JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF AGRICULTURE, FORESTRY AND WATER ECONOMY (MAFWE)
THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA

No.

THE STUDY ON CAPACITY DEVELOPMENT FOR SOIL CONTAMINATION MANAGEMENT RELATED TO MINING IN THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA

FINAL REPORT
VOLUME II
MAIN REPORT

MARCH 2008

MITSUBISHI MATERIALS NATURAL RESOURCES DEVELOPMENT CORPORATION

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PREFACE

In response to a request from the Government of the Former Yugoslav Republic of Macedonia, the Government of Japan decided to conduct "The Study on Capacity Development for Soil Contamination Management Related to Mining in the Former Yugoslav Republic of Macedonia" and entrusted to the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Mikio Kajima of MITSUBISHI MATERIALS NATURAL RESOURCES DEVELOPMENT CORP. between December 2005 and November 2007. In addition, JICA set up an advisory committee consisted of Dr. Junta Yanai, Associate Professor of Graduate School of Agriculture, Kyoto Prefectural University, Mr. Junichi Hirano, Supervisor of Environmental Activities Division, Aichi Prefectural Government, Dr. Mitsuo Yoshida and Mr. Masato Kawanishi, JICA Senior Advisors, which examined the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of the Former Yugoslav Republic of Macedonia, and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Former Yugoslav Republic of Macedonia for their close cooperation extended to the study.

March 2008

Ariyuki Matsumoto

Vice President

Japan International Cooperation Agency

LETTER OF TRANSMITTAL

March 2008

Mr. Ariyuki Matsumoto

Vice President

Japan International Cooperation Agency

Dear Sir,

We are pleased to submit herewith the final report for *"The Study on Capacity Development for Soil Contamination Management Related to Mining in the Former Yugoslav Republic of Macedonia"*.

The Study aims to achieve the environmental improvement in the Zletovica area, and the Study Team formulated Master Plan on capacity development for soil contamination management, Feasibility Study for priority projects and technology transfer through study activity and seminar/workshop.

The Zletovica area is an important grain field in the Former Yugoslav Republic of Macedonia. At the same time, it faces a challenge because of soil and groundwater contamination arising from the old tailings dam. To encounter these issues, some of the recommendations made by the Study Team have already been incorporated into the Master Plan of Capacity Development for Soil Contamination Management in the Former Yugoslav Republic of Macedonia.

We wish to take this opportunity to express the sincere gratitude to the officials of your Agency, the Advisory Committee, the Ministry of Foreign Affairs, and the Ministry of the Environment of Japan for their kind support and advice. We also would like to show the appreciation to the officials of the Ministry of Agriculture, Forestry and Water Economy, the Steering Committee and Probistip Municipality in the Former Yugoslav Republic of Macedonia, JICA Balkan Office and the Embassy of Japan in Austria for their kind cooperation and assistance throughout the field survey.

Finally, we hope that the recommendations of the Study Team will contribute to further environmental improvement in the Zletovica area.

Very truly yours,

Mikio Kajima

Team Leader

Study Team for the Study on Capacity Development for Soil Contamination Management Related to Mining in the Former Yugoslav Republic of Macedonia

FORMATION OF THE FINAL REPORT

The Final Report is comprised of the following volumes:

Volume I	:	SUMMARY
Volume II	:	MAIN REPORT
Volume III	:	APPENDICES
Volume IV	:	DATA REPORT
Volume V	:	ACTION PLAN OF RISK MITIGATION FOR SOIL CONTAMINATION IN THE PILOT PROJECT AREA
Volume VI	:	SUMMARY (in Japanese)

Volume I, SUMMARY, contains background information of the study, brief information of the Pilot Project and summary of the Master Plan for soil contamination management related to mining in Macedonia.

Volume II, MAIN REPORT, contains information of the overall study and its results; that is the background information of this study, results of the Pilot Project and the Master Plan for soil contamination management related to mining in Macedonia.

Volume III, APPENDICES, contains figures related to the main report and some explanation materials.

Volume IV, DATA REPORT, contains various material supporting the report, such as sampling methods, methods of chemical analysis, descriptions of soil and drilling core, results of chemical analysis, calculation and distribution of environmental risk in the Pilot Project Area and minute of the steering and technical committees and working groups.

Volume V, ACTION PLAN OF RISK MITIGATION FOR SOIL CONTAMINATION IN THE PILOT PROJECT AREA, contains the action plan for the soil contamination in the Pilot Project Area.

Volume VI, Summary in Japanese

ABSTRACT

The objective of this study is to conduct technical assistance for capacity development (CD), concerning the legislation, administration system and organizational structure, for soil contamination management related to mining in Macedonia.

The components of the study are:

-to formulate a Master Plan (M/P) for sound management in soil contamination related mining to improve the environment in Macedonia;
-to conduct a Pilot Project (P/P) at the planned irrigation site of the Zletovica Basin Water Utilization Improvement Project in Probistip, including soil survey, groundwater survey, crops survey and risk assessment of the soil contamination, and
-pursue technological transfer to the counterpart personnel in the course of the implementation of the study to facilitate the process of independently driving forward the sustainable system of soil contamination management after this study..

The M/P was formulated considering the whole area of Macedonia and the P/P was conducted in the Zletovica Basin in Probistip. The content of work includes preparation work in Japan, capacity assessment, the P/P (Phase 1: reconnaissance survey, Phase 2: general and detailed surveys, Phase 3: additional survey), preliminary assessment of the environmental situation at the soil contamination hotspots in the whole area of Macedonia and formulation of the M/P.

1. Results of Study

1.1 Present Capacity of Soil Contamination Management Related to Mining

Despite several potentially serious soil contamination hot spots near mining activities and smelter plant, there are no laws specific to soil contamination management and no standards for heavy metal contamination levels in soil in Macedonia at present. However, several existing laws, such as the Law on Environment (2005), Law on Agricultural Land (1998) and Law on Mineral Resources (2007), contain some relevant provisions. The Ministry of Agriculture Forestry and Water Economy (MAFWE), Ministry of Environment and Physical Planning (MEPP), Ministry of Health (MoH) and Ministry of Economy (MoE) have roles related to soil contamination management, but present roles of each ministry are poorly defined and unclear and sometimes overlapping among the Ministries. However, in 2007, the Division of Soil and Waste was established in MEPP and this division is expected to have a responsibility of the soil contamination management in future.

1.2 Pilot Project

The purpose of the Pilot Project (P/P) was to understand the situation of soil contamination of the P/P area and to implement capacity development for management of soil contamination to governmental institutions and local organisations.

(1) Survey Results of the Pilot Project

The grid soil surveys at the grid sizes of 400m, 200m, 100m and 50m, successively conducted in the P/P Area, resulted in identifying zones of high concentrations of heavy metals, narrow-downing the zones and clearly defining the boundaries of lower and higher concentration zones. The high heavy metal concentration zones from human and natural causes were clarified by the soil survey. The high concentration zones of Cd-Cu-Pb-Zn-Mn, occurring along the Kiselica River and lower stream area of the Zletovska River, can be attributed to the spillage of the tailings by the accidents of collapse of the tailings dam in 1976. Other high concentration zones of Cd-Cu-Pb-Zn-Mn, found along the Koritnica River and Zletovska River before the Kiselica River flows in, can be attributed to the mining activity of the Zletovo mine site. The two occurrences of high heavy metal concentrations are considered to be caused by mining activities of the area, therefore considered as contamination by human causes. A wide distribution of high Co-Cr-Ni grids in the southwest of the area corresponds well with a distribution of the Eocene sedimentary rock, and the cause of the Co-Cr-Ni enrichment in soil of the area is attributed to geological nature (natural cause). High As concentration zone occurs overlapping and close to high Cd-Cu-Pb-Zn-Mn zone in the tailing dam area and the other ones occur isolated in the area south of the Probistip, northwest and northeast of the P/P Area. The former is clearly related to the mining activities of the area and the latter are most probably related to the natural causes, caused by the mineralization of Pb-Zn.

The well/spring water samples collected from the 29 villages of the P/P area show high concentrations of As, Co, Ni and Pb, being higher than the Standard of Drinking Water in most of the wells and springs. It is a serious health problem that more than half of the wells/springs in the P/P area are still used as a source of drinking water by the local residents. The situation of river water is similar, showing the Ni, Pb and Mn concentrations exceeding the Water Quality Standard at most of the locations.

The crops survey conducted in 2006 and 2007 show that Pb concentration of wheat exceeded the standard value of Macedonia for 36% of 2006 samples and 22% of 2007 samples. It seems that yearly variations of Pb concentration in wheat exist, suggesting that long term monitoring is necessary to understand the Pb concentrations of wheat in the area.

(2) Risk assessment

Risk assessment was conducted using the results of the P/P survey.

a. Exposure Risk of Heavy Metals in Soil Characterised by Land Use

The results of the distribution of the exposure risk by heavy metals in soil show that 400m grids of Level 5, which has risk of 1,000 to 10,000 times more than the risk calculated from 10% of TDI (Tolerable Daily Intake) Value as an end-point, occur in limited areas near the Processing Plant and the Tailings Dam No.1. The 400m grids of Level 4, which have the risk of 100 to 1,000 times more than the risk calculated from TDI Value, occur surrounding the tailings dam and along the Kiselica, Koritnica and Zletovska Rivers. The 400m grids of Level 3, which have the risk of 10 to 100 times more than the risk calculated from TDI Value, widely occur in the P/P area.

b. Total Exposure Risk of Heavy Metals in Soil and Drinking Groundwater

Total exposure risk levels of soil and drinking groundwater in the P/P area consist of four exposure risk levels, ranging from Level 5 to Level 2. The exposure risk of heavy metals in the drinking water is classified as Level 4, and the grids of Level 4 are distributed widely in the west and southeast parts of the P/P area, where groundwater is used for drinking.

c. Agricultural Risk Assessment of Crops in the Pilot Project

In this study, “agriculture risk” was defined as “the risks of agricultural products by heavy metals” and the agricultural risk used in the report means “the risks of crops (wheat, rice and corn) production by heavy metals”.

The agricultural risk of crops was assessed using the standard value of heavy metals in crops of Macedonia. No clear correlation between Exposure Risk Level of Pb in soil and wheat exceeding the Pb Standard Value (0.2mg/kg) is recognised, The contaminated wheat exceeding the standard value of Pb content is widely scattered in the area, thus the agricultural risk in the area is relatively high. However, the agricultural risk cannot be clearly divided into agricultural high risk and low risk zones in the area due to the limitation of present survey.. As the difference between results of crop analysis in 2006 and 2007 demonstrates annual variation of Pb concentration probably caused by climate conditions and etc.,, it is necessary to continuously monitor the quality of crops for clarifying the agricultural risk in the area.

1.3 Master Plan on the Soil Contamination Management

The purpose of M/P is, based on the study, to further develop capacity for soil contamination management related to mining for improving the environment in Macedonia and to facilitate the process of independently driving forward the sustainable system of soil contamination management after this study.

(1) Institution Level of Capacity Development on Soil Contamination Management

On the legal framework of soil contamination management in Macedonia, the MEPP should take the initiative on soil contamination management and establish the "Basic Law on Soil

Contamination Management" as the leading ministry. The institutional framework and roles of the soil contamination management in each ministry should be:

-Ministry of Environment and Physical Planning (MEPP): Taking the initiative on Soil Contamination management and in charge of soil contamination management of urban, industrial/commercial areas.

-Ministry of Agriculture、Forestry and Water Economy (MAFWE): Taking charge of soil contamination management of agricultural land.

-Ministry of Economy (MoE): Taking charge of soil contamination management of mining areas.

-Ministry of Health (MoH): Taking charge of improvement of conservation of public health and environmental risk assessment.

-Local Municipalities: Taking charge of implementation of some soil contamination management activities for the sites within their areas of responsibility, with support from the relevant ministries.

a. Provisional Legal Framework of Soil Contamination Management until Establishment of the Basic Law of Soil Contamination Management

The adoption of the Basic Law of soil contamination management is likely to take much time, so that the process of provisional institution system until establishment of the Basic Law is required. The contents and framework of the provisional soil contamination management are basically similar to those after the establishment of the Basic Law.

b. Procedure of Main Tasks for Constricting Provisional Institutional Framework of Soil Contamination Management

The main tasks for constructing of provisional Institutional Framework of the Soil Contamination Management (SCM) are shown below.

Task - 1: Definition of Soil Contamination
Task - 2: Applying the P/P Survey Results (Review of the P/P)
Task - 3: Finding and Selection of Soil Contamination Sites
Task - 4 : Prioritisation of Investigation Sites for Soil Contamination Surveys
Task - 5: Soil Contamination Survey (Guideline of Survey) and Chemical Analysis (Method of the Official Analysis)
Task - 6: Reporting of Soil Survey Results
Task - 7: Counter-measures Method of Soil Contamination
Task - 8: Monitoring Method of Soil Contamination

Each task needs to be discussed adequately step by step in the Working Group of Soil Contamination Management (WG-SCM), facilitated by MEPP. The Environmental Standards for Soil and Groundwater should be discussed in the Technical Advisory Council and WG-SCM.

(2) Society Level of Capacity Development on Soil Contamination Management

The main components of capacity development at society level are public awareness, social education/research/training concerning soil environment, risk communication and resident participation.

Risk communication is an important aspect of the implementation of the remedial and management measures to mitigate soil contamination. Risk communication will need to involve a mix of general awareness-raising and information, plus specific community meetings with individual land owners that are affected in order to explain the proposed actions. Since, at present, the level of awareness is low among communities, farmers and other stakeholders in Macedonia on soil contamination and its potential impacts, it is a important tool for raising awareness of soil contamination and environmental risks. It should be mentioned in the "Basic Law on Soil Contamination Management" that stakeholder meetings should be held for prompt disclosure and information sharing between stakeholders.

(3) Organisation Level of Capacity Development on Soil Contamination Management

CD at organisational level will be necessary to ensure the successful implementation of the M/P and implementation of improvements in SCM on an ongoing and sustainable basis. Specific tasks on CD at organisational level for the main ministries and other stakeholders are provided below.

MEPP: The MEPP will have overall responsibility for SCM and implementation of the M/P. Therefore, CD at organisational level is particularly important for MEPP. The MEPP has recently, in 2007, restructured, establishing a Division of Waste and Soil and this section is expected to play a key role for SCM in future.

MAFWE: Although MEPP takes overall responsibility in relation to SCM and leadership in implementation of the M/P, MAFWE will still play an important role and must take responsibility for SCM with respect to agricultural land. Recently, the Sector for Registration and Management of Agricultural Land was established and this sector is expected to have responsibility for SCM of agriculture land.

MoE: The Sector of Energy and Mineral Resources will play an important role in relation to SCM in mining areas.

MoH: The Ministry of Health (MoH) will play an important role for soil contamination management in relation to public health protection.

Municipalities: The municipalities will have an important role to play in SCM, particularly those that have a high level of mining and other industrial activities within the area under their responsibility. It will be important for MEPP to regularly communicate with the municipalities and raise the profile of SCM. It is important that the capacity of municipalities is developed to a level where they can identify potential problem areas in relation to SCM and they will inform MEPP of these areas.

(4) Technical (Individual) Level of Capacity Development on Soil Contamination Management

The target of technical (individual) level of capacity development on soil contamination management consists of individuals of following four organisations/bodies.

1) Relevant administrative offices of soil contamination management
2) Soil contamination investigation and remediation firms
3) Analytical and soil mechanical laboratories
4) Business firms using harmful substances (as objective sites of soil contamination survey)

The contents of technical (individual) level of capacity development on SCM consist of 1) Soil Contamination Survey, 2) Data Analysis, 3) Counter-measures for Soil Contamination and 4) Management of Information on soil contamination.

The equipments and materials will be needed by the relevant stakeholder organisations in order to develop the capacity of individuals and to carry out their roles in the soil contamination management framework. The MEPP should have the overall responsibility of acting as a focal point for CD, organisation of training, etc. Training is likely to be needed in some of the topics, such as 1) Institutional/Legal Framework, 2) Soil Contamination Survey and Chemical Analysis, 3) Data Analysis, 4) Management of Information on soil contamination and 5) Construction of Data Base.

1.4 Working Programme on Survey and Counter-measures of Soil Contamination in Whole Area of Macedonia

Numerous soil contamination sites exist in Macedonia at present, not only large scale sites related to mining such as "Hot Spots" (the area of significant contamination derived from industrial waste and activities and, therefore posing significant potential risk to human health and the surrounding environment), but also many potential sites of soil contamination of heavy metals due to industrial activities, etc. in the whole area of Macedonia. The proposed survey programme consists of two types of soil contamination survey, namely Hot Spot Survey and Soil Contamination Inventory Survey. The "Hot Spots" are generally characterised by large-scale potential of soil contamination associated with extensive air pollution (mainly dust) and water contamination, which specifically affect human health by harmful substances of heavy metals. Hence, the Hot Spot Survey of soil contamination is a relatively urgent matter. The Soil Contamination Inventory Survey will aim to find contaminated sites other than the Hot Spot sites in whole area of Macedonia. After finding the sites of potential of soil contamination, the sites are listed and prioritised based on the scale of environmental risk due to harmful substances (i.e. heavy metals). MEPP needs to communicate and instruct on the survey concept of the Inventory Survey, such as survey methods, data analysis, soil contamination management, etc. to the staff of each municipality in advance.

There are two types of counter-measures, namely Temporary and Permanent counter-measures. The differences between them are:

- Temporary Counter-measures: In the case of permanent counter-measure can not be carried out immediately, temporary counter-measure is conducted to mitigate risks of human health and to prevent spreading of contamination to the surrounding environment.
- Permanent Counter-measures : It is conducted to prevent the spreading of contamination to the soil and groundwater to surrounding area in the future.

If the soil contamination survey indicates soil and groundwater contamination with urgent necessity of counter-measures and it is impossible to take action of permanent counter-measures immediately, then, temporary counter-measures should be taken to prevent the impact of contamination on the surrounding environment and human health.

2. Recommendations

2.1 Urgent Counter-measures

In the P/P area, the following counter-measure should be taken urgently.

(1) Water from most of the wells/springs of villages in the P/P area has high concentrations of arsenic (As), cobalt (Co), nickel (Ni) and lead (Pb), exceeding the Standard of Drinking Water according to the results of preliminary study using AAS. It is a serious health problem that the water is used for drinking by local residents in half of villages of the P/P area. It is necessary to conduct chemical analysis of the well/springs water at the accredited laboratory (MoH) to confirm the situation of water quality. If the water is confirmed to be contaminated, the counter-measure should be taken immediately to prevent the local residents to use water for drinking and other sources of water supply must be prepared. For taking actions for this problem, it is necessary, at appropriate time, to disclose the actual situation through a proper way of risk communication to the local residents for sharing information and raising awareness and discussing immediate counter-measures.

(2) Finding the scattered distribution of the wheat with high Pb concentration exceeding the standard over the P/P area suggests relatively high agricultural risk and cultivation of wheat must be carefully considered in the P/P area. The yearly variation of heavy metals in wheat found during the P/P suggest that continuous monitoring of wheat with increasing number of samples is necessary to confirm this. After monitoring, proper actions such as changing agricultural product from wheat to something else should be considered.

(3) The tailings dams of TD-I and TD-II are classified as Exposure Risk Level 5. Because they are located close to the residential area and the risk to human health is high, an urgent counter-measure for reducing high risk is necessary. As an urgent counter-measure, either removing tailing material or covering the surface of tailings dam and constructing retaining walls on the west side of the tailings dam should be considered immediately.

2.2 Recommendations

Additional recommendations are given below.

(1) Recommendation on Soil Contamination Surveys

a. It is recommended to include groundwater survey in parallel to soil contamination survey, when planning soil contamination survey. Particularly, for the area where groundwater contamination is anticipated from topographic and hydrological features and wells are used for drinking water, soil/groundwater survey should be conducted promptly.

b. Crops surveys should be included in soil contamination surveys of the agriculture area that have potential of heavy metal contamination.

c. The "Hot Spots" , most of which are related to mining activities, are generally characterised by large-scale potential of soil contamination and are likely to significantly affect human health by harmful substances of heavy metals. Hence, the Hot Spot Survey of soil contamination should be implemented as soon as possible.

(2) Recommendation on Counter-measures

The following remedial counter-measures are proposed in the P/P area for the mitigation of the risk of heavy metal contamination.

- **Priority No.1 –** Tailings dam I and II (proposed as the urgent counter-measures)
- **Priority No. 2 -** Tailings dams TD-IV and TD-V: covering by uncontaminated soil with re-vegetation/re-forestation, retaining walls along the foot of the dike and ditches/culverts for collecting seepage water from the tailings, and water treatment, protection of dust-blowing.
- **Priority No. 3 -** Middle stream of the Zletovska River: removing tailings, tailings should be returned to the new tailings dam.

- **Priority No. 4 -** Lower stream of the Koritnica River: sand controlled dam to stop the rock fragment and gravels with high heavy metal concentrations, install culverts and water treatment.
- **Priority No. 5 -** Lower stream of the Kiselica River: removing tailings; tailings should be returned to the new tailings dam.

(3) Recommendation for Institutional and Organisational Levels

a. MEPP should be take the initiative as the leading ministry responsible for soil contamination management and needs to develop the Basic Law on Soil Contamination Management and necessary ministerial ordinances, etc.

b. It is recommended that recruitment is carried out as soon as possible into the Division on Waste and Soil in MEPP so that it can kick-start the implementation of the Master Plan.

c. MAFWE should formalise the role on soil contamination management in agricultural areas in the new Sector for Registration and Management of Agricultural Land.

d. Linkages between Ministries are essential, and the Technical Advisory Council consisting of the members from the related ministries, organizations and institutes will need to be set up as soon as possible.

e. Financial mechanisms will need to be planned in detail for funding soil contamination management, particularly counter-measures.

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PART IV : CONCLUSIONS AND RECOMMENDATIONS

DATA REPORT

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LIST OF ABBREVIATIONS

AAS	Atomic Absorption Spectrometry
AIST	National Institute of Advanced Industrial Science and Technology, Japan
A/P	Action Plan
CA	Capacity Assessment
CARDS	Community Assistance for Reconstruction, Development and Stabilisation
CD	Capacity Development
C/P	Counterpart
CVAAS	Cold-vapour Atomic Absorption Spectrometry
DF/R	Draft Final Report
EAR	European Agency for Reconstruction
EC	Electrical Conductivity
EDA	Exploration Data Analysis
EEA	European Environment Agency
EEC	European Economic Community
EIA	Environmental Impact Assessment
EIONET	European Environmental Information and Observation Network
ESRI	Environmental Systems Research Institute Inc
EU	European Union
F/R	Final Report
GIS	Geographic Information System
GPS	Global Positioning System
HM	Heavy Metals
HSZ	Public Enterprise Hydro-System Zletovica
ICP	Inductively Coupled Plasma (Emission Spectrophotometer)
ISO	International Organization for Standardisation
ISPA	Instruments for Structural Policies Pre-Accessions
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
MAC	Maximum Allowable Concentration
MAFWE	Ministry of Agriculture, Forestry and Water Economy
MEIC	Macedonian Environmental Information Centre (MEPP)
MEPP	Ministry of Environment and Physical Planning
MoE	Ministry of Economy
MoH	Ministry of Health
MoLG	Ministry of Local Self-Government
M/P	Master Plan
Mt	Million tone
ND	Not detected
NEAP-1	1st National Environmental Action Plan

NEAP-2	2nd National Environmental Action Plan
NPAA	National Programme for Adaption of Acquits
OJP	On-the-job Training
P/P	Pilot Project
RM	Republic of Macedonia
SAPROF	Special Assistance for Project Formulation
SC	Soil Contamination
SCM	Soil Contamination Management
SDI	Spatial Data Infrastructure
SEA	Secretariat for European Affairs (Macedonia)
SGV	Soil Guideline Value
SoE	State of the Environment Report
SPM	Suspended Particulate Matter
SSO	State Statistical Office
SW	Scope of Work
TAC	Technical Advisory Council
TD	Tailings Dam
TDI	Tolerable Daily Intake
TEQ	Toxic Equivalent
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
WHO	World Health Organisation
WG	Working Group
WG-AP	Working Group on Action Plan
WG-MP	Working Group on Master Plan
WG-SCM	Working Group on Soil Contamination Management

Heavy Metals

As	Arsenic
Cd	Cadmium
Co	Cobalt
Cr	Chrome
Cu	Copper
Hg	Mercury
Mn	Manganese
Ni	Nickel
Pb	Lead
Zn	Zinc

CHAPTER 1 INTRODUCTION

CHAPTER 1 INTRODUCTION

1.1 Background of the Study

1.1.1 Zletovica Basin Water Utilization Improvement Project

The people living in the drainage area of Zletovska River, which is a tributary of the Vardar River, flowing in the eastern part of the Macedonia (Figure 1.1), have had to endure the inconvenience of frequent water cut-offs, particularly during the summer, and they rely on groundwater for their water supply. In order to solve the water shortage problems, the Zletovica Basin Water Utilisation Improvement Project was planned by the Government of Macedonia to store the rainwater from the rainy season and to supply it to the residents and irrigation area during the times of water shortages in the summer season. The project aims at supplying drinking and industrial water for over 100,000 people in seven municipalities and supplying irrigation water to an area of approximately 4,000ha.

The Public Enterprise Hydro-System Zletovica (HSZ) was established by the municipal government in 1992 and after working out a concrete idea of the project, they sought assistance from the central government. In response to this, the Government of Macedonia requested a government loan to Japan in 1996 for construction of the multipurpose dam and intake and transmission facilities of water and the Japanese government approved credit for the project in 2003.

During the SAPROF (Special Assistance for Project Formulation) study of JBIC (Japan Bank for International Cooperation), relatively high concentrations of heavy metals such as As and Pb were identified in some of the soil samples collected in the planned irrigation area. The cause of the soil contamination was attributed to spill incidents of the tailings dam of the Zletovo mine, mainly in 1976, when tailings of 150,000m^3 spilled out from the dam downstream, and few measures have been taken to prevent contamination of the soil.

The area of soil contamination within the area of future irrigation of 3,100ha is estimated to be 500 to 700ha, however, there was no clear identification of contaminated and uncontaminated areas. Furthermore, there are possibilities of contamination being extended not only to surface soil but also to groundwater and geological units. For these reasons, it is necessary to conduct a detailed environmental risk assessment for selection of the proper area (uncontaminated area) for the irrigation project, based on the scientific evidence.

Mining industries including lead, zinc, copper and chromium played a significant economic role in the Macedonia. However, the economy of Macedonia significantly declined following the collapse of former Yugoslavian market and local conflicts and, further, because of environmental and economical crises such as contamination-related closures, raw material shortages and financial difficulties, many mines were closed and are now considered in the national privatisation program.

In Macedonia, suspended/abandoned mines including their facilities such as processing plants, waste dumps and tailings dams were left untouched, and the risks of disaster, similar to the collapses of the tailings dam in the Zletovo and Sasa Mines, are high.

The Government of Macedonia then officially requested the Government of Japan for technical assistance, and the Government of Japan decided to assist the "Study on Capacity Development for Soil Contamination Management Related to Mining in Macedonia".

(Macedonia - CIA World Fact Book Map, 2004)

Pilot Project Area

Figure 1.1 Location Map of the Study Area in Macedonia

1.1.2 Present Situation Related to Mining in Macedonia

The present situation of soil contamination related to mining in Macedonia, and especially in the area of Zletovo Mine, is summarised based on the "Preparatory Study Report of the Project on

Capacity Development for Soil Contamination Management Related to Mining in Macedonia" (JICA, 2005) as below.

(1) During the SAPROF Project, relatively high concentrations of heavy metals such as As, Pb, etc. were obtained from some of the soil samples collected in the planned irrigation area of the Zletovica Basin Water Utilisation Improvement Project.
(2) The cause of the soil contamination was attributed to the collapse of the tailings dam of the Zletovo Mine in 1976, when material of 150,000m^3 spilled from the tailings dam to the downstream area and no measures have been taken to prevent soil contamination.
(3) Mining industries including lead, zinc, copper and chromium played an important economic role in Macedonia. However, the economy of Macedonia significantly declined following the collapse of former Yugoslavian market and local conflicts and, further, because of environmental and economical crises such as contamination-related closures, raw material shortages and financial difficulties, many mines were closed and are now considered in the national privatisation programme.
(4) In Macedonia, suspended/abandoned mines including their facilities such as processing plants, waste dumps and tailings dams were left untouched, and the risks of disaster, similar to the collapse of the tailings dam in the Zletovo Mine, are high.
(5) Comprehensive laws and regulations controlling soil contamination in Macedonia have not been established and the detailed situation of soil contamination in Macedonia is unknown. Therefore, the roles of government authorities, local municipalities, related institutions and universities for administration of soil contamination are not clear.
(6) However, various research independently conducted by government institutions, universities and overseas donors shows a high potential of soil contamination in Macedonia.

Understanding the situation currently Macedonia is facing, the Government of Macedonia requested to the Government of Japan to assist studies that include formulation of a Master Plan (M/P) concerning monitoring, risk assessment, remediation of soil contamination to eliminate the risk of soil contamination in future and the capacity development (CD) for soil contamination management through a Pilot Project (P/P) on the soil contamination survey in the Zletovica irrigation area, which has been conducted with the aim of formulating a model of the soil contamination remediation programme that can be replicated in the other mining areas of Macedonia.

1.2 Objective of the Study

The objective of this study is to conduct technical assistance for CD, concerning legislation, administration system and organisational structure, for soil contamination management related to mining in Macedonia through the P/P that includes soil contamination survey, analysis, interpretation, planning for counter-measures and risk assessment for land use.

The study components are:

- to formulate a Master Plan (M/P) for sound management in soil contamination related to mining to improve the environment in the Macedonia;
- to conduct a P/P at the planned irrigation site of the Zletovica Basin Water Utilisation Improvement Project in Probistip, including the survey, heavy metal analysis, geological interpretation and risk assessment of the soil contamination; and
- to pursue technology transfer to the counterpart (C/P) personnel in the course of the implementation of the study.

1.3 Objective Area of the Study

1.3.1 Objective Area of the Master Plan

Formulation of the M/P has been conducted considering the whole area of Macedonia (Figure 1.1)

1.3.2 Pilot Project Area

The P/P has been conducted in the area of planned irrigation of the Zletovica Basin in Probistip, covered by a 400m grid soil survey area (Figure 1.2). The P/P area is 201.5 km^2.

1.4 Scope of the Study

The study was conducted in accordance with the Scope of Work agreed between the Ministry of Agriculture Forestry and Water Economy of Macedonia and JICA on July 14, 2005 and the Minutes of Meeting. The content of study includes preparation work in Japan, capacity assessment, the P/P (Phase 1: reconnaissance survey, Phase 2: general and detailed surveys, Phase 3: additional survey), analysis of actual situation of soil contamination and risk assessment in the whole area of Macedonia and formulation of the M/P. The content of the study is shown in Table 1.1.

1.5 Work Flow and Schedule of the Study

The flow and procedure of the implemented work of the whole study are shown in Figure 1.3 and Table 1.2.

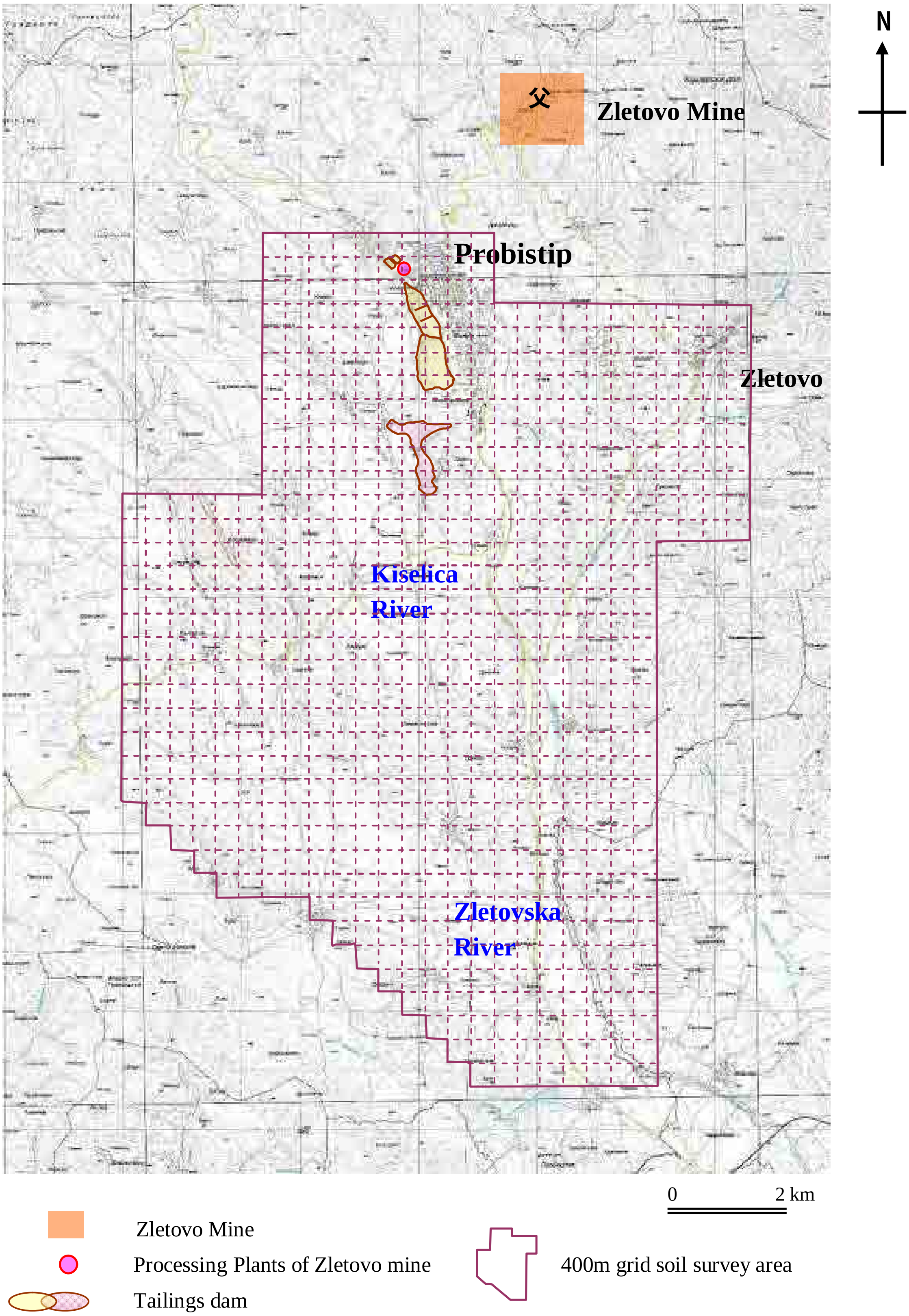


Figure 1.2 Objective Area of the Plan and Zletovo Mine

Table 1.1 Content of Works

Study Phase	Period	Work Item *1	
1. Preparation Work	2005/12～ 2006/1	(1) Collection of information and data (2) Consideration of methods of the Study (3) IC/R and CD assistance plan	
2. Phase 1	2006/1～ 2006/3	1) P/P Basic Study	(1) Presentation of IC/R (2) Collection of information and data (3) Site Investigation of the P/P area (4) Study for present situation (5) Planning of P/P
3. Phase 2	2006/5～ 2007/1	2) P/P General Survey	(1) Surface soil survey 1 (2) River sediments survey (3) Hydrological survey (4) Crops survey, etc. (5) Analysis
		3) P/P Detail Survey	(6) Surface soil survey 2 (7) Drilling survey of soil (8) Analysis (9) Formulation of A/P
4. Phase 3	2007/4～ 2007/10	(1) Additional site investigation (2) Analysis (3) Analysis of Actual Situation of Soil Contamination and Risk Assessment (Hot Spots Survey) (4) Formulation of M/P (5) Submission and Discussion of DF/R (6) Preparation and Submission of Final Report (F/R)	

*1 IC/R: Inception Report,
P/P: Pilot Project
IT/R: Interim Report,
CD: Capacity Development
A/P: Action Plan
M/P: Master Plan
DF/R: Draft Final Report

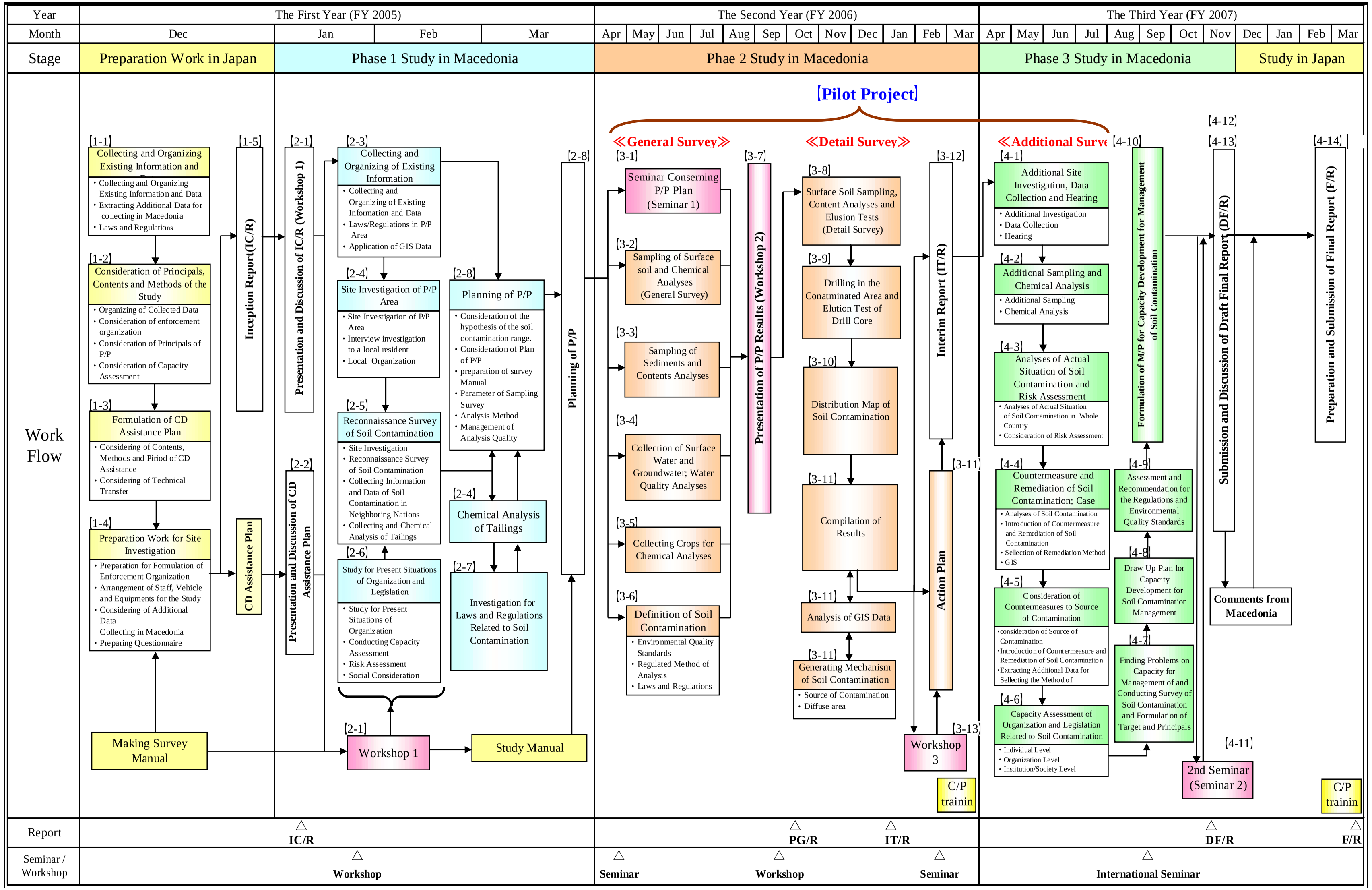


Figure 1.3 Work Flow of the Study

Table 1.2 Work Schedule of the Study

Work (Year / Month)	FY2005				FY2006												FY2007											
Month	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
(1) Preparation Work in Japan																												
1) : Collecting and Organizing Existing Information and Data																												
2) : Consideration of Principals, Contents and Methods of the Study																												
3) : Formulation of CD Assistance Plan																												
4) : Inception Report (IC/R)		△IC/R																										
5) : Preparation Work																												
(2) 1st Study in Macedonia																												
1) : Presentation and Discussion of IC/R (Workshop 1)		●																										
2) : Collecting and Organizing Existing Information and Data																												
3) : Site Investigation of P/P Area (Soil and Natural Environment Survey) and Chemical Analysis of Tailing																												
4) : Reconnaissance survey of Soil Contamination																												
5) : Study for Present Situations of Organization and Legislation																												
6) : Investigation for Laws and Regulations Related to Soil Contamination																												
7) : Planning of P/P																												
(3) 2nd Study in Macedonia																												
1) : Seminar Concerning P/P Plan (Seminar 1)						●																						
2) : General Survey Consisting of Sampling and Analyses																												
3) : Definition of Soil Contamination																												
4) : Progress Report (P/R)											△-△PG/R																	
5) : Workshop										●																		
6) : Detail Survey Consisting of Surface Soil Sampling and Drilling in the Contaminated Area																												
7) : Distribution Map of Soil Contamination																												
8) : Analyses of GIS Data																												
9) : Compilation of Results																												
10) : Interim Report (IT/R)															△-△PG/R													
11) : Seminar (Seminar 2)														●														
(4) 3rd Study in Macedonia (Phase 3)																												
1) : Additional Survey, Data Collection and Hearing																												
2) : Additional Sampling and Chemical Analysis																												
3) : Analyses of Actual Situation of Soil Contamination and Risk Assessment																												
4) : Actions against Soil Contamination: Case Studies and Suggestions																												
5) : Consideration of Actions to Source of Contamination; Case studied and Suggestions																												
6) : Capacity Assessment of Organization and Legislation Related to Soil Contamination																												
7) : Finding Problems on Capacity for Management of Soil Contamination																												
8) : Draw up Plan for Capacity Development for Soil Contamination Management																												
9) : Assessment and Recommendation for the Regulations, etc.																												
10) : Formulation of M/P for CD for Soil Contamination Management																												
11) : (International) Seminar (Seminar 3)																							●					
12) : Draft Final Report (DF/R)																							**DF/R**					
(5) 3rd Study in Japan																												
13) Preparation and Submission of Final Report (F/R)																											**F/R**	

Legend: ▬ **Work in Macedonia** ▭ **Work in Japan** △-△ **Report** ● **Seminar / Workshop**

1.6 Study Organisation and Personnel

1.6.1 JICA Study Team

JICA organised a study team of six experts headed by the team leader, Mr. Mikio Kajima. The members and their functions are summarised as below.

1	Team Leader/Soil contamination	: Mr. Mikio Kajima
2	Soil and Natural Environment Survey	: Mr. Masatsugu Okazaki
3	Organization, Legislation and Social Impact	: Mr. Michael Wenborn
4	Chemical Analysis	: Mr. Takeshi Higo
5	GIS	: Ms. Chiyo Kigasawa / Mr. Hiroshi Hyodo
6	Risk Assessment/Coordinator	: Mr. Takahide Kawamura

1.6.2 Counterpart Personnel

The JICA Study Team requested the Ministry of Agriculture, Forestry and Water Economy (MAFWE), Ministry of Environment and Physical Planning (MEPP), Ministry of Economy (MoE) and Hydro-System "Zletovica" (HSZ) to assign all the counterpart personnel, who worked in collaboration with the corresponding members of the JICA Study team, shown as below, on a regular basis.

(Ministry of Agriculture, Forestry and Water Economy: MAFWE)

1 Mr. Vanco Dimitriev	: Director of State Agricultural Inspectorate
2 Mr. Aleksandar Sapundzievski	: Head of Department, Water Economy Administration
3 Mr. Zivko Brajkovski	: Head of Sector, International Cooperation
4 Mr. Mihail Lukarev	: Head of Unit, State Agricultural Inspectorate
5 Mr. Donco Markov	: Head of Department, Regional Unit Probistip
6 Mr. Naumco Lazarevski	: Counselor, Water Economy Administration
7 Mr. Blagoja Stefanovski	: Assistant Director, State Agricultural Inspectorate
8 Ms. Vesna Kusakatova	: Associate, State Agricultural Inspectorate

(Hydro-System "Zletovica": HSZ)

1 Mr. Miroslav Nishovski	: Advisor
2 Mr. Aco Janevski	: Administrator of the Technical Section

(Ministry of Environment and Physical Planning: MEPP)

1 Ms. Margareta Cvetkovska	: Advisor, Environmental Information Centre, MEPP

(Ministry of Economy: MoE)

1 Mr. Jeton Kuchi	: Department of Exploration and Exploitation, MoE

PART I

CURRENT SITUATION
OF MACEDONIA

CHAPTER 2 ENVIRONMENTAL SITUATION RELATED TO SOIL IN MACEDONIA

CHAPTER 2 ENVIRONMENTAL SITUATION RELATED TO SOIL IN MACEDONIA

2.1 Natural Condition

2.1.1 Topography, Geology and Mining

(1) Topography

Macedonia is a landlocked country located in southern part of the Balkan Peninsula, surrounded by Albania, Greece, Bulgaria and Serbia. Its territory spreads over 25,713km^2.

A large part of the country is occupied by mountain relief and there are few flat areas. The mountains and hills make up 79%, while the flat area 19% and the remaining 2% is occupied by waters such as lakes and rivers. The area with elevation less than 200m occupies only 2% of the whole area and 200m to 500m takes up 22%, while the ratios of the area with higher elevation are larger, being 44% and 22%, respectively, for 500 to 1,000m and 1,000 to 1,500m.

In Macedonia, three morphological zones are identified: Western Macedonia, the Povardarie (the region following the course of the river Vardar) and Eastern Macedonia. The Western Macedonia is morphologically represented with considerable mountain relief where mountain peaks reach more than 2,500m and the river valleys show the shape of ravines. The highest peak is the Golem Korab reaching a height of 2,764m. The Povardarie zone, mostly consisting of northwest-southeast trending alluvial plains and valleys, is located in the centre of the country. Eastern Macedonia spreads eastward from the Povardarie zone up to the Bulgarian border. It is occupied by mountainous or hilly topography, and these mountains are less wooded, more rounded and they are prone to erosion.

The Zletovica area of the P/P is located in Eastern Macedonia and it is mainly occupied by hills, terraces and valley plains. The northeastern part of the area, where the Zletovica multipurpose dam site is located, is mountainous, reaching heights of 1,400 to 2,000m.

(2) Geology

A wide range of geological units, from Pre-Cambrian to Quaternary, is observed in Macedonia and they are geologically divided in three zones of Vardar zone, Pelagonijan Horst Anticlinorium zone and West Macedonia zone, from east to west.

a. Vardar Zone

It consists of Tertiary to Quaternary sediments, volcanic rocks and pyroclastic rocks and is widespread over the area east of the Vardar River, covering the terrain of lower elevation consisting of hills and flat areas. Paleozoic and Mesozoic units are locally observed in the zone. The Zletovica area of the P/P is located in the northwestern part of the zone, consisting of Miocene (Tertiary) sedimentary and volcanic rocks, and lead-zinc ore deposits occur in the area.

b. Pelagonijan Horst Anticlinorium Zone:

It occurs in the central to western part of Macedonia as a 30km wide belt and consists of Precambrian metamorphic rocks of crystalline schist and gneiss. It forms horst, being up lifted along a parallel fault system of extensional episode. This zone is assumed to be tectonically formed by regional tectonics that resulted from the collision of the African and the European plates.

c. West Macedonia Zone

This zone mainly consists of sandstone, shale, limestone of Paleozoic age and metamorphic rock of mainly crystalline schist and it forms steep mountainous topography of 2,000 to 2,800m high, as typically represented by Korab Mountains.

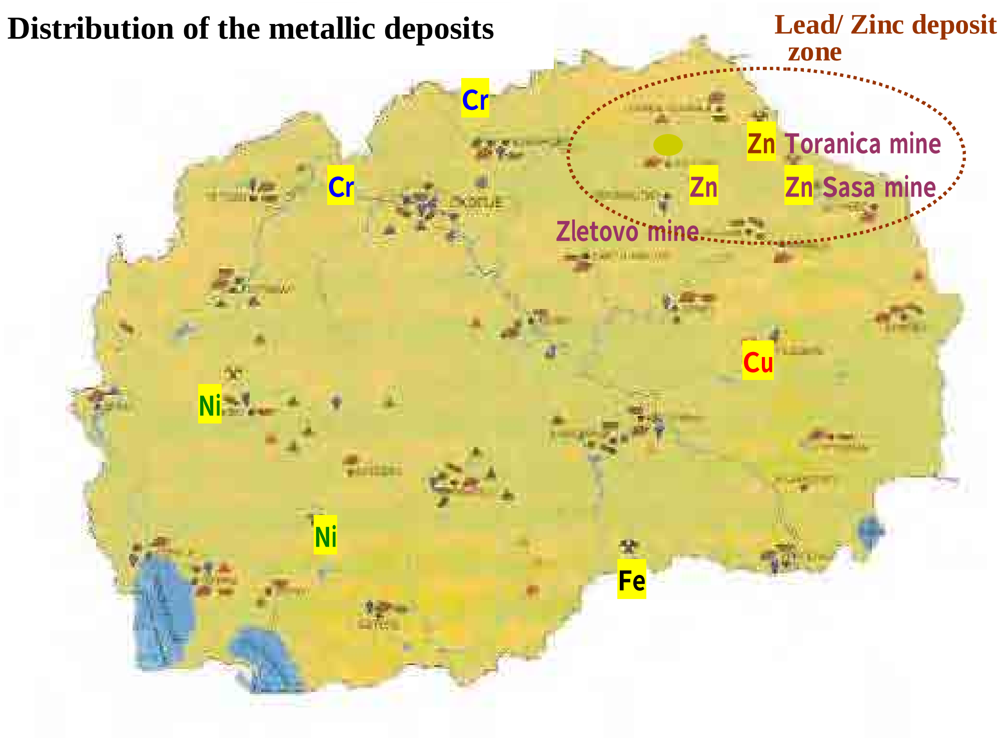
(3) Mining

In Macedonia, mining has been playing an important role since the ancient times of Alexander the Great (about 350 B.C.). The main metallic resources of Macedonia are iron, lead, zinc, copper, nickel, chromium, antimony, arsenic and manganese. A distribution of mines is shown in Figure 2.1. The main non-metallic resources of Macedonia are coal, clay, diatomite, gypsum, quartz and marble. Lead and zinc are the most important non-ferrous metals in Macedonia and the total reserves of contained lead and zinc at three mines of Sasa, Zletovo and Toranica, located in northeastern part of Macedonia, are reported to be, respectively, 385,000t and 310,000t.

The Zletovo Mine, located in the northern part of and upper stream area of the P/P area, is a vein-type, lead-zinc mine and the production of ore reached to 300,000t/yr at an average grade of lead 9% and zinc 2% (Alderton et al., 2005). But the production of ore has declined significantly to 150,000t/year after the collapse of former Yugoslavian economy/market and local conflicts. In March 2003, Zletovo Mines including the smelter/refinery and chemical facilities were closed and they are now under the process of privatization.

2.1.2 Hydrology

The drainage system of Macedonia consists of three areas; namely Varder, Crn Drim and Strumica areas. Among them, the Varder area, covering 80% of the country, has the largest drainage system. The Vardar River, starting from the north-western part of Macedonia, close to the border to Albania, turns to the north before passing through Skopje, then flows in a southeast direction towards Greece to reach the Aegean Sea. The Zletovica area of the P/P belongs to the Zletovska drainage system of the Bregalnica River Area, which is a tributary of Varder River (Figure 2.1)



(Source: Macedonia Atlas, 2004)

Figure 2.1 Distribution map of the Metallic Deposits

The Zletovska River, 54km long, has a drainage area of 460sq. km with average elevation of 500m and the Zletovica Area is located in one of the tributary areas in the middle stream of the Zletovska River.

In the Zletovica area, water shortage during the dry season is a serious problem and, for solving this, the Zletovica Basin Water Utilization Improvement Project planned to construct a multipurpose dam, aiming at supplying drinking and industrial water for over 100,000 people in seven municipalities and supplying irrigation water to an area of approximately 4,000ha.

2.1.3 Meteorology

The Mediterranean and the continental climates with their variations are present in Macedonia and there are quite large variations of rainfall and temperature through a year. The climate varies depending on the area, and the central part of Macedonia belongs to low precipitation area with less than 700mm average annual rainfall, while mountainous areas of western and eastern parts belong to the high precipitation area with more than 1,000mm.

The Zletovica area of the P/P belongs to the low precipitation area with an average annual rainfall of less than 500mm. The annual variations of dry and wet seasons are not consistent, but precipitation is generally low in January to March and July to August. In the Zletovska river area, rainfall increases with altitude and the average annual rainfall reaches 1,000 to 1,500mm in Zletovo Village.

2.2 Socio-economic Condition

2.2.1 General

Macedonia is located in the central part of the Balkan Peninsula. It is a relatively small landlocked country with an area of 25,713km^2. Approximately 80% of the territory is in the mountainous regions. About 2% of the land area is covered by water comprising 35 rivers, 3 natural lakes (Ohrid Lake, Prespa Lake and Dojran Lake), and 50 artificial lakes. The country is under the influence of several climate zones, which result in cold winters, long and warm summers with much sunshine.

Nearly half of the total area of the country is used by agriculture, split equally between cultivated areas and pastures. About 37% of the total territory of Macedonia is classified as forest lands, which is high in comparison to the other countries in Europe. Forest cover plays an important ecological function in terms of watershed protection and soil conservation.

The population of Macedonia is 2.04 million (in 2005) and approximately a quarter of it (452,000) is concentrated in the capital city of Skopje. The Macedonian Orthodox is the most common religion in Macedonia, accounting for 70% of the population and Islam and others are, respectively, 29% and 1%. Macedonian (68%) is most commonly used language and Albanian (25%) is also considered to be an official language.

In 1991, Macedonia declared its independence from Yugoslavia and it became a member of the United Nations in 1993 under the provisional name of the Former Yugoslav Republic of Macedonia. EU membership is Macedonia’s overarching long-term goal and the gradual harmonization of Macedonian laws and institutions with those of the European Union is currently in process.

Since becoming independent (1991), Macedonia was challenged by quickly declining levels of production, increasing inflation, significant falls in investment levels, and declining foreign trade. At the same time, unemployment levels rose sharply. However, the government in the 1990s embarked on a stabilization and reform programme with the objective to control inflation, reduce budget deflects, and promote economic recovery. The regional wars obviously hindered the reform efforts of the country. The government system in Macedonia is now a parliamentary democracy. Due to the infancy of Macedonia's democracy, political parties, electoral practices and the parliamentary system are in a fairly regular state of change. The Ohrid Framework Agreement brought about some significant changes to the electoral system, which seem to have been successful in ensuring fairer and more transparent elections, but there are still some political problems to overcome.

In recent years, Macedonia has had a high level of poverty, partly as a result of the slow economic development and the consequent increase in unemployment rates. The degree of poverty has increased from 19% in 1997 to 23% in 2000. About 30% of the workforce is unemployed and about 60,000 families (about 15% of the total number of families) receive social welfare.

Today, in Macedonia there is a growing awareness of environmental issues, and a willingness to treat environmental issues as an integral part of the overall strategy for economic and social development during the transition to a market economy. Further, Macedonia plans to harmonize its policies, including the ones on environment, with those of the EU so as to promote closer integration with other European countries.

2.2.2 Population

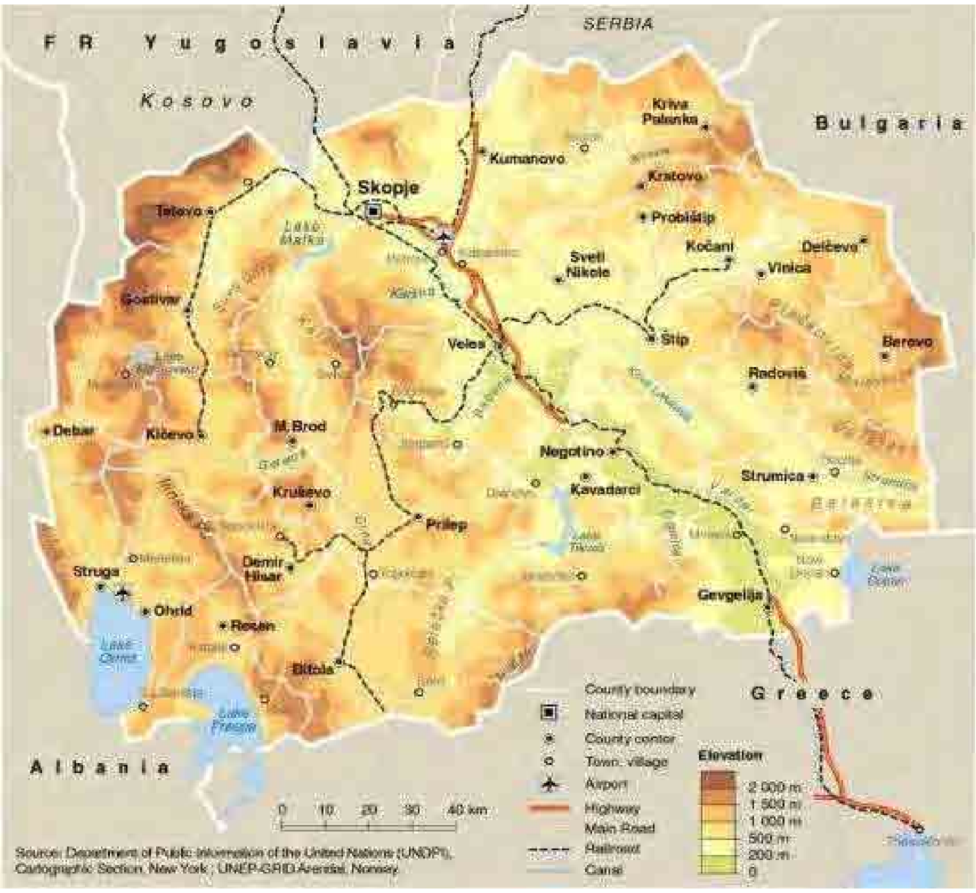
The population of Macedonia is about 2 million people and about 60% of the population lives in urban areas. The overall population density is about 81 inhabitants per km^2. The major urban centres are Skopje, Bitola, Tetovo, Kumanovo, Veles, Prilep, Stip, Ohrid, Strumica, and Gostivar (Figure 2.2).

According to the data generated by the population census in 2002, Macedonia had 2,022,547 citizens. The total number of citizens increased by 76,615 (i.e. 3.9%) between 1994 and 2002. In demographic terms, Macedonia is a fairly diverse area. Table 2.1 provides and overview of population trends (number of inhabitants) in the Macedonia. Table 2.2 provides some indicators of the scope and components of the total population increase, population density and urban population in Macedonia from 1994 and 2002.

The Skopje Region has had by far the largest population increase as people move from the rural to urban areas (the Skopje Region accounts for as much as 43% of the total population increase in the country from 1994 to 2002). The City of Skopje had a population of 495,540 in 2002. Table 2.3

provides the population for the major cities and towns in Macedonia. Note that the population of Probistip Municipality was 16,193 in 2002.

In cities, about 70% of the dwellings are supplied with basic environmental infrastructure in the form of water supply, sewerage system, and the provision of electricity and heating. The villages are not similarly covered with communal infrastructure leading to significant potentials problems for example with waste water treatment and waste disposal. Data on life expectancy is provided in Table 2.4.



(Source: Department of Public Information of the UNDP)

Figure 2.2 Map of Macedonia

Table 2.1 Population Trend for Macedonia

Region	Total population		Change (increase) of population		Natural Population increase	Migratory balance	Population density (inhabitants per km2)		Population concentration %	Urban Population 1994	
			No	Percent							
	1994	2002	1994~2002	1994~2002	1994~2002	1994~2002	1994	2002	2002	No.	%*
Macedonia	1,945,932	2,022,547	76,615	3.94	107,607	-30,992	76	79	100	1,163,598	59.8
Pelagonia	242,614	238,136	-4,478	-1.85	819	-5,297	49.7	48.8	11.77	159,803	65.9
Vardar	131,035	133,180	2,145	1.64	3,815	-1,670	40.7	41.4	6.58	92,087	70.3
Northeast	163,841	172,787	8,946	5.46	10,503	-1,557	70.6	74.4	8.54	89,500	54.6
Southwest	211,226	219,741	8,515	4.03	14,706	-6,191	64.2	66.8	10.86	96,195	45.2
Skopje	545,228	578,144	32,916	6.04	32,673	243	314.6	333.6	28.58	444,299	81.5
Southeast	168,481	171,416	2,935	1.74	7,678	-4,743	64.8	66	8.48	68,466	40.6
Polog	281,982	305,930	23,948	8.49	32,420	-8,472	116.8	126.7	15.13	91,352	32.6
East	201,525	203,213	1,688	0.84	4,993	-3,305	48.3	48.7	10.05	121,896	60.5

(Source: Census of population, households and dwellings in Macedonia, 1994 and 2002, State Statistical Office)
* Percentage of the total population

Table 2.2 Population Indicators for the Regions of Macedonia

Year	1921	1931	1948	1953	1961	1971	1981	1994	2002
Population	808,724	949,958	1,152,986	659,861	1,406,003	1,647,308	1,909,136	1,945,932	2,022,547

(Source: Census of population, households and dwellings in Macedonia, 1994 and 2002, State Statistical Office)

Table 2.3 Population in the Main Cities in Macedonia

City	Population (2002)
Skopje	495,540
Tetovo	189,066
Kumanovo	137,382
Gostivar	116,864
Bitola	105,644
Prilep	94,358
Strumica	92,695
Struga	65,809
Ohrid	61,256
Kicevo	56,739
Stip	51,808
Kocani	48,846
Kavadarci	42,882
Veles	38,391

(Source: Census of population, households and dwellings in 1994 -2002, State Statistical Office)

Table 2.4 Life Expectancy in Macedonia

Total	73.39
Men	71.15
Women	75.75

(Source: State Statistical Office)

2.2.3 Employment

Macedonia has had recent problems with unemployment. The national unemployment rate in 2002 was 38.1% in Macedonia. Table 2.5 provides data on unemployment rates. Agriculture employs about 15% of the labour force.

The regional unemployment rate in 2002 varied between the ranges of the lowest of 30.4% in the Skopje region to 49.9% in the Polog region. Three regions: Skopje, Southeast (34.4%) and East (34.5%) had a below national average unemployment rate.

In the Skopje region, the service industry is the most dominant, employing 66% of the total number of people in employment in that region. The industrial sector is the most dominant in the East region, covering 49% of people in employment in the region. The Southeast region is mainly an agricultural region, with 36% of the total number of people in employment.

At municipal level, the lowest unemployment rate is seen in several small rural municipalities where labour is predominantly engaged in agriculture. Thirty of the 123 municipalities have unemployment rate higher than 50%. Most of them are in the Polog region and the Southwest region, with only a few in the Skopje and Pelagonia regions. Most municipalities in the group of high unemployment rate are mountainous rural municipalities.

Table 2.5 Selected Labour Force Indicators

Items / Area	Unemployment rate	Unemployment rate -men	Unemployment rate –women
Pelagonija	39.9	36.2	45.0
Vardar	43.9	38.8	51.4
Northeast	48.6	45.6	54.0
Southwest	42.4	41.5	44.0
Skopje	30.4	31.8	28.4
Southeast	34.4	31.9	38.2
Polog	49.9	50.1	49.2
East	34.5	34.5	34.6

Source: State Statistical Office

2.2.4 Agriculture

Agricultural activities have been an important part of the Macedonian economy, and in year 2000 agriculture made up 11.5% of GDP. Over 35% of the land in Macedonia consists of agricultural areas and agricultural output is quite diversified, including wheat, corn, rice, tobacco, fruits and other vegetables, as well as dairy and livestock. Wheat production in 2002 was 267,000t, barley was 128,600t and maize over 140,000t.

Agricultural output is greatly affected by climate. Macedonia can be divided into three types of climate with respect to agriculture: Mediterranean (suitable for vineyards, horticulture and early vegetables), eastern European moderate continental (suitable for cereal and industrial crops) and a local mountain climate (suitable for livestock). The country has low rainfall that ranges from 400mm to 1,000mm per year, with a significant difference between the regions.

Overgrazing, improper farming practices and deforestation have damaged the soil in Macedonia, and there is a major problem with soil erosion.

However, the climate and the areas of relatively good soil (particularly in the valleys), provide advantages in achieving high yields in agricultural production, if irrigation is provided.

The potential for irrigation is estimated to be approximately 60% of the total arable land. The water demand for irrigation purposes corresponds to over 60% of the total water demand.

Table 2.6 provides a summary of the agricultural land use in Macedonia in 1999.

Table 2.6 Agricultural Land-use in Macedonia in 1999.

Arable land: field corps and vegetables	534,000 hectares	41%
Perennial crops: orchards and vineyards	45,000 hectares	4%
Meadows	54,000 hectares	4%
Pastures	649,000 hectares	50%

(Source: United Nations (2002), Environmental Performance Review of Macedonia (UNECE))

Arable land is split approximately by half between state enterprises and small private farmers. Much of the private agriculture is simply an extension of household work, and large private farms are rare. There are as many as 180,000 small individual farms of a relatively small size of 2.6 ha of arable land.

Previously, environmental concerns were only a minor issue in the policy or legislation on agriculture in Macedonia. However, at present, 3 out of 7 defined goals for the development of agriculture and the formulation of agricultural policies relate directly to environmental protection.

2.2.5 Industry (Excluding Mining)

GDP per capita of Macedonia in 2003 was US$ 2,496 and economic growth of 2.9% was attained in 2004, while inflation rate was 1.2% in 2003 and unemployment rate was as high as 38.6% in the first quarter of 2005. In 2004, total exports amounted to US$ 1,672 mill, and it was exceeded by total imports of US$ 2,792 mill. The major exports of Macedonia consist of food, beverages, tobacco, miscellaneous manufactures, iron and steel.

Industrial production accounts for a considerable share of overall pollution in Macedonia, but industrial production is essential to provide for economic development, poverty reduction and increases in the standard of living. Industry, including mining, remains the main sector of the national economy, contributing about 36% to GDP in year 2000. Industry employs about 37% of the work force. The industry of Macedonia is mainly concentrated on a few sectors (NEAP (2), MEPP (2005a)). Some of the sectors are:

- Food industry (3.8% of GDP)
- Electricity production (3.8% of GDP)
- Textile industry(2.0% of GDP)
- Basic metals production (1.1% of GDP)

The food sector employs 3.6% of the work force, and it accounts for almost 16% of the total export of industrial goods. Electricity production is very capital-intensive; it employs only 2% of the total work force but absorbs as much as 13.5% of the total investments in the economy. The textile industry on the other hand is very labour intensive. It employs 7.4% of the total work force and investments in this sector are just 1.6% of total investments. The textile sector accounts for 30% of the total industrial export. The basic metals production is exclusively export oriented and it is almost entirely in foreign ownership.

The country has no domestic oil resources and therefore oil is imported, mostly through Greece. Natural gas is also imported, particularly via Bulgaria. The only domestic energy source is coal and the country produced over 7 million tones of coal in 1999, most of which is consumed domestically to produce electricity. About 20% of energy production is from hydropower.

Comparing 1990 to 2002, the country experienced a decline in total industrial production by 51%. Behind this average figure however, there are large variations. Thus, some sectors have seen a fairly stable development over the period such as power, steel, and cement, while others were confronted with much larger reductions (e.g. battery production). The imports of industrial goods have always exceeded the exports clearly indicating that the international competitiveness of industry needs to improve.

Although the level of activity has declined over the past decade, industry has serious impacts on all environmental media. Industry and mining are highly dependent on natural resources. As well as waste water effluent from the major cities, industry presents a major potential source of water pollution in Macedonia. The Vardar River, which supplies about 75% of the country's total water resources, is heavily polluted. In addition, industry accounts for about 14% of the total water consumption.

2.2.6 Mining Industry and Environmental Issues

As well as mining coal, Macedonia is relatively rich in mineral resources, including zinc, lead, silver, gold, antimony, manganese, nickel, chromium, copper, iron ore and tungsten. The industrial output in 2001 included 20,000t of lead, 20,000t of zinc, 9,000t of copper, 10,000t of iron and 15t of silver. Mining and quarrying have significant impacts on air, water, noise and landscape. Copper and nickel ores and non-metal minerals including lignite are extracted by open pit mining, while lead and zinc ores are extracted by underground mining. About 18 million tones of various ores are extracted every year. Approximately half of this count as mine tailings and another 3 million tones are disposed as flotation tailings. Substantial amounts of water are discharged from mining pits and flotation units.

Apart from the continuous impacts on the environment from these discharges, several major accidents have occurred in the form of flooding of a wide area around the landfills and in the form of contaminating the surface and ground water.

The most recent accident happened in the Sasa lead and zinc mine in 2003, and some years ago a similar accident took place in the Bucim copper mine. There are several industrial contaminated sites, hot spots, where remediation is strongly needed in Macedonia. Environmental concerns related to industry are incorporated in the national legislation, but with regard to implementation, the development is still in its initial phase.

2.3 Present Situation of Environment in Whole Area of Macedonia: Hot Spot

2.3.1 General

The factors such as the weak economic situation in the 1990s in Macedonia, and the potential security concerns, following the break-up of Yugoslavia, resulted in environmental management and control being regarded as a low priority. Environmental education and awareness in Macedonia have been at a low level, but are starting to improve as the benefits of the country’s natural resources, landscape and their protection are recognized. The population, politicians and businesses in Macedonia are starting to realize the importance of the country’s natural resources and the need for environmental management and protection.

Environmental aspects such as water resources, water quality, air quality, solid waste management, soil contamination, bio-diversity and protected area management and cultural heritage are all priorities in Macedonia. However, as with most countries in the region, the affordability of environmental protection measures remains a problem in Macedonia, where budgets cannot cover all the requirements for expenditure on environmental protection, and therefore careful prioritization is needed.

As well as increased awareness on the need for protection of the environment, the step-by-step development of the legal framework to align legislation in Macedonia with EU legislation is driving the development and implementation of actions to improve the environment. Macedonia adopted its second National Environmental Action Plan (NEAP 2) in late 2005. One of the main themes of NEAP 2 is the need to address the strengthening of the institutional and legal framework and to develop institutional capacity. This approach is also a necessary part of the approximation process, and will provide a strong and robust framework for implementation of the environmental actions in the NEAP so that improvements are sustainable.

Despite a few potentially serious practices or accidents that have caused potential soil contamination, the activity of soil contamination management has been perceived by policy-makers in Macedonia as a lower priority than other environmental aspects.

The soil contamination in Macedonia shows two characteristic features. One is associated with large-scale extensive contamination, so-called “Hot Spot”, the other is associated with scattered small scale contamination in urban, industrial and commercial area.

The area that poses significant potential risks to human health and the surrounding environment is called “Hot Spot”. The Hot Spot, therefore, requires immediate environmental survey, risk reduction measures together with rehabilitation and environmental management. The areas of significant contamination derived from industrial activities and waste, most of which are related to mining, were listed in the existing information such as, NEAP (MEPP, 1996), UNEP (2000a), EAR (2005a) and UNEP (2006). In particular, the areas of environmental contamination derived form industrial waste were studied as a part of the preparation work for National Waste Management Plan and Feasibility Studies (EAR, 2005). It includes the evaluation methods and involved costs of the rehabilitation and/or temporary solutions for various heavily polluted industrial sites.

On the other hand, the industrial places using harmful substances are generally characterized by a relatively small to medium-scale potential of soil contamination. The industrial places using harmful substances are generally located in and near the urban area, so that the industrial places have a potential of soil and groundwater contamination which affects to the human health.

2.3.2 Hot Spot Survey

For understanding the present environmental situation of Macedonia, a survey visiting Hot Spot was conducted during Phase 3 (2007) and details are given here.

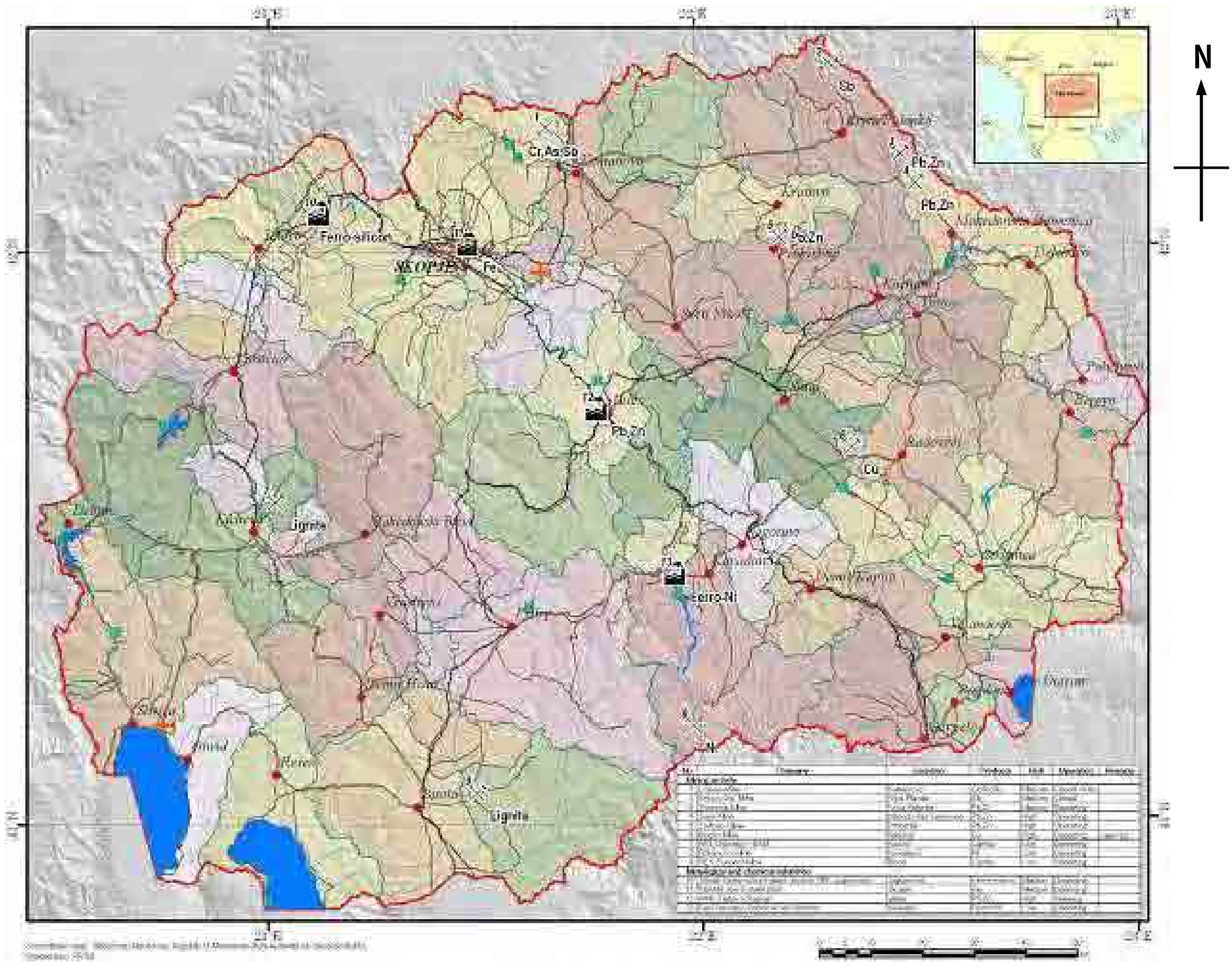
Analysis of the actual situation of soil contamination related to mining was conducted covering the whole area of Macedonia. The objective areas were decided based on the experience in the P/P and existing information, and site visits to the objective areas were conducted for observation of actual situations and consideration of countermeasures for soil contamination. The working group for this analysis was organized for planning, site visits and analysis, and collected information was shared and discussed at the working group meetings.

Based on the existing information and the results of P/P survey, 13 hot spots related to the mining activities were selected for the consideration (Table 2.7 and Figure 2.3). Among the 13 hot spots, 9 are mines and 4 are metallurgical industries. Three mines, once closed, were re-opened recently in 2005 and 2006, and have started production. They are the Bucim, Sasa and Zletovo Mines. The feasibility and remediation studies of particular hot spots have been conducted in the Bucim Mine, the Lojane Mine and the Silmak Ferro-silicon plant financed by European Union related organization and UNDP.

Table 2.7 List of Hot Spots Related to Mining in Macedonia

Level of Environmental Risk	No	Hot Spots	Municipality	Status of Operation	Environmental Liability	Project
High	1	Zletovo Mine (Pb and Zn)	Probistip	Operational since 2006	Macedonia, Zletovo Mine	Groundwater monitoring wells.
	2	Sasa Mine (Pb and Zn)	Makedonska Kamenica	Operational since 2006	Macedonia, Sasa mine	Groundwater monitoring wells.
	3	MHK Zletovo (Pb and Zn Smelter)	Veles	Closed (4yrs)	Due diligence	
	4	Bucim Mine (Cu mine)	Radovis	Operational since 2005	Arbitrary	EU remediation program ongoing.
Medium	5	Lojane Mine (Cr, As, Sb)	Lojane	Abandoned (32 yrs)	Macedonia	Feasibility study conducted byUNDP (2005-2007), remediation planned.
	6	Silmak ferro-silicon plant	Jegunovce	Dumpsite closed	Arbitrary	EAR restructuring plan (2003-2004), groundwater monitoring wells.
	7	Tranica Mine (Pb and Zn)	Kriva Palanka	Closed (>5 yrs), will be opened in near future	Macedonia	
	8	Makstil (Iron and steel plant)	Scopje	Operational	Makstil	
Low	9	Krstov Dol Mine (Sb)	Kliva Palanka	Closed (20yrs)	Macedonia	
	10	REK Bitola (thermal power plant and lignite mine)	Bitola	Operational	REK Bitola	
	11	REK Oslomej-ESM (thermal power plant and coal mine)	Kicevo	Operational	REK Oslomej	
	12	Feni Industry (ferro-nickel smelter)	Kavadarci	Operational	Feni Industry	
	13	Rzhanovo Mine (Ni)	Kavadarci	Operational	Rzhanovo Mine	

(After European Agency of Reconstruction (EAR), 2005a)



Base Map : Global map Macedonia, State Authority for Geodetic Works, Macedonia.
Shaded Topo : SRTM(Shuttle Radar Topography Mission) by NASA/USGS

⚒ Active mine， ⚒ Closed mine， Smelter

(Hot Spots related to mining)

1. Lojane Mine (Cr, As, Sb)
2. Krstov Dol Mine (Sb)
3. Tranica Mine (Pb, Zn)
4. Sasa Mine (Pb, Zn)
5. Zletovo Mine (Pb, Zn)
6. Bucim Mine (Cu)
7. Oslomej Mine (lignite)
8. Rzhanovo Mine (Nickel)
9. Suvodol Mine (lignite)

(Hot Spots related to metallurgical industries)

10. HEK Jugo-chrome (Ferro-alloy Smelting plant)
11. Makstil (Iron & steel plant, Skopje)
12. MHK Zletovo (Pb and Zn Smelting plant)
13. Feni (Ni, ferro-nickel Smelting plant)

Figure 2.3 Location Map of Hot Spots of Soil Contamination in Macedonia

(1) Zletovo Mine

Since the environmental study of soil contamination including groundwater, surface water and crops was conducted as P/P in this project (Chapter 4), the environmental situation of the Zletovo Mine area is only briefly given here.

The Zletovo Mine (lead and zinc mine), located close to Dobrevo Village, approximately 3km to the north-east of the town of Probistip, was initially opened in 1947. Mineralization occurs in a dacitic volcano-sedimentary suite with clays and mica alteration (Serafimovski and Aleksandrov 1995; Serafimovski and Boev 1996). Ore bodies are found in sub-vertical veins aligning sub-parallel to each other and they extend for several km in length and to depths of 500m below the surface. The ore minerals consist of galena and sphalerite with minor amount of tetrahedrite, pyrrhotite, magnetite, chalcopyrite, pyrite and Mn oxides are also common. Production reached 300,000 t of ore per year at ore grades of 9% Pb and 2% Zn, and significant concentrations of Ag, Bi, Cd, and Cu. While the operations of the mine were closed in 2001, the mine was re-opened in November 2006. The facilities of the mine include mine workings at the mine site, ore processing facilities (floatation plan) in town of Probistip and two (old and new) tailings dams, respectively located at the 3km to the north-west of the town and outskirts of town of Probistip, and a number of environmental problems are associated with them. Since the mine workings are located at the upper stream of the Koritnica River and processing plant and tailings dams are located in the Kiserica River area, in and near Probistip, the environmental impact caused by mining activities are more serious in the latter area than in former. Both of the rivers join the Zletovska River.

The poor maintenance of the Old Tailings Dam caused a failure of the dam in 1976 that resulted in spillage of 150,000m^3 of tailings materials down to the Kiselica River and the Zletovska River. The tailing materials remain on the river plain of two rivers causing serious soil contamination with high concentrations of Pb, Zn, As and Cu. The surface water and groundwater were contaminated with high concentrations of Cu, Pb, Zn and Mn because of discharged water of the mining facilities such as mine workings, floatation plan and tailings dam. In addition to them, concentrations of heavy metals in groundwater and surface water are elevated by old mine workings and geological feature of the area of the north of Probistip. Further, most of the waters of wells and springs of villages in the Municipality of Probistip show high concentrations of heavy metals exceeding the standard of drinking water of Macedonia. Some of the wheat samples, typically in the area southwest of Probistip, show high concentrations of Pb probably caused by high concentrations of heavy metals in groundwater together with heavy metal rich dust emitted from the tailings material.

(2) Sasa Mine

The Sasa lead-zinc mine is located approximately 10km to the north of the small town of Makedonska Kamenica, in a relatively remote location some 5km to the west of the Bulgarian border. The mine was opened in 1963 and during the 1990s ore production levels at Sasa were approximately 500,000t per year. A total of 14Mt (million tones) of lead and zinc ore had been produced until the mine closed in 2003. The mine was re-opened in 2005 and current production of ore is 640,000t per year. Mineralization occurs along the contacts between Miocene calcalkaline igneous bodies (latites and dacites) and graphite-chlorite-sericite schists, gneisses and limestone (Aleksandrov et al. 1998; Serafimovski and Aleksandrov 1995). The ore consists of pyrite, galena and sphalerite, with additional magnetite and chalcopyrite. Ore grades are about 10% Pb + Zn with additional elevated concentrations of Ag, As, Bi, Cd, Mn and Sb.

The ore is concentrated in a flotation plant located in the mine site and tailings are dumped in a dam in a narrow valley of the Kamenica River just below the mine. The Kamenica river is culverted beneath the tailings dam and flows 12km until it meets the Kalimansko reservoir at Kamenica. A major collapse of the culvert in the summer of 2003 allowed 4Mt of tailings to enter the river and discharged all the way down to the reservoir (Midzic and Silajdzic 2005).

The site had a number of significant environmental issues including: atmospheric dust emissions, mine and tailings dam discharges to surface water and a tailings landfill that had no environmental safeguards with respect to the lining of its base, however, the situation of environmental safeguards was improved significantly by the new owner of mine before and after the re-set of operation of mining.

Figure 2.4 Location of Sasa Mine

Photograph 2.1 Edge of Tailings Dam

Figure 2.5 Topographic Feature around Sasa Mine

Photograph 2.2 Adit and Waste Dump of Mine

Photograph2.3 Tailings Dam and Entrance of Sasa Mine

Photograph 2.4 Interviewing to Sasa Mine's Staff

The analytical results of water in the Sasa Mine area conducted by Alderton et al. (2005) are shown in Table 2.8 together with the results of on-site tests of heavy metal concentration by pack test.

Table 2.8 Analytical Results of Water in the Sasa Mine Area

Modified from Alderton et al. (2005)

		pH	Al	Ca	Fe	Mn	S	Ag	As	Bi	Cd	Location
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Sasa												
	S1	6.9	0.06	4.5	<0.05	0.05					<0.002	Stream above adits
	S2	5.0	9.49	44.7	0.28	4.17					0.0900	Water coming out of adit
	S3	6.5	<0.02	157.2	<0.05	3.47					0.0100	Below tailings dam
	S4	6.7	<0.02	137.5	<0.05	3.57					0.0100	Kamenica river
	S6	6.8	0.03	45.4	<0.05	0.72					0.0100	Kamenica river
	S15	7.7	0.02	49.9	<0.05	0.05					<0.002	Kamenica river
WHO			0.2		2	0.4			0.01		0.003	
Standard						0.05			0.03		0.01	

		Co	Cr	Cu	Mo	Ni	Pb	Sb	Tl	U	Zn	Location
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Sasa												
	S1	<0.004	<0.004	<0.002		<0.004	<0.03				0.04	Stream above adits
	S2	0.010	<0.004	1.070		0.12	1.34				14.33	Water coming out of adit
	S3	<0.004	<0.004	0.020		0.02	0.09				1.36	Below tailings dam
	S4	<0.004	<0.004	0.020		0.01	0.07				1.57	Kamenica river
	S6	<0.004	<0.004	0.066		0.01	0.04				1.37	Kamenica river
	S15	<0.004	<0.004	0.010		<0.004	<0.03				0.03	Kamenica river
WHO			0.05	2	0.07	0.02	0.01	0.02		0.015	3	
Standard		0.1	0.05	0.2		0.05	0.01				0.1	

WHO: Guideline for drinking water quolity (WHO 1993, 2004)

Standard Environmental Standard for Water of Macedonia

: Concentration exceeding WHO

: Concentration exceeding standard

(Results of On-site Water Quality Test) (mg/L)

	Location	pH	EC (mS/m)	As	Cr	Cu	Ni	Zn	Mn
No.1	Water from upper adit	4.67	181	0.2	ND	0.5	ND	10	2
No.2	Below tailings dam	7.14	96	ND	ND	ND	ND	10	1

N.D: not detected

The concentrations of contaminants of the river water are highest in the water coming from the adits, showing values exceeding the environmental standard for water of Macedonia or WHO in Al (9.49mg/L), Mn (4.17mg/L), Cd (0.09mg/L), Cu (1.07mg/L), Ni (0.12mg/L), Pb (1.34mg/L) and Zn (14.33mg/L) with slightly acidic (pH 5.0 and 4.67). Most values decrease quite rapidly downstream, however, below the tailings dam, the concentrations of Mn, Pb and Zn are still higher than standard for at least 8 km downstream from the mine, but by the time the river reaches the Kalimansco lake, none of the contaminants exceed the standard values.

(3) MHK Zletovo (Lead and Zinc Smelter)

The lead and zinc smelter of MHK Zletovo is located on the northwestern outskirts of the town of

Veles. The main smelter operations were initially opened in 1972 to 1973, an ion exchange cadmium plant was opened in 1979 and other minor processing operations were added in the 1990s. Each year it has used lead and zinc concentrates to produce about 30,000t of lead, 60,000t of zinc and 250t of cadmium, as well as smaller quantities of silver, gold and copper dross, and bismuth alloy. The process produces 100,000t per year of sulphuric acid as a by-product. The same company also owned and operated a nearby fertilizer plant. In 2003, the government closed the Zletovo smelter and chemical facilities, since these facilities were cited as a major point source of pollution, especially with respect to cadmium and sulphur dioxide.

The smelter emitted into the atmosphere large quantities of sulphur dioxide, and dust bearing lead, zinc and cadmium. In addition, raw materials, including coke for the smelter's furnaces, have been stored in an open field.

Although the smelter was polluting the groundwater beneath, the major source of soil and groundwater contamination is the disposal of more than 850,000t of solid waste containing heavy metals. This waste has been deposited at a dump approximately 1km from the smelter. Nevertheless, it is very likely that groundwater and nearby areas have been being contaminated with heavy metals as a result of percolate from the dump. Due to the direction of groundwater flow, the private wells have been probably being affected.

Wastewater containing sulphuric acid and other pollutants was also a source of serious concern. The plant had a treatment plant, which generated 1,500m^3/hour of wastewater. Analytical data from regularly monitored streams indicated that the effluent consistently exceeded maximum concentration levels for lead, zinc and cadmium. The wastewater was discharged into the Vardar River. The results of on-site water quality test are given in Table 2.9.

Figure 2.6　Location of MHK Zletovo

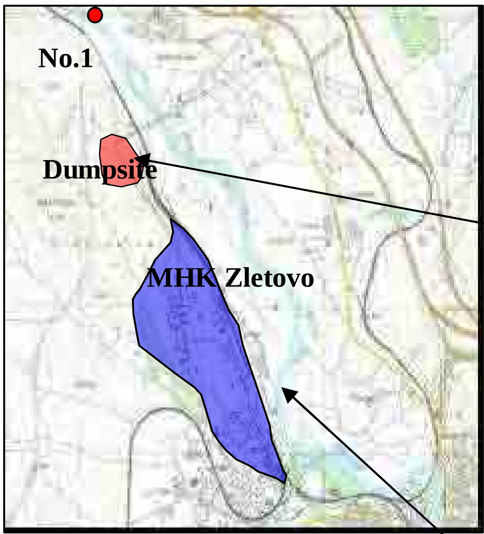
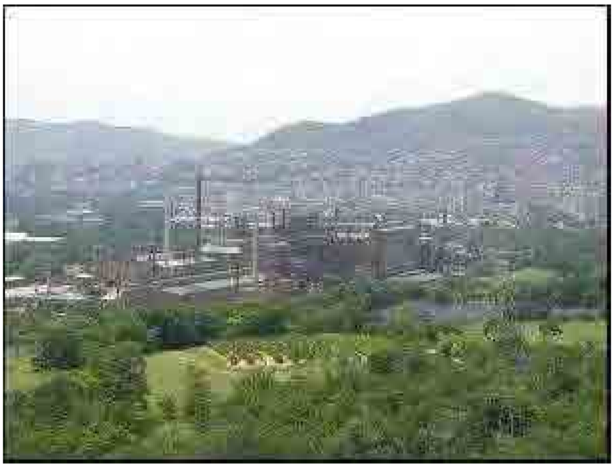


Figure 2.7　Topography around MHK Zletovo

Photograph 2.5　Slag dump Area of HEK Zletovo



Photograph 2.6　Plant of HEK Zletovo

Photograph 2.7　Plant of HEK Zletovo and Slag Dump Area

Table 2.9　Results of On-site Water Quality Test (by pack test)　(mg/L)

	pH	EC (mS/m)	As	Cr	Cu	Ni	Zn	Mn
No.1	6.96	55	0.2	ND	ND	ND	ND	ND

ND: not detected

The contamination of soil by heavy metals, namely Pb, Zn and Cd, mainly caused by the smelter in the Veles Region is a serious problem and it is considered to be one of the worst hot spots in Macedonia (Pancevski, 2007, Pancevski et al, 2006 and Stafilov, 2007 personal communication). The heavy metal concentrations are the highest near the smelter plant, and higher concentration zones occur in the western part of the town of Veles. The highly contaminated area, with Pb and Zn more than 10 times higher and Cd more than 40 times higher than the Netherlands Standard, occurs in the northern and western parts of the town of Veles including the smelter plant area and residential area. In addition to these heavy metals, Hg, Cu and Se are twice higher than the Netherlands standard in the area.

The causes of the soil contamination are attributed to (1) the fumes from the chimney, (2) stock of lead and zinc rich ore concentrates and (3) slag dump in and near the smelter plan. Wind, predominantly from north in the area, had spread the heavy metals from the smelter plant to the western part of the town of Veles, causing serious contamination in the residential area. Other than the town area, there are also high heavy metals concentration areas, such as Cu, in rural part of the Veles area caused by the agriculture chemicals. It is, also, known for some of the vegetables of the Veles area that ones cultivated closer to the smelter plant are higher in Cd and Pb (Stafilov et al., 1994, Stafilov and Jordanovska, 1996).   .

(4) Bucim Copper Mine

The Bucim copper mine is a porphyry cupper type, open pit mine, located in eastern central part of Macedonia, 10km west of the town of Radovis. Operation of the mine was started in 1979 and produced 400,000t of ore annually. The operation of mining was stopped in 2003 and re-started in 2005. The mineralization of deposits is related to Tertiary sub-volcanic intrusions of andesite and latite in a host of Pre-Cambrian gneisses and amphibolites (Serafimovski et al. 1996). Four ring-shaped ore bodies are located within and around the magmatic bodies. The main ore body is approximately 500m in diameter and 250m in vertical extent and has been worked in a large open pit. The ore grade is 0.3% Cu, 0.3 g/t Au, 1 g/t Ag, 13 g/t Mo with 1~ 4% pyrite. The igneous rocks are associated by alteration consisting of clay and mica minerals. The main ore minerals are chalcopyrite, pyrite and bornite with small amounts of galena, sphalerite, magnetite, hematite and cubanite.

There is a large uncontained waste rock dump of some 120Mt besides the open pit and a large 80Mt tailings dam in a nearby valley.

Concentrations of copper, gold and silver are achieved through the flotation process on site using sodium - and potassium – alkyl – xanthates, sulphuric acid a bacterium (*Basillus ferroxidacae*).

Each year, the mine has pumped more than 70,000t of solid wastes containing heavy metals from the flotation process to a large dam in a nearby valley. Dust from the 30-hectare hydro-tailings dam blew toward the nearby village of Polnica. Because many of the mineworkers have joint ailments and silicosis due to dust inhalation, adverse health effects can also be expected among local citizens. In efforts to abate the dust, trees have been planted and a polymer has been applied to a four hectare area.

Figure 2.8 Location of Bucim Mine

Wells in the valley downstream of the tailings dam are regularly monitored. The copper content of the wastewater is also regularly monitored. Surface water and sediment samples taken during the UNEP mission clearly documented environmental contamination with heavy metals (UNEP, 2000). The analyses of surface water showed very high values for copper concentrations in the range of 50 to 200 mg/L.

There are two streams draining the mining and processing areas in the Bucim Mine area. One, the Topolnicka River, is culverted beneath the large tailings dam, the other comes directly from the area of the mine with waste dump and flotation plant, and they meet together, flowing into Madenska River, which joins the Bregalnica River. Wastewater from the flotation plant, containing large amounts of copper, was released into a stream from which cattle drink. The discharge occurred at the rate of 10 L/sec. The bottom of the stream is covered with a bluish layer resembling malachite (copper hydroxy-carbonate).

The analytical results of Seramovski (2005) showed that the surface water samples collected along the Topolniska and Madenska Rivers had high concentrations of As, Co, Cu, Ni, Pb and Zn, exceeding the environmental standard for water of Macedonia.

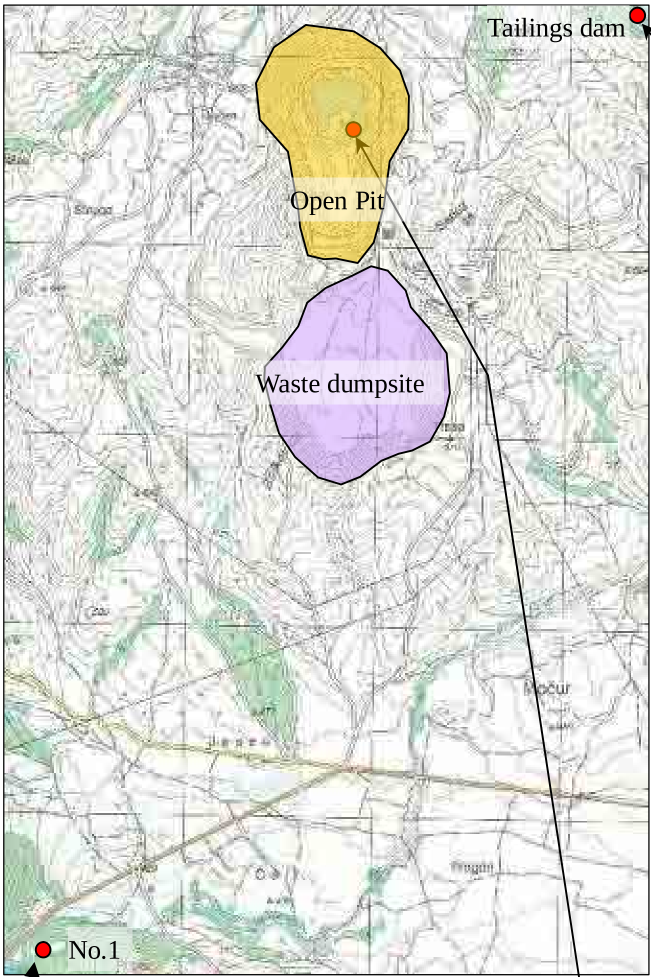


Figure 2.9 Topographic Feature of Bucim Mine

Photograph 2.8 Tailings Dam of Bucim Mine Covered by Top Soil

Photograph 2.9 Dust Jar for Air Monitoring near Tailings Dam

Photograph 2.10 The river bottom (blue) is contaminated by waste water containing compounds discharged from the mine.

Photograph 2.11 Open Pit of Bucim

The analytical results of water in the Bucim Mine area, sampling of which was conducted in 2002 when the mine was in operation, by Alderton et al. (2005) are shown on Table 2-10 together with the results of on-site water quality test by pack test.

The water from the culvert (B1) is slightly alkaline and none of the contaminants, except Mn, exceeds the standard value. While, the water from the mine site (B4) is acidic (pH 5.1) and has very high concentrations of particular elements far above the standards, for instance : Al (54.9mg/L), Mn (46.35mg/L), Co (1.16mg/L), Cu (139mg/L), Ni (0.62mg/L), Pb (0.18mg/L) and Zn (1.54mg/L). These very high values occur within about 3km of the mine but the influence of the mine, high Cu and Mn exceeding standard value, extends downstream. Particularly, Cu concentration is high 24km downstream, where the Madenska River joins the Bregalnica River.

Table 2.10 Analytical Results of Water in the Bucim Mine Area

Modified from Alderton et al. (2005)

		pH	Al	Ca	Fe	Mn	S	Ag	As	Bi	Cd	Location
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Buchim												
	B1	7.8	0.1	180.5	0.0	1.40					<0.002	Culvert from tailings dam
	B4	5.1	54.9	214.5	0.3	46.35					<0.002	Stream from mine
	B5	6.8	0.3	156.8	0.0	0.21					<0.002	Upstream of meeting with mine stream
	B6	5.3	15.5	189.6	0.8	23.82					<0.002	Downstream of confluence
	B7	4.5	75.2	173.6	1.9	61.00	1,232	0.0001	0.0078	0.0002	<0.002	Mine stream by road/bridge
	B10	7.1	0.3	199.5	0.2	4.44					<0.002	River Madenska: 8km from mine
	B14	7.8	0.6	210.6	0.2	3.52					<0.002	River Madenska; 11km from mine
	B19	7.2	0.3	159.4	0.1	0.03					<0.002	Confluence with River Bregalnica
WHO			0.2		2	0.4			0.01		0.003	
Standard						0.05			0.03		0.01	

		Co	Cr	Cu	Mo	Ni	Pb	Sb	Tl	U	Zn	Location
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Buchim												
	B1	<0.004	<0.004	0.08		<0.004	<0.03				0.03	Culvert from tailings dam
	B4	1.160	<0.004	139.16		0.62	0.18				1.54	Stream from mine
	B5	0.0021	<0.004	0.62		<0.004	<0.03				0.03	Upstream of meeting with mine stream
	B6	0.590	<0.004	69.69		0.32	0.10				0.72	Downstream of confluence
	B7	1.162	0.0046	141.04	0.0113	<0.004	0.26	0.0007	0.0004	0.9050	1.94	Mine stream by road/bridge
	B10	0.090	<0.004	0.94		0.05	<0.03				0.07	River Madenska: 8km from mine
	B14	0.060	<0.004	1.27		<0.004	<0.03				0.04	River Madenska; 11km from mine
	B19	0.002	<0.004	0.52		<0.004	<0.03				0.02	Confluence with River Bregalnica
WHO			0.05	2	0.07	0.02	0.01	0.02		0.015	3	
Standard		0.1	0.05	0.2		0.05	0.01				0.1	

WHO: Guideline for drinking water quolity (WHO 1993, 2004)

Standard Environmental Standard for Water of Macedonia

: Concentration exceeding WHO

: Concentration exceeding standard

(Results of On-site Water Quality Test) (mg/L)

	Location	pH	EC (mS/m)	As	Cr	Cu	Ni	Zn	Mn
No.1	Madenska River	7.38	245	1	0.5	ND	5	ND	20

ND: not detected

(5) Lojane Mine

The Lojane Mine is chromium, arsenic, antimony mine, located about 40km north of Skopje, near Kumanovo. Mineral veins containing the sulphides of arsenic and antimony together with nickel, cobalt and uranium occur (Radusinovic, 1966).

Country rocks are serpentinites and serpentinized peridotites intruded by granites, syenites and rhyolites. The chlomite ore bodies are within the serpentinites and were formed long before the sulphide mineralization. They are usually separated from the sulphide bodies, but in rare cases, they are intersected and replaced by the later sulphide veins and veinlets. It is believed the chromite mineralization occurred in the Paleozoic era. The sulphide ore bodies are concentrated in the contact zones between the serpentinites and rhyolites. They are generally vein-type bodies, but some impregnations and lens-like bodies are also present. The sulphide mineralization belongs to the Alpine metallogenic epoch, supposedly of Tertiary age. The sulphide mineralogy is relatively simple, consisting of stibnite and realgar with minor amount of pyrite, bravoite, vaesite, marcasite, orpiment and greigite.

Based on the site visit to the area and UNDP (2006), the environmental situation of the Lojane Mine is summarised below.

Lojane chromium and antimony beneficiation plant and mine were active in the period from 1923 until 1979 when antimony and chromium were extracted. After the stopping of mining activities, complete infrastructure i.e. production facilities (underground workings), beneficiation (flotation and smelting -ore frying) facilities, ore waste dump and tailings ponds, as much as storage yards, silo's and workshops were abandoned without undertaking any protection/rehabilitation measures. The old adits, dumps, roads and ruined objects have become very dangerous sources of contamination with heavy and toxic metals (As, Hg, Cr (VI), Sb). The most affected area is between the villages Lojane, Vaksince and Tabanovce.

Specifically, in the adjacent area of the former arsenic-antimony mine Lojane (along the flow of the Suva River) a dump with more than 20,000t of ore waste exists. This ore dump was left unprotected and it is prone to the mechanical disintegration and presents a significant source of contamination in the southern areas of the villages Lojane and Vaksince. In the close proximity of the old mining colony, there are, also, remains of the old arsenic-antimony flotation plant where the estimations count for 15,000t of arsenic concentrate that is left unprotected. Near this locality, there is also a mining tailing dump with 3,000,000t of material with an average concentration of arsenic and antimony up to 1 to 2% As + Sb. Until 1964 the ore concentrate was exported to the London Metal Exchange, but the export was stopped after it was confirmed that the concentration of arsenic was too high, and not in accordance with environmental laws. Starting from 1964, the ore concentrate was exported to the Zajaca metal facility in Serbia.

The other source of contamination with toxic metals is so called arsenic-antimony ore smelting-frying facility, located 4.5km east of the flotation facility, near the Civluk Village and along the railway station near the Tabanovce Village. A train along a narrow railway track transported concentrates from the flotation facility to the smelting-frying facility. Along the transport track, the material that was lost during the transport and due to its content presents a dangerous source of contamination. In addition, near the smelting-frying facility there are around 2,500 barrels (almost disintegrated) filled with As_2O_3, which is a very strong poison.

The open dumpsite is composed of two layers of tailings . The upper layer shows yellowish brown (the thickness is about 0.5m) and the lower layer shows gray and dark gray.

Figure 2.10 Location of Lojane Mine

Photograph 2.12 Test Pit at Waste Dump Area in Lojane Mine

Table 2.11 Analytical Results of Water and Soil from the Lojane Mine

	As	Cd	Cr	Cu	Ni	Pb	Sb	Zn	Mn
Water from dumpsite (mg/L)	0.25	<0.005	3.93	<0.005	<0.005	<0.02	0.04	<0.005	<0.005
Soil near dumpsite (mg/kg)	8.1	<10	99	26	1.68	131	457	48	1.1

0.25 : Values exceeding Environmental Standard of water of Macedonia. After UNEP (2000)

(Results of on-site water quality test) (mg/L)

	Location	pH	EC (mS/m)	As	Cr	Cu	Ni	Zn	Mn
No.1	Near Tailings dam	3.37	244	10	1	2	2	5	ND
No.2	Downstream of adit	7.41	54	ND	ND	ND	ND	ND	ND

ND: not detected

All the aspects observed in the area suggest that the area of the Lojane Mine has been contaminated with heavy and toxic metals, however the level, intensity and aureole of contamination are still uncertain. The feasibility study of the Lojane Mine area is being conducted now by UNEP.

The analytical results of water by UNEP (2000b) and on-site water quality test are shown on Table 2.11.

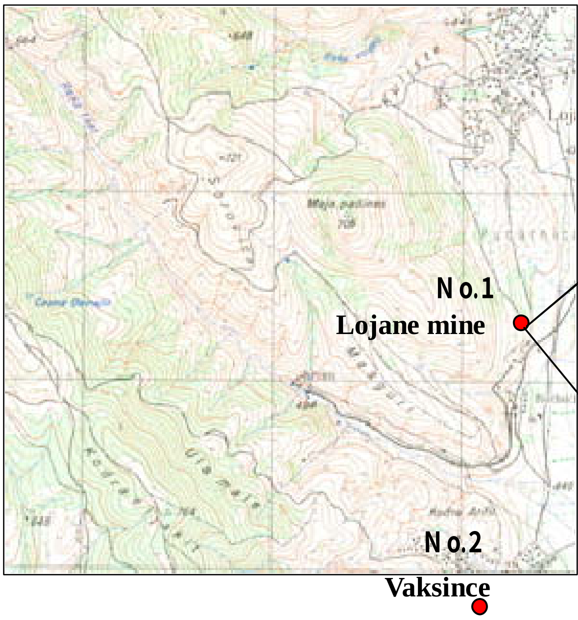


Figure 2.11 Topography Around Lojane Mine

Photograph 2.13 Foot of Waste Dump Area and Domestic Waste Dumpsite

Photograph 2.14 Water Spring at Vaksince Check Point – No.2 Tailling dam

Photograph 2.15 Surface of Waste Dumpsite

(6) Silmak Ferro-silicon Plant (Former HEK Jugochrom)

The Silmak Ferro-silicon Plant is located near Tetovo on the upper stream of the Vardar River (the north of Janciste town) and annual production is 80,000t of ferrosilicon (Si-content 75%, 65%, 90%) and silicon metal (small tonnages). Silmak is a company created with the aim to restart the activities of ex Jugochrom, whose main activities was production of ferroalloys (e.g. ferrochrome, ferrosilicon) using raw materials such as coal, quartz, ferrous iron, and chromium ore for the needs of the steel industry. The production in Jugochrom was stopped in December 2001. In 2002, the Macedonian government conducted privatization of Jugochrom in cooperation with the French investment group SCMM, then, Silmak was established in 2002, starting production in December 2002.

The uncontrolled disposal of waste material from the plant and the improper handling of material containing chromium salts have led to severe chromium contamination of surface water, groundwater and soil, including in the vicinity of the Vardar River. In 1982, the plant began monitoring soil and groundwater and the data confirmed contamination of the water by chromium. Nevertheless, the plant continued to produce chromium and chromium compounds. To address this problem the plant designed, installed and financed a groundwater treatment system, which resulted in reductions of concentrations of Cr (VI). However, they reportedly remain high, above acceptable levels. Dichromate production ceased in 1993 and the production buildings have not been cleared of toxic material nor secured. Smelting activities of this kind generated pollution via emission of Ni, Cr, Fe, Cu and Zn and total ferrochrome dust to atmosphere.

The plant used an on-site landfill to dispose of chromium slag and other waste. The NEAP states that the landfill contains 466,000t of ferrochromium slag and 385,000t of chromate sediment. According to studies carried out with support from the EU's Programme, pollution from the landfill is contaminating the Vardar River and posing a potential risk to Rasce Spring, the main source of water supply for metropolitan Skopje (UNEP, 2000).

The project of restructuring plan was conducted by EAR in 2003 to 2004. The results of chemical analysis by UNEP (2000b) are shown in Table 2.12.

Figure 2.12 Location of Silmak Ferro-silicon Plant

Figure 2.13 Silmak Plant

Photograph 2.16 Silmak Ferro-silicon Plant

Photograph 2.17 Northern Part of Silmak Ferro-silicon Plant

Table 2.12 Analytical Results of Water and Soil from of Silmak Plan

	Cd	Cr	Cu	Ni	Pb	Zn	Mn
Water from channel after pipe (mg/L)	<0.005	<0.005	0.04	<0.005	<0.02	0.089	0.0025
Water from sediments basin near water treatment station (mg/L)	<0.005	12.24	<0.005	0.017	<0.02	0.014	<0.005
Soil sample from dust on way to factory (mg/kg)	<10	121	344	109	86	453	1,242
Soil sample from chromium salt in former production shed.	<10	103,368	73	163	34	169	156

---- : Values exceeding Environmental Standard of water of Macedonia. After UNEP (2000b)

(7) Toranica Mine

The Toranica Mine is located approximately 18 km south-east of the town of Kriva Palanka and 2 km west of the Bulgarian border. It is close to the Sasa Mine and geological situation is similar to the Sasa Mine, but it is located in a separate watershed. The mine started commercial production in 1987. In the 1990s, mining production levels at the Toranica Mine averaged 200,000t of ore annually. Associated ore concentrate production was 16,000t in 1997, accounting for approximately 20% of the total Macedonian lead and zinc production. In late 2001, production at the Toranica Mine ceased. Ore reserves are understood to be sufficient for at least a further 20 years at the previous maximum extraction rates (a total of at least 10Mt. The Tranica mine is planned to re-start operation in the near future.

The ore formations are located variously in roof and underground gneisses, quartz-graphite shale, schist and volcanic dykes and sills, to the depth of several hundred meters below the ground surface (Serafimovski et al. 2004). Depending on the quality of the deposits, the lead content is between 3.99 and 4.29% while the zinc content of the ore lies between 1.98 and 3.14%. Various levels of pyrite, copper, cadmium, silver and other metals also occur in these deposits.

The mine adits are located in the valley at between 1,250 and 1,815m above sea level in the Osogovo Mountains. The ore processing buildings are situated some 2.5km to the north-west, on a hillside and the tailings deposits are located in the adjoining valley with a culvert directing the Toranica River beneath the dam

There are a number of environmental concerns associated with the site. Small communities are affected by the tailings dam. Snowmelt and heavy rains cause run-off from the tailings disposal area washing downstream area with mine adits discharges and run-off contaminated with oils and heavy metals. There is extensive metal contamination (by cadmium, lead and zinc in particular) in the river waters downstream of the mine. Moreover, the tailings storage facility has no environmental safeguards with respect to the lining of its base.

Figure 2.14 Location of Tranica Mine

Photograph 2.18 Tranica Mine

Figure 2.15 Topography of Tranica Mine

Photograph 2.19 Processing Plant of Tranica Mine

Photograph 2.20 Waste Dump Areas

Photograph 2.21 Check Point No.3 and Water Sampling

Mining and processing facilities have had a major effect on the chemical composition of river sediments in the river Toranica. Concentrations of Pb, Zn, and S are each >1000mg/kg. Concentrations decrease after the confluence with the Kriva River but are still significantly elevated (Alderton, 2005). The analytical results of water in the Toranica Mine area conducted by Alderton et al. (2005) are shown on Table 2-13 together with the results of on-site water quality test by pack test. Waters from the Toranica area have a near neutral pH and solute contents are generally not high compared with other mine area. Elevated values for As, Bi, Pb, S, U and Zn occur in the vicinity of the mining area and Al, Mn, Pb and Zn exceed the environmental standard for water of Macedonia. The high concentrations of Mn, Pb and Zn, exceeding the standard continue from adit to Tranica River and Kriva River.

Table 2.13 Analytical Results of Water from the Tranica Mine

Modified from Alderton et al. (2005)

		pH	Al	Ca	Fe	Mn	S	Ag	As	Bi	Cd	Location
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Toranica												
	T1	7.0	0.30	42.8	0.72	0.06	50.2	0.0001	0.0037	0.0003	<0.002	Water coming out of upper adit
	T2	7.0	0.11	20.6	0.81	0.15	27.2	0.0001	0.0035	0.0006	<0.002	Stream above adits
	T4	7.2	0.04	20.3	0.4	0.05	11.7	0.0001	0.0018	0.0001	<0.002	Tributary, no connection with mine
	T5	6.9	0.20	33.5	1.46	0.18	38.1	0.0002	0.0146	0.0032	<0.002	Immediately below lower adit
	T6	7.0	0.10	22.9	0.69	0.19	26.3	0.0001	0.0022	0.0006	<0.002	Stream below lower mine adit
	T7	6.9	0.07	42.9	0.43	0.12	30.5	0.0001	0.0012	0.0007	<0.002	Below tailings dam, small stream
	T8	7.0	0.11	13.2	0.32	0.08	11.7	0.0001	0.0006	0.0004	<0.002	River tranica; culvert under tailings
	T11		0.18	15.1	0.65	0.15	14.5	0.0001	0.0008	0.0001	<0.002	River Tranica, 10 km from mine
	T13		0.43	18.5	1.03	0.11	12.3	0.0002	0.0013	0.0007	<0.002	River Kriva; 1km above Kriva Palanka
WHO			0.2		2	0.4			0.01		0.003	
Standard						0.05			0.03		0.01	

		Co	Cr	Cu	Mo	Ni	Pb	Sb	Tl	U	Zn	Location
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Toranica												
	T1	0.0006	0.0008	0.0547	0.0033	<0.004	0.04	0.0004	0.0002	0.0187	0.31	Water coming out of upper adit
	T2	0.0010	0.0008	0.0189	0.0005	<0.004	0.06	0.0002	0.0002	0.0020	0.67	Stream above adits
	T4	0.0004	0.0006	0.0037	0.0012	<0.004	<0.03	0.0001	0.0002	0.0016	0.07	Tributary, no connection with mine
	T5	0.0006	0.0011	0.0124	0.0059	0.01	0.46	0.0005	0.0003	0.0053	0.055	Immediately below lower adit
	T6	0.0011	0.0006	0.0093	0.0009	0.01	0.07	0.0003	0.0002	0.0021	0.044	Stream below lower mine adit
	T7	0.0005	0.0007	0.0074	0.0015	0.01	0.08	0.0005	0.0002	0.0042	0.08	Below tailings dam, small stream
	T8	0.0006	0.0005	0.0069	0.0004	0.01	0.04	0.0001	0.0002	0.0014	0.15	River tranica; culvert under tailings
	T11	0.0006	0.0006	0.0049	0.0004	<0.004	<0.03	0.0001	0.0002	0.0027	0.19	River Tranica, 10 km from mine
	T13	0.0009	0.0012	0.0079	0.0003	<0.004	0.08	0.0004	0.0002	0.0016	0.12	River Kriva; 1km above Kriva Palanka
WHO			0.05	2	0.07	0.02	0.01	0.02		0.015	3	
Standard		0.1	0.05	0.2		0.05	0.01				0.1	

WHO: Guideline for drinking water quolity (WHO 1993, 2004)

Standard Environmental Standard for Water of Macedonia

: Concentration exceeding WHO

: Concentration exceeding standard

(Results of On-site Water Quality Test) (mg/L)

	pH	EC (mS/m)	As	Cr	Cu	Ni	Zn	Mn
No.1	7.85	32.4	0.2	ND	ND	ND	ND	ND
No.2	7.29	77	0.2	ND	ND	ND	ND	ND
No.3	3.80	235	1	ND	0.5	ND	<20	1

ND: not detected

(8) Makstil (Iron and Steel Plant)

Makstil, located in eastern part of metropolitan Scopje, is the only steel producing mill in Macedonia. The company Makstil came out from the reconstruction and the privatization of the former Mines and Iron & Steelworks Skopje. The plant started its activity in October 1967 and reached a production of about 1.15Mt/year of finished products in 1986 to 1989. During mid 90s the various production units were divided into 10 independent companies following the decision of the Government of Macedonia. Makstil Skopje was established in May 1997 as an independent entity, out of the above 10, with Duferco Group as majority shareholder, and it become an integrated producer of rolled products (hot rolled plates, hot rolled coils, cold rolled strips and sheets, galvanized strips and sheets and pre-painted coated strips and sheets) with annual production capacity of about 1,200,000t of finished products.

Sources of contamination in the Makstil Plant are dumpsite of 2,500,000t of oven slag covering an area of 125,000m^3 and emissions of smoke with toxic material from chimney.

Figure 2.16 Locatin of Makstil Plant

The analytical results of soil samples and groundwater conducted by EAR (2005) are shown in Tables 2.14.

Table 2.14 Analytical Results of Soil and Groundwater from Makstil

After EAR (2005)

	pH	EC (mS/m)	Cu	Pb	Zn	Mn
Groundwater sample (mg/L)	7.70	170	0.0011	0.0031	0.0090	0.214
Soil sample near slag dump (mg/kg)	-	-	30.6	15.7	110	888
Soil near Famord (mg/kg)	-	-	31.3	30.5	20.5	728

(9) Krstov Dol Mine

The Kristov Dol Mine is a small mine located approximately 15km north of Kriva Planke, near the Serbian border, in northeast Macedonia. The mine was mainly operated during 1970s and 1980s for mining small veins with stibnite (Sb_2S_3), berthierite ($FeSb_2S_4$), realgar (AsS), pyrite, quartz and calcite. In addition to them minor amount of Cu-, Zn-, and Pb-bearing sulphides occur. The mineralization of small vein in schist is thought to be related to quartz latites of Oligo-Miocene age (Mudrinic and Serafimovski, 1997, Alderton et al. 2005).

Figure 2.17 Location of Kristov Dol Mine

In the valley of Krstovska River, old adits, waste dumps, tailings dams, mill and floatation plant were observed as shown in Figure 2.18

Two adits were found in the upper stream of the Krstovska River together with waste dump. pH measurement of the water discharged from one of the adits, Adit 1, gives pH and EC, respectively, 8.14 and 107mS/m. On-site water quality test of As contents gives 0.2 to 0.4mg/L for the discharge water for the adit. The waste dump closely located to the two adits on the other side of the creek extends 100m long along the creek, and it is 5 to 20m wide and 8 m high. Most of the rubble in the waste is country rock and fragments of ore with mineralization were only rarely found. The volume of the waste is estimated to be approximately 8,000m^3 (Table 2.15).

Table 2.15 Volume Estimation of Dump and Dam

	Approximate volume (m^3)	Materials
Waste Dump	8,000	Rubble and soil
Tailings Dam 1	1,400	Orange brown sand
Tailings Dam 2	5,400	Orange brown sand
Tailings Dam 3	12,000	Orange brown sand

Three tailings dams, Tailings Dams 1 to 3, were observed along the Krstovska River. The Tailings Dam 1, the smallest among the three, is located close to the flotation plant. The tailings have been piled up more than 1m higher than cemented dyke of 5m high, allowing the tailings to flow over when heavy rain comes. The drainage system under the tailings dam, for the water from the upper stream, was installed but sand and gravel filled more than half of the 30 cm across pipe.

The Tailings Dam 2 is located along the east side of the river between the stream and the new road, and is distributed showing elongated triangle shape of 120m x 30m size with heights of 3 to 5m (Figure 2.18). The tailings are sandy materials with light brown colour on the surface and orange brown inside. The sidewalls of river and lower stream sides are consolidated and forbs are growing. The drainage pipes were installed underneath the dam for the water of a small tributary flows in from east side of the Krtovska River but is currently not functioning.

The Tailings Dam 3 consists of six small tailings dams aligning north to south along the Krstovska River on the river plain (Figure 2.18). They are simple dams with size of 30 to 50m x 30m and the tailings have been disposed on the river plain after digging and making separations of approximately 1m high. If floods occur, tailings materials are easily washed away.

No major agricultural activities are found in the downstream area from the mining workings to the confluence of the Kristovska and Lucka Rivers, however, the situation is that it is critical that the three tailings dams could easily start to flow away to the lower stream area if heavy rain comes.

The measurements of pH conducted at immediately below tailings dams and the discharge water from the adit give moderately alkaline nature ranging from 8.14 to 8.67, consistently increasing towards the lower stream with the lowest value at the discharge water from the adit. EC values ranges from 30.4 to 106.6mS/m, being highest at the adit, decreasing towards the lower stream.

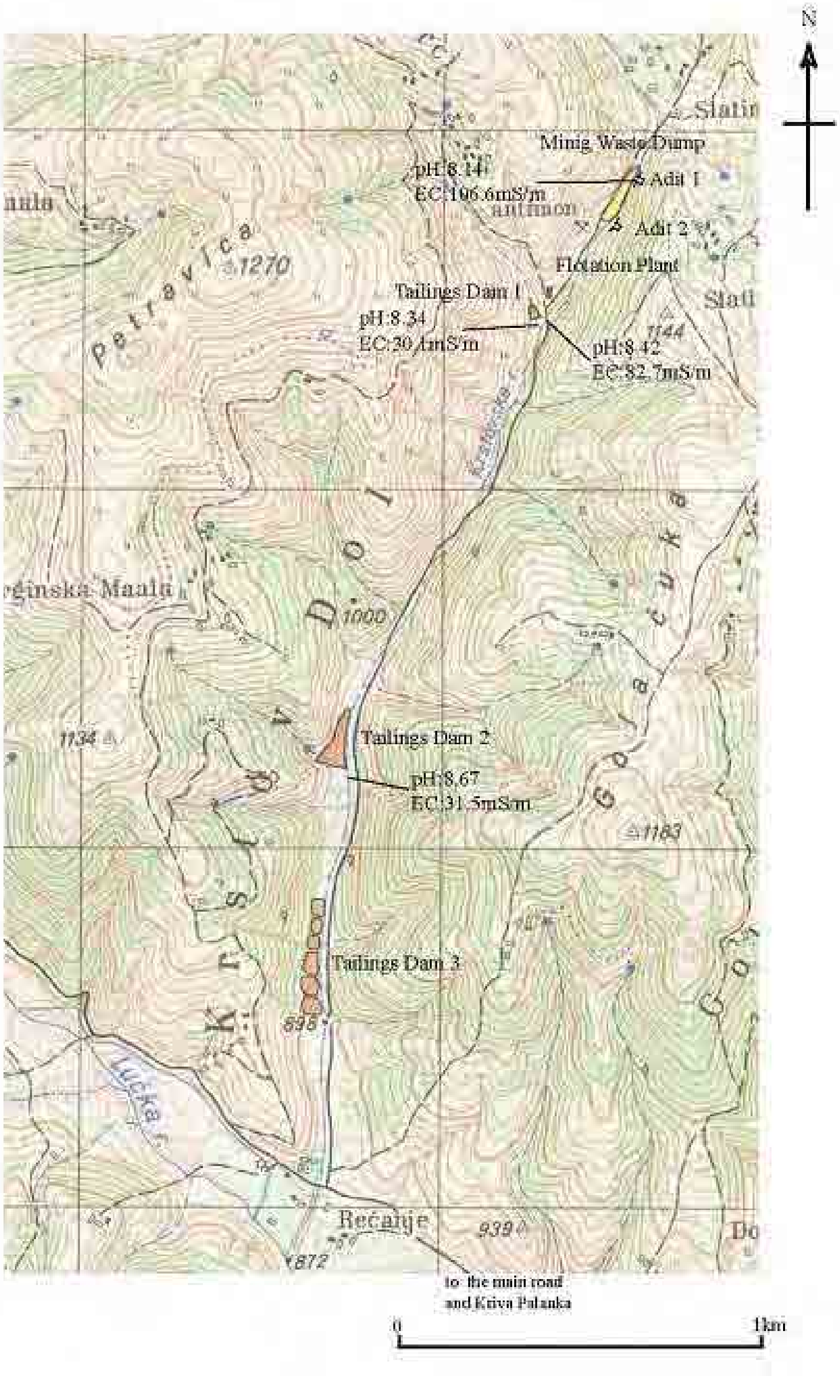


Figure 2.18 The Krstov Dol Mine

Photograph 2.22 Tailings Dam 1 (Kristov Dol Mine)

Photograph 2.23 Tailings Dam 2 (Krstov Dol Mine)

Photograph 2.24 Tailings Dam 3 (Krstov Dol Mine)

The analytical results of water in the Kristov Dol Mine area conducted by Alderton et al. (2005) are shown on Table 2.16. The effects of mining activities on the water are clear with elevated heavy metals such as As, Co, Cr, Fe, Mo, S and Sb (Alderton et al., 2005), however, the concentrations of heavy metals are relatively low compared with other areas, only three elements of Fe, Mn and Sb showing the concentration exceeding the standard value or guideline value of WHO. Among these, Sb shows a clear enrichment in water affected by the mining activities and it's concentrations are significantly high, reaching five times more than guideline value of WHO at the adits and below the tailings dam.

Because of the relatively small scale mining activities in the Krstov Dol, contamination seems to be limited in a local area. Although there is no available information concerning the soil contamination in the area, the soil contamination in the valley of Krstovska river seems to be not significant. However, the tailings dams have been left untouched, and countermeasures preventing tailings materials being carried away by water should be taken.

Table 2.16 Analytical Results of Water in the Krstov Dol Area

After Alderton et al. (2005)

	pH	Al	Ca	Fe	Mn	S	Ag	As	Bi	Cd	Location
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
K1	7.5	0.1	63.1	0.13	0.04	23.5	0.0001	0.0017	0.0001	<0.002	Upstream of adit
K2	7.7	0.1	96.7	0.02	0.03	176.3	0.0001	0.0072	0.0001	<0.002	Discharge from adit
K3	8.5	0.1	75.4	0.22	0.05	78.3	0.0001	0.0035	0.0001	<0.002	Small tributary through mine waste
K5	8.2	0.9	63.8	2.66	0.42	18.8	0.0002	0.0002	0.0001	<0.002	Upstream of tailings dam
K6	8.4	0.0	65.3	0.43	0.11	29.1	0.0001	0.0043	0.0002	<0.002	Below tailings dam
K7	8.3	0.1	62.0	0.18	0.04	59.2	0.0001	0.0045	0.0001	<0.002	Approx. 0.5 km blow K6
K9	8.4	0.1	40.7	0.19	0.04	16.2	0.0001	0.0015	0.0001	<0.002	River Lucka; 8km from mine
WHO		0.2		2	0.4			0.01		0.003	
Standard					0.05			0.03		0.01	

	Co	Cr	Cu	Mo	Ni	Pb	Sb	Tl	U	Zn	Location
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
K1	0.0005	0.0007	0.0046	0.0002	0.01	<0.03	0.0663	0.0003	0.0023	0.02	Upstream of adit
K2	0.0005	0.0002	0.0016	0.0002	0.01	<0.03	0.1003	0.0004	0.0014	0.03	Discharge from adit
K3	0.0006	0.0005	0.0030	0.0002	0.004	<0.03	0.0774	0.0003	0.0021	0.03	Small tributary through mine waste
K5	0.0026	0.0027	0.0055	0.0000	0.01	<0.03	0.0020	0.0003	0.0006	0.03	Upstream of tailings dam
K6	0.0006	0.0004	0.0021	0.0016	<0.004	<0.03	0.0109	0.0003	0.0006	0.02	Below tailings dam
K7	0.0005	0.0006	0.0025	0.0024	<0.004	<0.03	0.1032	0.0003	0.0016	0.02	Approx. 0.5 km blow K6
K9	0.0005	0.0007	0.0023	0.0002	<0.004	<0.03	0.0037	0.0002	0.0012	0.02	River Lucka; 8km from mine
WHO		0.05	2	0.07	0.02	0.01	0.02		0.015	3	
Standard	0.1	0.05	0.2		0.05	0.01				0.1	

WHO: Guideline for drinking water quolity (WHO 1993, 2004)

Standard Environmental Standard for Water of Macedonia

: Concentration exceeding WHO

: Concentration exceeding standard

(10) Thermal Power Plant, Bitola (REK Bitola)

REK Bitola is a thermal power plant, which has been operating for more than 30 years and there is lignite mine, Suvodal Mine, adjacent to the plant. The power plant generated 75% of Macedonia's annual electricity requirements. The lignite is relatively low in sulphur (approximately 0.5%) and produces 13 to 17% ash. The power plant's electrical precipitates (or dust filters) were old and did not work well. Similarly, its emissions monitoring system only functioned properly about half of the time. According to management, however, the plant's three units emitted 46,000ts of sulphur dioxide and 2,400t of fly ash to the atmosphere in 1999 (UNEP, 2000a).

The power plant produces 150t of fly ash and five tons of slag daily. The fly ash and slag contain silicate and heavy metals, including uranium compounds. The ash and slag travels by conveyor belt to a very large dump (97,630m^2, receiving 1.5 million tons of waste per year) close to the plant. Heavy metals, including uranium compounds, from the fly ash of dumpsite are probably contaminating soil and groundwater downstream of the dumpsite. The upper aquifer is believed to drain to a nearby river. Private wells along the river downstream of the plant provide local inhabitants with water for drinking and irrigation.

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

Figure 2.19 Location of REK Bitola

Photograph 2.25 Thermal Power Plant, REK Bitola

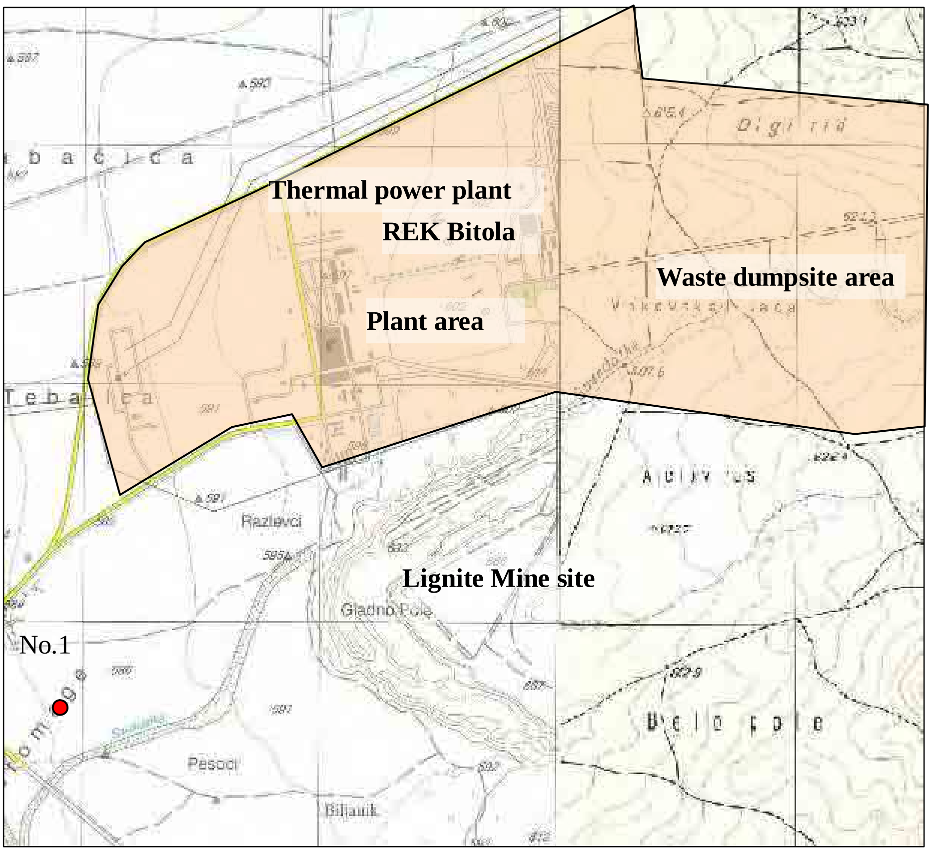


Figure 2.20 Location of REK Bitola

Photograph 2.26 Thermal Power Plant and Waste Dump Area

Photograph 2.27 Lignite Mine Site

There are many environmental concerns associated to the Bitola thermal power plant. Emitting of high levels of sulphur dioxide from chimneys and dust containing heavy metals, including uranium compounds, from the plant's dumpsite and mine, and it is affecting human health. Further, heavy metals in the fly-ash dumpsite are likely to be contaminating soil and groundwater and draining into a nearby river. The river supplies water to local inhabitants for drinking and irrigation. Untreated process wastewater containing heavy metals and dissolved oil also drains into the river via an open canal.

The analytical results of soil are shown in Table 2.17 together with results of on-site water quality test.

Table 2.17 Analytical Results of Soil and Water from REK Bitola

After Filipovski (2003)

	As	Cd	Cr	Cu	Ni	Pb	Zn	Mn
No.1	5	2	7	29	13	230	79	760
No.2	5	2	30	20	18	820	100	420

(Results of On-site Water Quality Test) (mg/L)

	pH	EC (mS/m)	As	Cr	Cu	Ni	Zn	Mn
No.1	7.71	48	0.5	ND	ND	ND	ND	ND

ND: not detected

(11) Thermal Power Plant Kicevo (REK Oslomej)

The REK Oslomej is a thermal power plant, which has been operating for more than 20 years, started in 1983, and there is lignite mine adjacent to the plant. Its capacity is 1,300,000t of coal per year. Thermo plant is located near the village the Oslomej, 8 km north east of the city of Kicevo. Landfill dams are situated near the thermo power plant. Total disposal quantity until now is 47,000,000m^3 of mine tailings and 2,000,000t of ash and slag.

Figure 2.21 Location of REK Kicevo

Photograph 2.28 Lignite Mine Site

The environmental concerns similar to the REK Bitola are associated to the RKE Oslomej thermal power plant. Emitting of high levels of sulphur dioxide from chimneys and dust containing heavy metals, including uranium compounds, from the plant's dumpsite and mine, and these are high risks to human health. Further, heavy metals in the fly-ash dumpsite are likely to be contained in soil and groundwater and draining into a nearby river. The river supplies water to local inhabitants for drinking and irrigation. Untreated process wastewater containing heavy metals and dissolved oil also drains into the river via an open canal .

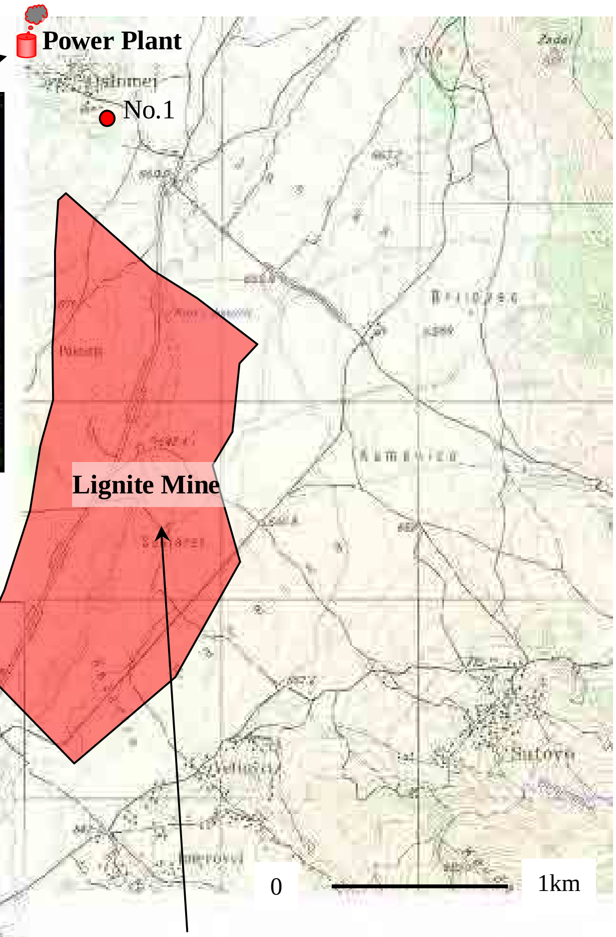
The results of on-site water quality test is shown in Table 2.18

Table 2.18 Results of Water Quality (by pack test)

	pH	EC (mS/m)	As	Cr	Cu	Ni	Zn	Mn
No.1	8.35	19	0.2	0.5	ND	ND	ND	ND
No.2	7.64	82	0.2	0.5	ND	ND	ND	ND

ND: not detected

Photograph 2.29　Thermal Power Plan



Photograph 2.30　Surface Water Monitoring at No.2 point

Photograph 2.31　Lignite Mine

Figure 2.22　Lignite Mine Site and Power Plant of REK Kicevo

(12) Feni Industry, Kavadarci

The Feni Industry metallurgical company is situated some 7km west from Kavadarci and is the only producer of iron-nickel in Macedonia. The Feni was build in the beginning of the 1980. After several stoppages, Feni was restarted in 2001. The company processes about 700,000t of nickeliferrous-iron ore mined in the Rzanovo deposit. Recently the company also started processing nickeliferrous ore imported from Albania and Indonesia.

Large amounts of slag, which, during the liquid state, flows into the dump close to Vozarci, comes from the hydrometallurgical technological process for obtaining iron-nickel. During the period from 1982 to 2007, two types of waste from the plant were generated: 7,000,000t from smelter and 270,000t from the converter. This waste is dumped at the dumpsite 2 km south of the smelter. During the site visit, black water including heavy oil was observed in creek running beside the plant.

Figure 2.23 Location of Feni Plant

Photograph 2.32 Feni Ferro-Nickel Smelting Plant

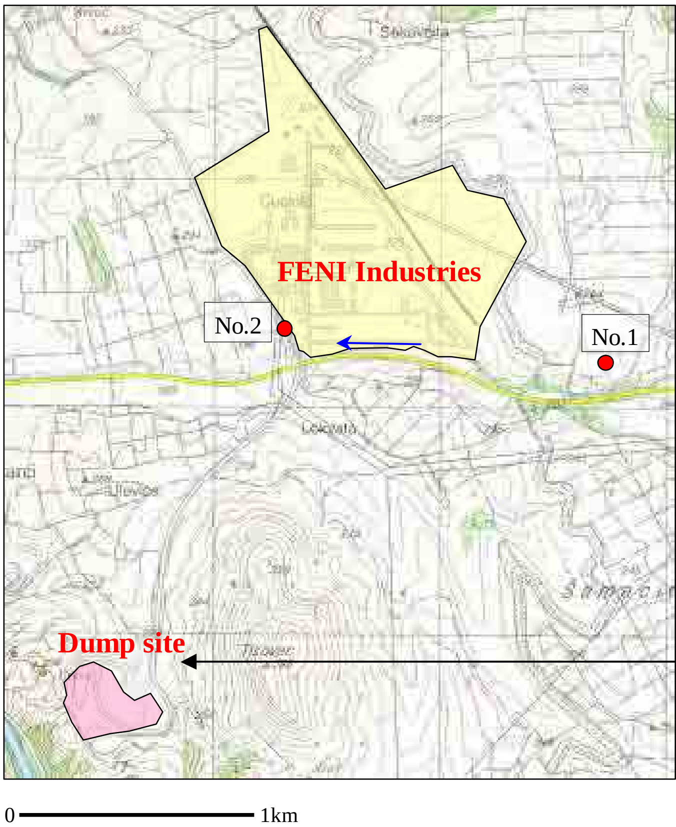


Figure 2.24 Topographic Feature around Feni Industry in Kavadarci

Photograph 2.33 Slag Dump Area in Feni Industry

Photograph 2.34 Slag Dump Area in Feni Industry Kavadarci,

Photograph 2.35 Monitoring Point - 1 in Fini, Upstream of Feni Industry

Photograph 2.36 Monitoring Point - 2 in Fini, Kavadarci,
Downstream of Feni Industry (Water is black by waste of oil.)

The results of on-site water quality test is shown Table 2.19

Table 2.19 Results of On-site Water Quality Test (by pack test)

	pH	EC (mS/m)	As	Cr	Cu	Ni	Zn	Mn	Oil
No.1	8.16	80.3	0.5	ND	ND	ND	ND	ND	ND
No.2	7.05	77.9	0.2	ND	ND	ND	0.2	ND	Strong

ND: not detected

(13) Rzhanovo Mine

The Rzanovo Mine, located in the southern part of Macedonia close to Greek border, is Ni-Fe mine. The deposits were discovered in 1952 and the mine is under operation, providing Ni crude ore for feedstock to the Feni Industry, Kavadarci.

Nickeliferous iron ore mineralization is located along the contact between the Jurassic serpentinites and schist in the footwall and the Cretaceous limestone in the hanging wall. The ore layer was explored through a vertical interval of about 500m with an average thickness of 30m. The ore reserve is believed to be 1.6Mt with approximately 1% of Ni. The yearly production is 800,000t.

Figure 2.25 Location of Rzhanovo Mine

The mining operation is conducted in an open pit of approximately 1km long in NNW-SSE direction and 0.3km wide. Besides this in the west, a huge mining waste dump exists. The crude ore is transported to the plant of Feni Industry in Kavadarci by belt conveyor of more than 30km long. These mining facilities are considered to be potential source of environmental contamination.

The prioritization and plan of proposed survey of each Hot Spot are given in Chapter 10.

CHAPTER 3 PRESENT CAPACITY OF SOIL CONTAMINATION MANAGEMENT RELATED TO MINING

CHAPTER 3 PRESENT CAPACITY AND CAPACITY DEVELOPMENT OF SOIL CONTAMINATION MANAGEMENT RELATED TO MINING

This Chapter covers the assessment of the current capacity on soil contamination in Macedonia, including an assessment of the institutional, organisational and individual frameworks. The Chapter also includes some suggestions for strengthening the institutional, organisational and individual frameworks and for further development of capacity. In addition to them, a overview of capacity development implemented during the study is given in this Chapter.

3.1 Concepts of Capacity Development

The definition of Capacity Development is "*the process by which individuals, organisations, institutions and societies develop 'abilities' (individually and collectively) to perform functions, solve problems, and set and achieve objectives;*" (JICA , 2004).

This definition also perceives the concept as three inter-connected layers of Capacity Development:

Level 1 - Individuals
Level 2 - Organisations
Level 3 - Institutions / society

(*Source: Capacity Development Handbook for JICA Staff, March 2004*)

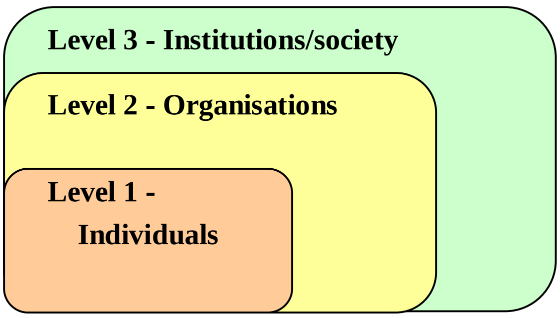


Figure 3.1 Layers of Capacity Development

The following provides more background on the concepts of the three levels of capacity development:

3.1.1 Level 1 – Individuals

- Focus capacity development activities on developing knowledge, skills and awareness (related to soil contamination management) of individuals.
- The aim is to enable individuals to be able to achieve objectives (related to soil contamination management) using their own knowledge and skills.

3.1.2 Level 2 – Organisations

- Focus capacity development activities on strengthening the organisational framework/ administrative structure so that the organisation can achieve its objectives (related to soil contamination management).
- The capacity development activities therefore include support in assignment of roles and responsibilities and in the decision-making process, development of management systems, etc.
- The development of the organisational framework is achieved by focusing on the capacity of individual employees (Level 1), physical assets (computers and databases), organisational strategy and structure, management systems, leadership, human resource management, etc.

3.1.3 Level 3 – Institutions/society

- Focus capacity development on developing the wider frameworks for the formation and implementation of policies, strategies, laws, etc, including education and awareness-raising.

3.2 Environmental Legislation Related to Soil Contamination

This section covers the existing situation in relation to environmental legislation on soil contamination management in Macedonia. The selection includes information and analysis on the situation with EU legislation on soil contamination management. This is relevant because Macedonia is aiming to align its legislation with EU legislation in the future. In addition, the section includes suggestions and principles for strengthening the legal framework related to soil contamination management.

3.2.1 Overview of Regulatory Framework

There are no laws specific to soil contamination management in Macedonia at present, although several existing laws contain some relevant provisions. Specifically, there are no standards in Macedonia for heavy metal contamination levels in soil, although some standards are proposed by soil contamination specialists in publications (e.g. Filipovski, 2003). The main existing environmental laws with some relevance to soil contamination management are:

- Law on Environment (2005)
- Law on Agriculture (1998, revised 1999 and 2002)
- Law on Waste management (2004)
- Law on Nature protection (2004)
- Law on Agricultural Inspection (2004)
- Law on Waters (drafted 2005)
- Law on Mineral Resources (2007)

Responsibilities related to the above Laws are scattered between different Ministries and the responsibility for enforcement of the Laws also depends on the issues. The lack of clear definition of institutional responsibilities is leading to the ineffective regulatory framework on soil. In addition, progammes for monitoring of soils have not been established. Macedonia therefore needs to develop clearer Laws and responsibilities on soil.

<u>Procedure for development and adoption of national regulations</u>

General laws are developed in the state administration and bodies. The Government proposes the law in the Parliament, and the Parliament adopts or rejects the law. After adoption, laws are published in the Official Gazette of the Republic of Macedonia.
Secondary legislation (rulebooks, orders and decisions) on specific areas under existing laws, are adopted by a competent minister on the basis of the provisions of the relevant laws. These secondary legislation acts need prior approval of compliance with the Constitution of Republic of Macedonia and with other legislation, issued by the Secretariat of Legislation. After adoption, the secondary legislation acts are published in the Official Gazette of the Republic of Macedonia.

Draft laws, other regulations and the acts submitted by the Government within its competences to the Assembly, contain compulsory analyses (review and summary) on their compliance with the EU legislation.

3.2.2 Assessment of Existing Legislation Relevant to Soil Contamination Management in Macedonia

(1) Main Regulations Relevant to Soil Contamination Management

The following main regulations are reviewed in more detail below:

- Law on Environment
- Law on Agriculture
- Law on Waste Management
- Law on Mineral Resources

Title of Law	*Law on Environment (Adopted 2005)*
General overview of Law	This Law regulates the rights and the responsibilities of state and local self government of Macedonia, as well as the rights and the responsibilities of legal entities and persons, in the provision of conditions required to ensure protection and improvement of the environment, for the purpose of exercising the right of citizens to a healthy environment.
Provisions specific to soil contamination	Chapters (articles in brackets) V. Environmental Monitoring (Articles 33 and 37) IX. Environmental Protection Planning (Articles 60 to 63) XX. Supervision – Other competences of the State Inspector of Environment (Article 199) The State Inspector of Environment shall have the right to perform supervision over the application of measures for protection of soil against pollution, erosion, and land use change, in particular whether: prescribed projects for re-cultivation of soil are complied with; measures of protection of the soil against pollution undertaken; monitoring devices/units are in proper functioning state; other states of his/her competence are ascertained. Other competences of the authorised inspector of environment (Article 202): The authorised inspector of environment shall have the right to supervise implementation of the measures for protection of the soil against pollution change of purpose, through ascertaining whether: all measures for prevention of the pollution have been undertaken and it is within the prescribed limits; appropriate measures have been undertaken in cases of pollution; ascertains other conditions under his/her responsibility.
Analysis	• All environmental media (soil, water and air) are treated together. The monitoring is broadly defined in several articles, and the lack of clear responsibilities is leading to a lack of activities on soil contamination management (Note that even when Laws do clearly define responsibilities then this is not necessarily enough for them to be implemented, for example the Law on Agriculture requires MAFWE to develop standards for soil pollution, but no actions have been taken by MAFWE). • By the articles 33 and 37, State Administration and Bodies (e.g. MAFWE and MEPP) can establish state monitoring network (e.g. soil pollution monitoring) using specific methodologies. • Environmental protection planning (chapter IX) is covered (see Articles 60 to 63), and the responsibility is with MEPP. • Articles 199 and 202 describe general obligations of environmental inspectors related to soil pollution prevention and monitoring.

Title of Law	*Law on Agriculture (Adopted 1998, revised 1999 and 2002)*
General overview of Law	The provisions of this Law determine the management, ownership and protection of agricultural land.
Provisions specific to soil contamination	The Minister of Agriculture, Forestry and Water Economy determines, the substances which are damaging for the agricultural land, defines their maximum permitted concentration in the soil and prescribes the measures to be taken if their concentration in the soil is higher than permitted (Article 31). Regulations for protection and improvement of the environment are applied for protection of the agricultural land against pollution and contamination, (Article 36).
Analysis	Soil contamination is mentioned partially in only two articles. However, no action has been taken related to these two articles. MAFWE have not yet established regulations on the soil pollutants, and no activity has been taken by the MAFWE on soil pollution standards.

There is currently a new law in the process of being adopted on Agriculture and Rural Development (it is at draft status as of August 2006), which will facilitate some restructuring of MAFWE and clarification of roles, if adopted under the new Government. More details are provided in the section on MAFWE above.

Title of Law	***Law on Waste Management (Adopted 2004)***
General overview of Law	This Law regulates the waste management; plans and programs for waste management; rights and obligations of the legal entities and individuals related to waste management; the manner of and conditions for waste collection, transportation, treatment, processing, storage and disposal; waste import, export and transit; monitoring; information system and financing.
Provisions specific to soil contamination	There are many articles that aim to control soil pollution from the aspect of: Waste handling (Article 24), Waste processing (28), Operations of waste disposal (35), General rules for handling hazardous waste (57), Handling of waste oils (68), Handling of TiO_2, Conditions to be fulfilled by the landfill (79), Rules for incineration and co-incineration of waste (94). Also, the Law describes the competent authorities (126) and supervision (127 to 138).
Analysis	This law additionally describes the inspection supervision and control, related to soil (Article 135), the obligations of Inspectors of Environmental are identified in relation to soil sampling.

There is a section in the new Law on Mineral Resources on environmental protection and liability. However, this section of the Law is driven by the MEPP, and MoE is not proactively involved in implementation and enforcement.

Title of Law	***Law on Mineral Resources (Adopted 2007)***
General overview of Law	This Law on Mineral Resources was adopted in 2007 and is directly related to mining activities. It has been developed and adopted via the MoE.
Provisions specific to soil contamination	There is one page of general provisions related to environmental aspects: **Chapter VIII** **Environment protection and damage compensation** **Article 70** **Environment protection** (1) The owner of the licence for conducting detailed geologic surveys or the concessionaire that conducts mining activities, i.e. exploitation of mineral resources and mineral technology is obliged to abide to this law and the Law on Environment, as well as other environmental regulations. (2) The owner of the licence for conducting detailed geologic surveys or the concessionaire that conducts mining activities, i.e. exploitation of mineral resources and mineral technology must conduct measures for environment protection from possible hazards and harmful impacts. **Article 71** **Damage compensation** The damage done during the basic and detail geologic surveys and during the performance of the mining activities, or exploitation of mineral resources and mineral technology, is compensated according to the legislation for damage compensation and the responsibility for damage on the environment. **Article 72** **Remediation of the environment and removal of the consequences**

	(1) The owner of the licence for conducting detailed geologic surveys or the concessionaire that conducts mining activities, i.e. exploitation of mineral resources and mineral technology, during the detailed geologic surveys and the conductance of the mining activities and the mineral technology works, and after their completion must conduct remediation of the area, according to the licence for conducting detailed geologic surveys, concession agreement and the exploitation permit. (2) For not conducting the acts described in paragraph (1) from this Article, the Government authority responsible for conductance of works in the area of mineral resources, i.e. the concession lender will perform the remediation of the area, according to the permit for conducting the detailed geologic surveys, concession agreement and the license for exploitation and mineral technology, on behalf of the owner of the permit for conducting the detailed geologic surveys, i.e. the concessionaire, in accordance with the law (3) After the completion of the detailed geologic surveys and the conductance of the mining works, i.e. exploitation of mineral resources and mineral technology, it is forbidden to store harmful, dangerous, hazardous, radioactive materials and waste in the abandoned mines and objects. **Article 73** **Intervention in the concession area** (1) Through the concession area, i.e. exploitation field, can be constructed public roads, railways and other traffic objects, power lines, water supply lines, oil pipelines and gas pipes, if proper conditions are provided that will not affect the exploitation of the mineral resources, endanger human life or property, or the integrated environmental license. (2) The waters that can occur during the mining operation can be used by the concessionaire for its technologic purposes according to the Law on Waters. Before discharging the wastewaters in the recipient, it is mandatory to be treated for removal of harmful substance, according to the law and the integrated environmental licenses.
Analysis	The Law is in its early stages of implementation and the enforcement mechanisms for the provisions on environment are still under development by the MoE.

(2) Other Regulations with Some Relevance to Soil Contamination Management

Other Laws with some relevance include:

a. The Law for Organisation and Operation of Governmental Bodies (2000) specifies the mandate of the different Ministries. However, the Law is out of date and has not been significantly amended to take into account the changes in the Ministry structures since 2000. One of the reasons it has not been updated for some time is that there are political sensitivities in the decision-making and approval of mandates of Ministries, and it is difficult to get agreement of the Government on these issues.

b. Law on Nature protection (“Official Gazette of RM”, No 67/2004) - This Law regulates the nature protection in relation to the biological and landscape diversity, and the protection of the natural heritage.

c. Law of Acquisition - The Law regulates acquisition of land, rights of land, buildings and properties, in the purpose of performing public object construction, declaration of public utility and prescription of compensation for lands and rights to be acquired.

d. Law on Agricultural Inspection ("Official Gazette of RM" No. 38/04) defines the methods for organisation, competences, authorisations and implementation of the work of the agricultural inspection in performing the agricultural supervision.

e. Law on the Local Self-Government ("Official Gazette of RM" No. 5/02) - defines the list of competences of local self government - including environment and nature protection (e.g. soil pollution).

f. Law on Water (drafted January 2005) - will regulates matters related to: surface waters (including permanent watercourses or watercourses through which water flows occasionally, lakes, reservoirs and springs), ground waters, as well as wetlands; management of waters and wetlands, including also the water resources distribution, water protection and conservation, as well as the protection against harmful impact of waters; water management structures and services; organisational arrangements and financing of water management; as well as the manner, the conditions and the procedures under which water can be used or discharged. However, the Draft Law on Water has not been adopted because MEPP, MAFWE and MoH have overlapping roles and cannot agree on the Law.

3.2.3 EU Directives Relevant to Soil Contamination

At present the EU does not legislate and manage soil contamination through a shared policy and directives, although such a policy is under development. Therefore, a simple transposition for Macedonia to EU practice is not possible. Macedonia therefore needs to develop national legislation taking into account potential future EU developments in this area. The EU has developed a Thematic Strategy for Soil.

Although at present there is no EU legislation specific to soil, there are many *emission* limit values in EU environmental directives, for example the directives on water and waste and the IPPC Directive. There are no limits in EU Directives for heavy metal concentrations in soils, except in the Sewage Sludge Directive (86/278/EEC), which is specific to the concentrations in soils only in relation to the application of sewage sludge to land.

The National Programme for the Adoption of the EU Acquis has carried out detailed work on comparison of Macedonian legislation with EU legislation. There are many Working Groups under this Programme, including Working Groups on Agriculture and Forestry, Energy, Enterprises and Industrial Policy, Environment, and Science and Research. The Working Groups come under the responsibility of the relevant Ministries or other Government Departments (for example the Working Group on Environment is managed by MEPP).

These Working Groups have developed a detailed response to a questionnaire on legislation from the EU. These responses were compiled by the Secretariat for European Affairs (SEA) and submitted to the EU in February 2005. Most Working Groups attached many annexes that included copies of existing legislation.

The EU has now agreed the Thematic Strategy on Soil and has developed proposals for a Soil Framework Directive. The Directive is in its early stages of development, and is likely to set new obligations to identify and remediate contaminated sites. More information, and the Strategy and draft Directive, are available at: http://ec.europa.eu/environment/soil.

3.2.4 Recommendations on the Legal Framework

The improvement of soil contamination management in Macedonia through the implementation of a national M/P requires a robust legal and regulatory framework. A legal framework with clear, realistic and affordable legislation, and with strong monitoring and enforcement, will act as one of the important drivers for action to improve soil contamination management.

However, there are no laws specific to soil contamination management in Macedonia at present, although several existing laws contain some relevant provisions. In addition, there are no standards in Macedonia for heavy metal contamination levels in soil.

Responsibilities related to the various Laws that have some relation to soil contamination management in Macedonia are scattered between different Ministries and the responsibility for enforcement of the Laws also varies. The lack of clear definition of institutional responsibilities is leading to the ineffective regulatory framework on soil contamination management. The current situation therefore is not sufficient to enforce a coherent national Policy and M/P in soil contamination management.

The relevant players - administrative authorities, mining and other industry, farmers, etc, as well as citizens, have to know precisely their roles and obligations. Only detailed legally binding rules can provide an appropriate framework to reach the objective of improved soil contamination management on a sustainable basis.

The alternative to a framework law is a complex body of inconsistent, conflicting laws and regulations, which are adopted on a needs basis. Macedonia therefore needs to develop clearer Laws and responsibilities on soil, including an overall Framework Law, specific regulations and standards.

Important Principles related to Development of the Legal Framework

The following are the main principles related to development of the legal framework, which should be taken into account during the process to develop legislation on soil contamination management in Macedonia:

- It is important for Macedonia to develop an **overall policy framework** and M/P on soil contamination management, within which legislation can be developed.
- It is essential that **clear responsibility is assigned** for development of the legislation, but that there is extensive consultation with the relevant other ministries and institutions during the development of the legislation.
- Legislation must be **affordable and practical** in relation to the situation in Macedonia. It is important that a Regulation Impact Assessment should be carried out before the legislation is agreed and adopted, and this should include a component to assess the future costs of the draft legislation.
- Development and implementation of legislation on soil contamination management in Macedonia over the next 5~10 years should **align with future EU legal developments**.
- There are many examples where the primary legislation related to environmental management with respect to a particular media (e.g. air, waste, water, soil) involves a **Framework Law**, which provides the **overall general provisions and within which more detailed regulations can be developed**.
- The development of an overarching Framework Law is particularly important for a subject such as soil contamination that already has some provisions scattered within existing laws. Therefore, the primary legislation for soil contamination management should be a Framework Law.
- Under the Framework Law, more detailed national regulations and decrees can be developed to regulate specific aspects related to soil contamination management, such as standards, remediation practices, etc. In addition, within the national legal framework, it may be necessary for municipalities to adopt their own local regulations/decisions.
- It will be important to strengthen the capacity of the relevant Inspectorates for the **monitoring and enforcement** of the new legislation on soil contamination management.
- The development of institutional structures and legislation in Macedonia on soil contamination management can learn from the lessons identified from similar processes in other countries.
- In addition, the EU have developed their draft legislation taking into account the lessons learned from EU member countries, and therefore Macedonia can learn from EU.
- Regulations and controls are only one instrument available for achieving objectives in soil contamination management. Other non-regulatory instruments can be used such as economic instruments (e.g. potential taxes and penalties), or non-economic instruments such as awareness and educational campaigns.
- The **lessons from EU countries** are that effective legislation on soil contamination management takes many years to properly develop (Figure 3.1), and there are examples where countries have moved too fast without proper assessment of the affordability, and very soon after adoption they have had to spend extra time and resources changing the legislation. The timescales for the development of legislation in Macedonia should not be too ambitions.

3.3 Institutional Framework Related to Soil Contamination Management

This section covers a review of the existing environmental policy and existing action plans in Macedonia, and the institutional framework for implementation of the policy and action plans.

The capacity of the individual organisations is then assessed in the following section. This section covers the following:

- Background on the need for a clear institutional and organisational framework in order to implement environmental policy and action plans.
- Environmental Policy.
- National Environmental Action Plans (NEAP)
- Recommendations for institutional strengthening in Macedonia in relation to soil contamination management, including the principles related to development of the institutional framework, suggestions for roles and responsibilities and the financial framework.

3.3.1 The Need for a Clear Institutional and Organisational Framework

Strong organisation and management are essential in order to sustain effective environmental policy and action plans, including a soil contamination management system (SCM), and the M/P (M/P) on SCM will include components on the institutional and legal frameworks related to SCM.

The focus of the institutional framework should be to ensure clear roles and responsibilities for soil contamination management. Organisations need to have autonomy and authority if improved systems are to be properly implemented. This includes overall responsibility for implementation of the M/P, although different organisations will have responsibility for different actions. It is important that organisations are accountable for their responsibilities.

In the absence of clear definitions of responsibilities there are likely to be potential political issues, ineffectiveness and lack of action, which will undermine the sustainability of the new plans and systems.

3.3.2 Environmental Policy

Macedonia does not have an official Environmental Policy or Strategy. However, it has adopted a new Law on Environment (2005) and its second National Environmental Action Plan (NEAP 2) in 2005. Also, MEPP has its own strategy in the form of a document entitled “Vision 2008 - The Roadmap of the MEPP”. The combination of the Law, NEAP and MEPP Vision presents the overall framework for environmental planning and action, although a short overall policy and an overall environmental strategy would strengthen the framework. MEPP is likely to develop a Strategy for Sustainable Development of Macedonia in the next few years.

In addition, MEPP has four thematic strategies at present:

- Communication Strategy
- Data Management Strategy
- Awareness Strategy
- Monitoring Strategy

3.3.3 National Environmental Action Plan (NEAP)

Macedonia adopted its first National Environmental Action Plan (NEAP) in 1996, developed under World Bank funding through a participatory approach involving many stakeholders. The MEPP is the main Ministry responsible for implementation of NEAP. The participatory approach to planning M/Ps and action plans is essential because involving key stakeholder organisations in the planning leads to their consensus to the plan, their understanding of the concepts, and their agreement to the actions for which they are responsible. This is therefore essential to facilitate the effective implementation of the plan. Provision is made in the Law on Environment (2005) for adoption of the NEAP.

MEPP have recently developed a second NEAP, through the Department of Sustainable Development in MEPP and international Technical Assistance. However, there has been limited consultation within MEPP on NEAP 2.

NEAP 1 and 2 are described in more detail below. NEAP 1 includes a few general recommendations on actions to improve soil contamination management, but more details are included in NEAP 2. For example, NEAP 2 recognises that the lack of clear definition in roles and responsibilities related to soil contamination is leading to ineffective management of the problems. It recognises that there is no overall co-ordination of soil contamination monitoring.

National Environmental Action Plan 1 (NEAP (1))

The Republic of Macedonia produced its first NEAP in December 1996. It was developed under World Bank funding through a participatory approach involving many different stakeholder groups including all the main Ministries, the World Bank, many Macedonian technical specialists, private sector enterprises, NGOs and representatives of the local community.

NEAP (1) includes sections on: the background to economic policy and the environment, baseline environmental conditions in Macedonia (covering sub-sections on: population, health, air quality, water, waste management, land, forests, biodiversity and protected area management, cultural heritage, earthquakes), environmental management, environmental policy, priority actions.

NEAP (1) includes only a few brief references to soil contamination management, including:

- An assessment of the relative soil pollution levels in some different regions of Macedonia (a simple categorisation of unsatisfactory, significant and critical.
- A particular reference to the problems with soil contamination in the region of Veles and the need for more testing and analysis in this region.
- Identification of industrial waste management as a source of soil contamination, particularly mining wastes, and the need to increase monitoring of industrial practices.
- Identification of the potential for ground water contamination in the areas of municipal disposal sites and illegal dumping of solid waste, and the need to increase monitoring of these practices.
- A general recommendation to regularly survey soil and control land use in agricultural areas.
- A general recommendation to monitor soil around industrial sites.
- A general recommendation to encourage land preservation and training to farmers.
- A general recommendation to develop land use plans through a participatory approach.
- A specific recommendation that for areas with highly contaminated soil the growth of fruits and vegetables should be restricted.

- Recommends that MEPP should be responsible for policy on soil contamination management and inspection related to soil (as well as other media), although the report recognises the inadequate resources in MEPP at that time.
- The section on the baseline conditions that relates to land mainly focuses on soil erosion and degradation, rather than soil contamination from pollution, although soil contamination through waste from industry and mining is mentioned, and recommendations for increased monitoring of soil contamination are included.

National Environmental Action Plan 2 (NEAP (2))

Macedonia produced its second NEAP in late 2005. It was developed under EU CARDS funding and provides an action plan covering 6 years to 2011. There has reportedly not been a detailed participatory approach involving stakeholder organisations during the development of NEAP 2, which might provide difficulties in achieving leadership in implementation by the relevant Ministries and other responsible organisations.

NEAP 2 recognises that the lack of clear definition in roles and responsibilities related to soil contamination is leading to ineffective management of the problems. It recognises that there is no overall co-ordination of soil contamination monitoring, and that Systems for the monitoring of soils have not been widely established yet. The NEAP 2 identifies that MEPP has initiated activities targeted towards the identification of the state of the soils, in line with the requirements of the European Environmental Agency.

NEAP 2 identifies the main problems in the field of soil management to include:
- Soil degradation (e.g. soil erosion and soil contamination).
- The absence of regular soil monitoring, as well as a lack of data.
- Only partial policies exist in soil protection.
- A tendency to focus mostly on the economic functions of soil.
- Low level of education and awareness in the area of soil protection.

NEAP 2 has a set of overall objectives, including one on soil: ***To reduce erosion, contamination and other types of degradation of soils and improve its conditions for sustainable use.*** The measures in Neap 2 associated with this objective are:

- Integration of soil management concerns into relevant sector specific policies.
- To introduce Soil Information Systems.

The actions in NEAP 2 on soil include the following:
- Development of a soil protection strategy and programme.
- Preparation of Soil Protection Law with clear definition of institutional competences.
- Establishment of a comprehensive soil monitoring system.
- Estimation of contaminated hot spots and preparation of remediation plan for particular main contaminated sites and its implementation as demonstration project in the guidelines.
- Establishing a database and preparation of basic soil quality map.
- Project for the calculation and mapping of critical loads on soils.

Although NEAP 2 has more focus on soils than NEAP 1, it does little to address the problems related to uncertainties and overlaps in responsibilities, and it assigns responsibility for the above actions to MAFWE and MEPP combined. This is unlikely to lead to implementation.

In addition there are several Local Environmental Action Plans in Macedonia, including one for Skopje. However, soil contamination management is not covered in detail.

3.3.4 Monitoring and Enforcement

The capacity of resources for monitoring and enforcement within the relevant Inspectorates varies. Some are clearly under-resourced in terms of number of inspectors (for example the State Agriculture Inspectorate and the Water Economy Administration under MAFWE). However, some inspectors from different bodies are reportedly communicating and co-ordinating work to try to optimise the efficiency of the work.

The Inspectorates under MAFWE are not carrying out soil contamination monitoring. The State Environmental Inspectorate is carrying out some soil contamination monitoring, and co-ordinates with the Institute for Health Protection (MoH), which also carries out monitoring.

In general for many Inspectorates the procedure for enforcement is complicated and bureaucratic and often time-consuming. Many court cases are dropped because the procedure is taking too long (e.g. over 2 years), and therefore the non-compliant practices continue. However, these problems affect the State Environmental Inspectorate less because they have the powers to shut down industrial sites, which encourage industries to take action to comply with environmental laws.

Prevention of Agricultural Activities on Agricultural Land

There are no specific provisions in the current regulations to prevent a farmer from growing crops on agricultural land. If this was needed, a “Decision” at a local level can be adopted to prevent certain activities. The procedure is for the Mayor to propose the Decision to the Municipal Council for approval. In most cases, a local Decision will also need approval from the relevant part of the national government. For example, a local Decision on changes in local land use will require approval from MAFWE and often other Ministries as well.

3.3.5 Recommendations on the Institutional Framework

This section covers a number of recommendations related to the institutional framework.

(1) Recommendations on the Components of the Institutional Framework

The improvement of soil contamination management in Macedonia through the implementation of a national M/P requires a robust institutional framework.

Strong organisation and management is essential in order to sustain an effective overall system for soil contamination management in Macedonia, and this can be achieved through the development of robust institutional and legal frameworks related to soil contamination management, as well as a focus on capacity development.

The main focus of the institutional framework should be to ensure clear roles and responsibilities for soil contamination management. Organisations need to have autonomy and authority if improved systems are to be properly implemented. This includes overall responsibility for implementation of the M/P, although different organisations might have responsibility for different parts of the M/P. It is important that organisations are accountable for their responsibilities.

In the absence of clear definitions of responsibilities there are likely to be potential political issues, ineffectiveness and lack of action, which will undermine the sustainability of the new plans and systems.

The important components of an Institutional Framework are:

- Well-defined and agreed roles and responsibilities.
- Assigned organisation to be responsible for development and implementation of policy and legislation on soil contamination management.
- The organisation needs accountability and authority, as well as the skills and resources necessary to carry out the function. Ongoing capacity development of the organisation is essential.
- Good communication with other stakeholders is important in development and implementation of policy.
- Senior management commitment is essential.

The important points in relation to the current institutional framework for soil contamination management in Macedonia are:

- Macedonia does not have a Policy or Strategy on soil contamination management before this M/P.
- There is currently no specific legislation or standards on soil contamination management in Macedonia. There are some brief and general provisions, but these are scattered among different laws.
- Until now, no Ministry has taken overall responsibility and initiative for development and implementation of policy on soil contamination management. There is some work in MEPP on collection of information on soil contamination. Also, there exists significant experience in monitoring and analysis in Macedonia, but there is no overall co-ordination of this work.

Policy on soil contamination management cuts across the remit of several ministries (e.g. MAFWE, MEPP and MoH), but it is important for one Ministry to take overall responsibility and leadership.

<u>Important Principles related to Development of the Institutional Framework</u>

The following are the main principles that should be taken into account in the development of the institutional framework for soil contamination management in Macedonia:

- It is important for Macedonia to develop an **overall policy framework,** including the M/P, on soil contamination management, within which the institutional framework/structures can be developed.

- It is essential that one Ministry is allocated overall responsibility for soil contamination management, including **overall responsibility and accountability** for implementation of the M/P. The MEPP should be allocated with overall responsibility.
- As in all countries, soil contamination management cuts across the remit of several Ministries in Macedonia. Therefore, mechanisms will need to be set up for MEPP to **work closely and communicate with other relevant Ministries** on soil contamination management, such as MAFWE, MoH and MoE.
- The **organisational structure** at MEPP needs to be developed to facilitate the implementation of responsibilities for soil contamination management.
- The institutional and legal framework needs to be developed so that senior directors within the relevant Ministries are **committed to implementation of the M/P** and improvement in soil contamination management.
- The MEPP and other Ministries need to collect more **information and data** on soil contamination, which can be used as a strong basis for policy decisions. Databases and management information systems (MIS) will need to be implemented.
- **Reporting and communication mechanisms** to stakeholders need to be established and implemented.

(2) Tasks to develop the Institutional Framework and Define Roles and Responsibilities

The tasks to develop the institutional framework can be summarised as:

- Develop National Policy in Soil Contamination Management - will involve development and adoption of an over-arching Policy on Soil Contamination Management in Macedonia.
- Assign and Agree Responsibilities for Soil Contamination Management - will involve the development, discussion and agreement of roles and responsibilities in the different relevant Ministries in relation to soil contamination management. In addition, it will include formalising the team on soil contamination management in MEPP. This will also include the set up the other necessary institutional structures to facilitate the implementation of the M/P. The development of roles and responsibilities will need to include the agreement on the mechanism for funding of remediation where the organisation responsible for the source of an incident of soil contamination cannot be identified.
- Set up Communication Mechanisms - important because soil contamination management cuts across the scope of several Ministries and it will be essential to formalise communication mechanisms.
- Ongoing Capacity Development - will involve setting up of employee development systems at MEPP for those responsible for soil contamination management, and ensuring the ongoing development of capacity of MEPP and MAFWE at individual and organisational levels.
- Information Systems and Reporting - data and information is an important part of capacity development and this will involve development of the necessary information systems and reporting mechanisms for soil contamination management.

For the sustainable improvement in soil contamination management it is essential that clear roles and responsibilities are assigned and agreed. In particular, as soil contamination management cuts across the scope of several Ministries, it is essential that overall responsibility for soil contamination management in Macedonia is assigned. This includes overall responsibility for implementation of the M/P.

It is proposed that a soil contamination team in MEPP is assigned overall responsibility for soil contamination management in Macedonia.

The lesson from other government structures in EU countries is that a department on soil contamination management is included in the equivalent to the Ministry of Environment, which in all countries is the Ministry that has overall responsibility for soil contamination management.

(3) Other Responsibilities in Soil Contamination Management

Although the overall responsibility for soil contamination management should be allocated to MEPP, other Ministries and institutions will still have an important role to play in soil contamination management. For example, MAFWE in relation to agriculture, MoE in relation to mining, etc. It will be essential that the roles and responsibilities of these other organisations are clearly defined and agreed.

In addition, it will be important that communication systems are formally set up so that all the relevant Ministries and other stakeholders are working closely on soil contamination management.

It is important that a separate body has the role of technical advisors on soil contamination management, and it is proposed that a Technical Advisory Council is set up with experts from the Ministries and relevant institutions. This Technical Advisory Council should be an extension of the Technical Committee of the JICA Study. The Technical Advisory Council will play a particularly important role in the development of legislation and standards.

Table 3.1 provides a summary of draft roles and responsibilities in relation to soil contamination management. Figure 3.2 then provides the proposed overall organisational structure for Soil Contamination Management in Macedonia.

The set up of strong communication mechanisms is important because soil contamination management cuts across the scope of several Ministries and it will be essential to formalise communication. This will reduce the potential for repetition of work, increase effectiveness, and keep the Ministries focused on the overall priorities. In addition, it will be useful to increase the sharing of information and data.

The team in MEPP that is leading the information of the M/P will need to act as the focal point for communication and the sharing of good practices, and be proactive in these tasks. For example, activities could include the publication and distribution of informal email newsletters on soil contamination management, and the distribution of more formal reporting on progress in implementation of the M/P. These mechanisms will inform stakeholders of what actions are being taken by the different Ministries and institutions.

Table 3.1 Summary of Draft Roles and Responsibilities in Relation to the Soil Contamination Management

Organisation	Draft Roles
MEPP	• Development of Soil Protection Policy for Macedonia. • Overall responsibility for implementation of the M/P on Soil Contamination Management. • Development and implementation of legislation and standards in soil contamination management, taking into account future EU legal developments. • A focal point for capacity development on soil contamination management. • Collection and management of information and data on soil contamination in Macedonia and use of the information to develop policy and actions. • Planning and management of priority Programmes for monitoring and research in soil contamination management, and overall co-ordination of these activities. • Regular communication and co-ordination with other Ministries and other stakeholders relevant to soil contamination management. • Facilitation of the sharing of good practices on soil contamination management. • Carrying out reporting obligations on soil contamination management to national government, international bodies and the public. • Provide technical expert as representative to Technical Advisory Body.
MAFWE	• Responsibility for soil contamination decisions and actions related to agricultural land. • Provide technical expert as representative to Technical Advisory Body.
MoH	• Support to MEPP in development of standards for contamination in soil. • Provide technical expert as representative to Technical Advisory Body.
MoE	• Inspection and control of industrial and mining activities to aim to prevent soil contamination management. • Provide technical expert as representative to Technical Advisory Body.
Technical Institutions	• Monitoring and research on soil contamination management within the framework of the M/P and in co-operation with MEPP and other stakeholders in soil contamination management. The monitoring should linked to the priority programmes specified by MEPP.
Technical Advisory Council	• Provision of technical advice to MEPP and other Ministries on soil contamination management, supporting implementation of the M/P, development of legislation, etc. • To monitor progress in implementation of the M/P and advise on any necessary actions. • Particular activity in relation to advising MEPP on development of legislation and standards.

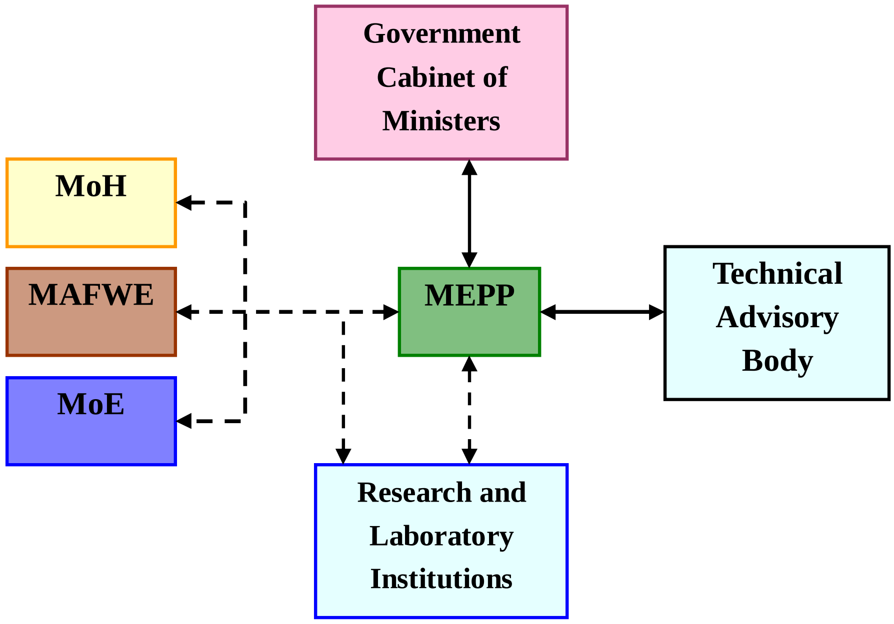


Figure 3.2 Proposed Overall Organisational Structure for Soil Contamination Management in Macedonia

Strengthening communication will be important for the sharing of data and information on soil contamination management, and the MEIC should be responsible for being the central focal point for information. These activities are linked to the activities on risk communication.

The stakeholders should continue to use the format of Working Groups to discuss and agree particular topics and developments. This is a useful mechanism to achieve overall consensus and agreement to plans. One example would be a Working Group on Legal Development.

(4) Financial Management Framework for Soil Contamination Management

The development of roles and responsibilities will need to include the agreement on the mechanism for funding of remediation where the organisation responsible for the source of an incident of soil contamination cannot be identified.

Financial Management Framework for Soil Contamination Management

Many counter-measures for soil contamination are expensive and the issue of funding mechanisms for the management of soil contamination is very important. It is essential to develop and agree a framework for the funding of counter-measures.

Many of the soil contamination management problems in Macedonia are historical, and the pollution was caused many years ago by state-run companies. The polluter pays principle is therefore difficult to apply. The liability for this contamination therefore lies mainly with the Government Ministries, and therefore

Government funding of counter-measures is needed.

Key Principles

The key principles for the development of the financial management framework for soil contamination management are:

- The affordability of counter-measures is very important related to soil contamination management because many technical counter-measures are very expensive. Affordability must be taken into account when planning counter-measures and planning financial mechanisms.
- The implementation of counter-measures will need to be taken on a step-by-step basis over a number of years, because of the problems that the measures are expensive.
- The prioritisation of soil contamination areas / hot spots is important so that the available finance is spent on the high priority areas that have the highest potential public health impacts.
- As part of the prioritisation, it is important that the most cost-effective counter-measures are implemented first.
- The budgets of the Government/Ministries in Macedonia have many other priorities and at present soil contamination management is a low priority for budget expenditure. Firstly it is important to implement actions to raise the priority of soil contamination management so that the Government realises the need to allocate budgets to soil contamination management. Actions that should be taken to raise the priority of soil contamination management in the Government of Macedonia include:
- Development of a Law on Soil Contamination Management. This will act as the main driver for improvement and clean-up.
- Raising awareness of policy-makers in the Government and relevant Ministries of the importance of soil contamination management.
- Development of a M/P on soil contamination management so that the Government are confident that the problems are being properly monitored and prioritised, which will give the Government confidence that the money will be spent properly on the main problems.
- Development of the capacity of stakeholders in soil contamination management, including companies that would carry out the remediation works, as well as the Ministries that will supervise the works. This development of capacity will give the Government confidence that the money will be spent properly.
- Development of capacity on management of funding mechanisms on soil contamination management. This will give the Government confidence that the money will be administered properly.

3.4 Organisations Related to Soil Contamination Management

One of the important aspects of capacity development in soil contamination management is to ensure the existing organisational structures are strengthened so that roles and responsibilities for implementation of the M/P are clear and agreed, so that improvements in soil contamination management can be implemented on a sustainable basis. Therefore, the first step is to review the existing organisational/institutional structures for environmental management and soil contamination management.

This section summarises the organisation structures related to environmental management and soil contamination management. MEPP is the main Ministry responsible for environmental management, although MAFWE have some roles in relation to soil contamination management and water resources development and management.

It should be noted that the structures of several Ministries are in the process of being changed, following the national elections in 2006. The following descriptions include the structures related to the situation in early 2006 before the elections, and summarise the current plans for change as of July 2007.

In addition, recommendations are made at the end of this section in relation to organisational strengthening.

3.4.1 Ministry of Environment and Physical Planning (MEPP)

The mandate of MEPP, which was established in the 1990s, is to develop policy and legislation on environmental management and carry out inspection activities. More specifically, as listed on the web site of the Government of Macedonia, MEPP carries out the following activities:

- Observing the condition of the environment;
- Protection of waters, soil, flora, fauna, air and ozone from pollution;
- Protection from noise, radiation, protection of bio-diversity, geo-diversity, national parks and protected areas;
- Restoration of polluted areas of environment;
- Proposing measures for solid waste management;
- Physical planning;
- Physical informative system;
- Supervision within its competencies and other activities set by the Law.

At present, MEPP is organised into three main groups:

- Office for the environment (developing policy and legislation)
- Inspection (carrying out monitoring activities)
- Sector for European Integration

There are about 100 full-time professionals in MEPP plus about 50 part-time professionals (e.g. employed for the duration of a project). The majority of the employees work on activities related to environment (only 7 employees work on physical planning). About 10 employees work in environmental inspection and 10 on environmental legislation. MEPP has 6 regional offices for inspectors and one regional project office in Ohrid.

Initial planning is being carried out to restructure MEPP and potentially raise the level of priority of environment towards an independent Agency or Ministry. Under the new structure, the proposed Sector for Sustainable Development would become a Unit for Environmental Policy and take responsibility for policy and action related to air, water, waste and nature, and this might be a sensible sector to include responsibility for soil contamination management.

MEPP is generally short staffed and the recent EU CARDS project on capacity building recommended that a larger organisational structure and more resources are needed for MEPP to carry out its mandate.

More specifically, MEPP currently has the following main departments and divisions:

- Department of Legislation and Standardisation
- Department of Sustainable Development
- Department of European Integration
- Macedonian Environmental Information Centre (MEIC)
- Division for Implementation of the Lake Ohrid Conservation Project based in Ohrid
- Division for Implementation of the Dojran Lake Salvage Project based in Star Dojran
- State Inspectorate of Environment
- Office of Environment
- Fund of Environment and Nature Protection and Improvement.

The organisational structure as at July 2006 is provided in (Figure 3.3).

Apart from the reporting process on soil contamination through MEIC, no other sector or department at MEPP currently has a significant responsibility related to soil contamination management.

There is some other experience of soil contamination management at MEPP, for example it takes into account soil contamination management in some EIAs. MEPP has experience with the management of the clean-up of the Sasa mine tailings incident in 2003 in northeast Macedonia. In addition, MEPP have submitted a proposal to UNDP for investigation of soil contamination by heavy metals in north-west Macedonia. UNDP has provisionally accepted the project but funding is yet to be agreed.

MEPP does have a remit to be responsible for raising awareness and communication on the environment, and this should include soil contamination where needed.

MEPP has a draft strategy that will be approved and implemented in the new Government and includes the setting up of a responsibility in MEPP for soil contamination management. The MEPP has recently restructured and the organisation now includes a Sector for Environment. This sector has 4 units, including a Unit on Waste and Soil. Responsibility for soil has therefore now been properly assigned, and the MEPP has plans to recruit 3 positions in this Unit in relation to soil.

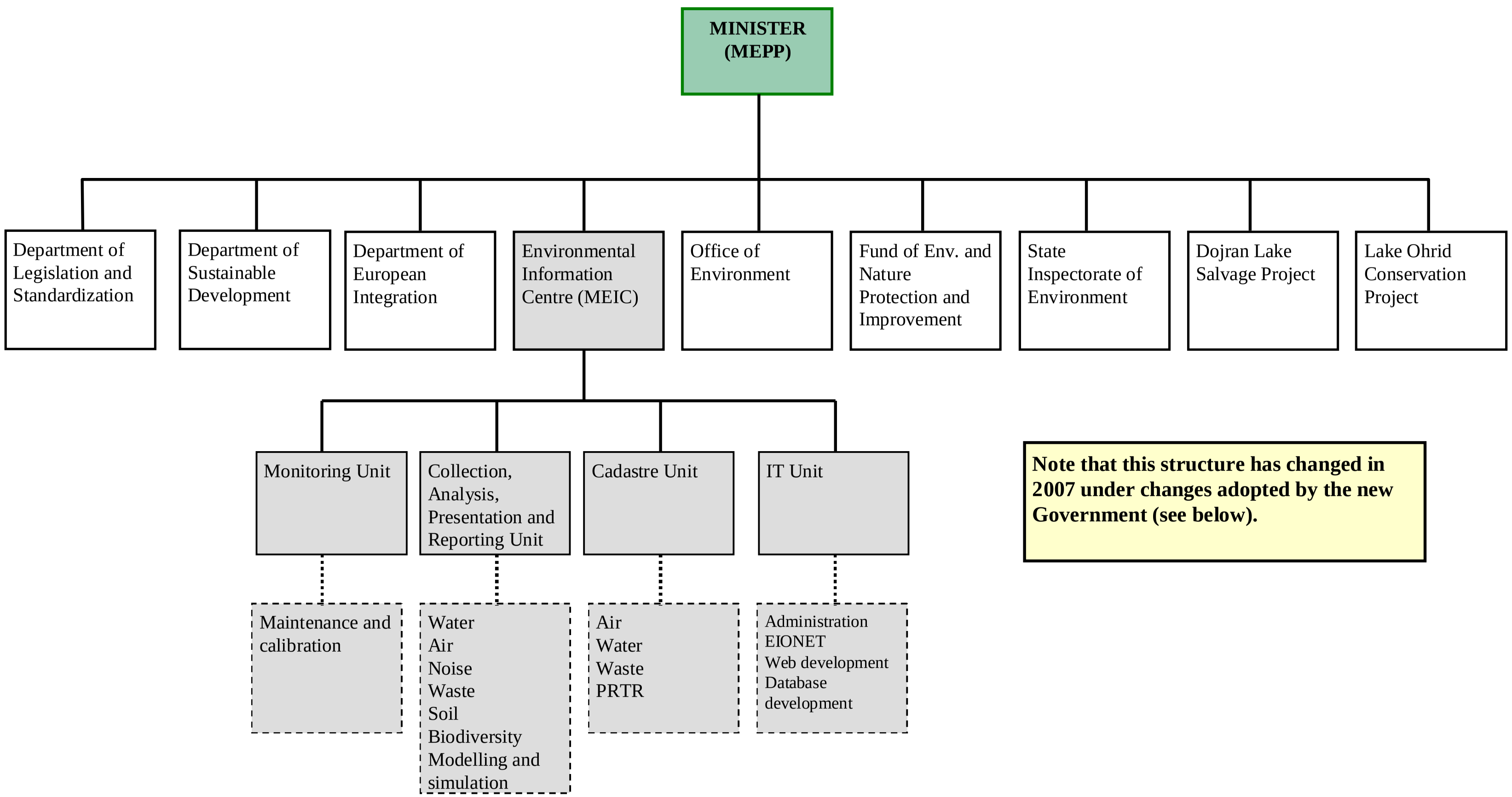


Figure 3.3 MEPP and MEIC - Organisational Structure (February 2006)

The structure of the Environment Agency (Administration for Environment) and the Structure of the Sector for Environment are provided below.

There are currently no official roles and responsibilities in relation to soil of the Unit on Waste and Soil. Their current roles relate to waste, but there are plans to expand their roles into soil also.

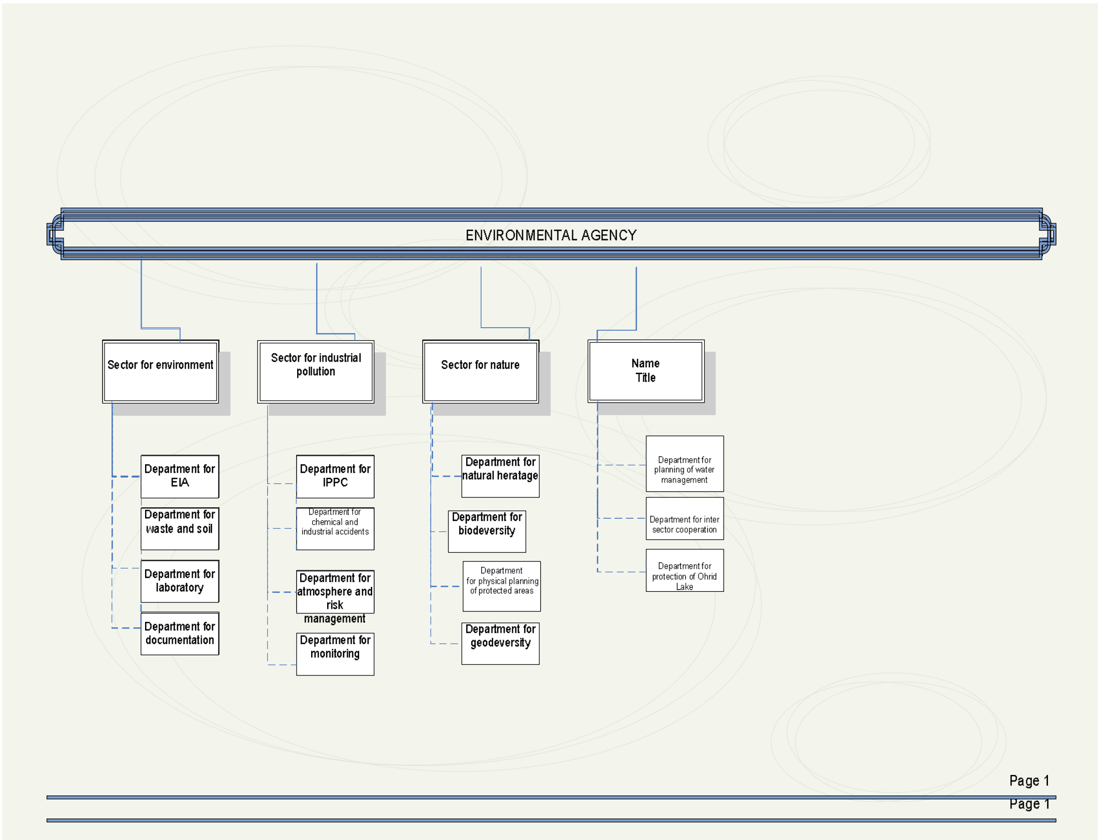


Figure 3.4 Structure of Environment Agency in MEPP (2007)

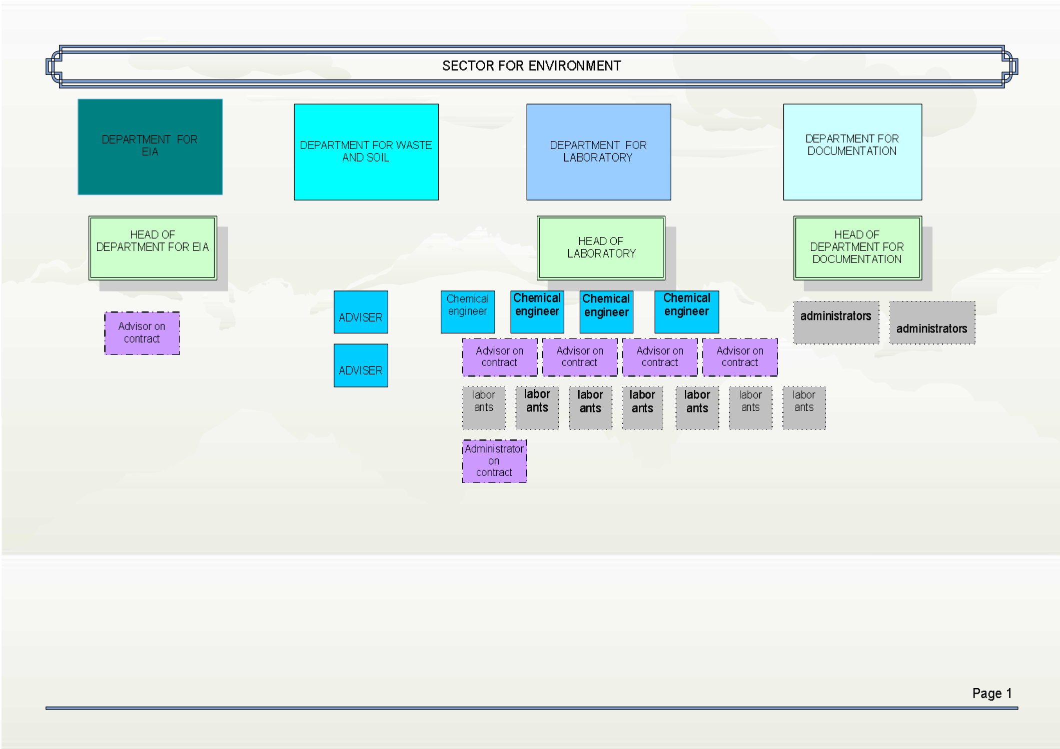


Figure 3.5 Current Structure of Sector for Environment (May 2007)

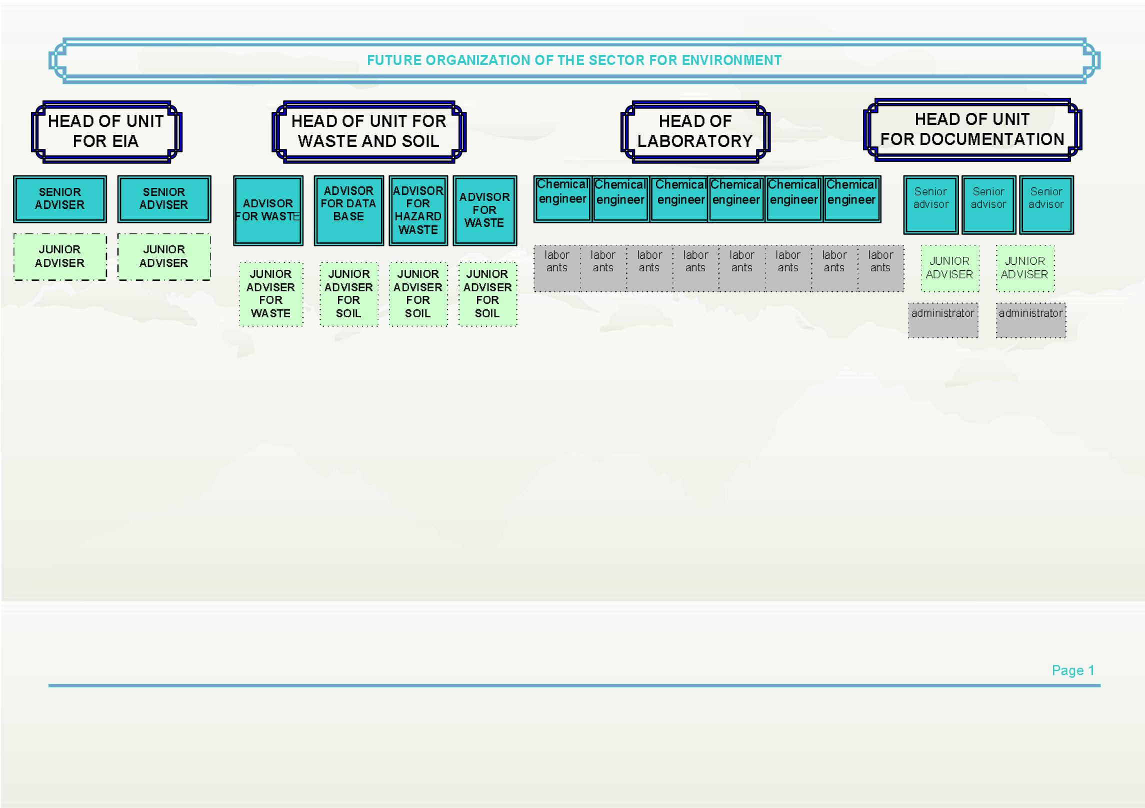


Figure 3.6 Future Planned Structure of Sector for Environment

(1) State Inspectorate of Environment

The State Inspectorate of Environment carries out inspection and supervision on industrial enterprises and other activities for air and water pollution, conservation of the special natural heritage, protection of soil against degradation and contamination, harmful noise and protection against waste matters and ionising and non-ionizing radiation. The Inspectorate has 10 Inspectors including 3 in Skopje, 2 in Tetova, 1 in Stip, 1 in Veles and 3 in other regional offices.

The Inspectorate does not have much experience in soil contamination monitoring or management. In Veles, where the soil contamination is a major issue compared to most other towns in which the Inspectorate has a regional office, the Inspectorate recognises that the Institute for Health Protection in Veles is carrying out monitoring of soil contamination and has therefore decided not to overlap work. The sampling and analytical work of the Inspectorate therefore focuses on air pollution and ground water, including heavy metals. The samples are sent to the Central Environmental Laboratory in Skopje for analysis. The Inspectorate is carrying out soil contamination monitoring at the Fe/Ni smelter in Kavadarci in southern Macedonia.

In general it is the local enterprises that are required by law to pay for the monitoring activities of the Inspectorate. Each major industrial enterprise is monitored 3~4 times per year. If the Inspectorate observes poor activities or non-compliance then it can provide a notification to require the enterprise to take actions to address the problem by a specified deadline. In extreme cases the enterprise can be shut down immediately, although most cases are addressed before court procedures are necessary. The Inspectors report to the Director of the State Inspectorate in MEPP in Skopje. Although the Inspectorate can provide any data from its activities on request to any stakeholder, there is uncertainty over the accessibility of the data to the MEIC.

The Inspectorate office in Stip covers the Municipality of Probistip, including monitoring of the battery plant, which is now operational having been shut for a few years until recently.

(2) Macedonian Environmental Information Centre (MEIC)

The MEIC collects environmental data and information for reporting to the Government of Macedonia, European Environment Agency (EEA) and other stakeholders. There are 12 employees working in MEIC, including one employee who works full-time in relation to reporting on soil contamination management. This employee was recently appointed to this role.

Macedonian Environmental Information Centre (MEIC)

MEPP is the focal point with regard to environmental data in the Republic of Macedonia. Within the MEPP, data management is performed by its MEIC. The primary task of the MEIC is to establish, maintain and regularly update the database of relevant, properly processed (systematised and standardised), comprehensive, accurate, transparent and publicly accessible information on the state, quality and trends in all environmental segments (water, air, soil, noise, waste and protected areas and items of nature).

The MEIC's concept of the MEPP is a network based institutional framework, which will be in the near future supported by GIS information technology in order to present the state of the environment and the trends in it in real time and space, i.e. presentation of environmental state, observation of relevant changes and broadcasting of future development paths by different scenarios, including the no action scenario, in the framework of appropriate data policy. MEPP has reporting obligations towards international bodies, such as EEA, UNECE, EUROSTAT and WHO. Reporting obligations, both national and international, are executed by the MEIC. These reporting obligations include the following:

- A large proportion of the effort in MEIC is for reporting to EEA through the EIONET (European Environmental Information and Observation Network) system of information exchange. This includes reporting on soil contamination management, under the following headings that are provided by EEA:
  - General information
  - Progress in soil contamination management
  - Estimation of expenditure on soil /ground water remediation activities
  - Causes of contamination
  - Mapping of contamination
  - Waste disposal sites
  - Mines
  - Risk reduction activities

EEA are particularly looking for information on contamination hot spots, such as mining tailings incidents, and on pesticides. However, at present MEIC is only able to provide answers to some of the questions of EEA on soil contamination management.

- The State of the Environment Report (SoE) for Macedonia is produced by the MEIC. Three such reports have been produced to date. According to EEA's recommendations, SoE Reports should be produced every three to five years and the most recent report is for 2003.
- MEIC produces monthly and annual reports on the basis of processed data, and these include some information on soil contamination management.
- MEIC also provides information, reports and answers questions on a regular ***ad-hoc*** basis from several stakeholders, including international bodies, government, NGOs, students, scientists and others.

Source: Ministry of Environment and Physical Planning

3.4.2 Ministry of Agriculture, Forestry and Water Economy (MAFWE)

(1) Overview of MAFWE

The main roles of MAFWE include agricultural policy, water resource management, agricultural land use, forestry and rural development. The roles cover policy development and implementation, as well as inspection and monitoring activities.

The MAFWE has about 400 employees, including about 100 in the head offices in Skopje and the remainder is based in the regional units in the municipalities. There are about 30 regional units and these typically have about 5 employees, depending on the size of the municipality and the amount and nature of the agricultural activities. Some regional offices have more employees (e.g. Stip has 10 employees) and some have less (Probistip has 3 employees).

According to the web site of the Government of Macedonia, MAFWE Supply performs the activities that include:

- agriculture, forestry and water supply;
- utilization of agricultural land, forests and other natural treasures;
- protection of cattle and plants from diseases and pests;
- observing/studying the situation with waters, maintenance/improvement of the water regime;
- irrigation systems;
- studying and researching of meteorological, hydrological and bio-meteorological occurrences and processes;
- supervision within its competence and other activities stipulated by the Law.

(2) Organisational Structure and Responsibilities

The organisational structure of the Ministry (as of February 2006) is illustrated in Figure 3.7. The structure is regularly changed as the Ministry develops its structure to improve the efficiency of its activities and to manage the key aspects related to its remit. There are two main elements of the structure of the Ministry:

- The Organisational Units (Sectors), generally responsible for policy development and implementation.
- The Bodies within the Ministry (Inspectorates and Administrations), which are semi-autonomous and generally responsible for inspection and monitoring.

The relevant units/bodies in relation to soil remediation management are:

- Sector for Agriculture
- Sector for Financial Support to Agriculture and Rural Development
- Sector for International Co-operation and European Integration
- State Agricultural Inspectorate
- Water Economy Administration

The organisational structure is likely to change following the elections in July 2006.

(3) Sector for Agriculture

The Sector for Agriculture is one of the larger sectors in MAFWE. It is currently split into several units, including the Livestock Unit, Arable Crops Unit, Fruit Orchards Unit, Wine Unit, Organic

Production Unit and the Land Policy Unit. In addition, regional units under MAFWE report via the Agriculture Sector.

The sector has limited capacity and experience in soil contamination management.

(4) Sector for Financial Support to Agriculture and Rural Development

This Sector is relatively new and has two units. The unit for financial support to agriculture is responsible for payments of subsidies, etc, to farmers and rural enterprises. The unit on Rural Development has been recently set up and is responsible for policy on rural development. This policy role has now been defined under MAFWE whereas the role was recently unclear and divided between several Ministries including the MAFWE and the Ministry of Local Self Government. The unit does have a high-level co-ordinating committee because its remit is relevant to many Ministries.

(5) Sector for International Co-operation and European Integration

This Sector has three Units, covering European Integration, Trade Relations and Co-ordination of International Activities (projects) related to MAFWE activities. The Sector has strong links with the Secretariat for European Affairs (SEA). The Sector has 4 employees, all based in Skopje.

(6) State Agricultural Inspectorate (SAI)

The State Agricultural Inspectorate is a semi-autonomous organisation within MAFWE that carries out monitoring and inspection in relation to compliance with regulations on agriculture and land use. The nature of the work of the Inspectorate means that most of its 31 employees are located in regional offices (only 4 employees are located in Skopje).

The role of agricultural inspectors includes the assessment of the purpose of land use, control of pesticide use, sales of pesticides, quality control on seeds, etc, in line with the Law on Agriculture (2002). The inspectors file a report to the MAFWE Head Office. If an inspector identifies a situation that is not in compliance with the laws then he/she provides the land owner with an instruction to correct the problem in a specific timescale. The inspector then carries out follow-up monitoring and if the situation does not change in the specified timescale then the land owner can be taken to a court of law. However, the procedure for enforcement is quite complicated and bureaucratic and is therefore very time-consuming. Many court cases are dropped because the procedure is taking too long (e.g. over 2 years), and therefore the non-compliant practices continue. Even when the land owner is fined for non-compliance, the levels of penalty are often too low to be a deterrent (e.g. typically about 100 Euros).

There is some overlap of the role of the State Agricultural Inspectorate with the Health Inspectorate in the Ministry of Health, which has roles that include monitoring of food processing enterprises.

The Agricultural Inspectorate does not have its own laboratory analysis facilities. It sometimes uses the laboratory of the Plant Protection Directorate in MAFWE, but usually uses the laboratory of the Agricultural Institute.

The work of the Ministry in the field is not limited by a lack of vehicles, or by a limited budget for fuel, which can be the case for equivalent roles in Ministries in some other countries.

(7) Water Economy Administration

The role of the Water Economy Administration is relevant to soil contamination management because it has overall responsibility for water resources development and management in Macedonia. However, the Water Economy Administration has no experience and capacity related to soil contamination management.

The responsibilities of the Water Economy Administration include development of policy on water resources management, issue of permits to water users and for construction of water facilities (e.g. for supply, irrigation, sewage treatment, etc). This includes the issue of permits for use of ground water. However, when there is an application to the Water Economy Administration for a permit for use of ground water, there is no checking of whether there had been incidents in the area that had the potential to cause soil contamination. The Administration is also responsible for inspection and monitoring of compliance related to the provisions in the permits. The Water Economy Administration has three Units:

- Administrative Procedures and Water Management Inspection
- Maintenance and Improvement of Water Resources Facilities
- Water Resource Planning

The main responsibilities that are potentially relevant to soil contamination management are within the Unit on Maintenance and Improvement of Water Resources Facilities, which has responsibilities including the protection against damaging water effects, and in the Unit on Water Resources Planning, which has a database and GIS capacity. However, these Units do not include aspects related to soil contamination in their activities at present.

A Water Resource M/P is currently being developed. There has been no such plan since 1974. In 2004 a detailed assessment was carried out internally by MAFWE of the functions of the Water Economy Administration (*Functional Analysis of the Water Resources Management Administration May 2004*).

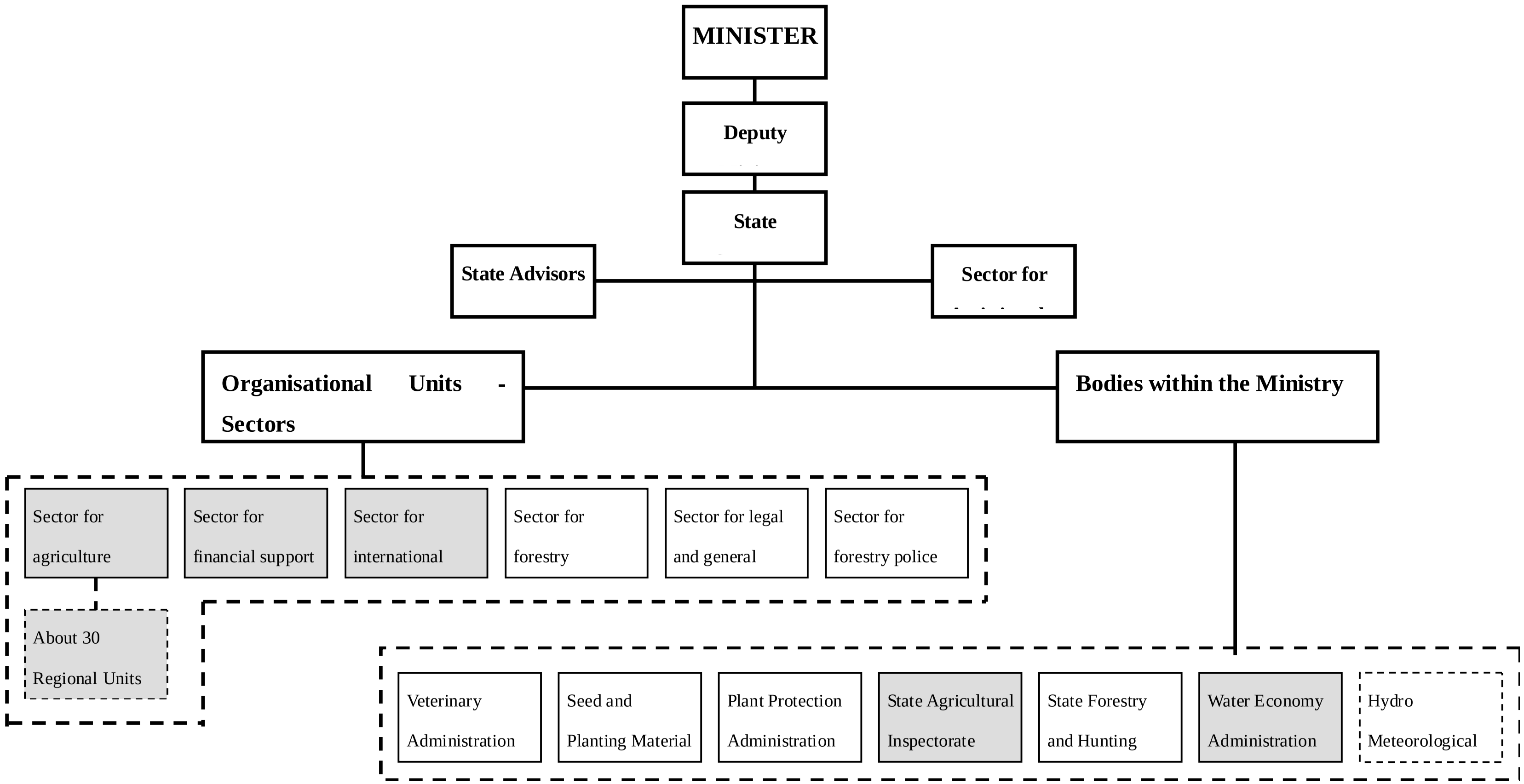


Figure 3.7 Ministry of Agriculture, Forestry and Water Economy (MAFWE) - Organisational Structure (February 2006)
(shaded units / bodies have significant relevance to soil contamination management)

There is significant uncertainty and potential overlap in the roles of the Water Economy Administration in MAFWE (the Unit on Maintenance and Improvement of Water Resources Facilities has responsibilities including the protection against damaging water effects), and the roles related to water pollution in MEPP.

In addition, local municipalities play a major role in the monitoring of water supply and use.

The Water Economy Administration currently has 12 employees (as of February 2006) although the regulations state that 21 employees are needed to carry out the role. This is an example of the overall inadequate levels of staff in MAFWE.

An additional role of the Water Economy Administration is the management of co-operation with neighbouring countries related to water resources management.

(8) Current Priorities and Plans of MAFWE

MAFWE is proposing some changes to its structural organisation. For example, a Sector for Registration and Management of Agricultural Land. This would be an appropriate place for a responsibility on soil contamination management.

The State Agricultural Inspectorate is likely to show major growth by 2010 as there are preliminary plans to combine food inspection activities of the MoH with those of the State Agricultural Inspectorate.

There is a potential conflict of interest in an institutional framework where the Inspectorates are within the organisational structure of the relevant Ministry. For example, one of the roles of the State Agricultural Inspectorate is to monitor the implementation of policy on agriculture by MAFWE, but the fact that the Inspectorate is within the organisational structure of MAFWE could potentially lead to a conflict of interest. The Government of Macedonia reportedly recognises the potential conflict of interest and is assessing whether to move all Inspectorates from the Ministries into one separate Government body that is independent of the Ministries.

MAFWE has some capacity for use of GIS, mainly under the Water Economy Administration. MAFWE will soon be starting the process of establishing a GIS and information system under a World Bank project on agricultural land.

MAFWE has limited experience and capacity in soil contamination management. It has not been able to carry out its responsibilities in this area.

3.4.3 Other Ministries and Organisations Relevant to Soil Contamination Management

(1) Hydro-System Zletovica (HSZ)

Hydro-System Zletovica (HSZ) is the public enterprise in Probistip Municipality that has been set up to manage water supply and irrigation. At present, its budget comes from MAFWE, and it is managed as a semi-autonomous organisation through the Probistip Municipality Administration, but the longer-term plans are for HSZ to be financially self-sustaining.

(2) Ministry of Health (MoH)

The MoH has responsibilities including:

- Health-care protection and health insurance of the population;
- Pollution of air, water, land and commodities;
- Organisation and development of healthcare;
- Observing the health condition of the population;
- Protection of population from contagious diseases, from harmful impact of gases, ionic radiating, noise, as well as air, water and land pollution;
- Food products and objects for common use;
- Hygiene-epidemiological condition;
- Medicines; additional medicals; medical appliances; medical equipment; sanitary devices and materials;
- Supervision within its competencies and other activities stipulated by the Law.

There is clear overlap in the above roles with those of MEPP and partly MAFWE in relation to environmental management. MoH has developed a National Environmental Health Action Plan (see below).

The Institute for Health Protection is part of the MoH. There are 10 Health Institutes in Macedonia (including the Republic Health Institute in Skopje). The overall objective of the Institute for Health Protection is to obtain information and data to inform the policy of MoH so that it can carry out risk assessments and plan and prioritise programmes. The Institutes have different core activities depending on the needs of the local area, for example the activities of the Institute in Veles include analysis of heavy metals in soil because of the potential health impacts from the Pb/Zn smelter in Veles. More details are provided in Section 2.4 below.

National Environmental Health Action Plan of Macedonia (1999)

The MoH developed the National Environmental Health Action Plan in 1999. It focuses on the environmental health aspects and, although it proposes co-operation between Ministries and a range of actions under the responsibility of MoH, MEPP and MAFWE, it had little integration with the NEAP (1996).

The plan includes major sections on water, air and food, and shorter sections on soil, waste and noise. The objective of the section on soil is to "*minimize soil contamination and, through that, reduce the health risks from contaminated soils; to start gradual re-cultivation of affected soils,*" and states that the priorities include the improvement of national legislation on soil protection from contamination, establishment of monitoring of soil quality. However, these priorities have clearly not been addressed since the plan was developed in 1999. The actions related to soil are allocated to MAFWE and include monitoring of pollutants, including heavy metals. However, MAFWE have not implemented these actions.

Although the plan states that responsibilities are divided between Ministries, it does not adequately address the need for clearer division of responsibilities between Ministries and the allocation of overall responsibility for soil contamination management. In addition, the fact that the document means that there were two parallel strategies related to the environment demonstrates the lack of co-operation and integration between Ministries. The plan recognises a need for capacity development in the various responsible Ministries.

Despite the development of the NEAP 2 in 2005-2006, and the inadequate implementation of the actions in the National Environmental Health Action Plan (1999), the MoH is reportedly developing an updated National Environmental Health Action Plan at present. It will be important for detailed consultation to be included during the development of the plan.

(3) Ministry of Local Self-Government (MoLG)

According to the web site of the Government of Macedonia, the Ministry of Local Self-Government has the following roles:

- Observing the development and proposing measures for promotion of local government;
- Observing the situation regarding the territorial division and developing standards for the size, population and needs of the units of local government;
- Proposing the system, policy, measures and instruments for accomplishing equal regional development and fostering the development of economically under-developed areas;
- Realisation and using the means allocated to the economically under-developed areas;
- Supervision within its competencies and other activities stipulated by the Law.

(4) Ministry of Economy (MoE)

The Ministry of Economy (MoE) has a mandate to develop the economy of Macedonia, and, according to the web site of the Ministry, it has responsibilities including the following:

- Monitoring the situation of commodities and services market and impact of the measures on the economic policy;

- Following the economic, structural and technical-technological developments and proposing measures for realization of the development and current economic policy in the sphere of production, trade, tourism, catering and craft;
- Following the ongoing material balances and providing the citizens with basic food products and other goods for wide consumption and of the enterprises with raw materials;
- Industrial ownership;
- Small and medium-sized enterprises and cooperative movement;
- Following international economic movements, as well as their impact on the economic relations of the Republic of Macedonia;
- Foreign-trade working;
- Geological researches and exploitation of mineral raw materials;
- Energy policy;
- Implementation of general and technical norms, regulations and standards;
- Oversight within its competencies and other activities stipulated by the Law.

The MoE has a Sector for Energy and Mining Resources, which is the basis for policy, action and overall supervision of mining and geological activities.

In addition, the MoE has a State Inspectorate, with 7 Inspectors and a Director. Two of the Inspectors cover mining activities, and monitor compliance with the Law on Mineral Resources. Activities include monitoring of the tailings dams, waste water, and cultivation of degraded land.

The Inspectorate reports that it has strong communication with Inspectors from MEPP and MAFWE.

(5) Ministry of Education and Science

According to the web site of the Government of Macedonia, Ministry of Education and Science performs the activities referring to:

- Development and education of all kinds and degrees;
- Organisation, financing, development and promotion of upbringing, education and science;
- Verification of vocations and profiles in education;
- Technological development, informatics and technical culture;
- Information system;
- International scientific-technical cooperation;
- Supervision within its competencies and other activities stipulated by the Law.

The Ministry of Education and Science covers at least some of the budget of the analytical and research institutes and faculties.

(6) Ministry of Finance

According to the web site of the Government of Macedonia, the Ministry of Finance carries out the activities related to:

- Financing, treasury and customs systems;
- Tax system and tax policy;
- Foreign exchange system;
- System of banks and savings banks and other financial institutions;
- Accounting system, audit and balance of payment;
- Loans and credits;
- Macroeconomic policy and policy for development of national economy;
- Preparation of projection of balance of payment;
- Preparation and realization of the Budget of Macedonia and the closing account of the Budget of Macedonia ;
- Ownership and property-legal affairs; and
- Oversight within its competencies and other activities stipulated by the Law.

(7) Secretariat for European Affairs (SEA)

The Secretariat for European Affairs (SEA) is a national policy organisation that co-ordinates activities related to the European Union (EU), as well as central co-ordination of all foreign investment projects and programmes for all Ministries. SEA has a comprehensive database of all projects in Macedonia.

(8) Macedonia State Statistical Office (SSO)

The aim of the State Statistical Office is to provide objective statistical information and analyses to Government stakeholders, other stakeholder organisations and society in general. The information covers demographic, economic and social aspects. The State Statistical Office is also responsible for management of the data base of information. The information is also used by the Government of Macedonia to report to the European Union and for other international reporting. The State Statistical Office has about 240 employees, including about 160 in Skopje and about 80 in regional offices. The Office provides no significant information related to environmental matters, but some information in industry and a little on agriculture. The MEIC (MEPP) is responsible for information on the environment, including soil contamination.

3.4.4 Analytical and Research Organisations

Analytical and research organisations play an important role in environmental management and soil contamination management. There are many Institutes and Faculties in Macedonia, many of which are part of the University of Skopje (Ss. Cyril and Methodius University), with varying capabilities in research and analysis in soil contamination management. A more detailed description of the main analytical and research organisations is provided below and Appendix 1.

- Agricultural Institute, Skopje
- Central Environmental Laboratory, MEPP, Skopje
- Institute of Chemistry, Skopje
- Faculty of Mining and Geology, Stip
- Institute for Health Protection, Veles
- Hydro-Meteorological Institute, Skopje
- Academy of Science, Skopje

(1) Agricultural Institute, Skopje

The Agricultural Institute is part of the University of Skopje and is associated with the Ministry of Science and Education, which provides about 25% of its budget. Although the Agricultural Institute reports to the Ministry of Science and Education, it does much of its work for the MAFWE. The institutional set up and roles of the Agricultural Institute are defined in the Law on Science.

A large part of the income of the Agricultural Institute comes from selling seeds to farmers, fees for quality control analysis of wine (paid by the wine companies), and fees for monitoring and analysis imports of pesticides and fertilisers (paid by MAFWE). Fees for research projects contribute a small proportion of the Institute's income.

The Agricultural Institute has three departments: Crop Production, Wine and Orchards. Each department is located in its own building in Skopje. In addition, the Agricultural Institute has a regional office in Kocani in eastern Macedonia (related to rice production) and rents about 350 hectares of land just outside Skopje.

The Agricultural Institute has 140 employees in total including about 40 scientific professional staff. The Agricultural Institute has laboratory analytical facilitates that include an atomic absorption (purchased in about 1998) to determine heavy metal content in samples. However, the Institute does not have ICP technology.

The only major experience in soil analysis of the Agricultural Institute is a study funded by MEPP on lead/zinc contamination in the Veles region in central Macedonia. There is a large lead/zinc smelter in Veles and potential soil contamination.

In addition, there has been a recent training project in Slovenia on heavy metal monitoring, analysis, data management and GIS.

The Agricultural Institute is strongly linked to the Faculty of Agriculture (University of Skopje), which focuses on education rather than laboratory analysis. The Agricultural Institute focuses mainly on the laboratory analysis.

(2) Central Environmental Laboratory, MEPP, Skopje

The Central Environmental Laboratory was established in 1980 under the mining/steel factory in Skopje. It became part of the MEPP in 2000, and about 30% of its work comes from the Environmental Inspectorate. However, it has no autonomy from MEPP; for example the extra work that it tries to obtain for private companies generates revenue that passes directly into the MEPP bank account and the Laboratory does not have its own account.

The Laboratory employs 20 professional staff including chemists, technical specialists, mechanical engineers and technicians. It analyses samples from air, water, soil and in relation to working conditions. The amount of work related to analysis of soils has been increasing since 2000 because the Environmental Inspectorate has been monitoring more industrial activities and taking more soil samples for analysis.

The Laboratory has ICP equipment so the analysis of most heavy metals can be carried out quite quickly.

The Laboratory is in the process of working towards accreditation of ISO17025 (General Requirements for the Competence of Testing and Calibration Laboratories). The management of the Laboratory have a professional and business-like approach, carrying out marketing activities to attempt to obtain additional work. It has the capability to do some sampling work, and the Laboratory has good co-operation with the Institute of Chemistry.

The Laboratory does depend on MEPP and has little autonomy. There are some risks of political influences in the Laboratory’s future development.

(3) Institute of Chemistry, Skopje

The Institute of Chemistry is part of the Faculty of Science in the University of Skopje. It is associated with the Ministry of Science and Education, and carries out educational activities as well as analytical research work. The Ministry of Science and Education provides the budget for some salaries and some overheads, but all other expenses are covered by revenues from research projects. Part of the revenue from these projects pays for improvements in the laboratory facilities, top-ups of salary, etc.

The Institute of Chemistry has 40 employees including 25 professors (teachers) and 15 assistants/ technicians. The Institute is organised into four divisions: Inorganic Chemistry, Organic Chemistry, Physical Chemistry and Analytical Chemistry. It is the Analytical Chemistry Division that carries out activities that include analysis of soil contamination levels. There is no one employed specifically in the laboratories as a mix of teachers and PhD students carry out the analytical work.

The Analytical Chemistry Division mainly uses Atomic Absorption equipment to analyse heavy metals in samples, and it collaborates with other laboratories in Macedonia or overseas if ICP analysis is needed. These include the Central Environmental Laboratory in Skopje and the Faculty of Mining and Geology in Stip. The Professor in the Analytical Chemistry Division has a wide network of relevant contacts in laboratories.

The Analytical Chemistry Division has significant experience in soil contamination analysis, including heavy metals, and some experience of leaching tests. It has been involved in work with MEPP at the Sasa Mine related to soil sampling. In addition it has published many papers in national and international journals on analysis of soil contamination. It has undertaken several bilateral projects on soil analysis and will be working with the Agricultural Institute in Macedonia and the Slovenian Geological Institute.

The Analytical Chemistry Division has started a major project on soil contamination monitoring in a large area around Veles. It has been the Institute's own initiative to apply for bilateral funding for this work. Some samples will be sent to Russia for analytical cross-checking. The aim is to prepare a geo-chemical map of the Veles region. The Institute quite regularly is applying for funding for projects and equipment. The Institute is aiming to develop into a centre for training for heavy metal analysis in Macedonia.

The Institute takes samples themselves for top soils, but sub-contract the work where samples are needed from several metres below the surface.

In addition, the Analytical Chemistry Division has much experience in heavy metal analysis of air quality samples, plus other experience such as analysis of heavy metals in moss.

The Institute is in the early stages of planning to get accreditation to ISO17025 (General Requirements for the Competence of Testing and Calibration Laboratories), but it will reportedly be difficult to achieve because there is a lack of commitment of the senior managers of the Institute.

(4) Faculty of Mining and Geology, Stip

The Faculty of Mining and Geology is part of the University of Skopje, but is based in Stip (about

40km from Probistip). The Faculty carries out teaching and investigation/analysis. The Faculty is split into two departments (Department of Geology and Department of Mining), each with several units. It is the unit on Mineralogy, Petrology and Geochemistry that carries out analytical work including analysis on soil and water samples, and the laboratory was established in 1996.

There are 43 employees of the Faculty, including four in the unit on Mineralogy, Petrology and Geochemistry. The Ministry of Science and Education provides the budget for some salaries and some overheads, but all other expenses are covered by revenues from research projects.

The laboratory has carried out many measurements of soil and water for various clients, including factories of private enterprises. The laboratory has some experience of leaching tests. The Faculty carried out analysis of samples from the Zletovica region in the earlier stages of the SARPOF study (Special Assistance for Project Formulation) in 1994. The laboratory has carried out other analysis of heavy metals in soils from other areas of Macedonia (e.g. parts of Skopje, Tikves region and Bitola region).

The Laboratory has ICP equipment so the analysis of most heavy metals can be carried out quite quickly.

The Faculty carries out the sampling of top-soils, except when large quantities of samples are needed, when it sub-contracts the sampling, for example to the Institute of Civil Engineering.

(5) Institute for Health Protection, Veles

The Institute for Health Protection in Veles is part of the MoH. It is one of 10 Health Institutes in Macedonia (including the Republic Health Institute in Skopje). All the Institutes for Health Protection combined have 500 employees, but the Institute in based in Veles is one of the larger ones with 65 employees (it has some other local offices in the municipalities that it covers and there are 30 employees in the Veles office), although it does not have a specialist specifically on soil contamination. The overall objective of the Institute for Health Protection is to obtain information and data to inform the policy of MoH so that it can carry out risk assessments and plan and prioritise programmes. The Institutes have different core activities depending on the needs of the local area, for example the activities of the Institute in Veles include analysis of heavy metals in soil because of the potential health impacts from the Pb/Zn smelter in Veles. The Institutes have three types of financing: standard funds from MoH, self-financing activities (e.g. research projects for private enterprises), and direct financing from the budget for specific health protection programmes.

There are four units to the Institute for Health Protection in Veles. These are: Hygiene and Environmental Health, Epidemiology, Microbiology and Health Statistics. The unit on Hygiene and Environmental Health carries out programmes of analysis of air, ground water, surface water, food, human tissue and soils. It has experience and capability of carrying out analysis of heavy metals.

The Institute of Health Protection in Veles has been carrying out monitoring of soil contamination in the Veles region since 2004, including heavy metal analysis. It has been comparing the results with reference points 15~18km from Veles town (including a position downwind of the smelter), and also taking samples near to roads to test the levels of Pb from vehicle emissions.

The Institute's laboratory has ICP equipment, meaning the analysis of most heavy metals can be carried out quite quickly. In addition, it does have microwave technology, which facilitates quicker preparation of samples. However, the owner of equipment is reportedly the local government. The Institute is starting the process of accreditation to ISO17025 (General Requirements for the Competence of Testing and Calibration Laboratories).

The Institute has the experience of heavy metal analysis in crops. It is noted that the area of Probistip is under the responsibility of the Institute of Health Protection in Stip.

(6) Hydro-Meteorological Institute, Skopje

The Hydro-Meteorological Institute is in fact an organisation within MAFWE. It does carry out laboratory analysis but most of its analytical work relates to water quality. For example, it monitors waste waters from mining activities on behalf of the State Inspectorate under the Ministry of Economy. It reportedly has no significant experience in soil analysis.

(7) Academy of Science, Skopje

The Academy of Science is separate to the University of Skopje. Professor M. Filipovski, who is now retired, has carried out significant research work on soil contamination in Macedonia for 40 years, and has published a book: *Soil Degradation as a Component of Environment in Macedonia (2003)*. This reportedly covers all the work on soil contamination in Macedonia until recently. It includes a reference to a Masters Degree Project on contamination in Probistip.

(8) Faculty of Agriculture, University of Skopje

The Faculty of Agriculture is part of the University of Skopje and linked to the Agricultural Institute. The Faculty focuses on education, and this includes some aspects related to soil contamination management in agricultural areas. There are no analytical facilities at the Faculty.

3.4.5 Recommendations on the Organisational Framework

It is proposed that a soil contamination team in MEPP is assigned overall responsibility for soil contamination management in Macedonia. The team might just have 1~2 specialist employees at first, and then be expanded as necessary. The proposed roles of such a team are provided below.

Proposed Roles of the Team on Soil Contamination Management in MEPP

- Development of Soil Protection Policy for Macedonia.
- Overall responsibility for implementation of the M/P on Soil Contamination Management.
- Development and implementation of legislation and standards in soil contamination management, taking into account future EU legal developments.
- A focal point for capacity development on soil contamination management.
- Collection and management of information and data on soil contamination in Macedonia and use of the information to develop policy and actions.
- Planning and management of priority Programmes for monitoring and research in soil contamination management, and overall co-ordination of these activities.
- Regular communication and co-ordination with other Ministries and other stakeholders relevant to soil contamination management.
- Carrying out reporting obligations on soil contamination management to national government, international bodies and the public.

It is not just a case of assigning responsibility to the MoE, it is a case of ensuring the Ministry sets up a team on soil, as it has had for some time on other environmental media, such as waste and air.

The MEPP has set up a team on Waste and Soil within the Sector on Environment, and has plans to expand the team through recruitment of at least 3 employees in the area of soil.

As well as clear roles and responsibilities, it is also important that the team on soil has a strategic team plan within which they are carrying out their day-to-day activities. Their tasks within this plan will be in line with the M/P, but it will go into much more detailed monthly actions with specific timescales.

It will be important that a budget item for soil contamination management starts to be included in the MEPP budget. This will cover salaries of the Soil Team, overheads, computers and larger items such as monitoring programmes.

It will be essential that employee development systems are implemented to ensure the capacity development and effective working of these employees, including the setting of the overall objectives and targets of their work, within the strategic team plan.

Although the overall responsibility for soil contamination management should be allocated to MEPP, other ministries and institutions will still have an important role to play in soil contamination management. For example, MAFWE in relation to agriculture, MoE in relation to mining, etc. It will be essential that the roles and responsibilities of these other organisations are clearly defined and agreed. MAFWE are currently planning to set up a new Sector for Registration and Management of Agricultural Land within their structure. This is an appropriate sector for a role on soil contamination management to be located in relation to agricultural land.

MoE also needs to establish appropriate responsibility, and this should be linked to the implementation of the environmental aspects new Law on Mineral Resources. The person responsible for soil contamination management aspects of MoE will need to work closely with MEPP.

3.5 Capacity at the Individual Level

The capacity at individual level is assessed by such as human resources, technology, existing surveys and research related to soil contamination management.

The target of technical (individual) level of capacity development on soil contamination management consists of individuals of following four organisations/bodies.

- Relevant administrative offices of soil contamination management
- Soil contamination investigation and remediation firms
- Analytical and soil mechanical laboratories
- Industrial firms using harmful substances (as objective sites of soil contamination survey)

Relevant administrative offices are composed of the central and local (regional) offices in MAFWE, MEPP, MoE, each municipality and State company, such as HSZ. The capacity of these administrative offices is discussed in the above sections.

There are several individuals with significant experience and capacity in soil contamination management, but there remain many gaps, for example in planning soil contamination management policy, legislation and implementation programmes. Several members of MAFWE and MEPP have had training and capacity development through the JICA Study as well as through JICA study tours and training in Japan.

Relevant soil contamination investigation firms include soil investigation and remediation consultants, drilling company, civil engineering companies, construction companies, etc. At present, there is minimal capacity of these groups in relation to soil contamination management, including in relation to technology and equipment.

As discussed in the above sections, there is strong capacity at some of the research and analytical institutions in Macedonia, and some have advanced equipment, in relation to soil contamination monitoring and analysis.

Capacity at industrial firms in relation to soil contamination management is weak. It is important that their capacity is strengthened through awareness raising so that they have increased knowledge on soil contamination mechanisms and are better prepared to prevent soil contamination in future.

3.5.1 Recommendations on the Capacity Development at Individual Level

Ongoing capacity development at individual level is important so that Macedonia develops overall capabilities for the different components of the framework for soil contamination management.

A mix of technical formal training will be needed, and on-the-job training in order to develop the capacity of individuals.

Example training for individuals includes:

- Planning monitoring programmes.
- Sampling and analysis.
- Planning counter-measures.
- Training in databases/GIS.
- Development of legislation and its enforcement.

More details of recommended training and capacity development at individual level are given below.

<u>Training for Soil Contamination Management</u>

Once responsibilities of the different Ministries have been approved in relation to soil contamination management, it will be important to carry out a detailed training needs assessment of the individuals that are working in soil contamination management.

The MEPP should have the overall responsibility of acting as a focal point for capacity development, organisation of training, etc. Training is likely to be needed in some of the following topics.

(Institutional/Legal Framework)

- Training on development of legislation
- Training on enforcement of legislation

(Soil Contamination Survey)
Training for soil contamination survey

- Preliminary survey method
- General survey method
- Detailed survey method
- Drilling survey method
- Monitoring method of surface water and groundwater
- Comprehensive survey methods and countermeasures of soil contamination

  Note: On-job-training of soil contamination survey, including General survey and Detailed survey and monitoring survey methods, was carried out during the P/P to staff of MAFWE, MEPP, HSZ, Probistip City and local staff of temporary employees. Part of counterparts, local staff of MAFWE and local staff of temporary employees are skilful technicians, therefore they are possible to be lecturer of soil contamination survey training course.

(Data Analysis)

- GIS
  - GIS analytical method: ESRI training course, etc.
- Risk assessment
  - Risk assessment method

(Information Management on Soil Contamination Management)

- Risk communication
  - Risk communication method, etc.

(Construction of Database)

- Training on Database

3.6 Overview of Capacity Development during the Study

3.6.1 Objectives of Capacity Development

Capacity development was the main focus of the JICA Project: *Study on Capacity Development for Soil Contamination Management related to Mining in the Republic of Macedonia.*

The organisations with responsibility for soil contamination management will need to have the skills and resources that are required to carry out their functions and responsibilities. It is important that capacity development is focused so that the skills and resources are available in Macedonia for implementation of the M/P, and therefore that improvements in soil contamination management are implemented in future on an ongoing and sustainable basis.

Capacity development should cover technical aspects, field surveys, data management, strategic planning and implementation, monitoring and enforcement, communication and awareness-raising, etc.

The improvement in soil contamination management will rely on a sustained commitment at senior levels in Ministries to the implementation of the M/P. The training component of capacity development should continue to be provided to senior policy-makers, as well as levels of staff that will be responsible for day-to-day implementation.

(1) Approaches of Capacity Development

The approach to capacity development should involve a mix of formal training and on-the-job training. In addition various training materials, procedures and guidance documents and manuals are useful tools.

a. Formal training

Formal training can involve various approaches including training courses with lectures and discussion sessions, seminars and workshops, as well as provision of guidance manuals. During the project formal training is being provided at seminars and workshops.

Some formal training could be provided in more detail using the train-the-trainer approach. This develops the capacity of those individuals that are being trained so that they have the capability to train others in future. This approach therefore would contribute to the ongoing sustainability of the overall improvements in soil contamination management.

b. On-the-job training

On-the-job training during the P/P activity and the development of the M/P was particularly important:

1) Continued **on-the-job training during the P/P** was important so that this type of activity can be repeated in other parts of Macedonia as necessary. This type of on-the-job training should cover the technical aspects of the P/P sampling and monitoring, as well as the handling and use of the data generated in order to plan mitigation actions. The training was applied to counterparts at a local level in Probistip, as well as at a national level.

2) On-the-job training during the development of the M/P, through Working Group meetings and workshops, helped to develop capacity for planning and it also gained the understanding and agreement of all stakeholders and their commitment to the implementation of the actions in the M/P.

Detailed training can also be provided on a study tour. However, it is important that those individuals selected for a study tour are entirely relevant for soil contamination management activities in Macedonia in future, using their knowledge gained on the study tour in future. (For all study tours, the success of capacity development depends on careful selection of participants to ensure the training is properly used in future).

3.6.2 Phase 1 Capacity Development

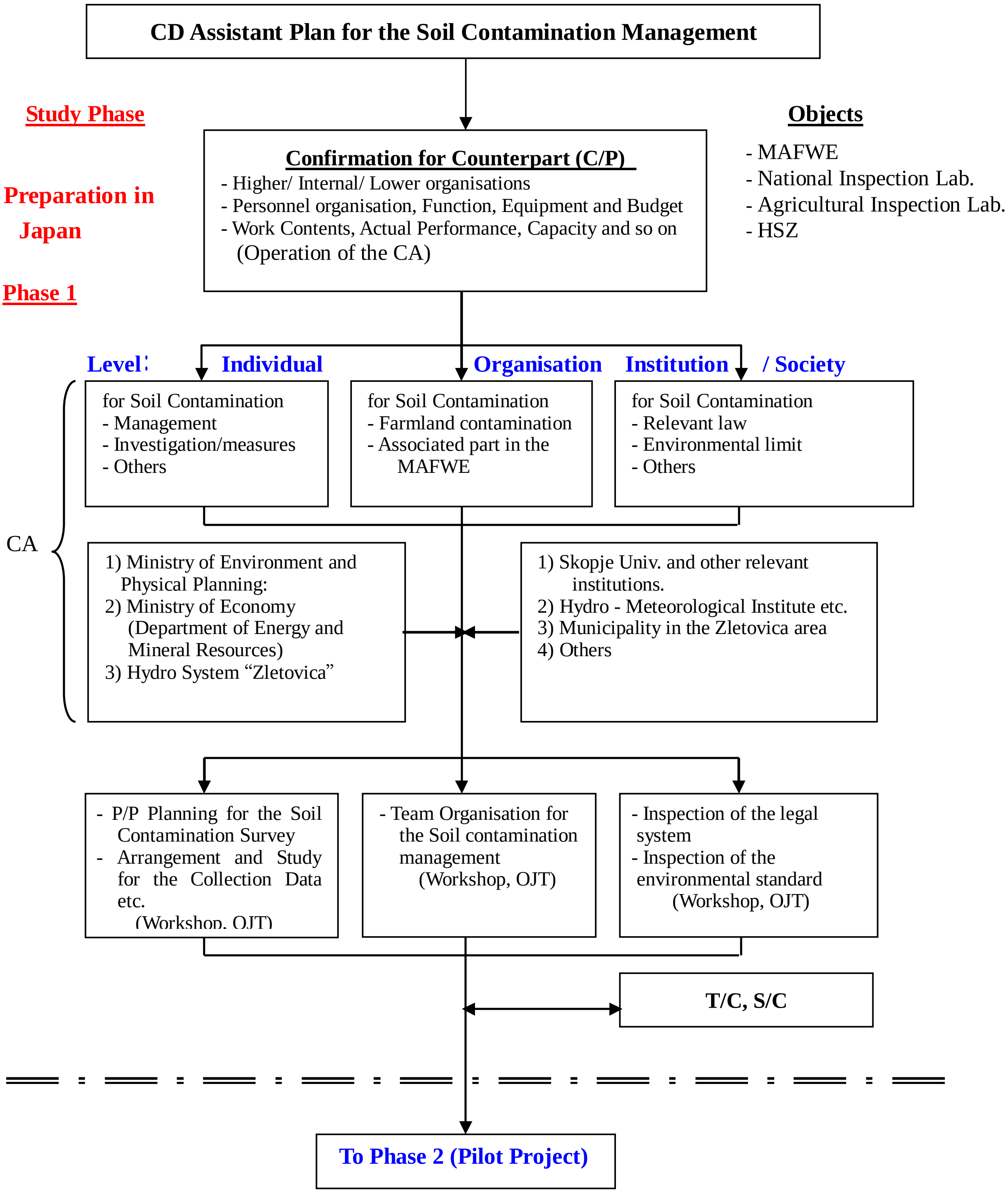
Phase 1 of the study was carried out from 9th of January to 14th of March in 2006. The contents of the main CD related to the soil contamination management during the Phase 1 were to establish the implementation organisation of the study, to discuss the work contents of the study, and to carry out the Preliminary survey in the Zletovica area.

The main works and flow of the CD of Phase 1 are shown below and in Figure 3.5.

- 1st Workshop
- Assignment of members for Steering Committee
- 1st Steering Committee
- Assignments of Counterparts for the Study
- Assignments of members for Technical Committee
- Assignments of members for Technical Meeting
- Execution of 1st Technical Meeting
- 2nd Technical Meeting
- 2nd Steering Committee
- Capacity assessment of stakeholders
- Preliminary survey in the Zletovica area
- Lecture of "Environmental Protection and Management of Mining Area in the Balkan Countries" in Japan.

After the establishment of the organisation for implementation of the Study at the middle of January 2006, several subjects, including existing legislation of Macedonia, soil survey methods of the P/P, provisional environmental standard for soil, and planning of the P/P, were discussed in the meetings of the Steering and Technical Committees.

In addition, 1st Workshop, attended by participants including ministries, universities, municipalities, other public organisations, private sector companies, etc., relevant to the soil contamination, was held on 19th of January, 2006 and mainly discussed on the Study and P/P.



CA : Capacity assessment
C/P: Counterpart
S/C: Steering Committee
T/C: Technical Committee
MAFWE: Ministry of Agriculture, Forestry and Water Economy
OJT: On-the-job training, Std: Provisional environmental standard for soil

Figure 3.8 Flow of CD Assistance of the Study (Phase 1)

The outline of the meetings and workshop are shown in Table 3.2.

Table 3.2 Overview of Meetings / Workshop in Phase 1

Date	Meeting	Content and Remarks
19 January 2006	1st Workshop	• Presentation of Inception Report of the Study • Outline of the Study • On the P/P
19 January 2006	1st Steering Committee	• Acceptance of Inception Report • Member of the Macedonian Counterpart Team • Members of Steering Committee and Technical Committee • Counterpart Training Program in Japan for MAFWE • Group Training Program in Japan
1 February 2006	1st Technical Committee (Meeting)	• Definition and function of technical meeting of the Study • Provisional environmental standards for soil for the P/P • Soil sampling method for the P/P
8 February 2006	2nd Technical Committee (Meeting)	• Risk communication • Method of chemical analyses (Content and elution analyses) • Soil contamination survey method • Second Steering Committee
15 February 2006	2nd Steering Committee	Survey method of the P/P • Method of Soil Contamination survey • Chemical Analysis Method • Selection of Parameters • Provisional Environmental Standards for Soil

3.6.3 Phase 2 Capacity Development

(1) Capacity Development in Phase 2

Capacity development at local and national levels was important during the P/P so that similar projects can be carried out in Macedonia in future. Much of the capacity development in Phase 2 of the Project was related to the P/P and has focused on the development of the capacity of local counterparts in Probistip.

The main works and flow of the CD of Phase 2 are shown as below.

- The soil sampling team in Probistip have been trained in the use of GPS, sampling methods, soil colour measurement, and packaging and labelling of samples. This has been through formal training and on-the-job training.
- The senior local counterparts have worked closely with the P/P managers in the planning and implementation of the P/P, including communication with the local community, and therefore have received on-the-job training.

The capacity development activities conducted during the Phase 2 are given below on each level basis and a flow chart of the capacity development is shown on Figure 3.9.

a. Individual Level

General Survey

Objectives: MAFWE (counterpart), HSZ, Municipality of Probistip, Staff of local subcontractors, laboratories of chemical analysis, compilation and analysis of survey results and others.

Contents: soil sampling method, water quality survey, drilling survey, description of drill core, methods of chemical analysis and others.

Methods: OJT through participating to survey and visiting survey site, OJT through preparation and participation to workshop and seminar.

Results: As the individual level, planning and survey methods of the soil contamination survey were discussed and actual surveys were conducted together with the counterparts of MAFWE, MEPP (Ministry of Environment and Physical Planning) and HSZ. The surveys were conducted hiring the local people as much as possible to help them to understand the actual situation. The contents and actual situations of the surveys were fully understood by all the counterpart through OJT including lectures, meeting/discussion, other activities, investigation of the site and participation to the surveys.

b. Organisation Level

Management of soil survey and soil contamination:

Objectives: MAFWE, HSZ, Municipality of Probistip and laboratories of chemical analysis,

Contents; Management of soil survey plan, actual planning and survey method
Management of conducting actual survey
Management of the survey results including chemical analyses (content and elution analyses)
Preparation of survey manual

Method: OJT through collecting information, planning of the survey and meeting/discussion
Understanding through workshop and seminar

Results: As the organisation level, planning for management of soil contamination survey, risk assessment (establishing preclinical environmental standard for soil and etc.) and risk communication were discussed together with the counterparts of MAFWE, MEPP, HSZ and Municipality of Probistip. The contents of these were discussed technically at the Technical Committee and administratively at the Steering Committee.

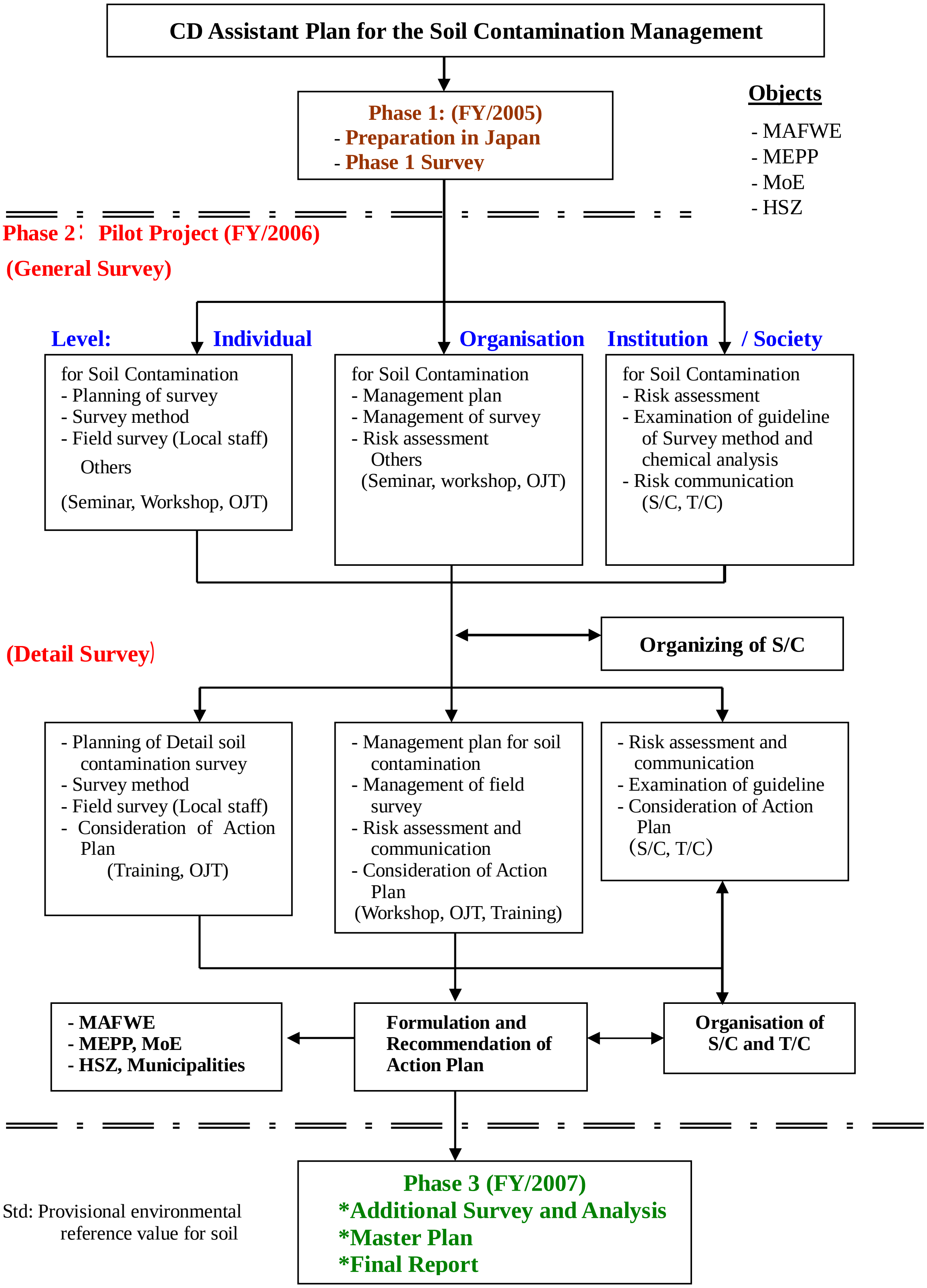


Figure 3.9 Flow of CD Assistance Scheme of the Soil Contamination Management (Phase 2)

The implementation of CD for the managements of planning and operational process of the survey was further conducted through the detailed survey. The chemical analysis was considered based on the ISO through few chemical laboratories for proposing the authorised analytical method of Macedonia and this work will be further continued.

For the management of soil contamination, management of the surveys, assessment and management of the survey results, countermeasures for soil pollution and release of information to the public were discussed with MAFWE, HSZ and Municipality of Probistip. Particularly, for the Provisional Environmental Standard, enough time was shared for collection of data and information, analysis and compilation work through OJT so that full understanding can be attained.

Concerning the risk communication, meetings were held with MAFWE, HSZ and Municipality of Probistip to persuade them to take action and also this was selected as an agenda of the workshop and seminar. The risk communication was also mentioned in the Environmental Plan of the Municipality of Probistip and one of the main concerns of the Mayor of the Probistip.

c. Institution/Society Level

Regulation of soil contamination and guidelines:

Objectives: MAFWE, Municipality of Probistip and members of Technical and steering Committees.

Contents: Formulation of survey methods and consideration of authorised analytical methods (content and elution analyses) and etc.

Method: OJT through collecting information and meeting/discussion.
Through activities of Technical and Steering Committee.

Results: On the institution level, formulation of the provisional standard using the results of the P/P was proceeded on the bases of risk assessment. Further, discussion was held concerning survey method of soil contamination and analytical methods of soil for preparation for formulating provisional guideline. From the second half of the Phase 2, based on the results of the first half, the working group, consisting of the members from MAFWE, MEPP and other related institutions, was established under supervision of Steering Committee for improvement of the regulations, and preliminary investigation concerning the regulations of the A/P (P/P) and the M/P of the project was started by the working group.

On society level, the results of soil contamination survey in the P/P area and counter-measures to soil contamination, including release of the information to the public, were discussed with stakeholders using the risk communication as a tool. The chemical analysis were considered based on the ISO through few chemical laboratories for proposing the authorised analytical method of Macedonia and this was the steppingstone for formulating guideline of the chemical analysis of soil pollution project.

Concerning the Environmental Standard for soil, it was mainly focused on the formulating the Provisional Environmental Standard for assessing the results of the P/P. For formulation of the Provisional Environmental Standard, the work was more concentrated in OJT through collection of data/information, analysis, compilation and preparation of the documents for Technical and Steering Committees.

The local capacity in Probistip has been developed and, by the end of the P/P, the local counterparts and workers were able to repeat this type of work in future when necessary.

In addition, it was important that the capacity of the local counterparts was further developed during Phase 2 of the Project so that they can use the results of such monitoring work to plan local actions to mitigate the impacts of contamination.

At a national level, the JICA Study Team was working with counterparts from MAFWE on a day-to-day basis. This was an important aspect of on-the-job training. This involved working meetings with MAFWE representatives on technical topics related to soil contamination management, visits to Probistip with MAFWE representatives, etc. Based on the experience of the JICA Study Team, this type of on-the-job training was very useful for counterparts, and the aim was to continue this approach throughout the study to ensure strong capacity development.

In addition, other capacity development was carried out in Phase 2 during the structured meetings, which particularly included presentations by the JICA Study Team to counterparts and specialists from MAFWE and many other stakeholder organisations. These meetings are summarised in Table 3.3.

Table 3.3 (1) Overview of Meetings/Seminar/Workshop in Phase 2

Date	Meeting	Topics covered
11 May 2006	Counterpart Meeting	• P/P detailed methods and plans. • Capacity development methods. • Plans for 3rd Steering Committee Meeting.
18 May 2006	3rd Steering Committee Meeting	• P/P detailed methods. • Report from Phase 1. • Capacity development methods. • Seminar planning.
31 May 2006	1st Seminar, Probistip	• P/P plans in Probistip.
31 July 2006	Counterpart Meeting	• P/P progress update. • Reminder and discussion on the wider project context (e.g. capacity development)
31 August 2006	Counterpart Meeting	• Results of general survey of P/P. • Selection of 200m grid areas for survey. • Capacity Development in Phase 2. • Plans for Steering Committee Meeting and Workshop.
15 September 2006	3rd Technical Committee Meeting	• Results of general survey of P/P. • Provisional standard for soil contamination in Macedonia.
20 September 2006	Counterpart Meeting	• Results of general survey of P/P. • Provisional standard for soil contamination in Macedonia. • Preparation for second workshop and steering committee meeting.
26 September 2006	2nd Workshop, Skopje	• Results of general survey of P/P. • Provisional standard for soil contamination in Macedonia. • Discussion session.
26 September 2006	4th Steering Committee Meeting	• Results of general survey of P/P. • Provisional standard for soil contamination in Macedonia.
6 October 2006	4th Technical Committee Meeting	• Background points on the Provisional Standards for Soil of Macedonia • Overview of the steps in development of standards • Discussion on main calculation method / equation
13 October 2006	Counterpart Meeting	• Next project steps • On the risk assessment for soil standards • On the risk communication for the P/P
17 October 2006	5th Technical Committee Meeting	• Development of Provisional Standard for Soil for the Pilot Project in Macedonia • Background concentration of heavy metal in Macedonia • On the Risk communication in the P/P
11 December 2006	6th Technical Committee Meeting	• Progress of the P/P • Geochemical Analysis of Soil Survey results of the P/P • Development of Provisional Standard for Soil and Discussion

Table 3.3 (2) Overview of Meetings/Seminar/Workshop in Phase 2

Date	Meeting	Topics covered
15 November 2006	Counterpart Meeting	• Progress of the detail survey of the P/P • Relation between soil and crops • Counterpart training in Japan • On the NGO (STUDIORUM)
18 December 2006	Counterpart Meeting	• Progress of the detail survey of the P/P • Risk assessment
27 January 2007	Counterpart Meeting	• Results of the P/P • Content of the Works in January and February, 2007 • Soil Contamination Management • Working Group for Action Plan • Progress of GIS
15 February 2007	Counterpart Meeting	• Action Plan • Interim Report • Next step of the Study

3.6.4 Capacity Development in Phase 3

The main capacity development in Phase 3 has been at institutional and organisational levels.

(1) Capacity development at institutional level

At institutional level, the Working Group on the M/P has met 6 times in Phase 3 to discuss the M/P.

These activities continued to build linkages between Ministries and strengthen co-operation on soil contamination management, and therefore build capacity on an institutional level on soil contamination management.

The Ministry of Economy was much more involved and interested in Phase 3 of the Study, and participated in the Working Group meetings on the M/P and numerous other working meetings.

This capacity development at institutional level was essential to ensure that there was a good understanding of the principles and activities in the M/P by the local counterparts, in particular an understanding of the benefits. This will ensure that the counterparts will take ownership of the implementation of the actions in the M/P.

(2) Capacity development in Phase 3 at organisational level

At organisational level, throughout the study the JICA team have been encouraging the counterparts to set up specific teams with responsibility for soil contamination management. This is an important part of the implementation of the M/P and applies to MEPP and MAFWE.

Following the work in this area throughout the study, MEPP is now setting up a soil contamination team to take overall responsibility for soil contamination management and overall responsibility for implementation of the M/P (Figure 3.10).

In addition, MAFWE is planning to set up a new Sector for Registration and Management of Agricultural Land, and will include a role within the Sector on soil contamination management.

The JICA study team have provided advice on the set up of such teams, including the main roles and responsibilities and the need for communication and co-operation between ministries.

(3) Capacity development at individual level in Phase 3

In addition, further capacity development of individuals was carried out as on-the-job training. This was particularly focussed on individuals at a national level in MAFWE and MEPP to help them so that they could be able to plan and manage the monitoring programmes and so that the type of monitoring work during the P/P can be repeated elsewhere in Macedonia. The national level counterparts will need to have the capacity to plan and manage such programmes and projects (Figure 3.10).

A summary of the meetings of the Working Group on Master Plan is provided in Table 3.4.

Table 3.4 (1) Overview of Meetings/Seminar/Workshop/Working Group in Phase 3

Date	Meeting	Topics discussed
1 June 2007	Counterpart Meeting	• Study Plan in 2007 • Submission of Interim Report • Counterparts • Working Group
12 June 2007	1st Working Group on Master Plan	• Objectives of Working Group on M/P • Framework of the Soil Contamination Management
12 June 2007	1st Working Group on Action Plan (Skopje)	• Survey Results of P/P (Detailed Survey and Risk Assessment) • Countermeasures for Soil Contamination in P/P Area
18 June 2007	2nd Working Group on Action Plan (Probistip)	• Survey Results of P/P (Detailed Survey and Risk Assessment) • Countermeasures for Soil Contamination in P/P Area
19 June 2007	2nd Working Group on Master Plan	• Institutional Framework of the Soil Contamination Management
26 June 2007	3rd Working Group on Master Plan	• Institutional/Society Level on the Framework of the Soil Contamination Management

Table 3.4(2) Overview of Meetings/Seminar/Workshop/Working Group in Phase 3

Date	Meeting	Topics discussed
25 June 2007	Counterpart Meeting	• Progress of the Master Plan • Organisation Level for Capacity Development • Agricultural Risk in the P/P Area
2 July 2007	Counterpart Meeting	• Progress and Results of the Additional Survey • Institution/Organisation Level for Capacity Development
3 July 2007	4th Working Group on Master Plan	• On the Results of Additional Survey in the P/P • Organization Framework of the Soil Contamination Management for M/P
3 July 2007	3rd Working Group on Action Plan (Skopje)	• Additional Survey Results of P/P
4 July 2007	Additional Meeting with State Advisor of Minister, MAFWE	• Principles Framework of the Soil Contamination Management in Macedonia
4 July 2007	5th Steering Committee Meeting	• Result of risk assessment of the P/P • Survey results of Additional Survey of the P/P • Master Plan for Soil Contamination Management of Macedonia
5 July 2007	Additional Meeting with Vice president, Macedonia	• Principles Framework of the Soil Contamination Management in Macedonia
9 July 2007	4th Working Group on Action Plan (Probistip)	• Additional Survey Results of P/P
10 July 2007	5th Working Group on Master Plan	• Review: Institutional/Society and Orgnisation Level of Soil Contamination Management for M/P • Technical Level of Soil Contamination Management for M/P
17 July 2007	6th Working Group on Master Plan	• Society/Orgnisation and Technical Level of Soil Contamination Management for M/P • Overall Review on Soil Contamination Management
27 July 2007	6th Steering Committee Meeting	• Master Plan of Capacity Development on Soil Contamination Management of Macedonia • Results of Additional Crop and Soil Analyses
1 August 2007	Counterpart Meeting	• Review of 6th Steering Committee • On the Master Plan • Former arrangement of Final Seminar
6 August 2007	5th Working Group on Action Plan (Probistip)	• Additional Survey Results of P/P (Crop and Soil)
7 November 2007	Counterpart Meeting	• Handover of Draft Final Report • Update and discussion on Master plan • Planning of Steering Committee Meeting • Planning of 2nd Seminar
13 November 2007	7th Steering Committee	• Master Plan of Capacity Development for Soil Contamination Management of Macedonia
15 November 2007	2nd Seminar (Skopje)	• Final Results of the Study

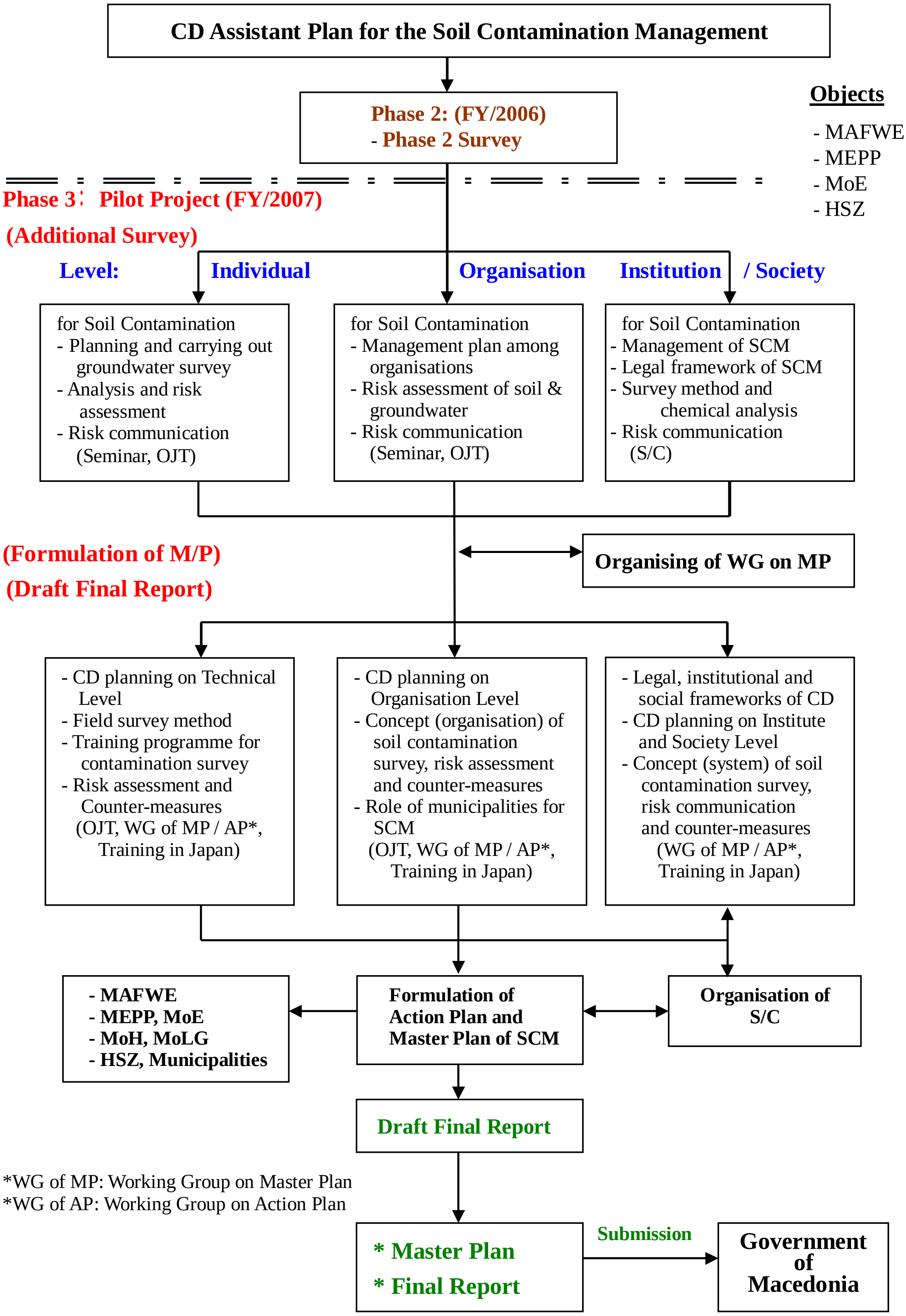


Figure 3.10 Flow of CD Assistance Scheme of the Soil Contamination Management (Phase 3)