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**Report of the International Task
Force for Assessing the Baia Mare
Accident**

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REPORT OF THE INTERNATIONAL TASK FORCE FOR ASSESSING THE BAIA MARE ACCIDENT

FOREWORD

This Report constitutes the response of the *International Task Force for Assessing the Baia Mare Accident* (the Baia Mare Task Force or 'BMTF') to the tasks given to us by Commissioner Margot Wallström, with the support of the Environment Ministers of Hungary and Romania, concerning the accidents which occurred at Baia Mare and Baia Borsa in Romania, in January and March 2000. These tasks were to consider:

- What happened, and why?
- What damage was caused?
- What other dangerous sites remain in the Tisa river basin system?
- What measures are recommended to minimise the risk of similar accidents?

We have tried to write the Report in a clear and succinct manner, in the hope that it will be easily accessible to those people affected by the accidents; from the outset the Commissioner asked the BMTF to ensure communication and dialogue with the people and the non-governmental organisations (NGOs).

The BMTF has travelled extensively throughout the affected areas in the Tisa river basin (the pollution had been largely diluted by the time that it reached the Danube River), and visited each of the accident sites.

We held intensive consultations with private citizens, local and regional officials, NGOs, and other professional associations along the course of the river through Romania, Hungary and the Federal Republic of Yugoslavia, from Baia Borsa and Baia Mare to Belgrade. Each of the three governments made available to us the results of their official investigations into the accidents and their impacts.

We were fortunate at an early stage to have access to the very valuable rapid assessments carried out by the UNEP/OCHA team in February and March 2000, led by Frits Schlingemann. We also had access to the results of studies undertaken by German and Dutch agencies and the WWF, and we commissioned a number of independent studies and investigations to assist us in addressing specific regulatory, engineering and environmental issues.

These were disastrous accidents which under different circumstances could have had more serious consequences. In the event, nobody died or became seriously ill despite the fact that 120 tonnes of cyanide and 20,000 tonnes of sediments containing heavy metals were released into the environment from the accidents. The impact might have been far more serious if the rivers had not been covered by ice for up to 200 km downstream of Baia Mare. Or, had the most severe floods for well over 100 years not occurred days after the second accident, with the result that heavy metals were washed away and dispersed, bringing heavy metal levels within the river system and on the flood plain back to levels which do not pose an immediate threat to health.

This must not, however, be allowed to obscure the fact that in many other locations in this region, and elsewhere in Europe, there are similar sites, both in active operation and abandoned, which pose the threat of similar accidents – the next time we may not be so lucky.

In our view, these accidents should act as the trigger for an urgent and thorough investigation of such sites. This should involve the preparation of an inventory, based on an agreed risk assessment methodology, so that all may be aware of the hazards and the need to minimise the risks posed. This is a task, the primary responsibility for which rests squarely on the shoulders of the countries themselves.

So far as the area of the Danube river basin is concerned, the International Commission for the Protection of the Danube River (ICPDR) should be the pro-active co-ordinating agency; but we strongly recommend that the European Commission takes the initiative to ensure adequate co-operation between all parties concerned. Such an inventory would serve as the basis for a programme of restoration and remediation. In addition, the relevant UN-ECE Conventions and Protocols should be quickly ratified by all UN-ECE member countries and the European Union.

We make a series of recommendations for the strengthening of existing regulations including emergency planning requirements, and for the addition of new regulations. In particular, we recommend that no new TMFs, where cyanide is used, should be based on the storage of water/slurry containing cyanide in tailings ponds open to the elements.

We feel that there is a clear need for a central *Industry Guidance Document*, which sets out and clarifies the many different regulatory requirements relating to the mining, extractive and ore-processing industries which are contained in a wide range of EU and national legislation – for EU countries and those countries seeking to become members of the EU, this task should be undertaken by the European Commission. Such a document would make it easier for both the industry and the public to be aware of the obligations of the industry regarding environmental protection, public safety and emergency planning. Our recommendations concentrate on *what* should, in our view, be done and not on *how* or at what level it should be done. In this context, the recent European Commission proposals are consistent with our recommendations.

Finally, we draw attention to the recent adoption of the EU Water Framework Directive, which calls for day-to-day protection of the Europe Union's water resources to be carried out by river basin authorities. The monitoring of water quality and water quantity for water resources management will require that river basin authorities develop the necessary skills, resources and flexibility to undertake these tasks. In the case of the Danube river basin, the

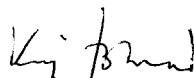
ICPDR will be expected to play a vital role in facilitating the co-ordination of monitoring and early warning arrangements, and will need greater funding from its member countries, and an enhanced capacity to take swift action where necessary.

A great number of people and organisations have assisted us with our inquiries. The European Commission provided both the initial impetus to establish the BMTF and also provided the resources without which we would have been unable to undertake our inquiries. The governments of Romania, Hungary, Slovakia, Ukraine and the Federal Republic of Yugoslavia provided us with their full support. Crucially, we received invaluable assistance from many local and municipal authorities and from non-governmental organisations. Without their input, our findings would be far less relevant. At an international level, the Dutch and Danish governments both provided the financial support for public communications initiatives proposed by the BMTF and we have also been greatly assisted by informal advice from the Irish and United States environmental protection agencies. On a technical level, we have received advice on regulatory and tailings pond management from a number of leading experts from Romania, Hungary and Germany. To all of these people, and the many others who have assisted us, we give our sincere thanks for helping us to complete our tasks.

The Baia Mare Task Force



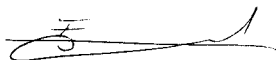
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1. WHAT HAPPENED AND WHY

1.1 OVERVIEW

On the evening of 30 January 2000, a tailings pond burst at a facility near the city of Baia Mare, Romania which was reprocessing old mining tailings and re-depositing the waste sludge into a new tailings pond. This led to approximately 100,000 m³ of waste water containing up to 120 tonnes of cyanide and heavy metals being released into the Lapus River, then travelling downstream into the Somes and Tisa rivers into Hungary before entering the Danube.

On 10 March 2000, another tailings dam burst in Baia Borsa in the same region close to the Ukrainian border. While some of this material was retained within the dam complex, 20,000 tonnes of sediments were then released into the Novat River, a tributary of the Viseu and Tisa rivers.

This section attempts to provide a brief account of what happened, and why, at the two sites concerned. While the BMTF was initially established to investigate the Baia Mare accident, its remit was subsequently enlarged to cover the Baia Borsa accident as well.

The Danube river basin and the accident sites

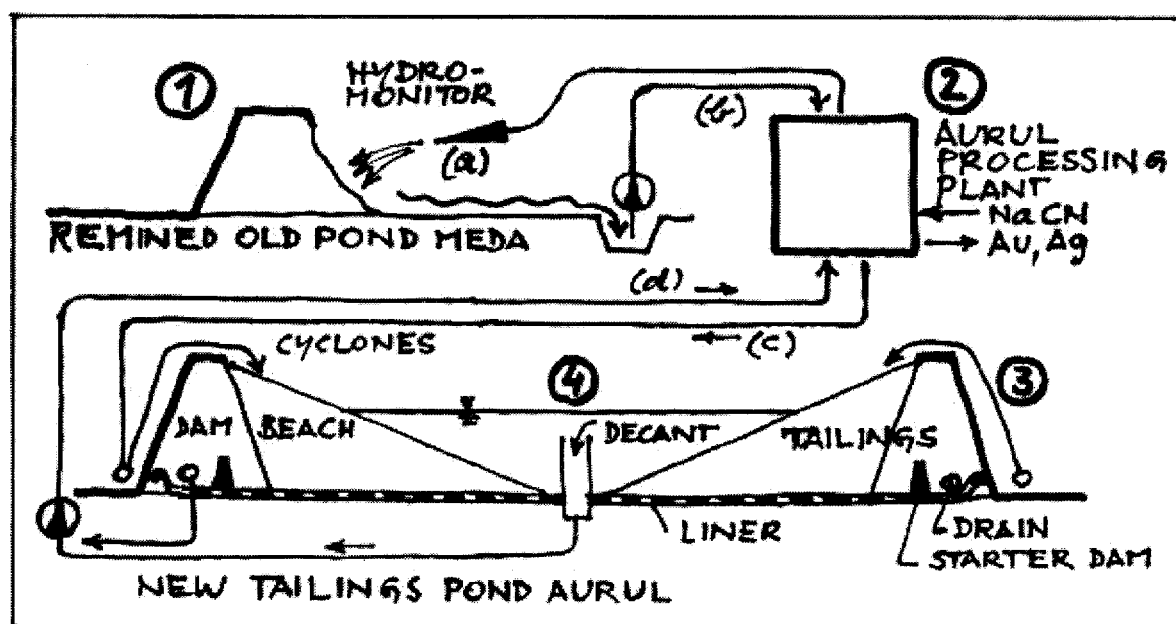


1.2 BAIJA MARE - WHAT HAPPENED?

The first accident occurred near the city of Baia Mare at a tailings pond operated by AURUL, a joint-venture between Esmeralda Exploration of Australia and REMIN the Romanian state-owned mining company. AURUL had been established to re-process the tailings of an old abandoned tailings pond, extracting gold and silver and other metals and, at the same time, removing the tailings from their existing site close to a residential area to a more remote site 8km from the city of Baia Mare.

The facility had been designed as a 'zero discharge' process, with no emissions of process water to local rivers. The dust blown from old tailings ponds contains traces of heavy metals which can cause adverse health effects, so removal of the material provided an environmental health benefit to the town, while also providing an economic benefit to the town in terms of employment by AURUL. Consequently, the facility appeared to offer the prospect of a 'win-win' situation, with both environmental and economic benefits. In line with the design of the process, the tailings pond received process water containing high levels of cyanide, which is used in the gold extraction process. The process water was then recycled to the plant, thus reducing the amount of new cyanide that had to be added into the process and reducing the operating costs of the facility.

Schematic diagram of the AURUL process



Source: UNEP/OCHA

The project began in 1992, and after a lengthy permitting process, AURUL started operations in May 1999. After seven months of operation, a dramatic failure of the retaining embankment wall led to the release of tailings water into local rivers.

The sequence of events leading to the accident was as follows:

- Throughout 1999, the tailings dam was developing as intended, with the hydrocyclones¹ building the embankment walls higher as re-mined tailings and waste process water were pumped into the tailings pond.
- Over the course of the winter of 1999, a significant amount of rain and snow fell on the tailings pond, and the pond became covered in a thick layer of snow and ice.
- Heavy (but not exceptional) rain and snowfall in December 1999 and January 2000, combined with rapid snowmelt from 27 January 2000 as the temperature rose suddenly from below freezing to 9.5°C, and nearly 40mm of rainfall on 30 January 2000 caused water levels to reach critical levels. The embankment walls became saturated and unstable as the snow melted directly on their surfaces.
- On 30 January, the dam overflowed and washed away a stretch of embankment wall 25 metres long and 2.5 metres deep. Approximately, 100,000m³ of tailings water containing cyanide began to flow into the nearby Lapus River. AURUL stopped processing operations and began activities to close the breach.

A view of the AURUL dam, showing hydrocyclones and ‘the beach’



Source: USEPA

¹ Hydrocyclones are devices used to separate fine sediments and water from coarse-grained sediments. The fines and water are deposited in the centre of the tailings pond while the coarser sediments are deposited on the dam wall, building up the embankment walls.

1.3 BAIA BORSA – WHAT HAPPENED?

The second accident occurred at the Novat tailings management facility (TMF) at Baia Borsa, belonging to the state-owned mining company REMIN SA. In addition to the primary dam, a second and third dam had been constructed downstream from the primary dam. The second dam was designed to support the primary dam structure as it reaches its final height. The third dam was built of concrete and was designed to collect water that leaked from the first two dams for re-pumping to the main pond.

The dam overflowed and burst on 10 March 2000. 100,000 m³ of water and 20,000 tonnes of tailings sludge containing heavy metals flowed out of the dam. While some material was retained between the two lower dams, the rest flowed downstream of the dam and into the Novat and Vasar rivers, from where it entered the Viseu and finally the Tisa river.

Due to the downstream area from the dam being a specially protected nature area, no emergency discharge of water is permitted from the dam. As a result, the dam system is a closed-cycle design with no discharge downstream of the third dam.

The process was designed as a partially closed-circuit system, with process waters discharged into the pond being recycled through the metal extraction facility. In addition, the pond also receives direct rainfall and indirect surface run-off from the surrounding hill-slopes. Evaporation and the recirculating of water back to the main mine complex was supposed to ensure that water levels in the pond were controlled, with the main stream in the valley bypassing the pond. The pond complex, however, contained no provisions for emergency discharges downstream of the pond. As a result, if water levels reached critical levels, there was no way that water levels could be reduced.

Over the winter of 1999-2000, heavy rainfall and rapid snowmelt caused the water level in the pond to reach critical levels and for the dam walls to become unstable. As the pumps designed to pump water out of the pond, back to the processing plant and into other ponds were not working, it was impossible to avoid the overflow and breaching of the dam wall.

The sequence of events leading to the accident was as follows:

- In early December, heavy rain fell into the reservoir and surrounding catchment;
- From mid-December 1999 to late January 2000, more than 120mm of precipitation as snow fell on the reservoir and surrounding catchment;
- Temperatures fell below 0°C from 21 December 1999 and were below -10°C from 22 January 2000;
- On 27 January 2000, the temperature began to increase rapidly, rising above 0°C on 30 January;
- On 8-10 March 2000, torrential rainfall and rapid snowmelt led to increasing water levels in the reservoir, and the pumping systems for the pond failed;
- On 10 March at 11-00am a breach 25m wide and 10m high occurred in the dam, leading to the spillage of 20,000 tonnes of tailings into the Novat river;
- The tailings overflowed the second and third dams to enter into the river system, flowing along the Ukrainian border, before flowing into Hungary.

The view from the top of the main dam, showing the sediments deposited below the dam



Source: USEPA

1.4 WHY DID THE ACCIDENTS HAPPEN?

The reasons why the accidents happened are both clear, and a matter of general agreement and are discussed below.

1.4.1 The use of closed circuit systems

Both the AURUL and Novat tailings management facilities (TMFs) were based on closed circuit systems designed specifically to avoid the need to discharge effluents into local rivers and streams. All the process waters (including in the Baia Mare case waters with high concentrations of cyanide), were re-circulated back to the processing plant for re-use. While in principle this was a worthy objective, both in environmental and economic terms, the design in each case contained no provision for the *emergency* discharge of excess waters when overflow threatened. Without specific provision for avoiding overflows, such ‘zero-discharge’ systems are not suitable, in our view, for use in meteorological conditions of heavy and intense precipitation, such as those prevailing in this part of Romania, and should never have been condoned by the permitting authorities. The result was that, in each case, during severe weather conditions the additional volume of rain and melting snow could not be contained within the ponds, causing them to overflow.

1.4.2 Construction

Furthermore there was a problem in the case of Baia Mare with the stability of the embankment walls themselves. This arose because the Baia Mare facility used a recognised technique of embankment or dam wall construction (called ‘construction by operation’) which called for the gradual deposition of tailings of sufficiently coarse grade on the starter walls to ensure stable and continuous growth of the height of the embankment walls. However, the mix of tailings used did not have the ratio of coarse to fine grades stipulated in the design and, in addition, the hydrocyclones used to distribute the tailings within the pond could not operate in the very low temperatures experienced before the accident. As a result, the embankment wall construction was interrupted at a critical time, leading to a reduction in the ‘freeboard’, and consequently to wall breaching and overflow.

In the case of Baia Borsa, the TMF was designed for a capacity of 2 million m³ of slurry, whereas only 400,000 m³ of slurry was actually deposited. As a result, the material available for dam construction was less than anticipated, leading to a lower dam wall than specified.

1.4.3 Monitoring

The monitoring of the water level of both ponds was by simple visual monitoring, difficult during times when the ponds are covered by an ice and snow cap. For Baia Mare, this form of monitoring was in conformity with the risk classification allotted to the pond by the operator, and accepted by the permitting authorities. In the case of Baia Borsa, while the monitoring procedures gave advance notice of the impending danger, it was not possible to reduce the level of the pond, and avert the accident, due to defective pumping equipment.

In these circumstances it should have been clear that a combination of melting snow and ice cap, due to rapidly rising temperatures, accompanied by heavy and continuous precipitation could have had only one result. And this is exactly what happened during the period leading up to the accident, when heavy rain was accompanied by a rapid rise in temperature from -13°C to +9°C, thus adding the snow/ice melt to the on-going rainfall. Our investigations have established that such conditions while severe, were by no means unprecedented, and therefore should have been foreseen.

1.4.4 Regulatory oversight

Apart from the design and operational factors, we have grave reservations over the adequacy of the permitting procedures existing when the projects were planned and constructed. It is apparent that no adequate appreciation of the likely variability in ‘water balance’ (the difference between the volume of water entering the system, and the volume of water exiting the system by evaporation) was brought to bear. The initial Environmental Impact Study carried out by ICIM² on the AURUL project, stated that *‘the danger of the dam overflowing the embankment...in the event of heavy rainfalls is out of the question’*.

From then on, after the entry into force of the Romanian law on Environmental Protection (No.137/95), and during the six years it took to obtain all of the necessary permits, there was

² ICIM: National Research and Development Institute for Environmental Protection.

a failure to perceive the inherent dangers of approving such closed circuit systems, with no provision for emergency discharge. It was difficult for the BMTF, during its meetings with all of the authorities involved in the permitting process, to discern where exactly the responsibility for the overall safety of the facility lay. The regulatory process is extremely complex and diffused and, in the view of the BMTF, needs urgent revision. The Romanian authorities have informed us that significant progress has already been made in this revision.

1.4.5 Conclusion

As a result, it is the conclusion of the BMTF that the accidents were caused:

- Firstly, by the use of an inappropriate design of the TMF;
- Secondly, by the acceptance of that design by the permitting authorities; and
- Thirdly, by inadequate monitoring and dam construction, operation and maintenance.

These were causal factors, which were triggered by the severe weather conditions, conditions which could and should have been foreseen. In the case of the Novat pond we fail to understand how this facility could have been brought into operation at all, as the local Environmental Protection Agency did not accept the Environment Impact Assessment submitted by the operators REMIN, and refused to issue an operating permit.

In summary, therefore, the reasons for the two accidents are as follows:

Baia Mare	Baia Borsa
<p><i>Design faults</i></p> <ul style="list-style-type: none"> • Use of a closed circuit TMF with no specific provision for the emergency discharge/storage of excess water • Inadequate dam wall construction due to lack of homogeneity of the tailings • Non operation of the hydrocyclones in very low temperatures 	<p><i>Design faults</i></p> <ul style="list-style-type: none"> • Use of a TMF with no specific provision for the emergency discharge of excess water • Non operation of pumping equipment • Inadequate provision for the diversion of surface runoff from the surrounding hill slopes
<p><i>Permitting faults</i></p> <ul style="list-style-type: none"> • Original EIA flawed • Failure to understand the water balance implications of the design in that location • Absence of clear responsibility for final decision on safety in a permitting process which is over complex and diffused • Monitoring requirements were inadequate 	<p><i>Permitting faults</i></p> <ul style="list-style-type: none"> • The facility was operated in the absence of an environmental operating permit
<p><i>Operational faults</i></p> <ul style="list-style-type: none"> • Failure to observe the design requirements for tailings grades for embankment wall construction 	<p><i>Operational faults</i></p> <ul style="list-style-type: none"> • Poor maintenance of pipelines and pumping equipment • There was no emergency plan or contingencies
<p><i>Weather</i></p> <ul style="list-style-type: none"> • A mix of weather conditions which were extreme but not unprecedented. 	<p><i>Weather</i></p> <ul style="list-style-type: none"> • A mix of weather conditions which were extreme but not unprecedented

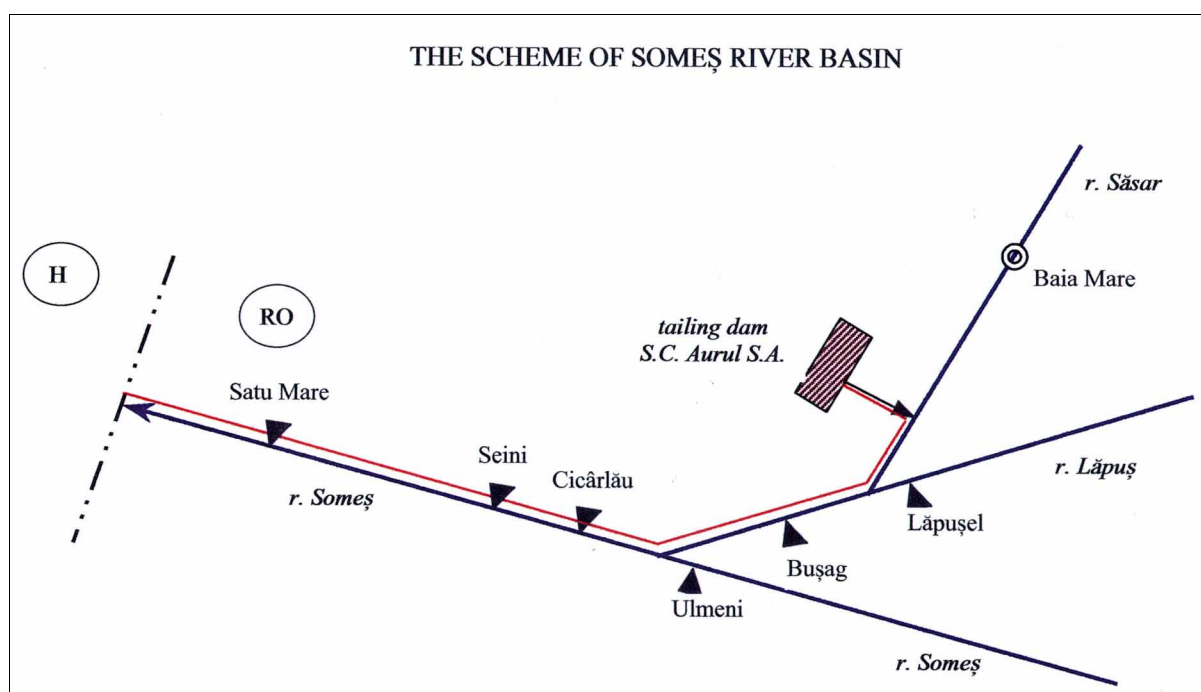
In effect, these were two accidents waiting to happen, waiting for the necessary trigger of adverse weather conditions which was bound to come sooner or later.

2. IMPACTS OF THE ACCIDENTS

2.1 INTRODUCTION

The accident at Baia Mare led to the release of a toxic 'plume' of a cyanide/copper mixture into the Tisa river. This plume travelled down the length of the river, into the Danube river and then into the Black Sea by which time it had become significantly diluted. It devastated large number of plant and wildlife species in the river systems, but once the plume had passed, water quality and sediment quality started to return to normal. As the plume consisted of dissolved materials, there was little deposition of pollutants. As a result, once the plume had passed, effectively no cyanide remained in the river or river banks.

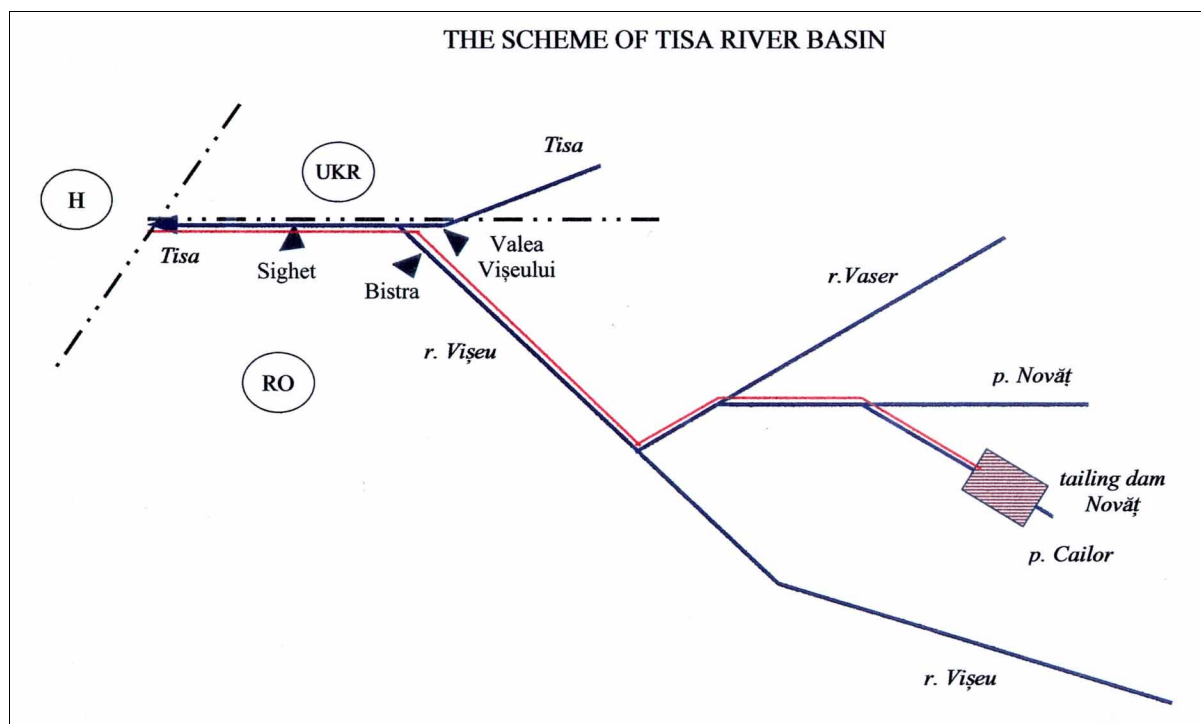
The course of the plume from Baia Mare



Source: Apele Romane

The accident at Baia Borsa was very different in character. A mass of mud and water containing heavy metals was released into the Novat stream. Most of the mud has remained close to the tailings pond, with the polluted water being washed downstream into the Viseu and Tisa rivers. The majority of the heavy metals within the water were then deposited in the upper reaches of the Tisa river. Almost immediately after the accidents, major flooding occurred in the Tisa river. This had the effect of re-mobilising and then dispersing the heavy metals.

The course of the plume from Baia Borsa



Source: Apele Romane

2.2 PUBLIC HEALTH IMPACTS

2.2.1 Short-term impacts

The most remarkable feature of the accidents was the fact that, as far as we are aware, no one was killed or became seriously ill as a result of the accidents.

Swift and concerted action by municipalities and water supply companies along the Tisa and Danube rivers ensured that none of the pollution entered into the public drinking water supply. High groundwater levels also helped to minimise the contamination of groundwaters by the accidents. Bottles and bags of drinking water were provided to local residents while the mains water supply was halted as the pollution plumes passed. There was local contamination of wells in Bozanta Mare, close to the accident site in Baia Mare, and these people were subsequently provided with bottled drinking water.

2.2.2 Long-term impacts

The long-term health impacts of the accidents are uncertain at this stage. They are unlikely to relate to cyanide, which has dispersed and does not bioaccumulate. Any impacts would relate to the heavy metals added into the sediments and soils of the Tisa ecosystem. All the evidence to date suggests that, as a result of the accidents, heavy metal levels have not been elevated significantly in the river system, except for immediately downstream of the Novat dam. This situation needs to be kept under constant surveillance. As a result, it is important

that some means is found to control the heavy metal sediments deposited immediately downstream of the dam, to ensure that they do not contribute, in the future, to increased heavy metal levels further downstream.

2.3 ENVIRONMENTAL IMPACTS

The data available to us on the environmental impacts of the accidents represent a preliminary assessment, and are the result of investigations conducted by VITUKI and evidence collected by WWF from a variety of sources. Investigations are ongoing in Hungary in the areas where the most significant damage occurred. Many experts take the view that one annual reproductive cycle may be an insufficient basis for reaching final conclusions as to the long-term impacts. We welcome this on-going monitoring of the ecological development and recovery of the river system.

2.3.1 Short-term impacts

The spill at Baia Mare led to immediate, and very severe, effects on plants and wildlife in the Tisa river. Due to the non-persistent nature of cyanide and the relatively natural condition of the upper Tisa river system, once the pollution plume had passed, the river ecosystem was able to begin the process of recovery.

Plankton

Plankton in the Somes and upper Tisa river in Hungary (closest to the accident) was completely killed, and in the middle and lower reaches of the Tisa between 30-60% of plankton were killed by the passage of the pollution plume. Within days of the spill materials passing, phytoplankton and zooplankton had begun to recover throughout the entire river system.

Current evidence indicates that the number and species composition for phytoplankton has substantially returned to normal over all the stretches of the river. A major factor which appears to have assisted the process of recovery, is the flooding which occurred in March, and presented ideal conditions for plankton growth.

Molluscs and benthic organisms

The current available data indicates that considerable mortality occurred among molluscs and other benthic organisms in the upper reaches of the Somes. It is probable, that some species may have already been reduced in numbers in this region, through pollution that has occurred over many years. In the middle and lower stretches of the Tisa river (Hungary and the Federal Republic of Yugoslavia) the benthic organisms appeared to survive the cyanide spill although there is evidence that many species populations were reduced as a result of the pollution.

Of great symbolic significance as an indicator of ecosystem conditions has been the survival of the 'Tisa Flower' (*Palingenia longicauda*), a mayfly which hatched in large numbers this past summer throughout much of the Tisa River system. The conditions for hatching were

apparently ideal following the spring floods. The fact that the cyanide appears to have been concentrated in the main channel of the river meant that the larvae survived and were able to hatch. Monitoring over the next 2-3 years will be required to confirm the recovery of the Tisa Flower, to reflect its breeding cycle.

In general it appears that the populations of macroinvertebrates were damaged from spill but not completely eliminated as originally feared. Recovery of the diversity of species and numbers has progressed rapidly during the first growing season following the spill.

Fish

The visible death of fish was a clear indication of the immediate impact of the accident at Baia Mare. Hungarian authorities report a total of 1240 tonnes of fish that were killed as a result of the spill. Of this amount 33.8% were predatory fish, 13.5% Carp, 8.1% Sturgeon, and 44.6% herbivorous fish. The fish collected included nearly all the fish known to be present in the river. It is clear, however, that not all fish were affected equally. The herbivorous fish, the Silver carp (*Hypophthalmichthys molitrix*), in particular seemed to be very vulnerable to the cyanide and made up a large percentage of the fish that died.

Of significance is the possibility that some native, protected and endangered species may have been finally eliminated by the spill. In this category are *Huso huso* (Danube Salmon) and *Acipenser guldenstaeedti* (a highly protected Sturgeon species) which before the spill may have survived in the Tisa, although only in very small numbers. In addition, three other species (*Stizostedion lucoperca*, *Stizostedion volgense* and *Lota lota*) were almost completely eliminated.

Investigations in the Federal Republic of Yugoslavia indicate that the general fish population does not seem to have been significantly adversely affected by the spill. Some dead and dying fish were recovered in the Federal Republic of Yugoslavia, but four species of fish examined in detail in a study prepared for WWF showed no major population alterations, with the exception of Zander.

There are no reports or evidence that fish in the Danube died as a result of the cyanide poisoning.

One of the important questions that emerged following the accident was why were not more dead and dying fish observed near Baia Mare and on the Somes river system in Romania. The explanation appears to lie in the fact that the ice cover prevented dead and dying fish from being seen and these were then washed downstream to Hungary where they were collected. In addition it seems that previous pollution of this section of the river had reduced the numbers and diversity of fish there. The ice cover also presented conditions ideal for compounding the effects of cyanide because in the ice covered stretches, the oxygen of the river would have been reduced. This deadly combination would have been most significant in the upper Tisa river section of Hungary.

Birds & Mammals

Immediate observations indicate that the effects of the pollution on birds and mammals were limited. The ability of mammals and birds to sense the presence of the cyanide and the ice cover over much of the river likely prevented large contact with the pollution.

There was direct evidence that two White Tailed Eagles were poisoned by the cyanide. The longer term effects on birds however would likely be more significant in relation to reduced breeding success resulting from loss of food supply. The initial evidence from Hungary and Romania, however, is that no detectable signs of population loss can be determined to date amongst species considered most sensitive.

Studies of species presumed to be sensitive to the loss of their food base through the spill including Cormorants, Storks, White-tailed Eagle, Bank Swallows, and Kingfishers in both Hungary and Yugoslavia found little evidence that major population loss has occurred. These species have found sufficient food from alternative sources – fish ponds not affected by the spill.

At the top of the food chain of a river system are otters. Evidence indicates that the population of otters was reduced significantly in the period of the spill either through death or moving to other areas and that in the months following the spill the situation has improved. Recently in some places under Tokaj the otters have already returned to their regular habitats. The process is hopefully going on toward the upper stretches of the rivers, but it is too early to summarise the effects on the population.

Studies of bats also found that despite the presumed reduction of numbers because of reduced food supply the population may have increased this past summer. One explanation seems to be that the reduced pressure of fish on the insect population may have made more food available for the bats.

2.3.2 Medium to long-term impacts

The spill at Baia Borsa posed the greatest risk of medium-term impacts. Heavy metals persist in the environment and ‘bioaccumulate’ in living organisms. As a result, even relatively low concentrations can pose a threat to ecosystems and human health over the medium to long-term.

Immediately after the heavy metal plume had passed through the river systems, heavy metal concentrations were above limit values in the river sediments. This situation was generally improved several weeks later, when severe flooding re-mobilised and dispersing heavy metals, bringing concentrations to below limit values. Nevertheless, this still represents an incremental increase in heavy metal levels, no matter how difficult to quantify. If heavy metal levels are assumed to be increasing over time, then any additional input of heavy metals over the ‘base load’ must be seen as a serious issue.

It appears that the majority of the heavy metals contained within the sediments from Baia Borsa have remained within 6-10km downstream of the Novat dam. Over time, they can be expected to migrate slowly downstream during flood events and become dispersed throughout the river system. This residual threat of heavy metal contamination needs to be the subject of ongoing monitoring and research.

2.4 SOCIO-ECONOMIC IMPACTS

The quantification of the economic losses caused by the accidents is a complex process, and one for which the BMTF had neither the time or the necessary data.

It is clear that the losses will be felt well beyond the delivery date for this Report, and that any quantification will require detailed economic analysis. Initial estimates can prove to be unreliable with the passage of time. The immediate economic impacts are, however, obvious as are the knock on social deprivations suffered by the citizens living along the river basin in the Romania, Hungary, and F.R of Yugoslavia. These immediate economic impacts concern losses in:

- direct employment;
- the fisheries sector;
- tourism;
- immediate remediation costs;
- industry and investment prospects.

2.4.1 Direct employment effects

In Baia Mare and Baia Borsa immediate job losses were very much lower than might have been expected. In Baia Mare, AURUL, while ceasing all production at the plant, kept all the staff employed. However there was loss of jobs in other activities which depended on the AURUL plant as a customer. In Baia Borsa, mining and ore-processing operations have continued as tailings were diverted to a number of other TMFs. In both locations, however, the impact on future investment prospects are likely to be unfavourable.

2.4.2 The fisheries sector

The fisheries sector suffered the biggest immediate losses. Commercial fishing is an important activity along the river in Hungary, and the pollution caused the death of at least 1240 tons of fish stocks and led to a six month ban on fishing. The losses suffered in Hungary included the actual tonnage of fish destroyed, the loss of income for commercial fishermen, losses for fish farming and fish processing plants, and the knock-on effects of these losses for the commercial life of the communities affected. Moreover, while the rate of recovery of the river has been impressive it will be some years before the number, age distribution and size of the fish returns to normal

After the first accident, a fishing ban was imposed on the Tisa river system in Hungary on 1 February 2000, and this was lifted in Hungary on 16 June 2000. During this time in Hungary, eight fishing organisations with 114 full-time fishermen and 115 part-time fishermen lost their incomes due to the ban. At the same time, 50,000 sport anglers were also prohibited from fishing. During the second half of 2000, the number of fishing licences issued along the Tisa river system reached 65% of the number issued in 1999.

Significant losses were not felt in either Romania or the Federal Republic of Yugoslavia as there is no significant commercial fishing activity on these stretches of the river.

2.4.3 Tourism

On the other hand all three countries suffered losses in tourism, both in terms of local tourism and, more importantly, in terms of foreign tourism. Again, the main impacts were felt in Hungary where there is important tourist income from holiday-makers from other parts of Hungary, and from countries such as Austria and Germany. Widespread cancellation of holidays followed Europe-wide media publicity of the pollution. This had serious consequences for the hotel and catering trades, and for other services used by tourists. In the Federal Republic of Yugoslavia, losses were felt locally as domestic holidaymakers did not visit the area for holidays this year.

The actual losses suffered this year do not represent the whole story, as it may require much marketing expenditure and time to persuade tourists to return to the area in the same numbers as before.

2.4.4 Mitigation and remediation costs

Account must also be taken of the immediate costs of combatting the effects of the accidents. These include the cost of providing alternative drinking water supplies (for example, at Bozanta Mare in Romania, and Szolnok in Hungary), and the significant costs involved in dead fish disposal, monitoring the state of the river, and the taxes and revenues foregone by the local and national authorities. In addition, considerable expenditure was incurred by the extra administrative costs of public information, surveying, and investigation.

2.4.5 Industry and investment prospects

Local industry suffered generally through loss of revenues and, for many firms, the cost of providing alternative sources of water and, for some firms, the cost of temporary loss of production. However, the most significant damage done may arguably prove to be the damage done to the prospects for future investment along the river basin.

We are aware of a number of attempts to put monetary values on these losses which have been undertaken by a variety of agencies. In the belief that accurate quantification must depend on detailed long-term analysis, we have refrained from quoting them.

The longer-term effects of the pollution may be felt, in our view, on the level of investment which the area so badly needs. The area around Baia Mare is heavily industrialised with ageing polluting industry, and the Maramures contains many abandoned, and potentially dangerous, tailings ponds. In Hungary, the Tisza/Szomes catchment area is well behind the rest of Hungary in terms of economic prosperity. Both regions badly require new investment in non-polluting industry, but the impact of the accidents can be expected to reduce the economic attractiveness of the area from an investment point of view. Therefore, we take the view that what is important at this stage is to remove the negatives and uncertainties which impact on the prospective investor. Thus, the first requirement for any serious effort to re-develop the Tisa river basin is to create conditions of '*environmental security*' in the upper reaches of the river system. After removal of the pollution threat, the restoration of wetlands, re-afforestation, and the development of rural industries and tourism can then be promoted. The restoration of confidence among potential investors can be best effected by a co-

operative effort between the Romanian and Hungarian authorities, in the context of a joint programme for the sustainable development of the region, the effects would also extend to the Federal Republic of Yugoslavia. We believe that such an initiative would receive sympathetic support from international donors and IFIs. We deal with this topic in more detail later in the Report

3. COMMUNICATING WITH THE PUBLIC

With the escape of such a quantity of deadly toxins into a much used river system, it was of vital importance that the task of warning the citizens of the dangers was effectively carried out. This first, and most important, task of urgently informing the public of the imminent threat to health and safety was, we are happy to report, effectively carried out by national and local authorities. The fact that no death or serious illness resulted from the accidents, to our knowledge, is a testimony to this. The local authorities in particular are to be congratulated in this respect. In those sections of the river where water supplies depended on treated river water, arrangements were quickly and efficiently made to provide alternative supplies of drinking water, and to inform the public: the municipal authorities of Szolnok, Hungary did an outstanding job in this respect. The visit of Commissioner Wallström, accompanied by the Hungarian and Romanian Ministers for the Environment did a great deal to allay the initial fears of the public, as did the subsequent publication of the UNEP/OCHA report.

Performance in the matter of keeping citizens informed about the nature and duration of the continuing hazards was somewhat different, we were told. It was not possible for citizens in any of the three countries (Romania, Hungary, the Federal Republic of Yugoslavia) to access sources of on-going information as to the likely medium to long-term effects of the pollution, or of the period over which the bans on fishing and bathing would last. Part of the reason for this may be the inability of the national authorities and agencies to give precise information on an accident so unprecedented as to its scale, so the local and municipal authorities had little to pass on to the public.

Others suggest that, in varying degrees along the course of the river, the 'culture' of public information is not yet fully developed. In some instances we found ourselves to be the channel through which information of the likely medium and long-term effects of the accidents was passed to NGOs. Additionally some of the media reporting of the accidents and its effects was less than factual causing unnecessary distress and concern to citizens. For these reasons the BMTF took steps to convey to those we met in the course of our investigative visits all of the information that we ourselves had been able to gather. We also arranged for the Regional Environment Centre in Szentendre, Hungary, to produce a simplified version of the UNEP/OCHA Report for dissemination in four languages through NGOs to the citizens. In addition, at our suggestion, the Danish government provided support for the WWF Danube-Carpathian Programme to establish a network of NGOs to disseminate and exchange information related to the accidents and their consequences.

We would like to underline the need to develop the capacities necessary to keep citizens up to date with the on-going situation; a greater emphasis on developing the sensitivities of Central Governments to appreciate the concerns of local citizens in such circumstances is called for. There is a need to improve and deepen the communication with NGOs.

We believe that in the matter of trans-national issues such as this, the International Commission for the Protection of the Danube River (ICPDR) should also develop its capacities in the field of public information. In terms of the overall reaction to the accidents, the key factor was the good personal relationships, underwritten by a bi-lateral agreement between Romania and Hungary, between the environmental and water authorities in the border areas. It was by telephone calls to colleagues that the news was spread. We believe that while these close personal contacts are invaluable in crisis situations, there needs to be

established a more sophisticated and responsive early warning system in this region and throughout the Danube river basin.

We understand that the ICPDR is working to produce a new improved monitoring system for the river, accompanied by an improved 'early warning system'. For these tasks, additional funding will be needed in the first instance from the Contracting Parties themselves – assistance from other donors may also be available. In the face of these new challenges, ICPDR should also review its decision-making and other administrative procedures, so as to achieve a rapid response rate to any problems that may occur in the future.

4. THE REGULATORY FRAMEWORK

In responding to our task of '*suggesting measures that could be adopted to minimise the risk of similar accidents*', we have concentrated on measures to add to, or strengthen, regulations presently applying to mining activities and ore-processing activities nationally, through EU Directives, or under UN-ECE Conventions. While our findings and recommendations in this field arise directly from our investigations into these two accidents, we have also become aware that the regulatory regimes in other countries, including the countries of the NIS, have need of strengthening. Accordingly our comments are equally applicable to those countries.

In what follows we have recommended what, in our view, needs to be added or made stronger in existing regulation at national, EU or pan-European level. In reaching these conclusions, we have also taken note of the recent Commission Communication on safe operation of mining activities. While we have an appreciation of the content of EU Directives and UN ECE conventions, we have not been able to study in detail the purely national or local regulations in operation in all European countries. Accordingly it may be that some of our specific recommendations will already be in operation in some countries. Also we have concentrated on stating what in our view needs to be done, and have purposely avoided suggesting in what form it should be done e.g. as additions to existing legislation or in new legislative acts; or whether at national or European level. The management of tailings waste (and TMFs) is normally associated with the operation of a mine or processing mill. Thus, any regulatory framework would ideally be one that embraces the integrated nature of these operational elements. Regulatory emphasis on just one of these operational elements is unlikely to yield the most effective environmental permit. In the absence of an integrated framework for the regulation of mine operations, it is considered that, in addition to the Industry Guidance Document recommended elsewhere in this Report, the funders or underwriters of mine operations insist that the operators carry out their business in an environmentally responsible manner. Financing agreements should, for example, stipulate the adoption and implementation of international codes of environmental management practice.

All effective regulation is based on rigorous risk analysis, and subsequent risk management decisions. In the matter of engineering standards used in e.g. the construction of buildings, bridges, and dams, risks posed by meteorological and climatic conditions are expressed in terms of previous experience. Thus a construction standard may be expressed in terms of capacity to withstand the worst conditions experienced in the last thirty or fifty or one hundred years. Moreover many regulations have been adopted against the background of similar reference to historical experience. Few now deny the existence of the phenomenon of Climate Change, it is something which plays an increasing part in the calculations of the insurance industry around the world. In the case of accidents such as these the influence of meteorological conditions have to be taken into account. In considering these issues the BMTF was struck by the need to take account of the possibility that such conditions may in any given area in the future differ significantly from historical experience. Thus the need to take the phenomenon of climate change into account in the regulatory sphere presents itself. This is a matter does need attention, but was not a topic for the BMTF. Nevertheless, we strongly urge on regulatory authorities and those responsible for the elaboration of 'standards' to place a heavier weight on the experience of climatic conditions in the more recent years in the elaboration of such regulations and standards.

Our recommendations make reference from time to time to relevant EU legislation and the appropriate provisions of UN-ECE environmental conventions. Under the auspices of the UN-ECE, its 55 member countries and the European Commission have negotiated a legal framework for core elements of environmental management. The Conventions on Transboundary Effects of Industrial Accidents (Helsinki, 1992), Protection and Use of Transboundary Watercourse and International Lakes (1992), Protocol on Water and Health to the above Convention (London, 1999), Environmental Impact Assessment in a Transboundary Context (Espoo, 1991), Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matter (Aarhus, 1998), and Long-Range Transboundary Air Pollution (Geneva, 1979), provide tools and guidance to help countries to improve their performance in preventing and responding to environmental accidents. The Conventions and Protocols are concerned with mitigating transboundary environmental (and accidental) problems. This provides a legal framework which is effective when neighbouring countries 'join hands' by acceding to the instruments. This, however, is not yet fully the case. We urge all countries, and the European Community, if they have not already done so to consider seriously the ratification of the UN-ECE Conventions which focus on the prevention of, and response to, environmental accidents.

4.1 THE USE AND MANAGEMENT OF CYANIDE AND OTHER TOXIC SUBSTANCES

We did consider the question of whether a total ban on the use of cyanide in ore or tailings processing, and its replacement by a less hazardous leaching agent, should be introduced. Those in the mining and chemical industries with whom we discussed this argued that it would not be possible to find an alternative which would be less toxic and, at the same time, commercially viable. We considered, however, that in view of the time and resources available to the BMTF we could not pursue this line of investigation. We are of the opinion that research into this area needs to be supported. We should emphasize though, that the environmental risk associated with the operation of TMFs is not restricted only to those where cyanide is involved. It is generally considered that the heavy metal-containing waste disposed in TMFs has, if not correctly managed, the potential to cause significant environmental pollution.

We are, moreover, seriously concerned by the continuing presence of open tailings ponds and lagoons, which hold large quantities of water containing high concentrations of cyanide, as one can never totally exclude the possibility of accidents due to human error or Acts of God. **Therefore our first recommendation is that no new TMF (Tailings Management Facility), where cyanide is used, should be based on the storage of water/slurry containing cyanide in tailings ponds open to the elements.** Instead the cyanide should be removed from the tailings 'in-plant' so that only cyanide-free water/slurry is pumped into the tailings ponds. In this way should any disaster cause the breaching of the embankment walls of the pond, the escaping water would be free of cyanide. It is perfectly feasible, both technically and economically, to remove the cyanide from the tailings 'in-plant' before the waters are piped to the tailings pond. It is our belief that the risks involved in the storage of cyanide rich waste waters in ponds completely open to the elements, regardless of the emergency procedures in place, is simply not acceptable. Moreover, on the advice of our advisors, we have recommended to the Romanian authorities that such a detoxification facility be introduced into the AURUL plant as soon as possible.

Furthermore we recommend in respect of similar TMFs elsewhere that an evaluation of the viability of such a process modification be undertaken as an urgent priority.

4.2 OTHER CONSIDERATIONS

The range of activities involved in the ore-processing sector is wide, and for many of them regulatory oversight is necessary. However we believe, that in an industry involving such potentially dangerous activities, compliance with regulations alone is an insufficient guarantee of risk minimisation. What is necessary is the development of a “safety culture” within firms, involving the entire workforce. Trades Unions have a major role to play in this context. This is not something that can be imposed externally. However, we are convinced that adherence to such internationally standards as ISO 9000 (quality management), ISO 14000 (environmental management), or the EU’s EMAS Scheme can constitute an indicator of the degree to which such a company is conscious of the ‘beyond compliance’ social obligations which it should meet. **We therefore recommend that adoption and practice of such management codes be made a condition by regulators for granting approval for new plants, and should be urged on existing ones.**

Our further recommendations are grouped into five categories:

- Design and approval;
- Operations;
- Waste management;
- Closure;
- Abandoned sites.

4.3 DESIGN AND APPROVAL

- Environmental Impact Assessments should be undertaken according to the provisions of Directive 85/337/EC (as amended) and the Environmental Impact Assessment submitted for extensive public discussion before the initial approval is given. We consider it is vitally important that the citizens living and working in the locality of such activities be made aware of their rights of consultation on such issues by the appropriate local authority.
- A TMF is essentially a water-retaining structure. This has significant implications for the design and operation of a TMF, which must be taken account of in the permitting process. No closed circuit connection between processing plants and the TMF should in future be approved without adequate provision for emergency storage facilities.
- All processing plants using cyanide or other highly hazardous process chemicals should incorporate a detoxification facility ‘in plant’ allowing the cyanide (or other hazardous chemicals) to be removed from the tailings *before* they are deposited in the tailings pond. No new TMF, where cyanide is used, should be permitted where the tailings pond would hold/store water with high levels of cyanide. We have recommended to the Romanian

authorities that a detoxification facility be introduced into the AURUL plant as soon as an evaluation of its financial viability has been conducted. In respect of similar TMFs using cyanide, we recommend that the same steps be taken.

- Specific and updated (in the light of climate change) specifications should be agreed and implemented concerning the design of tailings ponds which lay down *inter alia* the length of beach, height of freeboard, composition and construction of liner, and relation of pumping capacity installed to the volume of water in the pond.
- Risk assessment methodology and risk categorisation for TMFs should be set out in mandatory regulation; they should take strict account of the nature of the substances to be stored in the ponds, and should be validated and confirmed by the relevant permitting authorities.
- Other vital essential safety aspects of the design for TMFs should be agreed in the form of legal obligations or, where this is inappropriate, in the form of 'guidelines' for developers and regulators. While it is appreciated that TMF sites can vary significantly, agreement should be reached at EU level as to which parameters should be made obligatory, and which can be proposed as guidance notes for permitting authorities under the EU IPPC Directive.
- When tailings pond embankment walls are in construction strict rules need to be approved by the regulator concerning the grade-mix of tailings and the monitoring and operation of hydrocycloning equipment.
- Compulsory requirements need to be laid down in relation to the risk analysis to be carried out and submitted by the operator. This should also apply to emergency and accident planning. The principles for design guidance, or in the case of the EU IPPC Directive the BAT notes, need to be clearly set out.
- Each new TMF design should be reviewed by an *independent expert* reporting to the permitting authority.
- Each operating licence or permit should lay down clear and mandatory requirements for monitoring and reporting on the operation of the facility.
- Inspection of the facilities at regular intervals by the regulatory authority should be provided for in the operating permit, together with the right of intervention where the authority deems this to be necessary in the interests of safety.
- Rules for the requirements of risk assessment of the likelihood of accidents or failures need to be set out in the operating permit, which should make clear the extent to which the EU Seveso II Directive has to be observed in national legislation. As part of this emergency plans should be prepared as part of the permitting process.
- The permitting process should be both simple and transparent, with clear responsibilities assigned for overall safety.

- No operating licence should be granted until a ‘mine closure plan’ and a ‘perpetual aftercare plan’, and the means to finance both are agreed with the operator (see below).

4.4 OPERATIONS

- The duty of the operator is to observe faithfully the requirements of the operating permit(s) and to run the facilities with due concern for the safety of humans and the environment.
- The development of a “safety culture” within the company is deemed to be vital in view of the consequences of accidents. Operators should therefore be obliged via operating permits to follow recognised international management standards such as ISO 9000, ISO 14000, or the EU’s EMAS scheme. Operators must provide adequate capacity building and training facilities for all staff in this respect.
- The operator should maintain an appropriate level of indemnity to underwrite any corrective action following an accident. The amount of the indemnity must be based on an independent risk assessment of environmental liability.
- In the European Union, and in those countries in negotiation for accession to the EU, the provisions of the Seveso II Directive need to be applied to mining and ore processing, and staff trained in its implementation.

4.5 WASTE MANAGEMENT

- It has been suggested to the BMTF, by the representatives of the European mining industry, that there is ambiguity in certain EU Member States over whether national legislation, or the provisions of Waste Framework Directive (75/442/EC) and Directive 99/31/EC on the landfill of waste apply in this sector. In its recent Communication, the Commission has indicated that, in its view, the two directives do apply. A common understanding on this issue is needed. Moreover the latter Directive needs to be examined with a view to making clear which of its provisions apply in the context of tailings management, and which do not.
- Operators need to be helped to the maximum extent to understand what precisely are their obligations; and in cases where provisions exist in regulation which are inapplicable in this sector this must be made transparent.
- The manner in which this could be accomplished has already been spelled out in our recommendation above for an Industry Guidance Document.

4.6 CLOSURE

- The operator should prepare and maintain a comprehensive Closure Plan for the operation, to include the rehabilitation and aftercare of TMFs.
- The operator should demonstrate to the regulator the validity and effectiveness of the rehabilitation solution proposed.
- The operator must maintain a fund or guarantee bond to underwrite the implementation of the mine/process closure and the TMF rehabilitation plan.
- The regulatory framework must be implemented consistently from design to closure and aftercare.

4.7 ABANDONED SITES

There are many abandoned mining sites and tailings ponds in Europe which are a danger to human health and the environment. In our statement of September 2000, we published a list of twenty three dangerous sites in the mining and ore-processing sectors, along with undertakings from the Hungarian, Romanian, and Slovakian Governments to keep them under constant surveillance, and to take whatever remedial steps appeared necessary. The list that we presented does not include abandoned sites.

We restate our urgent concern about abandoned tailings, which leak toxic substances and heavy metals into the environment in Europe.

In addition, the problem for the future will increasingly be the rate at which existing operations in the mining and ore-processing sector will come to the end of their useful life and be closed down. The tailings left behind in tailings ponds constitute an environmental risk in perpetuity. This is a pan-European problem, which needs to be addressed. It does not fall within the competence of the BMTF to suggest in any detail what should be done. We know that in the case of the most recently commissioned major mining sites in Europe this aspect of the final operating permit has been taken very much into account. In the case of one of the largest ore-producing facilities in the world producing 1,500,000 tonnes of ore per year in Lisheen, Ireland, the permit granted in 1997 requires the establishment, maintenance and review of an Environmental Management System, a Mine Closure Plan, a Perpetual Aftercare Plan, as well as the development of a parallel research and demonstration project during the life of the mine, to validate the closure options. The licensee was required to lodge a €12.2 million bond to underwrite the Closure Plan, and a €1.7 million bond to finance the Perpetual Aftercare Plan. The BMTF takes the view that in the case of future operating permits for mining/ore-processing activities provisions covering mine closure and aftercare are stipulated (see above).

In respect of operations which are still ongoing, but for which no closure plans and funds have been agreed, the authorities should take immediate steps to ensure that adequate environmental protection arrangements are agreed, and the financing of such closure and aftercare plans takes account of the Polluter Pays Principle.

The real problem however are those sites where all operational activities have ceased and where 'closure' has not been adequately undertaken. In respect of such abandoned sites, especially those where no "owner" exists or the owner cannot be identified or the owner is not deemed capable of meeting the costs of proper closure and decommissioning, there is a real problem of where responsibility for their management lies. In such circumstances, the costs of remediation will need to be met elsewhere. We therefore strongly suggest that these concerns and possible approaches to regularise the situation be addressed urgently.

The question is who should be responsible and who should finance the necessary remediation at such sites? The first thing which needs to be done is to make an inventory of such sites and prioritise them in terms of environmental and health risks, on the basis of an agreed risk assessment methodology. Secondly, we are aware that the ICPDR is considering the extension of the work they carried out in the Tisa river basin during the summer of 2000. Thirdly, we are aware that the Romanian authorities are undertaking a detailed survey of abandoned and hazardous TMFs in Romania. Fourthly, a Hungarian, Slovakian, Romanian and Ukrainian joint expert commission agreed on 5 October 2000 to work together to produce an agreed list of water pollution sources in the Tisa river basin as a basis for seeking assistance from potential donors for remediation and safety action.

We consider it to be evident and necessary that close co-ordination between those carrying out these three surveys be put in place urgently, so that at best a common risk assessment methodology can be agreed, or at worst duplications may be avoided.

We call on the European Commission to take it upon itself urgently to establish the co-ordination necessary for this purpose.

It is only when an agreed listing and prioritisation of such sites exists for the continent of Europe, that the urgent work of remediation and the funding of remediation can be seriously planned.

5. SUSTAINABLE DEVELOPMENT OF THE TISA RIVER BASIN

One of the tasks given to us was to draw up a list of sites posing the risk of similar accidents in this mining/extractive/ore-processing sector and located in the Tisa river basin. The urgency of accomplishing that task at the earliest possible date was emphasised by the subsequent accident in Baia Borsa. Accordingly, the BMTF turned to the International Commission for the Protection of the Danube River (ICPDR), and on March 30th 2000 a Heads of Delegation meeting of ICPDR held in Vienna adopted a resolution to request their experts to compile such a list. On the following Monday April 3rd the Environment Ministers of Hungary, Romania, Slovakia, and Ukraine, meeting in Budapest, agreed to direct their officials to undertake this work. These data were received from the ICPDR on August 25th and the BMTF was able to receive assurances from the Ministers from Hungary, Romania, and Slovakia, concerning special measures to assure the safety of these sites over the winter.

We do, however, remain concerned about the effects on the future development of the river basin of the 'environmental insecurity' created by the threat of pollution. The necessary level of investment needed to create the jobs and future prosperity of those living in the river basin depends on the steps taken to minimise the risk of future accidents.

It seems logical to us that so interdependent are the economic and ecological conditions, and so interdependent are river basin countries in this regard, that nothing short of a regional integrated programme for the sustainable development of the river basin is called for. We therefore presented a 'concept note' along these lines to the Hungarian and Romanian authorities, urging them to set up the mechanisms necessary for the development of such a programme, and its subsequent management. We feel certain that such an approach to the redevelopment of the river basin would commend itself to the international donors and to the international financing institutions.

Such a joint initiative would also be consistent with the provisions of the new EU Water Framework Directive, which foresees joint management of trans-boundary waters by co-operating river basin authorities. Moreover, it seems to us that in this particular case of the Danube Basin, where there exists an International Convention setting out the principles for trans-boundary co-operation in water management, that Convention might be reviewed and revised to incorporate the concept of sustainable development as well as environmental protection, thus facilitating the accomplishment of such an integrated approach to river basin development. Such an examination should also analyse the present role and capacities of the ICPDR with a view to rendering it a suitable body for proposing and managing initiatives of this nature.

We have learnt that a Joint Expert Commission has been set up between the authorities in Romania, Hungary, Slovakia and Ukraine to produce a plan for the remediation of polluting sites in the Tisa river basin. We have been informed that the Hungarian Ministry for the Environment has invited his counterparts from Romania, Slovakia, Ukraine and the Federal Republic of Yugoslavia to a meeting in January 2001 to discuss proposals for a joint 'Environmental Programme for the Tisza River Basin'. A concept paper has been produced to provide the basis for discussions concerning the Programme. The general objectives of the Programme are:

'the improvement of the quality of life of the population within the Tisza river basin, the strengthening of environmental safety, the protection of the environmental and natural values through the development of sustainable water quality management and the reduction of pollution sources'.

The BMTF welcomes this initiative based as it is on a joint approach to solve joint problems. We urge the European Commission, the IFIs and other donors to provide appropriate external financial support to the projects that will be produced by this Programme.

6. CONCLUSIONS & RECOMMENDATIONS

The accidents were caused by :

- The use of inappropriately designed tailings management facilities;
- The acceptance of these designs by the regulatory authorities in Romania;
- Inadequate monitoring of the construction and operation of the dams;
- The above flaws were triggered by severe but not exceptional weather.

The impacts of the accidents:

- No human health impacts were recorded – but impacts on the livelihoods in the fishing and tourism sectors were serious;
- The immediate environmental impacts were serious – but the recovery rate of the Tisa river has been impressive;
- Urgent actions need to be taken to identify, manage and reduce the environmental threat from abandoned tailings ponds.

Recommendations for the strengthening of the regulatory framework relate to:

- Prohibition of closed-circuit tailings management facilities, unless equipped with adequate provision for emergency discharge and storage of excess water;
- Cyanide and other hazardous process chemicals should be removed in the plant before the tailings are deposited in the tailings ponds;
- A series of measures to clarify and strengthen existing EU legislation on mining and ore processing;
- Steps to promote a 'safety culture' in mining and ore-processing operations;
- The introduction of binding conditions for the closure and after-care of mines and TMFs;
- The early ratification by all member states and the European Community of the relevant UN ECE Conventions and Protocols.

Other recommendations:

- EU legislation pertaining to mining and ore processing activities should be brought together in a single Industry Guidance Document; the general approaches proposed in the European Commission's Communication on the safe operation of mining activities are endorsed;
- The role, funding, and decision-making procedures of the International Commission for the Protection of the Danube River (ICPDR) need to be strengthened.

7. APPENDICES

7.1 GLOSSARY

BMTF	The International Task Force for Assessing the Baia Mare Task Force, known as ‘the Baia Mare Task Force’
EMAS	The EU Eco-Management and Audit Scheme
NGO	Non-governmental organisation
ICIM	National Research and Development Institute for Environment Protection, Romania
ICPDR	International Commission for the Protection of the Danube River
ISO	International Standards Organisation
NIS	Newly Independent States
IPPC	Integrated Pollution Prevention and Control
TMF	Tailings Management Facility
UN-ECE	United Nations Economic Commission for Europe
UNEP/OCHA	United Nations Environment Programme/Office for the Co-ordination of Humanitarian Affairs
VITUKI	A Hungarian water research institute
WFD	Water Framework Directive
WWF	World Wide Fund for Nature

7.2 KEY DOCUMENTS SUBMITTED TO BMTF

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- Exploitation Concession License for Meda and Central Flotation dams.
- ICIM. Environmental Impact Study, 1993.
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- Point of view of Aurul with respect of the above report.

- Response of the Experts Commission to Aurul's point of view.
- Minutes of Control, issued by the CONSIB Office on 19 February 2000.
- CONSIB Note of 18 February 2000.
- Environmental Permit issued by EPA Baia Mare for Aurul tailings re-treatment plant.
- Environmental Permit issued by EPA Baia Mare for Aurul deposition dam.
- Construction Permit no. 38/1999.
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- Water Management Endorsement, 1992.
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http://www.esmeralda.com.au	Esmeralda Exploration website
http://www.natural-resources.org/environment	UNEP mining website
http://panda.org/crisis	WWF website
http://europa.eu.int/comm/dgs/environment	DG Environment website
http://www.apmbm.ro	Baia Mare EPA website
http://www.tisaforum.org.yu	Tisa Forum website
http://www.rec.org	Regional Environmental Centre website

7.3 LIST OF KEY LOCAL ORGANIZATIONS INTERVIEWED

25-27 April 2000, Federal Republic of Yugoslavia

- Federal Ministry for Development, Science and Environment
- Federal Ministry of Foreign Affairs
- Federal Hydro-Meteorological Office
- Yugoslav Water Association
- Serbian Ministry of Environment
- Serbian Ministry of Forestry
- Serbian Ministry of Health
- Tisza Club
- Municipality of Kanijza
- Scouts Association
- Inter-Municipal Commission for Monitoring the River Tisza
- Municipality of Novo Becze
- REC Yugoslavia
- Serbian Ecological Society
- Danube Environmental Forum
- University of Novi Sad

24-26 May 2000, Hungary

- Ministry of Environment
- Office of the Government Commissioner for Tisza-Szamos
- Ministry of Agriculture
- Environmental Inspectorate of the Upper Tisza Region
- Vasarosnameny Primary School
- Tisza Tourism Association
- Mayor of Tivador
- Blond Tisza Club
- Local fishermen
- Tisza Platform

- Environmental Inspectorate of the Middle Tisza Region
- Szolnok Water & Sewage Company
- Mayor of Szolnok
- Local citizens of Szolnok
- Tourist Association of Szolnok
- Police of Szolnok
- Fire Brigade of Szolnok
- Health Authority of Szolnok
- Fishing Association of Szolnok
- Duna Circle hotel

9-14 June 2000, Romania

- Ministry of Waters, Forests and Environmental Protection
- Ministry of Foreign Affairs
- Maramures Prefect's Office
- Baia Mare Environmental Protection Agency
- REMIN (national mining company)
- Eco Centre Baia Mare
- Apele Romane
- AURUL S.A.
- Satu Mare Prefect's Office
- Satu Mare Environmental Protection Agency
- Local fishermen's association
- REMIN, Baia Borsa
- Ministry of Industry
- Ministry of Public Works
- National Agency of Mineral Resources
- National Commission for Dam Safety
- ICIM
- Regional Environmental Centre local office
- Ecosis
- Danube Environmental Forum
- Earth-Kind
- UNDP
- Embassy of Canada
- USAID
- World Bank

7.4 CALENDAR OF MEETINGS

30 January 2000	Accident occurs at Aurul, near Baia Mare
18 February 2000	Commissioner Wallström announces the creation of the BMTF
10 March 2000	Accident occurs at Novat pond, near Baia Borsa
14 March 2000	First meeting of the BMTF, in Brussels

27-28 March 2000	BMTF Chairman visits the accident sites
30-31 March 2000	BMTF Chairman presents to ICPDR Steering Group meeting in Vienna
17 April 2000	Second meeting of the BMTF, in Brussels
24-26 April 2000	BMTF visits Federal Republic of Yugoslavia
24-26 May 2000	BMTF visits Hungary
25 May 2000	Third meeting of the BMTF, in Hungary
9-14 June 2000	BMTF visits Romania
13 June 2000	Fourth meeting of the BMTF, in Romania
24 July 2000	NGO 'open day' at the REC, Hungary
25 July 2000	Fifth meeting of the BMTF, in Hungary
4 September 2000	BMTF publishes the Inventory of High Risk Sites
2 October 2000	Regulatory seminar
3 October 2000	Sixth meeting of the BMTF, in Brussels
23 October 2000	Seventh meeting of the BMTF, in Brussels
6 November 2000	Eighth meeting of the BMTF, in Brussels
20 November 2000	Ninth meeting of the BMTF, in Brussels
15 December 2000	Report publication

7.5 MEMBERSHIP OF THE BAI A MARE TASK FORCE

The Baia Mare Task Force was established to provide a considered and consensual analysis and response to the accidents which occurred. The membership of the BMTF was as follows:

Tom Garvey

Independent Chairman

Kaj Barlund

Director, Environment and Human Settlements Division, United Nations Economic Commission for Europe

Liliana Mara

General Director, General Directorate of Waters, Ministry of Waters, Forests and Environmental Protection, Romania

Emil Marinov

Deputy Minister, Ministry of Environment and Waters, Bulgaria
President, International Commission for the Protection of the Danube River Basin (ICPDR)

Kalman Morvay

Director, Tisza-Szamos Trust Fund, Hungary

Jean-François Verstryngne

Deputy Director-General, Directorate-General for Environment, European Commission

Philip Weller

Director, Danube-Carpathian Programme, WWF

Zsuzsanna Kocsis-Kupper

Alternate member for Hungary

Environmental lawyer, Office of the Prime Minister, Hungary

Andrew Murphy

Alternate member for the European Commission

Balkans Desk Officer, Directorate-General for Environment, European Commission

Alex Mayhook-Walker

Co-ordinator

Previous members of the BMTF have included:

Robert Rakics

Ministry for Environment, Hungary

Janos Borbely

Ministry for Environment, Hungary

Timo Mäkelä

Directorate-General for Environment, European Commission

7.6 BMTF PRESS RELEASE OF 4 SEPTEMBER 2000, CONCERNING THE INVENTORY OF HIGH RISK SITES

STATEMENT FROM THE BAIJA MARE TASK FORCE

As part of its mandate, the Baia Mare Task Force was given the task of publishing an *Inventory of High Risk Sites* in the mining, extractive and ore-processing industries in the Tizsa river basin. These sites use dams and ‘tailings ponds’ to store mining wastes and sludges which can contain heavy metals and other toxic substances used in the mining and processing of metal ores. If these sites are poorly designed or maintained, they can pose a serious threat of significant pollution into river systems, either due to chronic leakage or catastrophic dam failure during periods of bad weather. While some of these plants are still in operation, many sites have been abandoned and may be in a poor state of repair.

The Ministers of Environment of Romania, Hungary, Slovakia and Ukraine met on 3rd April this year, and agreed to undertake the task of preparing such an inventory. This has been conducted under the auspices of the International Commission for the Protection of the Danube River (ICPDR). The resulting list covers a wider range of ‘hotspots’ than solely those in the mining and extractive industries. Nevertheless, for those sites identified within the mining, extractive and ore-processing industries, the Baia Mare Task Force has sought assurances from each Government that, commencing immediately, the following actions will be taken at each site by the competent authorities of each country :

- Each site will be inspected by suitably qualified personnel and a safety/risk assessment made;
- Hydro-meteorological data for each site will be re-evaluated in order to ensure that tailings ponds and lagoons are designed to cope with extreme weather events;
- Assessments will be made of the structural capacity of the tailings dams and impoundments to withstand extreme precipitation and snowmelt events;
- Immediate steps to improve safety will be carried out where these are deemed necessary;
- Operational and accident/emergency procedures will be reviewed and improved where necessary at both a facility and local administration level;
- All sites, will immediately be placed under regular surveillance - this will include, in respect to abandoned sites, daily inspection and tests in times of adverse weather conditions.

To date we have received assurances from the Ministers of Environment in Romania, Hungary and Slovakia that they will undertake these actions.

These actions are short-term measures to minimise the risks of accidents/spillages in the year ahead. In its report to be published at the end of this year, the Baia Mare Task Force will be making recommendations for the improvement of existing legislation, at both national and international level, to strengthen the environmental regulation of the mining, extractive and ore-processing industries in Europe.

As in all listings, the possibility exists that some high-risk sites may not – for one reason or another – be listed. In those cases, we have asked that the measures listed above also be taken in respect of such sites.

A full copy of the Inventory and a map indicating the location of the sites may be found at the following web-sites :

<http://www.cian.hu/doc/hotspots.htm>

<http://www.tisaforum.org.yu>

Quotation :

Tom Garvey, Chairman of the Baia Mare Task Force noted *‘the preparation and publication of this inventory represents an important first step in the identification and management of potential environmental risks in the region. We welcome the positive response that we have received from the governments in the region and encourage them to make every effort to ensure that such accidents do not occur in the future’.*

Editors note :

The International Task Force for the Assessment of the Baia Mare Accident (Baia Mare Task Force) was established by the governments of Romania and Hungary, the European Commission and the United Nations. Its remit is to review the mining accidents that occurred earlier this year at Baia Mare and Baia Borsa in Romania and to arrive at a considered and consensual conclusion as to :

- What happened and why ;
- The environmental and socio-economic impacts of the accidents ;
- Measures that could be taken to reduce the risks of such accidents occurring in the future.

The Baia Mare Task Force will produce its report during December this year.

The Baia Mare Task Force is headed by an independent Chairman and contains representatives from the Romanian Ministry of Waters, Forests and Environmental Protection, the Hungarian Ministry of Environment, the International Commission for the Protection of the Danube River Basin, WWF-International, the United Nations Economic Commission for Europe and the European Commission.

Sites identified in the Inventory as ‘high-risk’ in the mining, extractive and ore processing industries (presented in ARS map number order) :

Romania

Somes-Tisza sub-basin

- SC AURUL SA (pond), ARS map no. 2
- SM BORSA (Colbu pond), ARS map no. 3
- SM NOVAT (Novat pond), ARS map no. 4
- SM BAIA MARE UP Central Flotation Unit, UP Sasar (pond), ARS map no. 5
- SC AURUL SA (pond), ARS map no. 2
- SM BAIA MARE – EM Baia Sprie (pond), ARS map no. 7
- SM BAIA MARE – EM Cavnic (pond), ARS map no. 8
- EM AURUM – Ilba Sector, ARS map no. 9
- SM BAIA MARE – EM Herja, ARS map no. 10
- CMNPN REMIN BAIA MARE – EM Turt (pond), ARS map no. 11
- EM AURUM – Nistru Section, ARS map no. 12
- CMNPN REMIN SA BAIA MARE – Mining Subsidiary Rodna (pond), ARS map no. 13
- SM BAIA MARE – EM Baiut (pond), ARS map. No. 14
- SC COMINEX NEMETALIFERE SA – Mining Subsidiary Aghires (ponds), ARS map no. 16

Crisuri sub-basin

- CNCAF Minvest, SC Devamin SA, Branch Mine Brad – UP Gurabarza, Râbita Pond, ARS map no. 18
- CNCAF Minvest, SC Devamin SA, Branch Mine Băita – UP Băita, Fânate Pond, ARS map no. 19

Mures sub-basin

- EM ABRUD (pond), ARS map no. 21
- EM Roşia Montană (pond), ARS map no. 22

- EM Baia de Arieş (pond), ARS map no. 23
- EM Coranda Certej (pond), ARS map no. 24

Ukraine

- Zakarpatskyi polymetallic industrial complex, State, (not included on ARS map)

Slovakia

- Želba š.p. 02 Siderit, Rožňava, ARS map no.1

Hungary

- HIDROTECH Bányászati – és Környezetvédelmi Kft., ÁPV Rt, Gyöngyösroszi, ARS map no. 5