

Environmental Management in **Kosovo**

Heavy Metal emission from Trepca.



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Abstract

Through an interdisciplinary approach based on natural and social science, this project attempts to tease out some valuable lessons and guidelines relating to environmental management that may be utilised in the post-conflict UN governed transition economy of Kosovo, a territory with no effective environmental management in the past. The project focuses on the environmental impact that a huge dormant lead and zinc mining facility, named Trepca causes. The natural science investigations have thus focused on to determine the extent of the heavy metal pollution of the nearby river and found that the mining waste is still a very significant source of heavy metal pollution to the river, where the levels of in particular lead and cadmium were found to many times higher than WHO standards.

On the basis of this it is argued that the heavy metal contamination of the area presents a significant health risk to the local population (a sizeable town of 300,000 inhabitants) and action must be taken to eliminate this risk. The project analyses some legislative tools with reference to the EU that may help Kosovo's environmental management of Trepca and mining in general in the future. The project continues to contextualise how and why environmental issues as Trepca might be tackled and prioritised when considering that Kosovo has many other development issues to tackle, such as poverty, lack of economic growth and lack of safe drinking water for its inhabitants, and only has very limited funds available.

Through a discussion of other transition countries experiences with balancing different conflicting development objectives, it is argued that it is important not too focus too much on other development issues such as economic growth, at the expense of the environment. It is argued that Kosovo stands on a threshold of a new era, at least seen from an environmental point of view and should take advantage of the experiences other transition and developing countries have had by introducing environmental management policies from the put set and thereby avoiding many future environmental and health problems in the long run. Explicitly it means that explicit environmental policies and legislation needs to be in place in a transition country like Kosovo and that if a clean up of Trepca is prioritised, despite its large financial costs, it is possible that it will present some win-win situations where both environmental objectives and economic objectives are fulfilled.

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Abbreviations

AAS - Atom Absorption Spectrometry

ARD – Acid Rain Drainage

BTF – Balkan Task Force

CEE – Central and Eastern European countries

DANIDA – Danish International Development Assistance

DPSEEA – Driving force, Pressure, State, Exposure, Effect and Action

EAR – European Agency for Reconstruction

EIA – Environmental Impact Assessment

ERBD – European Bank of Reconstruction and Development

FRY - Federal Republic of Yugoslavia

GDP - Gross Domestic Product

HDI - Human Development Index

HDR – Human Development Report

HPI – Human Development Index

ISQG – Interim Sediment Quality Guideline

KFOR – Kosovo Force

KLA - Kosovo Liberation Army

KTA – Kosovo Trust Agency

MESP – Ministry of Environmental and Spatial Planning

NOEC – No Observed Effect Concentration

PEL – Probable Effect Level

PISG - Provisional Institutions of Self-government

PTWI – Provisional Tolerable Weekly Ingestion

REC – Regional Environmental Centre

RS – Republic of Serbia

SEE – Southern and Eastern European countries

SFRY - Socialist Federal Republic of Yugoslavia

SOE – Socially Owned Enterprises

SRSG - Special Representative of the Secretary General

SRS - Socialist Republic of Serbia

UNMIK - United Nations Interim Administration Mission in Kosovo

WHO – World Health Organisation

1. Introduction

Kosovo is a region in South Eastern Europe (SEE), which has undergone great changes during the last couple of decades. It has seen itself being part of the socialist-run Yugoslavia under Tito, gone through a civil war and can now in the beginning of the 21st Century be categorised as a post-conflict, UN- protectorate transition economy, which is run by the United Nations Interim Administration Mission in Kosovo (UNMIK).

At present there are huge economic and social problems in Kosovo, exemplified by the fact that unemployment soars at around 50-60 percent, which equals half the able-bodied workforce (HDR¹, 2002: 69). There is also a shortage of capital for investment in the economy and the infrastructure (ibid: 21). As a result of the conflict and the harsher living conditions, a World Bank study has found that about half the population has consumption levels below the poverty line² and around 12 percent live under conditions of extreme poverty (World Bank, 2001). The dire economic and social situation can be ascribed to both the unfavourable economic situation, that the country went through during the 1980's, the conflict and the present transitional nature of the economy, moving from a planned economy to a market based economy. Due to these problems it is of paramount importance to kick-start the economy and improve the well being of the people. Nevertheless, these are not the only problems that the protectorate faces at present. There are namely huge environmental problems³, which have an impact on the well being and the health of the people, which will be discussed below.

1.1 The current environmental situation

The insufficient Yugoslav environmental legislation, the complete lack of environmental protection during the last ten years, and the conflict has resulted in huge problems regarding the present environmental situation in Kosovo (MESP⁴, 2003). The state of the environment is the result of many factors such as the uncontrolled building of domestic and industrial premises, old industrial technologies, inadequate technology in certain industrial departments of natural resources, pollution of water courses due to a complete lack of wastewater treatment from domestic as well as industrial sites and accumulation of solid industrial and urban garbage (ibid). The major environmental pollution points in Kosovo are caused by the Trepca mining and smelting industry, a large-scale cement factory, and the Obilic power plants (ibid.).

¹ Human Development Report.

² The poverty line is set to USD 1,534 per day per adult (HDR 2002: 28).

³ Consultants working in Kosovo consider the country as the most polluted area in the whole of Europe.

⁴ Ministry of Environment and Spatial Planning

The present situation threatens the environment by creating surface water-, ground water- and soil pollution. With regards to water, Kosovo is already considered poor in drinking water resources, which are dwindling, due in part to the construction of new buildings and due to the deteriorating water quality of the existing watercourses. There are four main watercourses in Kosovo, which in, particular downstream from towns, get contaminated with organic waste, as there are no working sewage or wastewater treatment facilities in place in Kosovo. There are no industrial wastewater systems in place either and the rivers are used as sinks for industries. For these reasons the River Ibar and the Sitnica River are classified as dead rivers⁵ This means that the majority of the watercourses in Kosovo are highly polluted and *“cannot be used even for industrial purposes without prior treatment”* (MESP, 2003).

One of the main industrial polluters, of the River Ibar, is the mining complex Trepca situated in the North of Kosovo, close to the town of Mitrovica. This huge industrial mining site had been in operation engaged with large-scale exploitation since 1925, where a British Mining Company bought the rights to exploit the heavy metal reserves in the area. Since then, and until the year 2000, lead and zinc has been mined and smelted. The plant, including the lead smelting plant is not in operation today and the factory has during the last ten to twenty years deteriorated to a state beyond repair.

The World Health Organisation (WHO) (Shllaku, 1992) reports have shown that the long going activity of mining and smelting in the area has had a great impact on the health of the people living in a heavy metal contaminated area. This is because heavy metal contamination can harm most of the inner organs plus the corpuscle, and for example cause anaemia. Heavy metals are furthermore known to bio accumulate in the body as well. Sampling of agricultural crops and vegetables in the Mitrovica region (close to the Trepca mining area) in 1989, when the plant was still in operation showed, that concentrations of heavy metals in spinach were high in most of the contaminated areas by the following factors: for lead 20-30 times, for zinc - up to 10 times, for cadmium -up to 20 times, and for copper up to 5 times (Shllaku, 1992). It was also found that lead blood levels in pregnant women were more than three times higher in Mitrovica than in Pristina.

These investigations were conducted whilst the plant was in operation, but even today three years after the plant was closed, there might still, although somewhat reduced, be a risk that people are exposed to unacceptable heavy metal exposure. This is due to the large amount of mine waste (tailings) that are scattered close to residential areas in Zvecan and Mitrovica. It

⁵ The MESP does not offer any definition as to what the classification “dead” rivers is based on.

is the previous mining and smelting activity, which has resulted in that large mine tailings⁶ are lying on the riverbanks and piles of residue ore are placed many places on the smelting plant grounds. These mine tailings contain residue heavy metals, such as lead, zinc and arsenic.

According to measurements made by the consultant company Golder, one of the tailings, the Zitkovac mine tailing, which is situated right north of the town Zvecan, contains 8,500,000 ton of tailing material. This tailing contains between 0.2 and 0.7 percent of lead. This percentage is equivalent to in between 17,000 and 59,000 ton of lead (Golder, 2003). Due to wind the dust from these piles might be moved into the surrounding area and into the river. Precipitation may also cause the soil with high levels of heavy metals to erode and be released into the nearby river and groundwater

According to Trepca, who themselves have conducted some investigations into the extent of the pollution of the River Ibar and the air quality in the surrounding area, there are high levels of heavy metals both in and around the river and on the plant itself (Monitoring report august, 2003). In other words, one of the worst heavy metal contaminated sites in Europe is situated in the immediate vicinity of a large town inhabited by some 250,000 people and it is quite likely that the heavy metals are released into the aquatic environment, causing ecological discrepancies as well as having an impact on human health. However, there has been made no other investigations into the heavy metal contamination of the river, a part from the Trepca samples, which are of somewhat dubious quality. This provides one incentive to re-examine the extent of the heavy metal contamination. Other reasons are, that it is most likely that some people use the river water or wells dug into the riverbank for their drinking and household water supply, and that there are some fishing activities in the Ibar River, makes it interesting to examine the present extent of the pollution and the associated risks to human health. Such an investigation could help highlight the importance of better environmental management of this particular river system. However, there are also other reasons as to why water quality improvement or at least control of the water quality of the rivers may get its deserved political attention, as several factors put or in the near future will put pressure on the available water resources in Kosovo. These are discussed below.

- The water requirements of the Obilic power plant, results in a lack of drinking water for the population in Kosovo. Furthermore there is a great need to ensure the quality of the remaining rivers (MESP, 2003).

⁶ Mine tailing is the residue from the extraction of metals from the ore

- Kosovo could be self-sufficient in food. However, industrial pollution and polluted agricultural land and lack of clean water for irrigation results in, that Kosovo has to rely heavily on imports (MESP, 2003)
- Economic development requires availability of water of a certain standard. Growth in Kosovo's economy will result in an increased demand for water. At present the river waters are not even acceptable to industrial usage without prior cleaning.
- Exacerbating the issues above is the population growth in Kosovo. At present it stands at 21% making it one of the highest in Europe. Furthermore, Kosovo have the youngest population in Europe, with more than 40 percent below 20 years of age (MESP, 2003).

Thus, there are number of factors which in the future will increase the demand for fresh water at a decent standard. These factors also intertwine with each other. The present environmental problems have a serious effect on people's health, they hamper economic growth, they prevent the possibility of acquiring self-sufficiency in food and in the future they might also be lack of available drinking water due to the population growth and the environmental problems. Therefore, it is important to take action to prevent pollution of watercourses and to improve the water quality in the rivers.

Given the fact that the political status of Kosovo is still unresolved⁷ all development strategies, including environmental policies are difficult to introduce. However, UNMIK has declared that the setting up of democratic institutions and legislation should and can be done before the question of status is resolved. Special Representative of the Secretary General (SRSG), Michael Steiner, argues that European standards have to be met, which also mirror the demands that are set before integration into Europe can be considered (HDR⁸ 2002:93).

Thus the standards that are introduced to the Kosovo society are mainly based on EU standards and traditions. The Ministry of Environment and Spatial Planning has recently passed the very first framework law in the environmental area, The Environmental Protection Law (EPL) in Kosovo and will furthermore aim to introduce EU-standards. Thus, it seems that Kosovo, at least on the face of it, is taking some progressive steps towards improving the environmental situation, including a clean up of Trepca and the river water quality.

⁷ The debate centres around whether Kosovo should become an independent state or be an autonomous region of Serbia. Until this issue is resolved, it will remain a UN- protectorate, in which UNMIK has the highest political power.

⁸ Human Development Report

However, given the socio- economic situation of Kosovo outlined above, legislation and elevated statement are not enough to ensure that the environment will really be prioritised. Political will to really do something to improve the environmental situation is necessary. However, when a country faces many problems to solve and funds are limited, it can be difficult to strike the right balance between prioritising environmental problems and other problems, such as poverty. Indeed it can be argued that environmental issues should not be considered in the short and medium term development goals. Often, as can also be identified in other transition economies, economic issues are valued above environmental concerns. Instead the main focus has been improving and changing economic conditions, which has often resulted in that environmental problems have been allowed to occur detrimental to eco-systems and peoples health (BTF⁹, 1999). The rationale for doing just so, in Kosovo i.e. by ignoring the potential pollution caused by Trepca is therefore an issue that requires attention, along with an analysis of the drawbacks and consequences of postponing dealing with environmental issues, such as the heavy metal pollution from Trepca, till other development priorities have been implemented.

The point is however, that the Kosovo policy-makers stands at the thresholds of a new era, and now have the opportunity to reverse this trend of ignoring environmental issues by formulating new, long term, environmentally sound development policies and also reduce existing pollution levels. In this way the people of Kosovo can enjoy the same levels of environmental protection and public health, which have been achieved elsewhere in the greater European Region (HDR, 2002: 93). Therefore, it is necessary to formulate development strategies that take into consideration environmental issues, as well as social and economic priorities. Furthermore, given the fact that Kosovo is rich in minerals, it is therefore likely that a positive factor in the economic development could be to resume exploitation of minerals again. Particular Trepca has been the flagship within the mineral exploitation sector in Kosovo and has been a major employer in the Mitrovica region. Thus, in order to avoid further heavy metal pollution it is necessary for the Kosovo government to assess the risk of heavy metal pollution and to adopt environmental standards and policies to this type of pollution.

This project will for the sake of clarity focus on the water pollution that is caused by Trepca, namely, the contamination of the River Ibar with heavy metals. This case has been selected because it seems to represents a serious, constant contamination of the surrounding area, and especially the water, which might have adverse affects on health in the area and exposing the people living in the area to a considerable health risk. The environmental awareness in the area is furthermore, considered to be low. For example, kids play on the tailings area without

⁹ Balkan Task Force

knowing that they are exposed and very vulnerable to heavy metal polluted dust (McWeeney, 2003). Thus, it is the main purpose of this project to firstly, establish the extent of the heavy metal contamination, of the River Ibar, through experiments conducted in the field. Secondly, it is to examine how the implementation of EU standards can help dealing with the existing and future environmental problems taking the specific socio-economic and political context into account. It is hoped that the experience from other transition countries might be useful to include in such an analysis as they might highlight the political difficulties that prevent governments from implementing environmentally policies, however irrational that might seem. This might help tease out some lessons that policy-makers in Kosovo might take into account, when they inevitably will face the dilemma of addressing improving the environmental situation around the Trepca area and other competing and even contradicting development objectives that the Kosovo also have. This leads us to this projects problem formulation, which is as follows:

Problem formulation:

What is the extent of the present heavy metal emission from the Trepca plant to the Ibar River

And

How and why should this environmental problem be addressed, given that Kosovo have other competing development objectives?

The overall structure of the project structure is as follows. Firstly, an analysis of the socio-economic context of Kosovo and Trepca is given. Next an analysis of the extent of heavy metal emission to the river Ibar is provided. The second half of the project will take a more political approach to the situation in Kosovo, and it will discuss which political solutions and environmental legislative tools Kosovo can utilise to address the pollution problem. This part will also discuss what difficulties Kosovo might have in addressing the environmental problem that Trepca represent given the other development objectives that it has. This discussion will be based on the experiences that other transition economies have had and will therefore also provide some lessons and guidelines that Kosovo might want to consider. It should be noted that the scope of this project has some limitations. Considering the disturbances in Kosovo in the spring of 2004 it seems that there is a long way to the point where the Serbs and the Albanians can work together and therefore to implement, enforce legitimate legislation that both Serbs and Albanians will comply with. Therefore the conclusion reached in this report is based upon the assumption that there is a stable situation in Kosovo and the region can be declared more or less peaceful. Following is a more extended discussion of the structure and the overall idea with the chapters in the report.

2. Methodology

This chapter attempts to clarify the methodologies used in this report in order to answer the problem formulation. The chapter is divided into three parts. Firstly, the structure of the project is outlined, which at the same time provides an insight into how the problem formulation attempted answered. Secondly, the boundaries of the study are outlined, which also provides argumentation for using a case study approach and why Trepca has been selected as an appropriate case study to use. The approach to the environmental problem at the Trepca plant can be used when handling other problems in Kosovo. Thirdly, the methodology, with regards to firstly the empirical approach used is clarified, followed by a discussion of the theoretical framework adopted.

2.1 The project structure

This study is an in-depth analysis of firstly the environmental problems associated with the Trepca mine tailings, with a stringent focus on the possible heavy metal pollution of the nearby Ibar River. Secondly, it is, as the problemformulation states a discussion of how and why such massive environmental problems should be addressed in Kosovo, given that it has other conflicting development objectives.

The structure of the project will be as follows. After a general introduction to Kosovo and the state the country is in, both on the environmental area and the socio economic area, the extend of the heavy metal pollution will be discussed on the background of analyses of water, sediment and fish samples collected on a field study to Kosovo. Then, the effects on the water quality of the river Ibar, as they associate to heavy metal pollution and the mine tailings, will be addressed.

The focus will be on the impact that the tailings might have on the River Ibar. It is envisaged that an investigation into the heavy metal pollution of the river, will make it possible to discuss the environmental problems that this might lead to, and also associated human health risk, that the locals might be exposed to. Furthermore, heavy metals suspended in water or accumulated in aquatic animals can travel far, even beyond national borders and thus could possibly have transboundary environmental and human health effects. The discussion of heavy metals effects on nature and on human health in general is old and well documented, thus making it possible to discuss the impact on the local area and people as they are exposed to contaminated water possible and interesting. Possible technical solutions to what will also be presented, although only in cursory manner.

A discussion of potential initiatives towards environmental development will follow and lead into a discussion of Kosovo's declared political goals. The possibilities of Kosovo applying EU legislation will be discussed and the possible consequences of using EU directives will be presented. The research will however; initially focus on analysing the socio-economic context of Kosovo, in order to give an idea of the particular development path that Kosovo has gone through, and to provide an understanding of the development issues that Kosovo faces today, being a post-conflict transition economy governed by UNMIK. This section will thus also provide an insight into the origins of the environmental problems that Kosovo suffers from at present, whilst at the same time clarifying, what other development priorities that the environmental problems compete with. Next, the study will concentrate on analysing the socio-economic context of Mitrovica and how Trepca has had, and still have a political importance, which is due to its economic, ethnic and symbolic status as a major employer.

A point of the project will be to analyse, how and if it is possible to address and solve such environmental issues given the other development obstacles and problems that Kosovo face at the moment problematique, as teased out in chapter 3 and 4. This part of the project will start off by evaluating the newly adopted environmental framework law and its usefulness in addressing these problems and will then proceed to establish what EU directives, that Kosovo will have to adopt and transpose if the problems should be solved in the ways of according to EU standards.

An assessment of what socio-economic preconditions that is necessary to have in a developing society, such as Kosovo, in order to introduce meaningful environmental policies and legislation, is also thought important to conduct, as it illustrates the development issues and obstacles that many transition economies face with regards to enforcing and implementing environmental laws. When a country faces many problems to solve and funds are limited, it can be difficult to strike the right balance between prioritising environmental problems and other problems, such as poverty. Indeed it can be argued that environmental issues should not be considered in the short and medium term development goals. Often, as can also be identified in other transition economies, economic issues are valued above environmental concerns. The rationale for doing just so in Kosovo will therefore be discussed, followed by an analysis of the drawbacks and consequences of postponing dealing with environmental issues, such as the heavy metal pollution from Trepca, till other development priorities have been implemented.

On a more general level it is envisaged, that such a study will contribute to the understanding of the difficult choices that many transition economies face, between on the one hand solving or prioritising severe environmental problems and other important development priorities, such as creating economic growth. It is hoped that this project cannot only

highlight these dilemmas, but also provide insights into how they may not be thought of as dilemmas, but rather, when a longer time perspective is adopted, as win-win situations. It is also hoped that to integrate environmental concerns immediately, will provide the context for achieving a more sustainable development path in general.

Furthermore, many SEE countries and the region in general are aiming to adopt EU environmental legislation (Bandi and Kiss, 2003) and therefore, this study might also provide some valuable lessons for other countries in transition. Environmental research and data in general is hard to procure in Kosovo, either because it is of dubious quality or has been destroyed during the war, this project may thus contribute to research data within the environmental sector.

2.2 Boundaries of the study

Using a case study as a research method has the ability to provide explanation for complex abstract issues and it is particular useful when dealing with contemporary events, as in this case, where evidence is otherwise difficult to obtain. The fact that this project is concerned with Kosovo, is in itself a product of a conscious decision making process which therefore needs to be accounted for.

It was decided amongst the group members that the topic of interest was to examine the conflicts that can arise in a transition country in Eastern Europe, where there are huge environmental problems and also massive socio-economic problems. This is a typical conflict in development, which nevertheless requires attention and constant re-examination. Kosovo became the centre focus of the project for various reasons. Firstly, it fulfilled the criteria of interest, being a transition economy, with big environmental and socio-economic problems. Secondly, it is aiming to achieve EU environmental standards, thus actually expressing some sort of interest in rectifying the environmental situation. Thirdly, it is in many ways a country that stands on the threshold of taking a complete new development path, and thereby representing a unique opportunity to investigate the possibilities for Kosovo to formulate a more sustainable development strategy. Fourthly, the fortunate chance of going to Kosovo and to get the right contacts was made possible by Ramboll, to which it must be acknowledged that without their help and informative guidance, this project would not have been possible to conduct.

It is hoped that by using the Trepca as a study, it will be possible to give an idea of the extent and severity of the pollution problems that Kosovo has to deal with, and that it on a more general level can illustrate the conflictual nature between different development

objectives that many countries in transition and also developing countries for that matter, faces in the present world situation.

Trepca as a case study has been selected for various reasons. Firstly, Trepca is a typical relic from the socialist past, which can be found in many transition countries, thus hopefully making the findings of this study possible to generalise from, at least to some extent. It was a huge industry operated under socialist values, where environmental and public health issues were of limited concern in relation to the objective of achieving economic growth (Dingsdale and Lóczy, 2001: 187). Therefore, huge environmental problems were generated. Although the complex is no longer in operation, it still has a constant negative environmental impact on the surroundings due to, amongst other issues, the heavy metal contaminated tailings that lie nearby. It is one objective of this rapport to try and establish the extent of the contamination of the river Ibar.

Secondly, Trepca has been identified as one of the worst environmental hot spots in Kosovo and is probably also amongst the worst polluted areas in Europe as a whole. The question is how can the aim of achieving European environmental standards be aligned with the other very important development objectives of reducing poverty and unemployment? What challenges will this, in the case of Trepca present? It is hoped that the extremeness of the case helps to highlight the difficult choices that a transition country with only limited funds, like Kosovo, must make.

It was decided early on in the research process to focus attention on the heavy metal pollution from the tailings on the water quality of the River Ibar. The justification for this was that focusing on water quality, as oppose to soil contamination for example, is that the river runs directly through the tailings area, that fresh water resources are scarce in Kosovo and has great socio-economic importance for the future development of the province, thus making it of paramount importance to establish and address possible pollution sources. Furthermore, heavy metals are known to bio accumulate in aquatic animals and can thus expose people to the pollution although they live far away from the pollution source. In addition to this, many local people do not have access to piped water, but rely on water from wells, which could be contaminated by the river water and thus, heavy metals. There is also some farming activity along the banks at the river, and it is possible that when the river floods, these fields and thus crops will risk heavy metal contamination. In this given period when there is flood, the water also riches the sides of the tailings and thereby removes tailing materiel into the river.

In the attempt to find out what EU directives would be relevant to work with the choice fell on the EU directives that relate to mining or old mining sites of water were considered. To make the environmental situation better these directives are hopefully a tool.

Due to several factors, the availability of reliable statistical information and other basic data covering all aspects of human development and environment is limited. Therefore, comparisons over time are hampered and other basic analytical research methods are severely hampered. This must be kept in mind when interpreting all data and conclusions. In particular, environmental data is hard to obtain for several reasons. Firstly, environmental monitoring has not, during the Yugoslav regime, been conducted in a routinely manner. Therefore, there is an obvious absence of environmental research results. Secondly, the data from this period should be treated with great caution and scrutiny, as one always should do with data that is produced in situations where the regulator and the regulated is one and the same thing (Dingsdale and Lóczy, 2001: 187). Thirdly, a lot of information has been lost or destroyed during the war, meaning that in many ways Kosovo scientist and researchers have to start from scratch procuring the most basic sets of environmental data.

Trepca had though an environmental monitoring programme. They were measuring the water and air quality every month. But on fortunately if the Yugoslavian standards were exceeded it did only have consequences if it was very severe (Zvkovic, 2003). Fourthly, the knowledge of the local people employed at the Ministry of Environmental and Spatial Planning (MESP) and other official institutions are not necessarily experts on environmental issues. In fact, people fill many positions with little or no experience in public administration and environmental issues (HDR, 2002: 36).

The lack of qualified local staff is partly due to the fact that the Albanians were not allowed to work in certain administrative functions, or to attend university courses, during the Milosevic regime. However, it is also because people are appointed to positions on the basis of their political affiliations or ethnic background, rather than relevant professional criteria (ibid.). Therefore, it cannot be assumed that the civil servants at the ministry are a reliable source of information. Naturally all the complexities of the development issues that Kosovo faces today cannot all be fully explored within these pages, but it is however hoped that the discussion contains the main and most important complexities, without too much simplifications.

2.3 Empirical methodology

This section will present a critical discussion of the methods utilised in this thesis to answer the problem formulation and the sub-questions. The project is heavily based on empirical

data, but also theoretical data. The empirical data has been collected and obtained through the case study. This project is also based on an interdisciplinary approach, utilising both social and natural science in order to answer the problem formulation.

2.3.1 EMPIRICAL RESEARCH CONDUCTED IN KOSOVO

In order to gain some background knowledge of the topic under investigation preliminary research was done on Kosovo, mining and heavy metal pollution in general. Furthermore, a three-week study trip to Kosovo was arranged lasting from the 20th of November till the 11th of December 2003, in co-operation with Ramboll, who under the auspices of Danida was engaged in creating an environmental management system for Trepca. It was during this trip that all the empirical data was collected. The empirical data consists of several site visits to Trepca, tours of the surrounding areas, and meetings with relevant people in the capital Pristina and at Trepca and the trip also included surveying several of the mine tailings. During the visit it was possible to conduct some natural science investigations, which will be discussed in more detail below, and to conduct a range of interviews with people and organisations that were deemed relevant to interview. The latter was considered necessary because of the exploratory nature of the questions being asked, the answers to which are not available from secondary literature sources. However, the empirical element will also be supported by a theoretical discussion of issues pertinent to the subject matter, which will serve to provide knowledge and a framework enabling the interpretation of the results.

In order to locate suitable personnel in a position to provide information relevant to the research question it was first necessary to identify the various institutions involved with Trepca and water quality issues. This was performed in a variety of ways. Firstly, Ramboll provided the initial contacts to Trepca. Secondly, a review of the existing literature on the environmental administration provided a list of the publishing institutions. However, given the still very immature nature of the administration in Kosovo and the huge presence of international experts, it was mainly through personnel contacts established in Kosovo, that suitable interviewees were identified. These initial efforts resulted in a growing web of communication with an increasing number of potential interviewees and providers of information. It was very fortunate that the majority of people contacted were willing to provide assistance in one form or another.

The search for interviewees was guided by a key objective: to obtain different perspectives on the Trepca pollution problems, including water quality issues, and knowledge on the administrative approach to solving environmental problems as well.

The following people were thus interviewed:

- Mr. Stuart Brown, “Water Quality Expert”. International expert and supervisor for MESP on how to implement EU’s water frame directive
- Ms. Nezakete Hakaj, Division Head of Environmental Protection. MESP.
- Ms. Anna Marie Madsen, Deputy Head of DANIDA’s office in Kosovo.
- Mr. Roger Payne, Head of environmental board on Trepca.
- Mr. Tomislav Zvkovic, Head of Trepca Institute on Trepca North
- Ms. Dragica Jovanovic, Head of Environmental department under Trepca Institute.
- Mr. Asslan Vitaku, Environmental manager on Trepca South
- Mr. Baton Begolli. Director of the Water Department at MESP.

In general we had a lot contact to the international department at Trepca and daily and friendly contact to the locals that gave us a great input on life in general in Kosovo.

In order to extract as much relevant information from the different people/organisations as possible, interviews guides were constructed. However, these interview guides were guides only and the questions were characterised by being open-ended.

Furthermore, close and daily contact was established to Gerry Mcweeney, a WHO representative, researching environmental health problems in Mitrovica. Close daily contact was established to Ramboll staff, Carsten Helvind and Golder staff, David Engdahl and Martin Petersen.

It was also thought possible to obtain data from various institutions, which would be of great value to the project. However, it was soon realised that data procurement is particularly difficult to obtain in Kosovo, as discussed above. Practical issues such as the fact that hardly any roads in Pristina have names, which makes it difficult even to locate the relevant institutions, exacerbated this. Furthermore, there were poor telephone connections, which meant that contacting and arranging meetings with people became problematic.

Language barriers also presented a problem, as many people only spoke Serb or Albanian hampering communication. Most documents written before the war were also only in Serb and Albanian. Thus, with regards to data procurement as with any other issues in Kosovo, Kosovo must be regarded as being on the same level as many developing countries, where hardly any reliable systematic data collection is in existence. This lack of data and basic information obviously presented some problems with regards to conducting research, as even the most basic information is not available. For example, the search for evapotranspiration

data for the Mitrovica region reflects the general problematic encountered when searching for data. After having located the hydro-meteorological institute of Kosovo, setting up a meeting with the director, persuaded a new found friend to translate from English to Albanian, it was finally clear, that no evapotranspiration data existed, as they had all been destroyed by the Serbs during the war. Such was the general nature of the research and it is not surprising that collecting data and arranging interviews were very time consuming.

2.3.2 APPROACH TO THE EMPIRICAL RESEARCH IN KOSOVO.

Sampling from Ibar

To gain knowledge about how the actual pollution situation is, from the closed factory and the tailings to the local river Ibar that runs through the Trepca factory area. The find out how the influence the Trepca factory has on the water quality should be examined, if it still pollutes the river and how much. It was decided that it would be interesting to measure on 3 different parameters to get a better foundation. So there should be examined the heavy metals Zn, Pb Cu and Cd in the water, sediment and fish with atom absorption Spectrometry, AAS.

Trepca environmental agency takes samples on the river as well, and it was interesting to see if our measurements were like their results. So it was decided to actually take samples at the same spots as their measure program. These sample sites are located before the river runs into the tailing and factory area, next to the tailings and after it has passed the tailings and factory, see Maps in Appendix 1.

Samples and results

We decided that it would be interesting to analyze some samples from the area. The motivation was of two reasons. We would like to see if our own samples would give the same results as those Trepca Environmental institute had got. Some of their samples were analysed with equipment that was not sensitive enough, so their sampling methods are not capable of measuring samples low enough even to see if they are under the limits set by WHO for drinking water. For instance the lowest value they could detect for Cd was 0,01 mg/l but in WHO's standard for drinking water the limit is 0,003 Cd mg/l. It was of the same reason that Ramboll brought them a used Atom Absorption machine sponsored by Danida to replace the old one, so that their future samples to the measure program would be more valid.

The Trepca institute had some reports on the water quality of the Ibar and it was decided to examine some of the same parameters as they had, namely Pb, Cd, Zn and Cu. These heavy

metals were chosen because Pb and Cd are some very serious toxicants and from the reports it was clear that there was also were high levels of Zn and Cu in the river.

Sampling at Ibar – water and sediment

6 water samples and 6 sediment samples was taken from the river Ibar on the 8th December. It was decided that it would be interesting to examine both sediment and water from the same spots, to see if the present contamination were traces in the sediment from the present production. The large amounts of heavy metals in the sediment in the Ibar River will result in that the sediment will continue to release heavy metals a long time after a possible closure of the tailings.

In general it was found, that the river was running too fast to generate sediment. Therefore, it was only possible to get some samples from the riverbed in the side of the River. All the sediment samples were taken with a small hand shovel from the riverbank. It was not possible to get samples from the middle of the river due to the debt and heavy stream.

The 5-water and sediment samples were taken at sites as the Environmental Monitoring Reports from the Trepca Institute had been taken. These sites where called:

1. Second bridge
2. Dubin kr. ZV. S
3. Gate no. 3
4. Rudare bridge
5. The first bridge right after Zitkovac
6. The last sample was taken about 5 km down the river.

See map 3

The 1st sample (Iv 1) was taken in the Ibar River immediately before the Sitnica River, which runs by the Trepca South that used to produce zinc, fertiliser and SO₄ acid, feeds it.

The 2nd sample (Iv 2) was taken after the two rivers had run together in order to find out if the Sitnica contributed with heavy metals.

The 3rd sample (Iv 3) was taken after the first tailing area and where the factory is located. The sediment sample no. 3 was taken on the same side as the tailings located right next to the river.

The 4th sample (Iv 4) was taken about 1-2 km down the river after it had passed the factory area to see if some of the many heaps of heavy metal containing material that are lying on the factory ground, had supplied heavy metal contamination to the river.

The 5th sample (Iv 5) was taken after the river had past the last tailing Zitkovac. It was here expected that the level of heavy metals would rise again. The sediment sample no. 5 was taken partly from the riverbank because there was no sedimentation in the river and only bare stones.

The 6th and last sample (Iv 6) was taken about 5 km downstream from the Zitkovac tailing to see if the heavy metal contamination still is present in the water or if it gets absorbed or bound. By taking a sample further down the river to see whether the contamination is located around the polluted site or if it is being carried down streams.

Ibar water samples

The analyse of the water in Ibar and the comparison of the results to drinking standards and irrigation standards it was hoped to get an impression of how bad the present water contamination of Ibar is. It is as well possible to compare the results with the data from Trepca Environmental Institute.

Sediment samples

An analyse of the sediment would give an impression of how much of the heavy metals that are eroded into the river and is a constant threat to the environment. Further more, it was to see if and how far it is carried. The fast flow of the River was not characterised by great sedimentation and the bottom was quite rocky rather than sandy.

Fish samples

To exemplify that heavy metals can accumulate in the food chain and as well can affect the population if they live on fish from the river or animals in contact with the river some fish was collected. The motivation to do this was supported by that people was fishing in the river for consumption. It was only possible to get 2 fish from Ibar and 3 fish from the water reservoir Gazivoda. It was expected to find that the fish from Ibar had a significant higher level of heavy metals than the fish from the water reservoir.

Table 1 Fish Data

ID number	Location	Species	Length	Weight	Other remarks
Fish 1	Ibar	Chondrostoma nasus	27,5	229,2	Test Fish
Fish 2	Ibar	Chondrostoma nasus	28	234,8	Test Fish
Fish 3	Reservoir	Chondrostoma nasus	25,5	163,5	Control Fish

Fish 4	Reservoir	Crusian (Carassius)	19,5	150,3	Control Fish
Fish 5	Reservoir	Bleak (Albusnus)	16,3	33,3	Control Fish

Through an examination of the stomach content green/brown fluids was found in all the fish, which could indicate that the fish mostly feeds on plant material. This observation was supported by the fact that none of the fish had any teeth and their mouths was located on the lower part of the head, which indicate that they feed from the bottom of the river. Three fish was identified to be of the type: *Chondrostoma nasus*. This fish lives mostly on algae that it grasses from stone and pile work and on the same time it eats mosquito's larvae, worms and other small animals that live among the algae. In march-May they migrate up the river to breed in the strong current. In Donau (which Ibar runs into) the fish is often used as fodder in trout fish dams but is also used as human food. It has an average length of 25-35 cm.

One of the species caught is the Crusian, which is a carpe fish. Its food consists of small water animals, especially water fleas and other small crayfish. It measures around 30-50 cm in length.

The last type caught was a Bleaks. Its food mainly consists of insects and crayfish. It measures around 12-18 cm lengthwise.

Sampling procedures at Gornje Polje in the creek Leskov

The following section contains a description, and a discussion of the water and sediment sampling procedures in the creek flowing through the Gornje Polje tailings pit, and into the Ibar River.

On the south side of the Trepca plant, across the river Ibar, the Gornje Polje tailings dam is placed. The Gornje Polje contains approximately 12.000.000 tons tailings material¹⁰. The tailings material is the residue from the first heavy metal extracting process, which is done by flotation. Tailings material has not been placed on the Gornje Polje tailing since the 1950'es, where the Trepca began to use the Zitkovac tailing on the north side of the Trepca plant (Zvkovic, 2003). The Zitkovac tailing was used until the mid 1970 where the flotation process was moved out to the mines and new tailings areas were constructed.

A creek is running through the Gornje Polje tailings area and out into the Ibar River. The water in the creek upstream from the tailing is clear, but at the point of convergence between the creek and the Ibar River, the colours of the water in the creek was changed into a yellow/red colours, and the creek bed is bright red. Much of the colour change is possibly a result of iron oxidation. However due to the content of the tailing and the possibility of a

¹⁰ Power Point presentation from Trepca Environmental Institute.

very low pH value in the tailing¹¹ there are reason to believe that the creek absorbs heavy metals while passing through the tailing. Other arguments for why it could be interesting to analyse the water in the creek are that there are very visible signs of erosion on the tailing sides. Thus, tailings material is moved into the creek and contaminates the Ibar as well.

Figure 1: Picture of erosion on tailing side



The creeks flow of water is probably influenced by the amount of rain in the area. Therefore the question is how much water that percolate the tailing and into the creek and further in to Ibar. To calculation this it was necessary to obtain data on yearly rain, evaporation and a typographical map, but we found out that they were all destroyed under the war.

Instead it could be measured how much water that was running through the creek on the days where the samples was taken and how much heavy metal there was in the water. Then it would be estimated the amount heavy metals this creek was leaking to the river. It was only possible to measure how much water was running through Leskov on the days it was measured as well as the content of heavy metals.

The sediment and water samples have been taken at three places (see map 4, appendix 1) upstream (sampling point Pv3), which should be a background to measure the other samples against, midway through the tailings area (sampling point Pv2) and downstream from the tailing, where the creek meets the Ibar (sampling point Pv1). If the hypothesis is correct one would expect to find that the content of heavy metals increases the further downstream one move i.e. that Pv3 has the lowest if any, content and Pv1 has the highest content. To get

¹¹ A low pH can occur because of the sulphur rich ore. When the sulphur is in contact with H₂O, H₂SO₄ will occur.

more valid testing results it was decided to take samples from the creek three different days in December.

These measurements should contribute to get a picture of how the present pollution situation is from Trepca to Ibar, as well what influences the tailing Gornje Polje has on the river Ibar.

On the days the samples were taken the weather was cold (0°C) and clear and in the three weeks the sampling took place in Kosovo it only rained shortly once. The sampling procedure is located in the appendix. After taken the samples they got frozen down and kept frozen till they got analysed 2 months later by Atom Absorption Spectrometry (AAS) following the OECD standards.

2.4 Theoretical approach

It is anticipated that a thorough review of the literature with regards to how environmental problems are being addressed in transition and developing countries will be necessary in order to facilitate an understanding of, and explanation for, the problems that Kosovo might encounter when prioritising and balancing different needs.

The experiences from other transition countries are deemed particularly important to include, although no coherent theory on the difficulties of transition economies of addressing environmental concerns in the process of transition, has as such been thoroughly developed. Nevertheless, it is thought useful to positively utilise these experiences, as it is possible to deduce some common denominators and general explanatory factors, which illustrate the problematic encountered with balancing different development objectives. Furthermore, the experiences and the body of theory related to that of the transition countries that have now become EU accession countries are considered to be of even more explanatory power and interest, as these countries have not only gone through transition, but also transposed and aligned environmental laws with that of the *Acquis Communautaire*¹². In particular, the Slovenian experience is believed to be of particular interest for a number of reasons.

Firstly, it has the advantage of being an old Yugoslav republic and thus can be expected to have had roughly the same environmental legislation as Kosovo. Secondly, it is a post-conflict transition economy like Kosovo, but has in contrast achieved great success with its transition to the market economy and in transposing EU environmental standards, manifested with its invitation to join the EU in May 2004. Therefore, it seems obvious to put a focus on Slovenia when making comparisons, although relevant experiences from other countries will not be excluded either. However, it should be noted that there are also some important

¹² The *Acquis Communautaire* is the set of standards and laws which the accession countries have to adopt before being considered as member of the European Union.

differences between Slovenia and Kosovo. Firstly, Slovenia is in comparison to Kosovo and to all other accession countries, a relatively rich country. Secondly, it has a relatively homogenous population. Thirdly, it has been an independent state for almost 10 years, where Kosovo's political future is still unresolved and tense. Fourthly, it cannot be immediately assumed that Slovenia's environmental situation reflects that of Kosovo. Important differences might exist and these will have to be explored and accounted for.

Apart from using theory on transition economies, it was also deemed relevant to use the body of theory that has come into existence within the development study literature. There are many similarities between the development problematic encountered in the Third World and in SEE, therefore the body on literature dealing with development and environment, is thought to be very important and insightful. Furthermore, although the marrying of environment with development is relatively recent (Adams 2001), this diversely opinionated body of theory has been available for some time, in comparison to transition economy literature, and it can thus, be expected to be better founded and provide valuable insights into these issues.

3. Introduction to Kosovo

This chapter will outline and contextualise Kosovo's historic, political and environmental situation. The purpose of such an introduction is to enhance the understanding of the different political, socio-economic and environmental problems that Kosovo faces at present and will pin point some of the challenges that it will face in the future with regards to balancing the needs of implementing environmental legislation and other development priorities, whilst undergoing economic transition.

Firstly, an outline of the unique historical and political situation of Kosovo will be provided. Thereafter, an outline of the socio-economic situation will be given in order to give an insight into the nature of Kosovo's transition economy. Hereafter, an analysis of the environmentally legislative context will be provided, followed by an overview of the present environmental situation, as it relates to water quality.

3.1 The historical and political context

Kosovo covers an area of 10,887 km² and is surrounded by mountains creating natural borders with the neighbouring countries of Albania, Montenegro, Federal Republic of Yugoslavia (FRY) Macedonia and FRY of Serbia. Kosovo is an integrated part of the politically complex Balkans and shared a history of the socialist systems with other Central Eastern European (CEE) countries, including those in South East Europe. However, Kosovo also has its own unique features. Its population amounts to about 2,4 million¹³ which is divided into roughly four ethnic groups consisting of 81,6 percent Albanians, 9,9 percent Serbs, 3,4 percent Muslims and 2,3 percent Romany. Two thirds of the population lives in rural areas and there are only nine towns with more than 20,000 inhabitants. Kosovo is at the moment in a very dynamic political and economic situation due to the recent events. Firstly, it is a post-conflict society and in the process of recuperating from this period of violence, both psychologically and economically. Secondly, it is classified as UN-protectorate and only slowly building up its own institutions aimed for future self-governing. At present there is therefore great political and legal ambiguity, in which everyone must operate. Thirdly, Kosovo is also moving from a socialist style economy to a market based one, known as a transition economy, in which key socio-economic infrastructures and services are non-existent.

Historically both Albanians and the Serbs claim to be the original inhabitants of Kosovo and have throughout history been struggling with each other for control of the area. Kosovo has

¹³ Due to the conflict reliable demographic data is not available and the figure quoted is an informed guesstimate (HDR 2002: 19).

belonged both to the Kingdom of Serbs, Croats and Slovenes¹⁴. Later, during the Second World War Kosovo belonged to a greater Albania under the control of Italy.

After the war, the Socialist Federal Republic of Yugoslavia (SFRY) was born. Unlike the USSR, Tito embarked on a course of more liberal self-management, which meant that Yugoslavia consisted of six republics (Serbia, Croatia, Slovenia, Bosnia-Herzegovina, Macedonia, Montenegro) and two autonomous republics (Kosovo and Vojvodina). In 1974, Kosovo achieved more significant autonomy as a province under the SFRY and the Socialist Republic of Serbia (SRS). This status included a range of autonomous institutions, such as an assembly and a parliament, and Kosovo also had veto power over proposed changes in the SFRY and SRS legislation and constitution. However, it had no right, unlike the other republics, to withdraw from the Federation.

In 1989, when Slobodan Milosevic became president of Serbia, he immediately began taking steps towards absolving Kosovo's autonomy by removing the powers of the Kosovo Presidency, and dissolving the assembly and firing ethnic Albanians from state jobs. By the end of 1991, Croatia, Slovenia, Bosnia-Herzegovina and FYR Macedonia had taken steps to secede the SFRY. Only FRY Macedonia was able to do this without bloodshed and thus the Balkan wars erupted. The ethnic Albanians in Kosovo also declared their independence from SFRY and created a parallel government to that of the Serb dominated government in Kosovo. Throughout the late 1997, 1998 and 1999 there was skirmishes between, and atrocities by, the Serb forces and the Kosovo Liberation Army (KLA). In early 1999, when Milosevic refused to sign the Rambouillet Accord: the Interim Agreement for Peace and Self-government in Kosovo, NATO started its bombing campaign. The bombing campaign ended the 10th of June and UN's Security Resolution 1244 was adopted the same day. The resolution called for: Withdrawal of Serb forces, establishment of an interim administration for Kosovo, safe return of refugees, establishment of an interim political framework agreement on self-government for Kosovo, recognition of Federal Republic of Yugoslavia (FRY) sovereignty and territorial integrity.

3.2 The current political situation in Kosovo

Since the end of the conflict between NATO and FRY Serbia in 1999, Kosovo has been a UN protectorate governed by the UNMIK, which is headed by the Special Representative of the Secretary General (SRSG). As already mentioned UNMIK has the highest political power until the question of Kosovo's political status is resolved. Most Albanians would like

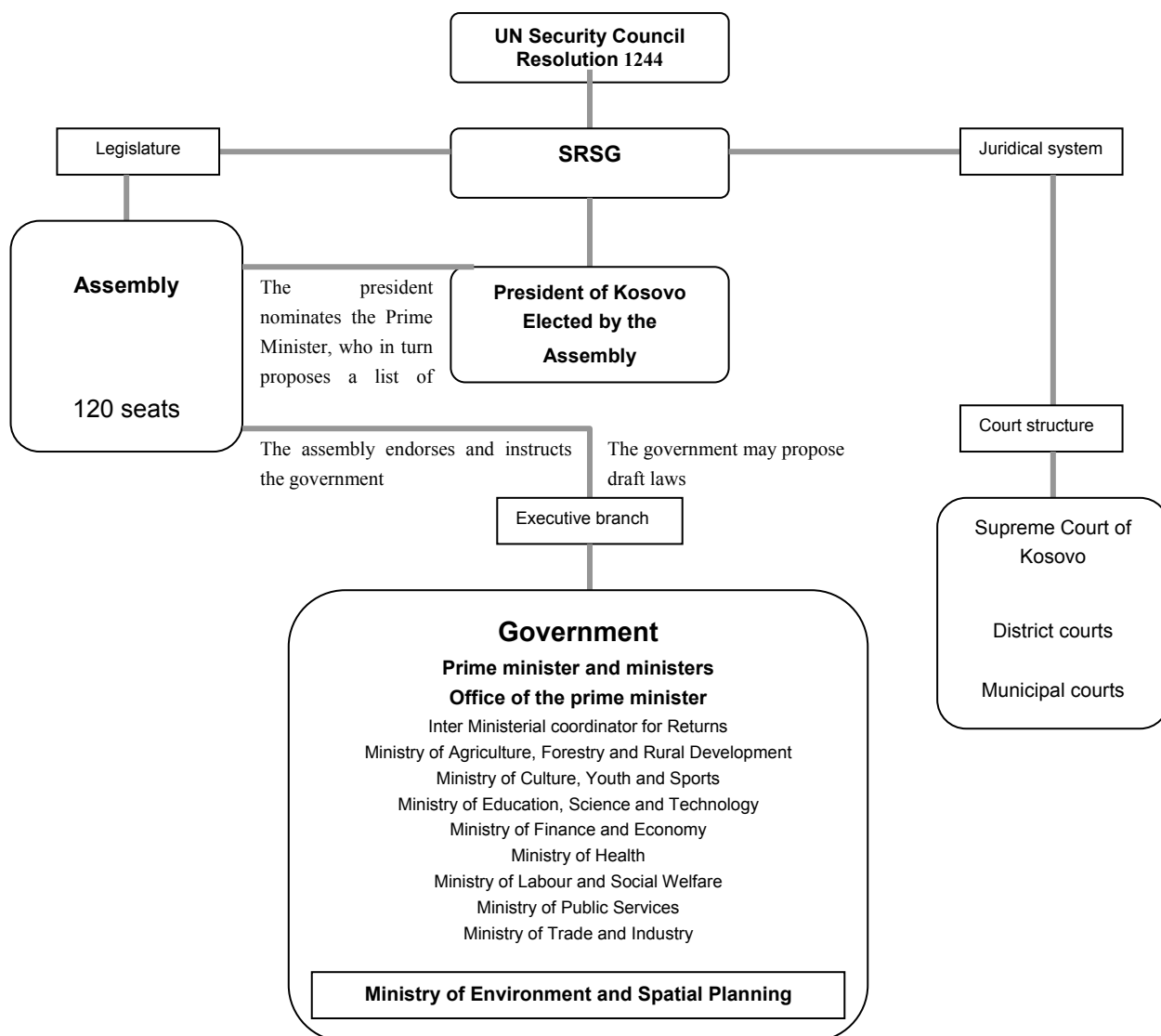
¹⁴ The Kingdom of Serbs, Croats and Slovenes was a consequence of the Versailles treaty. This kingdom was later to become Yugoslavia.

Kosovo to become an independent state, but the newly elected, strongly nationalistic government in Serbia, has as one of its main political aims to ensure that Kosovo becomes part of Serbia again. The question of the political status is one of the most sensitive and challenging issues that are discussed locally and internationally. However, there is no publicly available time frame in place for when such discussions on the issue could start. Among UNMIK there seems to be a general consensus on that, the issue is still too explosive a topic to discuss any time in the near future (Madsen, 2003) Although resolving this question is of paramount importance with regards to Kosovo's future development strategies, UNMIK has declared that the setting up of democratic institutions and legislation should and can be done before the question of status is resolved. As Michael Steiner, the SRSG argues:

"I have devised a series of benchmarks that will identify what needs to be done before we can launch the discussions on status. Kosovo can only advance towards a just and fair society when these minimum preconditions are met. First standards, then status. These standards also mirror those that are required to be considered for the integration into Europe. On the hand they represent the beginning of an exit strategy for the international community, but they are also in reality and entry strategy into Europe"
(HDR, 2002: 35).

As it is clear from the quote above UNMIK does not have intentions of waiting for this question to be resolved before launching any development strategies, including introducing EU environmental standards into the relevant legislation. In the resolution concerning UNMIKs governance of Kosovo it is also stated that UNMIK is to be replaced over time with self-governing democratic local institutions and in May 2001, the SRSG approved a Kosovo Constitutional Framework of Interim Self- government. The aim of this was to set up Provisional Institutions of Self-government (PISG), the structure of which can be seen in the following figure.

Figure 2: Structure of Provisional institutions of Self-Government (Adapted from HDR 2002: 33).



The PISG has been established through elections. Accordingly, elections for members of a new Kosovo Legislative Assembly comprising of 120 seats (see figure 2) were held in November 2001 and a broad based coalition government has been formed. Furthermore, the framework for a judicial system has been put into place. Nevertheless, the existence of the PISG does not mean that the Kosovars have complete self-government. Some powers are still reserved to the SRSG, which amongst other things is the power to dissolve the assembly and call for elections and have the final authority in approving the budget. The SRSG is obviously selected by UNMIK and not democratically elected and it is this person who has the highest authority in Kosovo. Furthermore, the power of the PISG is hampered by the fact

that it is UNMIK that has the financial resources¹⁵ to implement development strategies and thus the de facto power to decide on the course and priorities of development.

Some people put their doubt in the Motives of the UNMIK. An article on the “World Socialist Web Site” argues that the UNMIK had economical interests in taking control of Kosovo. For an example the article argues that the takeover of the control on the Trepca Mining Complex was motivated towards gaining profit. *“It will not be long before the profitable parts of the Trepca complex goes the same way as the rest of Kosovo’s industry – put up for sale on UNMIK’s web site”* (World Socialist Web, 2002: 7).

3.3 The socio-economic context of Kosovo

By being an autonomous region under the SFRY, Kosovo endured the same socialist planning style as the other republics in the federation. Heavy industries were largely public-owned, which in practice meant state-owned and the companies decisions were often taken on the basis of regional and/ or political factors, rather than on commercial criteria (REC, 2000: 9). During the past two decades, the economic activity has been characterised by the extractive industries, production of raw material, semi-finished products (such as lead, zinc, coal and some textiles) and agriculture. In particular, Kosovo is relatively rich in natural resources as it has one of the largest reserves of useable coal in Europe and other minerals (REC, 2000: 18).

Tabel 2 (adopted from REC 2000: 18)

<i>Mineral reserves in million tonnes</i>	
Lignite	11503,00
Mangan	1,36
Chrom (in 000 tonnes)	89,00
Bauxit	13,20
Lead and zinc	42,00
Nickel	20,10
Magnesium	9,70

However, despite having a rich natural resource base and also fertile agricultural land, Kosovo was and still is the least developed and poorest part of Yugoslavia. According to Mr.

¹⁵ International donors and international aid agencies finance the fiscal budget. However, provisions for a self-financed public budget have recently been made and some tax-revenue is also generated.

Zvkovic, environmental director at the Trepca North, money was pulled out of Kosovo and into Serbia. (Zvkovic, 2003) From 1985 to 1994 Kosovo's economic output decreased sharply as Gross Domestic Product (GDP) fell from 1,125 USD to 320 USD. As the table below illustrates, the industrial activities declined by 80% on average during the period of 1988-1995.

Table 3 Industrial activities in Kosovo (adopted from REC 2000: 16)

<i>Product</i>		<i>1988 production</i>	<i>1995 production</i>	<i>% Decline</i>
Coal	(000 tons)	11,004	7,023	36,1
Lead	(tons)	83,448	11,000	86,8
Zinc	(tons)	48,547	5,000	89,7
Fertiliser	(tons)	70,683	2,000	97,1
Cotton Yarn	(tons)	13,361	1,224	90,8
Knitted wear	(tons)	849	260	69,3
Rubber prod.	(tons)	10,143	1,923	81
Cement	(000 tons)	246	63	74,4

The reason for this drop was that during the 1990's the economic production dropped significantly, primarily due to the dissolution of the SFRY, the imposition of economic sanctions and the firing of ethnic Albanians from state jobs. This had serious socio-economic consequences as most major enterprises were state or socially owned employing a large number of people.

The conflict, apart from the 10,000 lives lost and the around 800,000 displaced people that it created, also resulted in damaged buildings and infrastructure and disruption of economic life. Thus, today the overall economic activity is still low in comparison to even with the 1980's and unemployment remains high soaring at around 50-60 %, which equals half the able-bodied workforce (HDR, 2002: 69). There is a shortage of capital for investment in the economy and the infrastructure (HDR, 2002: 21) and during and after the conflict heavy industries ceased their operations completely and there is currently no large scale industrial production taking place. This is due to the fact that the ownership issues of the SOE's have not been resolved yet, lack of maintenance and the general bad state of most installations (REC, 2000: 16).

As a result of the conflict and the harsher living conditions a World Bank study has found that about half the population has consumption levels below the poverty line¹⁶ and around 12 % live in conditions of extreme poverty¹⁷. Thus the report concluded that poverty is widespread and pervasive, but however not deep (World Bank, 2001). One of the issues that contribute to poverty and health problems is the lack of access to safe water. It has been estimated that only 8,4% of the rural population has access to the water distribution system, whilst 44% of the urban dwellers are connected to the distribution system. People living in rural areas, as already mentioned, actually amounts to two-thirds of the total population. This therefore means that the number of people without safe access to water is substantial. These people rely on village water supply¹⁸, their own wells or on spring and surface water (MESP, 2003). However, rural wells are typically in bad condition due to poor water quality owing to organic contamination. As a result of this there is a high incidence of water-borne diseases, especially diarrhoea (ibid.) When comparing Kosovo to other developing countries it is through the Human Poverty Index (HPI) found that Kosovo is ranked in the top third of such countries (HDR, 2002: 28). Kosovo is ranked 102 on the Human Development Index (HDI)¹⁹ for the year of 1999, which gives it a status of medium level of development, just below countries such as Vietnam and Indonesia and just above Tajikistan and Egypt (HDR, 2002: 24). In comparison, other South Eastern European (SEE) countries are ranked much higher. Macedonia is ranked 60, Slovenia 29, Croatia 46, Bulgaria 57 and Romania 58 for example (Ibid.). The Kosovo ranking should, however be regarded with some caution as statistical information in the country is hard to procure (HDR, 2002: 19). The reason for this rather low ranking can to some extent be attributed to the conflict, which disrupted economic life and educational activities. However, one must also look at the economic situation before the conflict.

Kosovo is at the moment moving from an aid based towards a more self-financed budget. In the year 2000, 50 % of Kosovo's budget was financed by aid donors (HDR, 2002: 77) and in 2003 the budget was projected to be financed almost entirely in locally collected tax-revenue depending on the economic growth. However, the budget is not enough to cover the expenses that the government will have, if it wants to ensure a minimum standard of living for its population, and it will have to increase at a rate faster than expected GDP growth, which for the year 2002 was expected to rise with 24 %²⁰ (HDR, 2002: 76). How this will be done is not clarified. One might be suspicious towards the fact whether it is possible to raise

¹⁶ The poverty line is set to USD 1,534 per day per adult (HDR 2002: 28).

¹⁷ Equivalent to USD 0,813 per day per adult (Ibid.)

¹⁸ Village water supply is mainly water collected from wells and springs.

¹⁹ The HDI measures the average achievement of a country in basic human capabilities, such as whether people lead a strong, healthy life, are educated and enjoys a decent standard of living (HDR 2002: 25)

²⁰ Never figures have not been possible to obtain. Nor can it be established whether the growth expectations concurred with reality.

and collect taxes higher than growth rates in a country marred by poverty and unemployment. It also raises the question whether the focus on achieving self-sustainability is too highly prioritised, as it rather appears as if, that donor support has vanished too quickly²¹, leaving the Kosovo's to solve their own problems as best as they can.

Nevertheless, when an economy is in transition, which Kosovo is, it offers an important opportunity to reassess the comparative advantages and disadvantages of Kosovo's economy, and thereby prepare interventions accordingly.

(adopted from HDR, 2002: 74)

Table 4 Comparative advantages and disadvantages for Socio-economic Development. (adopted from HDR 2002:74)

<i>Advantages</i>	<i>Disadvantages</i>
<ul style="list-style-type: none"> • Human capital, a young relatively well-educated population • High entrepreneurial energy and spirit • Positive attitudes towards economic reforms and transition • Natural resources (minerals, land and geographic location) • Medium-term commitment of international community to provide technical and financial assistance 	<ul style="list-style-type: none"> • Current low levels of social and economic development, • Lack of well-developed institutions necessary for a market economy • Still transitional nature of internal political and security issues

The objectives and future priorities for Kosovo has been identified by the HDR, which states that some of the main socio-economic development guiding principles to be followed over the next three to five years in Kosovo's transition period are:

- Greater economic self-sustainability and integration within SEE and the greater European Region.
- Building a more open market economy based on a well-established legislative system.
- Restructuring and the privatisation of Socially Owned Enterprises (SOE) and their technological regeneration, whilst prioritising those in areas of food production and those industries with good export potential (HDR, 2002:73).

²¹ Danida's program was only humanitarian aid and Kosovo is now under Danida in Beograd. (Interview with Anne-Maria Hansen, Head of Danida office in Pristina)

3.3.1 CONCLUDING REMARKS

As discussed, until now, in this chapter, Kosovo is a country with a mixed population, with two major ethnic groups, which has a long history of conflicts. This has resulted in poor integration between the groups and the situation is now that Kosovo is a poor country in transition under the control of the United Nations, with very unstable resources such as electricity and Water²². Compared to some of the other Balkan countries Kosovo ranks very low on the Human Development Index. Kosovo's aim to reach the European environmental standards and developing legislation that can be aligned with the one of the European Union is an ongoing development. At this time Kosovo is moving towards a more self-financed budget. In spite of the unpleasant history of Kosovo, it can be argued that there are some advantages such as the scheme above shows. Yet, the historical and political development that Kosovo has been through has also made an impact on the environment, which will be discussed below.

3.4 Environmental overview

Kosovo's environmental status can be characterised by one sentence – A big challenge.

This can be characterized as a consequence of very poor environmental management and governmental work. The past and the current environmental legislation as well as the environmental situation will be discussed below.

3.4.1 PREVIOUS LEGISLATION

It is the product of decades of various socio-economic development policies that sometimes failed to take into account the effects of industrial growth, agricultural expansion and urban expansion. From a legislative point of view the MESP argues that the environmental protection regimes has been historically lacking in the region (MESP, 2003). However, this is not completely correct, as environmental laws in the SFRY in fact existed, on paper at least. The general policy, legal and institutional framework that seems to have been in existence before the conflict has considerable parallels with those found in other CEE countries. For example, within the Republic of Serbia (RS), there existed an environmental policy statement, constitutional recognition of the right to a healthy environment, a framework environmental law, Environmental Impact Assessment legislation (EIA) and a ministry of environment.

There also was sectorial legislation on air, water, soil, natural/cultural heritage, spatial/settlement planning, and chemicals/wastes. However, the extent to which such policy-instruments were effectively implemented and enforced, particularly in Kosovo, is

²² In the Mitrovica area both the water and the electricity supply went off two to three times a day.

less clear (BTF, 1999, 1999). With regards to enforcement in general in SFRY an assessment of the environmental law in SEE, concludes that the laws was characterised by lack of effective enforcement and of being unsystematic and uncoordinated leaving several sectors unregulated, because the environment was not prioritised as an important issue in the region (Bandi and Kiss, 2003: 23). Historically, there has been little environmental consciousness in the SFRY, including Kosovo. However, the lack of environmental consciousness in Kosovo this was exacerbated during the 1990s by ethnic Albanians' exclusion from public sector employment and key services as well as their inability to easily access reliable official information (BTF, 1999, 1999: 3).

3.4.2 CURRENT LEGISLATION

The laws applicable in Kosovo are at present:

- The regulations promulgated by the SRSG and subsidiary instruments issued there under; and
- The law in force in Kosovo on 22 March 1989 (Bandi and Kiss 2003: 63).

Thus, given the fact that an Environmental Protection Framework Law was adopted by the assembly and signed by the SRSG in April 2003, this law is now in force. The law basically states that the EU environmental standards shall be gradually introduced into the subsidiary and normative laws (a more through analysis of the content of the law will be provided in chapter 6). However, until such standards are specifically devised it is as the second bullet point states in fact: the laws and standards enacted in the former Yugoslavia before the 22 March 1989 that are still in force in Kosovo²³. However, as there are no government bodies that are in fact enforcing the law at the moment, it does not have a great deal of relevance. Furthermore, although a body of Yugoslav environmental legislation was in place, war and conflict has obviously freezed environmental legislative development and enforcement in the region as a whole. As the State of the Environment Report in 2001 from Serbia states: “the system of environmental protection has slept through a decade...[it] is some 30 years behind the developed countries” (Bandi and Kiss, 2003: 56). With this in mind it is not difficult to understand why the dire environmental situation in Kosovo is as it is today. The following section will elaborate on the present environmental situation of Kosovo, with particular emphasis on water quality.

²³ This date is significant as it is the date on which Kosovo's autonomy was revoked.

3.4.3 THE CURRENT ENVIRONMENTAL SITUATION

The insufficient enforcement of the Yugoslav environmental legislation, the complete lack of environmental protection during the last ten years and the conflict has resulted in huge problems regarding the present environmental situation in Kosovo.

The state of the environment is the result of many factors such as the uncontrolled building of domestic and industrial premises, old industrial technologies, inadequate technology in certain industrial departments of natural resources, such as Trepca, pollution of water courses due to a complete lack of wastewater treatment from domestic as well as industrial sites and accumulation of solid industrial and urban garbage (MESP, 2003). The major environmental pollution in Kosovo is by other caused by the Trepca mining and smelting industry, the Obilic power plants and a concrete factory (ibid.). Since the start of the transition period, there has been little or no effort to reduce these pollution levels.

3.4.4 WATER QUALITY

The present situation threatens the environment by creating surface water, ground water and soil pollution. With regards to water, Kosovo is already considered poor in drinking water resources, which are dwindling due in part to the construction of new buildings and the deteriorating water quality of the existing watercourses.

There are four main watercourses in Kosovo, however all of these are relatively small and originate from the nearby mountains. The White Drin in the western part of Kosovo flows to the south of Albania and the Ibar and the Binacka Morava flow to the north to Serbia. The Lepenc flows to the southeast to Macedonia.

Overall public water consumption through water distribution systems was estimated to be 75,5 million m³ (2,39 m³/s) in 1985, while consumption by heavy industry was 149,9 million m³ (4,75 m³/s) (HDR, 2002: 95). Since most of this water goes back into the rivers without prior treatment, the water remains polluted. The quantity of water contaminated by industrial effluent discharged into the river systems was 82, 375,000 m³ in 1984 (HDR, 2002: 95). More than 90% of this was discharged into the Sitnica River, which essentially made the Sitnica and the Ibar River an open drain of industrial effluent (Ibid.) Wastewaters from Kosovo's thermal power plants, the chemical industry at Obiliq, the Trepca industrial complex, and ferrous nickel production have all been discharged into this river system. Trepca alone produced 150 t/yr, of lead, 500t/yr of zinc and 900 t/yr of fluoride during this period (ibid). As a result large quantities of organic and inorganic pollutants have been released into the river system. Today, although many of the industries are not in operation any longer, the water from rivers and canals are not in such great volumes to be free of the effects of the current levels of pollution (ibid).

A recent categorisation of the river water quality has been carried out which divides the White Drin, Erenik and Bistrica into 2nd class water quality. However, at the exit of cities they decline to the 3rd category; Bistrica in Prizren is a 1st category river before entering Prizren, but after exiting it becomes 4th category; Pristevka and Sitnica after Pristina, Ibar after mixing with Sitnica and Nerodimka are dead rivers; Lepenc and Binacka Morava River fall under 4th category of waters. The present state of the rivers could create the following future development constraints:

Firstly, the majority of the watercourses in Kosovo are highly polluted and “cannot be used even for industrial purposes without prior treatment “(MESP, 2003). This is obviously a major problem and will result in a water scarcity situation. Any economic development requires availability of water of a certain standard and if Kosovo’s economy grows there will be an increased demand for water. Secondly, water scarcity is only exacerbated by the water requirements for the power plants. They need a constant amount of water for the cooling processes, but as the coal reserves in Kosovo are placed in water scarce areas, water has to be directed from the White Drin River to the central part of Kosovo resulting in a lack of drinking water for the population of Kosovo. Thirdly, at present Kosovo relies heavily on import for foodstuffs, which puts a strain on the economy. It could however, increase its food self-sufficiency if irrigation was applied to the crops. Such a policy would obviously require access to water of a certain quality, thus furthering the need to improve the water quality standards of the fresh water sources. Another obstacle to achieving greater self-sufficiency in food production is the industrial pollution that many agricultural lands face from soil and water pollution (MESP, 2003). Therefore, there are also issues of curbing water pollution at the industry level or in other words at the source. Finally, exacerbating all these issues mentioned above is the population growth in Kosovo. At present it stands at 21% making it one of the highest in Europe. Furthermore, Kosovo also have the youngest population in Europe, with more than 40 percent below 20 years of age (MESP, 2003). Thus, there is a great need to ensure the quality of the remaining rivers (MESP, 2003).

4. Introduction to Mitrovica and Trepca

This chapter will attempt to give an understanding of the socio-economic context of Mitrovica in which Trepca is located. It will also provide an insight into the particular conflictual politics of the area of which Trepca plays an important symbolic political and economical role.

4.1 Mitrovica

Mitrovica is a city of approximately 250.000²⁴ people located in the North of the country (see map 1, in appendix 1). The river Ibar runs through the town dividing into a North and a South side. Along the River mostly Roma people live in shacks and make shift huts. The ethnic residential areas are split up. On the North side of the river, the Serbs reside and Albanians mostly live on the South side of the River. On both sides of the river small enclaves is placed. The conflict between the two ethnic groups is still rife even five years after the conflict. The CNN²⁵ Bridge crossing the river Ibar has been the symbolic scene for shootouts and other forms of violence against each other. The fact that two different currencies are used in Mitrovica, namely Dinars²⁶ on the Serbian North side, and Euros on the Albanian South side illustrate the lack of integration and rapprochement between the two ethnic groups.

The conflict between the groups in Mitrovica also mirrors the relationship between Serb and Albanians in Kosovo in general, where the Serbs in contrast to the Albanians view KFOR and UNMIK as an unlawful occupying force and the government in Pristina as an illegitimate Albanian dominated and biased government. However, the violence between the two groups is particular pronounced in Mitrovica and there is still a heavy presence of KFOR military in the area. The fact that unemployment and underemployment soar in the city being particular high in the northern part of the town (King, 2002) does not help matters much. In fact, Mitrovica, which once was one of the wealthiest parts of the territory, before 1999, is now recognised to be one of the most deprived areas in Kosovo (King, 2002). Economic activity is low, which again is particular pronounced in the Serb part of the town and there are hardly any industries functioning, including the Trepca complex. Trepca's role and impact on the town will be discussed below.

²⁴ This figure is based on 1991 consensus, which is perceived as unreliable due to the fact that many Albanians boycotted the consensus as it was compiled by the Milosevic regime. However, this is the only data available at the moment and does serve as an indicator of the size of the city (Statistical Office of Kosovo 2003).

²⁵ The bridge is among the international consultants called "The CNN Bridge", it is said that CNN is on the bridge whenever trouble is arising. It divides the Serbs from the Albanians.

²⁶ Dinars are the currency of the former Yugoslavia.

4.2 Trepca

Mining in Kosovo and the Mitrovica area goes back a long time. The Trepca lead ore mines which were already important in the 19th Century, increased production of lead and zinc considerably after the Second World War and this was followed by a rapid development of downstream industrial activities such as smelting, refining, fertilizer manufacture and battery industries (UNDP, 2001). It is one of the biggest mining complexes in Europe (MESP, 2003), which is divided into two areas, Trepca South and Trepca North the Trepca plant is within the city, very close to residential living areas. In total it consists of 14 operations divided into eight mines, three concentrators, two smelters, and a fertilizer plant²⁷.

In Trepca's hey day, around 1989, it employed approximately 22,000 people, which made it by far the biggest employer in Kosovo²⁸. The table below illustrates the production rate during the 1980's when Trepca was at its highest production capacity.

Tabel 5 Industrial activities at Trepca during the 1980's (adopted from Shllaku, 1992: 18)

<i>Location</i>	<i>Production unit</i>	<i>Products</i>	<i>Tonnes/ year</i>
Zvecan	Lead smelter	Raw lead	100,000
	Lead refinery	Refined lead	80,00
	Steam power plant	Steam, electricity	
Mitrovica South	Zinc electrolysis plant	Electrolytic zinc	50,000
	Sulphuric acid plant	Sulphuric acid	80,000
	Fertiliser plant	NPK, super phosphate	50,000
	Battery plant	Lead accumulators	30,000

From the table above it can be deduced that the production of lead and zinc and other chemicals was significant. The economic importance of Trepca during this period is also illustrated by the fact that the mineral export from the Trepca mines have been responsible for approximately 70 % of Kosovo's GDP (REC, 2000: 10), which also shows the importance of the mineral reserves for Kosovo in general. From the Tito years and after, this heavy industry was operated as a Socially Owned Enterprise and given its important economic and social role it became and still is a symbol of national Serb pride. During the 1990's the production decreased due to the faltering economic climate in Yugoslavia at the time and later also due to the economic sanctions imposed on the Milosevic regime. No

²⁷ Some mines and a single concentrator are however located near Pristina.

²⁸ During the 1990's ethnic Serbs due to the discriminatory policies introduced from the Milosevic regime held all positions, however.

investment was channelled into Trepca and it was allowed to deteriorate to a state beyond repair. During the war itself, the plant was not functioning at all, but, it was reopened after the war. It was however, immediately ordered to close by the UN (KFOR) in the summer 2000, due to environmental and public health concerns, as atmospheric lead levels were 200 times higher than the WHO acceptable standards²⁹ (MESP, 2003).

Despite these health concerns, many Serbs were very unhappy with the closure because they lost their jobs as a result. As written in chapter three, the World Socialist Web Site criticises the UN for closing the Trepca plant on false base. However, UNMIK has for a limited period allowed 1000 workers to receive salaries and a further 2300 to receive stipends (UNMIK, 2001).

Today, the Trepca plant remains dormant, but due to the symbolism attached to Trepca, many in particular Serbs would like, and expects Trepca to begin production again (Payne, 2003). However, this prospect seems very unlikely due to several factors. Firstly, there are technical problems as Trepca's machinery is years old and out of date. Some parts of ore processing facilities date from the original British investments of the 1930s. None of the machinery is able to compete, as it is, with the modern high-technology mines of today. Exploration records are also out of date and there are doubts about how much ore are left in the ground. Secondly, there are legal problems concerning the question: "who owns Trepca?"³⁰ and there are also arguments over debts from contracts dating back into the 1980's (Salome and Eyre, 2001). Thirdly, there are economic problems, as the facilities will not work without private investment, which in turn will be difficult to attract without substantial improvement in all other issues. The investment is conservatively estimated to be at around US\$ 200 million dollars³¹, which would bring the core facilities near competitive European standards (ibid.)

Overarching all these problems are the environmental problems that Trepca has produced, for although the complex is not in operation, it still poses significant and dangerous pollution problems. Before any investment into the facilities will take place, the huge environmental problems have to be addressed and the \$200 million do not cover the cost of an environmental clean up. UNMIK has stated that "the environmental hazardous are on such a scale that neither the state nor in any private investor will have the means to clean up"

²⁹ 6 weeks after the smelter had restarted in June 2000, blood test of French KFOR soldiers living near by, revealed dramatically increased lead levels and the atmospheric lead was measured to be two-thirds higher than the acceptable limits for workers in France (MESP, 2003).

³⁰ Both Greek and British investors have claimed the ownership of Trepca because of their investments in the plant. The ownership is yet not clarified. The Kosovo Trust Agency that has been selling the former socially owned enterprises couldn't sell Trepca of the same reasons.

³¹ Roger Payne estimated the costs of investments to be 100 million EURO.

(UNMIK 2001)³². However, some are still optimistic about the prospects (see for example Salome and Eyre 2001 who argues that Trepca has the potential for peace and prosperity) and the official UNMIK rhetoric would also seem to support this optimism, but it must be acknowledged that the latter organisation appears optimistic for political reasons (i.e. trying to avoid upsetting the Serbs in Mitrovica and thus avoiding further violence by denouncing a future for Trepca), and the optimism is not based on a realistic assessment of the problems that surrounds Trepca. In any case, most government officials and aid organisations are sceptical with regards to the reopening of Trepca, due to the above reasons, where the environmental problems are one of the biggest challenges (Payne, 2003) (Madsen, 2003).

In order to help Kosovo and UNMIK with the environmental challenges at Trepca, Danida has for example funded scooping plans for environmental clean ups at Trepca, which has been conducted by Ramboll and Golder.

When taking the findings of chapter 3 into account, it should be clear from the above that in many ways, the problems in Mitrovica and with Trepca reflect the overall situation of Kosovo in general, which is why, it is a particular relevant case study to use. However, first the environmental problems will be discussed in the following chapter.

³² International donors is helping funding the clean up, such as Danida.

5. Trepca's environmental impact

This chapter will discuss the environmental impact that Trepca has on the River Ibar and on the environment in general. Firstly, a brief discussion of the environmental situation that existed when the plant was in operation will be provided. This is done in order to provide an idea of the levels of emission that the local environment has been exposed to during the last decades and why. Thereafter, a discussion of the present pollution sources will be provided with particular reference to the tailings. This chapter will analyse the potential environmental hazards that mine tailings cause and will also discuss what effects heavy metals have on human health. This section will provide the basis for discussing how environmental problems and health problems interact, in the so-called environment and health chain. Thereafter, the results of our own water quality, sediment and fish sampling from the Ibar River and the Leskov creek will be provided and analysed. The analysis of the results makes it possible concretise the environmental health chain with reference to present pollution that Trepca causes although it is dormant and this will therefore be discussed in this chapter. Hereafter, a possible solution to the tailings problem in order to minimise the heavy metal emissions to the Ibar River, will be provided.

5.1 Trepca's impact on the environment before closure

As already mentioned in the previous chapters Trepca has been a huge source of pollution in the past due to its outdated technology. From the table below, where a comparison between three European lead smelting houses with comparable production capacity is presented, namely Trepca in Kosovo, KCM in Bulgaria and Budelco in the Netherlands it is quite clear that the production mode at Trepca from an environmental point of view is rather primitive.

Tabel 6 Comparison of the overall emission (in t/year) (adopted from HDR 2002: 94)

<i>Emission type</i>	<i>Trepca 1989</i>	<i>KCM 1989</i>	<i>Budelco 1991</i>
Dust	730	367	12,1
Lead	438	82,5	4,9
Zinc	83	71	0,7
Cadmium	3,6	7,6	0,1

Trepca releases a substantially more emissions into the environment than its counterparts in particular when comparing it to the technologically advanced and relatively strict environmentally regulated Netherlands.

When Trepca was in operation the following activities were considered as polluting:

- The Mine and Concentrator located in Stari Trg and Prvi Tunel.
 - In Zvecan the sources of pollution was the: Lead Smelter, Refinery, Concentrator and the Energy Plant.
 - In Mitrovica where Trepca South is located the sources of pollution was the: Zinc Metallurgy, Fertilizer Factory and Battery Factory.
 - Furthermore, the pollution came – and still does, from the tailings, which are located around the factory area in Zvecan.
- (Power point from Trepca Environmental Institute)

The following data provides an idea of how the different units of production contributed to pollution. The smelter for example, released the following into the atmosphere per day per ton lead produced:

- 0.46 t SO₂/ton of lead, on average 62.5 tons SO₂
 - 1529 m³ of non-treated waste water,
 - 1 to 1.1 t of granulated slag per ton of lead, on average 145 tons,
 - 7 to 10 kg of lead per ton of lead, on average 1.14 tons Pb/year,
 - 15 to 20 kg of lead dust per ton of lead, on average 2.33 tons/year,
- (Power Point, Trepca Environmental Institute)

In 1985, in the Zvecan area, a maximum concentration of 26,46 µg/m³ was measured which is 52-26 times more than the Yugoslavian limit (0.5- 1 µg/m³). In the period up to 1985 they had the biggest air pollution because the installed filters the lead Smelter had not been functioning. The air pollution decreased after 1985, because electro-filters and a new chimney were installed in the smelter, but the pollution was still too high. (Power Point, Trepca Environmental Institute)

Thus, it is clear that the previous pollution of the area has been quite severe. Investigations into the degree of the heavy contamination of the soil, agricultural crops, terrestrial flora, and fauna in the area around Trepca during the late 1980's, i.e. when the plant was still running also confirm this. The investigations revealed that vegetables and crops grown in the Mitrovica region contained elevated concentrations of mainly lead. People eating locally produced food thereby risked an intake of lead more than 3 times higher than the maximum intake, as recommended by WHO/FAO. (Shllaku, 1992)

Blood lead concentrations in inhabitants of Mitrovica were also several times higher than in the inhabitants of Pristina. In 12% of the children living in Mitrovica, the blood lead levels exceeded 70 µg/dL and in 35 % lead concentrations were 50-69 µg/dL. It was estimated that

about 9.000 children in Mitrovica might have blood lead concentrations above 40 ug/dL. (Shllaku, 1992) For comparison it is in Denmark considered unacceptable if people have a blood concentration of more than 35 ug/100 ml and for children the threshold level is set at 25 ug/100 ml. (Hansen, Tarp, 1992: 89). Thus, Trepca has also had an impact on humans in the area. Although the plant is no longer in operation, the plant still pollutes. This will be discussed in the following section.

5.2 Present potential emissions sources.

After the closure of Trepca and the mine activities the present pollution comes from the huge piles of tailings spread over the area and as well from the abandoned factory which is full of piles of metals and ash. The tailings, which is a waste product from the production process³³ is the main environmental problem related to Trepca at Trepca. Table 7 below illustrates the different tailings connected to Trepca, their size and pH value.

Table 7 Tailings at Trepca (Adopted from by Trepca 2003).

Source	tons tailings	Surface area ha	pH	Location
Phospho-gypsum Chem. Factory	400.000	17	4,5	Mitrovica
Zitkovac Concentr. Zvečan	8.500.000	26	4,9	Zvečan
“Emko”sludge Hydromet.Zn	500.000	14	4,9	Mitrovica
“Jarozit”sludge Zn Metallurgy	122.000	4,2	-	Mitrovica
Gornje Polje Concentr. Zvečan	12.000.000	50	4,8	Zvečan
Zarkov Potok Concentrator	9.000.000	20	-	Zvečan
Krnjin-Leposavic Concentr.Lep.	2.600.000	6,5	4,6	Leposavic
Ash deposit Energy plant	8.000.000	15	-	Zvečan
Granulated slag Smelter	2.500.000	-	-	Zvečan
Total	43.622.000	152,7		

Of particular interest are those highlighted in bold, the Zitkovac tailing and the Gornje Polje tailing, as natural science investigations, which is presented in this chapter are concerned

³³ A process description of the production of lead and zinc mining and processing is provided in appendix 3

with exactly these two tailings and their impact on the river Ibar. As the Trepca mining operation was started in 1925 it is likely that the older dam (Gornje Polje) were constructed soon after this date and operated until the early seventies when the newer series were built (Zitkovac). It is reported by CSA/SKM that the two tailings dams located in the Zvecan valley (Zitkovac and Gornje Polje) were generated from material worked through the Zvecan Concentrator that closed around 1983 (Golder Associates, 2003). Because the tailings is the main environmental problem related to Trepca it is relevant to briefly outline the environmental impacts such tailings may have on the surrounding environment.

5.2.1 KEY ENVIRONMENTAL ISSUES RELATED TO TAILINGS.

When a mineral has been mined, there is still some mineral left in the ore, sometimes up to 99%, which is deposited along with the rest of the rock waste in the tailing. When stored in the tailing, there is an increased possibility that physical, chemical and biological processes occur, which can affect the mineral. It implies that the constituents of the ore, including the heavy metals, are more accessible to the surrounding environment.

The tailings material at Trepca can thus be spread to the environment by the wind or through erosion. However chemical reactions may also spread the tailings material and release the heavy metals present in it to the environment.

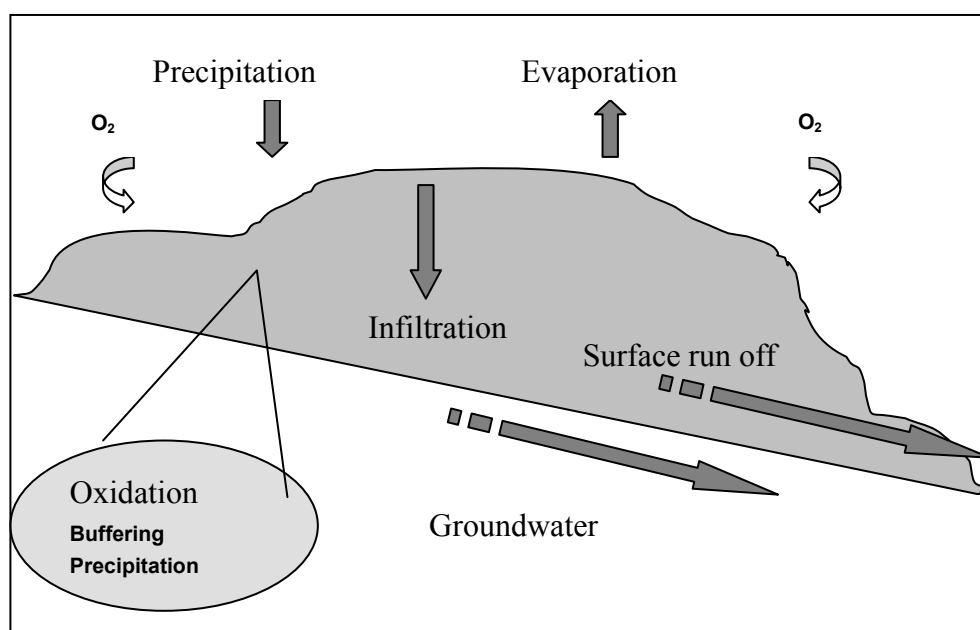
For instance when lead enters the environment it does not break down, but its chemical structure are change by sunlight, air and water. When it is released to the air, it may travel long distances before settling to the ground, and when lead falls onto the soil, it usually sticks to the soil particles. The movement of lead from the soil into the ground water will depend on the type of lead compound and the characteristics of the soil (<http://www.atsdr.cdc.gov/tfacts13.html#bookmark03>).

For example, sulphide ore, which was mined at Trepca, is not exposed to an oxidising environment, when it is in the underground. However, as soon as it has been mined and processed and finally stored in a tailing it is exposed to and made accessible by water and oxygen. It implies that if not managed properly, the rate of weathering and thereby the mobilisation of weathering products, including the heavy metals, may be significantly increased (European Commission, 2003:30). In order to combat the oxidising process it is common to store the tailings material under water, in a so-called dam, which ensures that the tailing material is not exposed to oxygen or other weathering processes. However, at Trepca this type of storage has not been done and the tailings are lying quite exposed to the weathering processes.

The main environmental concern connected with this, is whether the phenomenon Acid Rock Drainage (ARD) occur, which is a process that has the potential of releasing heavy metals and other substances into the environment³⁴. The naturally occurring environmental phenomenon of ARD is usually found in sulphide ore bodies that are mined for lead, zinc, silver, copper and also coal. There is therefore potential for that this phenomenon may occur at the mine tailings at Trepca.

When sulphide minerals come into contact with water and oxygen they start to oxidise which leads to acidification. This is a slow heat generating process, promoted by high oxygen concentration, high temperature, low pH³⁵ and bacterial activity (European Commission, 2003: 34). Oxidation means that an elements oxidation number rises by departure of electrons. To get an oxidation you need an oxidant. In the nature one of the most common oxidants is acid whereas acid is rarely common in the atmosphere and in rain. The formation of ARD is therefore highly linked to the contact to air and rain. The most important interaction between the tailing and the atmosphere is illustrated in figure 3.

Figure 3 Schematic illustration of the drainage water generation as a function of the interaction between the tailings and the atmosphere (Adopted from European Commission, 2003: 35).



The phenomenon will be described more detailed in the appendix 4, in order to give an idea of why the tailings at Trepca may have a detrimental environmental effect and what that effect might be on the surrounding environment. Unfortunately, it has not been possible, or

³⁴ However, it is not only the heavy metals in the tailings that might be of concern. Chemical substances used in the flotation process, such as cyanide and other chemicals may also be present in the tailing and thus potentially released to the environment.

³⁵ During a trip to the Gornje Polje tailing the pH of a puddle on top of the tailing was measured and the result was a pH of 2,4, which is quite low and thus illustrates the acid conditions of the tailing.

feasible to conduct an investigation into whether ARD is occurring at Trepca mine tailings, as it is much too complex and time consuming to do. Fortunately, it is possible to investigate whether heavy metals can be found in the Ibar River. Water, sediment and fish samples have therefore been collected to examine their heavy metal content. The results of these are presented in section XX³⁶. It is deemed interesting to conduct these investigations not only because there may be a release of heavy metals into the environment, which is a problem in its own right but also because humans living in the area may be affected by it. The following table below shows the effect on humans, animals and plants for metals included in the analysis in section XX, namely lead, cadmium, copper and zinc.

Tabel 8 *Effects of some metals on humans, animals and plants* (adapted from European Commission, 2003:33).

<i>Metal</i>	<i>Effect</i>
Cadmium (Cd)	Cadmium is concentrated in tissue and humans can be poisoned by contaminated foods, especially fish. Cd may be linked to renal arterial hypertension and can cause violent nausea. Cd accumulates in liver and kidney tissue. It depresses the growth of some crops and is accumulated in plant tissue.
Lead (Pb)	A cumulative body poison in humans and livestock. Humans may suffer acute or chronic toxicity. Young children are especially susceptible. In general it leads to anaemia.
Zinc (Zn)	May affect water taste at high levels. Toxic to some plants and fish.
Copper (Cu)	Small amounts are considered non-toxic and necessary for human metabolism. However, large doses may induce vomiting or liver damage. Toxic to fish and aquatic life at low levels.

The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. In our bodies many metals, such as zinc are playing a role in our system like in nerves and muscles but most of all in enzymes and or in redox processes. Some of these metals are therefore essential and absence of these will lead to reduce essential biological reactions. But when metals are in to great numbers they can be toxically. Other metals are not a part of the biological processes in the human body and are therefore considered as unwanted. These metals are for example lead, mercury, cadmium and silver etc. (Hansen, Tarp, 1992 p.74). Lead for example, can affect almost every organ and system in your body. The most sensitive is the central nervous system, particularly in children. Lead also damage kidneys

³⁶ It should be noted however, that regardless of the results it is not possible to say whether traces of heavy metals (if found) are due to the phenomenon of ARD or erosion of tailing into the river or the wind carrying particles into the river. It is likely that it will be a combination of a range of factors.

and the reproductive system. Exposure to lead is more dangerous for young and fetus. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, and decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead.

(<http://www.atsdr.cdc.gov/tfacts13.html#bookmark03>).

Thus, there is a range of health problems connected to the heavy metals. The link between environmental conditions and human health will briefly be discussed below in order to give an understanding of this link and it provides a more advanced understanding of why different heavy metal investigations were conducted and may also help interpret the results from an environmental health point of view. Before presenting the results of these investigations it necessary to discuss how people's health on a theoretical level may detrimentally affected by changes in the environment. This will be provided in the section below.

5.2.2 THE ENVIRONMENT OF HEALTH CHAIN

The link between environment and health operates through the exposure of humans to environmental hazards, also known as environmental health. Thus, environmental health is not concerned with the health of environment per se, but the ways in which certain environmental factors can influence or directly affect human health in both positive and negative ways.

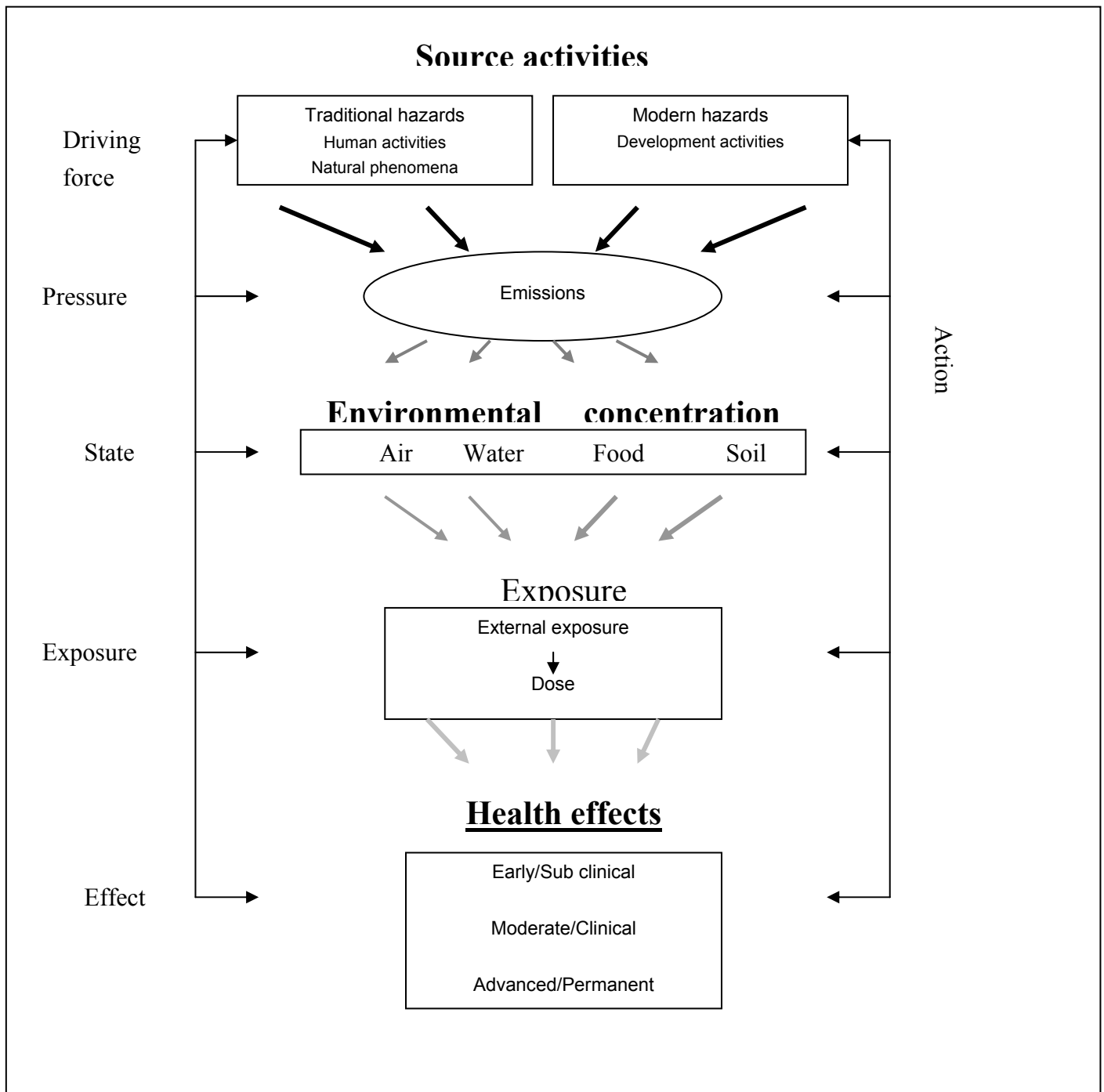
The definition of exposure is as follows: “an event that occurs when there is contact at a boundary between human and the environment with a contaminant of a specific concentration for an interval of time” (Corvalán *et al.*, 2000: 41). An environmental health indicator can thus be defined as:

“An expression of the link between environment and health, targeted at an issue of specific policy or management concern and presented in a form which facilitates interpretation for effective decision –making” (Corvalán *et al.*, 2000: 30).

An environmental health indicator is thus a measure, which indicates the health outcome due to exposure to an environmental hazard. In this project it is the application of an exposure-based indicator that is used to indicate the effect of heavy metals on humans and the environment. An exposure-based indicator is thus projects forward: “some knowledge about an environmental hazard to give an estimated measure of risk. Such an indicator can be conceived as the combination of environmental indicator with a known environment-health relationship” (Corvalán *et al.*, 2000: 31). In this case, for example, the environmental

indicator could be the presence of heavy metals in the river, where it is known that some heavy metals result in particular diseases. Lead for example can cause anemia in humans. The way in which humans might be exposed to environmental hazards is illustrated in the Environmental health hazard pathway figure 4.

Figure 4 A simplified diagram of the environmental health hazard pathway. Arrows indicate the flow from source activities to health effects. Arrow shading indicates the likely weakening of the impact from source activity to health effects. The writing in red indicates the framework for indicator development (Adopted from Corvalán et al, 2000: 43).



As with Trepca most environmental pollutants are the product of human activities and these may be released into the environment in a number of ways which then may be dispersed and accumulate in different environmental media (air, water, soil, food). In this case it means that the heavy metals in the tailings are released into the water ways, either through erosion or tailings particles are dispersed with wind and thus contaminating the water. The heavy metals may then contaminate the water, and accumulate in the food chain. Exposure obviously occurs when humans encounter the contaminants within any of these media, for example when people in Mitrovica extract water from wells that may be contaminated with river water and use for consumption. Fish caught in the water may also be heavy metal contaminated. This may result in a array of health effects ranging from minor sub-clinical effect, which in the case of lead might be deranged haem synthesis, non-specific CNS³⁷ symptoms, abnormal nerve conduction velocity to moderate/clinical, which in the case of lead exposure could result in Anaemia and decreased renal function to Advanced/permanent, which for lead includes renal failure, peripheral neuropathy, and encephalopathy. The severity of the health problems depends on the intrinsic harmfulness of the pollutant, the severity of the exposure and the susceptibility of the individuals exposed (Corvalán *et al.*, 2000: 37-38).

The whole process is often driven by persistent forces, which motivate the creation or the persistence of the hazard and increase the likelihood of exposure (*ibid.*). These are highlighted in red in the figure and are known as a framework for indicator development. The particular framework used here is called the DPSEEA (Driving force, Pressure, State, Exposure, Effect, and Action) framework. Others, such as the PSR (Pressure-State-Response) could also have been used. The former is however more comprehensive taking into account the driving forces responsible for pressures on the environment (*Ibid.*).

The driving force component refers to the factors, which motivate and push the environmental processes involved. Some of the most important is economic development and population growth. The former obviously resulted in initial the mining process that generated the mining waste. The driving forces within the DPSEEA model result in the generation of pressures (P) on the environment. Thus, the exploitation of the mineral resources at Trepca has resulted in large amounts of waste and contamination of the surrounding areas with heavy metals. The heavy metal contamination is released through a number of ways, i.e. the dust is dispersed with the wind, through soil erosion and ends up in the river water. Because these activities represent the starting point for environmental emissions they naturally also represent the starting point of prevention and control. In response to these pressures, the state of the environment (S) is often modified. These

³⁷ Central Nervous System

changes may be very complex and far-reaching, affecting the almost all aspects of the environment and all environmental media. In this case, the changes affect the water quality of the river. This can have both localised effects, i.e. contamination of local water supplies, affect the local diet, but it can also have regional affects if the heavy metals sedimentated many kilometres down stream from the Trepca site or if the heavy metal bio-accumulate in the food chain, thereby affecting people both up and down stream.

Exposure refers to the intersection between people and the hazards inherent in the environment. External exposure refers to the “quantity of the pollutant at the interface between the recipient and the environment” (ibid.: 41) and the amount of any given pollutant that is absorbed is often termed the “absorbed dose” and may be dependent on the duration and the intensity of the exposure (ibid.). Thus, it is necessary to provide an estimate of the amount of heavy metals released into the aquatic environment and how much of these are then absorbed by humans. Exposure to environmental hazards in turn leads to a wide range of health effects, which may range from sub-clinical (merely resulting in some loss of well-being) to advanced/permanent (illness and morbidity), as discussed above.

Health affects can be acute or chronic. In this case both are relevant as heavy metals have an acute and a chronic effect depending on the exposure. With regards to chronic effects it should be noted that the health effect of heavy metals requires the accumulation in the target organ before a health effect can be observed. Thus there may be a significant time lag between exposure and health effect. Indeed, this is one of the issues that makes environmental health risk assessment difficult, for in the case of Trepca measurements of heavy metals present in blood, would not say anything specific about the present risk, but rather give a picture of what risk people where exposed to when Trepca was in operation which resulted in massive air pollution.

In order to determine whether there might be an affect on the locals living in the area investigations into whether there indeed is heavy metals released into the river Ibar has been conducted, the results of which will be presented in the following section.

5.3 Sampling procedures

This section will present the results obtained from the investigations made into the heavy metal contamination of the River Ibar. These results will be interpreted in their own right as well as compared to the result that Trepca have conducted themselves. The results will also be discussed with reference to the environmental health chain discussion that was conducted in the previous section.

Samples have been taken from the River Ibar in the form of River water and sediment samples both upstream and down stream from Trepca. Fish was also caught in order to investigate whether there were any indications that the heavy metals might accumulate up through the food chain. Fish from a water reservoir upstream from Trepca, where the locals get the tap water from, were used as control group. Furthermore, in order to get an indication of how much tailings material and thus heavy metals might be released from the tailings area, water and sediment samples from a small creek, named Leskov which runs through the Gornje Polje tailing was taken. For a more thorough description of the sampling procedure see in the method.

5.4 Results analysis

Using Atom Absorption Spectroscopy (AAS) carried out the analysis. It is the same procedure as the one they used at Trepca, the only, but crucial difference being that the machine at the Tek-Sam institute is newer and is capable of measuring lower values than what was possible at Trepca, which was critical due to the fact that the equipment was not sensitive enough to measure values close the WHO emission levels.

5.4.1 IBAR WATER

The results obtained is compared to the WHO's drinking water standard as they relate to the different metals. See table 9.

Table 9 WHO standards for drinking water; selected metals.

WHO drinking water	Zn	Pb	Cu	Cd
mg/l	3	0,01	2	0,003

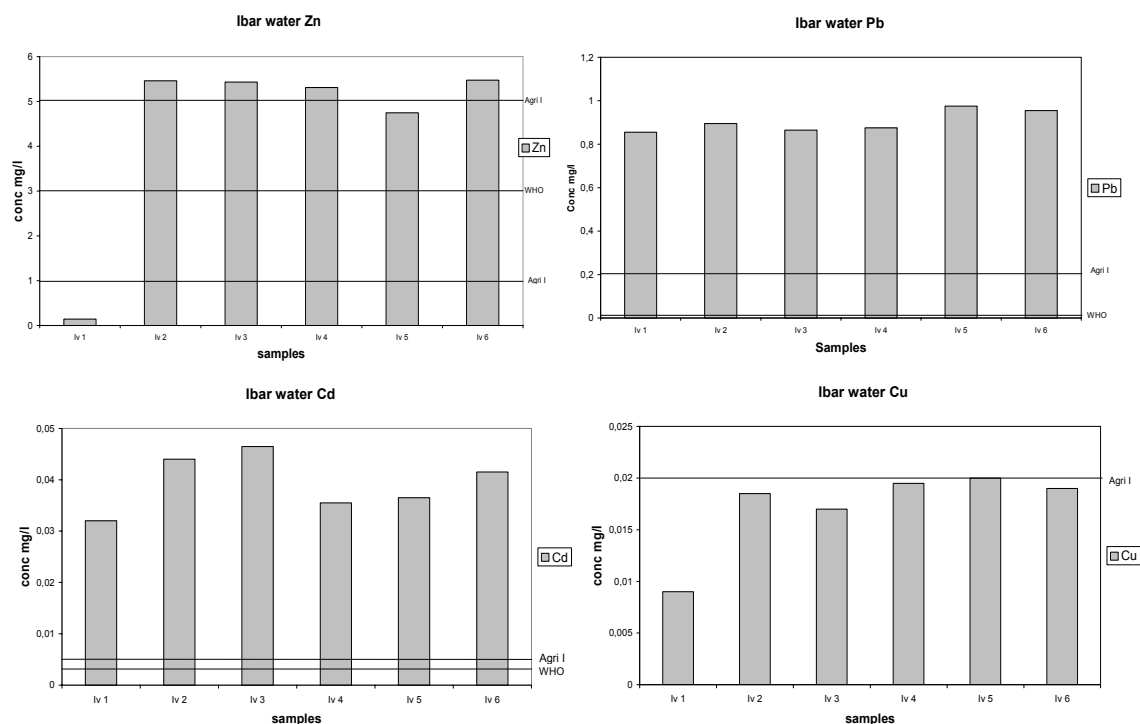
The results will also be compared with the Canadian environmental quality guideline for water used for irrigation in agriculture, see table 10. The Canadian Guideline has been chosen is because there does not exist such a guideline in EU – or in Denmark. (Karsten Hedegaard, 2003)

Tabel 10 Canadian guideline for irrigation water

Agriculture irrigation	Zn	Pb	Cu	Cd
mg/l	1-5	0,2	0,2-1	0,005

These values will be presented in the histograms as a line, called Agri I. The results from the water samples taken from Ibar are presented in the figure 5. There is a histogram for each metal analysed.

Figure 5 Ibar water



It can be seen from the figures that the heavy metals in general are lowest at the first sampling point, which is where the Ibar meets the River Sitnica. Hereafter the levels tend to increase.

At the first sampling place the Zn value is 0,14 mg/l which is fine compared to the drinking standard, but from sampling 2-6 the values are almost on the same level and ranges from 4,6 to 5,7 mg/l which is more than the drinking standards, set at 3 mg/l.

The water irrigation level according to the Canadian environmental quality guidelines ranges from 1-5 mg/l. Even though this value is not clearly defined the level of Zn in the water is still too high to be used for irrigation.

For Pb the level is almost the same from sampling points 1-6, and it only ranges from 0,85 mg/l to 0,97 mg/l. It is quite surprising that. sample 1 is at the same level as the others. When comparing the values with the drinking standard, it is clear that the level is much higher, namely about 85 to a 100 times higher.

In all the samples the content is about 8 times higher than the irrigation level for use in agriculture.

For Cu the values range from 0,009 to 0,02 mg/l. The lowest value is seen in 4 the 1. sample as expected, which is about 100 times lower than the allowed value compared to the WHO drinking standard. The other samples have values that are double as high, namely close to 0,02 mg/l.

The irrigation level ranges from 0,2-1 mg/l, which is much higher than levels of Cu in Ibar. So according to the Cu content the water is fine.

For Cd the values are also at the same level from 1-6, but sample 1 is still the lowest. The values range from 0,032 to 0,046 mg/l, which is about 10 to 15 times higher than the drinking standard. When the irrigation value for Cd is exceeded about 9 times.

Looking at the results it can be concluded that the levels of Zn, Pb and Cd are much higher than what the WHO drinking standards allow. This is a problem in a country where drinking resources are scarce and where not all people have access to clean drinking water. It also problematic when considering the fact that there is also a great demand in Kosovo for water that is suitable for irrigation (MESP, 2003), as three out of four measured metals exceeds the irrigation limits, and in fact the Cd content was up to 9 times higher.

All in all it can be concluded that the worst-case scenario must be considered to find out how bad the water condition is. This means that when there is a high value of Pb in the river, it doesn't matter if there are relative lower values of the other metals. So when the concentration of Pb is 85-100 times higher than the WHO drinking standard allows, it must be concluded that there is a serious problem.

By looking at the histogram for Pb it is clear that there already is a very high level of Pb in the water at the first sampling point before it enters the Trepca site. So it seems that there is a very high background value of Pb in this river. The pollution can come from the two power plants located in the area. Furthermore, Trepca has a 300 meter high chimney that could have spread fumes to a large region. Furthermore, the many old cars that are used in Kosovo and the fact that they are using a very poor quality of gasoline on their cars could contribute to this high level. Wind may also spread tailings material over a large area and thus contaminating the river upstream from Trepca. However, even if the high level of Pb is ignored there is still 10-15 times more Cd in the river, which also constitutes a serious problem for the environment and people's health.

5.4.2 IBAR SEDIMENT

The result of the test shows that the level of polluted sediment increased the further downstream from Trepca it was collected. It has its greatest peak at sample 3 just after

Gornje Polje, which probably is due to the fact that the tailing is located right next to the river.

As Denmark, EU or Kosovo doesn't have any guidelines for content of heavy metals in sediment, Canadian environmental quality guidelines for sediment in freshwater is used, presented in table 11.

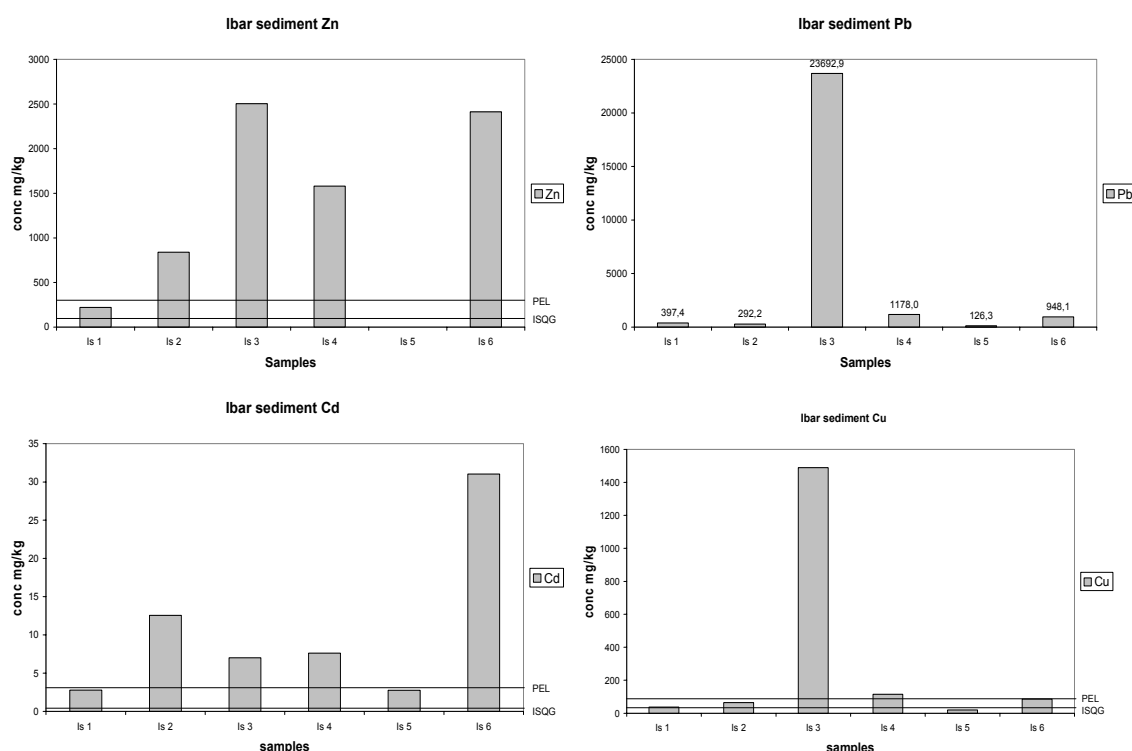
Table 11 Guidelines for sediment in freshwater, selected metals

	Zn	Pb	Cu	Cd
ISQG mg/kg	123	35	35,7	0,6
PEL mg/kg	315	91,3	197	3,5

ISQG = Interim Sediment Quality Guideline

PEL = Probable Effect Level

Figur 6 Ibar sediment.



With regards to the Zn concentration in the Ibar sediment it is clear that the values are too high. Only the first sample live up to the ISQG value. The rest of the samples are much higher than the quality guidelines recommend.

Sample Is 2, which is the second lowest sample and sample Is 3, which is the highest is between 2,7-8 times more than PEL and 6,8-20,3 times more than ISQG. There is no value for Is 5 due to a technical problem in the laboratory.

With regards to the Pb concentration the limits are so low that they are not possible to depict on the histogram. On this histogram it is remarkable how high the content of Pb is in sample Is 3. But in this case, as well as for Zn, these samples have been taken in the river right next to the tailing, which is located very close to the river. This might help explain the high values found in this sample. When looking at the other samples it is clear that all the values are higher than the limits. Sample Is 4 and Is 5 is 1,4-12,9 times more than the PEL and 3,6-33,7 times more than the ISQG.

For Cd the values are more on the same level. Sample Is 3 is even lower this time than some of the other samples, but it can be concluded that there has been sedimentation of Cd at the last sampling place down the river. For Cd all the values exceeds the ISQG limit from 4,5-51,7 times, and for the ISQG it goes from below the threshold value to 8,9 times higher. That the value is that much higher in the last sample (sample 6) could indicate that Cd settles and sediments more easily than the other heavy metals, which might flow even further downstream beyond the sampling points.

On the histogram for Cu the tendency to a high level in sample Is 3 continues. Here the value correspond to 1400 mg/kg, which is still very high. It is 7,6 times more than the PEL and 42 times more than the ISQG. The rest of the values are quite close to the threshold values, but a tendency to have a higher content than the ISQG value allows, can still be observed.

For the sediment samples from Ibar it is remarkable that there are much higher values in sample Is 3 for Pb, Zn and Cu. There is a clear tendency of a much higher content of heavy metals in the sediment where the tailing is located close to the river. The lesson must be that the tailing is placed much too close to the river and in general tailings should not be placed that close to rivers or lakes. The content of sediment in the river is in general higher than the Canadian environmental quality guidelines recommend. It should be clear that the present sediment situation in the river is harmful to the environment and for the aquatic life and action to store or seal the tailings in a proper way should be done.

5.4.3 FISH SAMPLES FROM IBAR AND WATER RESERVOIR

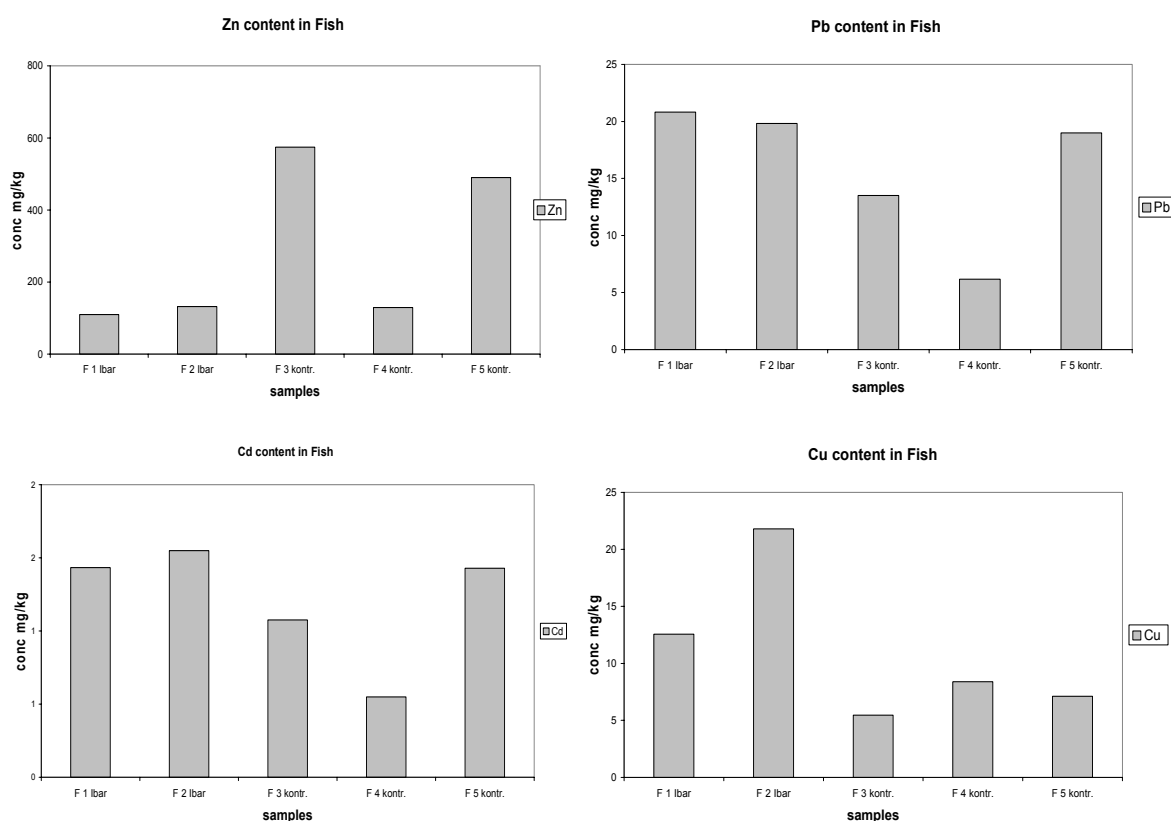
In order to investigate whether heavy metals have entered the food chain and to get a picture of the pollution over a longer period, rather than a situational picture of the present, 2 fish from Ibar and 3 “control fish” from a water reservoir was analysed for their heavy metal content.

According to The Danish Veterinary and Food Administration the Provisory Tolerable Weekly Ingestion (PTWI) of fish is 25 $\mu\text{g}/\text{kg}$ body weight corresponding to 1,5 mg lead pr. week for a person that weighs 60 kg. For Cd this value is 7 $\mu\text{g}/\text{kg}$ body weight corresponding to 0,42 mg Cd pr. week for a person that weighs 60 kg. For Cu and Zn there have not been set any limits for the content. To find out how much fish you can eat per week before reaching the tolerable limit for Zn and you can take the No Observed Effect Concentration (NOEC) for Zn and Cu and multiplied it with the daily tolerable dose per kg with 60 kg and then multiply with 7 days.

(http://www.noah.dk/foedevare/fdir_hoering_fisk.htm)

By doing so it is possible to estimate how much fish from the Ibar River you can eat when staying within the tolerable weekly ingestion. The following figure present the results from the analysis of the heavy metal content of the fish.

Figure 7 Heavy metals in Fish



When analysing the results it is seen that there is a higher concentration of Cd, Cu and Pb in the fish from Ibar when comparing to the control fish, and that there is more Zn in the fish from the water reservoir than the Ibar fish.

When the tolerable upper intake level for Zn is set at 45 mg/day³⁸ it means that it is tolerable to eat 1,8 kg fish per week.

For Pb the values for the two fish from Ibar are close to each other, namely 19,8-20,8 mg/kg. This means that you can only eat 75,9 gram fish pr. week from Ibar with out getting more Pb than recommended for a person that weighs 60 kg.

For the fish from the water reservoir the values are varies from 6,2-19 mg/kg. It can therefore be said that one should be careful when eating fish from the Ibar and certainly not eat more than 76 grams if you want to be on the safe side.

For Cd the values for Ibar fish is from 1,4-1,5 mg/kg, which makes it possible to eat 280 gram fish pr week for a person that weighs 60 kg.

The control fish from the water reservoir have values ranging from 0,55-1,4 mg/kg. This meant that if you take the worst-case scenario, food recommendations should in fact be the same as for the Ibar River. With regards to Cu it was only possible to get the NOEC value for a dog, not a human, which is 5 mg/kg/day³⁹ for one year. When using this data on humans it is necessary to multiply the NOEC value with 100 as a EU-risk factor, because there is only one available data from one mammal. A dog weighing 60 kg could eat 100 kg fish per week with the highest content of the samples without getting complications from the cupper, this means that when taking the EU- risk factor into account a human should not eat more than 1 kg fish per week.

After analysing the results from the fish in Ibar it can be concluded that there is a high level of Cd and lead in the fish and therefore it cannot be recommended to eat fish from Ibar even though the level of Zn and Cu was not of concern. The highest level of lead in the fish was in one fish so high that it cannot be recommended to eat more than 75 gram per week.

It is definitely questionable from a human health point of view to consume fish from this river in any great extent when these findings indicate that the fish contain critical levels of several heavy metals. However, more research into the matter will obviously have to be conducted in order to confirm these results. When analysing the risk that the heavy metals might have to human health, the heavy metals should not only be looked at individually. In fact, synergy effects can be expected, for example can both Cd and Pb cause kidney damage. Furthermore, when people live in an already heavy metal contaminated area, they are likely

³⁸ Calculated on basis of The Danish Environmental Protection Agency:
(<http://www.mst.dk/default.asp?Sub=http://www.mst.dk/udgiv/publikationer/2001/87-7944-667-1/html/kap03.htm>)

³⁹ Forbrugernes hus [www.....!!](http://www.forbrugernes-hus.dk)

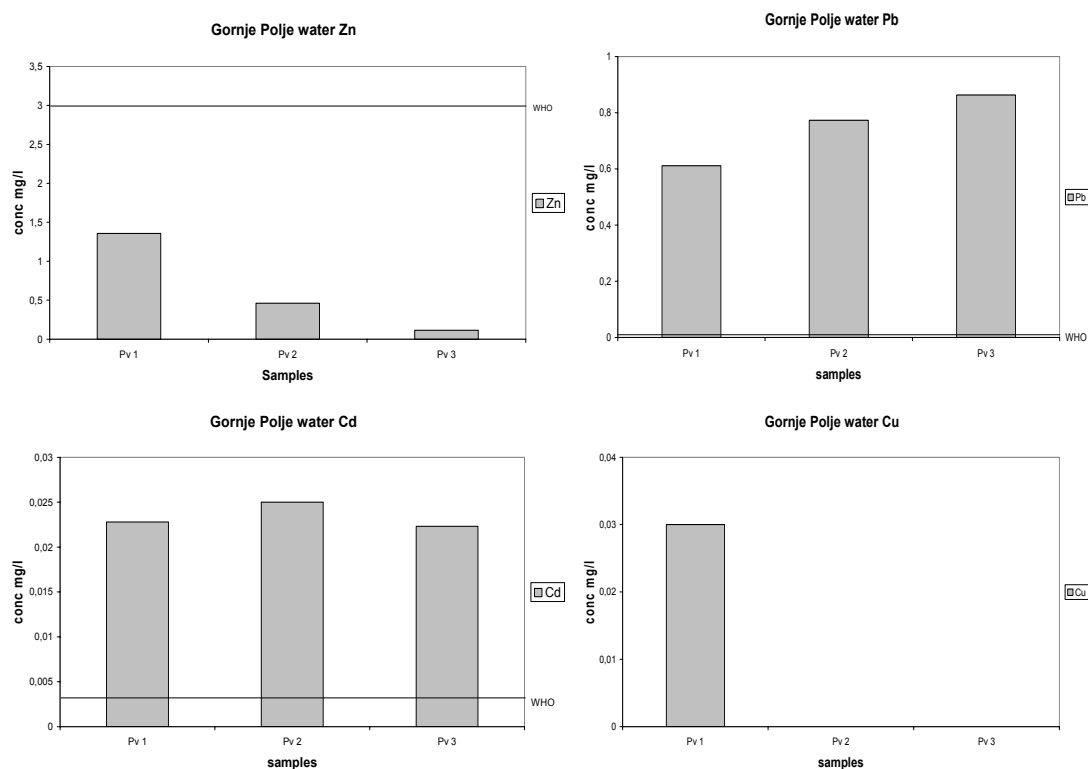
to be polluted from other sources apart from the food source and would therefore have to be even more careful with their consumption of fish from the river.

5.4.4 RESULTS FROM THE CREEK LESKOV

As described in the methodology the reason for collecting water and sediment samples from this little creek is due to the fact that it runs through one of the biggest tailings area, namely the Gornje Polje tailing. This tailing contains approximately 12.000.000 m³ tailings material. In the 1950's Trepca stopped using this tailing for dumping mine waste but constructed the Zitkovac tailing instead. The creek running through the tailing flows into the Ibar River. It is possible to see that the creek causes erosion of the tailing into the creek, which indicate that there might be tailing material and thus heavy metals transported into the Ibar river; a process that is likely to have been occurring to a greater or lesser extent since Trepca started operation in the 1930's.

As described in the methodology there are three sampling points (see map 4 in appendix 1), namely sampling point 3 (Pv 3), which is located upstream from the tailing, where the water is clear; sampling point 2 (Pv2) which is approximately half way through the tailings area (where the water has turned a reddish colour) and finally sampling point 1 (pv1), which is where the Leskov Creek meets the Ibar, immediately downstream from the tailing. At this point red sediment material is being washed into the Ibar from Leskov can be observed.

Figure 8 water samples from Gornje Polje



As expected the concentration of Zn in the water rises the further downstream one moves. The content of Zn in the water is far under the WHO drinking standard, so it doesn't seem like the creek supplies the Ibar with Zn of any concern.

It seems like the concentration of Pb is actually decreasing the further downstream one moves, which is not what was expected. The content is however, almost at the same level at all three sampling points, which indicates that the background levels are quite high in general. Perhaps tailings material is dispersed by the wind upstream of the creek and thereby contaminates it. And perhaps the physical and chemical condition of the creek causes the lead to be measurable in all three samples, but not the zinc. However, the values in the three samples are 61-86 times higher than the WHO standard recommends. It must be the conclusion that the creek is supplying Ibar with highly Pb contaminated water.

The content of Cd at the three sampling places is almost the same. They are all 7-8 times higher than the WHO standard. As with lead, it must be concluded that the background level of Cd is quite high, perhaps for the same reason as discussed with Pb above.

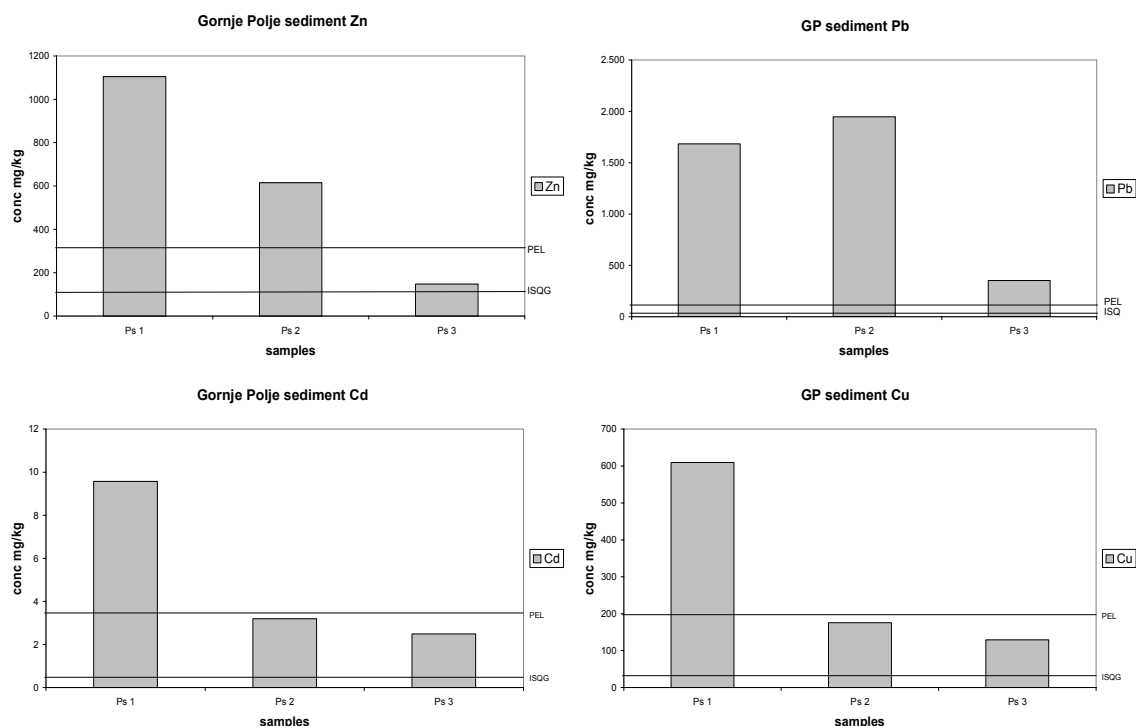
There is only one result from the analysis of the Cu content of the water. This is due to the fact that content of Cu in the water was so low that the AAS could not detect that low values. The value from Pv 1 is 0,03, which is 100 times less than the WHO standard on Cu, so there doesn't seem to be a problem with the Cu content.

In summary the content of Pb and Cd is quite a lot higher than the WHO drinking standards allows and it would without doubt be better for the river environment if the creek didn't run through the tailing area. On the days of measurement (from the 2-7th of December, 2003) the water flow of the creek was running at a speed of 13,4 litre per second on average. If this is representative for the average year it amounts to 1155 m³ of polluted water per day and 421.604 m³ polluted water a year that reaches the Ibar. However, these calculations are probably too conservative guesstimates, as the weather when the measurements were taken was very dry without precipitation. Had it been raining, rainwater that hadn't been absorbed by the tailing would probably have flowed into the creek carrying tailings material with it and thus changing the heavy metals profile of the creek. The creek would also have been carrying more rainwater, rather than surface water that originates from the mountains as it did on the days of measuring. Yet, the calculation that is available for certain, is the conservative estimate of 421,604 m³ a year. This amount of water is not much compared to how much water that runs through Ibar every year, but it has consequences for the

environment because Pb and Cd are toxicants that accumulate in the environment. So it is easier to avoid the pollution by not letting the creek run through the tailing area and into the Ibar. This could be done quite simple, by for example leading the water through a 300-400 meter long pipe.

The following histograms show the results from the sediment samples taken from the Leskov creek.

Figure 9 Sediment samples Gornje Polje



The histogram shows that the content of Zn in the sediment is rising, the further down the creek one moves as expected. Sample Ps 3 is a little higher than the ISQG guideline but lower than the PEL. However, Ps 2 and Ps 1 are higher than both PEL and ISQG and before the water runs in to Ibar it is 3,5 times over PEL and 9 times higher than ISQG.

The Pb histogram shows that the content of Pb is lowest at PS 3 upstream from the tailing, as expected. However, sample in the midway downstream Ps 2 has the highest content of Pb. Yet, all of the three samples are higher than the standards. The sample taken where the creek runs into the Ibar has values 18 times higher than the PEL and 48 times higher than the ISQG.

The histogram for Cd shows as expected that the content of Cd in the sediment rises the further downstream one moves. At sampling point Ps 1, downstream from the tailing it is 2,8 times higher than the PEL and 16,7 times higher than the ISQG standard.

The Cu histogram shows as expected that the content of Cu in the sediment is rising through the creek. Sampling point Ps 1 is 3 times higher than the PEL and 17 times higher than the ISQG standard.

The conclusion of the results from the Leskov Creek sampling is that in all of the measured metals the values have been too high. This is not surprising as it is running through a tailing area. This makes it even more important to stop this creek from running through the tailing area, because it is helping moving tailing material via the sediment into Ibar and contaminating this river further with heavy metals.

5.5 Summary of the results

The final conclusion on all the results makes it clear that the tailings still threatens the environment and keeps polluting the Ibar. It can be concluded from the results from the water samples in the Ibar River that the heavy metal pollution increases the further downstream it moves, in particular after the river passes Trepca and the tailings. In three out of four tested heavy metals in the Ibar water the content is higher than the upstream background sample.

This tendency is supported by the results from the sediment samples, which shows that the content of all the tested heavy metals is rising to critical levels downstream the river. The fish result shows that there is more Pb, Cd and Zn in the fish from Ibar compared to the fish from the water reservoir. However, there is not a significant difference in the levels in the fish from Ibar and the reservoir. This can be due to some different factors. Firstly it would have been optimal to examine more fish to get a more representative result. Secondly the fish that we got from Ibar could have had their habitat at another spot upstream the river and just passing by the contaminated area on the day it got caught and therefore it will not show the true consequences of having water contaminated from tailings as a habitat. Thirdly it is possible that the water reservoir is quite contaminated with heavy metals and the fish from the water reservoir was contaminated as well. In that case there could be a very high background level of heavy metals in the region, possibly caused by the high chimney on 300 meters from the smelter, the height of the tailings and the general mining activity in Kosovo that has been going on for decades, even centuries.

Whether the level of heavy metals in the Leskov water rises when moving downstream is not clear from the results. For Zn the tendency is clear but for Pb and Cd the levels are about the same and Cu only gave one result as the two others were under the level where it could be measured but this one result is from the sampling point Ps 1. However, it can be concluded

that the level of Pb and Cd in the water is far too high. The sediment samples, on the other hand shows a clear tendency that the level of heavy metals rises downstream towards Ibar and carries contaminated sediment into Ibar.

It can be concluded from the water and sediment samples taken from Ibar, Leskov and the fish analysis that the heavy metal concentration is too high. Ibar gets such a high concentration of heavy metals on its way through the tailing and factory area, that it can be used neither as drinking nor as irrigation water. From the Gornje Polje tailing there seems to be erosion of heavy metals into the Leskov creek, which runs into Ibar. The fish also have such a high concentration of lead that it is not advisable to eat fish from this river. In fact, with reference to lead only 75 grams per week can be eaten by a person weighing 60 kg and this is even without considering the other sources of lead pollution that the person might be exposed to by living in this area. Yet, it must also be acknowledged that the fish from the water reservoir has surprisingly high levels of heavy metals. Data that to some extent supplement these results are measurements of the ground water quality at Trepca south. The samples have been taken from February to May 2003 in the underground where the tailings are stored.

Table 12 Ground water quality at Trepca South. (Adapted from Trepca Environmental Institute 2003).

	Pb	Zn	Cd
mg/l	1,66	74,63	2,74
WHO drinking water	0,01	3	0,01

The results is a clear indication of that there is a huge leach from the tailings to the underground water and probably a further wash out to the river, which passes by very closely, and possibly pollutes the drinking water as well. Although the results cannot be compared directly with our results as the tailing at Trepca South consists of material from a different mine and therefore might have different background values and composition than the Gornje Polje tailing, it still supports the overall conclusion, namely that the tailings are a constant pollution to the environment and it would advisable to eliminate this pollution.

By comparing our results from the analyse of the water from Ibar with the results that Trepca environmental department has made from January – February 2003, it can be seen if there is similarities in the values to make sure that our results are valid. The samples from Trepca environmental department are average values from the half-year and therefore not that related to the certain month and has less fluctuation.

Tabel 13 Comparison of project results, Trepca results, WHO standards and Yugoslavian standards

Heavy Metal	Our samples from Dec. 2003	Trepca Environmental Department Jan-Jun 2003	Who drinking standard	Yugoslavian drinking standard
Zn mg/l	5	0,2	3	1
Pb mg/l	0,8	0,3	0,01	0,1
Cd mg/l	0,04	0,3	0,003	0,01
Cu mg/l	0,02	0,03	2	0,1

Overall it can be concluded by comparing our results with Trepca's that they are quite similar and it therefore seems that our results are overall valid. It can be concluded that two of our results are higher than Trepca's and two are lower. For Zinc our results are factor 25 higher and for Cd factor 8 lower. These differences can be caused by different sample techniques. When we came they just got some new sample equipment. Before that we were told and have seen a photo of that they for instance used an old tin of paint to get the water from Ibar, which could leak more material to the sample or react with it.

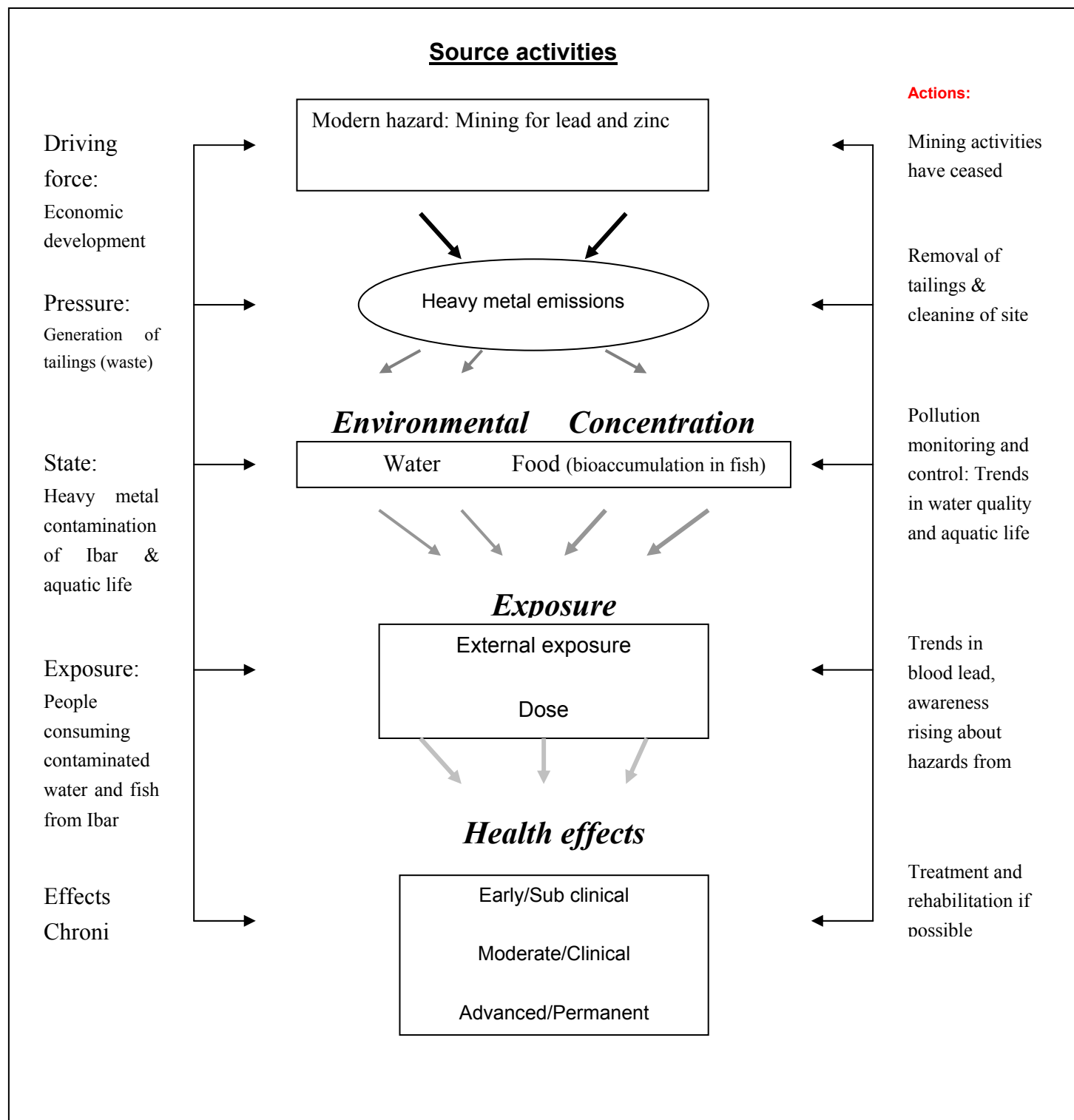
5.6 Trepca's effects on public health

With regards to environmental health it is clear from the results presented in the chapter that there is a clear risk to people living in the area, if they are in any way in contact with the water. When linking our results with the environmental hazards pathway as presented and discussed on page XX, the following figure illustrates in a visual way the possible pathway that the heavy metal exposure to humans may follow in the Trepca case.

The figure below illustrates the impact of the people who are in contact with the water from Ibar or cover some of their dietary needs in the form of fish from Ibar.

As already mentioned not many people are connected to central water distribution system, and the rest get water from local and private wells. Wells situated close to the river, may be contaminated with river water and thus with heavy metals. However, it is not known how many people in the area that this situation applies to. It is furthermore not known how many people supplement their diet with fish caught in the Ibar, which potentially may be contaminated with heavy metals. However, some fishing activities do take place. All in all there are a number of factors, which makes it difficult to estimate the exact number of people that are exposed to heavy metals through the Ibar. Yet this study can give some indications of the extent of the pollution and its potential health problems.

Figure 10 Heavy metal pollution from Trepca and its possible pathway affecting public health



The pathway and the extent of the exposure is however quite grave, when taking into consideration (assuming that nothing is done in the near future to prevent the contamination), that rapid population growth is taken place in Kosovo, as already discussed. This in theory may result in that more people will be exposed to the environmental hazards. The water scarcity, which is already acute in Kosovo (MESP, 2003) combined with the population growth, may also result in that more people will rely on the surface water from the Ibar or private wells. Therefore, it is obviously very important to react to the problem immediately. In the face of environmental problems and observed health effects society may attempt to adopt and implement a range of actions (A). These may take many forms and be targeted at different places with the environmental health chain. It could for example, be to ensure safe water coverage for all people. This type of action would eliminate the exposure that originates from water consumption at the local level. Yet it would not eliminate the possible exposure that people further downstream (in Serbia, for example) might be exposed to. Nor would it address the problem of the contamination of aquatic life, which also has transboundary effects. The most effective long-term actions are often those that are preventative in approach, i.e. aimed at eliminating or reducing the forces, which drive the system. Section 5.7 will briefly sketch out one possible pragmatic approach to eliminate the heavy metal emission from the tailings and chapter 7 will analyse the possibilities and constraints that Kosovo faces in dealing with this problem on a broader conceptual level.

It should be noted that the figure above does have some limitations. The casual pathway illustrated and described above can be quite complex, rather than a simple chain, it often acts as a network of connections. Multiple effects may result from a single driving force (i.e. the tailings also result in air pollution, soil contamination and thereby food contamination, landscape destruction and habitat loss). Furthermore, multiple causes may contribute to a single health effect. Increased levels of lead in the blood may apart from water and fish consumption from Ibar as analysed here, also result from air pollution (from car exhausts and Trepca), consumption of contaminated vegetables, children's exposure through their mothers (as a foetus and later through breast feeding) and lack of environmental awareness (e.g. lack of education). Thus, there are ranges of variables that can cause the same problem.

Furthermore, given that this is theoretical interpretation of reality, where there are only limited data and information available, there are great uncertainties connected to this analysis. Whether environmental hazards, such as the heavy metal contamination of the river lead to health effects "is determined by all the factors that control exposure and human susceptibility of exposure; on the social, economic and prior health status of the individuals concerned; and on the quality and accessibility of the health system" (Corvalán *et al.*, 2000: 50). However, as already argued, there can be no doubt that the Trepca complex and the tailings present and environmental hazard and present a great risk for the people living in the

Mitrovica area of being contaminated with heavy metals. Therefore, action should be taken to eliminate this risk. One way of doing so will be presented in the following section.

5.6 Zitkovac, an example of a solution.

The consulting firm Golder has analysed the Zitkovac tailing and has on the basis of this proposed a solution to the tailing with reference to eliminating the pollution that the Zitkovac tailing causes. It is here assumed that the overall guidelines will be applicable to other tailings, including Gornje Polje. The Zitkovac tailing is characterised by that the tailing sides, like Gornje Polje have traces of erosion, either from wind or surface water runoff, but at a reduced level due to formation of a hard cemented surface layer. The River Ibar passes very close to the base to the tailing sides, however there is no monitoring programme in place to assess the impact of this proximity on either surface or groundwater quality (Golder, 2003). Furthermore, the head of the Environmental Institute at Trepca, Tomislav Zvkovic stated that in the spring and autumn the water level rises so high that it is touching the sides of the tailing and thereby remove material.

In order to adopt the best solution Golder conducted a range of tests on the tailing in order to acquire some knowledge on the characteristics of the tailing⁴⁰.

Table 14 Key elements in the Zitkovac tailing. (Golder, 2003.)

Fe	Mn	As	S	Cd	Zn	Pb
20-32%	3,5-6,7%	0,7-2,48%	0,16- 20,1%	105-340ppm	0,3-0,5%	0,2-0,7%

The acid base accounting tests were performed to determine whether the tailings had potential to generate acid drainage (ARD), a phenomenon already discussed. After analysing the results Golder came to the conclusion that the material forming the tailings dam was acid generating and highly erode able. Analysis of the samples from the tailings shows that there are moderately acidic with pH values recorded between 4.4 and 6.8. To minimize the production of ARD, the structure should be domed and capped with a low permeable membrane to prevent the ingress of water and air into the tailings. The capping material should be able to support vegetation. The side slopes of the dam wall need to be stable protected from wind and water erosion. The tailing should be added lime there will have the added benefit of causing metals in solution to precipitate out, reducing metal availability for plant uptake. Where the dam wall is located near to and parallel to the river, protection will be required to prevent erosion during times of flood flow (Golder, 2003).

⁴⁰ A full set of laboratory results from the Golder report 2003 is included in Appendix

The cost estimate that Golder Associates has made for capped material, the construction of the drainage, river protection systems and administration costs is at a total of 2,317,550 Euro⁴¹ (Golder, 2003). The question remains how expensive it would be to seal up The Gornje Polje tailing, assuming that the two tailings require the same solution. Zitkovac has an area size of about half the size of Gornje Polje, which can be seen in table 7 in section 5.2, and it might be possible to assume that it would be about the double price for closing Gornje Polje.

However, there are other factors, which might make the Gornje Polje tailing more than twice as expensive. In terms of volume for example, the Gornje Polje tailing consists of 12,000 tons and Zitkovac consists of 8,500,000 tons of tailing, and thereby in terms of volume the Gornje Polje tailing is not double the size, but it is merely flatter in shape. Gornje Polje also has a creek running through it, which might complicate the engineering works considerably. Nevertheless, it is impossible to estimate how much more the Gornje Polje tailing will cost, and a conservative estimate might be that it will be twice as expensive, namely 4,6 million Euro for closing the tailing. This is obviously a considerable amount of money, which might be difficult to procure.

⁴¹ This price was by the International environmental manager Roger Payne considered to be too expensive, as some of the material needed would have to be imported.

6. The future of Kosovo

It was in chapter five stated, that the heavy metal emission from the Trepca lead smelter and especially from the tailings, into the River Ibar has too many environmental and health related consequences for the people living in and around Mitrovica and Zvecan. The water quality in the Ibar River exceeds internationally accepted limits for heavy metal content. These limits are both for drinking water and for water used for irrigation. From an environmental point of view, this is unacceptable and something has to be done.

Chapter five suggests a possible solution to the pollution problem, and in the chapter a price for the closure of the tailing is provided. One problem is, that at the moment, that the cost of the closure of the tailings is very high compared to the national- and especially the environmental budget of Kosovo. This will probably, with the present priority of the environment, be difficult to convince the decision makers in Kosovo, to spent minimum of 4.6 million Euros to close off the tailings when poverty in Kosovo is so endemic.

Whereas the pollution from the tailings is an environmental problem, is it additionally an economic problem. The poor quality of the water in the River Ibar is too poor to use for irrigation, and this makes the development of a more producing agriculture in the area very difficult. The poor water quality makes the water useless for industrial use, unless it is cleaned first (MESP 2003, sec.6.1). Another aspect of the problem with the polluted water is the general health in the area. If the people living in the area are affected by insufficient clean drinking water it can reduce their work ability.

6.1 solutions to the environmental problems in Kosovo

One solution to the pollution problem is to invite other countries to finance the closure, as the Dutch government has financed the first part of the closure process of the Zitkovac tailing. This will certainly be a good environmental improvement, and it will solve the specific financial and environmental problem. However, this is a very short-sighted solution, which only solves one of many environmental problems in what the WHO coordinator in Kosovo refer to as “*probably the most polluted area in Europe*” (McWeeney.2003). If the closure is funded other countries rid Kosovo of one of their environmental problems, but they still will not have the capability to deal with other environmental problems. And Kosovo does have many huge environmental problems.

Even if Kosovo had the money to start a project and hire consultants to plan a closure of the mine tailings, it is more than likely that this problem would not be prioritised highly enough. The UNMIK assigned HSE officer, Roger Payne stated that the major focus at the moment was to get the mines started afterwards Trepca management could deal with increasing the environmental demands (Payne, 2003).

6.2 Economy and environment

When considering the living conditions in Kosovo, the environmental situation aside, then what would be the possibilities? The soil in Kosovo is very fertile and it would be logical to consider developing the agricultural production in Kosovo (MESP, 2003). This would help the people living there to provide for themselves, and thereby not importing the high amount of food, and water, that they do at the present time.

Kosovo has, as described in chapter three, been in the past 100 years been a mineral economy. A nearby thought would therefore be that the country, in order to get some capital, could reopen the mines. This is also the plan of the UNMIK at Trepca. The plans are that the Stari Trg mine as well as a few other mines is planned in order to restart extraction of heavy metals in the spring of 2004. This will result in that some people might again be employed and that the Trepca Corporation will have some money to reinvest in further extraction (Payne: 2003). From an economical point of view it would be rational to open the mines again. The Stari Trg mine has according to MESP, about 29 million tons of lead and Zinc left in the mine. This amount of minerals is according to Roger Payne enough to approximately ten years of extraction, but it is not sufficient enough to attract foreign investors, who would consider rebuilding Trepca as a lead smelter (Payne, 2003).

One major problem about the plans of reopening the mines is that there at the moment is no general environmental control in Kosovo, and that there is no environmental control on mining either. The mining industry in Kosovo and the procedures in use have not been improved since the Trepca lead smelter was closed, and has not been developed the last decade of the years where Trepca was running. A reopening of the mining in Stari Trg could thus result in that the same environmental problems manifested at Trepca, which Kosovo is suffering under at the moment.

Similar problems occur when dealing with opening or reopening other industries in Kosovo. The power plant is one of the major pollutants and earlier the cement factory placed on the southeast side of Pristina, also were one of the major polluters in Kosovo.

Having economic development as the core objective, without having an eye for the many environmental aspects that it might result in, may result in, that Kosovo in the future will be even more polluted and the people living there will suffer in terms of their health. This should be regarded as unacceptable in a democracy. However, firstly one must consider, how could the environmental situation get to the state that it is in today. This will be the topic of the next section.

6.3 How could it come that far.

To the question about how the environmental situation came to this in Kosovo and in particular with reference to the environmental situation at Trepca, there are several answers

to this question. There has been a very low degree of environmental awareness in general in Kosovo. At the Trepca plant the situation was, that those who was educated and, through their education and job had some environmental awareness did not have sufficient influence to do anything about the environment. The head of the Trepca Environmental Institute, Tomislav Zvkovic, explained that officially the Yugoslavian standards were to be followed, yet unofficially nobody cared about it, and the standards were not followed even though the Trepca Institute made environmental monitoring reports, the reports was made once a week, and once a day in periods when there was high levels of emission to the surrounding area (Jovanovic, 2003). Secondly, when environmental problems occurred, Trepca did not have the necessary funds to react to them, and the priorities of the people high in the hierarchy at Trepca were more concerned about the economy of the plant. Hence nothing was done.

The last few years though people have been informed about the problems related to live next to Trepca, through distribution of pamphlets by the international organisations like the WHO and the KFOR. Earlier, people did not have any awareness on of how to handle these problems, but the future according to Zvkovic: *"If the international organisations leave the country again it will not take long before people have forgotten about the environmental problems"* (Zvkovic, 2003). During the interview with Mr. Zvkovic, he stated that when the wind was blowing from Mitrovica he took his family to the local villages in the mountains, when they wanted to go for a walk in order to get away from the smoke and the dust from the plant. His neighbours though did not have this knowledge about the environment, and they stayed in the Zvecan village. A local told that it was normal to clean windows twice a week when Trepca was running, which indicates the amount of sod that Trepca released into the air. When a strong wind was blowing over the city, the citizens complained to the municipality, but they did not have choice and had to accept living nest to and work on Trepca (Zvkovic, 2003).

As a consequence of high heavy metal concentration in the air Trepca did react at last. In 1985 they build a new 305-meter high chimney to substitute the old one at 75 meter, which halved the local air pollution, basically by spreading it over a lager area (Jovanovic, 2003). According to the International Head of the Environment on Trepca, Roger Payne, Trepca was not performing poorly financially well going in the 1980's and the former proud company was not giving any profit. Yugoslavia was in economical crises and the government drained Trepca's capital. The result of this was that Trepca could not afford to invest in new and better equipment. Therefore Trepca was even more outdated than other eastern European mine companies, according to the table 6 in chapter 5.

6.4 Environmental actors and initiatives

The question is then, where will the initiative to prioritise environmental concerns come from? The citizens living in the area do not have many initiatives to do something about the pollution themselves when there is such a low environmental awareness in the area. For example, it wasn't unusual that the children living in the area were playing football on the tailings (Engdahl, 2003), and playing with the plastic boxes, which used to contain industrial batteries⁴², (Hazardous waste conference, 2003). Furthermore, the workers at the Trepca plant did not wear respirator when working with the heavy metal contaminated material⁴³. The material had such a high level of heavy metals that it were loaded unto lorries and transported to Serbia to another lead smelter. On the basis of these findings, it can be argued that the initiatives of a closure of the tailings would probably not be prioritised very highly neither from the local population nor the local municipality politicians. With this knowledge in mind it cannot be expected that the local people of Kosovo suddenly will start being aware of the risks concerning the heavy metal contaminated tailings.

This means that the environmental development in Kosovo will not be developed as a bottom-up development where the people can force the government to think in more environmental lines. The goal from the politicians' side is of course to heighten the living standards for the Kosovo population. A development in Kosovo that heightens the living standards and at the same time take the environment into account can somewhat be characterised as a sustainable development. Some steps towards a more environmentally acceptable development have been taken. Goals have been set up for what the development in Kosovo should be guided by. The UNMIK and the Department of Reconstruction states that it is the ambition of the people of Kosovo, UNMIK and the international community to put Kosovo on the track of sustainable economic and social development (HDR, 2002: 73).

To put Kosovo on track of a sustainable economic and social development is very good but the environmental aim is lacking. This statement is though an indicator that development is ongoing in Kosovo. If environmental programmes have to be developed in Kosovo, it is at the political level it has to be done. But which parts of the politicians in the Kosovo assembly and in the ministerial administrations have possibilities to have a certain amount of influence in the development of a country where so many organisations, countries and last but definitely not least people have different opinions about and different agendas for the development path to be followed.

⁴² This is based on a question asked to the Danish consultant company. One of the participants in a conference asked how people in Kosovo could clean the plastic boxes from old car batteries that used to contain the liquid acid and the lead. The reason he asked was that the kids play with the plastic boxes and in that way was exposed to pollution.

⁴³ The workers did use respirator when working on the projects lead by the international consultants from Golder and Ramboll.

The Albanian people were, as described earlier, discharged from leading governmental positions as well as from leading jobs in large SOE's like Trepca. This has resulted in that many of the people sitting in the assembly, and in the ministries has little experience with developing legislation (Brown, 2003). Even if they have been working in the governmental organs since before the late eighties⁴⁴, it is still about 15 years ago, and one could argue that these experiences is quite old. Besides that it was quite a different system and things were weighed different. This project does not claim that the people responsible for developing the new legislation in Kosovo is not capable of doing so, but it does argue that people will be likely to listen very much to the consultants and advisors placed in Kosovo employed by UNMIK. This means that the people sitting in ministerial jobs are likely to have their possible environmental initiatives coloured by the advisors' opinions. This again means, that the initiatives towards an environmental focused development strategy can both come from the local politicians, and that it probably will be influenced by the different advisors background and political position. Different countries' development organisations like Danida has until recently been working in the area. Many of these organisations were pulled out of Pristina in January 2004. These organisations were sent to Kosovo as humanitarian organisations and since the problems in Kosovo no longer was considered as humanitarian, has Danidas further work in Kosovo been placed under the Danida office in Belgrade (Madsen, 2003). Many NGOs has also withdrawn from Kosovo but there are still different projects going on in Kosovo but not to the same extent as earlier. As regards to the different NGO's influence on the initiatives towards environmental development legislation, they do not have a very direct influence, at least not as direct as the consultants influence. However when so many NGO's and relief agencies are working in the area, without will their agenda and opinions question rub off on the political agenda in the area.

6.5 Political development in Kosovo

The last section of this chapter dealt with where the environmental initiatives should and would come from. It was stated that the initiatives towards an environmental directed development should come from the Assembly of Kosovo, from within the ministries or from the international consultants working with the government. This next section will deal with what political direction it would be logical, for the government to follow, when it develops the current legislation further. It will be discussed whether the logical development will be to align the legislation with the EU legislation.

⁴⁴ After Milosevic held his discriminating speech where he argued that only Serbian people should hold important jobs, Albanian people was fired and Serbian people was put in their place.

6.5.1 KOSOVO, A REGION OR A COUNTRY

In the Balkan region there is a common tendency, that the countries align their legislation with the one of the European Union⁴⁵. This seems quite logical when considering what major force EU is, in the whole of Europe. EU can be said to be the trendsetting force in environmental work, economic development and safety wise. It will be a rational choice for the Balkan countries to have a good relationship with the EU. If the countries in the Balkan region aim at having a good commercial relation to the European market, it is likewise logical to develop legislation towards having the same standards as the EU.

Furthermore it is probably the EU that Kosovo will have to apply for aid to both ordinary and environmental development work. The Assembly of Kosovo has stated that:

“A fundamental purpose of the present law is to establish a basic legal framework that will promote an increasingly healthy environment for the people of Kosovo through the gradual introduction of the Environmental Standards of the European Union.” (EPL, article 1, 1).

The situation in Kosovo is, as described in chapter three and four, relatively unstable. It is because of this, difficult to get a realistic idea of what the future of the region will look like, and it is even harder to suggest a solution to the ethnic tensions in the area. There is, in the international society, yet no common agreement about what the status of the province Kosovo will have in the future, although many of the international consultants in Kosovo, expressed that they believed in a Kosovo which had autonomy in cases concerning domestic concerns but were governed by Serbia in cases concerning foreign issues.

Different possibilities for what the status will be in the future exists, and the question is, will the borders of the country be the same as now, where the Kosovo province, more or less, is an independent area, or will the province look different in the future.

Possible solutions for Kosovo can be that it will end up being a part of Serbia. Another solution is that the area ends up being split, and the North part of Kosovo will be a part of Serbia and the south part will end up being independent or a part of Albania. Thirdly, a solution could be, that the whole province ends up being an independent country. All the mentioned solutions are somewhat problematic, because of the national feelings in Kosovo. Both the Albanian and the Serb population consider the whole of Kosovo as their heritage country, and they would rather see the other group migrate.

⁴⁵ Slovenia is already accepted as an accessing country to the EU.

At this time the major part of the population, the Albanian, consider the temporary government, the Assembly of Kosovo, as the government in force. The Assembly has designed a legislation, which is accepted by the Albanians. Yet there is still 10-20 percent of the population, the Serbs, which consider the Assembly as invalid. They consider the Serbian legislation as the one in force.

One future possibility will be, that a government with both Serbian and Albanian population is constituted, and a new legislation is developed. Yet, considering the turmoil in mid March 2004⁴⁶, it can be argued that the peace process between the Serbs and the Albanians is longer away than it seemed in November 2003⁴⁷. This also means that it will take a long time before the Serbs and the Albanians can work together and try to develop a common government, which is accepted by both. A government will have to focus on the minorities in the country, and make sure that they are all heard in the process.

It is as written earlier not possible to predict the future of the Kosovo region. Whether Kosovo ends up being an independent country ends up being a province in either Serbia or Albania, or if it is split up between Serbia and Albania is a question that time will answer. Hence it could seem like the Albanian Assembly anticipates their wish of being an independent country. In the contrary to that it seems logical to work with, and later align with the EU legislation.

EU is a major trendsetting, economic power, which neither of the countries in the Balkan area can disregard. Slovenia became a member of the European Union on the 1st of May 2004 along with 9 other former Eastern European countries, and other countries are to follow. Either of the possible solutions of Kosovo's future nationality seems to underlie a huge influence from the EU. Thus it seems logical for the Assembly of Kosovo to withhold the EU legislation and more precisely to align the legislation with the EU environmental directives. This too, seems to be the plans of the UNMIK as well, and the SRSG Mr. Steiner states: *"First standards, then status."* (HDR, 2002: 35), meaning that Kosovo can not be a member of the EU before it shows that it is on the way towards the EU legislation and that they have fulfilled the basic criteria.

⁴⁶ The riots started because the Albanians believed that some Serbs had chased three boys out in the River Ibar, where they drowned. The riots resulted in that 28 people got killed.

⁴⁷ The field study in Kosovo took place from the 20/11-11/12 2003

7. Legislation in Kosovo

The following chapter sets off in the idea that Kosovo has to develop a legislation, which can be used to deal with the different environmental problems in Kosovo. It is, as argued in chapter six, that it is important that this legislation is developed with a scope, that makes the government and the politicians in the municipalities able to handle present and future environmental problems.

This next section will analyse which focus the current environmental legislation in Kosovo has. The next section will, on the basis of the current legislations aims, analyse how EU environmental legislation can be used to deal with environmental problems. This will be discussed around the pollution from the Trepca tailings into the Ibar River. Whether the water frame directive is the right development instrument will be discussed, and experiences from water management expert Stuart Brown will be added. The proposal for the EU parliament and the EU Council's directive on management of waste from the extraction industry will be used to see which measures that Trepca and Kosovo in general has to deal with, when reopening the mines in Stari Trg.

The environmental legislation in effect in Kosovo is the Kosovo Environmental Act. It was passed on the 31st of October 2002. TJEK Furthermore some parts of the Yugoslavian environmental legislation, which was promulgated before 22nd of March 1989 TJEK are still in effect. It is by UNMIK expected that the Yugoslavian legislation will be incorporated in the Kosovo legislation to the extent possible. It is likewise expected that Kosovo follow the EU environmental compliance standards, because Kosovo is placed very near EU member countries, and therefore is a potential environmental hazard for the neighbouring countries. (Ramboll, 2003, C13, 1) All Serbian legislation passed since 22nd of March 1989 has been annulled because legislation, which was passed later, is considered as discriminating towards other ethnic groups than the Serbs. Consequently the former Yugoslavian legislation can be seen, as the basis of the legislation in Kosovo and it is the one in force until the assembly has passed new or additional legislation.

7.1 The Environmental Protection Law

As written in the introduction, the Assembly of Kosovo has passed an Environmental Protection Law (EPL). The next section of this chapter will analyse which focus this legislation has.

The introducing paragraph of the law states, that the Assembly is committed to, and the framework law adheres to, *“to the goal of providing the people of Kosovo with an*

increasingly healthy environment” (EPL, 2003:introduction). Thus, quite like the old Yugoslavian environmental law, the people of Kosovo are not granted a right, as such to a healthy environment. The purpose of establishing this basic legal framework is to: *“Provide an increasingly healthy environment through the gradual introduction of the environment of standards of the European Union ”*(EPL, 2003: Art 1,1). The law should furthermore *“ensure that the creation of such an environment is accomplished in a manner that is affordable and consistent with sustainable economic development”* (ibid). The law does not further elaborate on how exactly the introduction and implementation of EU standards can be done in a manner that is affordable and consistent with sustainable economic development, although the balance between economic and environmental considerations traditionally is problematic to strike.

Chapter two in the environmental protection law does, however set out a Kosovo Environmental Protection and Sustainable Development Strategy. Although, this strategy is formulated in vague and imprecise terms and in general only states that policy proposals shall be formulated to identify environmental strains. Of particular interest is the intention that the development strategy shall include *“an analysis of the state of the environment and an identification of main Excessive Environmental Strains and their affects on the public health”* (EPL, 2003: Art 6, f). Excessive Environmental Strain is defined as *“Pollution, Emissions or Discharges that exceed the applicable limits established by the present law or a subsidiary normative act issued pursuant to the present law”* (EPL, 2003: Art 2,m).

If such excessive environmental strain or critical strain is identified it is the owner of such piece of property that, if the concentration *“constitute a genuine and significant danger to human health or the environment”* (EPL, 2003:Art. 5,h) shall abate and reduce such concentration (Ibid.). However, the owners are not liable to reducing or abating the concentration if the concentration is the result of the activity of a socially owned enterprise (SOE). Thus, the question arises, who has the responsibility for the reduction of the concentration causing environmental strain at Trepca, as this is the result of the activity of a SOE and is owned by the state? Article 5,j, Principle of Subsidiary Responsibility, states, however, that if no person, group or undertaking can be imposed liability, it is the government that shall be responsible for bearing the cost *“in accordance with its financial ability, involved in reducing or abating a concentration of pollutants or hazardous waste that constitutes an Excessive or Critical Environmental Strain or repairing Environmental Damage”* (ibid.). Thus, it appears as if, the government in the case of Trepca will be footed with the clean-up bill. To identify who the government is would appear to be an easy task to do, as it would appear that it would be MESP left with the responsibility. However, the Division Head of Environmental Protection, MESP Nezakete Hakaj stated, that it was UNMIK’s responsibility (Hakaj, 2003).

With regards to discharge and emission limit levels, the law states that “*all subsidiary normative acts authorised [...] shall be developed, adopted and amended from time to time so as to gradually phase in relevant EU-standards and requirements in a manner that is both realistically affordable by public authorities, person and undertakings and consistent with the sustainable economic development of Kosovo*” (EPL, 2003: Art 10, 2).

Being a framework law, the law does not specifically state the precise discharge and emission level limit. Therefore, it must be assumed that the former Yugoslavian standards as set out before the 22 of March 1989 are applicable at the moment.

7.1.1 WATER PROTECTION

Article 29 sets out the framework law for water protection. It states that:

“Without prejudice to standards, rules and prescribed limit levels of pollution, the following is prohibited: discharge into waters of solid, liquid, or gaseous non-toxic materials, including organisms and different types of energy, that directly or indirectly cause a change to the turbidity, sedimentation, flavour or other changes to the quality of the water” (EPL, 2003:Att29).

From the lingua used in this sentence it could appear as if any discharge into water streams that cause a change to the quality is prohibited, including discharges or changes that might improve the water quality, which results in a rather absurd situation.

Yet, taking into account that the legislation aims at bettering the environment, it seems a bit strange to use the formulation “that cause a change”. It can be argued that the legislation has not been developed thoroughly enough, and that this formulation is a mistake. Concluding on the basis of the general lingua used in the law, the meaning of this article probably should be something like: *including organisms and different types of energy, that directly or indirectly worsen the turbidity, sedimentation, flavour or other changes to the quality of the water*.

With the new suggested formulation it would be prohibited to worsen the quality of the water, and thus, article 29 would make sense in a sustainable perspective, and in the perspective of the rest of the legislation.

7.1.2 CONCLUDING REMARKS

Although, this 35 page long environmental protection law is only a framework law and leaves some issues to be desired, it can all in all be said that it at least, is a step on the way towards a better environment and increased environmental protection. The law clearly sets

out that its aim is to adhere to EU environmental standards some time in the future. The time frame for this is, however, not stated in precise terms, nor is any other commitments, for example when exact discharge levels will be established and when enforcement of the law will be commenced. With regards to achieving EU standards the division head of environmental protection agency of the MESP argued that it would be achieved within 10 years (Hakaj, 2003). These ten years is at the same time the same time limits that are set for EU-member ship countries to implementate the EU water frame directive. However, water management expert, and consultant for the MESP Stuart R. Brown, who has advised Eastern European governments about river basin management for the last 10 years, argued that 15 years would be a more realistic time frame to operate with (Brown, 2003).

Nevertheless, the intentions of the transposing EU law can not be disputed and therefore, the following section will set out to discuss how EU directives can be relevant to deal with in order to regulate environmental problems such as Trepca, and what impact it will have on the environment.

7.2 EU Environmental legislation

This following section will, hence the aims of working towards European legislation, set of in EU directives. It will be argued, that Kosovo actively can do something about the environmental problems by implementing the European legislation. This will be exemplified by setting specific articles up against some environmental problems at the Trepca plant, and it will be followed by a discussion whether the articles in the directive can be used to handle the problem. Legislation does of course not result in environmental improvements itself. Experience have shown that it is not enough to create institutions and authorities that will introduce and implement environmental legislation, it is also of importance to change the behaviour of industries and citizens, ensuring that the legislation is actually complied with. The environmental authorities have to get used to a new role as facilitators of establishing dialogue between different interest groups (Danish Environmental Protection Agency, 1997: 51) Yet by adhering to the aims of the Environmental Protection Law of Kosovo, it seems that the government in Kosovo has a strong wish and initiative to implement the EU directives and to enforce the passed legislation. This was also argued by the division head of environmental protection, Nesakete Hakaj (Hakaj, 2003). For that reason this following section will exemplify the ultimate results of the directives, and a discussion of barriers to an implementation will come in chapter 8.

7.2.1 EU DIRECTIVES AND KOSOVO ENVIRONMENTAL PROBLEMS

If discussing the environmental problems at the Trepca mining complex, some pollution sources are certain to pop up. Heavy metal emission from the tailings, into the River Ibar is

as described in chapter five a major pollution problem. As an example it can be mentioned that the measurements that has been carried out shows, that the lead concentration in the Ibar River is 85-100 times higher than it is accepted in drinking water by the WHO⁴⁸. The Ibar River⁴⁹ is a fast moving river, and because of the fast flow, and the course of the river, it is logical to focus on the EU framework directive in the field of water policy⁵⁰. To get a picture of what elements that will influence the future legislation and because of the political development in the area, where Kosovo's legislation is being aligned with the EU, this section will tease out which environmental restrictions the EU has set up. Having the pollution into Ibar in mind the EU water frame directive is the one to use, if Kosovo has a wish to handle problem like this both now and in the future. The next section of the report will analyse which parts of water directive that is useful to deal with Trepca.

7.2.2 THE EUROPEAN UNIONS WATER FRAME-DIRECTIVE.

EU directive 2000/60/EC

The basic consequence of implementing the water frame directive is that Kosovo will have to adopt a certain administrative way of handling the water. The demands to the EU member countries are that all water courses, protected areas, lakes and groundwater has to be split up in different water basin districts. The river basins districts are defined and this opens the possibility for the authority to develop specific actions plans to control of each specific basin, and thereby enhance the quality of the water in the basin district.

The water frame directive sets up demands to the authorities responsible for each basin. One demand is that the water quality has to be analysed of its characteristics. Another is that a review of human activities has to be worked out. These demands are set in order to be able to rank the districts in different categories in order to compare the areas and to make it easier to formulate aim for the district.

In the case of Trepca an aim could be that within a certain number of years the Ibar River water district should go from category six to category four. This would mean that an improvement of the water quality had been reached.

The water frame directive states, that: *"Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such."* (Water-directive: 2000, § 1 introduction)

⁴⁸ WHO drinking water standards is 0.01

⁴⁹ The State of the Environment in Kosovo report states that the flow in the Ibar is 33 m³/sek.

⁵⁰ EU directive 2000/60/EC

The basic purpose of the water framework directive is to establish a community, which will protect the inland surface waters, the transitional waters, coastal waters and groundwater. This aim is to be reached in order to prevent and reduce pollution, to promote sustainable water use, to protect the aquatic environment, to improve the status of aquatic ecosystems and to mitigate the effects of floods and droughts. (Water-directive: 2000, A1, § a)⁵¹

These goals are to be reached by setting up guidelines for the administrative structure of the planning and completion of initiatives with the aim to monitor the water environment and quality, and to take action towards reducing and hopefully prevent further pollution. The frame directive is build up in a way where it both has environmental goals and criteria, but also has structural demands for the organisational structure of the ministry that, in the future, will handle the directive.

This section of the report will not be dealing with the actual future structure of such a ministry, but instead be dealing with the overall demands to the authority that shall handle the legislation and likewise to the environmental goals.

The Water Frame-directive is quite comprehensive and the criteria of success are set high. This will of course also have consequences for the structure of the governmental organ that will deal with the directives. In this case, because of the uncertain future of Kosovo, it will most likely be the environmental ministry, either in Kosovo or in Serbia. The situation in Kosovo is as stated earlier, yet not stable enough to conclude which part that will be the controlling. Hence it is even harder to predict how the environmental Ministry will be organized. To go deeper into the directive this project will point out different articles and discuss which environmental effects the application of this could have on the environment. The water frame directive has a series of priority substances, which is to be handled when occurring in the nature, and in clinch with the aims of this directive. Lead and Cadmium are among those priority standards and are therefore important to have in mind while reading the directive.

The introduction of the directive states among other that:

“Water is not a commercial product like any other but, rather, at heritage which must be protected as such”.

“This Directive is to contribute to the progressive reduction of emissions of hazardous substances to water”.

⁵¹ A = Article

“The ultimate aim of this directive is to achieve the elimination of priority hazardous substances and contribute to achieving concentrations in the marine environment near background values for naturally occurring substances”.

“Member States should adopt measures to eliminate pollution of surface water by the priority substances and progressively to reduce pollution by other substances which would otherwise prevent Member States from achieving the objectives for the bodies of surface water”.

(WFD⁵², 2000: introduction § 1,22,27,45)

These statements are some of the basic ideas behind the water frame directive. They give a good idea about what the purposes of this directive are, and which steps that has to be taken to meet these goals. It can be concluded that the focus of the directive is to protect water as it is a heritage of all people. It could be argued that water from this point of view is one of the most important elements that have to be preserved. Not to prioritise which natural reserve that shall be protected the most, but just to argue that water is very important in all countries and that the preservation should be regarded as a high ranging priority.

The next quote states that emissions and pollution has to be reduced or eliminated. In the case of Trepca a constant flow of water containing heavy metals are flowing into the River Ibar from the creek Leskov, and initiatives should be taken, to prevent the constant pollution of, among others lead and cadmium.

The aim in the third quote is to reach the natural background levels for the area. Of course there are higher background levels of heavy metals in areas, which contain large amounts of minerals. The fact that mining in the area had been going on since the Roman Empire (Payne, 2003), also effects the somewhat natural heavy metal levels in the area, while mining never has been an environmental friendly industry. Even though there are high levels of lead and cadmium in the River Ibar, the findings of the water sampling at the Leskov shows that there is a constant contamination of the Ibar River. The Leskov Creek is only one of the ways that heavy metals are carried from the tailings into the River. As discussed in chapter 5 both rain and groundwater has the ability to transport the heavy metals into the River Ibar. Furthermore the rainy spring brings water from the mountains and the banks of the river rise to a level that is above the bottom of the tailings. In that way heavy metals are lead into the river by erosion.

The last quote is directed at the member countries. The goal is that the countries should actively adopt measures that prevent the pollution of the surface waters. In the case of the

⁵² Water Frame Directive

pollution from the Trepca tailings, this means that The MESP should make sure that the emissions from the tailings are eliminated. One way of doing this is to close the tailings as described in chapter five.

The introductory paragraphs of the directive does, however, also include statements like the one in paragraph 31:

“In cases where a body of water is so affected by human activity or its natural condition is such that it may be unfeasible or unreasonably expensive to achieve good status, less stringent environmental objectives may be set on the basis of appropriate, evident and transparent criteria, and all practicable steps should be taken to prevent any further deterioration of the status of waters”(WFD, 2000:§31).

This paragraph states that economical concerns can be taken into consideration. The reason why a paragraph like this is formulated can be seen as a pragmatic way of developing a directive. Countries which cannot afford to implement the directive, can according to this paragraph adopt the directive to the extent economically possible. This can be seen as a opinion about that, a little environmental progress at a time is better than no environmental progress at all. Article 1 furthermore supports the objectives of the directive in the introduction in the directive.

It is stated:

“The purpose of this Directive is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater which:

(a) prevents further deterioration and protects and enhances the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems;

(b) promotes sustainable water use based on a long-term protection of available water resources. (c) aims at enhanced protection and improvement of the aquatic environment, inter alia, through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances;

(d) ensures the progressive reduction of pollution of groundwater and prevents its further pollution,

(WFD, 2000: A1, intro, §b,c,d)

The first article starts as it can be seen above, with a purpose of the directive. It sets up clear problems that have to be solved and it also gives the answer of how to deal with the environmental problems. The first part of the article deals with the aquatic ecosystems. The

River Ibar has in a recent classification been categorised as a dead river. Hence, that there is only one way forward, and that is to improve the water quality in the river. The next part is not directly relevant to the Ibar River, when it is discussed in the case of the Trepca plant. However, this paragraph would possibly be relevant when discussing the water reservoir from where the citizens from Zvecan to Pristina get their water. In a matter of fact this is also the Ibar River but the area discussed is closer to the riverhead. However, a sustainable water use, in Kosovo is far away, and besides the pollution problems at Trepca, a start would be if the domestic wastewater from both Pristina and Mitrovica was treated, before it was discharged into the Ibar River.

The third point is relevant when discussing the pollution problems at Trepca. This part of the article is aiming at enhancing the protection and the improvement of the aquatic environment. A framework to the protection of surface water has to be settled, and specific measures have to be taken, to cease the emission from the tailings. The fourth point of the article one is dealing with groundwater and this is more than likely also relevant for the tailings in Zvecan. Measurements at the Trepca South, which is placed in the Albanian part of Mitrovica, shows that the cadmium levels is 274 times higher than the drinking water levels set by the WHO. The water measured at the Trepca South is not drinking water, but the major difference in the heavy metal levels from the wells and the drinking water limits gives an idea of how polluted this water is.

7.2.3 ADMINISTRATIVE DEMANDS OF THE DIRECTIVE

Beside the environmental demands, the water frame directives also have organisational demands to the member countries. While Kosovo only has stated that they want to align with the EU legislation they have not forced themselves to harmonise exactly with the EU standards and legislation. Because of that these paragraphs do not necessarily have to be implemented in the Kosovo Environmental Protection Law, since the National Assembly, has not formulated any organisational goals. Yet, if Kosovo wants to join the European Union some time in the future, it will have to adopt the administrative arrangements, which are demanded for the river basin districts. Some examples of organisational demands are following below:

“Member States shall ensure the appropriate administrative arrangements, including the identification of the appropriate competent authority, for the application of the rules of this Directive within each river basin district lying within their territory.” and “Member States shall provide the Commission with a list of their competent authorities and of the competent authorities of all the international bodies in which they participate at the latest six months after the date mentioned in Article 24. For each competent authority the information set out in Annex I shall be provided.” (WFD, 2000: A,3, §2,8)

The reason these paragraphs are mentioned is that demands are set for which authorities are proper to handle the water frame directive. Likewise, the government will have to define which authorities that should apply and enforce the future environmental rules of Kosovo. The date mentioned in the quote is quite unimportant but one of the requirements in Annex I should be mentioned. That is the demand of “*a description of the legal and administrative responsibilities of each competent authority and of its role within each river basin district*” (WFD, 2000:Annex I). The purpose of this quote is to accentuate the importance of defining the fields of responsibilities within the actors, while enforcing the legislation. This can be seen as a wish from the EU, to be able to evaluate if the authority is good enough to handle the directive, and the consequences of it. This should ensure that the directive is used and that the authorities’ works within the frames of the directive, and reaching the goals set out. For an example it could mean that the River Ibar was categorised. The usage of the river water was analysed. The analysis of the water in Ibar it would find that people fish in the water. It would furthermore be found that the smaller villages downstream from Trepca have wells not far from the river, and that the fields placed next to the river are flooded in the spring when the river occasionally overflows. This should give some initiatives to develop improvement plans for the water district.

Some results of an improvement of the water quality is that cleaner water would make it possible for the farmer to irrigate the soil, which is a necessary mean in order to develop the agriculture in the area. Other initiatives could be that companies would have easier access to water if they did not have to clean it before use. The water can of course be cleaned before use but that will result in an increased start up costs, for the company or investor this might lessen the initiative to start industrial companies in the specific area.

The weightiest argument of cleaner water is the human health situation. Generally cleaner water usually results in healthier people, which again will result in initiatives to cleaner water, etc. Healthy people are also a more stabile workforce and this should be yet another argument for better water resources.

However, from an environmental point of view, the whole discussion of reasons to do something about the environment should not be discussed with economical arguments. Environment is too important, and should be prioritised highly, because everybody should have the right to a healthy and clean environment. Another reason is the argument that we shall give the generations after us the possibility to live in environmental equality with us. Hence we have to do our best to live in a sustainable society and we have to do our best to undo the mistakes that we have done.

Is the alignment of the EU then the best way to a better environment for Kosovo? There is no doubt in the discussion of which way Kosovo is heading at the moment. It is a fact that the European environmental legislation is a lot better than the former legislation in Kosovo. However is adopting the EU directives the best way to achieve the best possible environmental results?

One could argue that the demands of the EU are too comprehensive. As written earlier paragraph 31 states that the member countries have less stringent goals if the costs of fulfilling the demands of the directive are unfeasible or unreasonably expensive. Some politicians in Kosovo might argue that the feasibility and the costs of implementing a directive like the water frame directive exactly are the reason why Kosovo should not adopt EU legislation.

Water Management expert Stuart Brown, which is working as a EU adviser for the Kosovo government, agrees to a certain extend. He does not think that Kosovo should not develop a wide-ranging environmental legislation and he does not think that Kosovo should not prioritise the environment highly. He does, however think that Kosovo can reach further by using other environmental instruments than the EU water frame directive. The reason why the directive is not the ideal instrument is not because of the aims and the environmental demands. It is rather the monitoring and the classification, which demands a large organisational body. The monitoring work for each river basin has to analyse on many different levels. This huge organisational work is according to Stuart Brown too much to handle and too expensive for Kosovo. Mr Brown believes that it would take Kosovo more than 15 years to implement the water frame directive. In addition to that the infrastructure is very poor concerning water treatment plants. For an example Slovenia used around 30 billion euros to implement EU law. Kosovo is far behind what Slovenia was when they began implementing the EU legislation and thus it will probably cost more to do the same in Kosovo (Brown, 2003).

As a consequence of his critique of the Assembly of Kosovo's wishes, Stuart Brown has developed an alternative water management plan "A Realistic Perspective on River Quality Standards." The idea behind the report is based on the fact that Kosovo has limited resources and that Kosovo therefore cannot reach the goals they wish to reach by implementing the water frame directive. Hence *"Kosovo needs a system of river quality standards, which allows it to set realistic short-term objectives and then upgrade these as part of a phased programme to improve river quality."* (Brown, 2004; 1)

The basic idea in the report is to look at things that a country has to design, in order to plan and manage surface water effectively. According to Stuart Brown Kosovo has to reduce the

classification procedure and it has to be directed towards a suitability perspective. Compliance requirements have to be set for the different classes, in order to decide if something has to be done. And Kosovo has to use the quality requirements set to derive emission limits for discharges that enter into a river.

The way of building up a management system as the one suggested by Stuart Brown is based on more simple analyses. This should result in, that it is easier for Kosovo to develop action plans to clean the water and therefore end up having a better environment. Stuart Browns way of thinking is very pragmatic and he works with the environmental problems from a point of view that can be narrowed down into a quote of Stuart Brown: *“They (MESP) have to learn how to walk before they can run”* (Brown, 2003).

7.2.4 EU DIRECTIVES AND MINING

Trepca’s aim of restarting the mining in the Stari Trg is as discussed earlier in the report not without problems. Experiences from other countries with heavy metal exploitation have shown that there are problems with the storage of the waste from the flotation process, the tailings. Accidents have happened in Wales, Italy, Bulgaria and Spain. The problems are related to the stability of the storage of the tailings. Tailing material is stored in different ways. The most common is to store the material in heaps or pools. The problem is to secure the stability of either the walls holding the heaps and the dams holding the pools. If there is a rupture in either of barriers, large amounts of heavy metal containing material can be spread over a large area. In Wales in 1966 sliding tailing material killed 144 people. In Trento in Italy in 1985 200,000 m³ material killed 268 people. In Aznalcollar in Spain in 1988 2 million m³ material and 4 million m³ heavy metal contaminated water flooded the Guadamar River close to the Doñana National Park. (Mine directive, 2003:2)

In the light of these examples, it can be argued, that legislative steps towards securing a proper management of the material are necessary to prevent such kind of accidents. The European Union is at the moment developing a new directive on the management of waste from the extractive industries⁵³. The purpose of the future directive is to set some demands for the improvement of the waste management in the field. The proposal for the directive contains demands about the approval of waste management plants. The directive makes the extractor analyse the amount of waster that will be produced, and how it is going to be managed. Furthermore the waste has to be analysed, and thereafter handled in an appropriate way. Furthermore the directive aims at demanding a financial security from the extractors, in order to have the necessary funds to close mining sites (Mine directive, 2003:5)

⁵³ The proposal can be found on: http://europa.eu.int/eur-les/pri/en/lip/latest/doc/2003/com2003_0319en01.doc

Legislation like this would possibly result in, an absence of environmental problems like Trepca in the future. Trepca should when opening the Stari Trg mine have the guidelines from this directive in the back of their mind. Following these restrictions would result in a more environmental friendly way of extracting heavy metals, and the human consequences of a cleaner production will be worth working for. However, the problem is if the government of Kosovo will prioritise the environment highly enough. It is true that Kosovo in its legislation has committed itself to aligning itself with the EU, but is that enough. Will the economic aspects weigh more heavily than the environmental problems? The next chapter of this report will deal with the environmental and economic priorities and these will be discussed in a socio-economic context.

8. Obstacles and benefits of environmental priorities

How environmental priorities and policies may be introduced in Kosovo's society given the socio-economic context of the territory will be discussed in the following chapter. It will in particular attempt to tease out the obstacles that Kosovo might have in prioritising environmental concerns into its overall development strategy and discuss the rationale behind focusing on other pressing development issues.

The structure of the chapter will be as follows. Through an analysis of the term sustainable development itself, it will be discussed what can be expected from the UNMIK and the MESP. Afterwards, the obstacles for and possible motives behind not focusing on environmental issues, will be discussed, followed by a discussion of the possibilities of NGO's having an influence on the environmental development. Hereafter the role of the EU and its influence on the prioritising of environment will be discussed. Last but not least possible benefits of an environmental focus will be argued.

8.1 The socio-economic context of Kosovo and its development objectives.

As discussed in chapter 3 and 4 it is quite clear that Kosovo in terms of development faces a range of problems. It has many of the same problems that other transition countries in the region faces, but it also shares some features, such as widespread poverty and lack of access to safe water that is usually associated with developing countries in the so-called South. As shown in chapter 3, Kosovo's Human Development Index (HDI) rating is not much higher than middle-income developing countries, and is ranked far below other Southern and Eastern European (SEE) countries. Comparisons between Kosovo and other transition economies, but also some developing countries, may therefore be relevant, in order to create a framework for discussing and understanding development problematiques and the extent to which it is justified to prioritise environmental issues in such a context. At the same time, it should naturally be noted that Kosovo has some unique features and policy requirements that are specific only to Kosovo⁵⁴, which means that not all experiences from other developing countries and transition economies are applicable in a Kosovo context.

There are massive problems in Kosovo given the fact that the country has been through war, which has destroyed most of the infrastructure. The territory is under UN administration and largely dependent on international aid for funding. The political status of the territory is uncertain resulting in outburst of violence between the Serbs and the Albanians, even now 5

⁵⁴ Such as ethnic problems and lack of a clear political status.

years after the war. The newly elected government is still fragile and in a very early stage of its development, with only few institutions and administrations functioning properly and with only a few framework laws in place, which still needs development. Half the population suffer from poverty, which is prevalent. The economy is stagnant and frozen on a very low level of productivity. Unemployment and underemployment is high, affecting approximately half the able bodied workforce of the population. On top of all this, the territory is going through transition from socially planned economy to a more market based economy, which often requires more than changes to the system, but also a change in values and belief systems amongst the population (Baker, 2002).

The Kosovo Trust Agency (KTA) is trying to privatise many Socially Owned Enterprises (SOEs), in order to bring about and attract foreign investment and thereby, it is hoped, economic growth will ensure. In many ways, as chapter 4 argues, Mitrovica and Trepca is a case that illustrates the general development problems of the country quite accurately. It is within this context that Kosovo has to tackle the environmental problems, such as Trepca by incorporating these concerns into its development strategy. The following section will analyse how environmental problems are conceptualised and prioritised in Kosovo.

8.2 Kosovo's political aims and sustainable development.

It would appear when reading the development priorities set out by UNMIK that environmental concerns are valued high and that efforts are made into resurrecting the environment. Thus, for example, the European Agency for Reconstruction (EAR), who has the responsibility for the economic and social reconstruction of Kosovo, states that it is working towards achieving sustainable economic development. The Department of Reconstruction, furthermore states that:

“The common ambition of the people of Kosovo, UNMIK and the international community, goes beyond the return of Kosovo to where it was in the beginning of 1999 - or even in 1989. Our ambition is to put Kosovo on the track of sustainable economic and social development”. (Quoted from HDR 2002: 73).

Although the MESP, as already discussed in chapter seven, does not explicitly state that it aims to achieve sustainable development, it has formulated a sustainable development strategy and the Draft Action Plan, as discussed, sets out the priorities in order to move towards sustainable development. Kosovo has made a strong commitment of sustainable development, but what does that mean on a broader theoretical level? And what has actually happened in reality in Kosovo? The following section will tackle the first question and then proceed to outline an answer to the second question.

8.2.1 SUSTAINABLE DEVELOPMENT AND ITS MEANINGS.

It is not surprising to find commitments towards achieving Sustainable Development in Kosovo's development strategy. Without doubt the term "Sustainable Development" has become one of the most prominent phrases in the development discourse and one would expect to find it in any recent formulated development strategy. The dominant definition of sustainable development, put down by the Brundtland report, reflects the altruism of the term:

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland 1987: 43). It is also capable of breaking down the barriers between distinct disciplines such as economics and environmental studies, which might have hampered the cooperation between the two disciplines in the past, where the pursuit of economic goals often conflicted with environmental aims. The links between development, environment and health has also received more attention since the emergence of the term sustainable development. This has helped focus policy attention on environmental health determinants, particular with respect to pollution and resource depletion" (Corvalán 2000:13).

Some scholars argue that the term only do this because it is superficially simple, and in the same time capable of carrying a wide range of meanings and interpretations (Adams, 2001:4). In this way, as Adams argues it is a term that has power, but is devoid of meaning, which is clearly illustrated by the range of definitions that Sustainable Development have (Adams, 2001,4).

Adams point is that the term gives the user an opportunity to make high-sounding statements with very little meaning. Sachs argues that the term in its mainstream interpretation *"is explicitly conceived as a strategy for sustaining development"* (Sachs, 2001: 16) and not to critically analyse the environmental and social problems that development, in its own right might create. Part of the problem with this term, naturally lies with ambiguous meaning of the term development itself. Thus, although the phrase sustainable development is used to describe Kosovo's development strategy and it seems like a self-evident strategy to adopt, as discussed above, it is in fact in reality seldom pursued, which the literature within development studies (Adams, 2001) and the experiences from the transition countries in Eastern Europe (Carter and Turnock 1993, Pinder, 1998) testify to.

It is therefore, necessary not to accept the statements of sustainable development at face value, but to critically examine how and to what extent sustainable development in practice and in reality is intended to be carried out, if at all.

As a matter of fact, although Kosovo is in an early stage of transition, UNMIK has already been criticised for not focusing enough on the environmental problems, manifested by the fact that environmental legislation and institutions were some of the last areas of policy to be clarified (REC 2000: 22, HDR, 2002:93). However, UNMIK is not alone in relegating environmental issues below other concerns. The World Bank and the European Commission, which developed a program for reconstruction and recovery in 1999, also in the short and medium term recommended a reactive rather than a preventive approach to the prioritising of environmental problems in relation to other economic needs. Thus, they argued that:

“In the short term a balance has to be found between environmental concerns and the need to restart some of the most polluting installations. Beyond the emergency period measures should be taken to mitigate environmental risks”. (European Commission and the World Bank, 1999: 134).

The essence of this argument is that environmental problems will have to wait with being solved in favour of spending money on promoting economic growth and other services. There are however, two hidden assumptions in the quote that will have to be scrutinised. The first one is that when you adopt a reactive approach to environmental problems, rather than a preventive approach as the statement implies, that it is possible to mitigate against the environmental problems created at a later point in time. Yet, unresolved environmental problems that have a potential negative health impact on people as in the case of Trepca will not be possible to mitigate against subsequently. The word mitigate also implies, that the point is to take the pollution less severe, implying an end-of pipe solution, rather than solving the problem at the source, through for example cleaner technology.

The second assumption is that postponing dealing with environmental problems will not have a detrimental effect on the objectives prioritised above environmental concerns, such economic growth. In Kosovo’s Environmental Protection Law this assumption is also evident, in that they state that the aim of creating an increasingly healthy environment should be consistent with sustainable economic development (EPL, 2003, art. 1). Thus, economic development must not be hampered on the basis of environmental concerns. An indicator of the values attached to a clean and healthy environment in Kosovo is the budget allocation that the MESP has been awarded. The total budget for environmental spending was 396,000 DM in 2001⁵⁵, which represent less than 0,1 % of the overall Kosovo budget (HDR,

⁵⁵ Amounting to approximately 202,471 Euros.

2002:98)⁵⁶. Thus, the funds are limited reflecting the political will to improve the environment relative to other development priorities. It also raises the question of whether the declaration and ambitions stated in the Environmental Framework Protection Law are merely declarations of intent rather than of what can be realistically achieved with such small funds allocated to the MESP.

Despite the recognition that environmental issues have a legitimate place on the development agenda manifested by the invention of the term sustainable development, there still seems to be power structures in society that restrict the attention given to environmental issues and thereby helping to legitimise the constructed dichotomy between the environment and economic issues. This apparent dichotomy is the problem that all administrations with only limited funds have to deal with and strike a balance between. Often this balance is reached in favour of economic priorities, but it is not difficult to understand why, they are perceived to be more important, as the following quote illustrates, stated by the Indian leader Indira Gandhi representing the position of the developing countries on the issue of environment and development at the Stockholm Conference on Environment in 1972:

"Aren't poverty and need the most important pollutions? How can we talk to villagers and slum-dwellers of the need to protect the air, the ocean and rivers when their own life is contaminated? The environment cannot be improved in conditions of poverty" (quoted from Boesen et al 2002).

The statement illustrates the apparent contradiction between environment and development, i.e. that focusing too much on environmental issues will hamper growth and development and thus poverty reduction in the developing countries.

Today, it appears that Sustainable development has a more prominent position and it is therefore, the government as an environmental actor has the principal responsibility and duty to develop and enforce coherent environmental goals. However, environmental policy is not their only goal, quite frequently it can be expected that other interests and goals are deemed more important. A governments overall goal is to become re-elected and they therefore tend to neglect important environmental issues if they are perceived to be going against the overall majority of the populace opinion. Issues like unemployment, budget constraints and social poverty are likely to enter into contrast with the environmental policies and programmes of government. All in all it appears as if Kosovo has taken a tentative approach

⁵⁶ For comparison the Danish Environmental Ministry spent 22,3 billion kroner (Lomborg, 2002), amounting to approximately 3 billion Euros.

to their sustainable development commitments, which perhaps is not so surprising given the very early nature of their transition process.

The question is, if it is indeed correct to assume that relegation of importance of environmental concerns relative to economic aims will not have an adverse effect on the possibilities for achieving economic growth and other socio-economic ambitions. This assumption will be further analysed in the project.

Whether it is wise for the Kosovo government to take a tentative approach to incorporating environmental issues into their development strategy, can perhaps the experiences from other transition countries help shed light on. Furthermore, these experiences may also help highlight what possible obstacles Kosovo can expect in the future when it has to balance different and even seemingly contradicting development objectives, such as economic growth and environmental protection.

Thus, the purpose of this section is to analyse the environmental trends during transition drawing on the last 15 years of experience from these countries and tease out some relevant lessons and guidelines that Kosovo might learn from.

8.2.2 *TRANSITION IN THE EEC*

Since 1989 many EEC's have undergone transition from socialism to capitalism and should thereby in theory move ideologically and economically closer to Western Europe and the EU. However, the transition process has in effect created greater economic disparities between regions in Europe (Dunford and Smith, 1998: 210), as the experience of transition capitalism has been one of economic collapse (Ibid. 207), the results of which have been profound increases of poverty and inequality.

As already discussed, these conditions are duplicated in Kosovo as well⁵⁷. With regards to the environment it was assumed that the post-communist countries could avoid the environmental problems of the West brought about by the constantly diversifying consumerist attitudes, through integrating environmental concerns into their economic programmes at the outset (Saiko, 1998: 381). However, these optimistic hopes have not materialised firstly because of the dire environmental situation inherited from the communist era's legacy and secondly, due to the devastating environmental effects that the transition in itself has caused. Although the environmental problems differ significantly in magnitude and

⁵⁷ Naturally, the discriminatory policies of the Milosevic regime and war have also exacerbated these problems.

scope across the EEC, it is possible to describe the overall situation as one of an ecological crisis (Saiko, 1998: 383)⁵⁸.

With regards to the first point, it is argued that the environmental problems inherited from the socialist past originated from state attitudes towards development and nature (Saiko, 1998). From an historical point of view the Stalinist model of economic development meant that the highest priority was assigned to heavy and energy industries and was based on a very high consumption of raw materials. This type of economy created a specific development pattern, in which the concentration of industrial and mining enterprises – and therefore pollution- was situated in a single geographical region. Trepca and the so-called “Black Triangle⁵⁹” in central Europe are examples of that.

It is argued that the causes of environmental crisis go beyond just state attitudes, which cultivated pollution economies (Saiko, 1998: 387). As Saiko argues it is important to recognise the role of political, legal and social forces in the creation of the current environmental crisis. It is argued that the socialist attitude, towards nature is one, where nature is merely seen as a mean to an end, thus negating environmental issues. This idea that the socialist ideology results in environmental disregard gives rise to the argument that transition to a liberal market economy would be the panacea for solving environmental problems, as Western European countries according to some, in comparison have relatively less environmental problems (World Bank 1992a, World Bank, 1999:2). It was assumed that economic restructuring, privatisation and liberalisation of the economy would implicitly create the mechanisms needed for a rehabilitation of the environment, and also the prevention of any further destruction (World Bank 1992a, World Bank, 1999: 2). The strong belief in this assumption is clearly illustrated in some of the reports assessing the process of transition that the World Bank has made, in which transition is reduced to encompassing economic issues and their associated social effects (World Bank, 2002). Environmental issues are not mentioned at all and it is quite clear that the economic bias and justification for not analysing environmental problems must be based on the assumption that environmental issues will not effect the success of the transition process itself, but will be solved on their own accord in due time.

However, many scholars are not blind to the bias, as they have convincingly argued that the problem of environmental degradation stems not from socialism (or capitalism), but is a

⁵⁸ Although it should be noted that the economic collapse that some transition economies have experienced, also have resulted in environmental improvements, such as reduction of air and water pollution.

⁵⁹ The term refers to the area that encompasses the Silesian district of Poland, Northern Bohemia in the Czech Republic and the South-eastern part of the former GDR, which was dominated by heavy industries causing severe air pollution.

product of modernity, of which both ideologies are rooted in (Saurin 1996 and Paterson, 2001). Thus, it cannot be assumed that the transition to capitalism will automatically solve environmental problems, nor that environmental issues does not have an effect on development and the transition process in itself. Indeed, it therefore comes as no surprise to these scholars that the period of transition has been marked, not by better environmental performance, but in fact by further degradation (Manser, 1993).

Although, as already noted many transition economies, including Kosovo have observed a decline in environmental pollution as a result of the decrease in economic activities, this reduction in pollution is not proportionate to the economic decline observed, i.e. the pollution levels have not fallen as much as the economic levels have fallen (Saiko, 1998). Furthermore, in the attempt to recover from the economic decline caused by transition it has also been observed that environmental regulation and protective measures have in general been neglected, resulting in that industries tend to pollute more than they used to do (Saiko, 1998: 389).

Although there apparently not has been conducted any research into the relationship between economic and social losses arising from negation of environmental issues during the transition process⁶⁰ of, this relationship is found valid in other historical contexts, such as in the development literature (Todaro 2000, Adams 2001) and in literature on Socialist Eastern Europe. In the late 1970's in Poland for example it has been estimated that the degradation of the natural environment amounted to at least a tenth of the national income (Carter and Turnock 1993: 203). Major burdens arise through lost working time due to illness and the cost of hospital treatment for conditions caused or aggravated by pollution (Ibid.) thus, the neglect of environmental issues can in fact have detrimental economic and health effects.

In conclusion, it can therefore be said, that the assumption that transition implicitly and automatically will reduce environmental problems is not valid. It is therefore dangerous for Kosovo to be too lax about their environmental ambitions as is likely to result in adverse environmental problems, which has spill over effects on social and health issues. Yet, it must be pointed out that in some CEE countries there were a strong will to do something explicitly about the environmental problems. It was in fact the expectations of ecological improvements that helped bring about the quite revolutions in many CEE (Manser, 1993: 1), thus in many CEEs there were ecological movements which thought it necessary to explicitly adopt more environmentally friendly development strategies (ibid., Carter and Turnock 1993, Turnock 2001). It is therefore particular intriguing to investigate why,

⁶⁰ The transition process in Europe is unprecedented and still evolving, which perhaps explain the lack of research into this issue.

despite these aspirations, that environmental issues failed to be put onto the development agenda in an explicit and general manner. An analysis of this might help clarify the conflicts of development and provide insights and an understanding of the problems Kosovo faces and will face.

8.2.3 FROM ECOLOGICAL REVOLUTIONS TO A SQUANDERED DIVIDEND

The inadequacy of the environmental legislation and acute environmental problems lead amongst other things to the formation of environmental groups in several CEE in the 1980's (Dingsdale and Lóczy, 2001: 189), in particular in Poland (Carter, 1993a: 124), East Germany (Manser, 1993: 73) and Czechoslovakia (Carter, 1993b: 87). These environmental movements played a significant role in the downfall of the communist governments, as noted above and at the time it appeared as if they had such massive popular support that they could influence the transition process and make fundamental improvements for the environment (Manser 1993, Turnock 2001:165-168). In the early stage, fundamental changes meant (at least for the Polish Ministry of Environment) a reduction in water, energy and material demand by production processes, which in turn would slow down the use of natural resources and thus pollutants (Manser, 1993: 77). It was also hoped that the introduction of cleaner technology, could result in leap-fogging many of the environmental problems that the West had had to deal with during the past 20 years. Later, fundamental changes would also include legislative changes as many CEE recently has transposed EU's environmental acquis. This latter point will be discussed later.

Although environmental movements did not play as big a role in changing regimes in Yugoslavia, as they did in other EEC (Webster, 1993), Slovenia did have some environmental movements. In fact, an ecological movement formed a political party⁶¹, which managed to win 8,8% of the votes campaigning on a platform of closing a polluting and therefore controversial nuclear power plant. Their victory earned them three ministries and other important posts (Webster, 1993: 181). However, it soon became clear that Slovenia could not afford to close the plant. Given the huge investment, the energy that it generated and Slovenia's economic straits, it would be irresponsible for the government to shut off nuclear power (Webster, 1993: 181). Slovenia furthermore found that there was neither infrastructure nor capital to exchange the smokestack industries of the industrialising period for the high tech industries of post-industrialism (Webster, 1993: 181-182). The dilemma of weighing environmental problems up against economic gains were however, by no means restricted to Slovenia, but were reproduced in all the CEE countries. The overall trend in CEE was that the 2 main conditions for making transition successful in an economically sense, hinged on the restructuring of both national economies and individual businesses,

⁶¹ The Greens of Slovenia.

were prioritised above environmental conditions, namely the passing and enforcing of environmental laws and having appropriate policies and finances to steer the transition towards cleaner production and low waste technology (Manser 1993: 9-10).

The fact that the environment on an overall basis was not prioritised despite explicit political statement and action to do so hinges on many factors, some of which have already been mentioned. Firstly, the expectations of the speed of the transition were probably too high coupled with the magnitude of the environmental problems (Saiko, 1998: 393) as discussed earlier. Due to the dire economic situation the allocation of funds to achieve environmental goals had been neglected, which is a phenomenon that transcends the inevitable differences between the CEE in the rates of transition to the market economy and ways of economic structuring. There was also a continuous lack of environmental control measures, which reflected an important conflict between the environment and employment. In many countries the need to close polluting enterprises with outdated equipment was often counterbalanced by the threat of increased unemployment.

This dilemma often made decision makers reluctant to make hard choices, which might generate social discontent (Saiko, 1998: 394). In many CEEs unprofitable and very polluting lead and zinc smelters admitting sulphur dioxide and heavy metals, for example were not closed due to social reasons (Manser, 1993: 82). The closure of Trepca, as discussed in chapter four illustrates what social consequences it can have in a situation where unemployment and poverty is rampant. The tension between environmental security and economic well-being is acute even in developed countries, but it is doubtless all the more painful and difficult to justify in countries close to economic collapse. Given the budget constraints that the CEE faced, the sums needed for bringing up agriculture and industry to reasonable environmental level seemed daunting as a conservative estimate from the European Bank of Reconstruction and Development (ERBD) in 1992 put the needed investment at \$300 billion over the following 15-20 years (ERBD, 1992). It was a general trend in the CEE that the budget allocations for the environmental ministries were small and generally under funded (Manser, 1993: 88) which is now replicated in Kosovo.

The fact of the matter remains that despite a decade of transition the environmental enhancement progress has been slow and disappointing. This is due to the inherited environmental problems, but also due to the current transition process, of which some of the contradictions between achieving environmental results and other transition goals have been highlighted in this analysis. It is clear that it is obviously very difficult to strike the right balance between environmental problems and other socio-economic priorities. As also evident in Kosovo, the social problems caused by transition have simply pushed down environmental issues down to a significantly lower level of priority (Saiko, 1998: 395). The

result has been that there is now an ecological crisis in the transition economies. For Kosovo this trend is particularly disturbing as the prospect of making environmental issue a legitimate political issue to discuss is even slimmer than in the other transition economies. For in Kosovo, where there hardly exists any environmental awareness. Although a Green Party has come into existence it is quite small and with no political power. There are only a few environmental NGO's in Kosovo again reflecting the lack of an environmentally concerned civil society in Kosovo (REC, 2000: 22). It means that unlike in some of the more progressive CEE countries such as Slovenia, the political pressure that did in fact exist to some extent in the beginning of the transition is almost completely absent in Kosovo and thus political pressure to do something about ecological disaster areas like Trepca, can be expected to be correspondingly smaller⁶².

To make matters worse, the environmentally legislative starting point of Kosovo and Slovenia is also different. Although the environmental legislative situation in Yugoslavia on a general level was roughly the same in the republics, Tito's self-management style resulted in that there were some qualitative differences. Slovenia had for example according to Webster (1993) the most advanced and complete set of standards, and with a better enforced organisational and legal environmental management structure than did the less developed republics such as Serbia (Webster, 1993: 183)⁶³.

When comparing and qualifying the experiences of some of the CEE countries, of which Slovenia is the most compatible, with the present Kosovo context, there are clear indications that environmental issues and concerns, can be relegated an even lower priority than that observed in other transition CEE countries (REC, 2000: 22). The reason is that the lack of environmental awareness is widespread due to the lack of environmental awareness.

The frustrations about it, is expressed by a doctor working at the Obilic power plant's⁶⁴ workers clinic in the following quote:

"We have do to something about the pollution...before, nobody really took care of the environment and the quality of life issues, because of the political situation. And now people don't care of it because they are just happy to have a job and electricity." (Beardsley, 2002).

⁶² As a response to this civil society deficit, the Regional Environmental Centre for Central and Eastern Europe (REC) have launched a five year "South-Eastern European Development of Environmental Society Initiative" to rebuild NGOs, which is specifically targeted at Yugoslavia, due to the particular poor relations between government and NGO's that exists here (Turnock, 2001: 168).

⁶³ However, even Slovenia environmental legislation and enforcement was overall characterised by being patchy and uneven (Webster, 1993: 183).

⁶⁴ Another major environmental hot spot, apart from Trepca in Kosovo.

The quote also expresses the hierarchy of human needs, in which environmental problems are relegated below those of economic and social concerns in Kosovo. Indeed, in the face of all the other development obstacles, such as financial restraints and economic problems, it appears to be a rational prioritisation.

In connection with budget constraints, the fact that Slovenia, one of the relatively wealthier transition countries, has had major problems with closing down and upgrading their smoke-stack industries due to financial restraints and social issues, what will not be the size of the challenges that Kosovo will face in the future? The Slovenian experience provides a lesson in environmental/ economic trade offs for Kosovo to take into account. The MESP has as a matter of fact already encountered this trade off as expressed in the following quote by the Director of MESP:

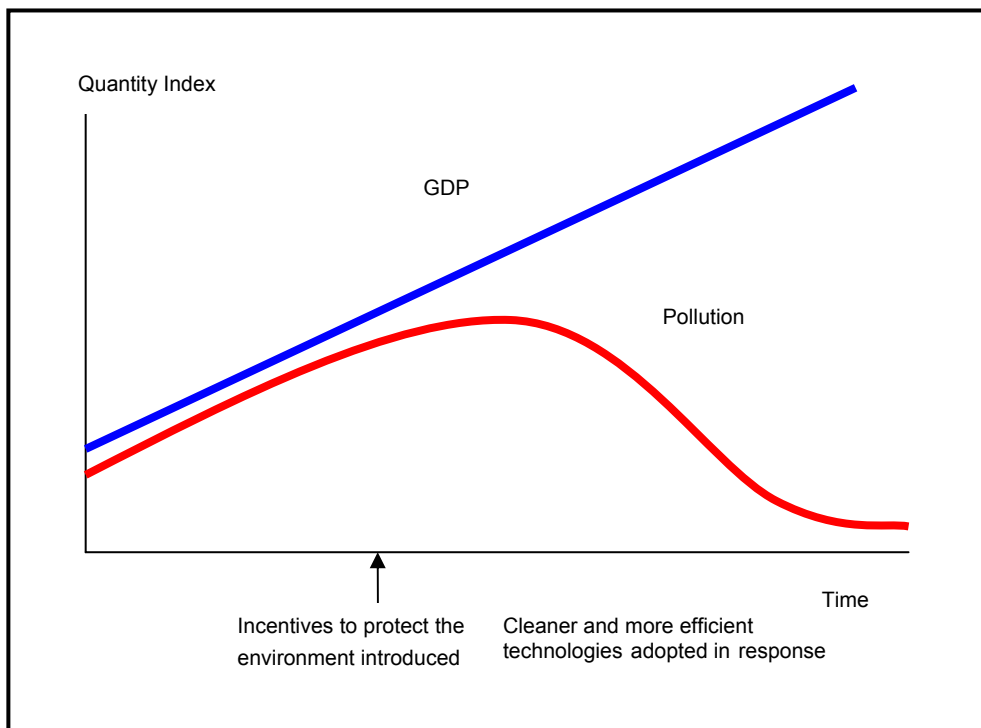
“There are enormous misunderstandings about the environment in Kosovo...People just don’t get it. Obilic wants to produce power as cheaply as it can, so why spend money on filters? It takes money to implement rules no one is interested [in]. But if you pollute your natural resources you can’t develop. Clean air means a healthy population, pure water sustains basic life and living soil means production” (Beardsley 2002).

Although the quote reveals that MESP acknowledges the link between environment and the economy, it also reveals that Kosovo might have great trouble in prioritising environmental issues and put them in the development agenda, due to the costs that it would involve. The lack of environmental awareness might also result in that the gains from introducing environmentally progressive policies are perceived as non-important relative to poverty reduction policies, for example. Furthermore, the political pressure to do something about environmental problems are likely to be easy to ignore as most people would properly perceive the trade off between spending money on growth stimulating policies more important and cost-effective. Thus, the statement by Indira Gandhi, although more than 30 years old, still seems strikingly applicable to the present situation in Kosovo. Although Kosovo, certainly is not as bad off as many developing countries were 30 years ago (or even now), the argument that economic growth is the most important development issue, given Kosovo’s economic situation seems plausible, and it can indeed be legitimately questioned whether Kosovo at this point in time is ready for such post-industrial values, which environmental issues according to some scholars (Lomborg 1998, World Bank 1992b) represent. The following section will scrutinise this viewpoint and also investigate the relationship between development and environment.

8.2.4 DEVELOPMENT AND ENVIRONMENT – A DICHOTOMY?

Instead of viewing economic growth and environmental concern as dichotomies, new ways of looking at the relationship between development and environment has been proposed. It is argued by the World Bank (1992b) and some scholars, such as Lomborg (1998), that environmental protection in fact *requires* economic growth (ibid.). By looking at the most developed countries a tendency has been observed where growth in the beginning of the development adventure is accompanied by increasing environmental pollution. However, when a country reaches a certain threshold in GDP increased growth is actually accompanied by a reduction in pollution, see figure 11.

Figure 11 Breaking the link between growth in GDP and pollution (Adapted from the World Bank 1992b: 40).



The development shown in figure 11 is due to technological improvements in the production methods, but also and more importantly due to that, in relation to the increase in living standards in the Western World, quality of life issues, which include environmental concerns, have become more important for people. Thus, from this point of view, a better, healthier environment presupposes economic growth, or in the words of the World Bank: “As incomes grow, the ability and the willingness to invest in a better environment rise” (ibid. 1992b: 41).

Yet, all persuasive and reassuring for Kosovo that this argument might seem, there are drawbacks to this theory, of which the World Bank does analyse some, but Lomborg on the other

hand, which is based on the World Bank Report, ignores (Lomborg, 1998: 158-160). It is the assumptions behind the theory, which limit the applicability of it. Firstly, there is the assumption that environmental damage caused until a certain level of economic growth has been achieved can be mitigated against. This is much in line with the already discussed opinion of the European Commission and the World Bank argued that in the medium term polluting enterprises would have to be re-opened in Kosovo in order to achieve some economic growth, in spite of the pollution that this will cause. As already argued, it cannot be automatically assumed that it is possible to mitigate against environmental harm.

Secondly, the trend is only valid for some sources of pollution, such as SO₂ emissions, but not valid for a range of other problems such as increase in waste, carbon dioxide emissions, human exposure to toxic pollutants, surface and ground water pollution and soil degradation (World Bank, 1992b: 40). Thirdly, to assume that only relatively well off people care for the environment, is too simplistic. As many scholars have pointed out, many rural communities in the Third World that are considered poor in monetary terms, often appreciate the intrinsic value of nature greatly (Sachs, 2001) and have lived in a sustainable manner for centuries. However, one does not have to look back into the past or in the Third World to find that relative concern for the environment or nature not necessarily follow rising income levels. In Slovenia, it is found that ecological awareness is higher in relatively poorer rural areas, not only because of closer links and dependence on nature that exist in these areas, but also because there is less dependence on manufacturing for employment (Plut et al., 2002: 243)⁶⁵.

This indicates that it is to a great extent the nature of economic system, i.e. capitalism and not necessarily income levels that influences the ability to take environmental concerns seriously. People have become embedded and dependent on the economic system, which obviously influences their ability to be critical of the system and the environmental problems that it produces. Furthermore, because the World Bank is a manifestation of capitalism and the belief in modernity in itself, it is barred from scrutinizing environmental problems related to growth in a nuanced and convincing way. Thus, it seems that environmental improvements cannot be automatically assumed with rising income levels. Therefore, explicit policies will have to be introduced in order to curb environmental pollution arising from the harnessing of natural resources either for production or as sinks caused by the pursuance of growth, or a even more radical solution would be to think of an economic system that did not tend to produce pollution in a mundane manner, as capitalism do (Saurin, 1996). Thus, the theory has in fact severe limitations, when examined more closely⁶⁶.

⁶⁵ Also the level of education increases the understanding of the causes and consequences of environmental problems (Plut et al. 2002:242).

⁶⁶ For more limitations, see also Sachs (2000).

With respect to the CEE countries it has furthermore become clear that, environmental issues are even more important to tackle, as more recent studies show that despite ecological damage caused by pollution in the heavy industrial centres and the high cost of ameliorative measure, the region, including Yugoslavia is in fact on the whole more sustainable than Western Europe (Turnock, 2001: 165).

Yet despite these insights and gained experiences over the last 15 years there are still a variety of tension and conflicts between political and economic change which has the effect of selling the environment in return for economic survival (Baker 2000). A tendency has been observed where there is resistance to radical environmental policies, once the worst pollution spots attended. Basically “*deindustrialisation and high unemployment have tended to overwhelm environmental signals in the long run*” (Turnock, 2001: 165). The result has been that, although there still are pristine places in CEE and that the region as a whole is in a better shape environmentally compared to Western Europe, it is still possible characterise the situation with that of an ecological catastrophe, which Saiko does. It is quite clear that environmental improvements will not happen automatically as a by-product from growth. Very explicit long-term environmental policies are needed in order to fully make development more sustainable.

However, it is worrying to observe that even in countries where environmental issues have had quite a strong influence within the new regimes; it has still been very difficult to put environmental issues on the agenda. Although the World Bank and some scholars speak of the importance of achieving sustainable development, the actual practice behind their actions reveals that economic issues are more important than environmental ones to achieve. This is seen with regards to the lack of mentioning environmental issues in their transition-assessment reports, and also their disputable theory on how growth can be decoupled from environmental degradation. This theory and the practice of the World Bank, help legitimise the preoccupation with economic issues rather than environmental ones. Yet, one cannot assume that a priori, environmental issues does not have an influence on the prospects for economic growth.

Yet there have also been some very positive developments in the region, in which in particular the European union have exerted considerable positive environmental influence on the region. These positive developments are in particular found within the accession countries⁶⁷. The role of the EU will therefore be briefly examined below.

⁶⁷ The accession countries, which became members of the EU in May 2004, are: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia.

8.3 The role of the EU.

By the mid – 1990s the ten accession countries had signed European Association Agreements with the EU. In order to become members certain criteria must be fulfilled, namely the so-called “Copenhagen criteria”, which still serve as the basis for further steps towards enlargement, for example, to other South Eastern European (SEE) countries, such as Kosovo. The requirements is focused on a development of democracy, human rights, protection of minorities, a functioning and stable market economy and ability to take on obligations such as adhering the overall aim of the EU (Bandi and Kiss, 2000:7).

Nevertheless, the Association Agreements are significant for governance in the CEE in a number of ways. Firstly, they have laid down a number of conditions governing the management of the environment in transition countries, such as in the long run transposing the *acquis communautaire*..

The Agenda 2000 however, emphasise that none of the candidate countries can be expected to comply fully with the *acquis* in the near future, but strategies for tackling water and air pollution are considered important to embark on immediately (Bandi and Kiss, 2000: 13). In the long term it is expected that policies are guided by the principle of sustainable development and that countries meet EU norms and standards regarding the conduct of policy making and its implementation (Baker, 2002: 32). The Communication of the Commission to the Council of the European Union and the European Parliament on Implementing Community Environmental Law (27/10 1996, com (96) 500 final) highlights three important basic issues of law implementation and enforcement:

- The development and projection of environmental law accompanied by the establishment of a complex system of legal institutions.
- The implementation and understanding of legal provisions.
- Issues of shared responsibility and questions of national administration responsibilities.

(Bandi and Kis,s 2000).

Yet, experience have shown that it is not enough to create institutions and authorities that will introduce and implement environmental legislation, it is also of importance to change the behaviour of industries and citizens, ensuring that the legislation is actually complied with. The environmental authorities in this respect also have to get used to the new role as facilitators of establishing dialogue between different interest groups (Danish Environmental Protection Agency,1997: 51).

There are however, some problems with adopting EU environmental legislation and with the use of EU policy goals and tools, as can be seen from the experience of the EU accession countries (Baker, 1998: 22). Firstly, many of the tools⁶⁸, especially those targeted in the EU's latest⁶⁹ Environmental Action Programmes, require functioning and effective market systems, which remain undeveloped in many EEC and naturally also in Kosovo. Secondly, EU environmental policy has not evolved in a vacuum, but in response to specific environmental policies in Western Europe. Their adoption by the accession countries assumes that they are possible to implement and that, in terms of policy priorities, they are furthermore the most appropriate responses to the environmental problems of the accession countries and other Eastern European Countries, including Kosovo (Baker, 1998: 22).

However, this assumption may not be a priori justified. As Manser (1993) Saiko (1998), Staddon and Turnock (2001) also note the emerging market economies are chiefly concerned with profit – and in a politico-social environment which is opposed to market regulation and the imposition of unnecessary costs, as manifested by institutions such as the EU, liberalisation cannot reasonably be expected to be a panacea for environmental problems.

In many transition economies a reorientation of values have also occurred and a culture of consumerism has taken hold, with its subsequent additional impact on the environment⁷⁰. Yet, at the same time the Association Agreements have also lead to the release of some funding through the Phare programme⁷¹, to help with environmental clean-up (Baker, 2002: 32).⁷² Through the influence of the EU conferences on “Environment for Europe” have been held, which have resulted in that National Environmental Action Programme have been developed and launched. As a matter of fact “the “Environment for Europe” process has become, in effect, the key transnational regime for the management of the region’s environmental problems” (Baker 2002: 33). These developments have had spill over effects, so that it is not only the accession countries that have more focus on the environment. The EU developments are a reflection of global standards that other countries, including the SEE cannot ignore (Turnock, 2001: 167). In the Balkans for example REC, which is funded by the European Commission are engaged in a number of environmentally related activities, including assessing the law drafting needs taking EU approximation as an overarching policy

⁶⁸ I.e. economic instruments that influences behaviour, rather than command and control policies.

⁶⁹ In particular since the Fifth Environmental Action Programme.

⁷⁰ For example has the number of private cars grown in all transition economies (Saiko, 1998: 390).

⁷¹ The Phare programme provides finance for economic development administrative reconfiguration, social change, legislative work to enable candidate countries meet the criteria for membership of the EU.

⁷² However, the Phare programme has been criticised for being weak and under funded and for prioritising economic reform over environmental considerations, which has helped legitimise the belief in the CEE that economic matters should take precedence over environmental ones (Baker, 2002: 32).

goal of the respective countries (Bandi and Kiss, 2000: 11-12). Thus there seems to be forces in this region which guides the countries, including Kosovo towards an overall common target, namely to become members of the EU. With this in mind the EU environmental policy must be viewed as potentially having a positive impact on the environmental policy development in Kosovo, not at least because a poor implementation record may influence the EU's decision on eligibility for membership, although far into the future membership may seem at present.

Thus, the alluring prospect of becoming member of the EU at some time in the future may therefore help assigning higher priorities to environmental issues in Kosovo.

At the same time there are also other important arguments for assigning high priority to environmental issues immediately in Kosovo, which will be discussed below.

8.3 Benefits of an environmental focus

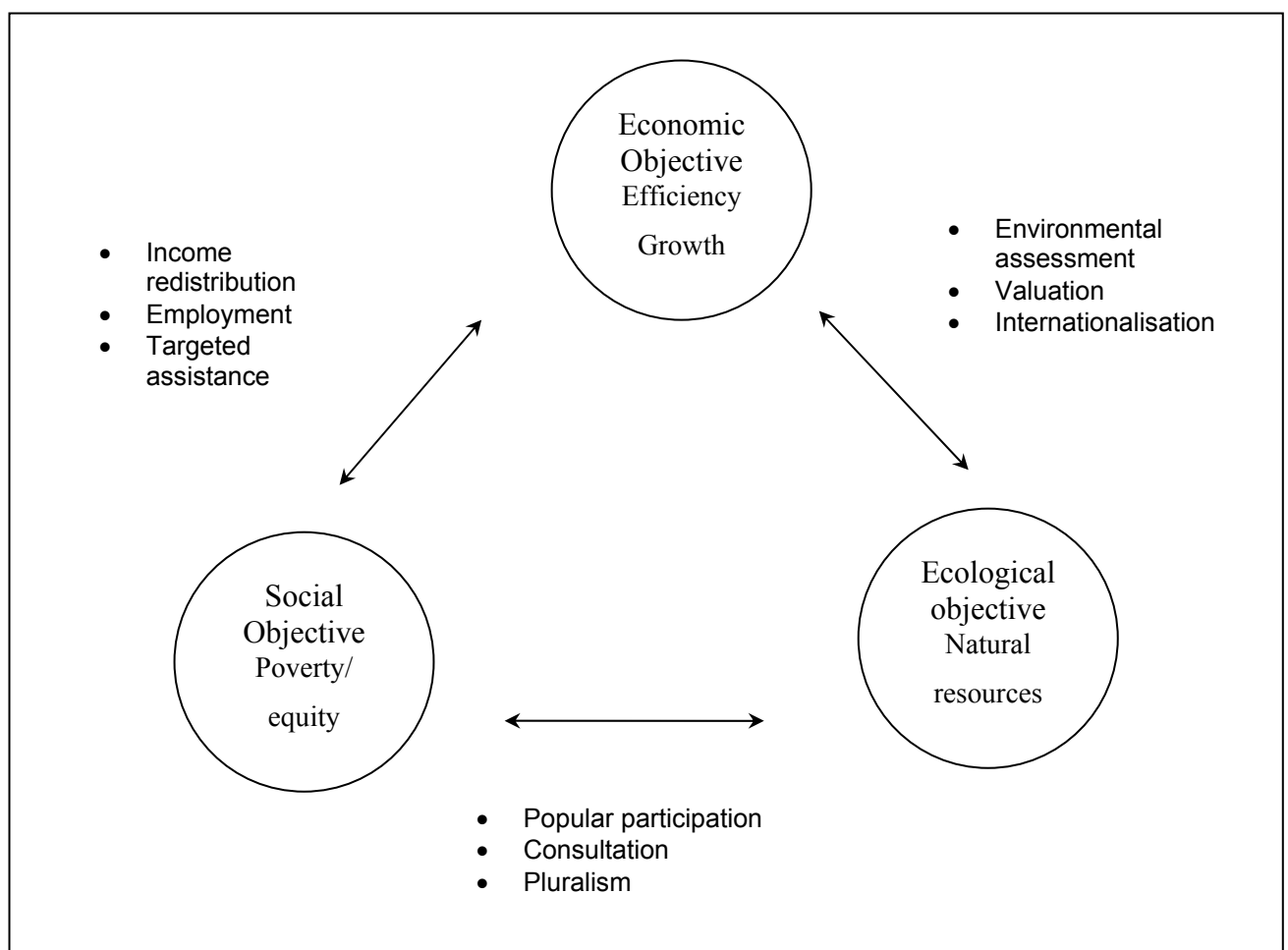
Experience in other former Yugoslav republics shows that the preoccupation with economic development issues after their political separation has resulted in environmental issues failed to receive serious attention for several years. One report indicates that the environment never has been and still is not treated as a political priority by the government or a majority of the population. However, according to UNEP Balkans Task Force it is no longer justifiable to postpone environmental considerations while providing humanitarian assistance and focusing on economic reconstruction/recovery. Therefore strong efforts should be made to convince both local people and international staff that "good environmental management is simply good management" and that there are visible, significant economic benefits to sound natural resource management and pollution prevention. Moreover, Kosovo ultimately will need to approximate its environmental policy and management with that of the EU. To that end, work should begin now to take into account the need to respond to local environmental priorities, consider longer-term environmental consequences of current actions/plans, and build local environmental institutions/capacity (Balkan Task Force, 1999).

UN's Human Development Report also emphasise the need for reversing the trend of environmentally polluting activities in Kosovo, as the Kosovo policy makers have a unique change to formulate new long-term environmentally sound development policies, while also working to reduce the existing pollution levels (HDR, 2002: 93).

Yet, of course this is very difficult given the budgetary constraints that MESP has to work with. However, the Kosovo government should reflect on the experiences gained from the other transition countries and also be very sceptical towards the assumptions that economic growth is more important than environmental issues, that economic growth will result in

increased environmental standards automatically and that the negligence of environmental issues does not hamper economic growth prospects. With regards to the latter studies have illustrated that political reasons aside, the lack of a clear and staple environmental requirements is perhaps the chief hindrance to long-term foreign investment in a particular country. Experience in CEE countries shows those uncertain requirements for environmental conditions are worse than those that are strict but EU compatible (Bandi and Kiss, 2003:19, Staddon and Turnock, 2001). There are also benefits of adopting a more sustainable development path as the following figure illustrates.

Figure 12. Trade-offs among the three objectives of sustainable development (adopted from Adams 2000: 128).



As the figure illustrates there are trade off between the elements of economy, ecology and equity. It means that thinking of the three components when formulating policies may bring benefits to the other components as well, while there is an interaction between them. With regards to the health for example, which is part of the social component, it is important to understand that there are linkages between health, development and the environment, which work in at least two directions. In the long run increased levels of human social and

economic activity can have a detrimental effect on the environment, its natural resource base, and the animal and plant life that it supports. This in turn can lead to lower food and energy supplies, and increased levels of pollution poses a direct threat to peoples health, as the heavy metal pollution from Trepca potentially does. However, by taking these issues into account by modifying environmentally harmful social and economic activities through legislation, a society in transition can also bring about positive environmental changes, which in turn lessen the health risks of many environmental factors (HDR, 2002: 92).

Therefore, it is necessary to formulate development strategies that take into consideration environmental issues, as well as social and economic priorities. However, the Kosovo policy-makers now have the opportunity to reverse this trend by formulating new, long term, environmentally sound development policies and also reduce existing pollution levels in the Ibar, as elsewhere. In this way the people of Kosovo can enjoy the same levels of environmental protection and public health, which have been achieved elsewhere in the greater European Region (HDR, 2002: 93). Yet the efficiency of the different policy measures that might be introduced should also be addressed. Environmental improvements can actually be observed in numerous ways, namely in ecological, financial, procedural and political terms (Baumgartl, 1997: 14).

Financial efficiency refers to the efficient use of available resources, i.e. an evaluation of how the money was spent. In this context it is important to have identified the best way to deal with the problem, which yields the best results. However, even if money is spent according to the project goals, it is important to acknowledge that the structures for running, implementing, monitoring and evaluating a project have to be in place. If these structures were not in place, “even doubling the available money would not be an inefficient way to sustainable environmental conditions” (Baumgartl, 1997: 14). The Dutch government sponsors the closure of the Zitkovac tailing. Yet the budget for the closure was only made for one year at a time. Because of a long analysis period, the major expenses had not come about when the first year had gone. Even though the plans were made for the closure the Dutch government stalled and wanted to consider if they wanted to sponsor the project one more year. The problem was that Trepca had not used the money on the budget because of the uneven expenses.

Focusing on financial efficiency assumes that investments in environmental policy measures are the only way of improving environmental conditions. However, it is widely acknowledged that although a number of environmental policy measures are necessary and beneficial, the highest environmental impact would be measures in other policy areas, by so-called procedural efficiency.

When environmental expenditures only amount to a very small fraction of the national budget, as in Kosovo, greater environmental benefits can actually still be achieved if there are made environmental progressive changes in policy areas which cover more prominent budget shares (Baumgartl, 1997: 14). However, the explicit adherence to this principle is not mentioned in Kosovo's environmental protection framework law (EPFL, 2003) and has yet to be integrated into a policy or legal act in Kosovo as a formalised official policy (Bandi and Kiss, 2003).

Finally, there is political efficiency, which is the result of different measures, which enables a better handling of the over-all problem (Baumgartl, 1997: 14). This aspect of environmental policy measures have to some extent already been discussed in relation to the experience of other transition economies. Yet, it is of extreme importance to ensure policy efficiency to evaluate the framework of institutions, capacities, knowledge, influence, procedures and expertise. In Kosovo, all of these aspects needs to be developed, which means that before any water frame directive can be implemented it is a pre-condition for its effectiveness that there is political efficiency in the territory.

Leaving the possibilities for environmental efficiencies aside, there are also other ways in which environmental issues can be tackled that furthermore have the advantage of bringing economic trade offs as well. These will be discussed with reference to the Trepca study in the following section.

8.3.4 ECONOMIC TRADE OFFS AND WIN- WIN SITUATIONS

Economic trade offs and win- win situations are in this context, situations in which solving environmental problems also have economic benefits. As discussed above dealing with environmental issues could lower health damage, avoid long-term cleaning costs and improve the actual state of the environment. By dealing with the environment seriously, it is also likely that it would be easier to assure aid flows from the West, which is linked to such commitments. Thus, there are several factors that could motivate the Kosovo government to tackle the environmental issue. Dealing with the pollution at Trepca and thereby improving one aspect of the water quality in the river Ibar, has the potential of providing several win-win situations, depending on the time frame adopted.

Kosovo is a water short territory, and when taking a long-term perspective it is only likely that the water shortage will become even worse due to several factors discussed below, thus making it of political importance to preserve and improve the existing water quality of the rivers in Kosovo. The factors that put additional stress on the water availability in Kosovo are firstly, that the water requirements of the power plants in Kosovo present site-specific problems. They need a constant amount of water for the cooling processes, but as the coal

reserves are placed in water scarce areas, water has to be directed from the White Drin River to the central part of Kosovo resulting in a lack of drinking water for the population of Kosovo. Thus, there is a great need to ensure the quality of the remaining rivers (MESP, 2003: 6), including the Ibar.

Secondly, although Kosovo actually has very fertile agricultural land and could be self-sufficient in food if irrigation techniques were implemented, it relies heavily on imports at present. This trade imbalance puts significant stress on the Kosovo's economy, and it is recommended by the HDR that it be improved, in which one way to do so could be to reduce food imports (HDR, 2003). One obstacle to achieving a decrease in food imports is the industrial pollution that many agricultural lands face from soil and water pollution (MESP, 2003). Another obstacle that hinders more intensive irrigation in the country is the lack of available water useable for agricultural purposes. Therefore, increased amounts of good quality water for irrigation would also be needed in order to achieve self-sufficiency. Improving the water quality in the Ibar to at least at a standard suitable for agricultural purposes would mean that it would be possible to use this water for irrigation, and thereby it might be possible to increase domestic food production and improve the balance of payments in general.

Thirdly, any economic development requires availability of water of a certain standard and if Kosovo's economy grows there will be an increased demand for water. At present the river waters are not even accessible for industrial usage without prior cleaning. The most sustainable solution to this would be to curb the pollution at the source. The clean up of Trepca would therefore also provide some economic trade offs in this context, as more water would be available for industrial use. Again, this is obviously only one issue that has to be dealt with in regards to improving the water quality of the Ibar, as organic pollution is also a major problem deteriorating the water quality.

Finally, exacerbating all these issues mentioned above is the population growth in Kosovo. At present it stands at 21% making it one of the highest in Europe. Furthermore, Kosovo also have the youngest population in Europe, with more than 40 percent below 20 years of age (MESP, 2003). The population growth will mean that more people will require water for consumption and household chores. Kosovo is already, apart from using groundwater already relying on surface water to fulfil the water demands, and it is therefore likely that more rivers will have to be used in order to cover the demands, including the Ibar. Thus, a tidying up at the Trepca site would be an unavoidable, albeit only one, step necessary towards achieving satisfactory water quality.

Thus, there are number of factors which in the future will increase the demand for fresh water at a decent standard. These factors also intertwine with each other. The present environmental problems have a serious effect on people's health, they hamper economic growth, they prevent the possibility of acquiring self-sufficiency in food and in the future they might also be lack of available drinking water due to the population growth and the environmental problems. Therefore, action needs to be taken in order to prevent pollution of the watercourses and to improve the water quality of the rivers. Apart from the moral obligation that it might be argued that the government has to prevent people from being contaminated with heavy metals, there are also sound economic reasons for doing so, as discussed above. It may even be argued that it would be economically unwise not to do so, as it would have economic repercussions in the future. There might be increased or at least not lower expenses allocated to the health system because people would require treatment from the effects of contamination. There might also be lost working time which again would lower the productivity of the country and thereby the economic gains. Lack of reasonable quality water would put severe strains on the possibility of food production, which does not have a positive effect on the balance of payment. Furthermore, the government might not even be able to ensure the fundamental human right that it is for people to have access to safe water for drinking and consumption. It could therefore easily be argued that the state of the environment is an important political development priority in Kosovo given the dire economic, social and political problems that the protectorate faces at the moment and will face in the future. However, the government will have to make explicit commitments to improve the water quality of the Ibar and the environmental in general immediately. If Kosovo becomes an independent state there is also the possible issue of transboundary pollution that has to be taken into account. For the Ibar River flows into Serbia, and heavy metals may be transported deep into Serbia affecting the people that rely on the river water for various reasons.

As the discussion above have illustrated environmental improvements does not automatically follow a transition from socialism to liberalism. Environmental improvements cannot be expected to appear as a side effect of economic growth, which the World Bank and some scholars unconvincingly try to argue. Indeed, if nothing is done, the experiences from the transition countries shows that environmental risks increase significantly, putting peoples health at risk as well as creating perhaps irreversible damage to ecosystems.

Yet, at the same time, for better or for worse, the EU has exerted considerable environmental influence in the whole region way beyond the EU and the accession countries, which helps promote the importance of the environment. Furthermore, given that there are economic, as well as health reasons, let alone morally grounds for making environmental improvements at the Trepca site and in Kosovo in general, it does not seem like quite an obvious and undisputable policy to adopt.

9. Discussion and Conclusion

It has been thoroughly documented that not only have there been a constant serious pollution of the local environment with heavy metals when the Trepca plant was in operation, but also that there still is a constant source of pollution from the tailings and the waste lying around on the factory site which constitutes a danger to human health even though the plant is no longer in operation.

It has been documented that people living in the area, during the time when the factory was in operation have been exposed to effects of the heavy metal pollution as it has had an impact on their health as documented by the blood samples and analysing conducted in the 1980's. Research in the late 1980's also revealed that locally grown crops were heavily contaminated with heavy metals.

This project has furthermore revealed that although the plant no longer is in operation there is still a severe heavy metal pollution of the River Ibar, where many metals are present in this aquatic environment is exceeded many times beyond the standards that the WHO set. The research revealed that the tailings are eroding and material from these tailings end up in the River and thus there is a constant emission of heavy metals to this river. The findings also show that the metals are transported some way a way from the pollution source, and indeed it cannot be ruled that the heavy metals are not carried into far away even into Serbia and thus the possible cause of transboundary pollution.⁷³

It can be concluded from the water samples that the river water seems to be so polluted with heavy metals that it cannot even be used for irrigation purposes, let alone for drinking. The sediments samples which indicate how far the heavy metals might travel and also gives an indication of whether the heavy metals can be consumed by aquatic life and thus enter the food chain and bio-accumulate, show that the sediment is heavily polluted, thus making heavy metals available for the aquatic life in the river to uptake. Indeed the fish data reveals that there is a bioaccumulation of heavy metals in aquatic life and thus making it dangerous for people to rely on fish from this river as the main source of protein intake. Thus, according to the samples presented in this project there is definitely emission of heavy metals to the river and thus of the environment. It is more difficult and beyond the scope of this project to determine the exact health impact that it might have on people living in the area who in some way or another are in contact with the water.

⁷³ Transboundary pollution problems will obviously only be a problem if Kosovo becomes an independent state, and not part of Serbia.

However, an environmental *risk* assessment has to some extent been discussed in section 5.2.2, where the theory of environmental health was presented and this was further elaborated upon in section 5.6. It is clear that when taking the environmental health chain theory and risk assessment into account that there is a definite health risk to the people living in the area. To quantify how many exactly consume fish from the river on a regular basis and how many extract water from wells that might be contaminated with river water has not been possible due to the complete lack of this kind of background data in Kosovo in general, as already discussed.

Nevertheless, it must be assumed that some people have this kind of contact to the river water, given the lack of full coverage of safe water, the closeness in which residential area are situated to the river and other socio- economic factors such as poverty prevalent in this town, which might force some people to eat fish from the river because it is a cheap way of getting a reliable protein intake. Indeed having this kind of constant heavy metal emission to the local environment so close to a rather large town of 250,000 inhabitants, might amount to environmental justice if nothing is done about it. On the basis of this assessment, there can be no doubt that something needs to be done about this constant pollution from the tailings and the factory area. The tailings have also been in the area for many years. The usage of the Zitkovac tailing stopped for about 30 years ago, and the usage of the Gornje Polje tailing stopped about 50 years ago. Therefore, they have been a constant source of pollution in this entire period and thus exposed the people of Mitrovica to heavy metal pollution during this entire period. The frightening problem with these tailings are, that they do not suddenly stop leaching heavy metals into the environment due to their sheer size and content of heavy metals unless they are covered up. Thus, the problem will not solve itself.

A little ray of hope with regards to improving the environmental situation is perhaps provided with the environmental protection law. This framework law acknowledges that people should be provided “*with an increasingly healthy environment*”. Thus the ideological will to do something about major sources of pollution that constitutes a threat to human health is present in Kosovo and acknowledged in the society in general. However, whether there is the political will and manouvre room for doing anything serious about this problem is another matter. As already mentioned the cost of covering the Zitkovac tailing stood at 4.6 million Euros. On top of this one has to consider that the Gornje Polje tailing also needs to be sealed up, along with the other tailings in the area and the factory area also needs to be cleaned up. Thus the total cost of a clean up might be very substantial. Economists who have been looking into the possible privatisation of Trepca have also considered how much it would cost to clean up the site, as this is an important factor for a possible investor to know. UNMIK has stated that there are not any investors that can afford the costs of a clean up.

Even if Kosovo didn't have any other problems to tackle, it would be a major burden to start such a comprehensive clean up programme for the government.

Yet, at the same time it could be argued that the current legislative status of Kosovo, which only have a loose framework law would give large extraction companies the opportunity to move into Kosovo and extract heavy metals without having to care about the environment and thus the clean up costs are not a deterrent. On a world basis there are markets that do not consider environmental friendly production as an aspect important for trade, unlike the EU where there to some extent at least is some environmental demands attached to the manufacturing of some products. In line with this, REC states that environmental conditions have a high influence on investors' interest when the selling the products in Europe. In today's world, the environmental status of a factory influences the possibilities for trade and profit, especially when trading in the EU and it is therefore of paramount importance for a possible investor to know how much money needs to be invested, not just in production units, but also to improve the environmental situation before buying. Furthermore, the fact that the environmental legislation is not fully developed yet might result in that investors, that would like to sell their mining products in markets that have stringent environmental demands would decline the offer of investing in Kosovo because of the insecurity about how stringent the future legislation might be. Other problems will be that investors will have difficulties with exporting their products if Kosovo has insufficient legislation, to issue green labels.

Nevertheless, with its new environmental framework law, the government signals that they are entering a new era of Kosovo's development where the environment is to be taken more serious than it has been previously. The environmental protection law spells out that they aim to introduce EU standards. Such standards will not only result in that Kosovo will have to adopt environmental discharge limits but likewise result in that they will have to adopt the specified procedures and monitoring methods as described in the EU directives. By aligning themselves with these limits and procedures they will acquire some instruments and tools that can be applied when trying to manage their environmental problems, including Trepca. However, as already discussed, introducing the water frame directive in full may be too big a mouthful given the socio-economic situation that Kosovo finds itself in at present.

A more pragmatic approach to the water quality problems of the Ibar might be preferable. However, it should be emphasised that to adopt amore pragmatic approach should not justify going for the lowest denominator and thereby water down the desired water quality aims. It has been suggested that it is the bureaucracy that shall be streamlined in order to increase efficiency and thereby use financial resources available to the MESP in the most efficiency and cost-effective way.

The fact that Kosovo is characterised to be a mineral economy it will, when looking into the future, also be relevant, as discussed to apply the guidelines from the future mining directive proposal. By accepting the principles in the mining directive proposal a range of environmental problems related to mining might thereby be avoided in the future, as the approach taken in the proposal is based on preventive rather than a reactive approach

However, this project has also questioned whether the alignment to EU standards is the most environmentally wise path for the Kosovo government to follow. If Kosovo's overall goal is to be a member state of the EU, it would make sense to adopt all the measures which is demanded in the Copenhagen Criteria and which is described by the *aquis communautaire*. Furthermore, if the rest of the Balkan region also aims to become members of the EU or at least align itself with its standards, it would make sense for Kosovo to do the same. This will, on the environmental field, mean that Kosovo will have to adopt the whole monitoring system, and for the mining directive it would set demands to Trepca to handle the tailings.

This will not necessarily mean that one can unquestionably assume that Kosovo will end up having a better environment, for the EU has not bettered the environment on the whole in the EU. In fact, some environmental issues have become worse since the EU has come into existence, perhaps because of the EU's foundation of being first and foremost a union with the aim of promoting economic growth and free trade. However, there is no doubt that the EU legislation is the most progressive legislation available to Kosovo. Yet, the EU legislation discussed in this project is quite extensive and requires an advanced organisational framework to implement it into and given the immature nature of Kosovo's governmental structure and administration it might be too difficult for the administration to handle. One can however, argue that the government has, by its rather vague wording in the environmental protection law, never stated that it would implement the EU legislation in full, but only follow the standards. This means, at least in a juridical sense that Kosovo not necessarily have to adopt all measures from the EU, and that Kosovo can formulate their own goals, and find their own ways of reaching a certain desired levels and standards.

Though EU legislation provides Kosovo with a number of methods which will enable it to deal with the environmental problems, Kosovo now also has the ideal chance to formulate their own clear environmental goals, which, if they are handled the right way, may result in an environmental legislation which both can handle existing problems and prevent future ones. By formulating environmental goals, and finding out how to get there themselves might give Kosovo an opportunity to develop a more manageable plan which does not require such a large environmental organisation and administration to handle. The EU

legislation may serve as a source of inspirations and may in the long run be set as the ultimate goal and standards to be reached.

Hence there are a range of legislative possibilities for Kosovo to utilise and to expand upon or even change to make it more suitable for Kosovo. However, just adopting legislation is obviously not enough to ensure a better environment now and in the future. The legislation will have to be introduced into the right organisational framework and be used proactively. Otherwise it is likely that enforcement and compliance with the legislation will not happen. Adopting progressive legislation and thereby doing something about the environmental problems connected to Trepca immediately and also avoiding future environmental problems related to mining is not easily done in Kosovo, however. This is because Kosovo has other very dire development needs, in terms of the need for economic growth, employment creation, infrastructure investment, poverty reduction, and indeed other massive environmental problems, Trepca aside, as already discussed. The question is how can Kosovo tackle all these problems and do something about its massive pollution problem that Trepca presents as well?

As already discussed, it is not simply a matter of having political will do to something about the problem. The experiences from the other transition countries show that the strong focus on economic growth has resulted in that the state of the environment has become much worse and some scholars even talk of an Eastern European ecological crisis. It has become clear that a healthier environment does not come automatically as a result of the transition from socialism to capitalism.

Furthermore, even though some countries had a very green profile at the time of the revolution and had some very clear political aims to improve the environmental situation in the process from changing from a socialist to a market economy, they often had great problem in actually doing something about the environment because it conflicted with other development objectives such as creating employment and economic growth. It means that although there is environmental awareness amongst the population it does not guarantee that environmental problems will be prioritised above other very pressing development requirements, such as jobs creation and poverty reduction. Environmental organisations can put pressure on the government, and thereby promote both environmental legislation and public awareness.

The problem in Kosovo is that the extent of public awareness in Kosovo, is at the moment is very low. The basis for a development of environmental organisations in Kosovo, without input from either foreign influence or from influence from the WHO or UNMIK, will probably have long prospects. Consequently the importance of an increase public awareness

about environmental issues has to be emphasised. A development of strong NGO's can result in that there will be an increased pressure on the government. Furthermore it can result in a larger extent of public awareness, which again can result in that people who are exposed to the heavy metal pollution will know what they are exposed for, and how they can take precautions against it. The development can be developed through civil society promotion. Promotion of environmental awareness in Kosovo cannot be emphasised enough, as people otherwise are exposed to heavy metal pollution without being aware of it. Furthermore, due to the fact that the environmental situation in Kosovo is in such a dire state in general means that people might perceive this as being natural and thereby it really has to be ecological catastrophes that will promote people to consider the environment as important factor in their everyday life. However, the point is that the heavy metal pollution poses a significant risk to people. It is possible to assume that in a Western European country with a stronger environmental profile that the extent of the heavy metal pollution that Trepca causes would have stirred people to make political demands and require an extensive clean up because the pollution simply would be unacceptable on environmental and health grounds. Obviously, it would be too much to expect the people of Kosovo to make this kind of demands, even if they had the knowledge about the consequences of the pollution, when living under a dictatorship and also during the civil war.

Yet, now Kosovo is moving towards becoming a democracy and therefore room has in theory been made to make this kind of demands, because the government should represent the population. However, before people can make such demands they must have knowledge about the pollution and its consequences and in general value the environment differently.

With regards to the difficulty in addressing conflicting development objectives, such creating economic growth at the same time as securing the environment, the transition countries have largely, as already mentioned prioritised economic growth at the expense of the environment. Obviously, it is easy to understand why, it in some cases has been decided to keep polluting lead smelters in operation despite their negative environmental impact that they caused, if it meant that people would have a source of income. Yet, at the same time the discussion also illustrated how important it is to take environmental issues into account for the outset, as many of the transition countries now have a worse environmental situation than they did before they went into transition.

It can be argued that the reason for ignoring the fact that environmental problems are often created in the wake of the pursuance of economic growth is due to the fact that the big development agencies, such as the World Bank have helped foster the idea that economic growth is a requirement for improving the environment. Yet, this theory is only applicable in some very few cases, and certainly the experiences from the transition countries illustrate,

that the focus on achieving economic growth before prioritising the environment in some cases has resulted in that the environment has deteriorated to a state beyond repair.

Furthermore, when pollution is prevalent it might also have adverse health effects on people, and thus lowering their ability to work due to illness, which in turn increases the expenses for health treatments and also reduce economic activity and thus the possibility for economic growth. Hence it is very important to focus on the environment and to develop procedures that secure a minimum of environmental impact from the outset.

This discussion have also revealed that in many instances one should not think of economic growth and environmental protection as contradicting development objectives, which it is very often done. To see them as competing development objectives, is as also pointed out in this project, is for example clear in the environmental protection law that Kosovo has adopted. Yet, this assumption might in some instances be fundamentally wrong. The project has pointed out that with regards to the Trepca case, there are, despite the enormous financial costs that it will cost to clean up the site, also positive economic benefits of having better water quality of the river, which might outweigh the clean up costs. These benefits are that the water can be used for irrigation, that it might be used as drinking water until a more permanent solution to the lack of safe drinking water is found, that fish can be consumed from the river, without fear of them being heavily contaminated with heavy metals, that the water might be used for industrial purposes without first having to be treated. There are obviously also health reasons as to why it would be better to improve the water quality.

The fact that water resources are scarce in Kosovo any way makes of even more importance to improve the water quality, as water is essential for any economic development. The massive population growth that Kosovo is experiences will increase the water demand in the future. Therefore, it is indeed possible to identify some win-win situation that a clean up of the Trepca site will provide. However, the assembly in Kosovo will have to see the economic and environmental benefits of thinking in this way and utilise these win- win situations when they present themselves.

If Kosovo has understood the Win-Win situations that can be a result of environmental development, there can still be many obstacles that can slow down the process of prioritising the environment at the same level as that of economical development. The World Bank and other development organisations tend to emphasise the importance of achieving economic growth as they have done in many transition economies rather than focusing on the environment. Thereby they also assume that ignoring environmental issues in a transition process will not have an economic detrimental effect, as discussed. Yet this assumption cannot always be withheld as discussed. Therefore, it would be wise of the Kosovo

government not to take these assumptions at face value, but indeed perhaps go against the flow. The question is if the neo-liberalistic ideology of the World Bank will result in that a country like Kosovo, which has such a unique chance to develop a legislation, which prioritises the environment in every aspect, will be influenced to ignore the positive aspects of environmental improvement in order to align with the ways of the World Bank, which has some influence on the development policies adopted as they are a major loan provider to Kosovo. The question is if it will be too demanding to go against the ideological development tide and choose a direction of development, which is different from the prevalent tendency in many countries and in the rest of the World?

9.1 Conclusion:

It has been documented in this project that the heavy metal emission from Trepca into the Ibar River is severe. Many of the samples showed that the heavy metals exceeded WHO standards significantly. The field work suggests that there is therefore a contamination of the water, sediment and aquatic life of the Ibar River. This, on top of the other polluting elements that the river contains (mainly organic waste) makes it a very polluted river. It poses a significant health risk to people living in the area. Especially if they consume fish from the river or use the water for drinking purposes. Transboundary pollution cannot be ruled out either. This, both from an environmental point of view and from a public health point of view requires action to be taken in order to curb this pollution from the tailing. The tailings located close to the river are a constant source of heavy metal pollution and this pollution will not cease unless proactive action is taken.

As it has been documented in this project one way of solving this environmental problem is to cap the tailings. However, it has also been discussed that it is extremely expensive to do this. The cost of dealing with the tailing problem constitutes a problem for Kosovo as they only have limited funds available to them. Furthermore, the environmental ministry is not a ministry with great funds available to them either, relative to other ministries. Kosovo might also use EU legislation as a way to improve and manage the water quality of the rivers in Kosovo. EU legislation in the form of the mining directive proposal also provides a tool for managing mining activity in Kosovo in the future, which if implemented and enforced properly is likely to prevent environmental disaster areas like the Trepca site from occurring in the future. Yet these EU environmental legislation and standards are not easy to implement from one day to another. There has to be an effective administration and monitoring programmes in place in order for the legislation to reach its desired goals. It might at present be too much for the Kosovo government to handle and perhaps a scaled down more pragmatic approach to the EU legislation and standards will have to be adopted

in the short term. However, the government must be careful not to go for the lowest environmental denominator and thereby not achieve any real environmental progress.

Dealing with such a massive problem that Trepca represent also poses other problems when considering all the other competing development objectives that Kosovo has, such as the widespread poverty, unemployment and a stagnant economy. It is therefore easy to imagine that, although the heavy metal pollution constitutes a significant danger to the environment and public health in the Mitrovica area, it will not be a priority development objective any time in the near future. It has also been discussed that balancing different development objectives is very difficult and not unique to Kosovo.

All transition countries have been through the same process, and they have largely prioritised economic growth above the environment, resulting in that the environmental situation in many places has deteriorated rapidly. However, this project has in fact highlighted some win-win situations that might take place if the Ibar River no longer was contaminated with heavy metals from the tailings. These win-win situations, as described above benefit both the environment and the economy in the long run. Thus, it seems that it would be beneficial for both the environment and the economy if the Trepca site was cleaned up. Indeed it can be argued that due to the severity of the pollution in itself, a clean up action plan should be started, whether or not it has any economic costs or benefits.

On a more general level it can be argued that Kosovo stands on the threshold of a new era, where they for the first time in history indicate that the environment will be taken serious. The people of Kosovo might therefore finally be rid of the dire environmental situation that exists now or at least that it will not deteriorate further. Kosovo should cease this chance to implement legislation and environmental policies that will lead Kosovo unto to a more sustainable development path. It should take into account the lessons the other developing countries and transition countries provides, by avoiding a too stringent focus on economic growth as this has lead to a worse environmental situation in many instances. It should instead realise that by promoting sustainable development from the outset is the most intelligent action to take both environmentally, economically and in terms of public health. This will not only ensure that the Trepca site will be cleaned up, but also that future mining disasters as they relate to the environment will e avoided in the future. Not many countries have the opportunity to redefine their development path so substantially and radically as Kosovo has now, and they should therefore realise this unique opportunity and grasp it.

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10.2 Interviewed Persons

Mr. Stuart Brown, “Water Quality Expert”. supervisor for MESP

Ms. Nezakete Hakaj, Division Head of Environmental Protection. MESP.

Ms. Anna Marie Madsen, Deputy Head of DANIDA’s office in Kosovo.

Mr. Roger Payne, Head of environmental board on Trepca.

Mr. Tomislav Zvkovic, Head of Trepca Institute on Trepca North

Ms. Dragica Jovanovic, Head of Environmental department under Trepca Institute.

Mr. Asslan Vitaku, Environmental manager on Trepca South

Mr. Baton Begolli. Director of the Water Department at MESP

Ms. Gerry McWeeney, WHO Coordinator Mitrovica.

Mr. David Engdahl, Site supervisor, Golder, Trepca Plant Zvecan

10.3 Conference

Hazardous Waste conference at the Grand Hotel in Pristina

Held by the MESP and the Danish consultant company DEMEX

Participants were environmental directors from the municipalities in Kosovo. 27/11/2003

Appendix 1 Maps of Kosovo

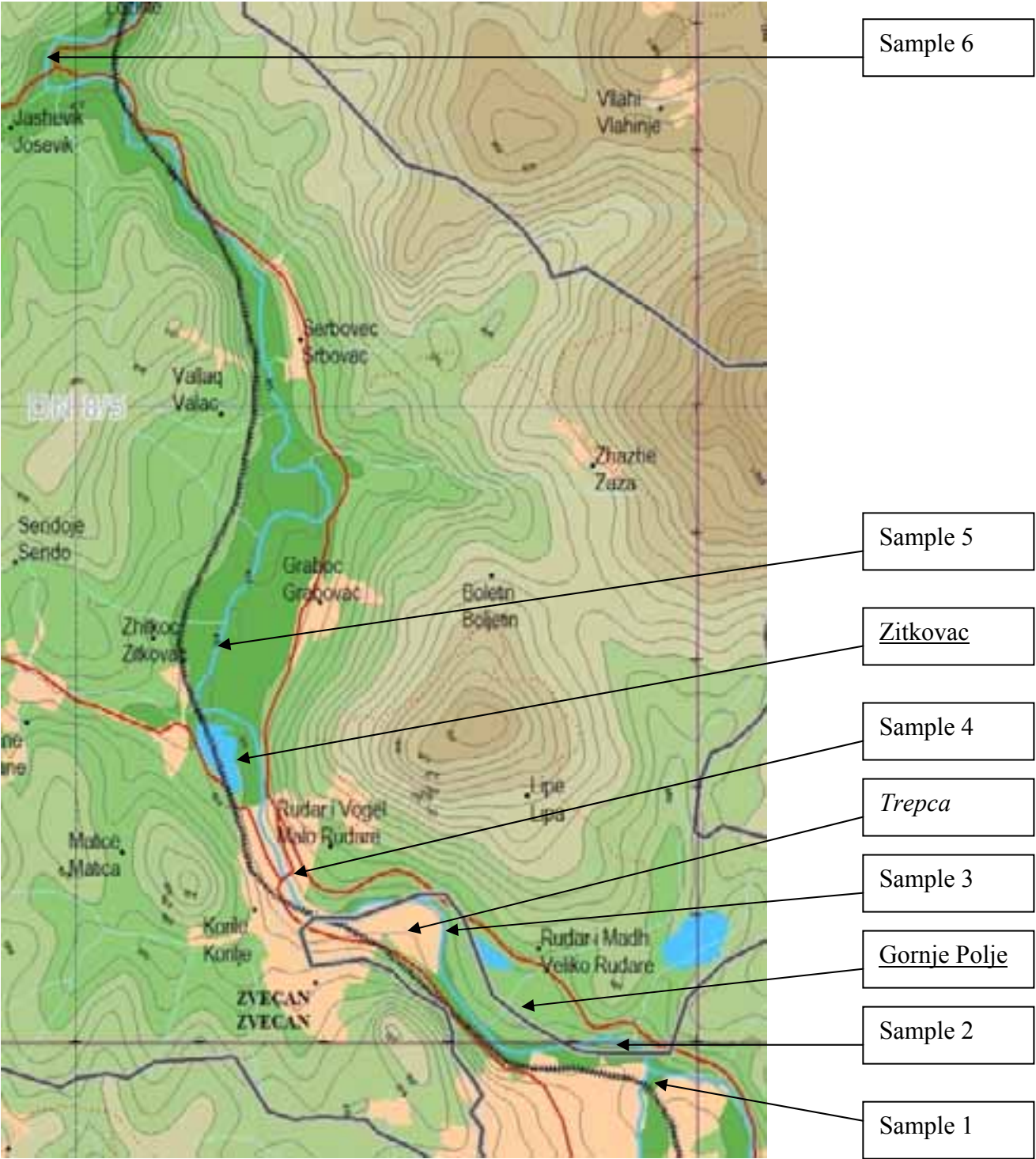
Map 1 Kosovo including mines



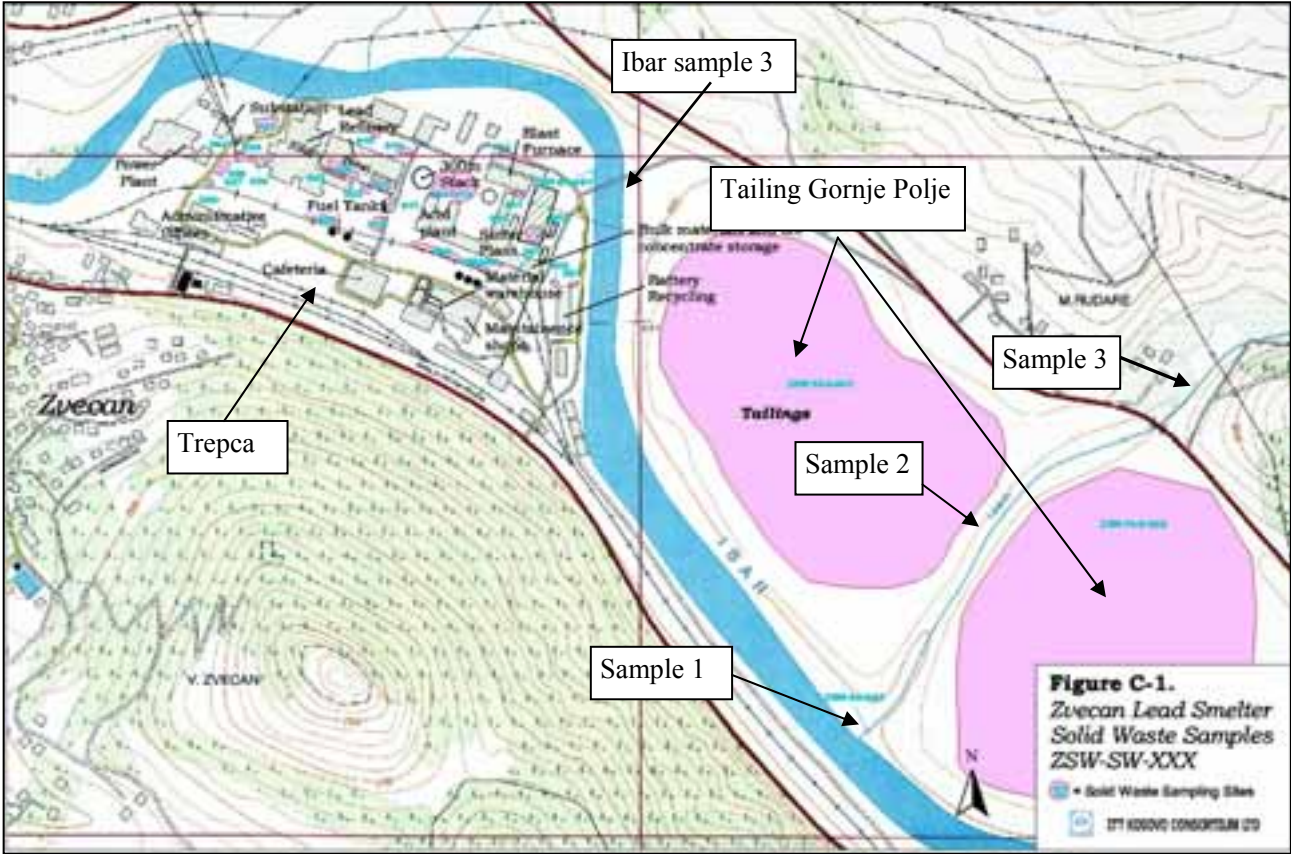
Map 2 The Ibar River system incl. water reservoir



Map 3 showing the water and sediment sample sites at Ibar, the tailings Gornje Polje and Zitkovac and the Trepca factory area.



Map 4 Water and sediment samples from Leskov – Gornje Polje tailing (incl. Ibar sample 3).



Appendix 2 sampling procedure of Gornje Polje

Sampling procedure at Gornje Polje:

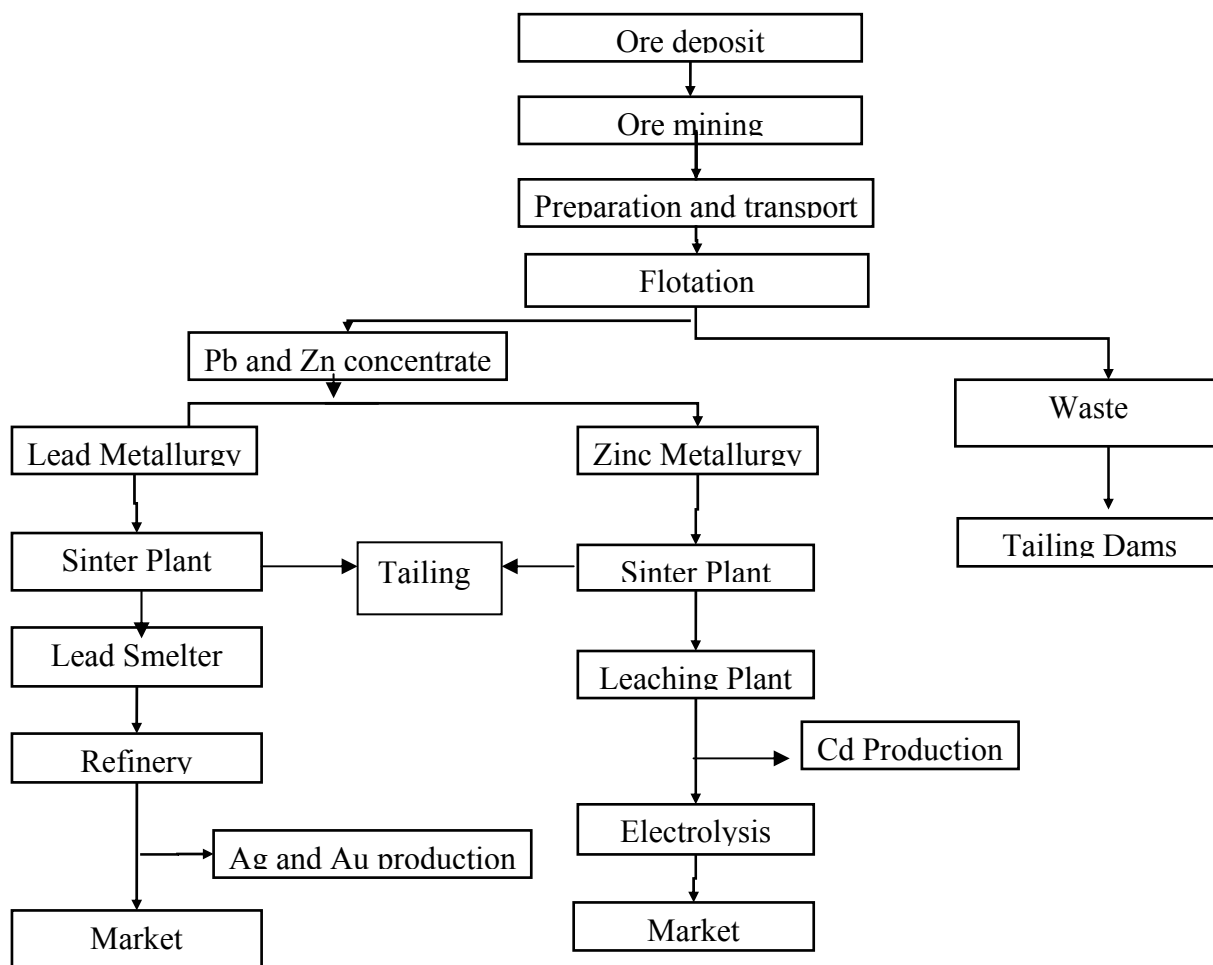
The top of a 1.5 litre bottle was cut off to get a larger opening in the bottle and the bottle was cleaned thoroughly. All sampling bottles had been acid washed before using them to samples.

- Five meters was measured
- Filled the sampling bottle half
- Measured the width of the river on 0,1,2,3,4 and 5 meter and calculated the average
- Measured the depth of the creek on four different places of each of the above measurements (The creek bed is more or less flat and not conic, so the density has to be calculated as a square)
- The flow of the water was measured by measuring how long time it takes for a 4 cm stick to flow the five meters.
- The rest of the sampling bottle was filled in the upstream end of the measurement area.
- The water in the bottle is mixed, and is then poured into a transportation bottle
- Extra water was taken to further pH measurement in the lab
- pH was measured with a pH test kit

Appendix 3 Process descriptions of lead and zinc mining

Appendix XX

Process descriptions of lead and zinc mining (general description).



Metals such as lead and zinc are mainly mined from two types of deposits, namely from lode deposits or placer deposits **Ore?**. Lode deposits are concentrated deposits that are fairly well defined from the surrounding rock. It is in these ore deposits metals such as lead, zinc, iron, copper and other metals are found.

There are three general approaches to mining namely surface or open pit mining, underground mining and solution or fluid mining. Since the Trepca mines are underground mining a description of this follows.

Underground mining requires removal of lots of underground waste rock material. Which can be eliminated with backfill of the waste rock into used ores. Furthermore lots of water will have to be removed when the underground digging hits an underground spring. This water is often highly contaminated with metals and sulphur.

Surface or open-pit mining requires extensive blasting, as well as rock, soil, and vegetation removal, to reach lode deposits Benches are cut into the walls of the mine to provide access to progressively deeper ore, as upper-level ore is depleted.

Ore is removed from the mine and crushed and transported to milling and beneficiating plants for concentrating the ore, and smelting, and/or refining (EPA Office of Compliance Sector Notebook Project 1995: 16).

When the ore has been extracted it is then prepared/beneficiated, which is the processing where the ores change the size of the product, to remove unwanted constituents, or to improve the quality, purity, or grade of a desired product. There are many different beneficiation methods, however in the lead and zinc mining industry milling, flotation, sintering and smelting are the main methods used.

Firstly, the lead and zinc ores milled which entails a crushing, grinding and filtration process in order to achieve uniform particles. In some milling processes the ore may be treated with conditioners in order to prepare the ore for the flotation process. Common conditioners may include lime, soda ash, and caustic soda, or sulfuric acid. The conditioned ore is then slurried in fresh or salt water with chemical reagents to beneficiate the ore. The ore is then ready for flotation.

Flotation is the use of a chemical reagent to make the minerals adhere to air bubbles (EPA Office of Compliance Sector Notebook Project 1995). Different metal compounds are separated from the fine-grained ore with the help of a flotation process, where water, sulphur dioxide (SO₂) calcium hydroxide (Ca(OH)₂), copper sulphate pentahydrate, zinc sulfate, coal tar, sodium or calcium cyanide and an organic compound is added as agents, in order to promote flotation⁷⁴.

⁷⁴ MANAGEMENT OF MINING, QUARRYING AND ORE-PROCESSING WASTE IN THE EUROPEAN UNION, 2001.

The result of the process is concentrating the minerals from the ore. The type of chemical reagent used depends on what type the ore is. Several separate flotation steps may be needed to concentrate individual metal values from the ore. Lead and zinc mineral concentrates that are going to be smelted and refined may require sintering, typically performed at the smelter site.

Sintering process partially fuses the ore concentrates into an agglomerated material for processing, and involves several steps. First, ore concentrates are blended with moisture and then fired (sintered) and cooled. During cooling, the sinter is crushed, graded, and further crushed to produce a smaller sinter product. By-products of these processes are sulfur dioxide, nitrogen dioxide, and carbon monoxide. Residues generated also include dust and primary lead process water.

The main wastes and materials generated from the processing of the lead and zinc ore are mine water, which is considered a waste if its released into the environment, overburden/waste rock, tailings and slag (EPA Office of Compliance Sector Notebook Project 1995). These problems will be further investigated below.

Potential pollution from mining

The extraction and beneficiation of metals produce significant amounts of waste and byproducts. Total waste produced can range from 10 percent of the total material mined to well over 99.99 percent. These numbers are based on mines in the United States, however (EPA Office of Compliance Sector Notebook Project 1995: 29).

The following table shows the potential pollution sources related to the mining process.

Table X potential pollution sources related to mining process (adopted from EPA Office of Compliance Sector Notebook Project 1995)

<i>Mining Process</i>	<i>Process waste</i>	<i>Air emissions</i>	<i>Other waste</i>	<i>Land, habitat, wildlife</i>
Site preparation	Erosion due to removal of vegetation	Exhaust from construction vehicles; fugitive dust	Run-off sediment	Deforestation and habitat loss from road and site construction
Blasting/excavation	Acid Rock Drainage	Dust blown to surrounding	Non-reused overburden;	Loss of habitat; increase in erosion; loss of plant

	(ARD); erosion of sediments; petroleum wastes from trucks	area; exhaust from heavy machinery	waste rock	population from dust and water pollution; reduction in localised groundwater recharge resulting from increased run-off; loss of fish population from water pollution; nearby structural damages from vibration and settling; competition for land use
Crushing/ Concentration	Acid Drainage (ARD) tailings	Rock from	Dust during transportation	created Additional waste rock; tailings
Leaching	ARD; water pollution from ruptures in pipes and ponds holding leach solution			Sludges from neutralisation of contaminated water Loss of plant, fish and water fowl population from water pollution

Several types of wastes are created when metal ores are extracted from the earth.

The first is overburden and waste rock, which is soil and rock removed in order to access an ore or mineral body. Overburden typically includes surface soils and vegetation, while waste rock also includes rock removed while sinking shafts, accessing or exploiting the ore body, and rock embedded within the ore or mineral body. Most overburden and waste rock are disposed of in piles near the mine site, which is also the case at Trepca.

Tailings are a second type of common mining waste. Most beneficiation processes generate tailings, which contain a mixture of impurities, trace metals, and residue of chemicals used in the beneficiation process.

Tailings usually leave the mill as slurry consisting of 40 to 70 percent liquid mill effluent and 30 to 60 percent solids. However, the liquids are commonly reused in milling processes. Most mine tailings are disposed in on-site impoundments. Impoundments are designed to control the movement of fluids both vertically and horizontally. These are also known as tailing dams and several catastrophic accidents have happened due to dam failures, for example in at the Los Frailes mine in Spain, where the dams wall collapsed and millions of cubic meters acid heavy metal water ran out and polluted a huge agricultural land. However, the tailings at Trepca are dry and thus are not stored in dams, but in opened exposed piles.

Water removed from a mine to gain or facilitate access to an ore body is known as mine water. Mine water can originate from precipitation, from flows into pits or underground workings, and/or from groundwater aquifers that are intercepted by the mine. Mine water is only a waste if it is discharged to the environment via a point source. However, mine water can be a big problem at many mines, and large quantities of water may have to be pumped continuously during operations.

Acid drainage is a potentially severe pollution hazard associated with mining, and can be difficult to predict. It occurs when pyrite and other sulfide minerals, upon exposure to oxygen and water, oxidize to create ferrous ions and sulfuric acid. Catalyzed by bacteria, the ferrous ions react further with oxygen, producing hydrated iron oxide, known as "yellowboy". When this reaction occurs within a mine it is called Acid Mine Drainage (AMD). When it occurs in waste

Rock and tailings piles it is often known as Acid Rock Drainage (ARD)⁷⁵. AMD is a significant problem at many abandoned mine sites. It is estimated that 5,000 to 10,000 Miles of domestic streams and rivers are impacted by acid drainage in the United States. Acid drainage can lower the pH of surrounding water, making it corrosive and unable to support many forms of aquatic life; vegetation growing along streams can also be affected. In extreme cases, acid drainage can kill all living organisms in nearby streams. Humans may also increase disease risks by consuming drinking water and fish tissue with heavy metal content. It is interesting in this context to note that acid drainage can pose significant threats to surface and groundwater quality and resources during active mining and for decades after operations cease. Thus, there is a need for water treatment decades after the mine has closed as abandoned mines and refuse piles can produce acid damage for over 50 years.

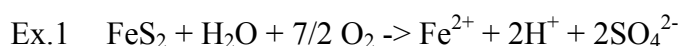
Acid leaching is an additional source of water pollution. The leaching process itself resembles acid drainage, but it is conducted using high concentrations of acids to extract metals from ore. Most environmental damage associated with acid leaching is caused by leakage, spillage, or seepage of the leaching solution at various stages of the process. Potential problems include: seepage of acid solutions through soils and liners beneath leach piles; leakage from solution-holding ponds and transfer channels; spills from ruptured pipes and recovery equipment; pond overflow caused by excessive runoff; and ruptures of dams or liners in solution-holding ponds.

Substantial air pollution can occur at mining sites during excavation and transportation. The inherent toxicity of the dust in the air depends on the type of ore being mined. Sources of dust may be from road traffic in the mine pit and surrounding areas, rock crushers located in pits and in mills, and from tailings.

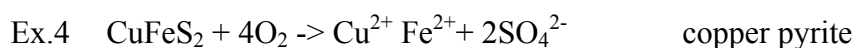
⁷⁵ AMD is the most widely used term for both.

Appendix 4 Chemical processes in tailings

In sulphide ore the wanted metals occur as copper, zinc, lead, cobalt etc. combined with reduced sulphur, sulphide (S^{2-}) as sulphide mineral. The problem is that sulphide is unstable in reducing environments. Reducing environments is for example anaerobe conditions in soil ore moor. By hewing and the following crushing and enrichment of the ore the acid in the air gets in contact with the reduced sulphur. The sulphur gets oxidized to sulphate (SO_4^{2-}). This is exemplified by the ex.1, which shows how sulphur mineral pyrite (FeS_2) oxidizes.



This oxidation of the sulphur causes that hydrogen ions and sulphate is produced (sulphur acid). The other equations of oxidizations of heavy metals are:



But the produced sulphate SO_4^{2-} will when it gets in contact with hydrogen ions H^+ from ex. water (H_2O) produce H_2SO_4 sulphur acid. (Miljöteknik/HH/L02064/Rapport Rågrecksgruvorna.doc).

When the ore is lying underground it is protected from this process, but as soon as it is exposed to atmospheric oxygen through excavation and dumped as a tailing, several bio-geo-chemical processes starts that can lead to the production of acid mine drainage. Therefore, it is not the content of the metal sulphides in itself, i.e. for example the lead content of the Trepca tailings, but the combined effects of the metal sulphide content and the exposure to atmospheric oxygen. The effect of the exposure increases with decreasing grain size, i.e. the smaller the particles are, the more of its surface is exposed to the oxygen. Although, if sulphide oxidation occurs in a tailing at Trepca, the acid produced that releases heavy metals to the surrounding environment, may be halted by other acid consuming carbonates that might also be present in the tailing. If carbonates are present in the tailing the pH is usually neutral, the dissolved metals precipitate and are thus not transported to the surrounding environment.

There are also other factors that influence the quality of the drainage water, namely spatial variations, such as the infiltration rate of the tailing, the evaporation rate, the oxygen profile in the tailing, the height of the tailing and the construction of the tailing and many others (see European Commission 2003: 35). The most important interaction between the tailing and the atmosphere is illustrated in figure XX.

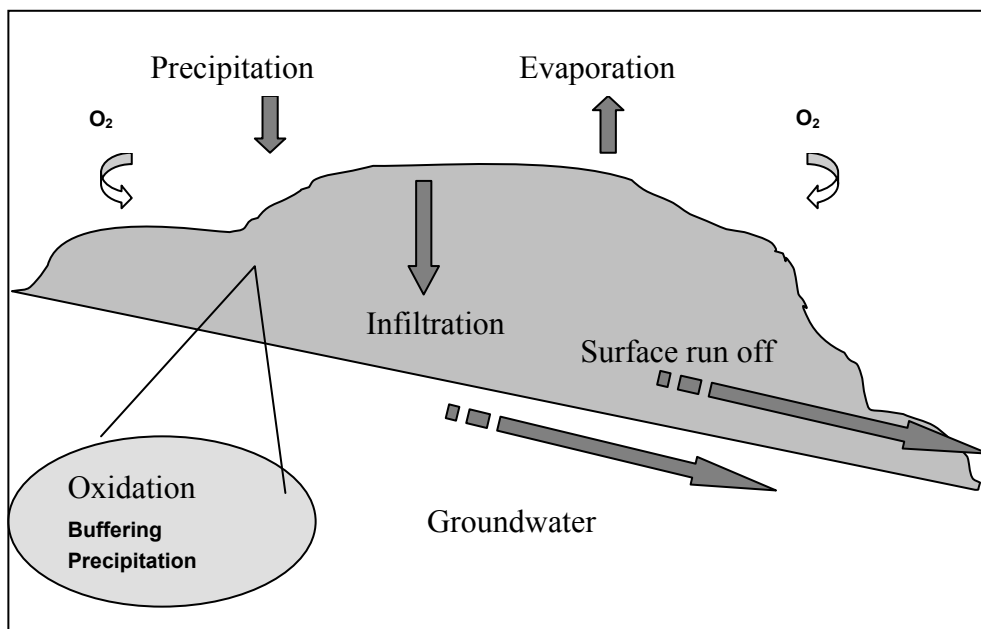


Figure XX. Schematic illustration of the drainage water generation as a function of the interaction between the tailings and the atmosphere (Adopted from European Commission 2003: 35).

Thus there are ranges of parameters that will have to be taken into account, if trying to investigate whether ARD is occurring or not. Unfortunately, it has not been possible, nor feasible to conduct such an investigation on the Trepca mine tailings. However, the company Golder have done an examination on the content of the tailing Zitkovac to find out a proper solution to make the pollution from the tailing to the surrounding area less. This report will be discussed later in the chapter.

Nevertheless, the release of ARD to surface and ground water deteriorates the water quality and may cause a number of impacts, such as depletion of alkalinity, acidification, bioaccumulation of metals, accumulation of metals in sediment, effects on habitats, elimination of sensitive species and making the eco-systems unstable (European Commission 2003: 34).

Heavy metals ability to bind to the soil is influenced by the Cat- ion Exchange Capacity (CEC) is the amount of exchangeable cat ions the soil can absorb. CEC depends on the humus and clay content. Most soil colloids are negatively charged and attract positive particles, for instance heavy metals. Therefore, the amount of colloids the soil contains is significant to how many cat ions the soil can contaminate. Sandy soil has a less content of colloids and therefore the toxic effects of heavy metals are larger because the heavy metals

are on ion form. For example, only 1/5 lead concentration in a sandy soil reduces respiration of microorganisms 15 % of what should be gained to a clay earth to reach the same reduction (Giller et al 1998).

pH has a double impact on the effect of heavy metals toxicity, cause it both influence on the CEC and the metals chemical structure. CEC decreases by lower pH due to the humus colloids in the earth is being occupied by H^+ - atoms and in general the extent of metals is increased by 200 %, when pH decrease with one unit (Giller et al 1998).

The soil's microbial biomass make a total of less than 5 % of the total organic material in the soil, but this biomass carries out several vital functions. The micro organisms are an important link in the re-circulation of carbon, sulphur phosphor and nitrogen. This re-circulation is very important for flora to grow. Almost all this activity is growing in the top layer 0-10 cm. (Nyle, 1999)

When the environment is exposed to stress factors like heavy metal pollution, it causes a decreased number of organisms and the diversity. High heavy metal concentrations can cause the emergence of heavy metal tolerant organisms. For example, an experiment showed that after 420 days zinc contaminated soil had returned to normal background values [Kelly et al 1999]. In general it seems like fungus are more tolerant to heavy metals.

The exposure of heavy metals to the soil can have an influence of the microbial uptake of essential metals as a competition between essential metals and heavy metals of binding to the cells surface may start. However, organisms can tolerate a certain limit of heavy metal and for some plants it is possible to store heavy metal in inactive deposits followed by later excretion. (Kelly, Duxbury)

The effluents and dust emitted from the tailings at Trepca may be toxic in varying degrees to humans, animals and plants. The actual environmental impact of emissions to watercourses, such as the Ibar, will depend on the concentration of the substances, pH, water hardness, and other factors (European Commission 2003:32). Fortunately, it is possible to investigate whether heavy metals can be found in the Ibar River. Water, sediment and fish samples have therefore been collected to examine their heavy metal content. Regardless of the results it is not possible to say whether traces of heavy metals (if found) are due to the phenomenon of ARD or erosion of tailing into the river or the wind carrying particles into the river. It is likely that it will be a combination of a range of factors.

Appendix 5 Chemical contents in Zitkovac (Golder 2003)

Determinand or element	Units	Top surface of dam		South & East slopes		North & West slopes	
		0-100	100-300	0-100	100-300	0-100	100-300
pH	-	8.11	8.14	4.38	5.7	8.21	8.78
Lime Requirement	tons / hectare	3.2	4.8	25.4	3.2	35.2	7
Electrical conductivity	mS/m	288	332	318	279	246	246
Phosphate	mg / kg	0.17	0.12	0.1	0.09	0.12	0.08
Boron	mg / kg	0.08	0.08	0.08	0.08	0.08	0.02
Potassium	mg / kg		77	8	10	8	8
Sodium	mg / kg		38	8	4	8	1
Calcium	mg / kg		23129	21260	21474	22879	24789
			20.129	21.25	21.474	22.879	24.789
Magnesium	mg / kg		47	29	47	21	36
Semi quantitative scan of saturated water extracts							
Lithium	mg / kg	0.0040	0.0048	0.0068	0.0017	0.0023	0.0022
Beryllium	mg / kg	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Boron	mg / kg	0.0509	0.0457	0.0333	0.0269	0.0285	0.0021
Titanium	mg / kg	0.9338	0.8731	0.8962	0.7923	0.7191	0.6388
Vanadium	mg / kg	0.0022	0.0015	0.0009	0.0010	0.0008	0.0005
Chromium	mg / kg	0.0002	0.0003	0.0005	0.0005	0.0002	0.0000
Manganese	mg / kg	0.0209	0.2214	0.0000	0.8849	1.8118	0.8958
Cobalt	mg / kg	0.0083	0.0086	0.0229	0.0058	0.0046	0.0035
Nickel	mg / kg	0.0466	0.0594	0.1193	0.0485	0.0449	0.0361
Copper	mg / kg	0.0026	0.0073	0.0108	0.0008	0.0002	0.0037
Zinc	mg / kg	0.0258	0.1099	3.7508	0.0621	0.0854	0.0752
Arsenic	mg / kg	0.0083	0.0064	0.0164	0.0093	0.0040	0.0048
Bromine	mg / kg	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Selenium	mg / kg	0.0087	0.0002	0.0034	0.0055	0.0002	0.0050
Rubidium	mg / kg	0.0079	0.0378	0.0022	0.0046	0.0021	0.0022
Strontium	mg / kg	0.1806	0.2621	0.1708	0.1108	0.1118	0.0832
Molybdenum	mg / kg	0.0004	0.0001	0.0007	0.0000	0.0002	0.0000
Palladium	mg / kg	0.0614	0.0184	0.0029	0.0118	0.0040	0.0048
Cadmium	mg / kg	0.0007	0.0021	0.0151	0.0012	0.0014	0.0003
Tin	mg / kg	0.0008	0.0004	0.0008	0.0003	0.0007	0.0000
Antimony	mg / kg	0.0019	0.0007	0.0009	0.0014	0.0005	0.0008
Tellurium	mg / kg	0.0006	0.0004	0.0006	0.0000	0.0003	0.0008
Iodine	mg / kg	0.0000	0.3651	0.8030	0.0000	0.7823	0.9809
Caesium	mg / kg	0.0009	0.0029	0.0014	0.0017	0.0011	0.0012
Barium	mg / kg	0.0125	0.0191	0.0041	0.0073	0.0029	0.0000
Lanthanum	mg / kg	0.0007	0.0004	0.0012	0.0001	0.0000	0.0002
Tungsten	mg / kg	0.0003	0.0004	0.0001	0.0000	0.0003	0.0001
Platinum	mg / kg	0.0008	0.0010	0.0000	0.0003	0.0003	0.0003
Mercury	mg / kg	0.0087	0.0217	0.0097	0.0033	0.0035	0.0033
Thallium	mg / kg	0.0002	0.0019	0.0002	0.0004	0.0001	0.0001
Lead	mg / kg	0.0000	0.0030	0.0023	0.0000	0.0000	0.0037
Bismuth	mg / kg	0.0001	0.0000	0.0002	0.0000	0.0000	0.0000
Uranium	mg / kg	0.0016	0.0000	0.0000	0.0005	0.0000	0.0000
Physical properties							
Grading							
Silt (0.6 - 2.0 mm)	%	62.8	-	75.3	-	83.8	-
Sand (0.25 - 0.5 mm)	%	31.4	-	18.7	-	11.0	-
Clay (0.106 - 0.25 mm)	%	6.0	-	11.0	-	6.0	-
Hydraulic conductivity	mm / hr	49.8	-	77.1	-	249	-

Appendix 6 Atom Absorption Spectrometri AAS

Atom Absorption Spectrometry (AAS)

AAS builds on that an atom in gaseous conditions absorbs light at specific wavelength. To make use of this Principle the sample solution is blown in to a gas flame at temperatures that makes the heavy metals existing on ion form to change to atoms. Spectral lamps with the same wavelength as the metals which to measure is send through the flame. A part of the light will be absorbed in the free metal atoms. The rest of the light will be separated in a monochromator so that only the right wavelength will be passed on. The separated light will afterwards hit a photocell that register how big a part of the light there has been absorbed in the metal atoms. All data is afterwards sent to a computer, which after a standard curve decide the concentration of the metal. To those calculations are used VST-software.

Method

A proper sample amount 0,5/1/2 gram dry weight sediment/fish/water and is mixed with 6 ml HNO₃ 70%, and 1 ml H₂O₂ 30 %. Thereafter the samples get prepared in the micro oven. After cooling down for 15 min the samples were filtrated. The filters were acid washed. The samples is added milli Q water till it reach the wanted amount. The analyses of the samples were carried out twice.

The standards used were:

Cd	3 mg/l
Pb	30 mg/l
Zn	2 mg/l
Cu	10 mg/l