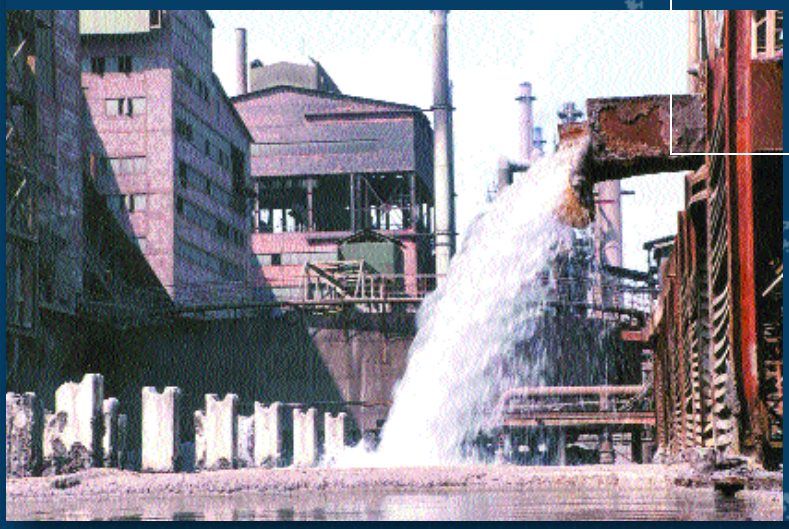
UNEP

Post-Conflict Environmental Assessment— FYR of Macedonia



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Foreword

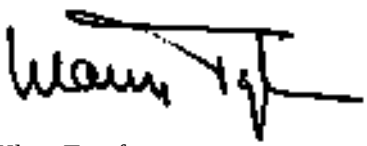
The Former Yugoslav Republic of Macedonia (FYR of Macedonia) has been undergoing a profound transition during the past decade. Economic and civil reforms have been accompanied by rising environmental awareness and the creation of a Ministry of Environment and Physical Planning. The Kosovo conflict added a new and urgent dimension to humanitarian challenges and efforts.

This report continues the United Nations Environment Programme's (UNEP) investigation of the impacts of the Kosovo conflict. It extends the body of knowledge about the environmental impacts of the conflict, and about the urgent environmental challenges facing FYR of Macedonia. The report should provide a useful tool for international community members seeking to assess FYR of Macedonia's needs and assist the country. It also underscores the importance of environmental management during humanitarian assistance efforts.

To conduct the assessment, UNEP drew on the skills of international experts from various scientific and environmental policy disciplines. During a field mission to FYR of Macedonia, the team visited refugee camps and environmental 'hot spots', including neglected industrial sites. The team also took samples and analyzed various environmental and human settlement data. I would like to thank this dedicated and highly skilled team for their hard work.

UNEP is committed to assessing areas of the world suffering from acute environmental degradation caused by human conflicts or natural disasters. This work began following last year's Kosovo conflict, when the Joint UNEP/UNCHS (Habitat) Balkans Task Force (BTF) was established. The BTF conducted a rapid assessment that culminated in the publication of *The Kosovo Conflict: Consequences for the Environment and Human Settlements.* Since that time, UNEP has implemented humanitarian projects to mitigate pollution at environmental 'hot spots' identified by the report.

This UNEP report, *Post-Conflict Environmental Assessment—FYR of Macedonia*, was made possible through generous support provided by The Netherlands, and with the close cooperation of the Stability Pact for Southeastern Europe, the United Nations Development Programme, the United Nations Economic Commission for Europe, and the United Nations High Commissioner for Refugees. My thanks go to the Dutch government and these partner organizations for their contributions and invaluable in-kind support.



Klaus Toepfer
Under-Secretary General of the United Nations
Executive Director of the United Nations Environment Programme

Introduction

During the past ten years, Southeastern Europe has experienced upheaval and instability. Conflicts were fought, and communities divided. Many fled their homes and their countries to escape danger. As attention focused on other issues, the region's rich natural environment, already under pressure from decades of urban and industrial pollution, became increasingly degraded.

Fortunately, the momentum in the Balkans has shifted. Peace, democracy and stability are taking hold. Cooperation is growing within the region and across Europe. Reconstruction efforts are underway, and protection of the environment is an emerging priority.

This assessment examines FYR of Macedonia's environmental needs in the context of these regional developments. As the country undergoes broad transformation of its democratic institutions, environmental protection is evolving alongside economic development. There is now an opportunity for FYR of Macedonia to stop the degradation of its precious environment and, at the same time, create a strong economy and prosperity for its citizens.

This report is not intended to be a comprehensive environmental survey. It is instead a rapid, strategic assessment aimed at identifying the most urgent environmental needs of FYR of Macedonia in order to prioritize rehabilitation funding. Accordingly, the report focuses on the country's severely polluted, 'hot spot' sites requiring immediate attention; the environmental consequences of refugee influxes from the Kosovo conflict; and the actions that can strengthen FYR of Macedonia's environmental institutions and policies.

Ultimately, the responsibility for environmental protection and enhancement rests with the people of FYR of Macedonia. The international community can play a valuable role in helping FYR of Macedonia to implement its environmental agenda. That agenda, however, must be set at the national and local levels.

UNEP hopes that the recommendations contained in this report will catalyze action. In particular, UNEP urges the international community to provide immediate assistance for remedial actions at the environmental 'hot spot' sites identified.

This assessment was developed at the request of FYR of Macedonia and within the framework of the Stability Pact for Southeastern Europe. It complements *The Kosovo Conflict: Consequences for the Environment & Human Settlements* (1999) and *Post-Conflict Environmental Assessment—Albania* (2000).

UNEP post-conflict assessments analyze environmental conditions with a view toward emergency prevention and preparedness as much as emergency mitigation and response. This requires addressing the broader context of a country's pre-existing environmental conditions and capacities. Assessments, therefore, entail extensive analyses of relevant environmental issues, meetings with key stakeholders, field missions, the publication of reports, and efforts to catalyze concrete environmental remediation action.

UNEP's environmental assessment of FYR of Macedonia was made with the close cooperation and support of the Ministry of Environmental Protection and Physical Planning (MEPP). The assessment process began with a systematic review of the available literature and data concerning FYR of Macedonia's environment. A preliminary UNEP field mission met with environmental leaders from the Government of FYR of Macedonia (the Government), the non-governmental community and academia. Based on this research, UNEP identified three core areas of concern:

- industrial 'hot spots' of urgent environmental concern;
- environmental impacts of the refugee influx; and
- measures needed to strengthen institutional capacities for environmental protection.

During the week of 10-17 September 2000, a UNEP-led mission, hosted by MEPP, investigated environmental conditions in FYR of Macedonia. The mission team was composed of specialists in chemical and technological processes, solid waste management, biodiversity, drinking water, waste water, air quality, soil, land use planning, law, government, humanitarian assistance, emergency management, environmental economics, environmental information, and communications. National experts from FYR of Macedonia accompanied the team and provided valuable information.

The team divided into three subgroups that focused on industrial 'hot spots', refugee impacts and institutional capacity, respectively. Throughout the week, the teams held dozens of meetings with key stakeholders from government, non-governmental organizations, donors, international organizations, academia, and the media.

The 'hot spot' team visited ten sites, as detailed in Chapters 3 and 4. The sites were selected in advance of the mission, through in-country consultations with national experts. The aim was to investigate those sites considered most likely to pose immediate risks to the environment and human health, and to include examples of the principal industries found in FYR of Macedonia. At each site (with the exception of Lojane), the UNEP team met with plant officials, conducted visual inspections of the facilities, and, when appropriate, took samples of soil, water or air. Experts from the team also met with Government and municipal officials, as well as representatives of non-governmental organizations.

➤ Map 2 : Sites assessed by the UNEP mission

The team specializing in the potential environmental impacts of refugees met with a total of fourteen agencies and organizations that were directly or indirectly involved with the refugee influx. These included the Resident Representatives of the United Nations High Commissioner for Refugees (UNHCR) and the United Nations Development Programme (UNDP); Oxfam International; the Macedonian Center for International Cooperation (MCIC); the International Rescue Committee (IRC); the Cooperative for Assistance and Relief Everywhere (CARE International); the Macedonian Red Cross; the MEPP; the Ministry of Interior; the Ministry of Agriculture, Forestry and Water Management; the Public Health Institute; the GEOhydroproject; and the municipalities of Cucer Sandevo and Resen. Based on pre-mission research and the aforementioned interviews, the team inspected the following refugee-affected areas: the refugee camps of Blace, Bojane, Cegrane, Radusa, Stenkovec I, and Stenkovec II; the collective centers of Suto Orizari, Pretor, and Radusa; and the wastewater treatment plants of Struga and Radusa.

The team reviewing institutional capacities met with the Resident Representative of UNDP as well as representatives of the European Commission; the Office of the Prime Minister; the MEPP; the USAID Environmental Fund; the UNDP Veles project; the Municipality of Veles; Veles Water Supply Enterprise; Veles Institute for Public Health; the EU-Phare Institutional Strengthening Project; the Ministry of Agriculture, Forestry and Water Management; the Public Enterprise for Physical and Urban Planning; the Municipality of Skopje; the Republic Hydrometeorological Institute; the Ministry of Local Self-Government; the Environmental Information Center; the Agency for Development and Investments; the Parliamentary Commission on Environment, Youth and Sports; the Macedonian Academy of Sciences and Arts's Research Center for Energy and Informatics; and the Organization for Security and Cooperation in Europe, as well as donors and representatives of non-governmental organizations.

At several of the locations and institutions, the available technical information was limited or outdated. The UNEP team followed-up by obtaining and reviewing additional data after the mission and by analyzing the results of samples taken in the field by mission experts.

Key conclusions

1. UNEP identified environmental 'hot spot' conditions in five of the sites visited during its field mission:

- the metal factory in Jegunovce;
- the OHIS chemical complex in Skopje;
- the lead smelter in Veles;
- the lead and zinc mine in Probistip; and
- the electrical power plant in Bitola.

These sites require urgent attention in order to halt serious risks to public health and the natural environment. The international community should immediately provide technical and financial assistance to these priority areas. (For detailed recommendations on environmental 'hot spots', see page 53).

2. The remaining five industrial sites visited by the 'hot spot' team have serious environmental problems. These problems require investigation, the implementation of remediation measures, and long-term monitoring in order to avoid further risks to human health and the environment.

3. The long-term environmental impacts of refugee influxes to FYR of Macedonia are considered to be minimal. UNHCR was largely successful at incorporating environmental considerations into most aspects of refugee operations and camp management. UNEP identified only minor instances of refugee-related environmental degradation that might have been avoided with a greater degree of environmental planning, management and integration with other sectors and government agencies. An issue that remains unresolved concerns the potential degradation of water quality in Rasce Spring. (For recommendations dealing with refugee management, see page 56).

4. The Government of FYR of Macedonia has taken significant strides toward developing its environmental protection capacities. The creation of the MEPP is a positive step. Government environmental responsibilities, however, need to be better coordinated, and the MEPP's funding base greatly improved. Environmental monitoring is insufficient and not adequately linked to public health. Enforcement of regulations is weak, and can be strengthened through the creation of a permitting system. (For recommendations dealing with institutional capacities, see page 60).

Acknowledgments

The UNEP assessment was entirely financed by The Netherlands with the support of the Stability Pact for Southeastern Europe. In addition, essential support in the planning and implementation of the project was provided by the UNDP, UNHCR, and the United Nations Economic Commission for Europe (UNECE). Special recognition must be given to the Resident Representatives and staff of the Skopje offices of UNDP and UNHCR, without whose guidance and logistical support UNEP could not have conducted this assessment.

The Government and citizens of FYR of Macedonia provided invaluable assistance to UNEP. The Ministry of Environment and Physical Planning deserves special thanks for its consistent spirit of support and expert advice. UNEP also received essential cooperation from many other ministries, authorities, non-governmental organizations and the industrial sector in FYR of Macedonia.

To all of its partners throughout the assessment, UNEP would like to express its deep gratitude.

Environmental context

Background

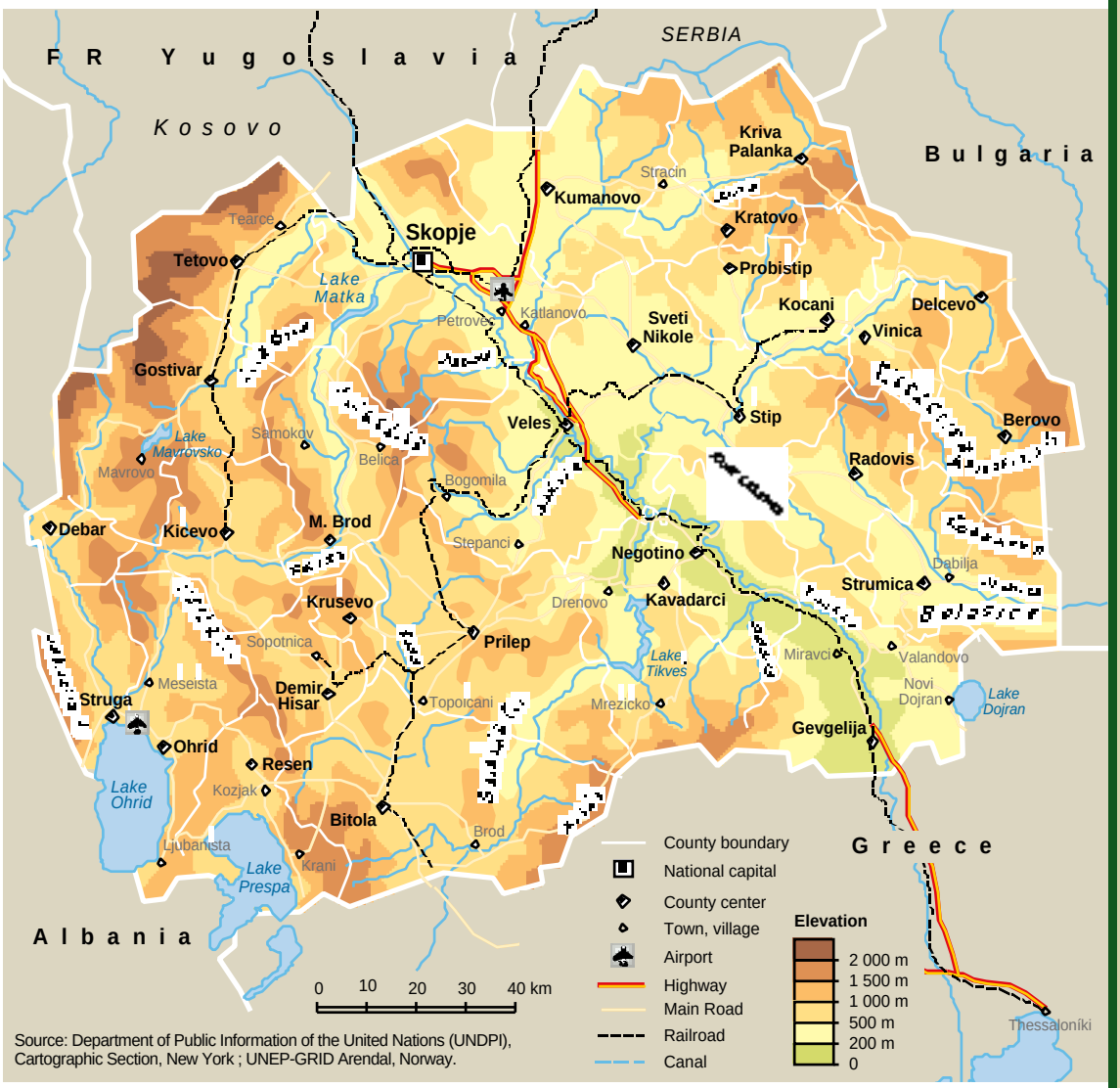
FYR of Macedonia is located in the central part of the Balkan Peninsula, bounded to the north by the Federal Republic of Yugoslavia, to the east by Bulgaria, to the south by Greece and to the west by Albania. The country's mainly mountainous territory covers a total area of 25,713 square kilometers. There are three large, natural lakes in the south of the country, well known for their scenic beauty: Ohrid, Prespa and Dojran. The population is approximately two million people, of which about 1.2 million, or 60 %, live in urban areas.

As a constituent republic of the former Socialist Federal Republic of Yugoslavia (SFRY), the economy of what is now FYR of Macedonia was subject to central planning during the period after World War II (WWII). What had been a largely agrarian economy prior to WWII, experienced dramatic industrial growth and urbanization. State-owned industries consumed raw materials and exploited energy sources at great expense to the nation's environment and natural resources. With little or no effective regulation, forests were cleared, pollutants were emitted into the air, soil and water, and waste was dumped into nearby water bodies or onto open land. In sum, short-term economic growth took precedence over environmental management and longer-term sustainable development.

In 1991 and 1992, several Yugoslav republics declared their independence. The disintegration of the Yugoslav common market aggravated economic conditions in the region. Industries began to reduce output, thereby lowering environmental stress to some extent. However, in FYR of Macedonia, as in neighboring countries, the basic, highly polluting industrial processes did not alter measurably, and even fewer resources were available for investment in environmental controls. At the same time, growing urbanization reduced air quality, increased pressure on water supplies, and further exacerbated waste treatment and disposal problems.

FYR of Macedonia remains in a period of transition. During the latter part of the 1990s, the national economy grew at a modest but steady pace, and growth continued in the first half of 2000. Prices have remained relatively stable, if high in certain sectors such as fuel and energy. The average monthly wage for citizens of FYR of Macedonia was approximately $170 USD during 1999, an increase of 3.3 % over 1998. Unemployment levels, however, have remained very high, averaging 36 % in 1997, and 34.5 % in 1998 and 1999. As a result, many families, particularly those in large, rural households, are living in conditions of extreme economic deprivation.

➤ Map 3 : FYR of Macedonia



Source: Department of Public Information of the United Nations (UNDPI), Cartographic Section, New York ; UNEP-GRID Arendal, Norway.

FYR of Macedonia is a multi-ethnic country. The culture, however, is in many ways divided. Strengthening the bonds among the country's communities remains a critical challenge for both the Government and civil society. In the field of environmental protection, it will be important to ensure the fair and equitable sharing of burdens and benefits.

The Environmental situation

In general, the environmental situation in FYR of Macedonia is comparable to that of other Central and Eastern countries. Within the framework of the centrally planned economies of the region's former socialist states, development was seen largely in terms of increasing production of the industrial and energy sectors. This resulted in the over-exploitation of natural resources and severe environmental degradation.

Up-to-date, systematic and internationally comparable State of Environment (SoE) reporting is new to FYR of Macedonia. The first official SoE report is currently being prepared by the MEPP for publication in 2001. FYR of Macedonia has, however, participated in cooperative projects with the European Union's 'Phare' Programme, the European Environment Agency (EEA) and UNEP to make up-to-date and comparable environmental information available via the internet (see http://www.soer.moe.gov.mk/).

In 1996, the Act on Environment and Nature Protection and Promotion (Act on Environment) was adopted. The Act requires the Government to create a National Ecological Plan, and municipalities to establish Local Environmental Action Plans (LEAPs). In 1997, the National Environmental Action Plan (NEAP) was developed with input from governmental and non-governmental representatives. At the time of writing, the NEAP remains the most comprehensive report available on the environmental situation in FYR of Macedonia. It provides an overview of economic policy and the environment; environmental conditions; environmental management and policy; and priorities for action.

The NEAP established the following national environmental policy goals for 1997-2001:

- air quality improvement;
- water quality improvement;
- biodiversity conservation, especially at Lakes Ohrid, Prespa and Dojran;
- renewal and preservation of forests; and
- strengthening the environmental management capacity of institutions responsible for monitoring and enforcement.

Other recently published overviews of the environmental situation in FYR of Macedonia include *The National Environmental Health Action Plan of the Republic of Macedonia*, published by the Ministry of Health of FYR of Macedonia in 1999, and the *Strategic Environmental Analysis of Macedonia*, published by the Regional Environmental Center for Central and Eastern Europe (REC) in June 2000. A comprehensive study on *Wastewater, Water Quality and Solid Waste Management in the FYR of Macedonia* was published in 1999 as a key element of a national water and waste strategy being developed with support from the EU's Phare Programme.

Smokestacks at HEK Jugochrom, Jegunovce

■ AIR POLLUTION

The NEAP rated air pollution "the most important environmental problem in the country." Half of the country's urban population (particularly in the cities of Skopje, Veles, Bitola and Tetovo) are affected by poor air quality. Pollution is caused mainly by industries (e.g., metallurgical plants, thermal power plants) and traffic. In addition to gases and particles containing sulfur dioxide, hydrocarbons, carbon oxides and nitrogen oxides, significant concentrations of heavy metals, such as lead, zinc and cadmium, are being emitted by some of these sources.

The Republic Hydrometeorological Institute (RHI) uses a network of 20 monitoring stations to measure air quality. In addition, the MEPP operates a monitoring system in Skopje that transmits data on an hourly basis to the Environmental Information Center, where they are sent directly to a public display. Various studies, in particular those conducted in Skopje and Veles, have shown that a large number of children in cities are suffering from respiratory diseases associated with air pollution. Reduction of emissions in Veles is one of the top priorities in the NEAP.

➤ Map 4 : River water quality in FYR of Macedonia

Source: Department of Public Information of the United Nations (UNDPI), Cartographic Section, New York ; National Environmental Action Plan, Synthesis Report, FYR of Macedonia, 1997.

■ WATER POLLUTION

The amount of wastewater receiving treatment in FYR of Macedonia is extremely low. There is only one official wastewater treatment plant in the whole country and it treats only a very small portion of the country's total discharges. Consequently, large parts of the country are affected by surface-water and groundwater pollution. The Vardar River, which supplies 75 % of the country's total water resources, is heavily polluted by untreated urban and industrial pollution. After passing through FYR of Macedonia, the river flows south into Greece, entering the Aegean Sea near Thessaloniki.

The principal sources of water pollution are the major cities and more than 130 industrial facilities throughout the country. Only three municipalities, Ohrid, Prespa, and Dojran, have wastewater treatment plants. Ohrid's, however, is the only one func-

tioning to capacity; the collector systems of the other two are not completed. The largest contributors of industrial pollution are the metallurgical, chemical and mining industries.

Surface water quality is monitored by the RHI, which maintains a network of approximately 60 measurement points throughout the country. An overview of river water quality, and the extent of pollution, is provided by Map 4. The surface-water monitoring network, for the Vardar and other rivers, is now being substantially modernized. Groundwater monitoring, however, was stopped in 1981 due to lack of financial resources.

■ SOLID WASTE

The existing regulations to control management of solid waste in FYR of Macedonia are inadequate. As a result, current practices are rudimentary and associated environmental problems clearly evident. There are approximately 25 known landfill sites around the country, almost all of which lack any environmental safety features. Many have been built in karst areas and pose significant risks to groundwater. The known landfills are, however, only the tip of a very large iceberg; the country is littered with casual waste disposal sites, particularly in rural areas. Solid waste is adversely affecting groundwater, surface water, soil and biodiversity throughout the country, including a number of protected areas, such as national parks.

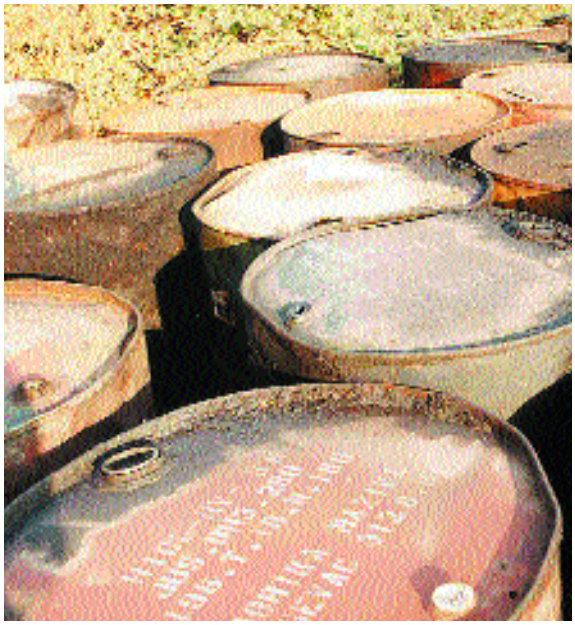
In addition to household waste, quantities of which are growing steadily due to changing consumption patterns, serious and widespread problems are arising from improper industrial and hazardous wastes. There is no nationally organized system for the collection, storage, treatment or disposal of industrial waste, and there is no

Illegal dumps along riverbanks near the city of Radusa

adequate legislation governing waste export to other countries. This is one of FYR of Macedonia's most serious environmental challenges. The current situation favors methods of waste disposal that are dangerous to the environment and human health. Furthermore, it is impossible to implement otherwise reasonable measures for reducing emissions to air, soil or water because the wastes that would be generated cannot be properly handled.

■ CHEMICALS

FYR of Macedonia has so far only introduced limited policy and legislative controls on the use, transport, storage and safe disposal of chemicals, including ozone-depleting substances, PCBs, pesticides and biocides. As a result of weak legislation, responsibility for this issue has not been allocated within the administration. The country is, however, a party to the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal (the Basel Convention).



Improperly stored chemicals at the Tane Caleski factory in Kicevo

In many countries, including parts of the former Yugoslavia, PCBs have been commonly used as insulating and cooling fluids in electrical equipment such as transformers and capacitors. At some of the industrial sites visited by UNEP, management was unaware of the potential risks associated with PCBs. While none of the limited number of fluid samples taken by UNEP revealed the presence of PCBs, the replacement and safe disposal of PCB-containing fluids may be an issue in some of FYR of Macedonia's industrial sites.

■ BIODIVERSITY AND LAND ISSUES

FYR of Macedonia has rich and varied flora and fauna and benefits from outstanding mountain and lake landscapes. There is high potential for the future development of environmentally sound tourism, and care will be needed in the development of other economic sectors, particularly agriculture and transport, to ensure that biodiversity and landscape values are not damaged.

Lakes Ohrid and Prespa have gained attention through their designation as wetlands of international importance under the 'Ramsar' Convention on Wetlands.

➤ Map 5 : Nature conservation in FYR of Macedonia

Source: Department of Public Information of the United Nations (UNDPI), Cartographic Section, New York ; National Environmental Action Plan, Synthesis Report, FYR of Macedonia, 1997.

Both lakes are shared with neighboring countries: Lake Ohrid with Albania, and Lake Prespa with Albania and Greece. Lake Ohrid has been the subject of a World Bank/GEF project, and a major transboundary initiative for the conservation and sustainable use of Lake Prespa has recently been launched. A third large, natural lake, Lake Dojran, has experienced excessive fluctuations in water level due to overuse for irrigation and low rainfall. The water loss has seriously affected the aquatic biodiversity of Lake Dojran.

Forest areas cover approximately one-third of FYR of Macedonia's area. Forest management is slowly shifting to sustainable methods, but clear-cutting remains the dominant method of timber harvesting. According to the NEAP, 38 % of FYR of Macedonia is classified as 'seriously eroded'. This is due mainly to overgrazing, deforestation and poor arable farming practices. The annual soil loss has been estimated at 17 million m^3. Rehabilitation of eroded areas is accorded high priority under the NEAP.

Principal industrial 'hot spots' investigated by the mission

Overview

During the week of 10-17 September 2000, a subgroup of the UNEP mission visited those industrial sites that appeared most likely to be 'hot spots'of environmental concern. The choice of sites was based on information gathered in advance, in close consultation with national experts. This chapter summarizes the main findings of the subgroup, whose full report is available online (http://balkans.unep.ch).

The mission's itinerary included facilities from each of the country's principal industrial sectors. Altogether, ten sites were visited. At each location, the UNEP team met with company representatives to discuss the plant's processes and environmental challenges. These meetings were followed by site inspections, during which UNEP experts took samples of water, soil, and air, as appropriate. Wherever possible, the team also met with local officials and stakeholders.

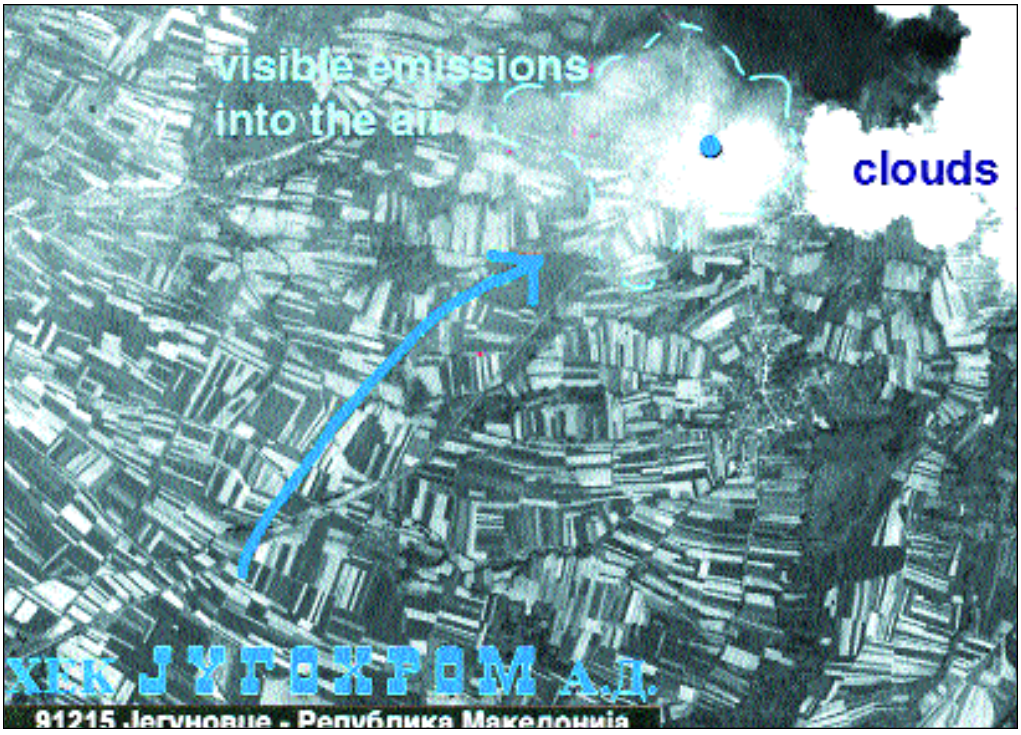
UNEP determined that five of the ten sites investigated should be considered environmental 'hot spots'. Each of these locations has serious problems that pose immediate risks to the environment and human health and require urgent remedial action. Corresponding recommendations are to be found in Chapter 7. Shortcomings in the handling and disposal of chemicals, contaminated sludge and other hazardous wastes reflect the general lack of appropriate facilities within FYR of Macedonia. It is clear that major investments are required to address these issues and that most, if not all, of the companies visited currently lack access to the technical and financial resources required.

Ferro-alloy plant at Jegunovce ('HEK Jugochrom')

Summary of key issues:

- Groundwater is severely contaminated by chromium, and there is a need to review and improve ongoing remediation measures. The production shed where chromium was used has not been cleared of chromium and secured.
- Furnaces generate significant air pollution, and a proposal to address the problem is not funded.
- A landfill containing chromium slag is reportedly polluting the Vardar River and may be endangering Rasce Spring, the source of Skopje's drinking water supply.

Established by the government of the former SFRY in 1952, the HEK Jugochrom plant at Jegunovce currently produces over 60,000 tons per year of ferro-alloys (e.g. ferrochrome, ferrosilicon) using raw materials such as coal, quartz, ferrous iron, and chromium ore. The company employs some 2,000 workers.



IRS-C satellite image of May 27 1999, depicting air emissions at HEK Jugochrom

(Source: Courtesy of the ENVIREF programme under the Nansen Environmental and Remote Sensing Center (NERSC) in Bergen, Norway and UNHCR.)

Improperly stored hexavalent chromium compounds at HEK Jugochrom

In 1982, the plant began monitoring soil and groundwater. Data confirmed that surface water and the upper secondary aquifer had been contaminated by chromium. Nevertheless, the plant continued to produce chromium and chromium compounds until 1993. The UNEP mission confirmed that soil and groundwater in the Jegunovce area had been contaminated, largely as a result of improper handling of material containing chromium salts and the dumping of solid waste containing chromium into a landfill near the Vardar River.

UNEP further concluded that a plan initiated in 1990, to treat contaminated groundwater from the upper secondary aquifer, requires revision. Chromium is not being removed completely from the water, but rather converted from hexavalent chromium – Cr (VI), to trivalent chromium – Cr (III). The treated water is then discharged into the Bistrica River, which drains to the Vardar. Under certain chemical conditions, Cr (III) can be reconverted to Cr (VI), which is classified as a human carcinogen. According to the plant's management, concentrations of chromium in the groundwater have been reduced from about 50 mg/l to about 12 mg/l (in line with a UNEP sample, which showed a level of 12.2 mg/l). The plant's remediation goal is a concentration of 1.0 mg/l. By way of comparison, however, the target and intervention values for drinking water in The Netherlands are 0.001 mg/l and 0.03 mg/l.

The plant uses an on-site landfill to dispose of chromium slag and other waste. The NEAP states that the landfill contains 466,000 tons of ferrochromium slag and 385,000 tons of chromate sediment. According to studies carried out with support from the EU's Phare Programme, pollution from the landfill is contaminating the Vardar River and posing a potential risk to Rasce Spring, the main source of water supply for metropolitan Skopje.

This facility is also a significant air polluter. The NEAP reports that, in the vicinity of the HEK Jugochrom plant, standards for total dust, black smoke and particle-borne chromium have been exceeded in past years. While current data were not made available to UNEP, the plant managers stated that no health effects on the local population or workers have been reported. The plant has three large electric furnaces and six smaller ones. An air quality monitoring station is situated near the plant. Dust concentrations in the flue gases were reported to average 3 - 6 g/m^3. With gas flows averaging 312,000 m^3/hour from three of the four furnaces, annual dust emissions can be assumed to average 9,000 to 17,000 tons.

The plant managers presented a project proposal that would cool flue gases enough to enable the use of bag filters to collect dust emissions. If funded, the project would reduce emissions to 30 mg/m^3. An additional claimed benefit of the project is that it would reduce the energy consumption of the three largest furnaces by 25 %. The proposal does not address the emissions from the smaller furnaces.

Organic chemicals plant, Skopje (OHIS A.D.)

Summary of key issues:

- Air, soil and groundwater contamination is being caused by 10,000 tons of technical mixture of HCH isomers stored in concrete basins for 20 years.
- Large quantities of other improperly stored hazardous materials are being emitted into the environment.
- Untreated wastewater is flowing into the Vardar River.
- Sulfur dioxide concentrations in flue gas exceed allowable limits.

Organochlorine waste dumpsite at OHIS A.D.

The Organic Chemical Industry of Skopje (OHIS A.D.) was founded in 1964. It manufactures a variety of chemical products, including plastics, detergents, polyacrylic fibers, plant protection agents, cosmetics, basic chemicals (e.g., chlorine, hydrochloric acid), pharmaceuticals, and process equipment. Several aspects of the OHIS A.D. facility raise strong environmental concerns. Approximately 10,000 tons of hazardous chlorinated organic chemicals (technical mixture of HCH isomers) have been stored on site in several concrete basins for the last 20 years. No detailed investigation or monitoring of the site has been carried out. Management assumes that the waste was stored in steel barrels and simply covered with soil.

One basin examined by the assessment team was approximately 100 meters long, 50 meters wide and several meters high. It was constructed without a drainage system for collecting percolating liquids and without a cover to prevent leaching. If barrels were used for storage, it is likely that they have corroded. The area around the basin smelled of chlorinated compounds. It is possible that these compounds contain persistent bioaccumulating substances. In addition, waste is likely to be contaminating the soil used to cover the storage site, and is probably leaching into the groundwater beneath and around the basins. There is a serious threat of major groundwater pollution.

The one million square meters industrial complex is situated in the former floodplain of the Vardar River and there is probably hydrological contact between the upper groundwater aquifer and the river. If so, contaminated groundwater from the OHIS A.D. compound is very likely to be polluting the Vardar.

The absence of a proper industrial and hazardous waste treatment facility in FYR of Macedonia has led OHIS A.D. to store its waste on site. The stores are old and in bad condition, due mainly to poor construction and inadequate maintenance. Management was unable to specify the types and quantities of these wastes, but the overall volume is reported to be in excess of 160,000 m^3 per year. The lack of proper collection, treatment and safe disposal of these wastes is undoubtedly causing significant pollution of the environment.

Wastewater flows partly through closed concrete canals, but these are cracked and leaking waste to the soil and groundwater. The newest part of the plant is connected to a wastewater facility for treatment prior to discharge into the Vardar River. The treatment plant, however, is not functioning at present. Other parts of the plant, such as the now-closed chlorine-alkali-electrolysis process, have never been connected to the treatment plant. This factory reportedly used two tons of mercury per year, causing mercury-laden wastewater to drain into the Vardar River. Management stated that eight tons of mercury remains stored at the plant. UNEP surface-water samples taken from a small wastewater canal close to the former chlorine-alkali-electrolysis plant did not show excessive levels of pollutants. Several phtalates were identified in the water sample but generally only at levels of about 0.5 mg/l. Mercury was analyzed in one water sample, giving a concentration of about 65 mg/l, some 10 times over the limit value for drinking water but below limit values for natural waters. The lead concentration (500 mg/kg) in one soil sample was above the threshold value for normal soil in many countries but not over the threshold values generally applied for soil at industrial sites.

The OHIS A.D. complex also generates air pollution, principally from an oil-fueled power plant. Data supplied by management suggest that the plant emits approximately 2,240 tons of sulfur dioxide, 315 tons of nitrogen oxides, and 15 tons of dust per year. The sulfur dioxide concentration in the flue gas, at 2,220 mg/m^3, exceeds the applicable 1,700 mg/m^3 emission standard. An acrylic fiber plant within the complex is an additional source of concern regarding emissions.

Lead and zinc smelter, Veles ('MHK Zletovo')

Summary of key issues:

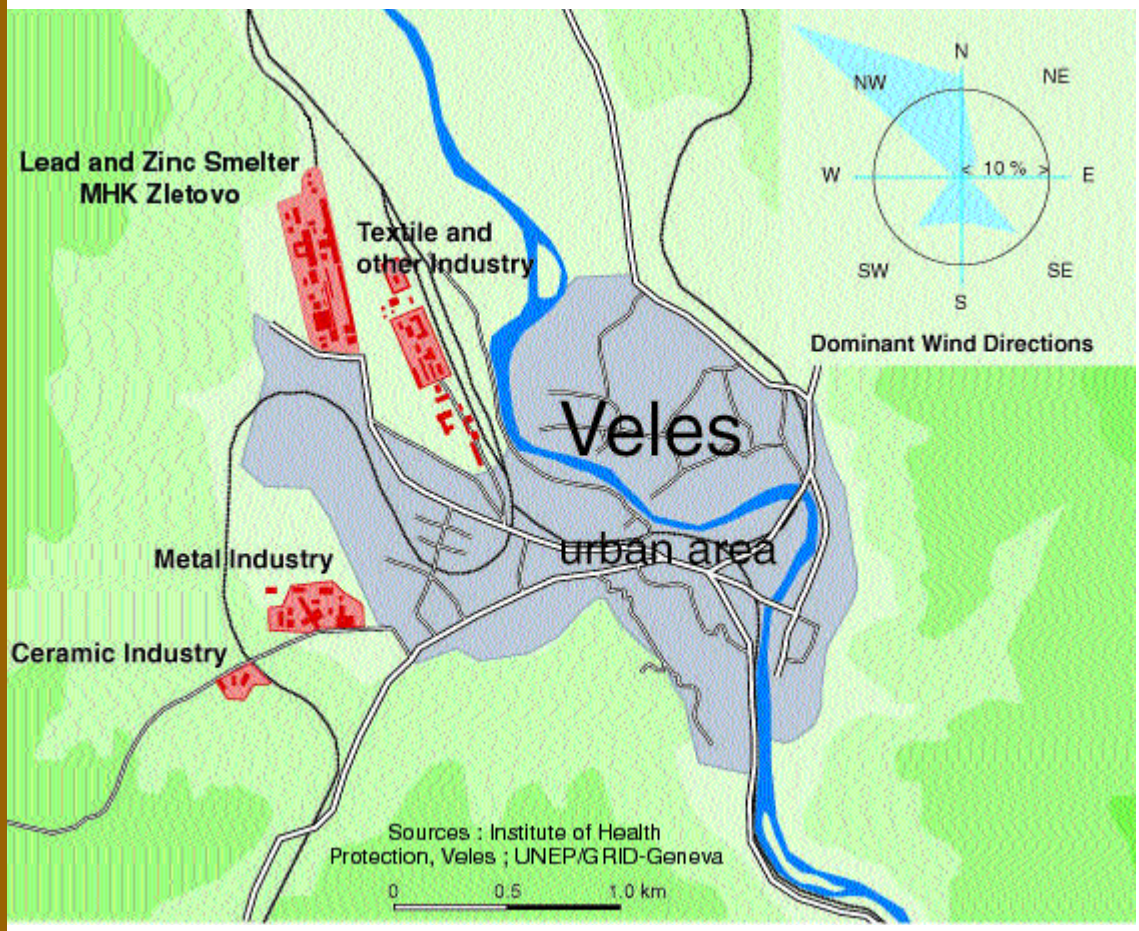
- Sulfur dioxide, particles and metals from the smelter have been linked to illnesses among workers and citizens in the Veles area.
- Soil and groundwater is probably being contaminated by a dumpsite containing over 850,000 tons of solid waste.
- Untreated wastewater containing lead, zinc, cadmium and sulfuric acid is being discharged into the Vardar River.

Established in 1973, MHK Zletovo is a lead and zinc smelter employing 1,100 workers. Each year it uses lead and zinc concentrates to produce 30,000 tons of lead, 60,000 tons of zinc and 250 tons of cadmium, as well as smaller quantities of silver,

gold and copper dross, and bismuth alloy. The process produces 100,000 tons per year of sulfuric acid as a by-product. The same company also owns and operates a nearby fertilizer plant.

The smelter emits into the atmosphere large quantities of sulfur dioxide, and dust bearing lead, zinc and cadmium. The air outside the factory smells heavily of sulfur dioxide and caused immediate respiratory reactions among UNEP team members. In addition, raw materials, including coke for the smelter's furnaces, are stored in an open field. Transportation of these materials and wind spread dust around virtually the whole of the plant's 15,000m^2.

➤ Map 6 : Location of lead and zinc smelter in relation to Veles



The NEAP states that, as of 1985, the plant was emitting concentrations of lead, cadmium, and zinc in dust over 100 times greater than control limits. According to data provided by national and local experts, the smelter emitted approximately 11,000 tons of sulfur dioxide, 2,000 tons of lead and 50 tons of cadmium in 1995. A 1999 study by the Veles Institute for Health Protection, however, found that total emissions were far larger than those originally estimated for 1995.

MHK Zletovo and the Republic Hydrometeorological Institute monitor air quality in the city of Veles. The factory is situated in a valley close to residential areas of the city, and wind directions tend to carry factory emissions toward Veles. The two existing monitoring stations, however, are poorly positioned and do not provide timely data that could be used to manage episodic risks to public health. With inadequate data, appropriate enforcement actions and public health protection measures are most often not available to local authorities.

According to recent studies, emissions are having a significant impact on the health of the population. Health effects are described in the study of Petrova and Ristova (1999) and reported in the NEAP (1997). Increasing morbidity, especially from respiratory diseases, and frequent occurrence of lung cancers and anemia, have been noted in the local population and among factory workers. Children are especially affected. Workers have been observed to have experienced blood in urine, suggesting possible kidney disease. They have also had elevated concentrations of lead and cadmium in blood relative to control populations.

Although the smelter is undoubtedly polluting the groundwater beneath it, the major source of soil and groundwater contamination is the disposal of more than 850,000 tons of solid waste containing heavy metals. This waste is deposited at a dump approximately one kilometer from the smelter. There has been no detailed investigation or monitoring of soil or groundwater contamination in the area, including private wells located downstream. Nevertheless, it is very likely that groundwater and nearby areas are being contaminated with heavy metals as a result of percolate from the dump. Due to the direction of groundwater flow, the private wells are probably being affected.

Wastewater containing sulfuric acid and other pollutants is also a source of serious concern. MHK has a treatment plant that was designed to treat 135 m^3 of effluent per hour. The plant, however, generates 1,500 m^3/hour of wastewater. Analytical data from regularly monitored streams indicate that the effluent consistently exceeds maximum concentration levels for lead, zinc and cadmium. The wastewater is discharged into the Vardar River.

The NEAP reported that cadmium, lead and zinc levels were 10-15 times higher in vegetables grown in Veles relative to control regions. As much as 4 to 10 times the acceptable levels for lead and cadmium were found in spinach and lettuce due to soil contamination.

Smelter at MHK Zletovo, Veles

Company management is participating in an initiative sponsored by UNDP and is working with the municipality of Veles, local authorities and other stakeholders in support of a Local Environment Action Plan (LEAP) for Veles. The plant has also received support from the EU's Phare Programme, as well as from The Netherlands, Czech Republic and elsewhere. A cleaner technologies training program is also working with plant management. According to management, investments in a new coal oven and new bag filters have improved emission levels. A proposal to reconstruct the smelter's wastewater treatment plant has been prepared but not financed.

Zinc and lead mine, Probistip ('Rudnici Zletovo')

Summary of key issues:

- Contaminated wastewater from the mine and concentration plant is being discharged into nearby rivers without treatment.
- There is a risk that tailings from the flotation process are contaminating soil and groundwater.
- Ore dust is harming the health of workers and poses a risk to the citizens of Probistip.

The Rudnici Zletovo mine in Probistip has existed since prior to World War II. Its 1,500 workers currently produce about 1,000 tons of zinc concentrate and 800 tons of lead concentrate per day, around half the mine's 1987 production level. The metals are extracted from mines 2.5 kilometers north of the company's concentration plant. According to management, 30 l/minute of acidic water used to settle

dust in the mine flows directly into a small nearby river, along which private drinking wells are located. The wastewater contains cadmium and other pollutants.

There is no wastewater treatment at the plant. Approximately one million cubic meters per year of wastewater contaminated with heavy metals and cyanide is pumped from the concentration plant into the Koritnico and Kiselia Rivers without cleaning or neutralization. According to the company's observations and analyses, there is little life in the rivers and high levels of heavy metals have been found in fish and other biological samples.

The flotation proccess uses xanthates, cyanides, metal sulfates, pine oil and lime to produce lead and zinc concentrates. Solid waste from the process contains zinc, lead, cadmium and cyanide. The waste is deposited at two different sites. The first is an old hydro-tailings area built on top of the Kiselia River on the outskirts of Probistip. The second is a new hydro-tailings sedimentation basin and dam built in a valley close to Probistip. This valley also drains to the Kiselia River, which, in turn, flows into the Zletovska River, a tributary of the Vardar.

UNEP expert sampling stream water near Rudnici Zletovo mine, Probistip

The company has not investigated or monitored likely soil and groundwater contamination in areas influenced by the mine, the concentration process, or the hydro-tailing disposal sites.

Substantial numbers of mine workers suffer from pulmonary diseases and other occupational health problems. Local citizens have complained to the plant management about the dust created by ore crushing.

Thermal power plant, Bitola ('REK Bitola')

Summary of key issues:

- The power plant emits high levels of sulfur dioxide.
- Dust containing heavy metals, including uranium compounds, is emitted from the plant's dumpsite and mine, and is affecting human health.
- Heavy metals in the fly-ash dumpsite are likely to be contaminating soil and groundwater and draining into a nearby river. The river supplies water to local inhabitants for drinking and irrigation.
- Untreated process wastewater containing heavy metals and dissolved oil also drains into the river via an open canal.

REK Bitola operates a 25-year old thermal power plant and an adjacent lignite mine. The power plant generates 75 % of FYR of Macedonia's annual electricity requirements and employs approximately 700 workers. The mine employs 1,400 workers and supplies the power plant with 6.5 million tons of fuel per year. The lignite is relatively low in sulfur (approximately 0.5 %) and produces 13-17 % ash.

The power plant's electrical precipitators (or dust filters) are old and do not work well. Similarly, its emission monitoring system only functions properly about half of the time. According to management, however, the plant's three units emitted 46,000 tons of sulfur dioxide and 2,400 tons of fly ash to the atmosphere in 1999. Average sulfur dioxide emissions of 1,600-2,000 mg/m^3 are four to five times greater than the permissible limit of 400 mg/m^3. Average 'best case' dust emissions of 100 mg/m^3 are double the permissible limit. The plant's smokestacks are 256 meters high, which should limit the plant's contribution to air pollution in its immediate vicinity.

The power plant produces 150 tons of fly ash and five tons of slag daily. The fly ash and slag contain silicate and heavy metals, including uranium compounds. The ash and slag travels by conveyor belt to a very large dump (97,630 m^2, receiving 1.5 million tons of waste per year) close to the plant. In cooperation with MEPP, the company has planted 100,000 acacia trees in the vicinity of the dump in an attempt to abate dust emissions. Estimates of fugitive dust emissions from the dump and the mine were not available.

The company monitors air quality at three sites located a few kilometers from the plant. The assessment team investigated a monitoring site in the village of Dedebalchi, where sulfur dioxide and black smoke are sampled on a daily basis. Dust is also measured, using non-standard equipment.

Adverse effects on the health of REK's workers have been documented. Management stated that 250 mineworkers and 150 plant staff have chronic work-related illnesses. The pulmonary function status of people in villages less exposed to REK emissions have been observed to be better than among populations living nearer to the plant.

Heavy metals, including uranium compounds, from the fly ash dumpsite are probably contaminating soil and groundwater downstream of the dumpsite. The upper aquifer is believed to drain to a nearby river. Private wells along the river downstream of the plant provide local inhabitants with water for drinking and irrigation.

Fly ash dumpsite of REK Bitola

The plant does not have a wastewater treatment plant. Water required for industrial use is taken from an artificial lake and, after use, is passed through an oil separator and two neutralization basins. However, due to the oil separator's limited capacity, free phase oil is discharged to the neutralization basins and then into the river via an open canal. The discharge of untreated wastewater containing oil compounds and heavy metals poses a risk of soil, groundwater and drinking water contamination in the vicinity. This issue is not currently being investigated or monitored.

The UNEP mission noted that excess heat from the power plant is currently being disposed of in cooling towers, but could be harnessed to provide domestic heating to the nearby town of Bitola.

Other industrial sites visited

This chapter includes information about the five additional industrial sites visited by UNEP. While these locations appeared to be of less immediate concern than the 'hot spots' identified in Chapter 3, each is nevertheless faced with significant environmental management problems. These require serious intervention if they are not to reach crisis point in the future.

Landfill site, Drisla, near Skopje

Drisla landfill was established in the mid-1990s for the disposal of municipal waste from Skopje. Located in a depression created by gravel extraction, the facility covers approximately 75 hectares. Its planned capacity is approximately 26 million cubic meters, only 4 % of which has so far been used.

UNEP experts concluded that the site is well managed and has the potential to serve as a model for future landfills in FYR of Macedonia. Nevertheless, plans to install an impermeable lining to prevent possible groundwater contamination have not yet been realized, and a partly-constructed system for collection of gas has not yet started to work properly because the production of gas is still low.

Incoming waste is weighed at the landfill entrance, and a visual estimate is made of its composition. Industrial or hazardous waste is forbidden. A recently constructed medical waste incinerator is not being used because producers of medical waste are unwilling to pay incineration fees. Consequently, medical waste is mixed-in with general waste. It is unclear how effective the current system is in ensuring that other forms of hazardous waste do not enter the site.

There are no up-to-date statistics on waste composition. In 1997, the NEAP reported that typical municipal wastes contain 25% ash and construction wastes, 24% paper, 20% food, 11% plastic, 5% glass and porcelain, 4% textiles and leather, 3% metal and 8% miscellaneous waste. The proportions of organic and plastic waste seem

to have increased considerably since that time, no doubt due to changing consumption patterns.

The landfill area consists of permeable sand and gravel deposits. No special construction measures, however, were taken to prevent possible percolation of leachate into the upper and lower aquifers. The upper aquifer drains to the river system and, downstream of the landfill, supplies water for drinking and irrigation. There are six monitoring wells within the site, and regular samples of river water are taken downstream. Four basic leachate parameters are monitored once a month, but the analyses do not cover hazardous, water-soluble organic and inorganic components.

Drisla landfill

During the UNEP mission, surface water samples (one taken from a pool beside the landfill, another from the Markovo River – a tributary of the Vardar – about 2.5 kilometers downstream of the site) were analyzed for hazardous organic and inorganic pollution. These samples showed organic compound contents of 10 mg/l, a level typical of organic waste in landfills. The level of organic compounds recorded in the Markovo River is a potential risk to human health in the area, though there are likely to be other sources of contamination in addition to Drisla landfill. For example, the city's former dump next to the Vardar River remains partly in use, and runoff from this site goes directly into the river.

Fertilizer factory, Veles ('MHK Zletovo')

The fertilizer plant uses the sulfuric acid from the MHK Zletovo smelter (see Chapter 3) and phosphate from Morocco to produce phosphoric acid and, in turn, mono-ammonium phosphate (MAP) and NPK fertilizer. The plant is currently working at 50 % of capacity and producing about 60,000 tons of fertilizer per year.

UNEP experts found that the production process was inefficient. Careless handling of raw materials and products is causing severe dust problems in the vicinity of the plant. Some areas are covered by deposits of up to several centimeters. Data on air quality and the amounts of dust emitted were requested, but not received.

According to studies carried out with support from the EU's Phare Programme, the plant's wastewater loadings of phosphorus and nitrogen are equivalent to those that would be generated by population centers of 4.6 million and 0.4 million people, respectively. Some diffuse soil and groundwater contamination can be expected on and around the plant facilities due to the use of impure raw materials containing heavy metals.

For each ton of phosphate produced, 5.5 tons of gypsum waste is generated. A mixture of 20 % gypsum and 80 % acidic process water (pH 2 – 3) is pumped to a special landfill that currently holds five million tons of gypsum waste. This waste was formerly deposited in the bottom of the valley, and sludge used to float directly into the Vardar River. It is now being deposited in the upper part of the valley, thereby reducing the direct risk to the Vardar. However, wastewater from the sludge dewatering process continues to drain into the river, and sludge can still be flushed into the river in flood conditions.

Copper mine, Radovis ('Buchim S.C.')

Buchim S.C. – Radovis, the only copper mine in FYR of Macedonia, has been operating since 1979. In 1999, it was 82 % Government owned and had approximately 800 employees. The mine produces about four million tons of ore per year and a similar quantity of tailings.

Concentration of copper, gold and silver is achieved through a flotation process using sodium- and potassium-

alkyl-xanthates, sulfuric acid and a bacterium (*Bacillus ferrooxidacae*). Cyanides were formerly used in the flotation process, but this practice ceased 15 years ago.

Each year, the mine pumps more than 70,000 tons of solid waste containing heavy metals from the flotation process to a large dam in a nearby valley. Dust from the 30-hectare hydro-tailings dam blows toward the nearby village of Polnica. Because many of the mineworkers have joint ailments and silicosis due to dust inhalation, adverse health effects can also be expected among local citizens. In efforts to abate the dust, trees have been planted and a polymer has been applied to a four-hectare area. However, there is no regular air monitoring at present.

Hydro-tailing dam near Buchim S.C. mine

There are two sources of contaminated water discharges into the environment: the flotation plant and the sedimentation lake. Wastewater from the flotation plant, containing large amounts of copper, is released into a stream from which cattle drink. The discharge occurs at the rate of 10 liters per second. The bottom of the stream is covered with a bluish layer resembling malachite (copperhydroxycarbonate). There is no wastewater treatment facility at the plant, although there are plans to construct one when resources permit.

Wells in the valley downstream of the tailings dam are regularly monitored. The copper content of the wastewater is also regularly monitored. According to the mine management, the concentration of copper in the water is increasing. Surface water and sediment samples taken during the UNEP mission clearly document environmental contamination with heavy metals. Analyses showed values for copper concentrations in the range 50-200 mg/l, as much as 50,000 times higher than the surface water quality standard in Germany. The Dutch target and intervention values for copper in groundwater are 0.015 mg/l and 0.075 mg/l, respectively. The samples also showed contamination with organic components in the range 0.5-10 mg/l.

Metal resurfacing factory, Kicevo ('Tane Caleski')

Tane Caleski, a screw, wire and metal resurfacing factory, was established in 1967. Its capacity is more than three times greater than its present annual production level of 1,500 tons. The plant currently employs about 350 workers.

Several hazardous chemicals (mineral acids, cyanides, cutting emulsions, and salts of chromium and zinc) are used for surface treatment. The plant's wastewater contains sulfuric acid, hydrochloric acid, nitrogen hydroxide, detergents, chromium III, zinc, and other heavy metals. In addition, an estimated 25 % of the 4.5 tons of oil components used monthly in production are lost to the environment, probably including groundwater.

Production processes, Tane Caleski, Kicevo

Construction of a wastewater treatment plant began in the 1980s, but was never completed. Wastewater is theoretically pre-treated in a sedimentation and pH-neutralization basin. The sedimentation basin, however, has never been emptied and is now completely full. Consequently, all wastewater, which is likely to be contaminated with heavy metals, especially zinc, is discharged into the canal without any pre-treatment or sedimentation. The canal water drains to the Vardar River and probably into the upper groundwater aquifer. The plant has not monitored or investigated the potential contamination of soil and groundwater in the vicinity.

The UNEP mission found that an area of about 50 m^2 was contaminated with oil, suggesting that oil-handling procedures should be improved. The upper groundwater aquifer is likely to be affected by this spillage.

Lojane mine

The Lojane mine, north of Kumanovo, was open almost continuously between 1923 and 1979. During the mine's first thirty years, chromium was extracted. In 1954, the mine began to extract antimony, and in 1965 an antimony smelter began operation at the site. According to the MEPP, an open dumpsite for flotation waste created by the mine holds over one million tons of tailings containing arsenic, antimony, and other hazardous substances.

UNEP sampling at Lojane mine

The UNEP mission paid a brief visit to the Lojane mine. A soil sample taken at the edge of the dump found 8,093 mg/kg of arsenic, over 50 times greater than the German threshold for arsenic in industrial soil. The dump is at the edge of a road regularly used by local people. Residents stated that wind blows landfill dust into the ambient atmosphere.

Further investigation, needed immediately, could reveal that Lojane is an environmental 'hot spot'.

Managing the Kosovo refugee crisis: environmental consequences

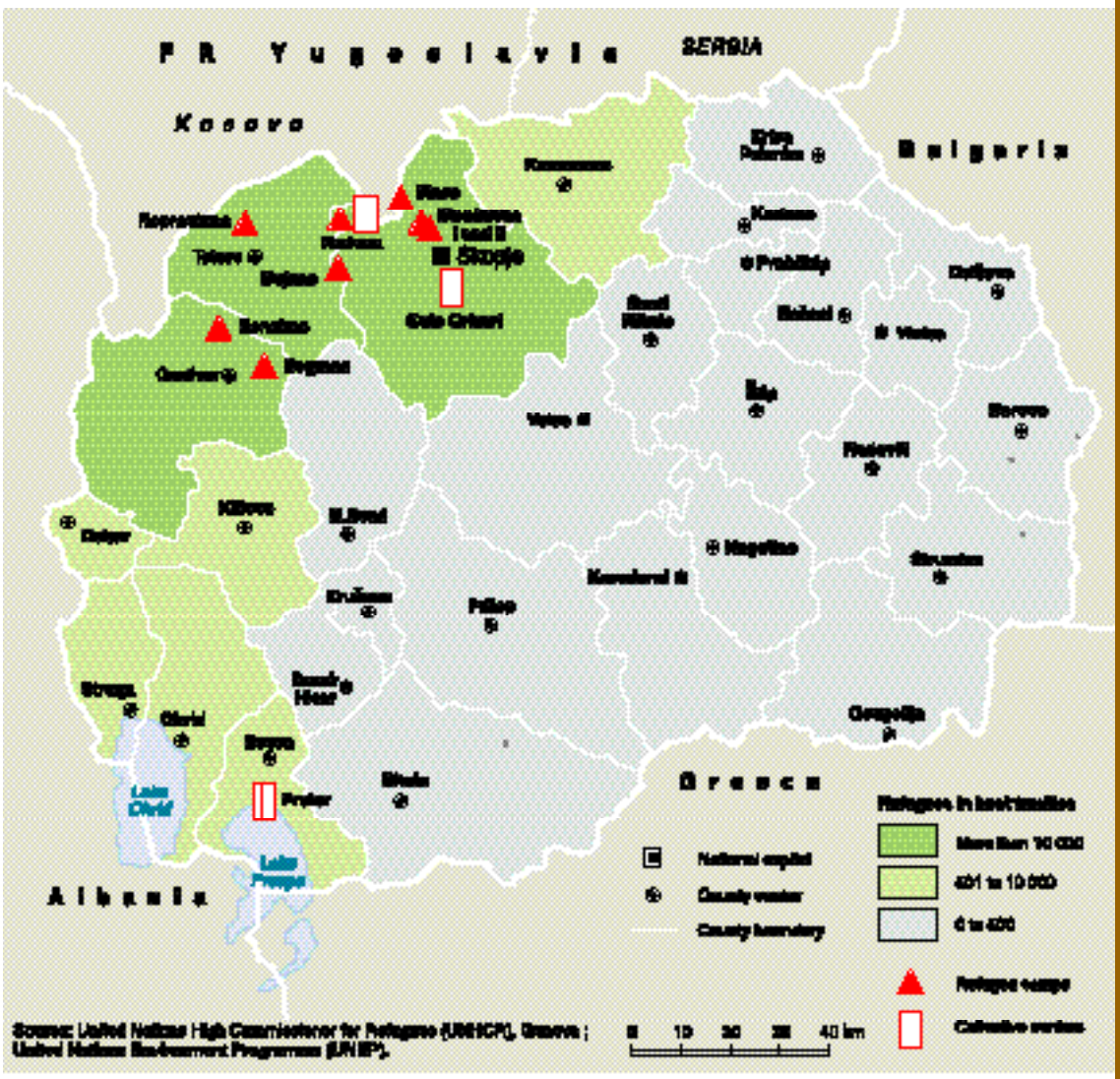
Background to the crisis

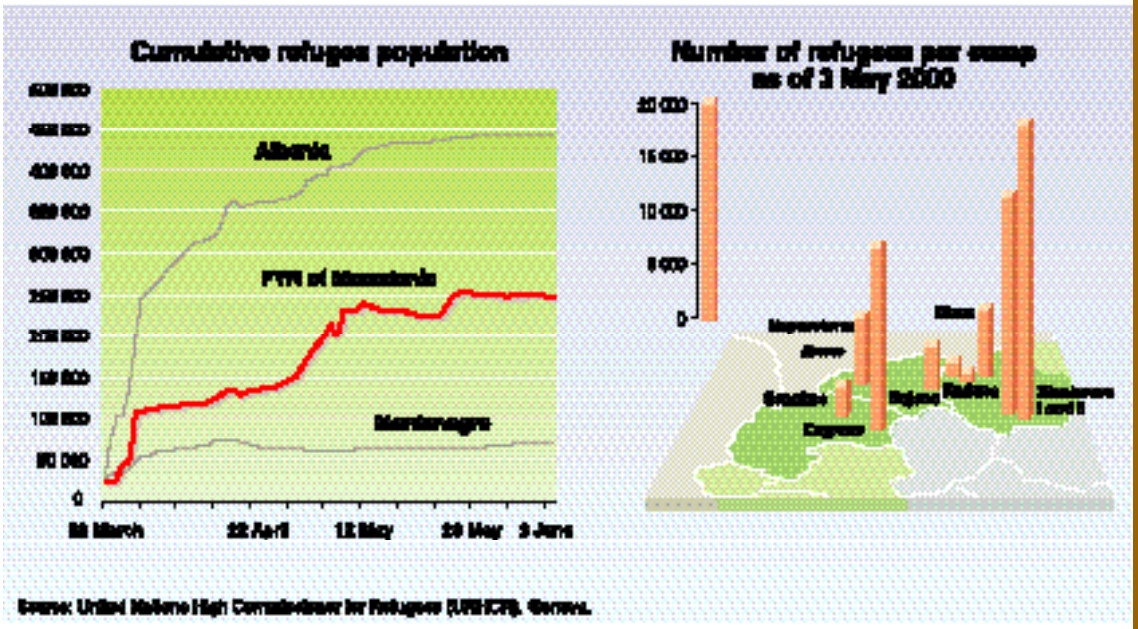
Refugees began arriving in FYR of Macedonia in March 1998 to escape conflicts occurring within the province of Kosovo, in the Federal Republic of Yugoslavia (FRY). By the end of the year, approximately 3,000 refugees had arrived. By February 1999, numbers had risen to 10,000.

Stenkovec I refugee camp

On March 24 1999, the Rambouillet peace talks having broken down, NATO commenced air strikes against FRY. Virtually overnight, hundreds of thousands of refugees fled to neighboring countries including FYR of Macedonia, Albania, Montenegro and Bosnia & Herzegovina. The sudden influx of new refugees posed a formidable relief challenge to FYR of Macedonia and the international community.

➤ Map 7 : Distribution of refugees in FYR of Macedonia
➤ Tables 1 & 2 : Cumultative refugee populations; Number of refugees per camp





Although FYR of Macedonia made efforts to receive the initial influx, the country's resources were inadequate to cope with what had become a crisis. In addition to the scale of the logistical challenges involved, concerns existed that further refugee influxes might cause ethnic destabilization. As a result, all decisions concerning refugee accommodation were made by the Office of the President, the Office of the Prime Minister, the Ministry of Interior, and the Ministry of Urban Planning and Construction. Absent from this process were representatives of environmental authorities, non-governmental organizations (NGOs), inter-governmental organizations (IGOs) and municipal authorities.

The Government chose to accommodate refugees with host families and in tented camps and collective centers. Facilities were located mainly in regions where people with Albanian heritage formed the majority of the population. UNHCR was the lead United Nations agency for providing assistance and support to the Government. Agreements with key ministries, international donor and multilateral agencies, NGOs and NATO forces further facilitated refugee protection and care.

The population of refugees in FYR of Macedonia peaked in June 1999, at which time humanitarian aid had been extended to some 261,000 refugees. According to UNHCR, approximately 57 % of these refugees stayed with host families, 42 % lived in eight tented camps, and less than 1 % were housed in collective centers. An additional 92,000 refugees were airlifted to 29 host countries, and 1,300 were transferred to camps in Albania.

On June 3, 1999, after more than two months of intensive air bombardment, FRY agreed to an international peace plan and the withdrawal of its military forces from Kosovo. On June 10, 1999, following further negotiations, NATO suspended its military operations, and the United Nations Security Council adopted Resolution 1244, the Kosovo Peace Plan. With the Kosovo conflict ended, the refugees began to return home.

The environmental dimension of the refugee influx

In the context of a conflict, the provision of refugee relief is the first and foremost priority. In the wake of refugee influxes, however, it is worthwhile to examine their impacts on the environment and to understand whether lessons for the future can be derived. In this regard, the Government and the international community met the basic needs of some 261,000 people, an overwhelming success in the provision of emergency relief. In spite of the time and pressure posed by the influx, UNHCR took several progressive measures to ensure protection of FYR of Macedonia's environment. Undoubtedly, the success of these measures is to some degree reflected in the fact that impacts to FYR of Macedonia's environment were found to be minimal.

Nevertheless, after the Kosovo conflict ended, concerns were raised that the refugees may have placed a heavy and lasting burden on the country's infrastructure for environmental management. As a result, one of the key aims of UNEP' mission was to determine the overall environmental impacts of the refugee influx and to consider what steps can be taken to further integrate environmental protection into future refugee operations. The observations and conclusions of the mission follow. General and site-specific recommendations are contained in Chapter 7.

■ SOLID WASTE

Subsequent to a significant refugee influx, vast quantities of solid wastes are inevitably produced, with excessive packaging of food aid and other basic goods being the principle cause. The successful management and disposal of such wastes depends largely on the waste management infrastructure of the host country.

Illegal waste dump in Bojane

During the crisis in FYR of Macedonia, solid wastes generated by refugees were managed in several different ways. For refugee camps, solid wastes were collected and transported to the Drisla landfill near Skopje (see Chapter 4). According to Drisla Public Enterprise (DPE), the camps produced a total of 29,022 m^3 of solid waste, representing an average of 215 m^3 per day. In contrast, the residents of Skopje and Tetovo produce an average of 1,000 m^3 of solid waste per day. On average then, the refugee camps increased the daily solid waste load to Drisla landfill by approximately 22%, a substantial additional burden that probably elevated the risks of the groundwater and river contamination discussed in Chapter 4.

In the cases of host families and collective centers, solid waste was managed by municipal authorities. No special procedures were used to accommodate the additional volume of waste generated and, as a result, disposal largely occurred according to accepted local practice. Since the majority of refugees in host families and collective centers were located in the Skopje and Tetovo regions, most of this waste would have been sent to the Drisla landfill. In other regions disposal of solid waste would have occurred at illegal and unmanaged sites, reflecting the inadequate solid waste management infrastructure in the country as a whole. Statistics concerning the solid wastes generated by refugees accommodated by host families and

collective centers are not available for analysis. However, if the volume of waste was in line with that produced by refugees in camps, then up to 40,000 m^3 may have been generated.

■ WATER SUPPLY

Water was supplied to refugee camps using tanker trucks and local sources such as wells and springs. The peak of the refugee crisis coincided with high daily summer temperatures that increased water demand and pressure on water supply systems. In some cases, this led to shortages in camps and local communities. Despite these periodic problems, water of acceptable quality and quantity appears to have been supplied to refugee populations without long-term impacts.

Prior to the UNEP mission, serious concerns had been raised about the potential impacts of the refugee crisis on Rasce Spring, one of the nation's major sources of drinking water. The spring yields an average of 6,000 liters of water per second, nearly half of which is used by Skopje's 500,000 inhabitants.

The Government did not include environmental criteria during the selection of refugee camp sites. As a result, five of the camps were located within the protection zones established around Rasce Spring to safeguard water quality and quantity. Bojane and Radusa camps were located in 'protection zone 1', while the Neprosteno, Senokos and Cegrane camps were located in the less strict 'protection zone 2'. The aim had been to provide the camps with ready access to potable water.

Despite the sensitive location of these camps, inadequate measures were taken to minimize the risk of groundwater contamination from wastewaters. Soak-away pit latrines were initially used in Bojane, Radusa, and Senokos. Although these pits were eventually replaced by sealed tanks, this did not occur until some two weeks after the peak refugee population was recorded.

Rasce Spring

There is currently no conclusive evidence to suggest that the refugee camps located within the protection zone had any adverse impact on the quality of water in Rasce Spring. However, a detailed study that is being conducted with financial and technical support from Denmark, in cooperation with the Government, will undoubtedly provide additional information.

■ WASTEWATER

Two systems were used to manage wastewater produced by the refugee camps. At the outset of the refugee influx, the camps at Bojane, Radusa, Senokos and Stenkovec I & II (see Map 7 for locations) relied on soak-away pit latrines, while the camps at Neprosteno and Cegrane used sealed metal tanks. These tanks were frequently emptied by DPE and transported to the Struga water treatment facility in the south of the country. Rising concerns over the potential for groundwater contamination in Rasce Spring by the soak-away pits led to their replacement by metal tanks in the Bojane, Radusa and Senokos camps. However, this was not done until after the peak of the refugee influx had occurred. The tanks were also emptied by DPE and the waste transported to Struga for treatment.

Struga treatment plant, Ohrid

The Struga plant, FYR of Macedonia's only operational wastewater treatment plant, processed all of the wastewater that was collected from the camps. The plant ordinarily treats approximately four million m^3 per year of wastewater and serves an estimated 120,000 inhabitants in the municipalities of Struga and Ohrid. DPE reports that a total of 6,639 m^3 of wastewater were collected from the refugee camps. However, the Struga treatment plant reports that only 2,002 m^3 of wastewater were received and treated. The fate of the missing 4,637 m^3 of wastewater is unknown, underscoring the need for a stronger national system of wastewater collection and management. An analysis by Proaqua, the company responsible for treating the effluent in Struga, suggests that the refugee camp wastewaters were less diluted, with higher concentrations of pollutants, than typical residential waste.

During the peak of the influx, refugees accommodated by host families and collective centers imposed stresses on wastewater collection systems, particularly in urban areas. These additional wastewaters were collected by septic tanks or municipal sewage lines and disposed of according to local practice. In many cases, this involved discharging untreated wastewater directly into the Vardar, Strumca or Crni Drim rivers. In the collective centers in Pretor, near Lake Prespa, refugee wastewater was discharged into the lake without treatment due to a malfunctioning treatment system. The wastes of 1,000 refugees in host families were also discharged into the lake without treatment between March and June. However, the mission could not assess the cumulative environmental impacts of these discharges, because wastewaters produced by the 17,000 residents of the region also enter the lake untreated.

■ FOREST AND BIODIVERSITY

In FYR of Macedonia, illegal timber harvesting and animal poaching by refugees was minimized by the provision of cooked or dry meals. While minor incidences of hunting and tree felling were reported at some of the campsites, e.g., Cegrane and Stenkovec II, in each case, camp management responded by providing hot or dry meals, and/or stoves and fuel from registered suppliers. As a result, long-term effects are not evident. Similarly, damage to forests and biodiversity have not been noted as environmental concerns associated with refugees accommodated in host families or collective centers.

■ AGRICULTURAL LAND

During the process of campsite selection, flat and well-drained locations are generally preferred. Agricultural land often presents ideal conditions. In FYR of Macedonia, the camps of Radusa and Blace were located on areas recently used for agriculture. Although these sites were cleaned by UNHCR after closure, gravel still covers much of the land, inhibiting future agricultural use. At the time of the UNEP mission, a UNHCR Quick Impact Project was being considered for rehabilitation of the Radusa site in cooperation with local landowners. However, rehabilitation of the Blace site, which totals only three hectares, has not been adequately addressed. An innovative project has been established to rehabilitate 52 hectares of unproductive land at the Cegrane refugee camp into a permacultural training center and growing operation.

Blace transit camp

Institutional capacities for environmental management

During the UNEP mission, a subgroup was specifically charged with assessing institutional capacities for environmental management. The subgroup interviewed numerous representatives of key Government ministries and agencies, industries and non-governmental organizations, and reviewed relevant legislation, regulations, reports and other documentation. The following sections summarize some of the main points to emerge, building upon the general environmental context provided in Chapter 2. Corresponding recommendations are to be found in Chapter 7.

Overview

The institutional structure for managing the environment has undergone significant changes in recent years. These partly reflect the wider political context, but are also driven by the NEAP, which led to establishment of the Ministry of Environment and Physical Planning. Short to medium-term priorities under the NEAP include amending the 1996 Act on Environmental Protection; requiring environmental impact assessments; and creating an independent Environmental Protection Agency. Short to medium-term priorities include developing a new air quality act; amending the water and waste laws; enacting a new nature protection law; strengthening environmental permitting and enforcement processes; and enacting provisions consistent with the Aarhus Convention and the EU directive on access to environmental information.

State responsibilities

The MEPP became an independent ministry in 1998, having previously been part of the Ministry of Urban Planning and Construction. The latter was abolished in the summer of 2000. By law, MEPP has broad authority to monitor, protect and improve the environment in the areas of water, soil, air, noise, radiation, and biodiversity. It also has authority to create self-financing mechanisms, develop standards and rules, and conduct inspections. It currently has 81 full-time employees, with a further 15 people working under special contracts. MEPP's budget for 2000 was about 2.56 million Euros (2.17 million USD), a ten-fold increase from 1999.

Environmental Minister Toni Popovski signing memorandum of understanding with Donald Kaniaru, UNEP Mission Chairman

The Ministry is organized into four divisions: Regulation and Standardization; Sustainable Development; International Cooperation; and the Environmental Information Center. The Ministry is also the parent body for the State Environmental Inspectorate, the Agency for Environment Protection and Nature Protection and Promotion, and the Fund for Environmental Protection and Nature Promotion. Two additional units implement specific projects: the Ohrid Lake Conservation Project and the Dojran Lake Salvage Project. The Agency for Environmental Protection and

Nature Promotion and Protection is expected to become independent during 2001. Under this scenario, a new Environmental Protection Agency would implement programs designed to achieve policy goals set by the MEPP.

Several other Government ministries and state agencies have some degree of environmental authority. These include the Ministry of Agriculture, Forestry and Water Resource Management; Ministry of Transport and Communications; Ministry of Health; Republic Institute for Health Protection; and the Republic Hydrometeorological Institute. This distribution of environmental responsibilities is a product of frequent institutional restructuring that has delayed policy implementation and often added little discernible benefit.

Water policy is a case in point. Responsibility for water is held by four ministries, each of which implement laws relevant to water policy. A clear division of responsibility is needed in order to address the significant challenges of establishing proper wastewater treatment and maintaining adequate water infrastructure. Similar inefficiencies exist in monitoring. The integration of related policy areas and functions would streamline decision-making, enhance effectiveness, and maximize the value of scarce resources.

International cooperation and strategic vision

In the last several years, FYR of Macedonia has entered a number of significant international, regional and bi-lateral conventions and agreements. On the international level, the country has become a party to the Basel Convention, Aarhus Convention, the Vienna Convention for the Protection of the Ozone Layer, the Framework Convention on Climate Change, the Convention on Biological Diversity, the Convention on Long-Range Transboundary Air Pollution and others (see Appendix III).

FYR of Macedonia has also played a strong role in regional environmental cooperation initiatives. The country's bilateral Memorandum of Understanding on Cooperation with Greece and Albania is improving joint environmental protection efforts. In addition, the MEPP is preparing a strategy for sustainable development (Agenda 21) in cooperation with Slovenia. As a member of the Regional Environmental Reconstruction Program for South Eastern Europe (RERep), the country has joined in cooperation with other Balkan countries seeking to strengthen environmental policy development and institutions in the Balkans. Created in March 2000, RERep is seeking to target funding to priority environmental projects in member states. The program, however, has not yet achieved the level of international assistance needed to support its agenda.

FYR of Macedonia is seeking close adaptation of its environmental provisions to those of the European Union's Member States. The European Commission is supporting the adaptation process technically and financially. An Agreement for Association and Cooperation with the EU is expected to be ready for signature by the end of 2000.

These international, regional and national developments together create a significant legal framework for environmental protection. Several challenges remain, however, for FYR of Macedonia. Most importantly, a clear strategic vision is needed to provide strong direction and coordination to the country's international partners. Among other things, this process will require the harmonization and rationalization of Government strategies and legislation.

Local and regional administration

Under current law, municipalities manage drinking water supply, green areas, hygiene, and solid waste disposal. They also have responsibilities in the fields of construction, land-use planning and zoning. Legislation is pending for the implementation of a program of further decentralization.

Local Environmental Action Plans (or 'LEAPs') have been developed in approximately one-tenth of the country's 123 municipalities. These plans are funded locally. As mentioned in Chapter 3, above, a project to build consensus in support of the LEAP in Veles has brought together a range of local stakeholders.

A new national spatial plan will designate the types of land uses allowed in different areas and will be complemented by local plans. This will ultimately provide a coherent overall basis for authorizing new activities.

A general regional level of public administration does not exist in FYR of Macedonia, although various individual ministries and public services operate functional units responsible for several communes or municipalities.

Environmental management instruments

Weak economic conditions during the period of transition following independence have rendered the national and local tax bases inadequate to support much-needed environmental programs. The MEPP's Fund for Environmental Protection and Nature Promotion ('Eco-Fund') is funded by a vehicle registration tax, but currently receives only about $700,000 USD per year. Under draft legislation the Eco-Fund would be more independent of the MEPP and would derive revenues from petrol and tobacco excise taxes. These revenues are expected to total approximately $3 million USD annually, a level still not adequate to meet the country's extensive environmental needs.

Monitoring of air and water quality falls under the jurisdiction of multiple administrations and is poorly coordinated. While monitoring equipment and techniques are inadequate and resources for improvements are lacking at the Republic Hydrometeorological Institute, modern equipment at the MEPP is unused because of untrained personnel. The monitoring that is conducted often does not include important parameters (e.g., heavy metals) and appears to be inadequately linked to public health monitoring.

The enforcement of environmental regulations is conducted principally by the State Environmental Inspectorate. The Inspectorate, which currently has seven inspectors among a total staff of eleven, performed approximately 800 inspections during 2000. Although all polluting enterprises are subject to inspection, the Inspectorate focuses principally on the country's approximately 100 heavily polluting industries. A comprehensive inventory of pollution sources, currently under development, will enable the systematic selection of enterprises appropriate for inspection.

Inspections routinely cover six areas: air, water, soil, noise, protected nature, and radiation. Building and operation permits do not contain pollution limits. Inspections, therefore, refer to laws and regulations. The relevant regulations containing maximum allowable concentrations of emissions or concentrations, however, are outdated and inadequate. When levels are exceeded, inspectors can impose fines, lower production levels, or order the installation of remediation equipment. In extreme cases, a facility can be closed. According to regional inspectors and others interviewed for this assessment, enforcement efforts suffer from a judiciary that is not adequately informed about environmental laws and policies.

Various other inspectorates at the national and municipal levels have jurisdiction over aspects of environmental policy. Communication among the inspectorates, however, appears to be unsystematic at best.

Environmental awareness

Under the Act on Environment, citizens have the right to be informed, publicly or on request, regarding the state of the environment and environmental or human health threats. In 1998, the MEPP created the Environmental Information Center. The Center's role is to establish a comprehensive base of relevant, accurate, and publicly accessible information concerning the quality and trends of FYR of Macedonia's environment.

FYR of Macedonia was the first country to ratify the Aarhus Convention. The MEPP is currently developing a strategy for implementation of the Convention, but guidance on how to complete this task is needed.

In 1998, FYR of Macedonia joined the GLOBE Programme and introduced environmental education activities into four primary and five secondary schools. No other public environmental education programs exist at the primary or secondary school levels. University level courses in environmental studies have been offered since the mid-1990's.

Recommendations

Introduction

The Kosovo conflict placed an additional burden on the already over-stretched resources of FYR of Macedonia. However, with the possible exception of Rasce Spring, where international research and monitoring efforts continue, the direct environmental impacts of the influx of some 261,000 refugees – the most tangible manifestation of the crisis in FYR of Macedonia – were found to be minimal.

In contrast, the wider political and economic destabilization of the Balkans region, have made environmental degradation in FYR of Macedonia more difficult to tackle, with corresponding implications for human health and the natural functioning of ecosystems. While the economic context of the last decade has led to decreased industrial output and some consequential reductions in pollution, there has also been a chronic lack of investment in environmental protection, so that much of the neglect of the post World War II era has not been remedied.

With regard to UNEP's 'hot spot' conclusions, two key areas of improvement emerged:

- The implementation of environmentally acceptable industrial processes, including measures for adequately controlling the use of chemicals; and
- Adequate handling, storage, treatment and disposal of waste, whether solid or liquid, hazardous or non-hazardous, municipal or industrial.

It is apparent that FYR of Macedonia is seeking to make progress in the field of environmental protection and that some key steps have been taken in recent years with the adoption of new environmental legislation and the creation of new institutional structures. However, many challenges remain, particularly in terms of investment, implementation and enforcement. The international community can provide crucial technical and financial assistance for FYR of Macedonia's priority environmental initiatives. Demonstration of concerted action and commitment to the provision of resources at the national level will be a major stimulus to external donors. The following series of recommendations is based on the findings detailed in previous chapters, though not all can be directly cross-referenced to the text.

Industrial 'hot spots'

1. **Ferro-alloy plant at Jegunovce ('HEK Jugochrom')**
   a) To prevent further contamination, the chromium processing facilities should be cleaned immediately, and the chromium waste should be stored and disposed of pursuant to appropriate waste handling methods.
   b) The chromium remediation program requires urgent revision and acceleration. Additional mapping of the chromium plume in the groundwater should be considered. Additional investigation wells may also be necessary. Chromium should be removed and properly disposed of, not simply converted from Cr(VI) to Cr (III). The program should encompass the area between the factory and the Vardar River and not be limited to implementation of a hydrological barrier. The potential impact of groundwater pollution on Rasce Spring should be thoroughly investigated.
   c) Existing proposals to reduce dust emissions from the three largest furnaces should be implemented. The six smaller furnaces require similar attention.

2. **Organic chemicals plant, Skopje (OHIS-A.D.)**
   a) A comprehensive strategy is needed to halt any contamination of soil and groundwater by the stored 10,000 tons of technical mixture of HCH isomers. While a long-term solution is needed, interim measures should be implemented at once. These include:
      • investigating the precise storage method used;
      • developing an overview of contamination inside and outside of the storage basins;
      • covering the storage area with a durable material to prevent leaching to groundwater and emissions to the atmosphere; and
      • establishing monitoring wells screened at different levels in the aquifer around the storage area.
   b) Longer-term measures should include a thorough investigation of the extent and nature of existing contamination; control and reduction of contamination that may pose a threat to human health; preventing contaminated groundwater from reaching the Vardar River; and remediation of contaminated soil.
   c) As part of an overall strategy for the safe treatment and disposal of all hazardous waste generated by the plant, the wastewater treatment facility should be renovated and upgraded to receive and treat *all* effluent. Untreated wastewater must not continue to enter the Vardar River.
   d) Steps are also required for the reduction of sulfur dioxide emissions.
   e) The landfill and other waste dumpsites located inside the complex should be closed and the non-hazardous waste taken to Drisla landfill. Hazardous waste should be collected separately and stored for proper treatment.

3. **Lead and zinc smelter, Veles ('MHK Zletovo')**
   a) If commitments for the financing of urgently needed filters and other clean technologies cannot be obtained within the next year, then management, together with appropriate Government officials, should review the costs and benefits of the plant's continued operation, taking into account the costs to public health and other relevant factors.
   b) In the short term, existing air monitoring stations should be moved to sites closer to the plant that will indicate more quickly when elevated pollution levels are increasing health risks. In the longer term, additional stations that provide continuous data should be installed to provide citizens and relevant authorities, including regional public health and environmental officials, with early warning of health risks.
   c) Urgent measures should be taken to reduce emissions of sulfur dioxide and dust containing heavy metals.
   d) The proposed reconstruction of the wastewater treatment plant should be accelerated. The volume of process water used should be reduced through recirculation in a closed system. Untreated wastewater must not continue to enter the Vardar River.
   e) A soil and groundwater monitoring program is required and should encompass the vicinity of the plant itself, the adjacent flood plain, and areas immediately downstream.

4. **Zinc and lead mine, Probistip ('Rudnici Zletovo')**
   a) High priority should be given to constructing a wastewater treatment plant for the concentration plant.
   b) There is an urgent need for investigation wells downstream of the hydro-tailings sedimentation basins.
   c) An investigation program should be established for private water wells downstream from the discharge points of the Koritnico and Kiselia Rivers into the Zletovska River. The Kiselia River should be diverted from its channel under the old hydro-tailing area to a position less vulnerable to the influence of leached pollutants.
   d) Measures should be implemented to reduce dust levels from ore crushing.

5. **Thermal power plant, Bitola ('REK Bitola')**
   a) Several steps are required for tackling the problem of contamination from the dumpsite:
      • divide the area into compartments;
      • separate the compartments, using layers of fly ash and slag covered with coarse material to prevent ash and slag from spreading to the surrounding area;
      • use only one compartment at a time; vegetate inactive compartments to increase rainfall evaporation and reduce leaching of contaminants into the groundwater; and

- establish a drainage system in the bottom of the dumpsite to handle leachate and percolate.

b) Technical solutions should be implemented to reduce fly-ash dust and sulfur dioxide emissions from the plant.

c) Soil and groundwater at the power plant site and in adjacent areas is likely to be contaminated, and polluted groundwater may be entering the river. This requires establishment of an investigation program that includes the waste-water canal, river water and private wells downstream of the power plant.

d) The flow of untreated wastewater from the plant should be halted by replacing the neutralization basins with proper wastewater treatment facilities and by reconstructing the oil separator to match wastewater volumes.

e) The feasibility of using excess heat to supply the city of Bitola should be investigated.

Other industrial sites visited

6. **Landfill site, Drisla, near Skopje**

a) Creating an environmentally safe, long-term operation of Drisla is a national priority. Failure to implement appropriate environmental safety measures, including those outlined below, could result in Drisla evolving into a 'hot spot'.

b) Hazardous wastes should be collected separately, stored and exported for treatment until the on-site facilities for their proper treatment are constructed.

c) The landfill's monitoring program should be expanded to cover hazardous, water-soluble organic and inorganic components.

d) Improved management of medical waste is needed. Steps should be taken to ensure that medical waste producers use Drisla's medical waste incinerator.

e) Parts of the site not yet receiving waste should be remodeled to incorporate environmental safety features, notably a groundwater protection lining.

7. **Fertilizer factory, Veles ('MHK Zletovo')**

a) More efficient dust collectors and insulation should be installed to reduce dust emissions. Workers need training and incentives to implement resource-retention and pollution-prevention practices.

b) Reconstruction of the wastewater treatment plant should be accelerated to prevent untreated wastewater discharges from entering the Vardar River.

c) The volume of process water should be reduced by recirculation in a closed system.

d) To prevent gypsum sludge from eventually floating into the Vardar River, the dumpsite should be redesigned to include a dam and artificial lake, similar to the hydro-tailings facilities used by the mining industry. Water from the artificial lake could be recycled as process water.

8. **Copper mine, Radovis ('Buchim S.C.')**
   a) Construction of a wastewater treatment that includes removal of heavy metals should be accelerated.
   b) In view of the high risk of groundwater contamination, the plant's monitoring program should be expanded to cover heavy metals such as lead, cadmium and chromium.
   c) The hydro-tailing dam poses a high risk of infiltration by heavy-metal contaminated water into the upper groundwater aquifer downstream, especially during high water periods. Additional monitoring is required to establish the presence and extent of contamination.
   d) Efforts to stabilize tailing dust at the hydro-tailing dam should ensure that emissions affecting the village downwind are eliminated.

9. **Metal resurfacing factory, Kicevo ('Tane Caleski')**
   a) There is an urgent need for appropriate management of by-products and wastes.
   b) The sedimentation and neutralization basin should be cleaned out, and an entirely new wastewater facility, including an oil separator, constructed.
   c) There is an urgent need for wells and an investigation of soil and water conditions around the factory facilities and in relevant downstream areas.
   d) To avoid further contamination of soil and groundwater by oil, the quantity of oil lost in the process should be reduced, and an oil storage facility (complete with bottom lining) constructed. Soil contaminated with oil should be collected and stored until proper treatment can be arranged.

10. **Lojane Mine**
   a) The site should be immediately subject to a comprehensive environmental investigation. Recommendations for short-term risk reduction should be implemented without delay, and longer-term remediation and environmental protection measures fully supported.

Managing environmental consequences of the refugee crisis

11. At the outset of any humanitarian emergency, GIS-based inventory and other state-of-the-art data should be used to identify environmentally sensitive areas in the country. This would make possible the selection of sites with low environmental impacts and high redevelopment potential. It would also enable the use of technologies to minimize environmental impacts on sensitive areas selected. UNEP's Environmental Information Services, UNHCR and other international organizations could assist in this process. In addition, the refugee campsite selection process should solicit input from competent national environmental

agencies, as well as from non-governmental and inter-governmental organizations, and municipalities.

12. Life-cycle assessment should be used as the basic planning tool at the outset of a refugee crisis. This approach mandates that the future use of a refugee accommodation site be considered during the site-selection process and during each successive management phase. The goal of life-cycle assessment is to ensure the use of appropriate on-site technologies that will facilitate rehabilitation and development at minimum cost. Developing after-uses that have significant long-term benefit to local communities should be the main priority.

13. Although UNHCR made best efforts to facilitate the process of camp rehabilitation, a lack of donor funding and interest prevented the complete rehabilitation of some camps. The environmental benefits of future rehabilitation efforts need to be assessed against other national environmental priorities, such as the rehabilitation of industrial 'hot spots' or the establishment of a solid waste management infrastructure.

14. In order to minimize the production of solid waste, the procurement policies adopted by aid and donor agencies should require purchasing of food products and durable goods that are produced with minimal and/or fully biodegradable packaging. Preference should be given to goods that are produced in a sustainable way and which can be used by local communities following the repatriation of the refugees.

15. In order to minimize the potential for contamination, metal tanks should be used as the default method for wastewater management. Soak-away pits may be considered if local geophysical and hydrological conditions are certain to prevent contact with groundwater. An improved refugee wastewater collection and treatment system needs to be developed to ensure that the amount of waste collected from campsites corresponds to the amount of waste received by the selected treatment facilities. High financial penalties should be imposed to deter illegal dumping by contractors.

16. UNHCR has developed environmental guidelines and policies to minimize the environmental impacts of refugees. These documents, however, were not distributed in a timely or comprehensive manner to some relevant agencies and camp managers. Improved efforts should therefore be taken by UNHCR to distribute these materials at the outset of refugee operations.

17. In order to assess the site-specific environmental impacts of refugee camps, standardized photographs should be taken from permanently marked camera locations before, during and after refugee occupation. This technique,

known as Photopoint Monitoring, would help to document site conditions throughout refugee operations and minimize the potential for false damage claims.

18. **Site-specific recommendations concerning refugee management:**

a) Blace Camp

A proposal exists to develop the site into additional border facilities and services. Decisions on this proposal should be made in cooperation with the landowners, and appropriate compensation should be provided for loss of land use. If additional border-crossing facilities are developed, care should be taken to minimize environmental impacts on the alluvial terrace and water quality of the Lepenca River.

b) Bojane Camp

In the short term, illegal dumping activities by local residents must be immediately stopped to prevent potential contamination to Rasce Spring. Signs should be erected to mark the boundary of the protected area, and fines should be enforced to deter illegal dumping. In the long term, the local municipality should develop a strategy for solid waste management, reduction and recycling, as well as environmental education and awareness programs for the community.

c) Cegrane Camp

The permaculture training center is being developed and managed by CARE International for 12 months, and then by a local NGO, the Permaculture and Peacebuilding Center (PPC), for the remainder of the project. Currently, the project is entering the fourth stage of implementation, known as the 'sustainability' phase. This phase will require donor support to help the center develop revenue-generating operations, which are to eventually become self-sustaining.

d) Neprosteno Camp

Rehabilitation has not been conducted due to a political dispute over the future use of the site. While the current development plan is for a cemetery for the neighboring municipality of Tetovo, local residents favor the development of a sports facility. A community-based process is needed for reaching agreement on the future use of the site.

e) Radusa Camp

UNHCR has recently provided resources to the land owners for rehabilitation. During the rehabilitation process, consideration must be given to its sensitive location in relation to groundwater, and the use of fertilizers or pesticides of any kind should be avoided.

f) Senokos Camp

Site rehabilitation was conducted by Mercy Corps International for UNHCR. This included stabilization of a creek that flowed through the campsite and rehabilitation of the community football field. The municipality is in charge of further development on behalf of the community.

g) Stenkovec I Camp

Appropriate compensation or assistance should be provided for the re-establishment of the site's original function as an airfield.

h) Pretor Collective Centers

Given the environmental importance of the Lake Prespa region, donor support is required to develop a strategy for the management of wastewaters and solid wastes. Existing wastewater treatment facilities, which are currently non-functional, should be repaired or upgraded as required by the strategy.

i) Radusa Collective Center

At the time of the mission, this collective center housed refugees and was being used as a long-term facility. While there are no significant environmental issues associated with this site, the sewage treatment plant servicing the local community is currently non-operational due to an inadequate electrical supply. As a result, the plant is idle and sewage is being discharged into local rivers. Donor support is therefore required to help investigate local sources of power generation including renewable options.

j) Suto Orizari Collective Center

This site has been recently developed for the current caseload of Roma refugees. The center is located on land that was formally used as an illegal dumpsite. As a result, it lacks vegetation cover and suffers from serious erosion and wind-blown dust. The establishment of a permaculture project on site would contribute to its greening and enhance the quality of life for the refugees. This could also improve food self-sufficiency for camp residents.

Institutional capacities for environmental management

General recommendations

19. The process of updating the NEAP should be broadly supported. The process should once again include consultation with all interested governmental and non-governmental institutions. The revised NEAP should include cost estimates for its elements, an identification of the planned sources of finance for each project, a timetable for project implementation, and clear, measurable targets. The devel opment of a national Agenda 21 strategy should be coordinated with any updating of the NEAP to ensure consistency and coherence, as well as effective coordination in policy and legislation.

20. It will be important for the Government to articulate a strong strategic vision regarding environmental management issues. Among other things, this will require further streamlining of environmental legislation and responsibilities. Environmental strategies and priorities will need to be communicated to donors to increase their interest in environmental development assistance.

21. A national environmental monitoring program is needed in order to be able to provide accurate data to political decision-makers, environmental inspectorates, health authorities, and the public. The number of stations and parameters monitored should increase, as much as resources permit, until a comprehensive program is established. The Government and municipalities should participate in international monitoring networks.

22. Enforcement of environmental regulations must be greatly strengthened. It is especially important that a permit system be developed and implemented, and that draft legislation to require EIAs be swiftly adopted. In addition, better coordination among the relevant inspectorates is crucial. Consideration should also be given to training judges and law students in environmental law and policy.

Specific environmental management recommendations

23. **Air**
    a) The anticipated revision of air quality legislation should provide for a comprehensive and effective permitting and inspection regime and ensure coordination of national and local monitoring and management programs.
    b) A nationwide air quality monitoring network should be created to ensure sufficient knowledge of ambient air quality, especially in urban areas. It is especially important that additional air quality parameters, particularly heavy metals and persistent organic pollutants (POPs), be monitored strategically in areas where there are high risks that such pollutants exist. Ozone should be measured to

enable assessment of risks to human health and crops.

c) Increased cooperation with EMEP and other international bodies should be an important element of FYR of Macedonia's strategy for improving air quality.

24. **Water**

a) State responsibilities for water policy should be consolidated to the extent practicable or, at a minimum, better coordinated among the relevant authorities.

b) Implementation of a national strategy for wastewater is one of the most urgent challenges facing the country. Relevant recommendations from the above-cited report on *'Wastewater, Water Quality and Solid Waste Management FYR of Macedonia'* should be acted on as soon as possible. Wastewater management in the Tetovo-Gostivar area should be made a priority in order to reduce potential threats to Skopje's water supply.

c) A system of discharge permits and emissions standards should be developed, based on local hydrological and physical/chemical conditions and consistent with relevant EU directives.

d) An integrated river basin management plan should be developed and implemented for the Vardar River. The approach should be consistent with the EU Water Framework Directive and take full account of transboundary considerations.

25. **Solid waste**

a) FYR of Macedonia urgently needs to implement a comprehensive, country-wide strategy and strengthen legislation for the management of solid waste. This should be based on further development of the 1999 national strategy for waste management, prepared with support from Phare. Special attention should be given to the handling of municipal waste and hazardous industrial waste.

b) Additional municipal landfills, designed, supervised and constructed in conformity with EU standards, should be established to meet the country's long-term needs. This would enable closure of many small and inadequately supervised landfills.

c) The practice of burning waste in landfills should be banned as soon as possible. Instead, landfill operators should continuously compact and cover waste with inert material.

26. **Chemicals**

a) Policy, legislation and management measures are urgently required for better control of chemicals such as PCBs, ozone-depleting substances, and agricultural pesticides and biocides. Clear responsibility for this issue should be assigned within the Government administration.

27. **Biodiversity and landscape management issues**

a) Effective nature and landscape conservation requires improved communication and cooperation between the MEPP and the Ministry of Agriculture, Forestry and Water Resource Management.
b) There is an urgent need for the development, implementation and adequate funding of management plans for all existing protected areas.
c) An expanded, fully-coherent network of protected areas should be established, taking into account the criteria of the 'Emerald Network' of the Council of Europe and the priorities of the Pan-European Biological and Landscape Diversity Strategy.
d) Special attention should be given to strengthening measures for the conservation and wise use of Lakes Ohrid, Prespa and Dojran.
e) Further development and implementation of the National Biodiversity Strategy should focus on integrating nature conservation as a key component of sustainable economic development, notably in the agriculture, forestry, tourism, water management and transport sectors.

APPENDIX I

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APPENDIX II
•
GLOSSARY

A

AMMONIA (NH_3) Ammonia is a colorless gas with a strong pungent odor. It is formed from the natural breakdown of manure, plants and animals. It is present in water, soil and air and acts as a source of nitrogen for plants and animals. Ammonia is also produced industrially, largely as a raw material in fertilizers. A smaller proportion is used to manufacture plastics, synthetic fibers and explosives. It is not persistent in the environment, but high levels may build up around waste disposal sites. Ammonia gas is soluble in water, where it forms ammonium hydroxide. Ammonia is highly toxic for fish and low concentrations can cause mortality. Human exposure to high levels of ammonia gas is also fatal. Death may occur immediately or from secondary complications after a few weeks. Exposure may also cause burns to the skin, eyes, throat and lungs, permanent blindness, or lung disease. In laboratory animals, long-term exposure to low levels of ammonia causes inflammation and lesions of the respiratory tract.

ARSENIC (As) Arsenic is a naturally occurring element with no detectable smell or taste. It is a silver-gray or white metallic solid. Organic arsenic is usually less harmful than inorganic arsenic. The latter is separated during copper and lead smelting and is used in the chemical industry, for example, in pesticides and herbicides. If released into the environment, arsenic does not break down but may change into different forms. If released into the aquatic environment it binds to sediments, and builds up in the tissues of some fish and shellfish. Workers exposed to inorganic arsenic dusts in air experience irritation to the mucous membranes of the nose and throat. Long-term exposure increases the risk of cardiovascular disease and various forms of cancer including lung, skin, bladder, kidney, and liver. The appearance of small corns or warts on the palms, soles, and torso is also symptomatic of arsenic exposure. Lower levels of exposure may cause nausea, vomiting, diarrhea, decreased production of red and white blood cells, abnormal heart rhythm, blood vessel damage, and a prickling sensation in hands and feet. Arsenic is also suspected of interfering with fertility, fetus development, and hormone production and regulation. The disposal of wastes containing arsenic is regulated by the Basel Convention.

ARSINE (AsH_3) Arsine is a compound containing arsenic and hydrogen. The human and environmental health effects of exposure to arsine are consistent with those of arsenic.

B

BASEL CONVENTION The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (the "Basel Convention") entered into force in 1982. A central goal of the Basel Convention is to protect human health and the environment by minimizing hazardous waste production whenever possible through environmentally sound management. The Convention requires that hazardous wastes be managed using an "integrated life-cycle approach", which involves strict controls from its generation to storage, transport, treatment, reuse, recycling, recovery and final disposal.

BIBIOACCULATION Bioaccumulation refers to the ratio between a chemical's concentration in an organism and its concentration in the environment. A compound accumulates any time it is taken in and stored faster than it is transformed into other compounds (metabolized) or excreted. As the chemical progresses up the food-chain (e.g., from contaminated plankton to small fish to larger fish to humans), it might become increasingly concentrated, having toxic effects on the host organism. Some persistent contaminants that bioaccumulate are heavy metals such as mercury and lead, and organochlorines. Understanding the dynamic process of bioaccumulation is very important in protecting humans and other organisms from adverse chemical exposure, and it has become a critical consideration in the regulation of chemicals.

BISMUTH (Bi) Bismuth is a white, crystalline, brittle metal with a pinkish tinge. It is used in the production of malleable irons, acrylic fibers, fire detection systems, cosmetics, drugs, and hemorrhoid creams. It is also used as a carrier for uranium fuel in nuclear reactors. Bismuth is one of the less toxic heavy metals. Excess ingestion of bismuth, however, may cause mild kidney damage.

BTF The Balkans Tasks Force was a Joint UNEP / UNCHS (Habitat) project designed to assess and monitor the environmental and human settlements impacts of the Balkans conflict.

C

CADMIUM (Cd) Cadmium is a heavy metal with a blue-white or gray-black appearance. It is primarily used in silver solder, batteries, plastics and pigments. Small amounts of cadmium enter the environment from the natural weathering of minerals, but most is released through industrial effluents and sewage. It is also an impurity in many fertilizers, leading to soil contamination. Cadmium has no known biological function, and is highly toxic to both animals and plants. For humans, eat-

ing food or drinking water with very high cadmium levels can severely irritate the stomach, leading to vomiting and diarrhea. Eating lower levels of cadmium over a long period of time can lead to kidney and liver damage, weakening of bone and sense of smell. Cadmium and cadmium compounds are likely carcinogens. The disposal of wastes containing cadmium is regulated by the Basel Convention.

CARBON DIOXIDE (CO_2) Carbon dioxide is a colorless gas having a faint odor and a sour taste. It is naturally produced by animals during respiration, and used by plants during photosynthesis. Although it only constitutes 0.03 % of the atmosphere, it is one of the most important "green-house" gases. The combustion of fossil fuels is increasing carbon dioxide concentrations in the atmosphere and is believed to be contributing to global warming. As a result, global emissions of carbon dioxide will be regulated by the United Nations Framework Convention on Climate Change.

CARBON DISULFIDE (CS_2) Pure carbon disulfide is a colorless liquid with a pleasant and sweet odor, similar to chloroform. However, the crude industrial product is a yellowish liquid with a disagreeable odor of decaying radishes. By far the most important use of carbon disulfide in industry is in the production of viscose rayon fibers. It is also used as a solvent in various industrial processes including the refining of paraffin and petroleum, and more recently in the production of flotation agents and herbicides. When released into the environment, carbon disulfide evaporates rapidly. It does not appear to be taken up by organisms living in water. Inhalation of carbon disulfide vapors may cause irritation to the eyes and respiratory tract. Carbon disulfide is a central nervous system depressant and may cause liver and kidney injury. Long-term inhalation may cause heart disease, and behavioral and neurophysiological changes. Carbon disulphide is a reproductive toxicant which also interferes with the normal development of the fetus.

CARBON MONOXIDE (CO) Carbon monoxide is a colorless, odorless, and tasteless gas that is slightly less dense than air. It is a product of the incomplete combustion of carbon-containing fuels and is also produced by some industrial and biological processes. In low concentrations, carbon monoxide can cause headaches, dizziness, and temporary loss of muscle coordination, memory and vision. Long term, low-level exposure can result in heart disease and central nervous system damage. High levels of exposure can impair the ability of blood to carry oxygen, leading to convulsions, coma and respiratory failure. During pregnancy, exposure to high concentrations can cause lowered birth weight and nervous system damage in offspring.

CAUSTIC SODA (NaOH) Caustic soda, also referred to as sodium hydroxide, is a white odorless solid that is highly corrosive. It is used in the production of various chemicals, as well as in petroleum refining and paper production. It is extremely hazardous to the eyes and can lead to permanent damage and blindness. Contact with skin can cause irritation and burns. Inhalation can inflame the lungs and cause coughing, shortness of breath, and fluid accumulation.

CHLORINE (Cl_2) Chlorine is a greenish-yellow gas with a strong irritating odor. It is produced electrolytically from a salt solution. It is sometimes manufactured to combine with petrochemicals to produce organochlorine products such as solvents, pesticides, plastics (especially PVC) and many other chemicals. Chlorine is also used as bleach in the production of paper and for disinfecting drinking water. Chlorine gas was used as a chemical weapon in the First World War and exposure can be rapidly fatal. There have been numerous releases of chlorine from industrial facilities, many of them resulting in deaths. Long-term exposure to low levels of chlorine is reported to cause respiratory complaints and corrosion of the teeth. Chlorine is a potent irritant to the eyes, lungs and skin. Chlorine is not carcinogenic in animals or humans, but is highly toxic to aquatic organisms.

CHROMIUM (Cr) Chromium is a naturally occurring heavy metal that has no taste or odor. It has a variety of forms. Chromium (III) compounds are naturally occurring and are essential nutrients in the human diet. In contrast, most chromium (VI) arises from human activities including leather production, wood preservation, waste incineration, fossil fuel combustion, and the mining and smelting of chromium ore. Long-term exposure to high levels of chromium (VI) can cause damage to the nose and lungs, and can increase the risk of lung disease. Ingesting very large amounts of chromium can cause ulcers, convulsions, kidney and liver damage, and death. Skin contact with liquids or solids containing chromium (VI) may lead to skin ulcers and lesions. Studies also indicate chromium (VI) is a carcinogen. Data are inconclusive about the cancer-causing ability of other forms of chromium. The disposal of wastes containing chromium (VI) is regulated by the Basel Convention.

COPPER (Cu) Copper is a reddish-brown, ductile and malleable heavy metal. It is found naturally in a wide variety of mineral salts and organic compounds, as well as in metallic form. Copper is widely used in cooking utensils and water distribution systems, as well as in fertilizers, herbicides, and paint. It is also used in animal feed additives for growth promotion and disease control. Anthropogenic emissions include smelters, power stations and waste incinerators. The major release of copper to land is from copper mine tailings, sewage sludge and agricultural applications. Copper is vital to life in small amounts, but toxic at high doses. In humans, ingestion of gram quantities of copper salts may cause severe abdominal pain, vomiting, diarrhea, blood or protein in the urine, hypertension, convulsions, coma, and death. Evidence also indicates that copper compounds are spermicidal. The disposal of wastes containing copper is regulated by the Basel Convention.

CYANIDE (CN) The cyanide ion is usually found joined with other elements such as hydrogen, sodium or potassium. These cyanide compounds are used in electroplating, metallurgy, production of chemicals, photographic development, plastic production, and fumigation sprays. Cigarette smoke and automobile emissions also contain cyanide compounds. Exposure to low levels of cyanide may result in breathing

difficulties, heart pains, vomiting, blood changes, headaches, vertigo and enlargement of the thyroid gland. Cyanide is acutely toxic to humans and short-term exposure to high concentrations produces almost immediate collapse, respiratory arrest, and death.

D

DDT ($C_{14}H_9Cl_5$) DDT, or dichlorodiphenyltrichloroethane, was the first chlorine-based organic pesticide to be used on a wide scale. It is packaged as colorless crystals or white powder. After its release in 1939, it appeared to be the ideal insecticide due to its low production cost and apparently low toxicity to mammals. However, problems related to extensive use of DDT began to appear in the late 1940s. Many species of insects developed resistance to DDT, and it was also discovered to have a high toxicity toward fish. Furthermore, DDT was found to accumulate in the fatty tissue of animals and bioaccumulate in the food chain. Exposure to DDT can cause nausea, vomiting, dizziness, confusion, loss of muscle control and tremors. DDT may also damage the liver and kidneys and interfere with the immune system. It is believed to be carcinogenic and should be treated with extreme caution. The trade of DDT will be addressed by the PIC Convention. A United Nations convention on Persistent Organic Pollutants (POPs) is currently being developed to further restrict and control the use of DDT and other hazardous chemicals.

DIOXINS (e.g. $C_{12}H_4Cl_4O_2$) The terms 'dioxin' or 'dioxins and furans' generally refers to a group of 210 chlorinated pollutants, chemically known as the polychlorinated dibenzo-p-dioxins and dibenzofurans. Dioxins are organochlorines and are regarded as among the world's most toxic organic pollutants. They are produced as by-products of industrial processes involving chlorine and all types of incineration. Once released into the environment, dioxins are environmentally stable and tend to become associated with sediments or suspended material. Dioxins have the potential to bioaccumulate in the food chain and pose series risks to ecological and human health. The most toxic of the dioxins and furans, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), is used as the toxicological model for the group and has been extensively researched. It is classified as a human carcinogen. In addition to causing cancer, animal studies have shown that it causes damage to the nervous system, the immune system, the reproductive system and malformations in the unborn. The most common health effect in people exposed to dioxins is a severe skin disease with acne-like lesions that occur mainly on the face and upper body. Other skin effects include rashes, discoloration, and excessive body hair. Changes in blood and urine that may indicate liver damage have also been observed. The disposal of dioxin wastes is regulated by the Basel Convention. A United Nations convention on Persistent Organic Pollutants (POPs) is currently being developed to further restrict the production of dioxins and other hazardous chemicals.

E

EMEP Cooperative Programme for the Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe.

F

FERRO Ferro is used as a pre-fix in chemistry to indicate a compound containing iron with valence II. Ferri indicates compounds containing iron with valence III

FRY Federal Republic of Yugoslavia.

FYR of MACEDONIA Former Yugoslav Republic of Macedonia.

G

GLOBE PROGRAMME GLOBE is an international environmental education project initiated in 1995 by U.S. Vice President Al Gore. The programme seeks to embrace environmental awareness, and promote opportunities for students to increase their science, math and internet skills. To date, over 86 countries and 8,000 schools have joined GLOBE worldwide.

GRID UNEP's Global Resource Information Database (GRID) is a network of information centres that provides decision-makers and the public with improved access to high-quality environmental information. There are currently sixteen GRID centres operational world-wide, the European sites being Arendal, Budapest, Geneva, Moscow, Tbilisi, Warsaw and the MAP/Blue Plan Office.

GYPSUM ($CaSO_4$) Gypsum, or calcium sulfate, is an industrially important compound that comes in a variety of different colors and forms. It is the primary ingredient of plaster-of-Paris and is also used for a variety of building materials such as 'drywall'. There are no serious human health or environmental risks caused by this substance.

H

HCH (1,2,3,4,5,6 HEXACHLOROCYCLOHEXANE) See Lindane.

HEAVY METALS Heavy metals is a group name for metals and metalloids that have atomic densities of greater than 6 grams per cubic centimeter. Many of these metals are toxic at very low concentrations. They are also persistent in the environment and have the potential to build up (bioaccumulate) through the food chain. Heavy metals discharged into the aquatic environment will bind predominantly to suspended material and finally accumulate in the sediment.

HOT SPOTS Sites that pose significant potential risks to human health and the surrounding environment. All identified hot spots require immediate risk reduction measures together with rehabilitation and environmental management.

HYDROCHLORIC ACID (HCl) Hydrochloric acid is colorless or slightly yellow and has an irritating pungent odor. It is used primarily in metal processing, chemical production and analytical chemistry. Exposure via inhalation in the short-term may cause chest pain, coughing, inflammation and ulceration of the respiratory tract. Higher exposure levels can cause a build-up of fluid in the lungs, which can lead to death. Skin contact may produce severe burns, ulceration and scarring. Exposure of workers to hydrochloric acid over long time periods has been reported to cause chronic bronchitis, dermatitis, gastritis and photosensitization. Prolonged exposure to low concentrations may also cause dental erosion and discoloration.

I

IRON (Fe) Iron is a heavy metal with a gray metallic appearance. Nearly all iron produced commercially is used in the steel industry and made using a blast furnace. The pure metal is very reactive chemically and rapidly corrodes, especially in moist air or at elevated temperatures. Iron is an essential dietary element which is used by blood cells to store oxygen. Excess ingestion of iron, however, has been linked to increased risk of cardiovascular disease and colon cancer. Reports also indicate excessive iron can damage the liver and pancreas, leading in some cases to diabetes. However, overall iron is not a significant risk to human or environmental health.

L

LEAD (Pb) Lead is a naturally occurring bluish-gray heavy metal found in small amounts in the earth's crust. It has no special taste or smell. Lead is used in ammunitions, metal products (solder and pipes), roofing, batteries, paints and x-ray shields. Pollution of the environment occurs primarily through the smelting and refining of lead, and the burning of petroleum fuels containing lead additives. In the home, lead pipes and lead-containing paints are also a significant source of exposure. Terrestrial and aquatic plants are known to accumulate lead in industrially contaminated environments. Lead is a serious threat to human health and can adversely affect almost every organ in the human body. The most sensitive is the central nervous system, but immune system and kidney damage are also common effects. Lead exposure during pregnancy can lead to spontaneous fetal abortion, decreased infant size and irreversible brain damage. Children are especially susceptible to lead poisoning because they absorb and retain more lead in proportion to their weight than adults. Learning difficulties and reduced growth rate are common side effects of childhood exposure. Because of health concerns, lead from gasoline, paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The disposal of wastes containing lead is regulated by the Basel Convention.

LINDANE ($C_6H_6Cl_6$) Lindane is an organochlorine pesticide. It is a colorless, crystalline solid with either a faint or no smell. It is composed of approximately 99% HCH. Lindane has been used as a broad-spectrum agricultural insecticide since the early 1950s and is 5-20 times more toxic to insects than DDT. It is also used in ointments to treat head and body lice, and scabies. It is poorly soluble in water and rapid bioaccumulation takes place in microorganisms, invertebrates, fish, birds and humans. However, the elimination of lindane from the body is relatively rapid when exposure is discontinued. Lindane can remain in the air for up to 17 weeks. Workplace exposure has been reported to cause blood disorders, dizziness, headaches, and changes in the levels of sex hormones. The ingestion of large amounts has caused seizures and death. Liver and kidney effects and immune suppression has been observed at moderate ingestion levels. Lindane is considered to be a carcinogen, and has been associated with liver cancer. The international trade of lindane will be addressed by the PIC Convention.

M

MERCURY (Hg) Mercury is a naturally occurring metal that has several forms. Metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless gas. Metallic mercury is used to produce chlorine gas and caustic soda and is also used in thermometers, dental fillings, and batteries. Mercury enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants. Once metallic mercury has entered the environment, it can be methylated by micro-organisms to organic forms of mercury, most commonly methylmercury. This compound rapidly crosses cell membranes and is known to bioaccumulate in the food chain. The nervous system is very sensitive to all forms of mercury, and effects include irritability, shyness, tremors, changes in vision or hearing, and memory problems. Exposure to high levels of mercury can permanently damage the brain, kidneys and lungs. Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and can pass to a nursing infant through breast milk. Exposed infants may suffer from brain damage, muscular incoordination, blindness, seizures, and an inability to speak. The disposal of wastes containing mercury is regulated by the Basel Convention. The trade of mercury compounds will be addressed by the PIC convention.

METAL SULPHATES Metal sulphates is a generic term used to describe compounds containing metal and sulphur. Human and environmental health risks depend on the metal sulphate in question.

MONO AMMONIUM PHOSPHATE (H_6NO_4P) Mono ammonium phosphate is an agricultural fertilizer that is produced by the reaction of ammonia with phosphoric acid. Human and environmental health risks are consistent with those of phosphate.

N

NITROGEN OXIDES (NOx) Nitrogen oxides refers to nitric oxide gas (NO) and nitrogen dioxide gas (NO_2) and many other gaseous oxides containing nitrogen. The main source of these gases in urban areas are motor vehicle exhaust and indoor gas stoves and kerosene heaters. The brown haze sometimes seen over cities is mainly nitrogen oxides. These gases are also partly responsible for the generation of ozone, which is produced when nitrogen oxides react with other chemicals in the presence of sunlight. Exposure to high levels of nitrogen dioxide can interfere with the ability of blood to carry oxygen, leading to dizziness and shortness of breath. Prolonged exposure can lead to respiratory failure.

NPK FERTILIZER A type of agricultural fertilizer containing three primary growth nutrients consisting of nitrogen (N), phosphorus (P) and potassium (K).

O

ORGANOCHLORINES The term organochlorine refers to a wide range of chemicals that contain carbon, chlorine and, sometimes, several other elements. A range of organochlorine compounds have been produced including many herbicides, insecticides, fungicides as well as industrial chemicals such as polychlorinated biphenyls (PCBs). The compounds are characteristically stable, fat-soluble and bioaccumulate. Organochlorines pose a range of adverse human health risks and some are carcinogens.

P

PCBs Polychlorinated biphenyls (PCBs) are mixtures of 209 different chemicals (cogeners) that come in various forms including oily liquids, solids and hard resins. PCBs are organochlorines that were manufactured until the mid-1980s, after which they were banned due to their toxicity and persistence. PCBs have been widely used as insulators in electrical equipment. They have also been used in the production of hydraulic fluids, lubricants, inks, adhesives and insecticides. They are still found in old electrical equipment and releases into the environment continue from landfills. PCBs are very persistent in the environment, taking years to degrade. They are fat-soluble and bioaccumulate in the tissues of animals. PCBs have become worldwide pollutants due to long-distance transport on air currents. Exposure to PCBs can permanently damage the nervous, reproductive and immune systems of the human body. PCBs are known carcinogens and have been linked with the development of various forms of cancer including skin and liver. In mammals, PCBs are passed via the placenta to developing young in the womb and via breast milk to newborn babies. The disposal of wastes containing PCBs is regulated by the Basel Convention. The trade of PCBs will be regulated by the PIC convention. A United Nations convention on Persistent Organic Pollutants (POPs) is currently being developed to further restrict the use of PCBs and other hazardous chemicals.

PERSISTENT ORGANIC POLLUTANTS Persistent organic pollutants, or POPs, are chemical substances that persist in the environment, bioaccumulate through the food web, and pose a risk of causing adverse effects to human health and the environment. The international community has called for urgent global actions to reduce and eliminate releases of these chemicals (See the POPs Convention).

PETROLEUM HYDROCARBONS Petroleum hydrocarbons are formed from the decomposed remains of prehistoric plants and animals that have been buried in the primeval mud of swamps, lakes and oceans. They are a complex mix of individual chemical compounds and are used in over 3,000 industrial applications. While gasoline is the most common product, other applications include plastics and fertilizer manufacturing and asphalt production. When released into the environment, petroleum hydrocarbons undergo a number of complex chemical, photochemical and biochemical reactions, leading to a diverse number of breakdown products. Each of these products has unique environmental and human health impacts which require individual assessment and analysis.

PHARE The European Union's Phare programme provides grant assistance to partner countries in Central and Eastern Europe (CEE) to support the efforts of those countries to assume the obligations of EU membership. These countries are Albania, Bosnia-Herzegovina, Bulgaria, Czech Republic, Estonia, FYR of Macedonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia.

PHOSPHATE ($PO_4 3+$) Phosphate is the ion used in the compound phosphoric acid.

PHOSPHORIC ACID (H_3 P O_4) Phosphoric acid is a colorless, odorless thick liquid. It is used in rust-proofing and in making metal products, fertilizer and livestock feeds. Phosphoric acid is a corrosive chemical and contact can severely bum the eyes and skin. Exposure to the vapor can irritate the nose, throat and lungs Although phosphate is very immobile in soil, it can be washed into streams and lakes where it can cause algae blooms and deplete oxygen levels. Phosphate fertilizers have also been implicated in reef declines.

PIC CONVENTION The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade was opened for signature in 1998. It will come into force when 50 countries provide final ratification. The Convention will enable the world to monitor and control the trade in various chemicals that threaten human and environmental health. It will give importing countries the power to decide which chemicals they want to receive and to exclude those they cannot manage safely. If trade does take place, requirements for labeling and the provision of information on potential health and environmental effects will promote the safe use of these chemicals.

POPs CONVENTION The United Nations is currently developing an international convention to reduce or eliminate the production of a number of persistent organic pollutants (POPs).

R

REC The Regional Environmental Centre for Central and Eastern Europe (REC) is a non-advocacy, not-for-profit organization. Its mission is to assist in solving environmental problems in Central and Eastern Europe. The Centre fulfils its mission through encouraging cooperation among non-governmental organizations, governments and businesses, supporting the free exchange of information, and promoting public participation in environmental decision-making. The REC was established in 1990 by the United States, the European Commission and Hungary. Today, the REC is legally based on a Charter signed by the governments of 25 countries and the European Commission, and on an International Agreement with the Government of Hungary. The REC has its headquarters in Szentendre, Hungary and local offices in each of its 15 beneficiary CEE countries, which are:Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, FYR of Macedonia, Poland, Romania, Slovakia, Slovenia and FR Yugoslavia.

ROTTERDAM CONVENTION See PIC convention.

S

SILISCON (Si) Silicon is a dark gray element with a bluish tinge. Silicon makes up 25.7 % of the earth's crust by weight. It is mostly present in its oxidized form called silicate, such as quartz. Silicon is the second most abundant element, exceeded only by oxygen. Silicon is used in a variety of commercial products including window glass, computer chips, pencils, concrete, lubricants, and varnishes. At room temperature, silicon is relatively inert and does not pose significant environmental or human health risks. However, excessive inhalation of silicon dust is known to lead to scarring of the lungs known as silicosis.

STABILITY PACT FOR SOUTH EASTERN EUROPE This initiative, signed by 27 states, seeks to stabilize, transform, and eventually integrate Southeastern Europe into the European and Trans-Atlantic communities by promoting cooperation and multi-ethnic democracy. The Pact was formally launched in Sarajevo, during a July 1999 summit attended by over 40 leaders from Europe and North America.

SULFUR DIOXIDE (SO_2) Sulfur dioxide is a colorless gas that has a pungent, irritating odor. It is produced from the combustion of fossil fuels, and the roasting of sulphide ores. It is also used in the production of sulfuric acid. Acid gases such as sulfur dioxide can influence the pH of precipitation, making it acidic. Over time, acid rain can have deleterious impacts on soil and water quality. In terms of human health,

there is evidence that sulfur dioxide affects lung function, particularly in asthmatic individuals. It is also a severe corrosive irritant of the eyes, mucous membranes, and skin. Rises in urban levels of sulfur dioxide have been associated with increases in hospital admissions and mortality. Increased morbidity is evident in individuals with pre-existing respiratory diseases.

SULFURIC ACID (H_2SO_4) Sulfuric acid is a colorless, oily and odorless liquid. Its main use is in phosphate fertilizer production. It is also used to manufacture explosives, dyes, parchment paper, glue and lead-acid batteries. Sulfuric acid is very corrosive and irritating and can damage the skin, eyes, and respiratory and gastrointestinal tracts. It can cause blindness if in direct contact with the eyes. Drinking concentrated sulfuric acid can burn the mouth and throat, erode a hole in the stomach, and possibly cause death. Breathing sulfuric acid mists can result in tooth erosion and respiratory tract irritation. The disposal of sulfuric acid contained in batteries is regulated under the Basel Convention.

U

UNDP Since 1965, the United Nations Development Programme has assisted countries to achieve sustainable human development by helping to build capacity in four key areas: poverty eradication; employment creation and sustainable livelihoods; the empowerment of women; and the protection and regeneration of the environment.

UNECE The United Nations Economic Commission for Europe (UNECE) was founded in 1947 as a forum at which the countries of North America, Europe and Central Asia come together to strengthen economic cooperation. UNECE focuses on economic analysis, environment and human settlements, statistics, sustainable energy, trade, industry and enterprise development, timber and transport.

UNEP The United Nations Environment Programme (UNEP) was established as one of the consequences of the 1972 Stockholm Conference on the Human Environment. The mission of UNEP is to be the leading global environmental authority that sets the global environmental agenda; promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system; serves as an authoritative advocate for the global environment; and encourages international cooperation and action based on the best scientific and technical capabilities available.

UNCHS The United Nations Centre for Human Settlements (Habitat) was established in 1978, two years after the United Nations Conference on Human Settlements was held in Vancouver, Canada. The Centre serves as the lead agency for United

Nation's human settlement development activities, as well as for the global exchange of information about human settlements, conditions and trends.

UNHCR The United Nations High Commissioner for Refugees (UNHCR) was established in 1951. UNHCR is mandated to lead and coordinate international action for the world-wide protection of refugees and the resolution of refugee problems. UNHCR's primary purpose is to safeguard the rights and well-being of refugees. UNHCR strives to ensure that everyone can exercise the right to seek asylum, find safe refuge in another state, and return home voluntarily.

URANIUM (U) Uranium is the principal fuel for nuclear reactors and the main raw material for nuclear weapons. Natural uranium consists of three isotopes: uranium-238, uranium-235, and uranium-234. Uranium isotopes are radioactive. The nuclei of radioactive elements are unstable, meaning they are transformed into other elements, typically by emitting particles (and sometimes by absorbing particles). This process, known as radioactive decay, generally results in the emission of alpha or beta particles from the nucleus. It is also often accompanied by the emission of gamma radiation, which is electromagnetic radiation, like X-rays. These three kinds of radiation have very different properties in some respects, but are all ionizing radiation; i.e., each is energetic enough to break chemical bonds, thereby possessing the ability to damage or destroy living cells. The major health effect of exposure to uranium is cancer. It is suspected of causing lung cancer and tumors in the lymphatic and bone tissues.

V

VINYL CHLORIDE (C_2H_3Cl) Vinyl chloride is a colorless, flammable gas with a mild, sweet odor. It is a manufactured substance that is used to make polyvinyl chloride (PVC) and adhesives. PVC is used to make a variety of plastic products, including pipes, wire and cable coatings, and furniture upholstery. Vinyl chloride formed from the breakdown of PVC and other chemicals can enter groundwater, but is unlikely to build up in plants or animals. Exposure to vinyl chloride can cause headache, dizziness, fatigue, sleeping disturbances, loss of memory, nerve damage and immune system suppression. People who work with vinyl chloride have reported problems with blood flow in their hands and occasionally finger bones have degenerated. Animal studies have shown that long-term exposure to vinyl chloride can damage the sperm and testes and lead to various forms of cancer, including liver, brain and lung.

XANTHATES Xanthates are formed by combining alcohol with carbon disulfide in the presence of an alkali metal – namely lithium (Li), sodium (Na), potassium (K), rubidium (Rb), cesium (Cs), or francium (Fr). The term is derived from the Greek word xanthos, for yellow. The most important group of xanthates are the sodium salts produced from cellulose. These materials are processed to form rayon and cellophane. Some xanthates are used as flotation agents for the concentration of certain metal ores. Human and environmental health risks depend on the chemical xanthate in question.

ZINC (Zn) Zinc is a heavy metal that occurs naturally. However, environmental releases of zinc from anthropogenic sources far exceed the releases from natural sources. Anthropogenic releases include those resulting from electroplating, smelting and ore processing, as well as mine drainage and effluents from chemical processes (textiles, pigment and paint, fertilizer and PVC production). Cadmium and mercury are often found as impurities in zinc ore, and are released during smelting. Although zinc is not considered especially toxic, it is sometimes released into the environment in appreciable quantities, and can have deleterious effects on certain aquatic species. Zinc is an essential trace element, but ingestion of higher than recommended levels even for a short time can have adverse effects on health including stomach cramps, nausea and vomiting. Ingesting high levels for several months may cause anemia and damage to the pancreas.

APPENDIX III

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MULTILATERAL ENVIRONMENTAL AGREEMENTS TO WHICH FYR OF MACEDONIA IS A PARTY

Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus), as of 22 July 1999.

Convention on Biological Diversity, as of 2 December 1997.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), as of 4 July 2000.

Convention on the Conservation of European Wildlife and Natural Habitats, as of 17 December 1998.

Convention on the Conservation of Migratory Species of Wild Animals, as of 1 November 1999.

Convention Concerning the Protection of the World Cultural and Natural Heritage, as of 30 April 1997.

Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR), as of 8 September 1995.

Convention on Environmental Impact Assessment in a Transboundary Context, as of 31 August 1999.

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, as of 16 February 1997.

Vienna Convention for the Protection of the Ozone Layer, as of 10 March 1994.

Convention on Long-Range Transboundary Air Pollution, as of 17 November 1991.

Framework Convention on Climate Change, as of 28 January 1998.

Note: FYR of Macedonia is not a party to the Convention on the Protection and Use of Transboundary Watercourses and International Lakes; the Convention on Transboundary Effects of Industrial Accidents; or the Convention to Combat Desertification.

APPENDIX IV
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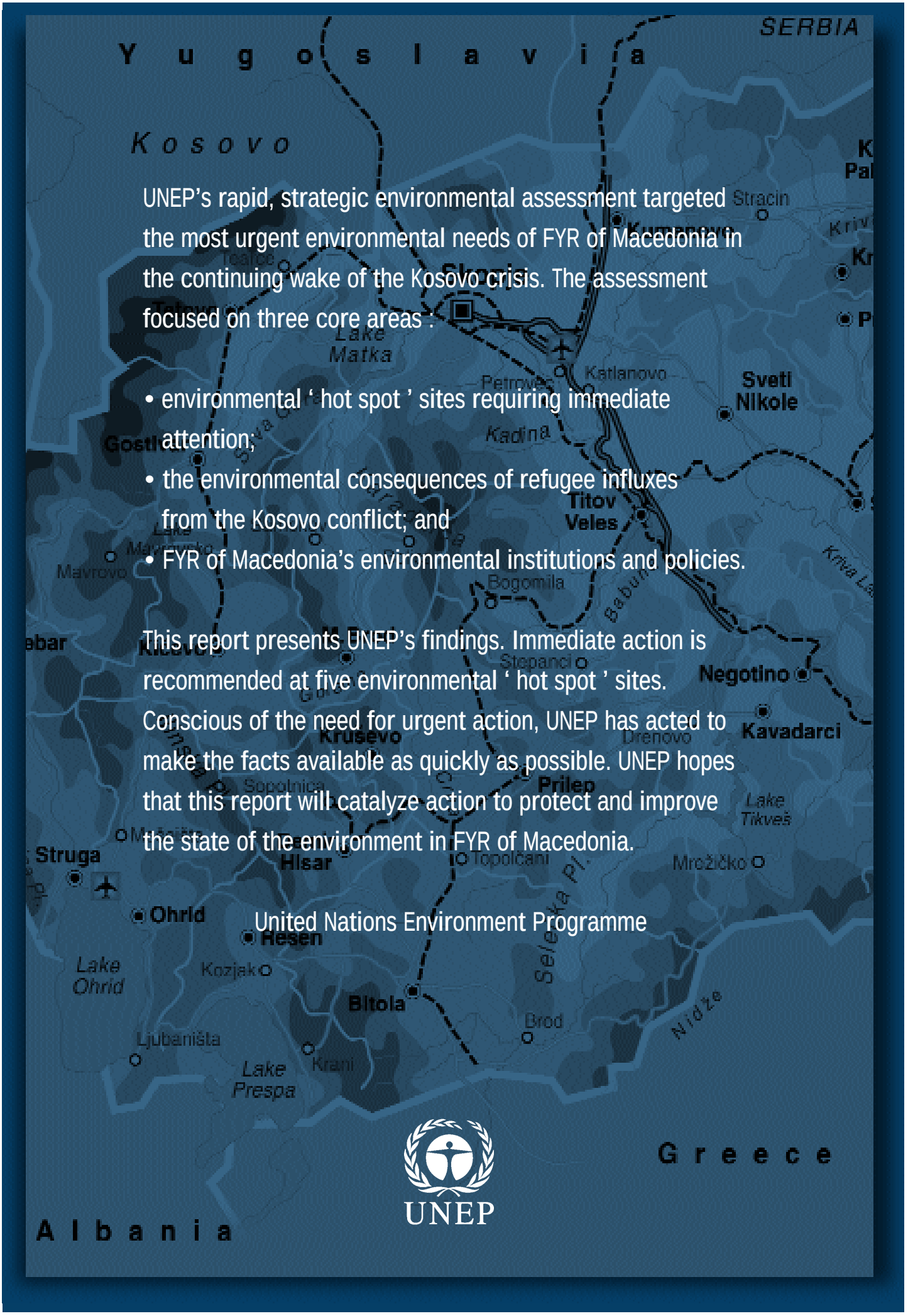

UNEP's rapid, strategic environmental assessment targeted the most urgent environmental needs of FYR of Macedonia in the continuing wake of the Kosovo crisis. The assessment focused on three core areas :

- environmental ' hot spot ' sites requiring immediate attention;
- the environmental consequences of refugee influxes from the Kosovo conflict; and
- FYR of Macedonia's environmental institutions and policies.

This report presents UNEP's findings. Immediate action is recommended at five environmental ' hot spot ' sites. Conscious of the need for urgent action, UNEP has acted to make the facts available as quickly as possible. UNEP hopes that this report will catalyze action to protect and improve the state of the environment in FYR of Macedonia.

United Nations Environment Programme

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