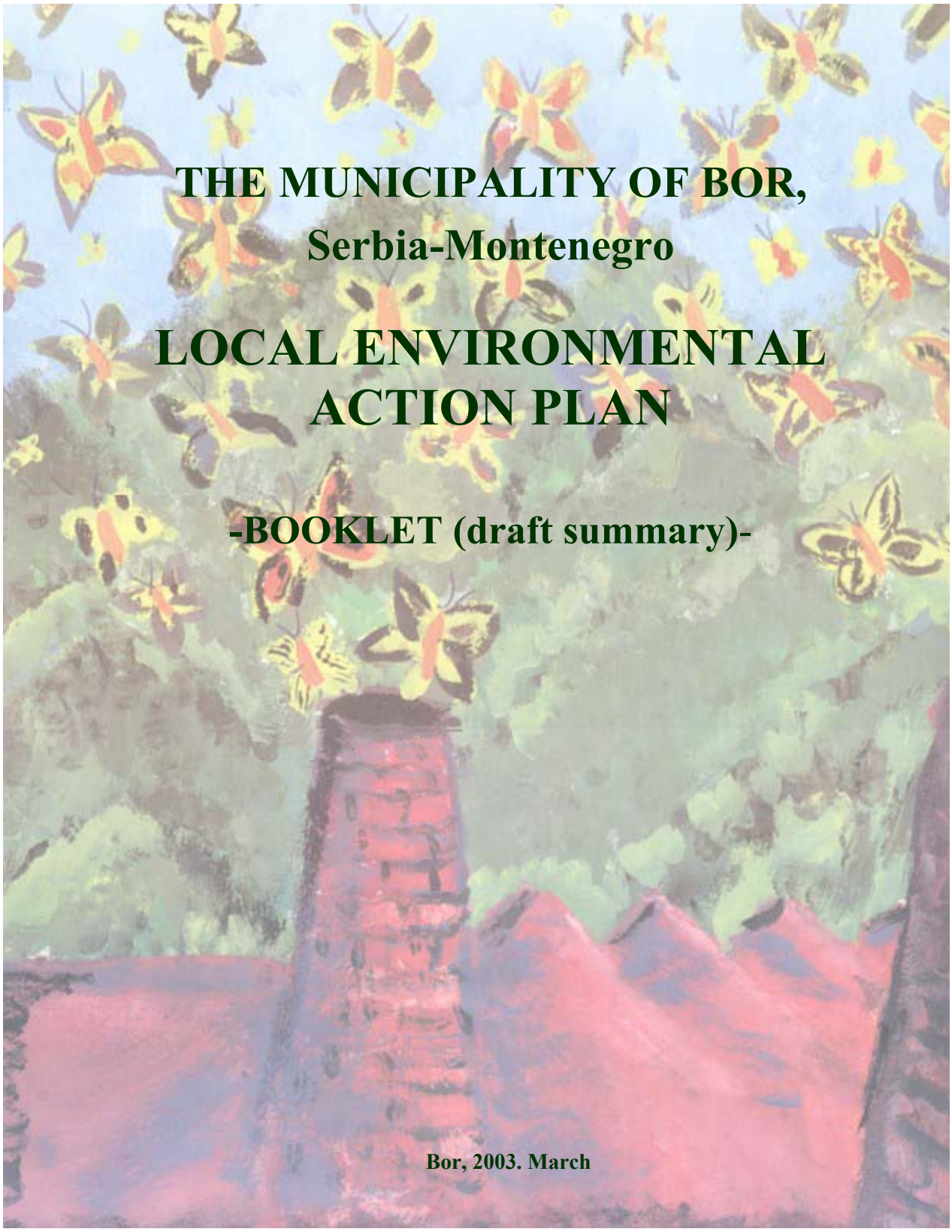

THE MUNICIPALITY OF BOR,
Serbia-Montenegro

LOCAL ENVIRONMENTAL ACTION PLAN

-BOOKLET (draft summary)-

Bor, 2003. March

ACKNOWLEDGEMENTS

The Local Environmental Action Plan for Bor is launched in 2003, the year when Bor celebrates a century of modern mining in this area. The LEAP process, which was initialized by the Ecological Association of Young Researchers, has received full support from the local authorities that have recognized in this process a possible way out from the crisis we are facing. This LEAP document is only a first step towards solving the environmental problems of Bor Municipality, towards sustainable development and creating better human living conditions for present and future generations. It is the result of common work by experts who are ready to transform their knowledge, experiences, ideas and visions into concrete actions and in that way help their community to solve the problems that were created in the past century.

We would like to express our great gratitude to the citizens of Bor who were honest about their problems and who shared with us their ideas, visions and hopes - acting thereby as our guides in making this document. We are extremely grateful to UNEP whose workers have realized and understood the problems of Bor, who supported us with expertise and financial means, initialized others to help us, promoted the results of our work worldwide and encouraged us to persist in our work. We would also like to thank the experts of UNEP/GRID-Arendal for their technical help, for their guidance towards the key issues, for the experience and knowledge they shared with us allowing us to create the document which will be understandable for the citizens of the whole world.

We thank the country office of the Regional Environment Centre in Serbia and Montenegro and the Ministry for Protection of Natural Resources and Environment of Serbia for financial and other support they gave us.

The LEAP Technical Team

Bor, April 2003

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BOR - CITY OF SMOKE WITH A GREEN RING

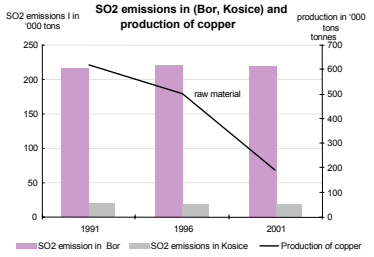
The Municipality of Bor is located in the northeastern part of Serbia. It covers a mostly mountainous area of 856 km^2 and has a population density of 67,2 citizens per km^2. While today the central economic activity is mining and metallurgy, only a century ago Bor was a small village in the Valley of Bor River. It was a far smaller and poorer village than the poor other villages in the areas. The discovery of copper ore and its exploitation since 1903 lead to quick development of Bor from a village to an industrial and urban centre in Serbia.

When the mining started, Bor counted 150 houses and 717 citizens. A French mining association expanded the production in the mine, did build worker colonies thereby strongly influencing the development of the city. Prior to World War II, Bor had a population of 10.000 citizens, of which 6.000 worked in the mine, with the recorded production of copper in that period at 40.000t of anodes. The 1960s was characterized by very rapid industrial and urban development. New metallurgical and industrial capacities were built, new mines opened, buildings, railroads, roads and other infrastructure constructed. The city, attracting people from all over the country, creating job opportunities and families, quickly became an educational, health and cultural centre of East Serbia. In the year 1990 production reached record levels: 151.395 tons of cathode copper (representing 1.5% of world production), 344'655 tons of sulfur acid, and 4'703 tons of gold. The population of the city itself has reached 40'000 (60'000 in the whole municipality), with some 14'000 people working in the Mining and Smelting Company Bor. The last decade of the past century was marked by the decrease of production and economic decline, with degenerating infrastructures due to lack of finances for maintenance, and rapid increases in unemployment and poverty. In 2002 production was only 19% compared to the levels of 1990. The number of employees in Mining and Smelting Company Bor had decreased to around 8'800 and the number of unemployed increased to 7'200. The number of citizens in the municipality has also started to decline (57'500), as people have difficulties to envisage their future in Bor.

A hundred years of mining has left polluted air, lifeless rivers, damaged and destroyed agricultural soil, with over 11,000 tons of waste per citizen of the city. The huge environmental problems will not disappear with reductions of production in the mining and smelting company, but the risks of ecological accidents are often getting higher and the consequences of those accidents can be catastrophic for the Western and Central Balkan region , the Danube river system as well as the Black Sea. The development in the last century was based on a resource that cannot be restored – copper ore. The usage of renewable natural resources was neglected, despite Bor and its surroundings having plenty of these resources to offer - forests, waters, steam-mineral springs, biodiversity, unique reliefs.. Sustainable usage of these resources and development of new economic activities offer an opportunity for economic recovery and a solid foundation for survival of the population of Bor.

AIR QUALITY

Since its start up in the early 1900s, the copper mining and smelting industry in Bor gradually developed and expanded over the years its production capacities based on technologies generating high levels of air pollution resulting in ever increasing violent and destructive pressures on the environment. The Smelter plant which processes copper concentrate, emits high quantities of SO_2 (20,000 tons/year), arsenic (300 tons/year) and heavy metals (incl 150 kg mercury/year) into the atmosphere. Reasons for the high emissions include:



1. Decreased production of the sulfur acid plants, which utilize and process SO_2 into sulfur acid;
2. Deterioration of the gas pipeline and other equipment used for transporting gases from the smelter plant to the sulfur acid plant;
3. Obsolete technologies; and
4. Low levels of environmental awareness, lack of good housekeeping manifested by insufficient work and technical discipline and work organization.

SO_2, arsenic and heavy metals are continuously present in high concentrations even when the smelter plant does not work at full capacity (see table above). Monitoring of air quality is limited only to sulfur dioxide imissions, air monitoring equipment is deteriorated and/or partly operating, and no adequate response system exists in case of accidental air pollution emissions.

As an inevitable consequence of the continued emergency situation, a high prevalence of respiratory diseases exists, primarily among children. In average children visit a medical specialist five or six times a year due to respiratory complaints. Sulfur dioxide concentrations in the city center exceed over 100 days per year the allowed limits, whereas concentrations of arsenic exceed 73 to 102 times the allowed limits by WHO. The number of cases of cancerous diseases increased five fold during the period 1979 – 2001. Air pollution impacts also other livelihoods as well as infrastructure and buildings in the city and surroundings

If sulfur acid could be marketed it would result in i) a maximal usage of capacities of Smelter plant and sulfur acid plants, ii) an increase in processing of SO_2 into sulfuric acid decreasing therefore air pollution, iii) better economic performance of the company which would lay the basis for increased funds for maintenance and investments, iv) production increase at artificial fertilizer plant using the sulfur acid with potentially increased agricultural production through improved use of fertilizers by farmers, and v) decreased poverty and increase in employment rate.

Following reduced operations by the sulfur acid plant, the processing of waste gases from the smelting plant has also been reduced resulting in emission increases of arsenic and heavy metals. By solving the SO_2 emission problem, the problem of arsenic and heavy metals emissions in the air could be solved as well.

GOAL: For improving the air quality it is necessary to reduce SO_2 and As emissions in two steps: Step 1: 50% decrease by 2006 and Step 2: 90% decrease by 2010.

ACTIVITIES - STEP 1:

- **Economic:** To find the market for sulfur acid, to start continuous production in sulfur acid plant using SO_2 from the smelter plant as raw material.
- **Technological-technical:** Reconstruction of sulfur acid plant and gas pipeline, which connects sulfur acid plant and smelter plant. Replacing of old and defunct equipment and systems in chemical plant. Reconstruction of old gas pipeline, to reduce gas emissions to the atmosphere.
- **Management:** Introduction of environmental management systems (EMS) and ISO 14000 standards.

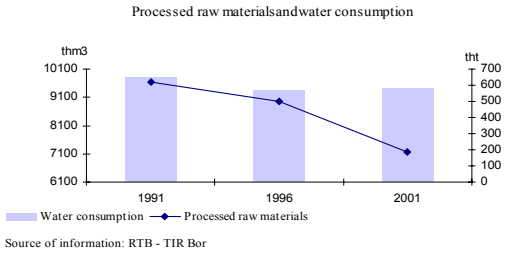
ACTIVITIES – STEP 2:

- **Technological-technical:** Introduction of new BAT technologies in metallurgical- chemical complex with potential to decrease emissions of SO_2 and arsenic by 90%.

QUALITY OF WATER

WATER SUPPLY

The development of the water supply system over the years has been in line with urbanization and industrialization in Bor. The municipality of Bor is in general supplied with drinking water from underground karst springs, whereas the Bor Lake provides for industrial water. However, water consumption by industries is irrational and uncontrolled. In the last 10 years industrial water consumption increased 3 times per ton of product. From 1991 to 2001, 80% of all water was used in mining and industry and only 20% for the supply of households. Given that most of the industrial water comes from underground springs the excessive and irrational consumption is causing shortages of drinking water in dry periods of the year.



Source of information: RTB - TIR Bor

Industrial and municipal water supply systems and networks are old and deteriorated, with leaking pipes causing excessive water losses. Industrial water pipes are frequently damaged due to explosions in mining and aggressive impact by acid soils. More than 10km of the municipal network consists of asbestos-concrete pipes (asbestos concentrations in drinking water are not controlled), and drinking water is cross-contaminated by wastewater from leaking sewerage pipes. A number of cases of yellow fever and other contagious diseases have occurred during the past years. In addition, higher parts of the town do not have enough water during peak hours and/or dry periods due to lack of reservoirs that could be used for buffer storages during such periods. Supply to rural households is covered only in part. The Municipality lacks systems for sound management of water resources and proper water quality monitoring. The excessive exploitation of underground springs affects the rivers, which in turn disrupts biological balances and endangers unique life forms in surface and ground waters.

GOALS:

1. Decrease of losses and water consumption in industry (40%) and in households (20%) by 2006.
2. Providing of water quantities sufficient for sustainable development by 2010.

ACTIVITIES:

i) reconstruction of deteriorated and/or old pipes by 2006.
ii) construction of storage reservoir for secure supply of all parts of the town by 2006.
iii) replacement of asbestos-concrete pipes by 2005.,
iv) construction of dam and creation of artificial lake “Bogovina” by 2015. ,
v) introduction of system for riverbed management according to the EU guidelines by 2007.,
vi) education of factory management for the rational use of water by 2008.
vii) education of population for the rational use of water – permanent task .

WASTE WATERS

Wastewaters are generated by households, mining and other industries. Mining operations discharge waste waters untreated into waterways whereas open mining pits, depots and tailing ponds generate vast quantities of leachate waters. Every year a total of 22 million m3 of wastewaters are released in this way into the Bor, Krivelj, Brestovac and Ravna rivers. Waters from leaching gangue minerals and from abandoned mining structures reach ground and surface waters. Due to past leaking of old tailing ponds large quantities of flotation tailing reached the Bor and Veliki Timok rivers destroying over 20’000 ha of the most fertile agricultural soils. At present a damaged collector under the flotation-tailing pond Veliki Krivelj poses a similar new risk for an environmental disaster threatening the whole region.

Rivers downstream of the mining-metallurgical complex have been downgraded into open wastewater collectors,, limiting further the economic activities and livelihoods of villagers settled along the riverbanks. In addition, leaching from accumulated flotation tailing on riverbanks contaminates ground waters and surrounding areas. Wastewaters from Bor represent a regional problem as they endanger communities along rivers in Serbia and Bulgaria and contaminate the river Danube. Solution of this problem is thus of great importance for Serbia as well as the entire Eastern Balkan region.

GOALS:

1. Protection of surface waters from mining, metallurgy and households waste waters by 2008.
2. Biological remediation and revitalization of degraded rivers by 2012.

ACTIVITIES:

Introduction of hydrometallurgy technologies for refining mining wastewaters in order to increase mining income and employment by 2008.

SOIL QUALITY

Fertile soil is an essential natural resource, which normally is formed very slowly but can be destroyed very quickly when exposed to degradation processes. Mining and metallurgical industries cause soil degradation notably through their open mining pits, gangue minerals depots and flotation tailing ponds. Leaking flotation tailing ponds have been responsible for considerable destruction of fertile soils in the Bor and Velika Timok river valleys. Copper ore smelting in Bor with high sulfur dioxide emissions have caused erosion, high acidity of soils and destruction of vegetation in the nearby areas. The construction of the smelter plant followed by regular increases in production capacity and building of ever-higher chimneys – without any treatment systems for gas emissions, resulted in soil degradation over a much wider area. Gas emissions from the smelter plant include dust containing arsenic and heavy metals.

Mining operations have degraded agricultural soil in the communities of Bor, Slatina, Ostrelj, Bucje and Donja Bela Reka. Discharge of wastewaters from flotation and tailing ponds have completely destroyed soil in the communities of Slatina, Rgotina, Vrazogrnac and numerous other villages situated in the valley of river Veliki Timok. Waste gases from smelter plant have destroyed to various extents soil in almost all villages around Bor. Total affected surface of damaged soil in Bor Municipality is estimated at some 25'500 ha, which constitutes 60% of all agricultural soils, and resulting in the figure of 0.5 ha of damaged soil/capita.

Acid soil affects fertility and also increases mobility of heavy metals that can reach plants. Around the mining-metallurgical industrial complex acidity rates of agricultural soils are the highest. Arsenic and heavy metals can also be found in soils. Maximum allowed heavy metal content in Serbia is 100mg/kg and for arsenic it is 25mg/kg. Copper concentrations exceed allowed limits in the communities of Ostrelj, Slatina and Bucje. In other areas the levels remain just below the allowed limits. Arsenic concentrations are generally also just below the allowed limits. The measurements confirm that remediation, revitalization and/or protection measures are urgently needed. Limestone from nearby mines could be used for such remediation measures and this would also be beneficial to mining operations.

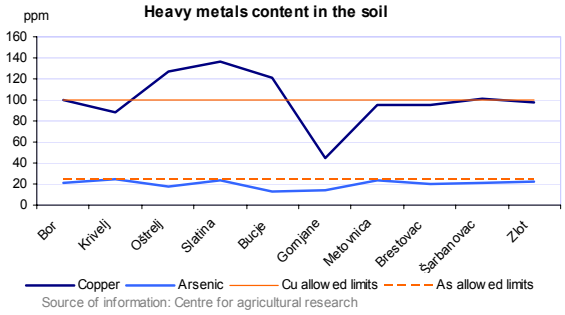



Photo: SRIF Bor

The high extent of damaged soils in Bor area has both economical and health-related consequences such as the fall in agricultural production, production of lower-quality food, further impoverishment of farmers, higher food prices on the local market, with a consequent fall in living standards and inadequate nutrition affecting growth and development of children and health in general. Although the figures of 0,76 ha of arable soil per capita and 5.3 ha of arable soil per farmer seem to indicate otherwise, the arable surface currently available is not sufficient to meet local needs due to 1) low overall quality of soils for geological reasons, 2) frequent droughts, and 3) inadequate soil cultivation practices as a result of low agricultural education level of farmers, consisting mostly of women. Furthermore there is no system for monitoring of hazardous substances in the soil and no spatial planning for determining the use of land and soils.

GOAL:

To remediate and revitalize agricultural soils by 2006.

ACTIVITIES:

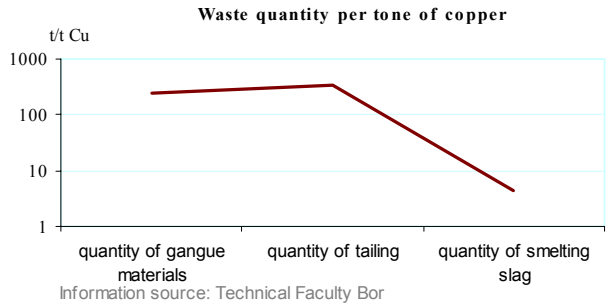
- Preparation of cadastre/inventory of damaged soils by 2005
- Adoption of a Spatial Plan that defines future use of agricultural soil by 2006
- Afforestation of town surroundings by 2006
- Implementation of selected projects for remediation and revitalization of agricultural soil by 2006

- Education of farmers for application of soil remediation and revitalization techniques by 2006

WASTES

The industrial activities, in particular the mining and metallurgy processes are big sources of waste. Many decades of exploitation and ore processing, last years characterized by poor production efficiency, questionable process reliability and inadequate environmental controls, have produced huge quanitites of waste, which have not been treated and stored safely. The mining waste contains high levels of heavy metals, which poses a particular risk to water resources, the soils and through plants also the food chain.

There are currently no proper treatment and storage capacities for hazardous waste in Serbia. A particular problem in Bor is caused by oils and emulsions from the local industry. Organic waste from agriculture is thrown away or burned, with uncontrolled burning often causing forest fires in the area. Due to lack of education, the use of pesticides is not efficient and causes unnecessary environmental stress. A further problem was created during the Kosovo conflict, when the power station on the premises of Mining and Smelting Company was bombed. On that occasion 130 condensers filled with PCB were damaged or destroyed and PCB spilled around the power station. Debris from the power station and damaged condensers were removed to a temporary unsecured dump.



Waste quantities in Bor primarily depend on the scope of ore exploitation and on capacities of metallurgical aggregates. With regards to production efficiency, up to 320-450 tons of ore are dug and some 224-315 tons of gangue materials removed to produce 1 ton of chatode copper. During 1991 some 3,315 tons per day/per citizen of waste was created. Due to recent production decreases, in 2001 amount reduced to 0,795 tons per citizen. So far, as a result of mining and metallurgy activities, an estimated 450 x 10^6 tones of gangue materials, 207 x 10^6 tailing, and 23 x 10^6 tones of smelting slag have been stored on the territory of Bor municipality, or 99,95% of its total waste stored.

Gangue materials are stored next to open pits without appropriate protection measures. Tailing is stored in the tailings ponds in the valleys of rivers and streams. The collector under tailing pond Veliki Krivelj, which redirects the Krivelj river, is also damaged and its collapse could cause another great environment catastrophe, as was the case for the city's wastewater collector in the 1950s which heavily polluted the banks of rivers Bor and oVeliki Timok. Due to natural leaching of gangue materials, ground and surface waters as well as agricultural soil are continuously polluted. While gangue materials and tailing contain significant quantities of copper, some ideas for their recycling have been elaborated, parallel to some attempts to re-cultivate these areas. Slag from reverberatory is stable and it is very slowly dissolved under the atmospheric rainfalls. Stored near the Smelter, away from river currents, it does not pose an immediate danger to the environment.

The communal waste dumps have been located in an abandoned part of the mining pit near the city. While this has decreased the investments and transport costs, waste is dumped without any previous treatment or covering with earth. In addition, big quantities of uncontrollable waste and dumps (wild dumps) are found around the city. There are no proper management systems for medical and biohazardous waste in Serbia, and there are also no cattle cemeteries in the villages of Bor. However, a national action plan envisages the building of a recycling centre and regional landfill in Bor.

GOALS: To reduce environmental impact of hazardous and communal wastes through introduction of appropriate management systems by 2010

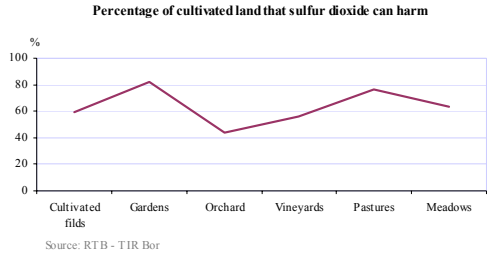
ACTIVITIES:

- Prepare study for the classification and characterization of stored waste, by 2005;
- Create a data base on wastes, dumps and storages, by 2006;
- Removal of wastes from illegal dumps and safe storage of HZW in industrial sections by 2006,
- Education of citizens about the importance of collecting and recycling waste by 2007,
- Construction of a collection and recycling centre and regional landfill in Bor by 2008.
- Construction of a specific HZW storage site by 2010

FOOD QUALITY

The basic component of soils in Bor area is magma rock, which is rich in copper, arsenic and heavy metals. Mining and metallurgical industries emitting air pollutants and releasing wastewaters into rivers, also used for irrigation, are responsible for high contents of hazardous substances in soils. The use of chemical fertilizers and pesticides by farmers has added to the problem. Hazardous substances from soil through plants reach food chains and supplies and therefore pose risks to human health.

Mining operations and metallurgical processes emit dust and generate sulfur dioxide, which directly or indirectly affects plants, as well as heavy metals which reach plants through nutritious substances from soil. Sulfur dioxide damages plant and tree leaves in either an acute or chronic manner. Acute damages are caused by a short impact of very high sulfur dioxide concentrations and are manifested by damages on cells and/or drying of leaves. Chronic damages occur after longer exposure of plants to lower sulfur dioxide concentrations, and this causes decrease in organic growth.



In Bor, damages especially occur after rains or early in the morning when sulfur dioxide concentrations are high. Agricultural plants cultivated near metallurgical industries suffer higher level of damages, as well as plants in valleys and ravines where smoke is retained longer. Plants react in different ways to sulfur dioxide. Oats is the most sensitive cereal, and wheat the least sensitive. Sulfur dioxide affects 57% of agricultural areas in Bor. As a consequence Bor cannot supply enough food for the needs of its population.

Copper is a necessary element for the growth of plants, however the high copper content in the soils around Bor is toxic for plants as it reduces the growth of their roots. High arsenic concentrations also adversely impact on the growth of plants. Content of arsenic and heavy metals in food supplies has been analyzed from four villages around Bor. Results revealed that the copper and arsenic contents in food supplies from the village Krivelj (located next to mining operations) were much higher than in the other 3 villages (Ostrelj, Zlot and Sarbanovac). Higher than allowed concentrations were found in fruit, grapes, vegetables and eggs.

The shortage of food supplies caused by soil contamination has resulted in the need for people to obtain food from elsewhere which causes higher prices and further reduction of living standards. Consequently people in Bor buy cheap but not varied food, which affects child growth and development and human health in general. Due to the existing situation village farmers are unwilling to invest in agricultural development, with some choosing instead to go to the town in search of jobs. This in turn causes neglect of their farms and as a result further decreases agricultural production.

GOALS for immediate action, and preconditions for production of sufficient quantities of healthy food are i) addressing the sources of air-, water- and soil pollution and ii) the remediation and revitalization of contaminated agricultural soils.

ACTIVITIES that should be undertaken include:

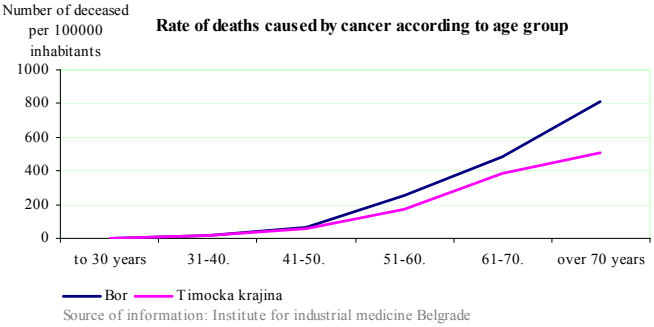
- Zoning of mining and industrial facilities that have impact on agricultural soil
- Spatial planning that defines zones for future agricultural production
- Sanitary protection zones
- Education of population for production of healthy food supplies
- Efficient system for monitoring of food supplies

HEALTH

Mining and metallurgy have polluted air, water, soil and food with numerous hazardous substances in Bor area. These substances can have severe health effects and worsen the living conditions in Bor that is trying to ensure acceptable living standards and health services in a transition period with uncertain development prospects.

Polluted air causes slowdown of children's growth and development, it weakens resistance to infections and it also causes diseases of internal organs. By studying of air quality impact on health, growth and development of children in Bor and Sokobanja (unpolluted region) it was found that hemoglobin content is 1,1% less and number of red cells in general 400000 less for children in Bor than children in Sokobanja. The same study showed that children from Bor are more liable to diseases of respiratory organs: blocked nose, enlarged tonsils, swollen pharynx, swollen glands secretion in bronchi. This is why children in Bor are more liable to allergy diseases, particularly to bronchial asthma. Asthma can cause disability and it requires urgent therapy with compulsory change of climate as one of the main conditions for successful treatment. Research has also been conducted on lead and arsenic content in blood and urine of children in Bor and village Zlot (outside metallurgical smoke range). This research showed that children from Bor have considerably higher content of these metals. This means that that there is continued risk of lead and arsenic input into organisms of children from Bor, especially if they spend their whole life in polluted surroundings. Although the found values were under allowed limits, it should be taken into consideration that children in Bor are at the same time exposed to other pollutants (copper, zinc, lead, sulfur dioxide, mineral dust etc), which increases health risk.

People that work in metallurgical facilities are exposed to high concentrations of sulfur dioxide, arsenic, lead, copper and other pollutants, which multiplies the risk of diseases. Research has shown that arsenic quantity in workers' urine is 195.4% higher than quantities found with Zlot population, arsenic content in the hair was 213.3% higher, lead content 80% higher, and lead content in urine 22.5% higher. Out of the examined workers 79.1% had in average two chronic diseases. This can be connected with working conditions and pollution of the surroundings where they live. Chronic diseases can cause premature disability and loss of working ability. Average working experience of disabled workers and disability pensioners from RTB is 15.98 years. Arsenic is carcinogenic, and special attention was dedicated to research of cancer occurrence. Results show that death rate (divided in decades) is higher for people older than 40 in Bor than in Timocka Krajina. This indicates that there are carcinogenic factors that cause this.



Source of information: Institute for industrial medicine Belgrade

Disease rates for Bor population in 2001 were higher than for the population in Timocka Krajina. Number of respiratory system diseases in Bor/1000 inhabitants was 718 (in Timocka Krajina 648), number of digestion system diseases was 143 (85 in Timocka Krajina), number of blood system diseases 261(142 in Timocka Krajina) and number of urino-genital system diseases 208 (158 in Timocka Krajina). There is currently no central system for tracking of public health, or correlation of environmental quality and public health, nor institutions and financial funds that could subsidize preventive health measures.

GOALS include *i)* Improving local community facilities for undertaking preventive health protection measures by 2005, and ii) Putting into effect preventive health protection- urgent and longer-term task

ACTIVITIES:

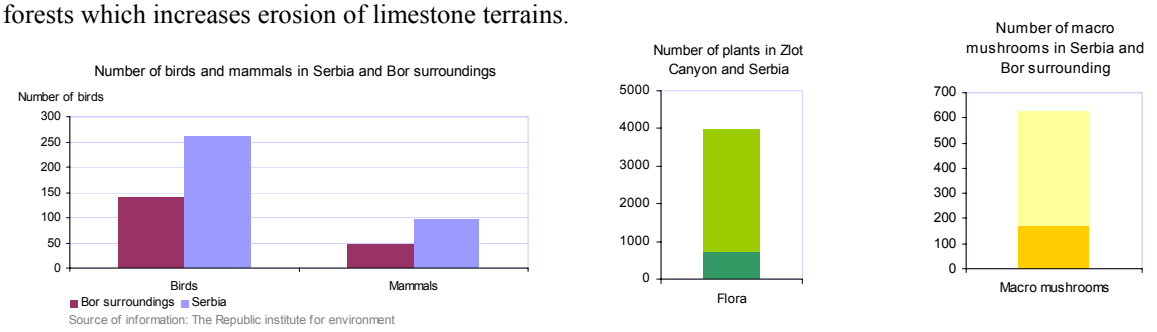
- Establish local environmental fund by 2003 and environmental agency by 2004.
- Establish efficient environmental and health information system by 2005.
- Form service for preventive medicine in Medical Centre Bor by 2005.
- Realize projects for research of environmental impacts on public health by 2005.
- Organize rehabilitation and recreation stays for children in rehabilitation and recreation centers -in spas, on the mountains and at the seaside (permanent task)
- Organize rehabilitation of workers with diseases (permanent task).

NATURAL RESOURCES AND BIODIVERSITY

Bor and its surroundings with their natural characteristics represent one of the most interesting geographical locations in Serbia. Due to the geological structure, morphology and terrain geology, climate conditions and complex historical development of animal and vegetable world (before, during and after the ice age), the area presents rich natural resources in geodiversity and biodiversity.

Western part of the Municipality of Bor belongs to mountain complex Juzni Kucaj. Karst plateau Dubasnica (spreading over 70km^2) stands out with diversity of its surface and ground relief shapes. So far 116 caves and 14 pits have been explored, with two caves available as tourist sites: Lazar Cave and cave Vernjikica. Eastern part is limited by limestone mountain ranges and areas spread over 50km^2. In this area 88 caves and 14 pits have been explored. 45% of the municipality is covered by forests (43,098 ha). In total, 86% of the territory is under human influence, and 14% is preserved nature.

In the 18th century 68% of the area was covered by forests, compared with 45% today. Anthropologic pressure on natural resources and biodiversity is reflected through clearing of forests in order to make cultivable soil, uncontrolled forest exploitation, mining and metallurgy development, urban development, development of systems for water supply, tourist development and global climate change. Anthropologic pressure on biodiversity is reflected in capping of springs, uncontrolled and non-professional collecting of medicinal herbs, forest fruits and mushrooms, illegal hunting and fishing and illegal trade, introduction of coniferous forests in the areas of broadleaf forests as well as uncontrolled use of pesticides in forestry and agriculture. Geodiversity is endangered through non-professional arrangement of speleological structures for tourist visits, adventurous research of speleological structures, deliberate destruction of stalactites and stalagmites and illegal trade, changes of courses of ground waters because of their use for water supply, as well as clearing of forests which increases erosion of limestone terrains.



Lazar Canyon is one of the most important centers of plants and trees diversity in the Balkans. 720 plants have been found here, representing 20% of flora in Serbia and 11% of flora in the Balkans. On the Malinik, a mountain on the edge of canyon exists a 180-year-old forest community of beech, ferns and yew with largest wood pulp in Serbia. 174 species of mushroms have been registered here, some having direct economic importance. With regards to fauna, Sirfide(wasp like fly), 205 species have been identified, and most of them are of great importance for preservation of biodiversity in Serbia and Balkan peninsula.. Mountains Mali and Veliki Krs have special importance because they are the habitat of 11 species of bird of prey that are endangered species in Europe. With regards to nammals, 47 species have been identified. Concerning ground fauna, the area is rich in waters that have organic substances, and the caves in Bor surroundings are ideal places for the development of 20 unique invertebrates.

The renewable natural resources and rich biodiversity are great potentials for sustainable development and preservation of this region. Development of new economic branches by sustainable use of these resources is a challenge and chance of survival for the population in this region.

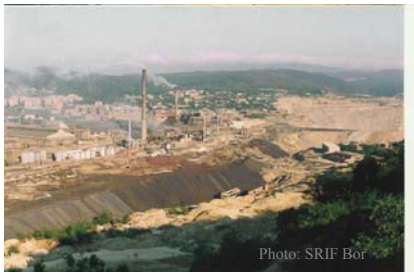
GOALS include i) Protection, preservation and sustainable use of natural resources and biodiversity by 2005, and ii) Preservation of genetic fund by 2010.

ACTIVITIES:

- Strategy for sustainable development by 2004.
- Strategy for development of tourism and promotion of tourism by 2004.
- Legal protection of Dubasnica, Stol, Mali and Veliki Krs by 2005.
- Founding of public enterprise for management of protected natural resources by 2005.
- Founding of natural collection by 2006.
- Renewal and conservation of forests and reintroduction of some animal and vegetation species by 2007.
- Founding of gene bank of flora and fauna of Bor surroundings by 2008.

ENVIRONMENTAL AWARENESS

The basis that determines the environmental awareness of citizens of Bor originates from the characteristics of the city and its economy. In a very short time the city developed from a small poor village into developed urban centre of East Serbia. While the city's economy is strikingly mono-structural, i.e. over 80% of the population depends on mining and metallurgy, most of the citizens came from other regions, and a certain lack of traditions characterizes the city This economic structure has been the basic source of survival for the city and of relatively high life standard of the citizens. At the same time it has been the main cause of environmental degradation highly visible to the citizens.



Strengthening environmental awareness of the citizens is an important tool for improving the living conditions in Bor. This can be achieved through introducing environmental topics into entire educational system, strengthening of non-governmental sector and developing environmental information systems.

Environmental awareness of citizens of Bor is very contradictory. On one hand, there is highly expressed awareness about the size and reasons of environment problems in Bor, but on the other hand there is not enough knowledge and awareness about consequences of environment pollution, including consequences for further economic and communal development as well as consequences for people's health and for nature. On the other hand, the citizens of Bor are aware about many environmental threats, but cannot gather enough motivation and actions to solve the problems.

In general, people of Bor are more aware of their city as a «black spot» than they are aware of its surroundings, and the biodiversity values it presents on the Balkans and in Europe. Awareness is focused on economic effects of mineral resources usage and it is insufficiently focused on sustainable usage of other nature resources, which could be the foundation for development that is less aggressive on the environment (e.g. production of healthy food, tourism and so on). Overcoming these barriers demands better information systems regarding the state of the environment and ecological education, which would lead to bigger participation and interest of the citizens for solving the environment and key development problems.

Due to current state of environmental awareness, citizens are passive to get involved in the process of decision-making, and to participate in concrete actions and campaigns for solving the environment problems. A more drastic consequence is the wish to leave the city, which is mostly expressed by young people who are becoming more and more alienated because they see no future in their city. The launch of the LEAP process and education reform can enable significant steps forward and motivate the change in behavior. In this process the extensive educational system created during the past rapid growth of the city and based on earlier better financial times should be benefited from.

GOALS

Active involvement of the citizens in solving the environment problems can be achieved through raising of environmental awareness and raising of expert knowledge level and of competence

ACTIVITIES

Raising of environment awareness can be achieved with following activities:

- Forming a centre for environmental education of the citizens,
- Forming an information centre and development of environment information system,
- Introducing environmental education into all public media, starting of new publications and development of electronic communications,
- Forming local experts network and connecting with other national and international networks
- Introducing environment topics into the whole education system