RAPID ENVIRONMENTAL ASSESSMENT OF THE TISZA RIVER BASIN

Prepared by

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INTRODUCTION

1. Description of the Natural Environment of the Watershed

The Tisza[1] River Basin (TRB) is located almost exactly in the geographical centre of Europe and crosses the new boundaries of the European Union. The streams and rivers feeding into the Tisza originate in the Carpathian Mountains in the territories of Romania, Slovakia and Ukraine. It flows through the Pannonian flood plain of eastern Hungary and then south into Serbia and Montenegro where it joins the Danube (Figure 1).

The Tisza catchment area is characterized by high diversity of landscapes, fauna and flora, with a significant number of nature protected areas and national parks. The region has outstanding natural ecological values such as regionally (and perhaps globally) unique freshwater wetland ecosystems of 167 larger oxbow-lakes and the total of more than 300 riparian wetlands. However, there are significant environmental concerns in the TRB related to the extreme dangers of both the excess and shortage of water (occurring almost simultaneously within a given year), the frequent landslides in the uplands due to deforestation, the multiple hazards of diffuse and point source pollution and the further potential accidents at industrial "hot spots", including tailings dams (e.g. the Baia Mare cyanide spill in January 2000 and the Baia Borsa heavy metal spill in March 2000).

The TRB is the largest sub-basin (157,186 km^2) of the Danube Basin (801,463 km^2), being divided into three main parts:

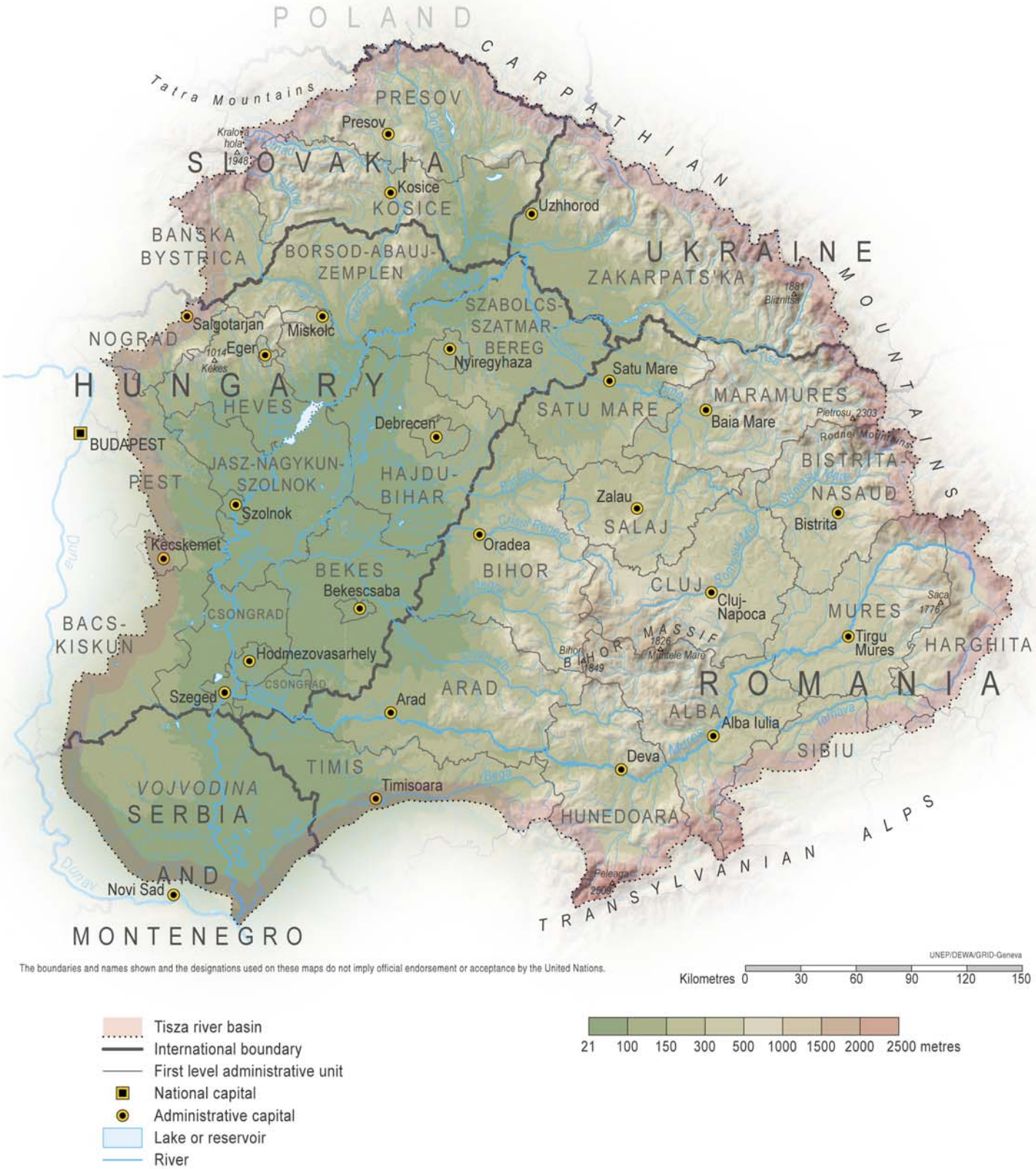
- *the mountainous Upper Tysa in Ukraine*: the headwater section upstream of the Ukrainian-Hungarian border, including the border sector and tributaries of Romania;

- *the Middle Tisza in Hungary*: receives the largest tributaries Bodrog River and Slana/Sajo River collecting water from the Carpathian Mountains in Slovakia and Ukraine as well as the Somes/Szamos River, the Crisul/Koros River system and the Mures/Maros River draining Transylvania in Romania, and

- *the Lower Tisza downstream of the Hungarian-Serbian border*, where it receives the Bega/Begej River and small tributaries through the Danube-Tisa-Danube Canal System.

[1] Tysa in Ukraine, Tisa in Romania, Slovakia and Serbia and Montenegro, and Tisza in Hungary. The internationally known name Tisza is used in the general text of this report.

Figure 1: Map of the Tisza River Basin.



The *Upper Tysa* catchment area covers only 2 per cent of the Ukrainian territory and lies in the Zakarpatska Oblast, with 1.3 million inhabitants. Most of the Ukrainian basin area is located in the Eastern Carpathian Mountains, with the highest elevation peak of 2,061 m and average elevation of 550 m. The largest part of the TRB lies in Romania (72,636 km^2). The basin area is located in the western, central and north-western parts of the country. It has 6,095,024 inhabitants and represents about a third of both the total land surface and population of Romania. The TRB occupies an area of 15,250 km^2 in southern Slovakia. The basin drains predominantly mountainous areas in both the Romanian and Slovak territories, with the highest elevation peaks of 2,300 m in the Rodna Mountains (Tisa sub-basin) and of 2,500 m in the Retezat Mountains (Mures sub-basin). Some lowlands occur in the south, on the edges of the Pannonian basin. Almost 50 per cent of the Hungarian territory is covered by the *Middle and Lower Tisza*, which flows through typical lowlands of the Great Plain and occupies an area of 46,222 km^2. The *Lower Tisza* also lies within the northern part of Serbia and Montenegro (Backa and Banat areas), covering 10 per cent of the country's territory. A brief description of some natural conditions in the TRB riparian countries are given in Table 1.

1: Selected natural conditions in TRB riparian countries.

Characteristics	Serbia and Montenegro	Hungary	Romania	Slovakia	Ukraine
TRB area in the country (square km)	10,376	46,222	72,636	15,250	12,734
Percentage of TRB area of the whole country area (%)	10,1	49,7	30,5	31,1	2,1
Relief	Typical lowland river, same for its tributaries	Typical lowland river, same for its tributaries	Mountainous and lowland areas	Mountainous and lowland areas	Mainly mountainous areas and very minor lowlands
Climate	Continental with low precipitation	Continental with low precipitation	Continental with high precipitation in the mountains	Continental with high precipitation in the mountains	Continental with high precipitation in the mountains
Other characteristics	Canal between Danube and Tisa, 269 km embankments for flood protection	Unique wetlands and conservation areas Frequent floods Regulated river bed	Great biological diversity and high rate of natural ecosystems Frequent floods River pollution	Frequent floods	50% forest cover Frequent floods Erosion

2. Historical and Political Background

Historically, the main structural changes of the Tisza River happened in the 19th and early 20th centuries. During this period, the former huge floodplain was drained and dikes were constructed, with about 84 per cent loss of the floodplain. The Tisza was also strongly regulated (32 per cent of the river length).

Several years of communism in Central and Eastern Europe resulted in negative effects for the water quality of the TRB. Since 1989, deep changes in the political regimes, the opening of the market economy and the economic difficulties encountered by the countries in the region resulted into a reduced pressure on the basin environment. For example, with the decline of the Romanian economy, pollution from major economic sectors located in the TRB area, such as mining/metal processing and agriculture, has decreased. Still, some of these sites continued to be serious pollution and accident risk spots. Also, many wetland areas were drained over decades to support unsustainable agricultural and industrial practices, e.g. along the Tisza river in Hungary 2,590,000 ha of floodplains were reduced to 100,000 ha.

However, the TRB possesses a generally higher level of biodiversity than other catchments in Western Europe. For example, there are still some extensive areas of natural or semi-natural floodplain habitats and other wetlands in the Tisza catchment area. In the Carpathians, generally a remote and marginal area, many of the bad effects of the communist central planning were avoided, such as preservation of many rural areas from intensive agriculture and forestry.

The interaction between transitional political systems, economic readjustment and development, together with the expansion of the European Union, have led to a wide variation in capacity throughout the TRB region to address and mitigate environmental deterioration. Currently, the Tisza riparian countries are at different phases of development, and have wide-ranging capacities to address local, national and regional river basin management issues. While some of these circumstances have promoted advancements for the region as a whole, historically there has been a lack of coordinated environmental and water management among the Tisza states, even though institutional capacity existed to do so.

1. ENVIRONMENTAL POLICY OVERVIEW

1.1. Policy Framework

All Tisza countries are signatories of the Danube River Protection Convention (DRPC, Sofia 1994), which provides all the policy objectives and required actions to improve the environmental situation in the entire basin. In 2002, the International Commission for the Protection of the Danube River (ICPDR), which is responsible for the DRPC implementation, started the implementation of the European Union Water Framework Directive (EU WFD) in the Danube basin. In support to the ICPDR commitments, the five TRB countries are required to implement the WFD and prepare a sub-river basin management plan by 2009. Moreover, the ICPDR has adopted its first Joint Action Plan for the Danube in 2000, which addresses pollution from point and non-point sources, wetland and floodplain restoration, priority substances, water quality standards, prevention of accidental pollution, flooding and river basin management. This also includes the Tisza River Basin.

Several EU and other policies are connected with the sustainable development of the Tisza River Basin. These include:

- *EU Water Initiative*, EECCA component: in order to support the achievement of the Millennium Development Goals for water and sanitation, the EU has started the Water Initiative in which principles of Integrated Water Resource Management (IWRM) are promoted. These principles link with those contained in the WFD.

- *EU Water Framework Directive (2000/60/EEC):* sets objectives for all waters to be achieved on a river basin scale. The preparation of a river basin management plan is envisaged by 2009.

- *EU Directives on the Protection of Wild Birds (79/409/EEC) and Fauna and Flora Habitats (92/43/EEC).* A major objective of these legal standards is the conservation of biodiversity in Europe. For this purpose, both "improvement demands" and "deterioration bans" regarding environmental quality have been provided. Countries have to nominate "Natura 2000" sites, i.e. areas containing habitats and species of EU interest listed in the Directives above.

- *EU Flood Communication*: the European Commission (EC) has recently adopted a Communication on "Flood risk management, flood prevention, protection and mitigation". In October 2004, the EU Environment Ministers asked the Commission to present a programme of action in the first half of 2005.

- *EU Seveso II Directive (96/82/EC):* concerns the prevention of industrial accidents. In the light of recent industrial accidents (i.e. Toulouse, Baia Mare), this Directive was amended by the Directive 2003/105/EC. The most important extensions of the scope are to cover risks arising from storage and processing activities in mining, from pyrotechnic and explosive substances and from the storage of ammonium nitrate and ammonium nitrate-based fertilizers. Member states shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive before 1 July 2005.

- *Draft EU Mine Waste Directive*: deals with all wastes resulting from prospecting, extraction, treatment and storage of minerals. It provides for the application of Best Available Technology (BAT) for mine waste facilities, as well as for the obligation to draw up closure plans with a financial security to cover any environmental damage. A political agreement on the draft has been reached by the EU Environment Ministers in October 2004.

There are many other relevant EU policies that, once fully implemented, will contribute to the sustainable protection of the Tisza River Basin, such as the Common Agricultural Policy (CAP) as well as the Directives concerning pollution prevention and control (96/61/EC) and urban waste water treatment

(91/271/EEC, amended 98/15/EEC).

1.2. International and Regional Cooperation

International and regional cooperation in the TRB has a long tradition and has developed both on bilateral and multilateral levels. There are numerous initiatives involving many different partners in the Tisza region. A non-exclusive list of such activities covers, in particular:

- *Towards a Sub-River Basin Management Plan for the Tisza River:* a recent dialogue with the Tizsa basin countries was started by the EU Presidency of the ICPDR in July 2004 as part of the implementation of the Water Framework Directive in the entire Danube basin. In December 2004, all the Tisza countries signed a Memorandum of Understanding for an integrated Tisza River Basin cooperation under the umbrella of the ICPDR. They agreed to cooperate more closely in order to produce a Tisza River Basin Management Plan by 2009, aiming at the objectives set by the EU Water Framework Directive.

- *Declaration of Co-operation concerning the Tisza/Tisa River Basin and Initiative on the Sustainable Spatial Development of the Tisza/Tisa River Basin*: this is an initiative of the Council of Europe on Sustainable Spatial Development of the Region of the Tisza/Tisa River. All five countries have signed it in September 2003.

- *Tisza River Project / EU research project:* launched in January 2002 under the 5th Framework Programme of the EC, aiming at the investigation of possibilities for improvement of water quality in the catchment area.

- *Tisza Environment Forum:* on May 2001, the five countries of the TRB have signed the Budapest Declaration. Working Groups were formed and focused the work on flood mitigation and protection. This is the only platform for cooperation that all the TRB countries recognize and support, although it does not hold the status of a trans-boundary river commission.

- *Tisza River Basin Sustainable Development Programme*: this initiative was started in 2001 by UNDP Regional Bureau for Europe and the Commonwealth of Independent States (RBEC) and the Regional Environmental Center for Central and Eastern Europe (REC). The main goal of this programme was to improve the life quality for the inhabitants of the basin through strengthening environmental governance based on sustainable development principles. The second phase of the programme was finished in June 2004.

Among other initiatives, there is a proposal to develop an Environmental Programme for the Tisza River Basin, launched by the Hungarian Ministry of Environment in 2001, in a joint action with Ministries of Environment from other Tisza countries, EU and ICPDR. Also, there are numerous bilateral

agreements on issues like flood protection and water quality monitoring between the Tisza riparian countries.

Besides the Danube River Protection Convention (Sofia, 1994), other international conventions regarding integrated aspects of river basin management have also been signed by most of the Tisza countries, such as:

- Convention on Wetlands of International Importance, Ramsar, 1971;
- UNECE Convention on Environmental Impact Assessment in a Trans-boundary Context, Espoo, 1991;
- UNECE Convention on the Trans-boundary Effects of Industrial Accidents, Helsinki, 1992;
- UNECE Convention on the Protection and Use of Trans-boundary Water Courses and International Lakes, Helsinki, 1992;
- Convention on Biological Diversity, Rio de Janeiro, 1992;
- UNECE Convention on Access to Information, Public Participation in Decision-making, and Access to Justice in Environmental Matters, Aarhus,1998;
- Framework Convention on the Protection and Sustainable Development of the Carpathians, Kiev, 2003.

Over the last years, there have been few improvements in the environmental situation of the region, despite the impressive number of initiatives concerning the TRB. This is probably due to the lack of real political commitment and coordination between these initiatives, leading to duplication of efforts, as well as to poor or non-existent enforcement of measures.

2. SOCIO-ECONOMIC TRENDS IN THE TISZA RIVER BASIN

2.1. Economic Driving Forces

2.1.1. Agriculture

Past agricultural methods significantly altered the traditional agrarian structure of the region. In general, agricultural lands were transformed into vast large-scale arable fields covering hundreds of hectares. In the 1960s, this centralised method drained existing wetlands, destroyed forests, increased soil erosion, and dramatically altered the landscape in the Tisza region.

During the last 10-15 years, agricultural production, including plant production and animal husbandry, has decreased in the TRB and huge areas became fallow land. Agricultural land does not have an optimal structure, with cereals occupying a much too important position, considering the soil and climatic

conditions in the TRB. Also, there has been a general decline in the livestock, particularly in cattle and sheep stocks. Climate and soil conditions were not taken into account for crop cultivation and livestock farming. Moreover, modern agricultural equipment is not either readily available or appropriate in mountainous areas such as those in the Maramures region in Romania. In the Ukrainian TRB area, agriculture has a limited importance owing to unsuitable natural conditions, producing only small amounts of grain, meat and milk for domestic needs. Traditional agriculture (based on seasonal pasturing of mountain meadows) is well preserved in the Carpathians, although the cattle and sheep stock decreased significantly during the past decade. In Romania, big livestock farms have been closed down in the 1990s. In 2002, the Hungarian pig and poultry stock decreased by 63 and 60 per cent, respectively, compared to the 1980 stock. In the lower TRB in Serbia and Montenegro, fishponds and pig and cattle farming are still important for the local economy.

Intensive agriculture is still practiced in the Pannonian flood plain, which includes both the middle and lower Tisza regions. This has been possible after many rivers were un-braided and canalised for irrigation purposes, and wetlands were drained, resulting in the Hungarian part of the Tisza in repeated severe flood damage. This has also led to an increase in soil pollution and erosion, a loss of the absorptive capacity during floods, an additional agricultural run off and surface and ground water pollution. Flora and fauna diversity are also affected by the disconnection and drainage of floodplains along the Tisza and its tributaries. The situation is exacerbated due to the use of agrochemicals, which run off into rivers and ground waters. The sharp decline in Hungarian crop production in the beginning of the 1990s was accompanied by a decrease in the use of pesticides and fertilisers. With the increase of production since 1994, fertiliser consumption was resumed, but the use of pesticides remained very low.

Although the Pannonian plain is very suitable for cultivation, the average precipitation on this area is not enough for intensive cultivation, and evaporation “consuming” too much water. Because of these reasons, natural water deficiency occurs regularly and resources have to be substituted by man-made means. In southern Slovakia, there are lowlands on the edge of the Pannonian basin with intensive agriculture. Most streams have been canalized and the water quality and conservation value is considered poor. However, irrigated surfaces are decreasing as a result of significant costs involved in maintaining and extending existing irrigation systems. A similar situation is found in Serbia and Montenegro, where intensive agriculture is also practiced.

2.1.2. Industry

Industrial production has also drastically dropped since the 1990s. In the TRB, main industrial regions are located in Romania and Hungary, although there are also some important industrial facilities in Ukraine, Slovakia and Serbia and Montenegro. Due to the economic decline and stagnation during the last decade, industrial sectors are now mainly oriented towards local resources. In

the Upper TRB in Ukraine, for example, timber processing, furniture and food production comprised 68 per cent of industrial output in 2000. Currently, the mining and metallurgical industries have an important share in the regional economy of the TRB, as well as chemical, petrochemical, cellulose and paper, food, textile, and furniture industries.

The mining industry is well developed in the TRB, notably in Romania. Non-ferrous metals' mining generates much needed income along the Somes and Mures sub-basins, the major Romanian tributaries to the Tisza. Small-scale mining also occurs in the Ukrainian TRB section, with the extraction of salt, kaolin, mercury, gold, complex ores, zeolites and rocks used as construction material. However, the environmental risks involved in these activities continue to raise concerns throughout the region as many mining sites are significant sources of pollution and the development of additional mines is envisaged.

Non-ferrous metals are intensively explored and exploited in the Romanian TRB. The mining industry has been developed in some mountainous areas like the Maramures, Gutii and Apuseni Mountains. This industry offers employment for ten thousands of local inhabitants, but also constitutes a serious source of soil and water pollution. A serious problem in this sector is the obsolete technology that transforms the industry into an important polluting agent. In order to improve the sustainable use of mineral resources and the efficiency of the mining industry, some mines were selected for closure. The Ministry of Industry and Mineral Resources of Romania, with the support of the Government and international donors, carries out the restoration of contaminated sites in these areas. Main industrial sources of air pollution are copper and lead smelters such as the Cuprom Bucaresti (former SC RGB Phoenix SA) and Romplumb SA Firiza. A similar situation is recorded in the Zlatna smelter area, where there are 2,000 hectares of heavily degraded land.

Ferrous metals industry in the TRB is present in Hunedoara (Romania) and Roznava (Slovakia). The Hunedoara site is currently one of the beneficiaries of a reorganisation programme adopted by the Romanian Government, which will require US$ 360 million of total amount of investments until 2010.

The chemical industry operates mostly in the upper and middle Tisza in Hungary (Miskolc and Szolnok regions), in northern Romania (Cluj-Napoca) and in southern Slovakia (Presov region). In recent years, production has been reduced because of the lack of market demand in Eastern Europe. **The petrochemical industry**, including oil refinery, storage and transport (pipelines), is an important sector in the Hungarian and Ukrainian parts of the TRB. Accidental spills have occurred and are considered major environmental issues from this entire sector.

The cellulose and paper industry is present in the upper TRB, in Slovakia, Romania and Ukraine, whereas the **food industry** is mainly located in the middle Tisza, although it is also a locally important sector in Ukraine and Serbia and Montenegro. Production has also been reduced in the last decade,

and pollution patterns have gradually improved in this sector.

The textile industry has developed fast in the TRB due to a rapid transfer of technology and expertise. Since 1999, Romania occupies the first place in Central and Eastern Europe with regard to textile exports to EU countries. The increasing demand for textile products represent an opportunity to augment the land surfaces cultivated with flax and hemp, crops that are well adapted to the climatic conditions of the TRB. The modern technology used reduces the impact of the textile industry on the environment.

The furniture industry is one of the few economic sectors that maintained a positive trade balance after 1990 and shares an important part of the industrial output in the Romanian and Ukrainian parts of the TRB. Important investments are needed in order to implement integrated production cycles to avoid the degradation of the environment due to subsidiary products, for example, sawdust. Also, there are industries producing leather goods, porcelain and pottery, the last one being a large energy consumer.

2.1.3. Energy

Although some of the TRB riparian countries hold important fossil fuel reserves, they are neither large producers nor consumers of energy. Total proven oil and natural gas reserves are limited in these countries, excepting in Romania, which is the largest oil and natural gas producer in Central and Eastern Europe. However, Romania's oil and gas production has declined in the past years by about 50 and 60 per cent, respectively.

Despite the general decline in consumption, the TRB countries remain highly dependent on imported oil and natural gas. However, increased consumption of natural gas, as an alternative to coal, is considered to be a key component of the region's plan to meet the stricter EU energy use and environmental regulations. The TRB countries import most of their crude oil and natural gas requirements, mainly from Russia.

Over the past decade, the TRB countries have continually restructured and downsized their coal industries by reducing the number of inefficient mines in operation, cutting the labour force associated with coal mining, and increasing awareness of environmental issues related to the industry in line with EU standards. Romania and Ukraine coal reserves are significant, with deposits located out of the area of the TRB. Slovakia and Hungary have only limited coal resources and its consumption has decreased sharply in recent years. Between 1993 and 2002, coal consumption fell by 40 per cent in Slovakia and 21 per cent in Hungary.

The strategic importance of the TRB region lies largely in the crude oil and natural gas pipelines which traverse most of the riparian countries on their way to Western Europe. The Druzhba (Friendship) pipeline transports Russian crude oil to Slovakia and Hungary and onward to Western Europe. The southern branch splits in Uzhgorod (upper TRB area in Ukraine), with one section going through Slovakia and the other going to Hungary, where it

connects to the Adria pipeline. The Adria pipeline in turn transfers oil to Serbia and Montenegro and downwards. The Brotherhood and Soyuz natural gas pipelines pass through Ukraine to Slovakia. The natural gas that transits Slovakia represents about 25 per cent of the natural gas consumed in Western Europe and about 70 per cent of the Russian natural gas exported to Western Europe.

In general, power production in the TRB countries relies mainly on thermal sources (oil, natural gas and coal), followed by nuclear, hydro- and renewable sources. Hungary is a net power importer, mostly from Slovakia. In the TRB area, there is the 860-MW oil/natural gas-fired Tisza II power plant in Tiszaujváros, operated by a US based company. Since two nuclear reactors came on line in 1998 and 2000, Slovakia has become more reliant on nuclear generation and less reliant on fossil fuels. In 2002, nuclear power plants produced 56 per cent of the country's electricity while thermal plants provided 27 per cent and hydro 17 per cent. In Ukraine, thermal power plants (oil, natural gas, coal) account for nearly 50 per cent of generation, with nuclear power generating another 40 per cent, and hydroelectric accounting for approximately 10 per cent. Romania's one-reactor nuclear plant Cernavoda accounted for about 10 per cent of electricity generation in 2001. Hydroelectric power also plays a significant role in Romania, accounting for almost 30 per cent of generation in the same year.

2.1.4. Transport

The TRB is crossed by the Pan-European Corridor IV: Berlin-Nurenberg-Prague-Budapest-Arad-Bucharest-Constanza-Istanbul-Salonic, and is situated in the vicinity of Corridor VII: Danube with the branch Sulina and Danube-Black Sea Canal. Other important routes that cross the region are the European E576, E60, E671, E673, E68, E70, E79, and E81 roads. However, there is a lack of highway systems and the national road networks require improvements.

The major part of the TRB does not have watercourses fitted for navigation, with few exceptions (i.e. parts of Tisza River in Hungary for local transport). Thus, water pollution from navigation is not a major issue for the Tisza. The regional railroad network shows continuous degradation due to the lack of maintenance. Rehabilitation of most of infrastructure is necessary to attain European standards.

The TRB is well served by air transportation, with many airport facilities and daily direct flights from many locations in Hungary, Slovakia, Romania, and at a lesser extent, Ukraine and Serbia and Montenegro, to major centres such as Vienna, Bucharest and Budapest.

2.1.5. Forestry

Forestry is an important economic sector in the uplands of the TRB, particularly in Slovakia, Romania and Ukraine. Forestry practices vary from country-to-country and are not generally addressed in conjunction with water

management issues, despite the very close linkages within an integrated land use management framework. The usual method of forest exploitation is selective cutting. Clear-cutting is permitted only in some forest types and limited areas.

Primary processing of wood is declining due to the decrease in some traditional markets and to the obsolete technology still used. In the Ukrainian sector of the TRB, about 500,000 m^3 of timber are logged annually, mainly by small and middle-sized companies, representing a local source of employment. However, in most cases, logging techniques do not meet environmental standards and illegal logging is common. In Romania, poor management of the forestry sector and economic hardship led to unsustainable logging to maintain the furniture industry production. Forest products other than wood are also an important exploited resource, such as forest fruits, mushrooms, medicinal plants, forestry seeds and others.

2.1.6. Tourism

The TRB has a complex and valuable tourism potential, as well as diversified tourism facilities. The main limitation for the sector's development is poor infrastructure and mostly very low development (standards, skills and expertise). Transportation, lodging and accommodation facilities need to be developed in order to make use of the natural potential of the region.

The Carpathian Mountains, which occupy large areas in Slovakia, Ukraine and Romania, have been identified as a possible region for tourism development. Geomorphologic landscapes with a great natural potential, such as the Apuseni and Retezat Mountains National Parks and the Pietrosul Rodnei Biosphere Reserve (all in Romania), attract since long hikers and skiers to the mountains. Salt mines and lakes as well as thermal mineral water springs provide the basis for health tourism. In addition, during the last years, some efforts have been made to develop fishing (middle Tisza) and rural tourism (e.g. Maramures) in the TRB, but their development has been slow.

In general, urban tourist infrastructure in the TRB region is dominated by hotels, from 1 to 4 stars, with capacities from hundreds to 1,000 beds, concentrated in the main cities of the region. Small-scale tourist accommodation, like motels and camping sites, are situated along the major roads, and cabins are found in the mountains. In addition, a modest system of family-owned rural pensions, related to the rural habitat, is offered.

There are also several monuments in the TRB region, which are impressive from the architectural and historical point of view. For example, there are cultural-historical sites and treasures such as medieval towns and museums, and Dacian and Roman ruins in the Romanian area of the TRB.

2.2. Social Driving Forces

2.2.1. Population, Employment, Migration and Poverty

The Tisza River Basin, the largest catchment area of the Danube River, is home to some 14 million people (Table 2). It is characterized by heavy industries in decline, poor economic development, high levels of unemployment (up to 30 per cent in the Slovak and Romanian territories), and increasing levels of social and ethnic tensions exacerbated by the countries' widely varying courses of transition. The population preserves cultural and economic traditions, especially in the mountains. Migration has increased in recent years due to the scarcity of work opportunities in the poorest areas of the basin and offers in other parts that are more economically developed (e.g. Ukraine-Hungary and Romania-Hungary borders and outside of the basin). Moreover, in the Hungarian Great Plain, the agrarian crisis together with the frequent floods of the Tisza and some tributaries has drastically increased local migration to 4.5 per cent over the last seven years, whereas the country average is 1.4 per cent.

The TRB lies within a large Roma-dominated region, with Roma communities residing in eastern Slovakia, north-eastern Hungary, western Ukraine and northern Romania. These are some of the poorest regions of their respective countries and suffer from high unemployment and economic underdevelopment. These communities are vulnerable; their residents are victims of poverty, social exclusion, and discrimination. Addressing these concerns is becoming an increasingly important issue for the national and sub-regional governments and effectively integrated land and water management applied in a sustainable manner is one of the tools that can be used to alleviate poverty in the region.

Table 2: Selected socio-economic aspects of the TRB.

Aspects	Serbia and Montenegro	Hungary	Romania	Slovakia	Ukraine
Number of inhabitants in the TRB	810,000	4,126,362	6,095,000	1,670,000	1,300,000
Main economic sectors operating in the TRB	Large pig and cattle farming Intensive agriculture Fish ponds	Intensive agriculture Industry Tourism	Energy sector Industry Agriculture Mining Tourism Transportation	Agriculture Forestry Industry	Timber processing Food production Some mining

2.3. Financial Initiatives

The TRB has attracted the attention of international donors during the last years, particularly after the Baia Mare accidental spill in 2000. But while there

were countless private investments, only few public donor initiatives have been or are planned to be carried out in the region.

Recently, UNDP prepared a concept paper for a full-sized Global Environmental Facility (GEF) project for the Tisza River Basin region, which will be co-funded by the EU, UNDP and the Carpathians Convention through UNEP, as well as the participating states. The "Reversal of Land and Water Degradation in the Tisza Basin Ecosystem: Establishment of Mechanisms for Land and Water Management" project will take the concept of integrated river basin management further by truly integrating the management of land and water resources and embedding conservation and environmental policy into the planning framework. The project estimated costs are US$ 5.0 million, with a co-financing of US$ 6.0 million till 2010.

The GEF also supports a Biodiversity Strategic Action Programme in Serbia and Montenegro and four biodiversity projects in the TRB at the country level, focusing on water-related habitat conservation measures. The countries are Hungary, Romania, Slovakia and Ukraine. The Hungarian project focuses on conservation and restoration of the globally significant biodiversity of the Tisza River floodplain through integrated floodplain management. The Romanian project focuses on strengthening Romania's protected area system by demonstrating public-private partnership in Romania's Maramures Nature Park, located in the Carpathian Mountains. The Slovakian project focuses on integration of ecosystems management principles and practices into land and water management of Slovakia's Eastern lowlands. The Ukrainian project is about conserving globally significant biodiversity and mitigating/reducing environmental risk by integrating biodiversity conservation principles and practices into forestry and watershed management in Ukraine's Trans-Carpathian region. In addition to these specific TRB financial initiatives, there are larger regional scale projects going on. Among them, there is the UNDP-GEF Danube Regional Project (Strategic Partnership for Nutrient Reduction in the Danube Basin).

The World Bank approved in 1999 a US$ 44.5 million loan for a mining closure and social mitigation project in the period 2000-2005, which supports the Government of Romania's effort to restructure the mining sector. This will be achieved through support for (i) closure of a few complex mines, (ii) implementation of environmental rehabilitation programme, (iii) implementation of social mitigation in mining regions; and (iv) institutional reforms and capacity building for public mining institutions. The total project cost is US$ 61.5 million, from which US$ 17 million are from the Romanian Government.

Currently, the World Bank is preparing a new Mining Closure, Rehabilitation and Socio/Economic Regeneration (Mining II) project, which includes the Romanian part of the TRB. Total costs are estimated at US$ 100 million. The project's objective is to assist with mine closure and remediation of environmental damage and to provide social support for mining communities. One of the target areas is the Baia Borsa mine (accidental spot from 2000).

There were also various bilateral and private corporate support initiatives in the region. Many of them addressed the development of the civil society (small grant programmes for NGOs), but some are directly addressing environmental issues (e.g. rehabilitation of the Baia Borsa-Novat tailing pond by the Austrian government in 2004).

3. MANAGEMENT OF NATURAL RESOURCES AND STATE OF THE TISZA RIVER BASIN ENVIRONMENT

3.1. Water Resources

3.1.1. Water Balance

The TRB waters discharge into the Black Sea, with the remaining waters providing a hydrological cycle that interacts with the natural ecosystem by precipitation, evaporation, evapo-transpiration, and infiltration. Water in the landscape evaporates and returns to the land in the form of precipitation (rainfall or snow). The water that flows to the sea also returns to the land as part of the larger global hydrologic cycle. It evaporates, collides with water vapour and then returns as rain and snow to the regional natural ecosystem. This supplies water to the land, recharging groundwater, streams, lakes and rivers.

The climatic conditions in the upper TRB countries (Ukraine, Romania and Slovakia) are quite similar, with a moderately continental climate characterised by cool summers and mild winters. January is the coldest month and July the warmest month of the year. In the middle and lower TRB (Hungary Great Plain and Banat region in Serbia), the climate is also typically continental, but much hotter and drier, with four pronounced seasons.

The annual precipitation in the upper TRB is quite variable, with the highest volume of rainfall in January and February and the lowest from May to July. In the Ukrainian TRB, for example, the annual volume of precipitation varies from 600 mm in the plain to 1,400 mm in the mountain ridges. Annually, rainfall ranges from 450 mm in the south-western part of Slovakia to 1,500 mm in the mountainous areas of the Tatras. Twenty per cent of the total annual precipitation is snowfall. Frequent extreme weather conditions such as heavy rains and intensive snow melting occur in the TRB (e.g. Ukraine and Romania) and, amplified by other factors (e.g. deforestation), can cause floods three to eight times a year. The recent 1998 and 2000 floods were devastating, particularly in mid-stream countries. In the middle and lower TRB, rainfall volumes are lower than those in the upper parts of the basin. For example, annual precipitation in the Serbian part of the TRB is one of the lowest of the country and the entire basin region, resulting in low water levels of the river in this area.

3.1.2. Water Availability and Use

Water resources in the TRB consist of surface and ground waters, and natural

and artificial lakes. The Tisza River ranks as the longest tributary (966 km) and the second largest tributary of the Danube River by flow volume, with an average discharge of 794 m^3/sec. The basin drains a large area of 157,186 km^2 and is the main water source for Hungary, a significant source for Serbia and Montenegro and an important source for western Romania and south-eastern Slovakia.

The waters of the TRB are mainly used for drinking, irrigation and industrial purposes, but also for hydropower, fishery and recreation. In the basin region the demand for drinking water is about 30.3 per cent of total water use in Romania, 12.5 per cent in Hungary and 12.3 per cent in Slovakia. Irrigation of agricultural crops is done through a series of often degraded canals, particularly in Hungary (49.7 per cent of total water use). Intensive agriculture, fish ponds and large pig and cattle farms are responsible for a large share of water abstraction from the TRB. In the last decade, the water abstraction for industrial use decreased due to the regional economic decline. However, the Tisza region water demand for industry is still high in Slovakia (86.9 per cent), Romania (63.4 per cent) and Hungary (49.7 per cent). Significant amounts of water are currently used for mining and metal processing, oil and gas, chemical, food, cellulose and paper, textile and energy production industries.

3.1.3. Surface and Ground Water Quality

Compared to previous years, no significant changes in the water quality of the TRB in Ukraine, Slovakia, Hungary, and Serbia and Montenegro were observed in 2003. A slight improvement in water quality was detected in Romania, most probably the result of an improving enforcement (monitoring) of environmental legislation and of better industrial technologies. However, serious temporary water quality problems are still caused on some small watercourses in Hungary and Romania as a consequence of overloading by effluents from municipal sewage treatment plants. Analogous problems were recorded in streams in the low plain of Serbia and Montenegro, where an increased number of polluting events leading to the oxygen deficit was detected as a result of elevated temperatures and droughts.

The surface water quality in the TRB is mainly affected by industrial and municipal pollution, agricultural run off and accidental wastewater discharges. The degree of pollution varies, with areas where water is polluted in concentrations regularly exceeding the limits and areas where concentrations are less than the maximum permitted. For example, in the Romanian TRB, in spite of recent improvements, elevated amounts of wastewater produced by major industrial and municipal pollution sources are still discharged into river systems untreated or insufficiently treated. In Hungary, run off from agricultural lands increases the sediment loading of the Tisza, reducing the efficiency of downstream impoundments and damaging the composition and productivity of the riverine ecosystem. As a consequence, the impacts of pollution from both point and non-point sources are significant in the TRB, limiting the availability of water resources. These affect the human health (via food and drinking water), the access to healthy fisheries, the safety to human settlements, and the development of a tourism industry capable of competing

with less environmentally-challenged regions.

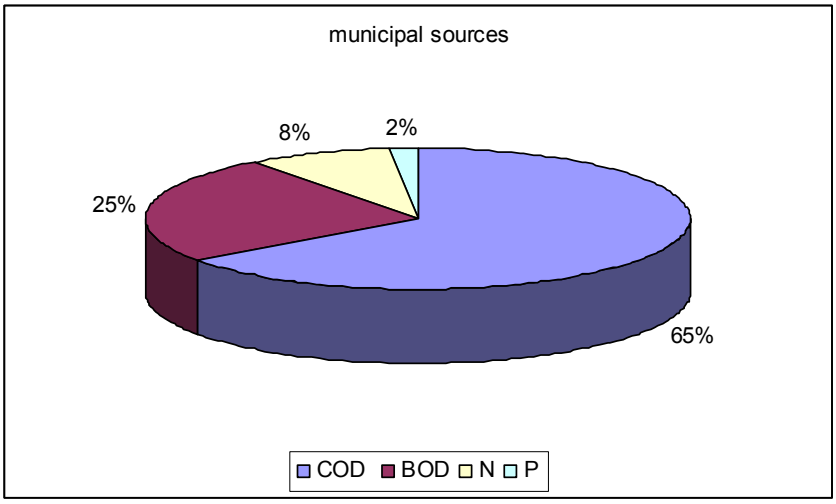
Similarly, ground water quality in the TRB is affected by pollution from industry, agro-chemicals, livestock farming and urban waste water. High pollution with fertilisers and pesticides used in agriculture occurs in the vicinities of major industrial production sites and in croplands. This diffuse pollution, mostly nitrates and limited phosphates, affects individual wells in rural areas and the exploration for drinking water. Pollution resulting from industrial processes that include a large variety of polluting agents (e.g. heavy metals, oil products) is mainly detected in areas close to industrial sites (existing and old ones). In addition, underground water pollution from urban waste water and livestock farming (organic substances, nitrogen-based substances, bacteria, etc.) occurs in major towns and zoo-technical complexes due to inadequate or insufficient waste water treatment. In the lower Tisza in Serbia and Montenegro, the public water supply systems are characterised by exclusive abstraction of ground water, with more than 80 per cent of the urban population connected to the system. However, ground water reserves are continuously declining in the region of northern Banat - the water table of the second water-bearing stratum fell at some points by 10 to 27 m during the past 10 years. Therefore, pollution of the Tisza River, which can potentially be used for domestic water supply, poses a serious problem in this area.

3.1.4. Waste Water

The total annual volume of municipal waste water discharges in the TRB was about 562 million m^3, according to the ICPDR Emission Inventory for the year 2000, which does not include Serbia and Montenegro. From this total volume, 61 per cent is from Romania, 16.7 per cent from Slovakia, 15.4 per cent from Hungary, and 6.9 per cent from Ukraine. The total nitrogen (N) and phosphorous (P) loads from municipal sources in the TRB are 4,883 and 1029 tons per year, respectively. Annual chemical oxygen demand (COD) and biological oxygen demand (BOD) are also elevated in the basin, corresponding to 37,507 and 14,327 tons, respectively. These discharges are illustrated in Figure 2.

Throughout the TRB, there is a lack of municipal waste water treatment facilities. Though some cities and towns have more up-to-date standards, the majority of inhabitants live where wastewater treatment is lacking or badly operating. In some areas, less then 50 per cent of the urban population is connected to public sewerage systems, while septic tanks are widely used. As a result, raw and partially treated sewer is dumped into the tributaries of the Tisza. In addition, run off from stockyards and animal wastes flow into the Tisza River, increasing the organic loading and bacterial levels of the waters. While steps are being taking to improve these conditions under the EU Urban Waste Water Directive and the GEF Danube Regional Project intervention, in some cases there are areas where more than 80 per cent of municipal waste waters enter the Tisza and its tributaries untreated.

Figure 2: Municipal point source discharges of COD, BOD, total N and P in the Tisza River Basin.

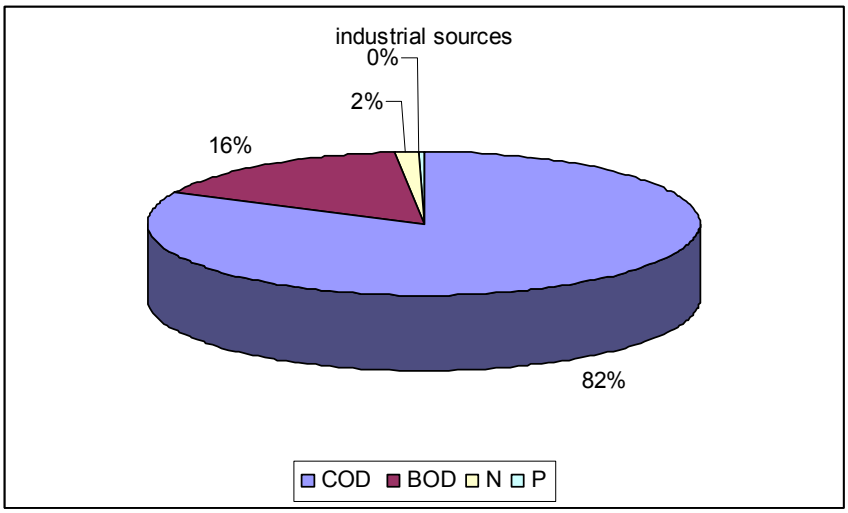


Source: ICPDR Emission Inventory (2000).

Concerning industrial emissions, the total volume of waste water discharges in the TRB in 2000 was about 447 million m^3 (excluding Serbia and Montenegro), from which 61.5 per cent is from Slovakia, 32 per cent from Romania, 6.4 per cent from Hungary and 0.1 per cent from Ukraine. Total annual COD and BOD discharges from industrial sources are lower than those from municipal sources, amounting to 16,662 and 3,315 tons, respectively. Similarly, annual loads of total nitrogen and phosphorous are significantly lower, corresponding to 331 of nitrogen and 32 tons of phosphorous (Figure 3). In the TRB, elevated amounts of COD and BOD are particularly found in cooling waters from power generation in Slovakia, which are discharged without treatment. In addition, important contamination of surface and ground waters with heavy metals (i.e. copper, iron, manganese, zinc, lead and cadmium) occur in the upper basin and is mainly due to untreated or inadequately treated industrial discharges from mining and metal processing industries.

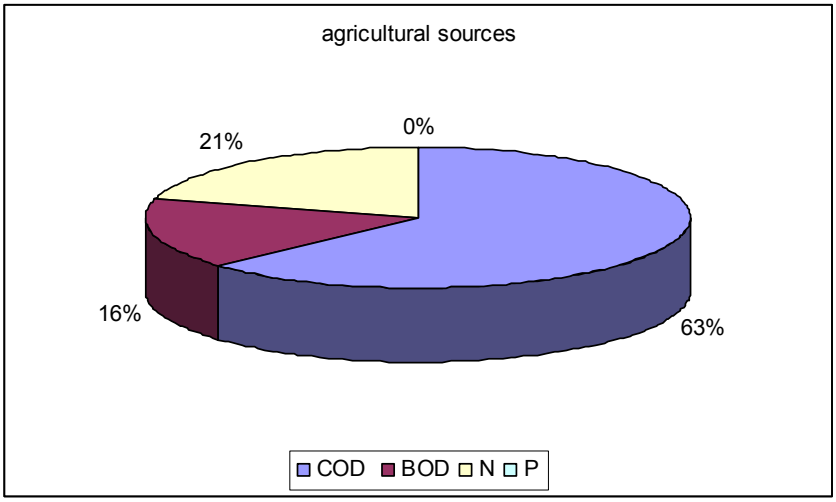
Agricultural sources also contribute to the total loads of COD (2,263 tons), BOD (579 tons) and nitrogen (749 tons) discharged annually into the TRB (Figure 4). Diffuse pollutants in the TRB include nutrients resulting from the over-application of fertilisers, silt from soil erosion, pesticides from the handling and application of chemicals, effluent from sewage and industrial treatment plants. The legal limit for nutrient content in groundwater is often exceeded throughout the basin. For example, the tributaries Mures/Maros and Zagyva in Hungary show chlorophyll-a contents above 250 µg/l. This has resulted in eutrophication, as well as changes to the ecosystem and biodiversity losses. Better integration of agriculture will enable action to be taken to reduce diffuse pollution, which remains a serious problem, as well as preventing toxic algal blooms from excess manure and fertilisers. Restoring wetlands would also significantly increase the river's natural "self-cleansing" capacity.

Figure 3: Industrial point source discharges of COD, BOD, total N and P in the Tisza River Basin.



Source: ICPDR Emission Inventory (2000).

Figure 4: Agricultural point source discharges of COD, BOD, total N and P in the Tisza River Basin.



Source: ICPDR Emission Inventory (2000).

3.2. Biological Diversity

3.*2.1. Flora and Fauna Diversity*

Generally, the TRB is characterized by a rich biodiversity, including some populations of species that are no longer found in Western Europe. Vast areas of wild nature in the mountains contain some endemic flora and fauna species, including large carnivores such as brown bear, lynx, wolf and otter, as well as rare (e.g. *Galium bailloni*) and very rare (e.g. *Fumaria jankae,*

Andryala levitomentosa) plant species. In most cases, although the forest and grassland ecosystems of the basin riparian countries are similar in terms of structure, they differ in terms of flora and fauna diversity. In Ukraine, the Carpathian Mountains account for an elevated number of vascular plant species, being one of the richest regions of flora species in the basin area. The upper TRB in Slovakia has a high biodiversity level due to its location on the boundaries of the West Carpathians and the warm Pannonian region. Lowland, sub-mountain and mountain species are found close to each other in this area. The Hungarian middle and lower TRB contains many nature sites of international importance due to their biodiversity richness, such as the inland systems of the Tisza River, wetland areas and the last floodplain forest complexes, which are home of over 10,000 plant species and almost 2,500 animal species. In Romania, the TRB is characterized by extensive forests covering the Carpathian Mountains, with a great variety of endemic fauna and flora species and a significant density of large carnivores. About 60 per cent of the total European brown bear population lives in this area. The large Carpathian Mountains are particularly important since they provide a natural corridor for the biodiversity spreading in the region.

3.2.2. Protected Areas

The Tisza riparian countries have a great number of protected areas (Figure 5). Within the most important water-related protected areas for species and habitats in the upper Tisza, there are two Slovakian protected areas: a medium size (<50,000 ha) protected area (karst) in the Slana/Sajo River, partially shared with Hungary, and a small size (<10,000 ha) protected wetland on the Latorica River (upper Bodrog River), near the Ukrainian border. There are also other nature reserves and protected areas in the upper TRB in Slovakia, such as the Nature Reserve Vysoky vrch and Protected Area Kavecianska, both in the Kosice region.

In Romania, biosphere, nature reserves and national parks in the upper TRB represent a total surface of 194,271 ha (Table 3). In these areas, many protected flora and fauna species mentioned in the national Red Book are found. In addition, there are plans to create a new protected area in the Upper TRB - The Maramures Mountains National Park. The Maramures Mountains are located in northern Romania where active but unorganized tourism has a negative impact on fauna and flora conservation. There are also projects for the preservation of the aquatic fauna in rivers of the upper Tisza. The main objective is to restrict fishing activity and to create small fishing farms. This would protect valuable fish species and develop sound tourism in the area.

Nature conservation is an important economic component in the Ukrainian upper TRB. Protected areas occupy 1,600 km^2, or more than 12 per cent of the Zakarpatska Oblast area, and there are plans to expand the network of nature conservation areas. The most prominent reserve is the Carpathian Biosphere Reserve, which covers a surface of 57,889 ha.

Figure 5: Protected areas within the Tisza River Basin.

Five National Parks and several protected areas are located in the middle Tisza in Hungary. The National Parks Hortobagyi, Koros-Maros, Bukk, Kiskunsagi (with oxbow lakes), and Aggtelek contain numerous important environmentally-sensitive areas (ESA) of the country.

In addition, a mosaic of Ramsar sites, important bird and landscape protection areas, and biosphere reserves can be found along the wetlands of the middle and lower Tisza River. The Ecsedi Lap Complex (Ukraine, Slovakia, Romania and Hungary) forms a riverine ecocorridor which is 400 km long and has a size of 140,000 ha. There are also Ramsar Sites within both the Hortobagy (23,121 ha) and Kiskunsag (3,903 ha) National Parks.

In the lower Tisza, the Pusztaszer (Hungary) and Stari Begej (at the confluence of the Begej and the Tisza Rivers in Serbia and Montenegro) Ramsar sites are among the most valuable wetlands.

Table 3: Main National Parks, Nature and Biosphere Reserves in the TRB area of selected riparian countries.

National Parks, Nature Reserves and Biosphere Reserves	Surface (ha)	Location
Cãlimani	24,041	Romania: Part of Bistrita-Nasaud, Harghita, Mures and Suceava counties
Grãdistea Muncelului - Cioclovina	10,000	Romania: All in Hunedoara county
Muntii Apuseni	75,784	Romania: Part of Alba, Bihor and Cluj counties
Retezat	38,047	Romania: All in Hunedoara county
Rodna	46,399	Romania: Part of Bistrita-Nasaud, Maramures and Suceava counties
Carpathians Biosphere Reserve	57,880	Ukraine: Zakarpatska Oblast
Synevyr	40,400	Ukraine: Zakarpatska Oblast
Uzhanskyi	39,158	Ukraine: Zakarpatska Oblast
Hortobagy	52,173	Hungary: Middle Tisza region
Kiskunsag	22,095	Hungary: Middle Tisza region
Aggtelek	19,247	Hungary: Middle-Upper Tisza region

Source: World Database on Protected Areas (2004)

3.2.3. Current Threats

Current threats to the TRB biodiversity are the loss of species and habitats, as well as habitat modification. Many fauna and flora species have become endangered or threatened and are listed by the IUCN as well as National Red Books.

As a result of intensive agricultural development over the past decades, many natural ecosystems, particularly the Tisza floodplains, have been transformed into arable lands and pastures. In the upper TRB, notably in Ukraine and Slovakia, deforestation in mountain areas is responsible for changes of typical habitats. For example, in the Kosice region the fragmentation of natural areas and the disappearance of wetlands have caused a decrease in the biodiversity. In addition, extensive use of fertilisers and agro-chemicals led to

soil and water contamination with heavy metals and POPs, and river and lake eutrophication from organic materials and biogenic substances.

The TRB biodiversity is also threatened by industrial pollution of rivers, particularly heavy metal pollution from the mining and metal processing industry located upstream in northern Romania. Natural fishery resources in the Romanian area of the TRB (i.e. Târnava Mare, Târnava Mica and Aries Rivers) are affected due to permanent pollution by heavy metals with a high rate of toxicity, even in small concentrations (e.g. lead, cadmium). In the case of the Abrudel River, in a sector of 24 km, planktonic and benthonic biocenosis were destroyed due to permanent pollution with very acid mine wastewater containing heavy metals, mostly from the Rosia Montana and Rosia Poieni mines. On the Ampoi River, the wastewater output downstream from the Zlatna industrial plant destroyed component species of aquatic fauna and flora in a 10 km sector. Mining and metal processing industry operations should be carefully managed to prevent negative impacts into natural ecosystems along the entire TRB.

3.3. Land Resources

3.3.1. Land Uses

Land in the TRB is mainly used for agriculture, forestry, pastures (grassland), nature reserves, as well as urbanized areas (buildings, yards, roads, railroads; Figure 6). Cultivated arable land and surfaces with permanent crops decreased during the last decade; surface occupied by meadows increased in the same period. This is mainly due to the reduced use of arable land after 1990. The surface occupied by buildings and yards has also increased.

Land uses in the upper Tisza catchment are crucial to overall regional risk management. Continuous land losses, especially within the buffer zone of headwater streams, are increasing the speed of run off, suspended solid and nutrient loads, and producing more unstable catchment behaviour, where the retention time of rain water is reduced, leading to larger flood pulses downstream. Thus, integration of land use planning into the Tisza river management should be made a priority by the local authorities, not only for socio-economic reasons due to frequent floods downstream, but also for promoting the sustainable development of the region.

3.3.2. Land Degradation

Vast areas in the TRB are affected by land degradation due to soil pollution from municipal and industrial sources. This is caused by the inappropriate location and inefficient management of municipal and industrial landfills, as well as mine waste deposits (overburden and tailings ponds), and by intensive agricultural practices (erosion, soil contamination). As a result, these soils are polluted by heavy metals, oil products and other hazardous substances. Moreover, soil contamination is exacerbated by flooding and accidental spills affecting sensitive areas. Salinization of soils due to poor irrigation practices also occurs.

Figure 6: Land use within the Tisza River Basin.

Source: Pan-European Land Cover Monitoring (PELCOM)

Land degradation by diverse construction and mining works constitutes the gravest form of soil loss, particularly in the case of mining activities. Most of the terrains affected by this type of activity became practically unproductive. Also, the covering of soil with waste and solid residues causes a direct economic damage to agricultural production due to the resulting pollution.

Land degradation is also induced by bad management of forest resources. In the uplands of the TRB, many areas are damaged by unsustainable logging, which is frequently associated with landslides and flood events.

3.3.3. Soil Erosion

Soil erosion is a problem related to wind and water. Hydro-erosion is present in a significant area, with anti-erosion measures mostly degraded. Together with landslides, these cause soil losses of up to 41.5 t/ha per year. Large deforested areas with strong to extremely strong erosion potential are found in the upper TRB, mostly in Slovakia and Ukraine. Hydro-erosion can also affect the mechanical stability of tailings dams through the creation of breaches in dam walls; it can result in an increasing leaching of heavy metals too.

Wind erosion occurs on a much smaller scale, but this could be increasing, as some forests and protective curtains in regions susceptible to the degradation process have been cut in recent years. In tailings ponds and mine overburden deposits, wind erosion causes dispersion of fine particles contained in these materials, constituting a potential health hazard for local inhabitants living nearby (e.g. a problem presently tackled in the city of Baia Mare).

3.4. Forest Resources

3.4.1. Forest stands

Forest resources are unevenly distributed throughout the TRB region. In the Ukrainian TRB, forests cover about 6,500 km^2. The portion of mature tree stands is 21 per cent of the forested area. Oak and beech forests occupy volcanic massifs bordering the plain. The "core" ridges of the Ukrainian Carpathians are characterised by beech, fir and spruce tree stands. There are natural mountain shrubs and meadows on ridge's tops rising above 1,500 m. The total forest area in the Romanian TRB covers 23,314 km^2, representing 9.8 per cent of the total national territory. At this is added the forestry vegetation situated outside the total forest area (wooded pasture, tree-lines, riparian wooded corridors, etc.). The overall status of forests health has decreased, with a high percentage of unhealthy trees registered in forests of Arad (31.4 percent) and Timis (24.7 per cent) counties. Healthier and partially protected forests, with fewer injured trees, are found in Maramures, Mures, Salaj, Cluj, Alba and Harghita counties. Forests in the Slovakian TRB are divided into commercial forests, special-purpose forests and protection forests for ecological and conservation functions. Broad-leaved forests predominate, favouring the ecological stability of forest stands such as beech, spruce and mixed spruce-fir-beech forests. In Hungary, there are some forests (and floodplain forests) with important ecological value, particularly in the upper

Tisza River area close to the borders with Slovakia, Ukraine and Romania. However, the current level of forest cover is low and the proportion of afforestation and plantations of non-indigenous species (e.g. hybrid poplars) is relatively high. The most important tree species in forests are oak, beech, hornbeam, ash, maple, elm, alder, linden, poplar, willows and wild fruits.

The main harmful factors that contribute to forest damage are wind-throw hazard, snow, frost deposits, fires, drought, woodworm, insects, rot, etc. The loss of forests promotes soil erosion and loss of absorptive capacity during heavy rains. Unregulated pasture in mountain meadows can also be a problem, since it lowers the upper natural limit of forested areas. Upper forests and meadow zones receive the maximum volume of precipitation, and are thus crucial for run off regulation.

3.4.2. Logging

Forest logging is one of the main economic activities in the uplands and along the lowlands of the TRB. The increased economic reliance on forestry has been exacerbated by a decline in work opportunities in transitional economic systems. However, the conventional approach to forestry management, focused on trees rather than ecosystems, resulted in significant environmental impacts.

Currently, the intensity of logging is having negative impacts on the retention capacity of the landscape, which in turn, may exacerbate the flooding problem. Deforestation also endangers the water quality of the Tisza and tributaries, and impacts the biodiversity (e.g. loss and change in habitats). In addition, there is a lack of sustainable techniques for forest logging, and inappropriate equipment used for logging as well as for afforestation endangers the future of forestry in the region.

Another serious issue is related to unsustainable logging in mountainous areas, which increases the propensity for landslides, endangering human settlements. In Romania, whole hillsides of trees have collapsed because of indiscriminate logging. Similarly, in the Ukrainian part of the TRB, in the Zakarpatska oblast, illegal logging is widespread, yet the economic conditions are so bleak that there are few other activities except forestry to generate income for local residents. Moreover, unemployment is high and thus there has been difficulty on enforcing forestry regulations. In the lowlands of the basin, in Hungary and Serbia and Montenegro, logging is mainly focused on softwood stands in the floodplain of the Tisza and its tributaries.

3.5. Mineral Resources

3.5.1. Endowment and Use

The TRB region is endowed with important reserves of ferrous and non-ferrous ores and has a great variety of exploitable mineral resources. The region also holds limited reserves of oil, natural gas and coal.

Among the riparian countries, Romania has the most developed mining and ore processing industry due to its significant deposits of copper, lead, zinc, gold, silver, bauxite, manganese and iron ore. Copper is mined in two districts in the TRB, both located in Romania: the north-western part of the country with mines at Baia Mare, Baia Sprie, Cavnic and Lesul Ursului, and the south-western part of the country with major mines at Moldova Noua, Rosia Montana and Rosia Poieni. The ore grade is generally low, with major producing mines (Moldova Noua and Rosia Poieni) hosting ore grading only 0.35 per cent copper or less. Concentrates from these areas are smelted and refined at Baia Mare and Zlatna. Lead and zinc are produced at underground mines in Baia Mare, Baia Borsa, Certej and Rodna districts. They are low-grade ores grading 0.4-1.0 per cent of lead and 0.6-1.2 per cent of zinc, with associated copper (0.35 per cent), antimony, bismuth, cadmium, gold and silver. Due to the complex mineralogy of the lead and zinc ores, concentrates produced from them have proved to be uneven. Metal recovery in concentrate ranges between 50 and 75 per cent for lead and zinc, respectively. Smelting and refining of lead and zinc from domestic and imported ores and concentrates are mainly carried out at the Romplumb SA Smelter at Baia Mare. Bauxite open pit and underground mines are operated at Dobresti-Oradea. The regional production of alumina is performed by the Oradea refinery.

Gold resources in the TRB region are mainly concentrated in Transylvania's Golden Quadrilateral, a major gold mining area comprising the cities of Baia de Aries, Brad, Sacarimb and Zlatna. The Rosia Montana open pit and the Brad underground gold mines belong to the joint-venture between Gabriel Resources of Canada and the state-owned mining company MINVEST S.A. Deva. Rosia Montana's output has been reported to be from 10,000 to 12,000 ounces per year. Feasibility studies connected with developing the Rosia Montana mine, and reprocessing tailings from both mines, have been undertaken. The special situation of the Rosia Montana mining area will involve major environmental and landscape interventions, and the relocation of the population of the Rosia Montana village, in order to allow gold exploitation (see Box 1). The mining plans have originated a strong stakeholder opposition, and the Government has not decided yet to grant the required permits. The gold deposits of Cetate and Carnic were evaluated at 45 million tons of ore grading 1.7 g/t of silver and 2.46 million ounces of gold. Since 1999, gold has also been processed from old tailings in the Baia Mare city area by the Australian-Romanian joint-venture company Transgold S.A (former Aurul SA). This company is the owner of the tailings dam where the accidental cyanide spill happened in 2000. Its precious metal treatment plant was designed with a through capacity of 2.5 million tons per year.

Uranium deposits are also found in the Romanian part of the TRB, located in the Western Carpathians (Apuseni Mountains) and Banat Mountains. The Apuseni and Banat Mountains are highly prospective for uranium, holding the deposits of Bihor and Avram Iancu, and Ciudanovita, Dobrei and Natra, respectively. Underground mining technology has been used in all of the deposits mined, with the exception of the Banat Mountains deposits, where open-pit mining was used. Many uranium deposits are now depleted, as the

high grade Baita Bihor (1.13-1.26 per cent of U) deposit. A total 15,557 tU of known conventional resources are reported from ores, with average uranium content of 0.11 per cent. According to IAEA estimates, Romania produced 90 tU in 2003.

Box 1: The Rosia Montana mining site.

The Rosia Montana mining site lies within the Romanian part of the TRB, drained by the Abrud River that flows to the Aries, then to the Tisza and Danube Rivers. The site is located in the Apuseni Mountains, and has a long history of mining, including periods of Roman, Dacian and Austro-Hungarian works. There are up to 140 km of historical mining galleries, in which acid rock drainage has been and still is actively generated.

Mining legacies in the area are serious and extensive, with risks of both national and trans-boundary pollution. Concerning the ongoing mining operations, their impacts include chronic and (potentially) acute environmental pollution. The continuous discharge of 5 to 30 litres/sec of heavily contaminated acid water and almost 400 ha of disturbed ground and waste dumps are major environmental issues in the area. As a result, surface and ground water are contaminated by heavy metals and other hazardous substances, landscape is disturbed, and fauna and flora habitat is modified or destructed. The existing tailings impoundment at Gura Rosie contains mill residues from gold flotation process and occupies an area of about 22 ha. Local drainage goes to the Abrud River.

Planning for large scale open pit mining of gold and silver, the Rosia Montana Project, is advanced. Total proven reserves are about 218 million tons from four main ore bodies (four proposed open pits) occupying 210 ha. The mine life is estimated at 17 years producing 13 million tons annually, with 1.52 g/t gold and 7.47 g/t silver. The project will use the carbon-in-leach cyanide extraction technique, and includes 400 ha tailings facility (with about 250 million tons of tailings materials) and 150 ha of waste rock dumps. These sites are planned to be re-vegetated and mine drainage (including historical AMD) to be collected and treated before discharge.

Although principles of a modern environmental management are included in the project, their implementation may be an issue after all the licenses are granted due to the lack of enforcement by local authorities. Also, this huge operation will directly impact an area where over 900 families currently live. The mining company, Gabriel Resources, will acquire about 2000 properties in the Rosia Montana village. Many small-holding houses and traditional farms occupy a significant part of the populated area to be relocated. These major environmental and social concerns originated a serious opposition of stakeholders involved.

Minor amounts of iron ore feed the metallurgical production in Hunedoara, Romania. Steel is produced in a major plant in the Kosice area, Slovakia. In addition, several construction materials quarries are distributed throughout the basin region.

3.5.2. Tailings Deposits

Major non-ferrous metals deposits in the Romanian part of the TRB contain copper, lead and zinc ores in the form of sulphides. Under aerobic conditions, sulphuric acid is formed by the oxidation of sulphides. This process results in the formation of acid mine drainage, which is a major source of chronic environmental pollution from tailings and mine wastes in the upper TRB. Due to the low pH of these waters (between 1.5 to 3.0), heavy metals such as copper, zinc, cadmium, arsenic and lead, can be leached from the rock and mobilized, causing severe contamination of surface and ground water, soil and vegetation. Consequently, heavy metals can enter and bioaccumulate in the natural and human food chain. As the sulphide oxidation only takes place under aerobic conditions and the reaction is rather slow, acid mine drainage is mainly a long-term problem of poorly managed or abandoned mining sites (including waste rock piles and tailings ponds). Currently, there are many old tailings dams and mine waste rock piles in the Romanian part of the TRB which are potential sources of heavy metal contamination by acid mine drainage. Most of them belong to MINVEST S.A. Deva or REMIN S.A. In the Maramures County, where the total area occupied by tailing dams is about 450 ha, the problem of acid water generation is aggravated by the high amounts of pyrite and marcasite observed in the sulphide ore, which are not separated by milling and flotation processes, being deposited with the tailings.

A serious environmental problem occurs in old mine sites where all operational activities have ceased, but the closure has not been adequately undertaken. In respect of such abandoned sites, notably those where no “owner” exists, cannot be identified or the owner is not deemed capable of meeting the costs of proper closure and decommissioning, there is a problem of where responsibility of their management lies. In such circumstances, the costs of maintenance and environmental safety (including remediation) will need to be met elsewhere (at least for the time being), since they pose a serious risk to human health and the environment. There are only few cases where contaminated mine waters from old mine sites are collected and treated, but even for these sites the future of financing is insecure. For example, in the Ilba Mine, Baia Mare region, there is a modern waste water treatment plant for mine waters collected from this closed site. However, there are operation problems due to finance lacks, resulting in the discharge of acid waters into the nearest river stream. The operations that are still ongoing, but for which closure plans and rehabilitation have not been finalised and financially secured are also of concern, such as those belonging to the Romanian mining company REMIN S.A. that will close seven mining sites in the next years.

3.5.3. Mine Waste Water

Aside from the problem of acid mine drainage, typical at old mine sites and tailings deposits, waste water discharges from current mining and ore processing activities are also of concern in the TRB. Due to economic constraints, investments for waste water treatment plants by Romanian mining companies have been reduced to a minimum since long. Many waste water

treatment plants are currently in a bad state, operating with obsolete and non-effective technologies. As a result, huge volumes of waste water containing heavy metals and other toxic substances (e.g. cyanide) are continuously discharged into the tributaries of the Somes and the Mures sub-basins without adequate treatment, and thus with severe consequences to the local and downstream ecosystems.

The Romanian mining company REMIN S.A., in a joint assessment with Greenpeace and local authorities in 2002, has identified several priority measures and areas of action in order to reduce major water pollution in the upper TRB from its operations (Table 4). There is an urgent need to take action, due to the high impact (risk) on downstream water users, particularly people living in the Baia Mare region and across the Hungarian and Ukrainian borders in north-western Romania. The investments required are small to medium-sized, ranging from EUR 110,000 to 1,000,000 per mining site.

Table 4: Main problems related to mining waste waters in selected sites operated by REMIN S.A. and proposed rehabilitation measures.

Location	Main problems	Rehabilitation measures
Novat Tailing Pond, Baia Borsa Mine	High risk of accidents and chronic pollution of the Vaser-Viseu-Tisa river system	Completing the needed reconstruction and safety works after the big accident in March 2000*
Aurul/Sasar Mine	Risk of accidents for the Sasar river and residents at Nicului street, in Baia Mare	Building a new mining drainage water transport system to the Sasar Flotation Plant, Baia Mare
EM Herja Mine	Chronic pollution from the old wastewater treatment plant of the Firiza river and private wells	Upgraded transport and neutralization of mining drainage waters to the Central Flotation Plant in Baia Mare
Baia Sprie Mine	Chronic and accidental pollution of the Sasar river	Improving the transport system of mining drainage water and tailings to the Tautii de Sus tailing pond
Tautii de Sus Tailing Pond, Baia Sprie Mine	Chronic and accidental pollution of the Sasar river	Improving the pipeline system for wastewater transport to the Central Flotation Plant in Baia Mare**
Central Flotation Plant, Baia Mare	Risk of pollution from pipeline breaks: residential area of Baia Mare and Sasar river	Upgrading the hydro-transport system of the treated tailings to the Bozanta tailing pond
Bozanta Tailing Pond, Baia Mare	Pollution of the Sasar-Lapus-Somes river system	Various upgrading measures of the largest pond and final deposit

*This project was selected by the Austrian government in 2003 and was successfully implemented in 2004.
**A complementing rehabilitation and environmental protection project for the Tautii de Sus pond was financed and executed with support of the Dutch government in 2003-2004.

In the Western Carpathians, uranium mine and mill effluents containing natural radioactive elements above maximum permitted concentration are of

environmental and health concern. In 2000, the daily release of radioactive liquid effluents into the environment was about 14,000 m^3, from which 10,000 m^3 are mine waters with average content of 2-3 mg U/l, and 4,000 m^3 are effluents from uranium processing with average content of 4-7 mg U/l. Part of the liquid effluent is treated in order to retain uranium, so that at release the average contents are of 0.2 mg U/l for mine waters and 0.4 mg U/l for processing waters, which are compatible with international limits. Nevertheless, huge amounts of radioactive effluents are still discharged into the river systems without adequate treatment. There is a general need for construction and enlargement of water treatment plants from uranium mining and milling in mine sites located in the Apuseni and Banat Mountains. Also, there is a serious problem of seepage from uranium tailings, which represent 6 million tons of accumulated wastes, increasing the risk of contamination of soils and groundwater by radionuclides (mainly Ra-226).

Some accidental spills have occurred from uranium mining operations in the TRB, but their causes and environmental and health consequences were not sufficiently investigated. The April 2000 spill, when several tons of waste sludge contaminated with uranium poured from a mining operation in western Romania into nearby streams and then into Fekete Körös River in eastern Hungary, is an example of such an accident. The present situation requires urgent and effective measures in order to prevent future accidental spills from uranium mining and milling sites in Romania, which pose a serious risk of trans-boundary environmental pollution to the Tisza region.

3.6. Wastes

3.6.1. Municipal Wastes

Municipal wastes were, and often still are, mixed with industrial wastes in the TRB. During decades, there was no governmental monitoring and control of landfills; old sites were frequently badly recorded and their content was unclear. The lack of efficient municipal solid waste management in the TRB adversely impacts the environment and is a public health hazard. Leakage on the slopes of landfills situated near to surface water bodies adds to the littering and pollution of such waters with organic substances and suspended matter. Landfills that are not waterproof at the base often represent sources of groundwater pollution by nitrates and nitrites, as well as other pollutants. Water leakage on the landfill slopes also negatively affects the quality of the surrounding and downstream soils and waters, which may limit their utilization. Moreover, air pollution is common in areas located near these sites, and is due to inadequate dumping and after-care practices.

Concerning the effects on the local biodiversity, any waste landfill means the subsequent deterioration or even elimination of a large number of species on each hectare of the area hosting that landfill. Moreover, other changes are likely to occur in these areas, such as plant species specific to polluted terrains would become dominant, and some mammals, birds and insects would desert the area being replaced by fauna adapted to live on or near to these sites.

Box 2: Waste management in the Košice region, upper TRB.

The city of Košice is located in southern Slovakia, in the upper TRB. The area is drained by the Hornad River, a tributary of the Tisza. The municipal waste from the territory of Košice is disposed in the Ekothermal '99 Municipal Waste Incinerating Plant (the KOSIT firm since August 1, 2001). Waste collection is done by the Technical Services of the city of Košice and by the AsaFura Company. The incinerating plant with the capacity for the disposal of 120,000 tons of municipal waste annually is exploited for approximately 40 – 50 percent.

What is causing the problems?
- The Municipal Waste Incinerating Plant does not meet the required criteria arising from legislative requirements for the protection of air in some parameters.
- No redevelopment or reclamation actions have been taken at the municipal waste landfill near Myslava even when it de-activated.
- Waste of hazardous category is mixed with household waste.
- A low-level of separation and sorting of secondary raw materials from collected municipal waste (only 10 per cent).

What are the main issues?
- Landfills of municipal and industrial waste in the current technical conditions represent a potential hazard for the pollution of surface water (Torysa and Hornad Rivers), ground water, soil and air. Old waste burdens create an intrusive aesthetic effect in the natural environment.
- The Municipal Waste Incinerating Plant does not meet the required emission limits for air protection. The produced emissions of greenhouse gases, volatile organic compounds and heavy metals also affect adversely local people, forests and vegetation. Insufficient separation of waste increases requirements for incineration of municipal waste.
- The lack of financial resources is one of the problems related to the management of old landfills. Project documentation has been prepared for their redevelopment and reclamation, which is being gradually implemented in stages. In order to reduce the production of municipal wastes, it is necessary to expand and improve separate collection of secondary raw materials from municipal waste.
- By the construction of collection centres for particular substances and hazardous wastes, with the objective to eliminate them from municipal waste, a reduced production of harmful substances from their incineration can be achieved at the same time.
- In the field of industrial waste, it is necessary to pay attention to the finalisation and sound management of environment-friendly landfills of industrial waste at U.S. Steel Košice, as well as to the utilisation of secondary raw materials from technological processes (utilisation of steel-making dusts and sludge).
- Finally, it is necessary to increase the awareness of local inhabitants in order to expand and improve the general separation of wastes in the city of Košice.

The main problems related to municipal waste management in the TRB are the following:

- storage in open ground is the most frequently used method;
- in some cases, old and existing landfills are located in rather sensitive places (e.g. in proximity to human settlements, surface and ground

water bodies and recreational areas). Also, poor people are frequently allowed to live near landfills, even though these are dangerous sites;

- waste landfills were improperly designed from the environmental protection point of view, thus triggering water and soil pollution in these areas;

- municipal landfills, in most cases, are not operated in a sound manner: waste layers are not compacted nor periodically covered with inert matter. There is no strict control of the quality and quantity of waste that is dumped on the landfill, there are no facilities to assess the amount of biogas produced, the main and secondary roads used by the waste carrier vehicles are badly maintained, transport vehicles are not washed when departing from the landfill, many landfills are not fenced, and do not feature an appropriate point of entry, nor warning signs; and

- household waste is often not collected in a selective manner. Until few years ago, mixed waste was dumped at the landfills with losses of great part of their potential re-use (paper, glass, metal, plastic matter). This is gradually but slowly improving.

3.6.2. Industrial Wastes

Most industrial wastes represent a health hazard due to their significant content of toxic substances such as heavy metals (e.g. lead, cadmium) and organic compounds (e.g. hydro-carbons, pesticides, solvents and oil products). Many years of poor industrial waste management in the Tisza riparian countries led to significant pollution of soils, air, surface and ground waters, and deteriorated the quality of landscapes, flora and fauna.

Within the Tisza catchment area, the amount and type of industrial wastes have a large variation from one country to another. For example, mine wastes account for about 52 per cent of total industrial waste produced in Romania. In general, the global amount of industrial waste has decreased in the last years, coinciding with the sharp decline in local economies.

The largest amounts of waste in the TRB are generated by the following economic activities: mining industry, energy generation, metallurgy, crude oil refining, chemical industry, agriculture, construction materials and food industry. The most usual practice for industrial waste disposal in the region is to store it in open landfills, as it is done with more than 80 per cent of the annual waste generated. Most of these landfills are not properly constructed, usually consisting of simple concrete platforms. There is also a large number of mining overburden deposits and tailings ponds, as well as metallic waste and slag deposits. In the Romanian part of the TRB, for example, there are critically polluted areas because of ash deposits from chemical processes (e.g. Alba, Hunedoara, Maramures, and Salaj counties). Pollution from metallurgical (Zlatna, Baia Mare, Copsa Mica) and chemical (Targu Mures) industries also occurs, with heavy metals (i.e. copper, lead, zinc and cadmium) usually exceeding limits in these areas.

Hazardous wastes originate mostly from the chemical industry, oil refining and metallurgical processes in the Tisza region. The main types of hazardous waste include: oil waste, slag from non-ferrous metallurgy, residue from organic chemistry (pharmaceutics, pulp and paper) and cyanide sludge containing heavy metals (chemical industry). A serious environmental problem arises from the joint storage of industrial hazardous materials (e.g. toxic sludge, oil products, metallurgical slag) and solid urban waste. This situation is likely to generate inflammable, explosive or corrosive mixtures and combinations. Another negative aspect is the fact that several recyclable and useful materials are stored next to or in the same place as materials that cannot be recycled; consequently, these materials blend together and become chemically and biologically contaminated, which renders their retrieval rather difficult.

Some industrial landfills in the TRB region do not own an operating license. In general, these sites are inadequately located (e.g. within town limit, nearby riverbanks), do not feature any kind of environmental protection (they are simply fenced) and are not monitored at all. However, there are landfills that have been subject to one or more rehabilitation works (waterproof bottom layers, drains, monitoring drilling), but few of them are able to meet environmental quality standards. In some landfills that are used for chemical and metallurgical waste, drying layers or pits for various types of sludge have been designed in order to ensure that groundwater is better protected from infiltrations.

3.6.3. Radioactive Wastes and Hazardous Chemicals

In the Hungarian part of the TRB, there is a radioactive landfill at Puspokszilagy, upstream the Zagyva River in the middle Tisza region. This site is considered as a pollution “hot spot” by the Regional Inventory of Potential Accident Risk Spots in the Tisza Catchment Area conducted by the ICPDR (2000).

There are also several radioactive waste deposits from uranium mining and milling in the Romanian section of the TRB. They include approximately 6 million m^3 of waste rocks from uranium mining operations and two tailings ponds containing 6 million tons of wastes from uranium ore processing. Another environmental hazard is the storage at mining sites of low-grade ore with a uranium content of 0.02-0.05 per cent, which is not currently processed. These deposits are all potential sources of surface and ground water contamination by radionuclide due to run off effluents and seepage. They are also responsible for airborne radiation resulting from the decay of radon gas released from the ore and dust, a health hazard for local inhabitants. These radioactive waste materials also are sometimes inadvertently used as part of building construction materials.

Many radioactive dumps and tailings do not have an environmental management system in place. Moreover, the safety capacity of some tailing impoundments is not appropriate, needing to be increased. At present, some

uranium mines in the Romanian part of the TRB have waste storage sites that should be properly closed to prevent further environmental contamination.

Box 3: Increasing environmental radioactivity in uranium mining areas of Western Carpathians, upper TRB, Romania.

A study conducted by the Romanian National Commission for Nuclear Activities Control concluded that uranium mining activities are increasing the natural radioactivity of the environment. One of the two uranium mining areas investigated, the Western Carpathians, includes the Alba, Bihor and Arad regions, where the tailing sites of Lupsa, Garda, Arieseni, Baita, Lazuri, Ranusa, Barzava and Milova are located. This area is drained by the Mures River and the Crisul Repede, Negru and Alb Rivers (in Hungary called Koros River), all tributaries of the Tisza. Quarterly sampling campaigns were conducted at these sites. Samples of surface and ground water, river sediment, vegetation, undisturbed soil and tailings were collected and analysed.

In the Western Carpathians area, higher natural radioactivity levels were recorded for samples from Barzava, Ranusa (Arad County) and Baita (Bihor County) mining sites. Soil samples displayed high concentrations of lead, uranium and thorium isotopes. Vegetation samples collected in Barzava displayed relatively elevated radioactivity due to the presence of lead isotopes (Pb-214). The water samples displayed concentrations in the normal variation ranges for surface waters. However, the Garda Creek, Zalea Neagra Creek and Baita mine waters showed higher amounts of lead (Pb-214), uranium (U-235) and thorium (Th-234), twice higher than water elsewhere in Romania. In addition, highly radioactive tailing samples were found in the sites of Barzava, Ranusa and Baita.

During many years, there was an excessive use of agro-chemicals, including fertilisers, pesticides and herbicides, due to intensive cultivation of crops in several TRB riparian countries. This resulted in high nutrient loads flowing through the TRB that negatively affected the aquatic ecosystems; the situation has, however, improved over the last years. Also, the storage of hazardous chemicals, particularly obsolete pesticides, is of regional concern. Currently, there are no inventories available about these sites covering the TRB area as a whole.

4. ENVIRONMENT AND SECURITY

The Tisza is one of the most threatened European rivers. Accidental pollution from industrial sites and exceptional floods which affected the TRB have been in the news these last years and underlined the need to strengthen efforts to prevent further environmental and socio-economic damage in the entire region.

4.1. Natural Disasters

4.1.1. Floods

Flooding is a natural event crucial for riverine ecosystems, but it is also a significant threat to communities settled in the floodplain (i.e. flood-prone areas). The rainfall in the Carpathian Mountains can be substantial and sudden rains, combined with extensive drainage, floodplain deforestation and river canalization reduce the ability of the catchment to attenuate the flood wave. When heavy rains occur, the flooding threatens human lives as water levels rise quickly, without sufficient retention capacity.

Where river floodplains traditionally supported flood-tolerant land uses (forests, meadows and fishponds), land development interests since the 19th century up to modern agricultural production demand low and tightly-regulated water levels and protection from seasonal inundation. This trend has been facilitated by the availability of arable area, crop intervention payments and grant aid for drainage, including pumped drainage within floodplains. This has led to the development of arable agriculture that demands low water levels in associated rivers. Industrial and urban building has also increased within drained floodplains over the last decades. In Hungary, draining of the Tisza wetlands began in the 19th century and today some 500,000 people – 5 per cent of Hungary's population - live on land reclaimed from the Tisza. As a result of efforts to reduce flood impacts by building higher dykes and continued river bed regulation, there is a deposit of silt within the main bed, which has inadvertently increased flood risks.

In addition to the altered nature of floodplains, the reduction in upper and mid-catchment water retention leads to more flood events downstream where river channels and small floodplains no longer contain peak water levels, even from minor flood events. The lack of coordinated mechanisms for mitigating flooding already in the upper catchment may lead to compounded impacts downstream. When flooding occurs, industrial sites, mining areas, agricultural fields and municipal waste facilities become inundated and spill bio-hazards into the Tisza waters. This is a major problem because several Hungarian communities receive their drinking water from bank-filtered wells.

The trans-boundary impacts of flooding are cumulative, especially for those countries further downstream. Within the Hungarian plain, disruptive downstream flooding and consequent disruption of economic activity has been frequent over the last years. For example, during the serious floods of April 2000 (Photos 1 and 2), the level of the Tisza River in the city of Szolnok was 10.4 meters higher than the mean water level . This is driving the relevant authorities to promote greater cooperative efforts to better manage the Tisza floods. A new Hungarian plan to allow floodwaters to flow into meadows planted with indigenous species that have high absorptive capacities, mimicking more natural flood conditions while reducing flood impacts on human settlements, is under implementation (see Box 4).

In the upper TRB in Ukraine, there are 685 km of dykes and embankments as well as 296 km of bank-protecting structures. Twelve retention reservoirs in the headwaters are not operational and five existing reservoirs cannot cope with extreme floods. The most important project initiated in the area is the “Programme of Integrated Anti-Flood Protection in the Tysa River Basin of

Zakarpatska Oblast for 2002-2006 and Forecast till 2015" (Decision of the Cabinet of Ministers of October 24, 2001), which was already mentioned as a legislative document. The programme is mainly aimed at extensive structural measures, although environmental improvements in forestry and agricultural sectors are also envisaged. It would cost over EUR 300 million, but the sources of financing are not yet clearly identified and secured.

The DRPC emphasises the need for trans-boundary level cooperation in forecasting and monitoring flood events if their impacts are to be minimised. In response to this, the Danube countries have decided to establish joint emergency plans. The ICPDR has included flood prevention in its five-year Joint Action Programme 2001-2005. Primary importance is given to the elaboration of a flood prevention programme, adjusted to the specific local situation in the various parts of the Danube River basin, with particular attention to tributaries and sub-river basins. The *"Action Programme for Sustainable Flood Protection in the Danube Basin"* was recently drafted and will be endorsed at a Ministerial conference in December 2004. From 2005, sub-regional plans (including the TRB) will be prepared.

Recent severe floods highlighted the problem of inundation of landfills, dump sites and storage facilities where harmful substances are deposited. Potential transfer of toxic substances into the water poses a clear threat to the environment. Such potential threats were recognised by the ICPDR (Potential Accident Risk Sites in the Danube River Basin, 2002), and an inventory of old contaminated sites in potentially flooded areas in the Danube River Basin was compiled in 2002-2003.

Box 4: The New Vásárhelyi Plan for the Tisza River, Hungary.

Following the severe floods of the Tisza between 1998 and 2002, the Hungarian government has adopted an ambitious flood safety plan, the New Vásárhelyi Plan. This plan includes the diversion control of peak flood flows, the retention, use and subsequent return of water to the river, and a further water emergency storage and transfer to areas with short supply.

In parallel to enhancing flood safety, the plan is oriented to the development of agro-ecological farming practices, ecotourism and nature conservation, in which the constructed water reservoirs play an essential role in changing the landscape structure and land uses. Adapted cultivation techniques in the adjacent areas to the reservoirs will ensure higher income levels and support sustainable rural development, independent of flooding events.

The Stage I of the plan is scheduled for the period 2004-2007, with total estimated costs of HUF 130 billion from which one-fourth is to be financed by the EU. This first stage includes the construction of six emergency reservoirs along the upper and middle Tisza sections in order to enhance the level of flood safety, and the clearing of the flood bed to improve its conveying capacity. The preparatory work for the Stage II will be completed by June 2005.

Source: Szolnok Environmental Inspectorate, MEW of Hungary

Photo 1: Middle Tisza River, Szolnok, Hungary.

Source: Szolnok Environmental Inspectorate, MEW of Hungary

Photo 2: Middle Tisza River (same section as in Photo 1) during the severe floods of 2000, Szolnok, Hungary.

4.1.2. Droughts

The TRB run off is highly variable; there are alternate periods of drought and flooding that are difficult to forecast and manage effectively. During the strong droughts of the 1930s, the need for surface water supplementation became obvious. At this time, the construction of lowland reservoirs was started in the Körös/Crisul River, to be followed by those on the Tisza River in the second half of the 20th century.

The droughts of recent years had severe effects in the region, particularly in the Hungarian Great Plain, such as the drought of August 2003, when the Tisza level was 2.8 meters lower than the mean water level in the city of Szolnok. This caused extreme harm to agriculture practiced in this region, climatically classified as "semi-arid". The lack of water reduces not only agriculture, but also the development of industry and urbanisation. Cities and other communities demand more water than the quantity available from rainfall, and it has always been difficult to get enough water for settlements far away from rivers. This has necessitated the construction of reservoirs on the Tisza, and two facilities have been completed, one at Tiszalök and the other at Kisköre. The latter has a 106 million m^3 storage space developed between flood control levels. The water from the reservoirs is conducted through the Great Plain by the Keleti (East), Nyugati (West), Nagykunság and Jászság main canals to the Berettyó and Körös Rivers, enabling the development of the economy and recreation, even during periods of droughts.

4.1.3. Landslides

Deforestation in mountainous areas located in the upper parts of the TRB increases the propensity for landslides and mudflows, posing a serious risk to the local population and infrastructure. The water-regulating function of the forest cover has drastically decreased in the last years due to improper forestry practices throughout the region. In addition, some human settlements, infrastructure and industrial facilities located in sensitive areas are vulnerable to landslides owing to inappropriate physical planning.

Landslides and mudflows in the Ukrainian and Romanian parts of the TRB are mainly due to unsustainable forestry practices and uncontrolled logging, which are also closely associated with floods. An Integrated Anti-Landslide Programme in the Zakarpatska Oblast from 1999 to 2010 was prepared and approved by the Cabinet of Ministers; however, its implementation proceeds slowly.

4.2. Accident Pollution

4.2.1. Potential Accident Risk Spots

In response to some major accidents on the Danube Basin, the ICPDR elaborated a wide inventory of Potential Accident Risk Sites in the Danube River Basin based on national inventories 2002 (excluding Serbia and Montenegro, Ukraine, Austria and Bosnia-Herzegovina). The assessment

reviewed potentially dangerous installations in the Danube Basin region, including those in the Tisza Sub-Basin. However, it must be pointed out that the accident risk sites survey could only hint at potential hazards. The actual risks arising from the hazardous sites depend on safety measures, effectively applied in each installation. In order to estimate the safety level that has been attained, special checklists have been developed and distributed to national authorities. At present, an ICPDR methodology is being created that would enable these checklists to be used in a harmonised way in the whole Danube River Basin.

A previous risk assessment covering Potential Accident Risk Spots in the Tisza River catchment area (Romania, Hungary, Ukraine and Slovakia) was conducted by the ICPDR in August 2000. Altogether 42 potential accident risk spots in four Tisza countries were reported and ranked. From this total, 17 sites were tailing ponds and deposits, four were mining industries and two were metallurgical industries. A similar survey was carried out by Greenpeace in autumn 2001, covering only Slovakia, Hungary and north-western Romania.

An updated map of potential accident risk spots in the TRB is shown in the present assessment (Figure 7). It is based on the previous inventories carried out by the ICPDR (2000) and Greenpeace (2001) in the Tisza catchment area, with the updated information provided by competent authorities of the TRB riparian countries.

Following the Baia Mare and Baia Borsa accidental spills of 2000, several environmental assessments were carried out by international institutions/organizations, notably by UNEP/OCHA, US EPA, WWF and UNDP. A further environmental assessment was carried out by the European Commission, which constituted the Baia Mare Task Force for this purpose. According to these reports, acute effects were observed where the cyanide plume passed along the river system, such as immediate plankton, macrozoobenthos and fish killing. The spill also drastically increased the existing heavy metal contamination (particularly copper, lead and zinc) of sediments near the broken dams. However, heavy metal contamination decreased rapidly with increasing distance from the accident site. The River Basin ecosystem is currently regenerating itself, with wildlife largely recovering along the Tisza and its tributaries.

In addition to spills, leakage from old industry installations and pipelines and dam safety problems are of high concern in northern Romania (e.g. Somes-Tisa sub-basin) due to the environmental and health risks involved. For example, some accidents due to leakage in the pipeline system of the Transgold S.A. Company in Baia Mare, have been reported in recent years. Fortunately, related negative impacts on the quality of the surface waters were not found.

Figure 7: Potential accident risk spots in the Tisza River Basin, with zoom in the Maramures mining region.

Industrial Hot Spots and Tailing Ponds

- Mining with tailing ponds
- Mining industry
- Metallurgical industry
- Energy production and deposit
- Oil industry, pipeline
- Chemical industry
- Cellulose and paper industry
- Food, sugar factory
- Pig farm

21 100 150 300 500 1000 1500 2000 2500 metres

- Tisza river basin
- International boundary
- First level administrative unit
- National capital
- Administrative capital
- Lake or reservoir
- River

SLOVAKIA

1. Zelba s.p. Siderit Nizna Slana/Rozvana
2. Bukocel Hencovce a.s. Vranov nad Toplou
3. Chemko Strazske a.s.

HUNGARY

1. Radioactive landfill at Püspökszilagy
2. Hunviron Deposit, Lörinci
3. Hidrotech Banyaszati, Gyöngyösoroszi
4. Borsodchem Rt., Kazincbarcika
5. AES Borsod power plant & AES Summit Generation, Kazincbarcika
6. EMV Kft (North Hungarian Chemical Works Ltd.), Sajobabony
7. Columbian Chemikal Co. & Columbian Tisza soot plant, Tiszaujvaros
8. AES Tisza I coal power plant, Tiszapalkonya
9. MOL oil refinery, Tiszaujvaros
10. AES Tisza II oil power plant AES Summit Generation
11. TVK Chemic Combine, Tiszaujvaros
12. Begin-say, Szolnok
13. TVM chemical works, Szolnok
14. Mol base depot, Szajol

UKRAINE

1. Perechynski industrial complex
2. Prykarpattrans oil product
3. Svalyava industrial complex
4. Druzhba
5. Prykarpattrans naftoproduct
6. Velykobychkivsky industrial complex

ROMANIA

1. Nutrisam Moftin
2. West Construction Company
3. EM Turt
4. IMI Baia Mare-sector Ilba
5. IMI Baia Mare-sector Nistru
6. EM Baia Sprie-sector Herja
7. Romplumb Baia Mare
8. Transgold Baia Mare-Bozanta Aurul pond
9. EM Aurum Baia Mare-sector Sasar
10. Cuprom Bucuresti-sucursala Baia Mare
11. UP Flotatia Centrala Baia Mare
12. EM Baia Sprie-Tautii de Sus pond
13. EM Cavnic-Plopis Rachitele pond
14. EM Baiut-Bloaja pond
15. EM Baia Borsa-Novat pond
16. EM Baia Borsa-Colbu pond
17. Cominco Bucovina Frasin-Valea Bailor
18. EM Rodna-Valea Glodului pond
19. SC Somes SA Dej
20. SC Agroflip SA Bontida
21. SC Devamin SA Mine Baita (Fanate)
22. SC Devamin SA Mine Brad (Rabita)
23. EM Coranda Certej
24. EM Abrud
25. EM Rosia Montana
26. EM Baia de Aries
27. SC Bicapa SA Tarnaveni

Box 5: Major accidental spills in the TRB.

The most significant accidental spill in the TRB occurred in Baia Mare, on 30 January 2000, when a tailing dam operated by Aurul S.A. company (currently Transgold S.A.) broke due to an overflow. The result was a spill of about 100,000 m^3 of liquid and slurries containing about 50 to 100 tonnes of cyanide, as well as significant amounts of heavy metals. The contaminant spill was released into the closest river system and travelled via tributaries into the river Somes, Tisza and Danube before reaching the Black Sea, affecting most Romania, Hungary, and to a lesser extent, Serbia and Montenegro. International experts indicated as the main causes of this accident a combination of design defects in the facilities, unexpected operating conditions and bad weather.

Another important accidental spill happened in Baia Borsa, Romania, on 10 March 2000, as a consequence of an overflow and breach of the Novat tailings dam operated by the state-owned mining company REMIN S.A. 100,000 m^3 of sludge with about 20,000 tons of solid tailings containing elevated amounts of heavy metals were released into the Viseu River, a tributary of the Tisa River in northern Romania. The causes of the break were similar to those of the Aurul accident, as design deficiencies, operational shortcomings and unusual weather.

On 17 September 2003, a five-kilometre oil slick formed on the Latorica River in western Ukraine's Trans-Carpathian region, as a result of a Druzhba oil pipeline incident. The amount released was estimated to be vast, given the pumping rate and the pipe's diameter. Moreover, there were no automatic shut-off valves in place. There was a serious risk that oil would get into the Latyrka River, the only source of drinking water for the city of Chop, on the Hungarian-Ukrainian border, and 20 other settlements in the region. Although the spill was largely contained, and downstream nations were little impacted, the treatment of such accidents remains an ever-present concern.

4.2.2. Management of Trans-boundary Environmental Impacts

Minimizing accident pollution risk and establishing an efficient warning system are the most important tools for preventing environmental impacts from surface water pollution. In the Danube Basin, the management of trans-boundary environmental impacts is done through the Danube Accident and Emergency Warning System (via the ICPDR's Principal International Alarm Centres).

The system is activated in the event of trans-boundary water pollution danger or if warning threshold levels are exceeded. A significant proof of the efficiency of the Accident and Emergency Warning System occurred during the Baia Mare and Baia Borsa accidental spills on the Tisza River in 2000. A sound operation of the system enabled timely activation of measures, preventing larger damages to the Tisza River ecosystem.

The Warning System has been tested many times during various alerts, with the most frequent pollutant being oil. From 2001 to 2003, the System was activated by 17 accidents, from which four were in the TRB. These accidents involved oil spills in Tizsa tributaries in Ukraine, with a serious risk of trans-

boundary pollution into Slovakia. In addition, accidental pollution by mining wastes in the Aries River (a tributary of the Mures River in Romania) occurred in June 2002, without significant trans-boundary impact downstream. In the same year, public media reported significant water pollution with cyanide in the Somes River (Romania), activating the warning system in Hungary. However, it was demonstrated that cyanide concentrations were below the threshold level.

A substantial upgrade of the Danube Accident and Emergency Warning System was carried out in 2003 with the support of the UNDP/GEF Danube Regional Project to make the whole Warning System more effective and cost-efficient. Satellite-based communication was replaced by web-based communication via internet to become an integral part of the ICPDR information system.

5. DEVELOPMENT ALTERNATIVES FOR THE TISZA RIVER BASIN

5.1. Current Policies and Programmes

The European Union *acquis communautaire* – the set of EU legislation to be transposed and implemented in the EU member states – is the dominant guidance for environmental and water policy in the five TRB countries. The most important water policy document is the European Union Water Framework Directive (EU WFD). Several other directives such as Mine Waste (draft), Integrated Pollution Prevention and Control, Seveso II, Wild Birds, Fauna and Flora Habitat, Urban Waste Water, as well as the Common Agricultural Policy (CAP) are also connected to the integrated management of water resources, constituting a fundamental basis for the sustainable development of the TRB region.

Slovakia and Hungary, as new EU member states, have transposed the environmental *acquis* into their national legislation and must fully implement it. Romania is a candidate country in the process of finalising its accession negotiations, and is currently transposing the *acquis* by amending the existing laws.

Serbia and Montenegro is part of the EU's Stabilisation and Association Process towards accession, and is using the EU legislation as a model for developing its own legal system. Ukraine, as a country of the Eastern Europe, Caucasus and Central Asia (EECCA) region, is a beneficiary of the EU Water Initiative, which aims at to provide assistance to countries of the region to modernize their water management systems and incorporate principles of the EU water legislation into their laws.

The main activities for the implementation of the EU **Water Framework Directive** in the TRB are taking place in the context of a River Basin Management Project under the umbrella of the ICPDR. The overall objective of the river basin project is to establish an integrated monitoring and management system for all waters within the TRB, to develop a dynamic

programme of management measures and to produce a River Basin Management (RBM) Plan by 2009, which will be continually updated. The two TRB EU-countries, as well as the remaining three non-member states, will have to ensure that a coordinated approach is adopted for the achievement of the objectives of the WFD and for the implementation of programmes of measures for this purpose, according to the ICPDR commitments.

Box 6: Main objectives of the EU Water Framework Directive.

As part of a substantial restructuring of European Union water policy and legislation, a Directive establishing a new framework for Community action in the field of water policy was agreed by the European Parliament and Council in September 2000 and came into force on 22nd December 2000. The Water Framework Directive (2000/60/EC) sets a framework for comprehensive management of water resources, within a common approach and with common objectives, principles and basic measures. It also rationalises and updates existing water legislation and provides for water management on the basis of River Basin Districts. The Directive addresses inland surface waters, estuarine and coastal waters and groundwater.

The fundamental aim of the WFD is to maintain the "high status" of waters where it exists, preventing any deterioration in the existing status of waters and achieving at least "good status" in relation to all waters by 2015. Other objectives of the WFD are:
- to protect and enhance the status of aquatic ecosystems (and terrestrial ecosystems and wetlands directly dependent on aquatic ecosystems);
- to promote sustainable water use based on long-term protection of available water resources;
- to provide for sufficient supply of good quality surface water and groundwater as need for sustainable, balanced and equitable water use;
- to provide for enhanced protection and improvement of the aquatic environment by reducing / phasing out of discharges, emissions and losses of priority substances;
- to protect territorial and marine waters, and
- to establish a register of water-related protected areas (e.g. areas designated for protection of habitats or species).

Most water policies have been recently adopted or drafted by the TRB countries. Hungary, Slovakia and Romania are actively involved in the preparation of action plans, pilot projects, water management master plans and strategies for implementing the WFD. In Slovakia, the EU WFD has been transposed into the Water Act, focusing on watershed management, protection of the ecosystem and human health. There are still enforcement problems at local level, though. Hungarian water legislation has also been aligned with the EU environmental *acquis* including quality control requirements, especially pertaining to discharges of wastewaters and sewerage. With respect to general water management, new government decrees have been adopted in the field of protection of river basins, water management authorities, utilization and use of different water sections. Works are still being carried out to meet the EU WFD, and the government has adopted a Strategic Document defining the tasks and deadlines to be achieved. A new Romanian law that completely transposes the EU WFD is up for approval, and the transition period for implementation is under negotiation.

Slovakia and Hungary have also negotiated transition periods for the implementation of large investment measures in the water sector, which will enable better planning with a gradual transition. For example, they have requested and negotiated agreements on a transitional period for the implementation of the Urban Waste Water Directive until 2015. Several legislative works are also under way in other related sectors to fully transpose the EU *acquis*.

Ukraine has demonstrated an increasing interest in harmonising its national policy with the EU approach. In this framework, efforts have been done in order to adjust the country's water policy with the EU WFD regarding the development of basin principles of water management and protection, development of ecological standards for water quality and improvement of water pricing policy. The main challenge in Ukraine seems to be financial resources, enforcement, effective monitoring and compliance with the EU WFD over time.

Serbia and Montenegro is currently dealing with serious water management issues, particularly water quality and wastewater treatment, due to the lack of legislation and poor economic conditions. Water management is based on specific territories and there is little enforcement of the existing federal laws. The Water Law of the Republic of Serbia is currently being enacted, in parallel with the drafting of the Constitution of Serbia and Montenegro. Thus, the current situation in the country will require significant efforts and huge investments to allow compliance with the EU WFD in the timeframe established under the coordination of the ICPDR.

One of the key principles of the WFD is that planning and management of all waters should consider water basins as comprehensive units, ranging from the very source of the watercourses to their outfall into the sea. This means that cooperation across national borders is essential for the Directive's implementation. Although many efforts to strengthen cooperation in the TRB region have been undertaken in recent years, especially in the flood control field, there is still a lack of major and effective mechanisms for this purpose. Thus, there is a growing need to develop participatory frameworks for cooperation between countries, sectors, communities and stakeholders in the TRB.

Another major implementation issue faced by the Tisza countries is related to their water management structure, which was not in line with the WFD's river catchment approach. Before the Directive, water management used to be based on specific administrative territories and carried out separately. County councils were responsible for water planning and management within their own region and not within the river sub-basins. Thus, with the implementation of the Directive, significant changes to cope with its new requirements are necessary. Slovakia and Hungary have already applied the river basin management approach to their water policies, and have established water management authorities for river basins. Romania is an exception, since its water management was already based on sub-basin districts, each with its management unit. This constitutes an advantage for Romania in the implementation process of the WFD. In Ukraine, river basin management is

still based on the administrative boundary criteria. Although Ukraine's key water policy document "State Programme on the Development of Water Husbandry" encompasses major integrated water management principles, it does not specify the setting up of a water management body for the TRB. In Serbia and Montenegro, the Water Management Master Plan adopted in 2002 does not reflect a river basin management approach in line with the WFD. The document focuses mainly on developing a "unique" water management system for the country, probably due to administrative problems raised by the territorial division of Serbia and Montenegro.

The adoption and implementation of the draft EU **Mine Waste Directive** (see Box 7) will represent a step forward in the protection of the natural environment and human health, particularly in north-western Romania, where most of the TRB mines are located. New mines and mines in operation will have to comply with the requirements provided by the Directive, which should result in improvements in the overall water quality of the TRB.

Box 7: Draft proposal for an EU Mine Waste Directive.

Wastes from the extractive industry represent a major waste stream in the European Union (about 30 per cent), constituting a main source of soil, surface and ground water pollution. A large number of tailings management facilities are located within the TRB, particularly in the Romanian sector of the basin. Following the mine accidents in recent years (e.g. Baia Mare and Baia Borsa, 2000) and in order to prevent and reduce effects from management of mine waste facilities throughout their life-cycle, the European Commission decided to develop a Best Available Technology (BAT) document for the management of waste rock and tailings from the extractive industry. This document does not come under the Integrated Pollution Prevention and Control (IPPC) Directive, since the extractive industry is exempted from its scope. The mining BAT document was then linked to the new draft proposal for an EU Mine Waste Directive, which was officially published by the Commission on 2 June 2003 COM (2003) 319 final. In October 2004, the EU Environment Ministers sealed an agreement on the draft Directive.

The Draft Mine Waste Directive:
- covers waste from extraction and processing of mineral resources (mining and quarrying activities),
- excludes unpolluted soil, mineral exploration, off-shore extraction, waste transported off-site and non mining-originating waste,
- contains limited requirements for non-hazardous inert waste, and
- excludes mining waste from the Landfill Directive (1999/31/EC).

It also proposes measures on:
- planning, licensing and eventual closure of waste facilities; emphasis on stability and prevention of water and soil pollution,
- preventing and dealing with major accidents, and
- sufficient financial guarantees by operators to ensure eventual full restoration of the waste facility based on Best Available Technology.

However, the draft Mine Waste Directive excludes sites containing so-called

"non-inert, non-hazardous" waste from some of its key obligations. This includes some mining and quarrying wastes, such as silts and ashes, as well as fine particles from quarries. This waste, which is generally common in the TRB region, would not only physically choke the life out of freshwater plants and animals, but also alter the chemistry of the aquatic environment due to suspended matter. “Hazardous” mining and quarrying waste can harm humans as well as aquatic plants and animals because it is directly poisonous due to contamination with dangerous chemicals used during ore extraction and treatment (e.g. cyanide). In spite of this, some of the draft proposals to manage "hazardous" mining and quarrying wastes are weaker than international recommendations such as those from the UNEP/OCHA and Baia Mare Task Force reports after the Romanian spills. For example, waste storage sites closed or undergoing closure by the end of transposition could be excluded from the Directive. This means that the "closure and after-closure" phases may not be carried out under the provisions of this Directive, which could perpetuate the pollution problems from closed/abandoned tailings and mine sites that some Romanian areas located in the TRB are facing at the moment. Moreover, existing/active waste storage sites that pollute could keep on doing so for another (at least) seven years.

The **Integrated Pollution Prevention and Control (IPPC) Directive** has been fully transposed in Hungary and Slovakia. Relevant legislation on IPPC implementation is under preparation in Romania. IPPC principles have not been yet introduced in Ukraine. Serbia has plans to introduce a draft regulation on IPPC, as well as an integrated permitting approach through a new environmental law (not adopted yet).

The **Seveso II Directive**, which aims at the prevention of major-accident hazards involving dangerous substances, as well as the limitation of the consequences of such accidents, is under implementation in Hungary and Slovakia. During the reporting period, the acceding countries that became member states on 1 May 2004 were already aware of the Directive and the reporting procedures. The Commission had undertaken a screening process showing that the legislation was in place. In the framework of the Directive, a Safety Report and an Internal Emergency Plan must be prepared for dangerous industrial facilities, which will enable local authorities to draw up External Emergency Plans. This process is almost achieved in Hungary, but is still ongoing in Slovakia, which has postponed the legal deadline for safety reports submission to 2005. Romania did not provide information on its activities.

The main objective of the EU **Urban Waste Water Directive** is to protect the environment from the adverse effects of discharges of urban waste water and of waste water from industrial sectors of the agro-food industry. Thus, Slovakia and Hungary and the candidate country Romania must provide prior regulation or specific authorization for all discharges of urban waste water and industrial waste water from the particular sectors mentioned in the Directive, as well as for all discharges of industrial waste water into urban waste water systems. Furthermore, they must provide urban waste water collecting systems (sewerage) and treatment plants for all agglomerations above 2,000

inhabitants. Although there have been huge improvements in the waste water management of Slovakia, Hungary and Romania, much still has to be done to fully implement this Directive in the TRB region, both in terms of investments and enforcement.

With the enlargement of the European Union, **the Wild Birds and the Fauna and Flora Habitats Directives** will also apply to parts of the TRB territory. The new EU-member countries Hungary and Slovakia, as well as Romania, Ukraine and Serbia and Montenegro still host species and habitat types that have nearly vanished from Western Europe. But not only that: they hold nature values that currently do not occur at all in the European Union. This is why the Birds and the Habitats Directives had to be adapted to cover these unique assets of the new member states, and one new biogeographic region, the Pannonian region, was added to the existing six (Continental, Mediterranean, Alpine, Atlantic, Macaronesian, Boreal). As regards the legal transposition of the Directives and the implementation of Natura 2000 network, no transition periods were agreed. Therefore, Hungary and Slovakia, which had already transposed the legislation, had started implementing the Birds and Habitats Directives from the date of accession (1st May 2004), whereas the other Tisza countries, although already making efforts, will take a longer period to transpose and implement them.

The EU **Common Agricultural Policy (CAP)** comprises an integrated approach with regard to land conservation, particularly high nature value farmlands. Environmental requirements were introduced as a condition for payments of the first pillar of the CAP as well as to obtain incentives for farming in marginal areas. The second pillar allows member states to implement measures for alleviating or improving the ecological impacts of agriculture, promoting environmentally-friendly farming systems. The accession agreement provides the farmers and rural areas in the Hungarian and Slovak parts of the TRB with well-targeted and well-financed measures to develop the sector in a sustainable way and assist their incomes. However, the situation is not the same in Romania, Ukraine and Serbia and Montenegro, where agricultural policy reforms are still needed, and financial arrangements to promote better practices are weak. This unfavourable condition is hampering a common sustainable development of the agricultural system in the TRB region.

Among the most relevant international **programmes** for the Tisza, there is the GEF project on the Tisza River Basin, which is currently a concept paper. The project aims to develop a planning framework at the regional and national level to deliver mechanisms for integrated land and water management in the Basin. The framework is compliant with the EU Water Framework Directive whilst extending beyond the water sector. The project also deals with flood mitigation, strengthening of regional cooperation, and development and implementation of pilot projects in the region. The TRB countries of Ukraine, Romania and Serbia and Montenegro, as non-EU countries, are eligible for GEF support. The EU-countries of Hungary and Slovakia will be either supported by the EU through the ICPDR or will be self-supporting.

5.2. Integrated Sustainable Development Strategy

There is growing recognition throughout the TRB of the urgent need for an Integrated Sustainable Development Strategy (ISDS) for the region. The main objective of such a strategy would be to promote the coordinated development and management of water, land and other resources in order to maximize the resultant economic and social welfare in an equitable manner, without compromising the sustainability of the vital ecosystem.

An ISDS for the TRB would take the concept of Integrated Water Resources Management (IWRM), incorporating all the relevant environmental policies into the planning framework but, at the same time, allowing for a deeper and wider planning scope. This Strategy would also meet the requirements of the WFD, while further addressing sustainability issues in the water, agriculture, energy, industry and forestry sectors, as well as poverty issues. Major trans-boundary concerns, such as floods and risks of accidental water pollution, would be made a priority. Other important issues such as land use (particularly biodiversity and forest management), sustainable use of mineral resources, tourism development and natural hazards management would be dealt with in this policy document, providing effective cross-sectoral measures for improvement. The development of such a complex strategy would take into account what already has been attained through the EU accession process and the EU and GEF support to the ICPDR in implementation of the WFD, as well as the UNDP sustainable development initiatives in the basin. It would also be in line with the GEF project on the Tisza River Basin.

Integrated water management issues and related issues on industry and mining, forestry and agriculture are closely interlinked with poverty in the TRB. Problems with adequate access to water for household use, food production and industrial processes and the lack of a clean environment for people living in the region are among the basic contributing factors of poverty. A Strategy for the Tisza would thus focus on the sustainable management of water and land resources, giving priority to the review of water, sanitation and productive water infrastructure, aiming at eradicating poverty. It would also promote economic prosperity and reduce poverty by clearly establishing people's rights to use land and water, and ensuring more agricultural jobs and crops.

A key element towards integrated sustainable development and effective trans-boundary cooperation in the region is the political commitment of all the TRB countries, taking into account conflicting regional interests for water use. National economic and social pressures are triggering political sensitivity in relation to water management. For example, upstream countries, particularly Ukraine and Romania, have several large, outdated industrial and mining facilities located in the TRB. As a consequence, there are serious economic, social and environmental impacts in these areas with a risk of trans-boundary pollution. Downstream countries, especially Hungary, besides having numerous industries along the river, value the Tisza as a resource for agriculture, tourism and fishing, these being environmentally sensitive to pollution loads from the upper basin.

Political commitment of the Tisza countries could be established through the adoption of effective instruments (i.e. agreements, protocols, plans) for this purpose. This would not be duplicating the current efforts for promoting cooperation throughout the region, but would complement the actual framework of commitment for these works. The establishment of an institutional body or a commission for the management of the TRB has been suggested by some regional assessments carried out by the EU-PHARE Programme (International Cooperation for the Management of the TRB), UNEP (Integrated River Basin Management and Environmentally Sustainable Regional Development in the Tisza River Region) and UNDP/REC (TRB Sustainable Development Programme). In spite of these concrete proposals to create an effective mechanism of coordination encompassing much more than water management in the entire TRB, there has been an evident lack of progress on such area. A successful example of a river basin agreement, which provides for sustainable water management, river basin management plan and regime of navigation, was achieved in the Sava River Basin (see Box 8). To implement the agreement contracted by the Parties, the Sava River Basin Commission was established and a joint River Basin Management Plan was recently developed.

The development of effective tools such as protocols or plans would be necessary to deal with major components of an ISDS for the TRB (e.g. integrated water and land resources management), ensuring thus its full implementation.

All the five TRB countries are part of the Danube River Protection Convention (Sofia, 1994). These countries have then taken the responsibilities set by the Convention, particularly on the cooperation in key areas of water management such as a common monitoring methodology, coordinated communication and early warning systems. Under the Convention, all the water management efforts should be coordinated with the work undertaken for the Danube River. The preparation of a RBM Plan for the Danube, based on the requirements of the WFD, was agreed by all the Danube Basin countries. This will require coordination work also at the sub-basin level. While only two of the five TRB countries are EU-members, and thus have the obligation to implement the WFD, the other three countries are at different stages in the harmonisation of their water policy with that of the EU. The economic disparities and lack of effective cooperation mechanisms among the Tisza countries are currently the main obstacles for the harmonised implementation of the WFD in the region. In order to enhance cooperation to develop a joint RBM Plan, the EU presidency of the ICPDR started a dialogue with the TRB countries (Tisza Initiative). In December 2004, all five countries signed a Memorandum of Understanding for cooperation in the TRB under the umbrella of the ICPDR, and a working group was set up to deal with this matter. This represents a step forward to a coordinated approach for a RBM Plan at a sub-basin level.

The Framework Convention on the Protection and Sustainable Development of the Carpathians was adopted during the Kiev 5th Pan-European Conference “Environment for Europe” in May 2003. It was signed by six Carpathian countries, including all five TRB countries. The main objective of this

Convention is to pursue a comprehensive policy and cooperate for the protection and sustainable development of the Carpathians with a view to *inter alia* improving quality of life, strengthening local economies and communities, and conservation of natural values and cultural heritage. The extensive geographical area of the Carpathians (including a large section of the TRB) encompasses a great variety of landscapes, fauna and flora diversity, river systems and other valuable natural resources, constituting a strategic instrument for regional biodiversity protection. The Carpathian Framework Convention also provides for integrated land resources and water/river basin management, sustainable agriculture, forestry, transport and tourism, and spatial planning, being consistent with the principles of an ISDS for the TRB.

Box 8: Framework Agreement on the Sava River Basin.

The Sava River Basin ranks as the second largest sub-basin of the Danube, just after the TRB. The geographical area of the Basin extends over the territories of Bosnia and Herzegovina, the Republic of Croatia, the Republic of Slovenia and Serbia and Montenegro, which are the Parties of the Agreement on the Sava River Basin. This commitment (signed in 2002) ensures the sustainable development of the region that should be brought about in cooperation with the Basin countries.

The Sava Agreement is in accordance with the European Union integration process, promoting sustainable water management by regulating utilization, protection of the waters and aquatic eco-system and protection against the detrimental effects of the waters in the Sava River Basin, taking into consideration the Danube River Protection Convention (Sofia, 1994). For the implementation of this Agreement, the Parties established the International Sava River Basin Commission.

According to the Agreement, the Parties should cooperate in order to achieve the following goals:
a) Establishment of an international regime of navigation on the Sava River and its navigable tributaries;
b) Establishment of sustainable water management; and
c) Undertaking of measures to prevent or limit hazards, and reduce and eliminate adverse consequences, including those from floods, ice hazards, droughts and incidents involving substances hazardous to water.

To reach these objectives, the Parties have cooperated in the process of developing joint plans and programmes for the Sava River Basin, and harmonising their legislation with the EU's. In the framework of the UNDP/GEF Danube Regional Project and the EU-CARDS regional programme, two pilot projects for developing a River Basin Management Plan for the Sava River Basin were recently started.

6. CONCLUSIONS AND RECOMMENDATIONS

The TRB holds significant natural resources such as water, minerals, forests and other valuable lands, as well as important cultural and historical assets. The region's great natural potential and political stability constitute the basis for long-term sustainable development in the entire area, although the Tisza countries still have major challenges to overcome prior to achieving this goal.

In addition, the TRB region has a high diversity of landscapes, with the Carpathian Mountains and Pannonian Plain providing natural corridors for a large number of endemic fauna and flora species. It also has extensive wetland areas of international importance, as well as a significant number of protected areas and national parks.

All five countries of the TRB have either directly transposed the principles of the EU water legislation into their national legal frameworks or used them as a key reference. Water management issues in the TRB have been efficiently tackled by the EC and the ICPDR through the implementation of the Water Framework Directive in the Danube Basin. A Memorandum of Understanding, under the ongoing EU Initiative "Towards a Sub-River Basin Management Plan for the Tisza River", was recently signed by the Tisza countries (December 2004) in order to strengthen regional cooperation and produce a river basin management plan by 2009.

Nevertheless, the full implementation of water and other relevant EU policies, which have strict requirements and deadlines for implementation, is still a major challenge for the Tisza countries. Only two of them are EU member states with developed institutional and policy frameworks, whereas the other three Tisza countries are at different phases of harmonisation of their national policies with the EU legislation. This constitutes a main obstacle for trans-boundary cooperation and may significantly hamper the full implementation of the EU environmental *acqui*s in the TRB, in particular the Water Framework Directive.

Following the positive example of the above EU Tisza Initiative, developed under the lead of the ICPDR in the overall framework of the Danube River Protection Convention, complementary efforts are required to further enhance cooperation aiming at a harmonised approach towards the implementation of other relevant EU policies throughout the TRB (e.g. sustainable agricultural policies, the Natura 2000 network or effective action in integrated pollution prevention and control). The Framework Convention on the Protection and Sustainable Development of the Carpathians provides a balancing multi-sectoral and sub-regional platform for a coordinated implementation of such EU (in member and accession countries) and corresponding (in "third" partner countries) legislation and policies.

Recommendation 1

The Tisza countries, especially Ukraine and Serbia and Montenegro, should be further supported in aligning their national legal frameworks with international and European Union policies. Also, countries that have not yet ratified the Carpathian Framework Convention should proceed to do so without delay.

At the same time, there is a need for a broad, long-term Integrated Sustainable Development Strategy (ISDS) for the entire catchment area of the Tisza River. Such a Strategy, based on principles of IWRM, would address the integration of water protection concerns into sectoral policies and the establishment of a river basin management plan.

A Strategy for the Tisza would also deal with, *inter alia*, land management issues (i.e. biodiversity and forest management), accident risks from mining and other industries, as well as the sustainable development of economic activities such as tourism and transport. Poverty reduction and flood management issues, although out of the scope of the WFD, should also be included in this ISDS.

The international community (e.i. EU, UNDP, UNEP, ICPDR, REC, NGOs and other organizations), together with national Governments, should recognize the crucial importance of such a Strategy for the region and take joint action to promote and support it.

Recommendation 2
A long-term Integrated Sustainable Development Strategy (ISDS), encompassing integrated water and land management, as well as environmental security issues, should be agreed by the Tisza countries and supported by national Governments and the international community.

Political commitment of all TRB countries is necessary to ensure sustainable development and effective trans-boundary cooperation in the region. A real commitment between these countries has also to consider their different economic, political and geographical contexts in the framework of a common sustainable development strategy for the region.

The Danube River Protection Convention, whose main goal is to achieve sustainable water management, covers one sector of main importance with respect to integrated sustainable development at a sub-basin level. In addition, the large area covered by the scope of this Convention (including the entire TRB), could support the adoption of a legal instrument/plan for integrated RBM of the TRB.

A large part of the TRB lies within the Carpathian region, thus making the Framework Convention on the Protection and Sustainable Development of the Carpathians an important driver in the process of building up an integrated sustainable development strategy for the area. The wide objective and multi-sectoral nature of this Convention, based on principles of integrated land resources management but also including water management issues, is in line with an ISDS for the TRB. Under the Carpathian Framework Convention, the Tisza countries committed themselves to examine the possibility of introducing integrated development tools encompassing the region. This possibility could be further explored in order to establish a Biodiversity Protection Protocol/Plan for the entire TRB, as well as other land use plans/strategies (e.g. forest management).

Thus, the Danube Protection and the Carpathian Framework Conventions are, to some extent, complementary and both could provide the basis for legal instruments/plans on the TRB, avoiding the creation of new structures for this purpose.

Recommendation 3

Protocols or plans, as the framework for regional cooperation and implementation of an Integrated Sustainable Development Strategy (ISDS) in the TRB, should be developed as soon as possible. Priority should be given to the establishment of a RBM Plan and development of a Biodiversity Protection Protocol/Plan for the Tisza region.

A major component of a Tisza ISDS would be environmental security involving, among other issues, prevention and control of accidental water pollution from industry and mining (e.g. rehabilitation of priority accident risk sites). Due to the huge environmental impact and human health risks caused by old and ongoing mining activities in the TRB and the risks involving new mines, the Strategy would pay special attention to fully address this issue, in order to promote both economic growth and environmental sustainability in mining regions.

Since 2002, the Environment & Security Initiative has been carried out by UNEP in collaboration with UNDP and the Organisation for Security and Cooperation in Europe (OSCE). The general purpose of this project is to identify linkages between major environmental concerns within European sub-regions and countries, and existing or potential security problems that impact on people and states. These include threats to biodiversity and human livelihoods, land degradation, international waters and obsolete or polluting industrial/waste sites.

The Environment & Security Initiative represents an opportunity for strengthening the participatory role of UNEP and other partners in major environmental programmes and projects in the TRB. This can be done through the carrying out of desk studies, assessments and pilot projects, and the organization and promotion of workshops in the TRB region. For example, a key mining project in the Romanian section of the Basin (Rosia Montana project), where different stakeholders reported a major conflict of interest, needs further discussion and transparency that could be provided through a workshop, with broad participation of the stakeholders concerned. Also, the promotion of contribution to the work developed by the Accident Emergency Prevention and Warning System Expert Group of the ICPDR concerning accidental water pollution is necessary.

Recommendation 4

Under the Environment & Security Initiative:

- *a trans-boundary risk assessment study for all mining and ore processing industries in the TRB, should be carried out in order to update the current data and prioritise the most cost-effective actions for pilot project implementation.*
- *a regional workshop dealing with technical, environmental and social aspects of mining/tailing management, as well as related water and land use issues, with participation of all interested stakeholders, should be organized.*
- *a pilot project for strengthening capacity building for better accident prevention, improved emergency preparedness and response*

measures in case of accidental water pollution, should be developed and implemented. In addition, cooperation and coordination with the work of the ICPDR Accident Emergency Prevention and Warning System Expert Group should be promoted.

Another important environmental security issue in the TRB concerns flood management. Effective flood protection and control, also in the middle and upper parts of the Basin, should be made a priority by a Tisza ISDS due to the high economic, social and environmental damage caused by frequent floods. Coordinated measures for flood mitigation, relying on natural mechanisms to minimize impacts of water flow variations throughout the Basin, are necessary and have been recommended by the EU Tisza Initiative to be included into a proposed sub-river basin management plan (in line with the EU Flood Communication and the ICPDR Flood Action Programme).

At the same time, environmentally-sensitive areas with a rich biodiversity, particularly in the upper TRB, require special attention and efforts from the Tisza countries and international community in order to protect them and, at the same time, promote their sustainability. A regional ISDS should thus apply an integrated approach for water, land use and biodiversity management to better preserve high nature value and other important areas of the Tisza Basin.

Recommendation 5
Trans-boundary pilot projects at the local level, *including demonstration of economic, social and environmental advantages of water and land management integration, as well as harmonised flood management, should be developed and implemented in the TRB. Priority should be given to re-connection of floodplains (also in the upper and middle sections), conservation/restoration of alluvial forests and enlargement of the protected areas network within the entire Basin region.*

In the framework of an integrated river basin management plan for the Tisza, it is necessary to introduce a common water and sediment monitoring system throughout the Basin. This should involve inter-calibration studies of chemical analyses of water and sediment samples, and information exchange on a regular basis between the authorities in all the Tisza countries. Groundwater monitoring should also be harmonised and improved. This is important since some watercourses in the TRB originate from groundwater, but also because groundwater is used as a source of drinking water in some regions (e.g. Banat in Serbia and Montenegro).

Recommendation 6
The Tisza countries should give high priority to the improvement and harmonisation of existing monitoring systems, and to setting up common baseline indicators for sediment, surface and ground water quality monitoring. A coordination mechanism for a common monitoring system for the TRB, in line with that of the Danube Basin, should be established.

Stakeholder participation is fundamental in the process of building up an

Integrated Sustainable Development Strategy for the Tisza region. This could be done, *inter alia*, through the greater involvement of current civil society institutions such as the Regional Environmental Center for Central and Eastern Europe (REC) and NGOs in the region. In addition, the REC's participatory role as a major regional partner in assessing the effectiveness and enforcement of environmental legislation should be strengthened building on the REC's experience and prior/ongoing work in this field.

Recommendation 7
Raising public awareness and promoting stakeholder participation in environmental matters, particularly in the development of an integrated RBM Plan, and improving the current level of enforcement of existing environmental legislation, should also be among the priorities of a TRB ISDS.

The Rapid Environmental Assessment of the Tisza River Basin has demonstrated that the region faces significant environmental challenges in relation to future economic and human development. Environmental policies in the Tisza countries need further coordinated efforts and joint action for effective implementation and enforcement.

It has also been clearly shown that the TRB region as a whole has a unique environmental endowment that must be protected from the harsher impacts caused by unsustainable management practices. These impacts could be minimized with an Integrated Sustainable Development Strategy for the Tisza region encompassing integrated water and land management, as well as environmental security issues. Priority should be given to biodiversity protection, mining/industry rehabilitation, harmonised flood management and development of a river basin management plan. The objectives of such a complex Strategy for the TRB could only be achieved by strengthening regional cooperation and promoting a broad involvement of current stakeholders.

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Abbreviations and symbols

BAT	Best Available Technology
BOD	Biological Oxygen Demand
CAP	Common Agricultural Policy
CFC	Framework Convention on Protection and Sustainable Development of the Carpathians
COD	Chemical Oxygen Demand
DRPC	Danube River Protection Convention
EC	European Commission
EECCA	Eastern Europe, Caucasus and Central Asia
EPA	Environmental Protection Agency
ESA	Environmentally-sensitive Areas
EU	European Union
GEF	Global Environmental Facility
ICPDR	International Commission for the Protection of the Danube River
IPPC	Integrated Pollution Prevention and Control
ISDS	Integrated Sustainable Development Strategy
IUCN	World Conservation Union
IWRM	Integrated Water Resource Management
N	Nitrogen
NGO	Non-Governmental Organization
OCHA	Office for Coordination of Humanitarian Affairs (UN)
OSCE	Organisation for Security and Cooperation in Europe
P	Phosphorous
PHARE	Programme of Assistance for Economic Restructuring in the Countries of Central and Eastern Europe
POPs	Persistent Organic Pollutants
RBEC	Regional Bureau for Europe and the Commonwealth of Independent States (UNDP)
RBM	River Basin Management
REC	Regional Environmental Center for Central and Eastern Europe
TRB	Tisza River Basin
U	Uranium
UNECE	United Nations Economic Commission for Europe
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
US	United States
WFD	Water Framework Directive
WWF	World Wild Fund for Nature

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Appendix 1:

Rapid Environmental Assessment of the Tisza River Basin: Mission Report
26 September - 01 October 2004
Dr. Karin Burnod-Requia

During the mission, the consultant held meetings (see the complete list in annex) with representatives from the:

- ✓ Carpathian Framework Convention - Interim Secretariat (Vienna)
- ✓ ICPDR (Vienna)
- ✓ UNDP – Danube Regional Project (Vienna)
- ✓ Ministry of Environment and Waters (Budapest, HU)
- ✓ Twining project for the implementation of the EU WFD (Budapest, HU)
- ✓ Environmental Protection Inspectorate of the Middle-Tisza region (Szolnok, HU)
- ✓ Regional Environmental Center for Central and Eastern Europe (REC) in Szentendre (HU)
- ✓ Apele Romane: Somes-Tisa Basin Water Directorate (Cluj, RO)
- ✓ EU-Phare project for the implementation of the WFD in the Somes-Tisa Basin (Cluj, RO)
- ✓ Environmental Protection Inspectorate (Cluj, RO)

The main objectives of the mission were:

- ✓ to explain why UNEP/DEWA is carrying out a rapid environmental assessment of the Tisza River Basin,
- ✓ to establish consultation and collaboration with international organizations (e.g. UNDP, ICPDR), national environmental and water authorities, EC representatives and consultants, and NGO's working in the region, and
- ✓ to gather data and information for the assessment.

The exposed goals of the UNEP/DEWA's rapid environmental assessment were:

- ✓ to provide an overview of the environmental situation and problems of the Tisza River Basin,
- ✓ to provide fundamental input to the broader Carpathian Environmental Outlook report, which will serve as a data and information support to the Carpathian Framework Convention,
- ✓ to feed into the Environment and Security Initiative projects in SEE, such as "Risks from Mining/Industry" and "Trans-boundary Biodiversity Management", and
- ✓ to indicate priority areas of action that could be targets for pilot project implementation in the framework of the full-sized GEF project on the Tisza River Basin.

Main topics discussed during the meetings:

- ✓ regional policy/cooperation,
- ✓ socio-economic trends,
- ✓ management of natural resources,

- ✓ environment and security, and
- ✓ possible development alternatives for the TRB.

Key relevant issues rose from discussions:

a. Regional cooperation:
Although bilateral and multilateral agreements have been signed by the Tisza riparian countries in the past, enforcement has been weak or non-existent. Therefore, support to establish an enforceable agreement between the five Tisza River Basin countries, including flood management and early warning systems for accident and emergency situations, is needed. Hungarians have expressed the urgency of such agreement. Also, harmonization of policy/ legislation for land planning in the region and preparation for transposing the future EU Mine Waste Directive (which will complement the Seveso II Directive) should be a priority for regional cooperation development.

b. Potential trans-boundary risks:
- need to address pollution from new and past mining activities (RO)
- management of floods and related soil erosion/landslides/deforestation (Hungary, Ukraine, Romania)

c. Natural resources management:
- integration of land use and soil erosion into water management (all countries)
- wetlands/floodplains rehabilitation (Hungary and Romania)
- biodiversity protection (Carpathians Mountains, Hungarian Great Plain)
- great potential for the development of eco-tourism in the Carpathian Mountains (Romania and Ukraine)

d. Development scenarios:
- business as usual: there is no place for this scenario since it is related to the implementation of the WFD (scenario number two), which is underway and coordinated by the ICPDR.
- implementation of the EU WFD: by 2009 all the Tisza riparian countries should have implemented the EU WFD and developed a basin management plan under the umbrella of the ICPDR. However, the disparities between these countries (two of them are part of the EU, one is in pre-accession and the last two countries are non-members) will directly affect the implementation pace. This should be a matter of discussion in the assessment.
- integrated development plan/strategy for the TRB: it will include aspects not fully covered by the WFD (e.g. poverty, development of specific economic sectors) and focus on regional environmental issues such as mining, nature protection and forest management. This alternative development scenario will be adapted to the Tisza region and will show priority areas of action for future projects.

Final remarks:
This report describes the results from discussions held during the mission, thus it does not reflect conclusions or recommendations of the Rapid Environmental Assessment of the Tisza River Basin, which is in its preliminary

stage. However, some issues were stressed by many and must be carefully consider in the assessment such as rehabilitation and long-term management of mining tailings, floodplain/wetland rehabilitation and biodiversity conservation. Other important environmental aspects that should be also considered in the assessment are agriculture pollution (eutrophication), soil erosion, floods, deforestation as well as water management.

Appendix 2: List of interviewed persons during the mission.

Contacted persons	Institution/Organization	Address	Place	Email/tel
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