production. The importance and effect of weather and climate are best illustrated by the damaged caused to Yugoslavia's economy by them, particularly by climatic extremes such as draughts, frosts, floods, hailstorms, forest fires, etc.

### *Trans-border Air Pollution*

The emission of sulphur dioxide and nitrogen oxides has been decreasing in the West European countries that have signed the Protocol on the Reduction of Sulphur Dioxide and Nitrogen Oxide Emission. Thanks to this decrease, the deposition of these pollutants is decreasing in Yugoslavia, too. Investigations show that "imports" in pollutants, sulphur dioxide in particular, are continuing to show a tendency to decrease, in consequence of an effective implementation of the Convention on Long-range Air Pollution and the annexes to it concerning the reduction of the emission of pollutants in West European countries. Despite reduced "importing", Yugoslavia is still "receiving" more pollutants than it is "sending", which goes for sulphur dioxide and nitrogen oxides alike.

### *Pollution of International Rivers, Lakes and Sea*

Pollution control of the international waters is regulated by the Convention on the Protection and Utilization of Trans-border Rivers and International Lakes. In view of the fact that about 84 percent of the available waters come from its neighbouring countries, it is clearly in Yugoslavia's interest to ratify the mentioned Convention as soon as possible, especially because its border lies on the biggest river (Danube), a lake (Skadar) and a sea (Adriatic).



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Tests have shown that the quality of the river Danube water varies from Class II to III, as well as IV at times. In the upper course of the Danube in Yugoslavia (Bezdan entry profile), the water is oversaturated with oxygen and its nitrogen and phosphorus contents are high in the summer months, causing an intensive organic production which is manifested in the form of an oxygen regime disruption in the Djerdap Hydroelectric Power Station water storage. Excessive concentrations of hazardous substances (mercury and nickel) are also registered from time to time at the Bezdan profile. Accumulation of the hazardous substances in the Djerdap accumulation sediment is potential chemical risk.

The quality of the river Tisa water corresponds to Class III and IV (Class II prescribed). It has a risen content of organic matter, particularly ammoniacal nitrogen and phosphorus. At the entry profile (Martonos), the concentration of hazardous substances (lead and zinc in particular) exceeds the maximum permissible one. Hungarian sources show that the concentration of heavy metals in the Hungarian part of the Tisa is a high one.

As it is known, during the night January 30/31, 2000 the dam of flotation dump site in the gold mine "Aurul" near Baia Mare in Romania was broken. According to official Romanian data, about 100.000 m<sup>3</sup> of muddy water containing cyanide, heavy metals and other pollutants, spilled to the stream Lupus, then reached rivers Somes, Tisza and finally, Danube. The consequence of that heavy accident was the largest fresh water environmental catastrophe in Central and Eastern Europe so far. It caused the havoc in the rivers Lupus, Somes and Tisza, as well as the serious destruction of aquatic life in the Danube River.

The Adriatic Sea and its littoral are threatened by pollutants originating from the many settlements situated on the shoreline itself, tourist facilities, factories, shipyards, ports, crude oil and oil-product storage facilities, means of transport, hospitals, etc. Preliminary investigations have shown that the water, sediments and living organisms of the Adriatic Sea are polluted by almost all pollutants resulting from human activity, whose quantity varies from traces to considerable concentrations, depending on the season, locality, organism and sediment type.

## **Protection of Biodiversity**

*Yugoslavia's biodiversity is one of the biggest in Europe.*

Yugoslavia is one of the most important centres of plant diversity in Europe. Researches have covered 4 282 species and subspecies of flora. According to the number of species in the whole territory (no. of species/ sq. km), Montenegro tops the European list, Yugoslavia as a whole is third and Serbia is fourth. The higher species of flora in Yugoslavia, of which there are almost 4 850, account for 1.7 percent of the total number of such flora species in the world. This percentage is not a negligible one in view of the fact that the area of Yugoslavia is only 0.035 percent of the total area of land in the world. The fact that Yugoslavia accounts for almost 2 percent of the total number of higher flora species in the world makes it a country abundant in flora. The fauna of Yugoslavia (excluding some groups of invertebrates) includes about 15.000 species. The Adriatic Sea fauna has not been investigated fully yet, but according to available data, about 2.300 species live in it.

Besides being abundant in wild growing plants and wild animals, Yugoslavia also has a large number of autochthonous cultivated populations of plants and domestic animals, obtained through centuries of selection.

Since Yugoslavia is on the main routes taken by migratory birds from continental Europe to the Mediterranean and Africa, many of them, including some species of international importance, can be seen there for a good part of the year.

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The unbridled economic development, which is showing no regard for ecological equilibrium and environmental protection needs, is posing a threat to and decreasing the biological diversity. The main causes of this are as follows: changes of climate, acid rain, destruction of the ozone layer, degradation and destruction of the habitats of the various plant and animal species, air, water and soil pollution, and excessive or non-controlled exploitation of wild flora and fauna.

Non-controlled, illegal, large scale and non-selective hunting and fishing are producing a major negative anthropogenic effect on wildlife.

The collecting of living or dead plant and animal material is also a highly negative activity of a global character. The most affected are the rare, threatened and delicate species of flora and fauna. The bringing in of alien species of flora and fauna is something undesirable and conducive to a decrease of biodiversity. The changes caused to a domestic flora or fauna species by alien species are so big that a serious threat is posed to the autochthonous endemic species, if the "newcomers" are more competitive.

In the opinion of some experts, the hitherto long-lived negative anthropogenic effects on biodiversity, which are manifest in different ways, have changed the natural ecosystems in Yugoslavia to such an extent that climax ecosystems have been preserved more or less in only a small part of Yugoslavia, which is estimated at about 10 percent of its total area.

### **The Effect of Sanctions on the Environment**

In the middle of 1992, the United Nations Security Council imposed sanctions onto the Federal Republic of Yugoslavia. In view of the resulting low pays and living standards, when it was difficult to satisfy even the minimum needs in food, accommodation and clothing, people were not in a position to concern themselves over the quality of the environment and its protection. Because of sanctions, the utilization of natural resources, including those under special protection, was intensified, a greater threat was posed to natural and cultural goods, and the society's capability to spend on and upgrade the environment was reduced.

In the long-run, the consequences of sanctions could be even worse, given thus caused economic, scientific and technological regression, and require much time for adjustment to the standards the world has already adopted or opted for. In other words, the FR of Yugoslavia might be also in an "ecological blockade" because of the unpreparedness of its industries to meet the requirements set by the countries which used to be its trading partners.

Because trading with the rest of the world was not possible, which particularly affected the supply in fuels, the citizens of Yugoslavia had to use the energy sources which because of their high pollutant content spoiled the quality of the environment even more. The use of wood for heating purposes was increased, resulting in a greater degradation of forests and disrupted biological equilibrium in large areas. Intensified erosion is resulting in an increased back filling of rivers and water storages and lasting changes to the hydrological regime of waters, including the Danube in the Djerdap storage.

The dilapidation of production facilities and difficulty in having them refitted are resulting in an intensified emission of pollutants into the environment. The danger of breakdowns has increased because of the impossibility to import spares. Increased pollution was caused by the use of low quality fuels for the means of transport and by the poor state of repair of the latter.

Poor quality inputs were used in the agricultural sector. Because of deteriorated living standards, substandard products were often in use.

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Suitable substitution of imported raw materials and intermediates was not always possible because of technological limitations and quality of domestic materials. This often resulted in a risen pollution of the environment, the consequences of which were more than of local character.

Decreased supervision over the movement of hazardous waste through Yugoslavia increased the hazards to the environment even more. This also goes for the risk of illegal trade in hazardous and other waste.

The sanctions also affected international cooperation. It was made impossible for Yugoslavia to implement fifty or so ratified international conventions relating to the environment. What was particularly paradoxical was its being prevented from implementing the conventions geared to protection against trans-border pollution or that of a global character. The participation of Yugoslavia's representatives at international meetings was objected to and some organizations were threatening to expel Yugoslavia from their membership.

Regional and bilateral cooperation in the field of environmental protection was discontinued and it is not likely that it can be reestablished within a short period of time.

International financial support to the environmental protection projects has also been denied, producing long-lived consequences. The exclusion of Yugoslavia from international programmes and cooperation with international financial institutions has already affected the environmental protection and improvement effort.

Scientific and technological cooperation was suspended. Study tours and participation in seminars, as well as access to databases of many international and regional organizations, have been suspended almost completely. The isolation of Yugoslavia resulted in an information blockade and almost all kinds of communications with international organizations and institutions dealing with environmental protection were severed.

The negative effect of sanctions on the country's development is posing a threat to our natural and cultural heritage, including that on the UNESCO List of World Heritage.

The cooperation in the protection of the Adriatic Sea and watersheds was suspended, although this matter is not a problem of Yugoslavia only, since regional cooperation is called for.

A special problem is posed by the consequences of the severance of ties with the former Yugoslav republics, resulting in a risen hazard of trans-border pollution of air and water, especially that of the river Sava, not to mention the harm which could be caused by accidents in the high-risk facilities.

### **The Consequences of NATO Bombing on the Environment in FR Yugoslavia**

NATO bombing of the Federal Republic of Yugoslavia took place from 24th March to 10th June 1999.

National parks, nature reserves, monuments of cultural and natural heritage, rare and protected plants and animal species, among which are those of international importance were targets. Even the cultural and historical monuments were not spared.

By daily attacks on the chemical industry and electrical power plants, the NATO forces caused numerous technological, chemical and industrial accidents throughout Yugoslavia, with wide-ranging local consequences and with all elements of a trans-boundary

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environmental disaster. Permanent bombing caused numerous explosions, swift uncontrolled spreading, spilling, evaporating and sublimation of huge quantities of highly toxic substances, as well as burning, combustion and incomplete combustion of inflammable materials. Large quantities of substances with cancerogenic, allergenic, teratogenic, mutagenic, toxic and other dangerous characteristics with negative consequences for people, plants and animals have been emitted in to the environment.

Destruction of chemical industry plants caused wide-ranging environmental pollution. In order to illustrate this, only a few of typical examples are given here:

large quantities of dangerous and harmful substances were dispersed: chlorine, chloro-carbon hydride, ammonia, benzene, vinyl-chloride, the concentration in the air somewhere reaching the values of several hundred and even more than a few thousand times higher than the permissible maximum;

incomplete combustion of inflammable fuel caused the emission of a huge quantity of carbon-monoxide, nitrogen and sulphur oxides, cancerogenic polycyclic carbon-hydride and soot;

bombing of the chemical industry plants caused spilling of highly toxic mercury, which is used in certain technological processes;

thousands of tons of oil and oil derivatives, acids and alkalis leaked into the rivers, adversely affecting and, at some localities, destroying aquatic flora and fauna;

thousands of tons of oil leaked into the Danube, the most important European river, thus destroying and endangering over the long term flora and fauna, as well as water supply for great numbers of people in several countries;

heavily damaged electric power transformer stations released pyralene oils - only one liter of spilt oil can pollute one billion liters of water;

certain quantities of heavy metals were also released into some water flows; etc.

Chemical compounds following bomb and missile explosions were extremely dangerous, as well as fires resulting from building destruction including surrounding forests, all being important ecosystem components. Bearing in mind that the NATO used the banned cluster bombs, the endangered areas covered a vast region.

Many forest complexes, national parks and orchards were damaged in the bombing, by cluster bombs in particular. Large forest areas were damaged in fires, trunks were damaged and destroyed thus devastating forests and contaminating the forest soil. Due to fossil fuel combustion, a great quantity of harmful gases were emitted in to the air causing on the death of forests.

During the bombing NATO used ammunition with radioactive charges. It was proved that A10 warplanes use an ammunition with depleted uranium at about 110 locations, mainly in Kosovo and Metohija, seven locations in Southern Serbia and at one location in Montenegro. Uranium oxide particles with micro dimension and in the form of mobile aerosol are spread widely by air circulation. The depleted uranium has its long time of semi-disintegration, actually its effect is ever-lasting. If it is inhaled, this radioactive and highly toxic material can not be removed from the lungs, thus causing even more serious toxic and cancerogenic effects.

Soft graphite bombs also caused a humanitarian disaster several times breaking down the electric power system in Yugoslavia.

The NATO bombing of Yugoslavia caused pollution of numerous especially valuable habitats of flora and fauna and vulnerable ecosystems by dangerous eco-toxic materials. Fresh water flows and underground waters were polluted, and air pollution endangered a vast area causing long-term soil pollution and endangering agricultural and forest areas,

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leading to unforeseeable threats to bio-diversity. Presently destroyed bridges slow down the water flow and cause the flooding of up-stream regions. The slow-down of the Danube flow at Novi Sad has already caused flooding of cultivated land, and town and villages were threatened with flooding too.

Regarding the NATO bombing of oil and chemical industry plants, and bearing in mind danger to the environment at local and trans-boundary level, preventive security measures have been undertaken (evacuation, dislocation etc.).

Numerous international documents have been grossly violated including UN Charter, the humanitarian law provisions, as well as provisions of international agreements in the field of environment, and proclaimed principles of environmental protection.

The principles of the Rio Declaration on the Environment and Development, adopted at the UN Conference on the Environment and Development in 1992, and in particular principle 24 that reads: "The war conflict in its essence is destructive to sustainable development. Therefore, states shall respect international law which enables the protection of the environment during war conflict, and when necessary, shall cooperate in its further development." and principle 25 that reads: "Peace, development and protection of environment are interdependent and indivisible" have also been put at a risk.

Bearing in mind the above, it is imperative to start rehabilitation and reconstruction of the destroyed. Clean-up and sanitation activities should be carried out with international support. Special attention should be paid from NATO countries specially having in mind that they have the best practise, clean-up technology, experts, and needed financial resource.

The UNEP / Balkan Task Force report titled "The Kosovo Conflict - Consequences for the Environment & Human Settlements" in October 1999 concluded, that contamination detected at four environmental "hot spots" in the Federal Republic of Yugoslavia require urgent remediation. Locations of "hot spots" are in the areas of Novi Sad, Pančevo, Kragujevac and Bor. It is important to point that UNEP / Balkan Task Force visited less than 10 percent of potentially polluted areas.

The degradation of the environment, following the conflict has created new problems for the local population and for the whole area on a larger scale. The UNEP / Balkan Task Force (BTF) reacted and responded to these problems by carry out an independent environmental assessment of the impact of the conflict. This assessment recommends urgent environmental clean up as part of the humanitarian assistance to South Eastern Europe. These recommendations were included in the "OCHA consolidated inter-agency appeal for funding humanitarian assistance" for the year 2000. The recommendations are also included in the project list for the Stability Pact for South Eastern Europe. The aim of these projects is to prevent further degradation of the environment and to protect the local population against serious health problems resulting from the above mentioned pollution.

The mentioned report was followed in February 2000 by a feasibility study, finalized in April 2000, that identified 27 clean-up projects to address the post-conflict environmental and humanitarian problems. Estimated costs of the projects are about 37.248.000 US\$ respectively 20.000.000 US\$ to prevent further pollution of the environment in four "hot spots".

The first environmental projects implemented in FR Yugoslavia in 1999 were a part of the FOCUS initiative established by Switzerland, Russia, Greek and Austria. Because the FOCUS ecological projects were only dealing with a few immediate remediation measures, it appeared during the actual work on the different sites that additional projects were necessary, either for completing some on-going works or for implementing other necessary remediation measures. These additional projects, described below, are all financed and

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implemented by SDR/SDC (Swiss Disaster Relief Unit / Swiss Agency for Development and Cooperation).

SDC/SDR Environmental Projects in Federal Republic of Yugoslavia:

- Wastewater canal floating barrier in Pancevo;
- Mercury decontamination in HIP Petrohemija Pancevo;
- Soil decontamination in Beopetrol fuel storage in Bogutovac;
- Decontamination of HIP Azotara fuel storage in Pancevo;
- Groundwater monitoring in Novi Sad;
- Groundwater monitoring in Pancevo;
- Groundwater monitoring in Nis;
- Groundwater monitoring in Smederevo; etc.

## Conclusions

It can be concluded that despite sporadic stagnation or improvement, pollution and degradation of the environment are commonplace in Yugoslavia. The states of the environment has showed that pollution has increased after the imposition of sanctions against Yugoslavia and NATO bombing of Yugoslavia in 1999.

Clean-up activities in at-risk areas must begin immediately. Having in mind the present situation in Yugoslavia and the scope and complexity of the activities needed to clean up the polluted areas their implementation will require, financial and technical support from the international community.

Top priority should first be given to 27 clean-up projects in the four so called "hot spots" in Novi Sad, Pančevo, Kragujevac and Bor, identified in a feasibility study finalized by the UNEP Balkan Task Force in April 2000.

Top priority also must be given to identification, assessment and clean-up activities in the areas where NATO used ammunition with depleted uranium.

Priority must also be given to preparation of a feasibility study for clean-up activities in areas identified in the Federal Republic Report - The Consequences of NATO Bombing for the Environment in FR Yugoslavia, prepared in February 2000 by the former Federal Ministry for Development, Science and Environment.

Assessment of environmental pollution must be made on other sites with fuel storage facilities destroyed during the NATO bombing like fuel storage facilities near Smederevo, Sombor, Novi Sad, Priština, etc.

Having in mind the new political conditions, assessment of environmental pollution must be made also of the main permanent environmental polluters and their reconstruction. Priority should be given to facilities with big environmental risk for instance in environmental black points in Bor, Trepca, thermal power plants in Obrenovac, Lazarevac, Obilic, etc.

Yugoslavia also must harmonize national environmental regulation to approximate European Union regulation and strengthen environmental institutions.