MINISTRY OF FOREIGN TRADE AND ECONOMIC RELATIONS,
BOSNIA AND HERZEGOVINA
FEDERAL MINISTRY OF ENVIRONMENT AND TOURISM,
FEDERATION OF BOSNIA AND HERZEGOVINA

THE PROJECT FOR MASTER PLAN FOR REMEDIATION OF HOTSPOTS IN BOSNIA AND HERZEGOVINA

FINAL REPORT

SUMMARY

MAY 2014

JAPAN INTERNATIONAL COOPERATION AGENCY

JICA EXPERT TEAM (NIPPON KOEI CO., LTD.)

GE
JR
14 - 120

MINISTRY OF FOREIGN TRADE AND ECONOMIC RELATIONS,
BOSNIA AND HERZEGOVINA
FEDERAL MINISTRY OF ENVIRONMENT AND TOURISM,
FEDERATION OF BOSNIA AND HERZEGOVINA

THE PROJECT FOR MASTER PLAN FOR REMEDIATION OF HOTSPOTS IN BOSNIA AND HERZEGOVINA

FINAL REPORT

SUMMARY

MAY 2014

JAPAN INTERNATIONAL COOPERATION AGENCY
JICA EXPERT TEAM (NIPPON KOEI CO., LTD.)

Exchange Rates (as of 15 May, 2014)
Source: Central Bank of Bosnia and Herzegovina
USD1.00 = EUR0.727 = JPN101.8 = BAM1.422

Locations of the Project Area (Target Sites of Site Survey)

BOSNIA AND HERZEGOVINA

The Project for Master Plan for Remediation of Hotspots in Bosnia and Herzegovina

Final Report
Summary

Table of Contents

Locations of the Project Area

Chapter 1 Overall Framework of the Project 1
1.1 Background 1
1.2 Objectives 1
1.3 Outputs of the Project 1
1.4 Project Area 2
1.5 Organization of the Project 2
1.5.1 Steering Committee (ST/C) 3
1.5.2 Technical Committee (T/C) 4
1.5.3 JICA Expert Team 4
1.6 Project Activities 4
1.6.1 Output 1 – Review of Legal and Institutional Background 5
1.6.2 Output 2 – Analysis of Current Status of Target Hotspots 5
1.6.3 Output 3 – Drafting of Master Plan for Management and Treatment of Hotspots 6
1.6.4 Implementing Schedule 6
Chapter 2 Environmental Hotspots in Bosnia and Herzegovina 8
Chapter 3 Review of Legal and Institutional Background 9
3.1 Legal Background 9
3.2 Institutional Background 10
Chapter 4 Site Survey 12
4.1 Former Chemical Factory Site in Tuzla Canton 12
4.2 Former Soda Factory Site in Tuzla Canton 13
4.3 Lake Modrac in Tuzla Canton 14
4.4 Abandoned Mining Sites in Vares, Zenica-Doboj Canton 15
4.5 Major Issues Identified through the Site Survey 17
Chapter 5 Draft Master Plan 18
5.1 Goals of the Draft Master Plan 18
5.2 Target Year 18
5.3 Target Sites 18
5.4 General Framework 18
5.4.1 Activities Proposed in the Draft Master Plan 19
5.4.2 Baseline Survey and Analysis of Situation 20
5.4.3 Development of Regulatory Framework 21
5.4.4 Development of Technical Guidelines 22
5.4.5 Remediation of Priority Sites 23
5.4.6 Capacity Development 23
Chapter 6 Social and Environmental Considerations 25
6.1 Major Environmental and Social Issues 25
6.2 Mitigation Measures 26

6.3 Stakeholder Engagement Plan....26
Chapter 7 Lessons Learned and Recommendations....28
7.1 Lessons Learned....28
7.1.1 Project Period....28
7.1.2 Legacy Pollution as Main Focus of the Project....28
7.1.3 Remediation of Contaminated Site....28
7.2 Recommendations....28
7.2.1 Adoption of the Draft Master Plan....28
7.2.2 Securing Enough Administrative Resources to Fulfill Legal Responsibilities....29
7.2.3 Technical Committee and Unit of Technical Specialist....29
7.2.4 Creating More Opportunities....29
7.2.5 Exploring Possible Opportunities in Problems....29

Attachments

Attachment 1 Project Implementation Structure
Attachment 2 Photos

List of Tables

Page

Table 1-1 Steering Committee Meetings 3
Table 1-2 Technical Committee Meetings 4
Table 1-3 Member of JICA Expert Team 4
Table 3-1 List of Environmental Laws and Regulations Related to the Management of Environmental Hotspots 9
Table 4-1 Results of Site Survey at Former Chemical Factory Site 12
Table 4-2 Results of Site Survey at Former Soda Factory Site 14
Table 4-3 Results of Site Survey at Lake Modrac 15
Table 4-4 Results of Site Survey at Open-Pit Pond 16
Table 4-5 Results of Site Survey at the Abandoned Processing Plant 16
Table 4-6 Results of Site Survey at the Tailing Pond and Dam 16
Table 5-1 Activities Related to Baseline Survey and Analysis of Situation 20
Table 5-2 Activities Related to Development of Regulatory Framework 21
Table 5-3 Activities Related to Development of Technical Guidelines 22
Table 5-4 Activities Related to Development of Plans for Remediation 23
Table 5-5 Activities Related to Capacity Development 24

List of Figures

Page

Figure 1-1 Overall Framework of the Project 2
Figure 1-2 Organizational Structure of the Project 3
Figure 1-3 Project Implementation Schedule 7
Figure 2-1 Environmental Hotspots in BiH 8
Figure 4-1 Site Photos of the Former Chemical Factory Site 12
Figure 4-2 Hazardous Maps of the Former Chemical Factory Site 13
Figure 4-3 Site Photos of the Former Soda Factory Site 14
Figure 4-4 Site Photo of Lake Modrac 15
Figure 4-5 Site Photos of the Abandoned Mining Sites 15
Figure 5-1 Overall Framework of the Draft Master Plan 19
Figure 5-2 Activities Proposed in the Draft Master Plan 20

List of Abbreviations

BiH	Bosnia and Herzegovina
BD	Brcko District
DQO	Data Quality Objectives
EIA	Environmental Impact Assessment
FBiH	Federation of Bosnia and Herzegovina
EU	European Union
FMoAWF	Federal Ministry of Agriculture, Water Management and Forestry
FMoEMI	Federal Ministry of Energy, Mining and Industry
FMoET	Federal Ministry of Environment and Tourism
F/R	Final Report
HEIS	Hydro - Engineering Institute Sarajevo
HRS	Hazard Ranking System
IC/R	Inception Report
JET	JICA Expert Team
JICA	Japan International Cooperation Agency
MoAWF	Ministry of Agriculture, Water Management and Forestry
MoFTER	Ministry of Foreign Trade and Economic Relations of BiH
MSPEP	Ministry for Spatial Planning and Environmental Protection
PCBs	Polychlorinated Biphenyls
PEL	Probable Effect Levels
SEA	Strategic Environmental Assessment
RS	Republic of Srpska
ST/C	Steering Committee
S/W	Scope of the Work
T/C	Technical Committee
USEPA	United States Environmental Protection Agency
QC	Quality Control

Chapter 1 Overall Framework of the Project

1.1 Background

According to various investigations in the past, there could be hundreds of environmental hotspots[1] in Bosnia and Herzegovina (hereinafter referred to as BiH), and if all small illegal dumpsites scattered in the country are included, there could be thousands of such sites. Many of these sites are legacy pollution sites from the era of the Socialist Federal Republic of Yugoslavia and the subsequent period of internal strife that have been left unattended for a long time. To protect people and the environment from possible harmful impacts, these sites have to be controlled urgently. Under such circumstances, the Project was implemented in order to formulate a draft master plan for sustainable management of such environmental hotspots in accordance with the Scope of Work (S/W) agreed between the Council of Ministers of Bosnia and Herzegovina and JICA in December 2012.[2]

1.2 Objectives

The objectives of the Project are:

- To formulate a Draft Master Plan for sustainable management and proper treatment of environmental hotspots located in the Federation of Bosnia and Herzegovina (hereinafter referred to as FBiH), and
- To enhance the capacity of the counterpart personnel and relevant organizations for policy planning on environmental management in FBiH.

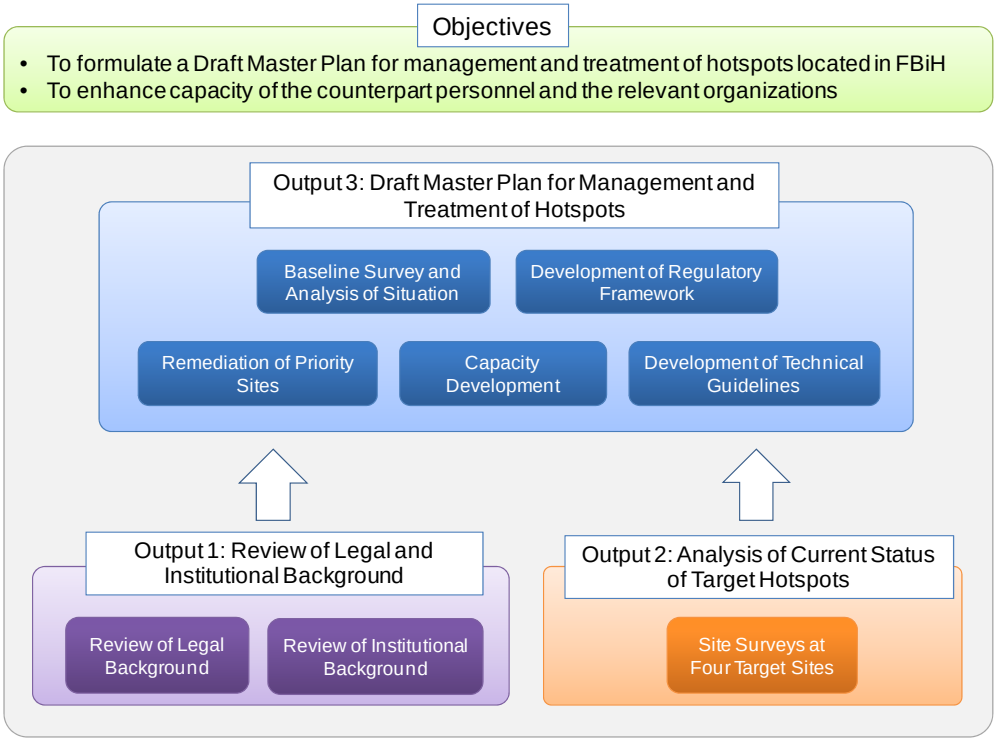
1.3 Outputs of the Project

In order to achieve these objectives, the Project is designed to produce the following three outputs as explained in Figure 1-1:

Output1: Legal and institutional background of hazardous waste management in BiH is reviewed.
Output2: Current status of hazardous waste management in the environmental hotspots of FBiH is analyzed, and
Output3: The Draft Master Plan for the management and the treatments of the target areas is drafted.

1 In this report, an environmental hotspot generally means a site contaminated with hazardous substance, and the terms "environmental hotspot" and "contaminated site" are used interchangeably without rigorous definition as in BiH these terms are often used synonymously.

2 It was noted that the Constitution of Bosnia and Herzegovina organizes the state into administratively divided entities, the Federation of Bosnia and Herzegovina (FBiH) and Republic of Srpska (RS). In addition to the entities, there exists also the Brcko District of Bosnia and Herzegovina (BD), as a local self-government unit. According to the Constitution of Bosnia and Herzegovina, state level authorities are not directly responsible in matters of environmental protection. However, the Law on Ministries and other Administrative Bodies of Bosnia and Herzegovina (Official Gazette of BiH Nos. 5/03, 26/04, 42/04, 45/06, 88/07, 35/09, 59/09 and 103/09), designates the Ministry of Foreign Trade and Economic Relations of BiH (hereinafter referred to as MoFTER) as the responsible state level authority to conduct activities and tasks related to the definition of policy, basic principles, coordination of actions and harmonization of plans of entity authorities and representation at the international level. According to the RS Constitution, RS institution organizes and provides for environment protection. When it comes to the FBiH, the Constitution of FBiH envisages that the Federation Government and cantons share responsibilities in environmental protection. Concerning BD, it has responsibility over all fields which are not responsibility of the state. Accordingly, the Government of BD has responsibilities that are entrusted to entities, municipalities (and cantons in FBiH) when it comes to environmental protection.
The Ministry of Physical Planning, Civil Engineering and Ecology of RS was involved in all the activities to prepare the project proposal and made the decision to not participate in the project in accordance with the act No.15.04-96-193/11 from 7 November 2011. Thus, the S/W was signed by the representatives from MoFTER and Ministry of Foreign Affairs at the central level, Federal Ministry of Environment and Tourism (FMoET) and JICA.



Source: JET

Figure 1-1 Overall Framework of the Project

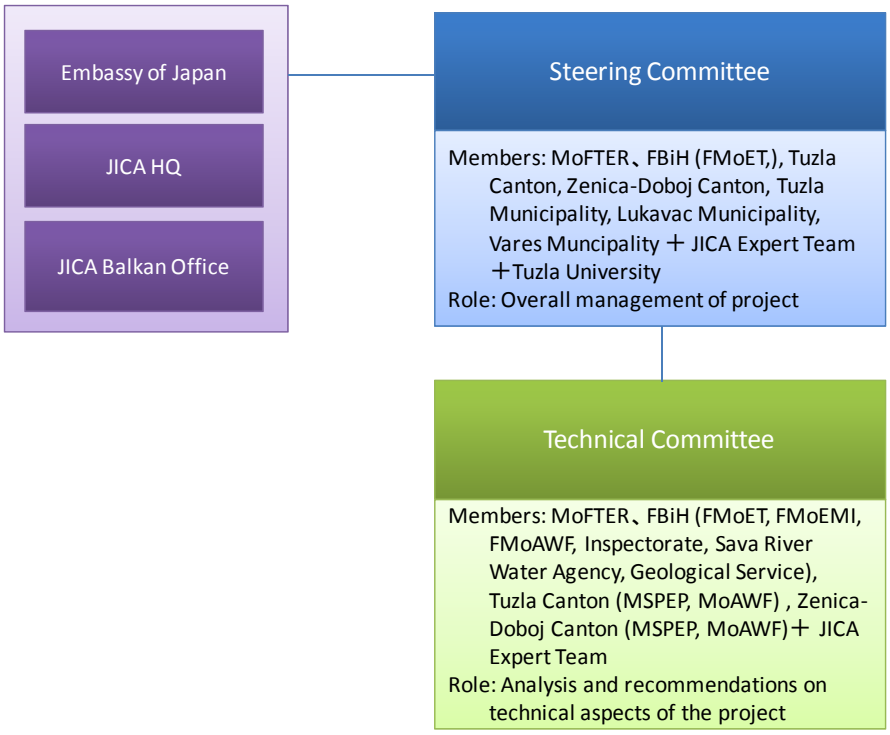
1.4 Project Area

The following four sites in Tuzla and Zenica-Doboj cantons were selected as the target sites; these Project areas are hotspots in FBiH:

- Former chemical factory in Tuzla, Tuzla Canton
- Former soda factory in Lukavac, Tuzla Canton
- Lake Modrac in Tuzla Canton
- Abandoned mining sites in Vares, Zenica-Doboj Canton

1.5 Organization of the Project

To ensure smooth implementation of the project activities, a Steering Committee (ST/C) was organized, chaired by a representative from MoFTER. Under the ST/C, a Technical Committee (T/C) was also organized to discuss the technical aspects of the Project.



Source: JET

Figure 1-2 Organizational Structure of the Project

1.5.1 Steering Committee (ST/C)

ST/C is composed of the representatives from the central government, federal government, related cantonal and municipal governments, and a university. The members of the ST/C are listed in Attachment 1. There were two ST/C meetings during the course of the Project as summarized in Table 1-1.

Table 1-1 Steering Committee Meetings

Meeting Name	Date and Venue	Main Agenda	Number of Participants
Steering Committee Meeting No. 1	20 September 2013, MoFTER, Sarajevo	The JICA Expert Team explained the plans for the project activities and site survey. Then, the members agreed on the following items: - Contents of the inception report (Ic/R) and activity plan in this project. - Members of ST/C. - Members of Technical Committee (T/C). More members will be added afterwards. - Four target sites to be investigated in this project. - Survey plans at all target sites. - How to organize and what topics will be discussed at the T/C meetings	19

Steering Committee Meeting No. 2	23 April 2014, Hotel Bristol, Sarajevo	The following four presentations were made: - "Outcomes of the Project" by JICA Expert Team - "Implementation of Stockholm Convention in BiH" by MoFTER - "Directions to Remediation of Environmental Hotspots" by FMoET - "Activities of Federal Environmental Protection Fund" by Environmental Protection Fund of FBiH The ST/C members confirmed the following: - The project activities in BiH were successfully executed in accordance with the Scope of Work signed in December, 2012. - The ST/C members thanked the efforts made by all the participants, and also promised to make further efforts to resolve the issues of environmental hotspots in BiH. - The BiH side hoped for further opportunities for bilateral cooperation with Japan, and the representative of JICA promised to convey the message to JICA Headquarters in Japan.	47

Source: JET

1.5.2 Technical Committee (T/C)

T/Cs were held with the participation of the representatives from the central government, federal government, related cantonal and municipal governments, a university and other organizations depending on its agenda. The members of the T/C are listed in Attachment 1. There were two T/C meetings during the course of the Project as summarized in Table 1-2.

Table 1-2 Technical Committee Meetings

Meeting Name	Date and Venue	Agenda	Participants
Technical Committee Meeting No. 1	4 November 2013, Hotel Hollywood, Sarajevo	Three presentations were made by the JICA Expert Team, namely: (i) introduction to hazardous waste management, (ii) site investigation on contamination of soil and groundwater, (iii) risk management. The participants requested the JICA Expert Team to clarify the priorities among the target sites, and hoped for further support by the Japanese government.	42
Technical Committee Meeting No. 2	25 February 2014, Hotel Hollywood, Sarajevo	Five technical presentations, on result of site investigation, risk assessment and remediation plan for environmental hotspots, were made by HEIS Expert Team (i) former soda factory, (ii) former chemical factory, (iii) Lake Modrac, (iv) abandoned open-pit mining pond, (v) abandoned processing plant and a tailing pond and dam. The participants discussed issues to be considered for implementation of remediation plans.	35

Source: JET

1.5.3 JICA Expert Team

The JICA Expert Team (JET) consists of four members, as summarized in Table 1-3.

Table 1-3 Member of JICA Expert Team

Name	Position
Itaru OKUDA	Team Leader/Environmental Management
Hisamitsu OHKI	Hazardous Waste Management
Masako TERAMOTO	Soil Pollution Control/Pollution Risk Analysis
Tomoe TAKEDA	Environmental Pollution Survey/SEA/Coordinator

Source: JET

1.6 Project Activities

All the project activities are summarized below. The results of the activities are explained in the Chapters 2 to 6 of this summary report.

1.6.1 Output 1 – Review of Legal and Institutional Background

(1) Review of Policies and Regulations

The current policies and regulations related to the management of environmental hotspots were reviewed. Similarly, the current organizational set up for the management of hotspots at the central, entity, and cantonal levels were reviewed.

(2) Identification of the Gaps with EU Directives

The legal gaps between FBiH and EU Directives were analyzed. The gaps were addressed in the draft master plan developed in this Project.

(3) Recommendations for Management of Environmental Hotspots

Based on the review of policies and regulations in (1) above and a detailed legal review report developed by local lawyers, recommendations on existing legal and institutional issues related to management of environmental hotspots were provided in the draft master plan.

1.6.2 Output 2 – Analysis of Current Status of Target Hotspots

(1) Selection of Target Hotpots

Previous studies on hotspots in BiH were reviewed. Also, a cadastral map of FBiH was checked for the industrial locations in Tuzla and Zenica-Doboj Cantons. Then, a number of meetings were held to select the target sites. Based on the discussions, the following four sites were selected as the target sites:

- Former chemical factory in Tuzla, Tuzla Canton
- Former soda factory in Lukavac, Tuzla Canton
- Lake Modrac in Tuzla Canton
- Abandoned mining sites in Vares, Zenica-Doboj Canton

(2) Site Survey

In October and November 2013, a series of surveys were conducted by the sub-contractor at the four sites mentioned above based on the sampling plans designed by JET. Prior to sampling, concentrations of heavy metals and soil gases were measured using portable equipment in order to optimize the sampling design and also to demonstrate how to implement a rapid on-site survey.

(3) Sample Analysis and Development of Hazardous Waste Maps

Following the sampling, the samples were analyzed at the laboratory of the subcontractor. Then, a set of hazardous waste maps was prepared for different contaminants for sites where relatively dense sampling was done.

(4) Evaluation of Results and Assessment of Environmental Risks

The results of the analysis were compared against local and international environmental standards for soil, sediment, surface water and groundwater. Environmental risks at each site were evaluated for different pathways using the Hazard Ranking System (HRS) developed by United States Environmental Protection Agency (USEPA). It was found that the former chemical factory in Tuzla and the site of former flotation plant and tailings dam in Vares are heavily contaminated.

(5) Discussions with Stakeholders

Two stakeholder meetings and a T/C meeting were organized (7 and 11 November 2013 and 25 February 2014) to discuss the results of the site surveys and proposed remediation measures. In addition, as a part of SEA study, a stakeholder meeting was organized on 18 March 2014 in Sarajevo in order to present the draft master plan and exchange opinions about the various aspects of the draft master plan.

(6) Development of Possible Remediation Measures

Remediation measures were suggested for each site. It should be pointed out that these measures were developed merely to demonstrate how such measures can be developed considering the specific conditions of each site. In accordance with the laws in FBiH, it is the responsibility of the polluter or operator to develop and implement remediation measures.

1.6.3 Output 3 – Drafting of Master Plan for Management and Treatment of Hotspots

(1) Formulation of Draft Master Plan

A draft master plan for 2014-2020 was prepared which elaborated various actions that FBiH has to take in order to develop the regulatory framework for the management of hotspots, to remediate priority sites, and to train environmental officers and to raise awareness of stakeholders. The draft master plan is presented in Chapter 5 of this summary report.

(2) Development of Checklists

A checklist of the site-level activities was developed and annexed to the draft master plan.

(3) Reference on Treatment Methodologies

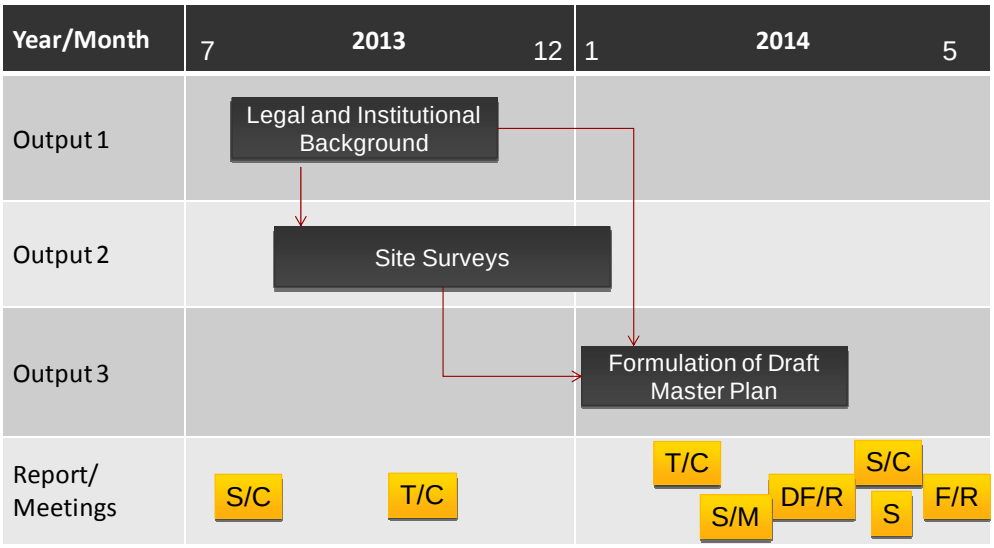
A guideline summarizing the treatment methods for various hazardous substances was developed. It is annexed to the draft master plan.

(4) Nation-wide Seminar

A nation-wide seminar was organized together with the 2nd ST/C in April 2014.

1.6.4 Implementing Schedule

The implementing schedule of the Project is indicated in the Figure 1-3. The Project activities in BiH started in July, 2013 and terminated in April 2014.



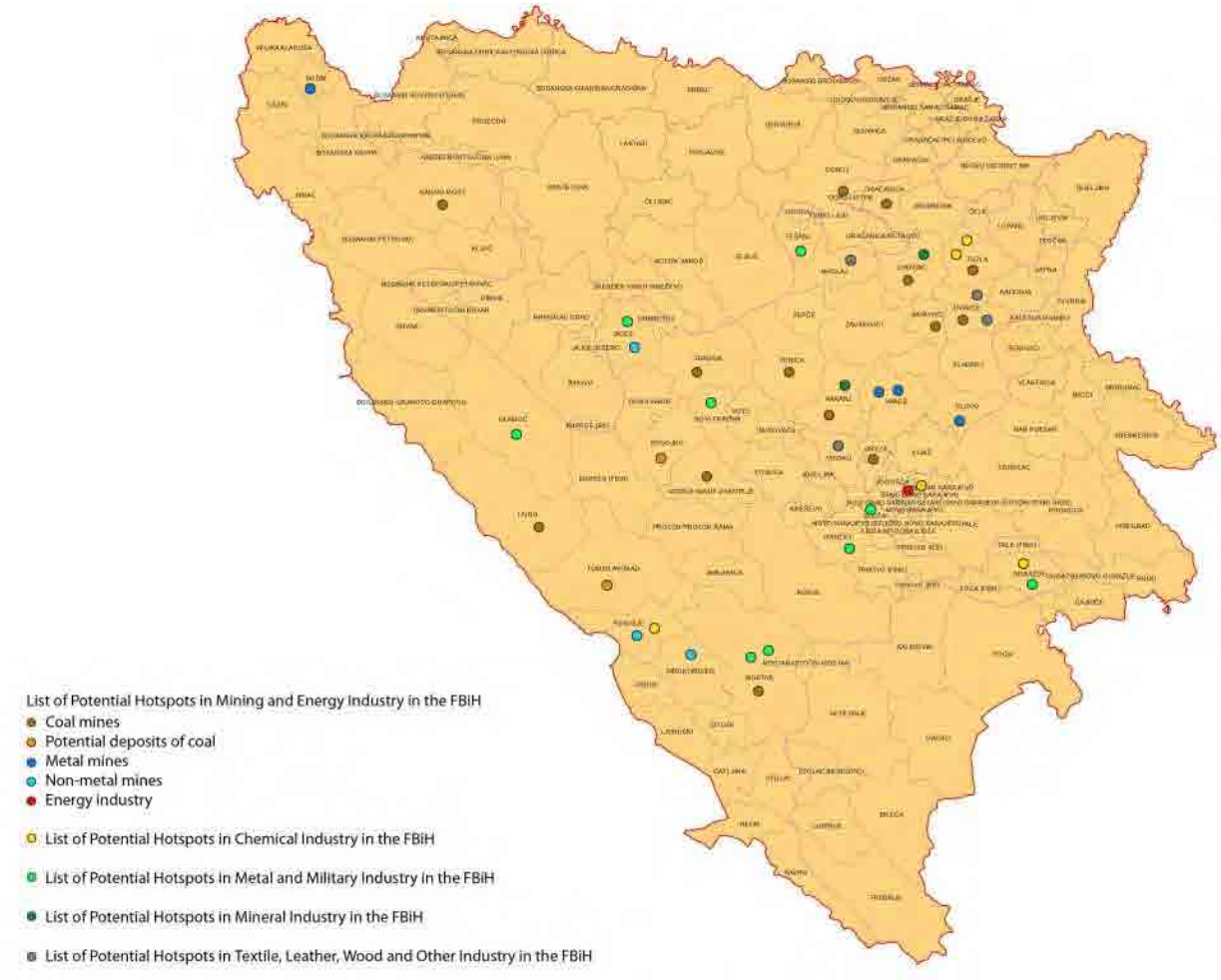
Note: S/C:Steering Committee meeting, T/C: Technical Committee; S/M: Stakeholder Meeting; DF/R:Draft Final Report, F/R: Final Report, S:Seminar

Source: JET

Figure 1-3 Project Implementation Schedule

Chapter 2 Environmental Hotspots in Bosnia and Herzegovina

Some studies of environmental hotspots (contaminated sites) have been executed in BiH in the past, although such studies are sporadic and information on each site is limited. Figure 2-1 shows the distribution of hotspots which have been identified in the BiH. There are dozens of such sites, mainly industrial sites and abundant mines. Aside from them, it is know that there are 340 known illegal waste disposal sites in FBiH alone. Most of them are open dumping sites at which pollution control measures were inadequate and it was possible to dump hazardous wastes in the past. There is speculation that as many as 2,000 such illegal waste disposal sites exist in FBiH alone. Hence, it is not surprising if there are hundreds, if not thousands, of contaminated sites in BiH.



Source：ENOVA, Survey for Strategic Environmental Assessment (SEA) for the Project for Master Plan for Remediation of Hotspots in Bosnia and Herzegovina, 2014

Figure 2-1 Environmental Hotspots in BiH

Chapter 3 Review of Legal and Institutional Background

3.1 Legal Background

Laws and regulations related to environmental standards, waste management, industrial pollution control, mining, environmental liability, information disclosure, and other aspects were reviewed, and the gaps with relevant European directives were analyzed.

There are about 100 environment related laws and regulations at the levels of central government, FBiH government and the target cantonal governments (Tuzla Canton and Zeniza-Doboj Canton). The following table summarizes the major environmental laws and regulations in FBiH, Tuzla Canton, and Zenica-Doboj Canton, as well as relevant international treaties, although the list is not exhaustive.

Table 3-1 List of Environmental Laws and Regulations Related to the Management of Environmental Hotspots

Name of Laws
FBiH Laws
- Law on Environmental Protection (Official Gazette of FBiH, Nos. 33/03 and 38/09)
- Law on Waste Management (Official Gazette of FBiH, Nos. 33/03 and 72/09)
- Law on Waters (Official Gazette of FBiH, No.70/06)
- Law on Air Protection (Official Gazette of FBiH, Nos. 33/03 and 4/10)
- Law on Mining (Official Gazette of FBiH, No. 26/10)
- Law on Agriculture (Official Gazette of FBiH, Nos 88/07, 4/10, 27/12 and 7/13)
- FBiH Law on Inspections (Official Gazette of FBiH, No.69/05)
- FBiH Law on Spatial Planning and Land Use (Official Gazette of FBiH, Nos.2/06, 72/07, 32/08, 04/10,13/10 and 45/10)
- FBiH Law on the Environmental Protection Fund (Official Gazette of FBiH, No.33/03)
- FBiH Law on Obligations (Official Gazette of FBiH, Nos. 29/03 and 42/11,)
- FBiH Law on Criminal Procedure in FBiH (Official Gazette of FBiH, Nos. 35/03, 37/03, 56/03, 78/04, 28/05, 55/06, 27/07, 53/07, 09/09, 12/10 and 08/13)
- FBiH Law on Privatization (Official Gazette of FBiH, Nos. 27/97, 8/99, 32/00, 45/00, 54/00, 61/01, 27/02, 33/02, 28/04, 44/04, 42/06 and 4/09)
- FBiH Law on Health Protection (Official Gazette of FBiH, Nos. 46/10 and 75/13)
- FBiH Law on Concessions (Official Gazette of FBiH, Nos. 40/02 and 61/06)
Laws of Tuzla Canton
- Law on Environmental Protection (Official Gazette of TK, Nos. 06/98 and 15/00, subsequently abolished by Law on Abolishing the Law on Environmental Protection, Official Gazette of TK, No. 14/11)
- Law on Concessions (Official Gazette of TK, Nos. 5/04, 7/05, 6/11 and 1/13)
- Law on Mining (Official Gazette of TK, No.14/11)
- Law on Waste (Official Gazette of TK, No.17/00)
- Law on Waters (Official Gazette of TK, No.11/08)
- Law on Spatial Planning and Construction (Official Gazette of TK, Nos.06/11, 04/13 and 15/13)
Laws of Zenica-Doboj Canton
- Law on Environmental Protection (Official Gazette of ZDK, No.01/00)
- Law on Geological Survey (Official Gazette of ZDK, No.08/12)
- Law on Mining (Official Gazette of ZDK, No. 10/12)
- Law on Spatial Planning and Construction (Official Gazette of ZDK, No. 1/14)
- Law on Concessions (Official Gazette of ZDK, No. 5/03 – consolidated text)
- Law on Waters (Official Gazette of ZDK, No. 17/07)
International Conventions
- Convention on Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal (Basel, 1989; accession by BiH, 2001)
- Protocol on Pollutant Release and Transfer Registers (Kiev, in 2003; signature by BiH in 2003)
- Convention on Persistent Organic Pollutants (Stockholm, 2001; ratification by BiH in 2010)
- Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam in 1998; accession by BiH in 2007)
- Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (adoption in Aarhus 1998; accession by BiH in 2008)
- Protocol on Strategic Environmental Assessment (Kiev, 2003; signature by BiH in 2003)
- Convention on the Protection and Use of Trans-boundary Watercourses and International Lakes (Helsikini in 1992, amended Madrid in 2003; accession by BiH in 2009)

Name of Laws
- Convention of Environmental Impact Assessment in Trans-boundary Context (Espoo, 1991; accession by BiH in 2009)
- Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Trans-boundary Waters (Kiev, 2003; signature by BiH in 2003)
- Framework Agreement on the Sava River Basin (Kranjska Gora,2002; ratification by BiH in 2003)

Source: JET based on UNECE, the Second Environmental Performance Review of Bosnia and Herzegovina, 2011.

Some of the main laws and regulations relevant to management of environmental hotspots have been established at the level of FBiH. There are environmental standards on air and surface water; however, there is no standard for soil other than agricultural soil, and there is no standard for sediment. With respect to environment hotspots, the Law on Environmental Protection and its bylaws stipulate the responsibilities of related governmental organizations and operators as well as requirements for environmental impact assessment (EIA) and counter measures against environmental accidents. The Law on Waste Management and its bylaws stipulate classification of hazardous wastes and administrative procedures in case waste of unknown composition is found. "Federal Waste Management Plan 2012-2017" lays out the plan for establishing regional waste disposal sites. However, establishment of the further laws and/or regulations is required to legally mange environmental hotspots. The key findings of the review are as follows:

- Contaminated site is not defined in the laws in FBiH.
- There is no law specific to management of contaminated sites.
- There are no technical guidelines regarding how a site should be investigated, how a remediation goal should be set, and how a site should be remediated.
- The current legal frameworks for environmental liability have various problems (e.g., support for innocent site owners, retrospective liability, and clarification of issue of burden of proof) to effectively resolve the issues of contaminated sites.
- There is no detailed plan for the management of environmental hotspots other than the Federal Waste Management Plan 2012-2017.

3.2 Institutional Background

Organizational frameworks at the central, federal, and cantonal levels were reviewed with respect to their organizational structures and the number of staff.

The Ministry of Foreign Trade and Economic Relations (MoFTER) at the central level coordinates various international initiatives and international cooperation projects on environmental issues, including this Project. At the FBiH level, the key organizations are Federal Ministry of Environment and Tourism (FMoET) which administrates environmental issues of FBiH level, Federal Ministry of Agriculture, Water Management and Forestry (FMoAWF), Federal Ministry of Energy and Mining and Industry (FMoEMI), Federal Inspectorate which investigates enforcement of law and regulation system of environment, and there are a number of other organizations. At the cantonal level, Cantonal Ministry of Spatial Planning and Environmental Protection and Ministry of Agriculture, Forestry and Water Environment are usually in charge of environmental and water-related issues.

Major issues with respect to organizational aspects are as follows:

- Environmental authorities in FBiH are seriously understaffed both at the entity-level and the cantonal-level compared with those in European countries and Japan.
- Experts specializing in different tasks of remediation are limited. Examples of expertise that require strengthening include site investigation, risk assessment, remediation technologies, resolution of liability and other legal issues, environmental communication, and support for victims.

- Organizations in FBiH are highly fragmented, and there are problems of information sharing as well as communication among related ministries, other related organizations, and across different levels of governance (i.e., central, entity, canton, and municipality).

Chapter 4 Site Survey

Site survey was carried out at selected target sites in order to investigate the current status of typical environmental hotspots in FBiH, and in order to identify major issues for site investigation and remediation. Concentrations of hazardous substances at each site were compared with environmental standards in FBiH and other reference values. Based on the chemical analysis data, hazardous maps were prepared for the former chemical factory site and abandoned processing plants and tailing dams site in Vares where the concentration distribution of hazardous materials might be localized. Also, environmental risk for each site was assessed semi-quantitatively by the scoring system of HRS methodology (Hazard Raking System) developed by Environmental Protection Agency in United States in order to examine the relative environmental risk of each site on human health and/or the environment. Risk is evaluated with respect to four migration pathways (groundwater, surface water, soil and air). Also, remediation measures were developed to demonstrate how such measures should be designed. It should be emphasized that these activities were implemented only as pilot activities. In practice, a remediation measure should be developed and implemented by the party responsible for remediation in accordance with the laws in FBiH.

4.1 Former Chemical Factory Site in Tuzla Canton

This site is located within a former industrial complex in Tuzla Canton, which is now largely derelict. Elevated concentrations of mercury (Hg), cadmium (Cd), lead (Pb), zinc (Zn), and Polychlorinated Biphenyls (PCBs) were detected from the surface soil especially around the buildings used for industrial salt production and electrolysis. Arsenic (As) for groundwater, PCBs were detected in the monitoring well. Pictures of the site are shown in Figure 4-1.

Mercury on the ground of the electrolysis plant

Sedimentation tank for discharged water which comes from the electrolysis plant

Source: Taken by JET in September 2013

Figure 4-1 Site Photos of the Former Chemical Factory Site

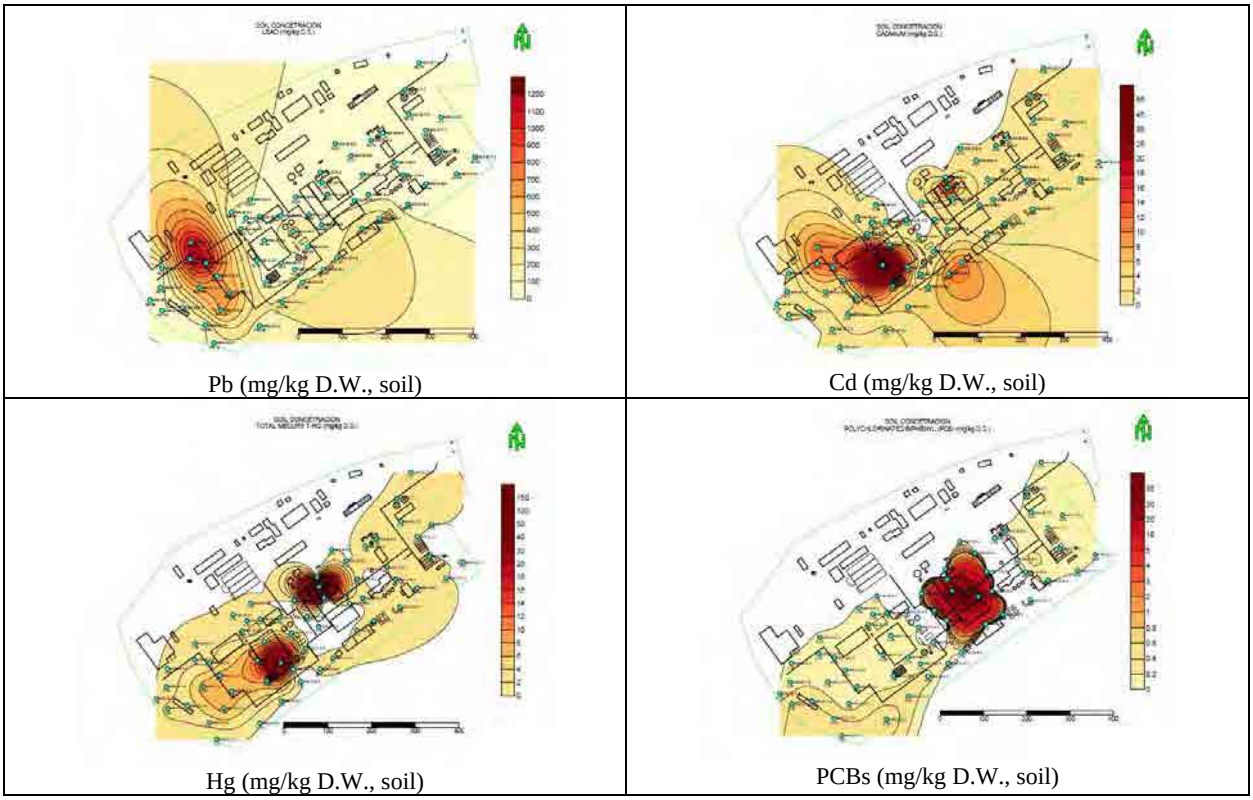
Table 4-1 below summarizes the site conditions, key results of the survey, the proposed remediation plan, and its estimated cost. The hazardous maps of this site is given in Figure 4-2. At this site, remediation of contaminated soil and groundwater is needed.

Table 4-1 Results of Site Survey at Former Chemical Factory Site

Category	Summary
Site condition	- The site is within the premises of a former polyurethane factory. In the main area, there are heavily damaged buildings and facilities. Next to the site are a metal recycling firm, other factories in operation, and a large chemical factory which recently became bankrupt. - Drops of liquid mercury on the ground and many drums that contain waste material contaminated by mercury were confirmed. - A transformer tank containing PCBs has been reportedly removed from the site.

Category	Summary
Key results of survey	Surface soil: - Hg: max. 105 mg/kg and three samples exceeded 10 mg/kg (reference value at 10 mg/kg) - Cd: max. 53 mg/kg and four samples exceeded 10 mg/kg (reference value at 10 mg/kg) - Pb: max. 1,124 mg/kg (reference value at 500 mg/kg) - Zn: 1,464-1,847 mg/kg (reference value at 1,000 mg/kg) Groundwater: - PCBs: 4.7 µg/L (intervention value in Austria at 0.1µg/L)
Proposed remediation plan	Proposed measures consist of (i) development of a detailed design for final closure, (ii) decommissioning and demolition of buildings and infrastructure, (iii) remediation of contaminated soil, (iv) remediation of groundwater, and (v) post-remediation activities. Rough estimate of remediation cost is BAM 5,296,000.

Source: JET



Pb (mg/kg D.W., soil) | Cd (mg/kg D.W., soil)

Hg (mg/kg D.W., soil) | PCBs (mg/kg D.W., soil)

Note) In this hazardous map, the concentration of un-sampled area is estimated by interpolation. Generally, when the sampling number is limited, the accuracy of equal-concentration line is low. Extension of the polluted areas, especially when far from sampling points, should be considered only as indicative and it will require being checked during future investigation.
Source: HEIS, Final Report of Sampling Survey and Analysis for the Project for Master Plan for Remediation of Hotspots in Bosnia and Herzegovina, 2014

Figure 4-2 Hazardous Maps of the Former Chemical Factory Site

4.2 Former Soda Factory Site in Tuzla Canton

This site used to be a settling pond for treating wastewater from the soda factory, and is filled with settled white sludge made largely of calcium carbonate and calcium hydroxide. Site pictures are shown in Figure 4-3.

Former disposal site of soda factory waste

White sludge waste

Source: Taken by JET in September and October 2013

Figure 4-3 Site Photos of the Former Soda Factory Site

The result of the survey showed that the concentrations of heavy metals are generally low except arsenic (As) which was higher than the reference value for soil used in this Project. Table 4-2 is a summary of the site conditions, key results of the survey, the proposed remediation plan, and its estimated cost.

Table 4-2 Results of Site Survey at Former Soda Factory Site

Category	Summary
Site condition	- In the target settling pond, the total volume of settled material is about 40,000 m^3. - It encompasses an area of about 10 ha. It was constructed as a simple flat pond with earth embankments and no specific containment barriers at the bottom. - The surface of the target site is already dry. The vegetation development on the site is poor although some calciphile plant species are visible.
Key results of survey	Sludge: - As: max. 94 mg/kg (reference value at 50 mg/kg)
Proposed remediation plan	Proposed measures consist of (i) development of a detailed design of final closure, (ii) technical recultivation with gravel and soil, and (iii) biological recultivation by revegetation. The site owner is exploring different ideas for remediation. Rough estimate of remediation cost is BAM 986,000.

Source: JET

4.3 Lake Modrac in Tuzla Canton

Lake Modrac in Tuzla Canton was formed in 1964 with the construction of a high reinforced concrete arch dam on the Spreca River in Modrac. The initial purpose of this reservoir was to supply water to industrial facilities in Tuzla and Lukavac municipalities, primarily the Tuzla Thermal Power Plant, and to enable flood protection for the settlements and agricultural areas in the Spreca River valley downstream of the dam. The lake is now an important source of drinking water for Tuzla and Lukavac municipalities. Excessive sedimentation is considered one of the most serious problems of the lake. Eutrophication and accumulation of contamination are among other issues.

The site picture is shown in Figure 4-4.

Source: Taken by JET in September 2013

Figure 4-4 Site Photo of Lake Modrac

The results of the survey showed that the heavy metal concentrations in water satisfy those for Class IV water, but the levels of Hg, chromium(Cr), and Nickel(Ni) in the sediment are somewhat high. Table 4-3 is a summary of the site condition, key results of the survey, the proposed remediation plan, and its estimated cost.

Table 4-3 Results of Site Survey at Lake Modrac

Category	Summary
Site condition	- The surface area of the lake is approximately 17.10 km² with a maximum length of 10.70 km and a maximum width of 1.60 km. - The catchment area of the lake is approximately 1.180 km^2. - The main environmental problem is suspended solids entering the lake from the Spreca and Turija rivers. - Deterioration of water quality (water transparency, DO, COD, N, P Fe, Mn, Pb, Zn, Cr, Cu, and Al) and eutrophication in some parts of the lake have been reported. - Local people do sport fishing. It has been reported that the lake is inhabited by 22 fish species.
Key results of survey	Water quality: - Slightly elevated levels of heavy metal concentrations at several sites compared with Class II water, but less than the level prescribed for Class IV water. Sediment quality: - Hg: max. 1.9 mg/kg (Probable Effect Level (PEL) in Canada 0.486 mg/kg) - Cr: max. 265 mg/kg (PEL 90 mg/kg) - Ni: max. 318 mg/kg (No PEL defined)
Proposed remediation plan	Proposed measures consist of dredging in three stages: (i) Phase I (river mouths), (ii) Phase II (littoral zone to lowest water level), and (iii) Phase III (limnetic zone). Rough estimate of remediation cost is BAM 252 million.

Source: JET

4.4 Abandoned Mining Sites in Vares, Zenica-Doboj Canton

The target sites are composed of three separate sites in Vares municipality: namely, the abandoned open-pit pond of an iron mine, the abandoned processing plant of a former lead, zinc, and barite mine, and the tailings dam used by the processing plant when it was still under operation. Site pictures of each site are shown in Figure 4-5.

Open-pit pond

Abandoned processing plant

Tailing pond and dam

Source: Taken by JET in September and October 2013

Figure 4-5 Site Photos of the Abandoned Mining Sites

Table 4-4 to Table 4-6 below summarize the site conditions, key results of the survey, the proposed remediation plan and the estimated costs for the above mentioned target sites, respectively. The rehabilitation of the tailings dam is considered as the most pressing issue because if the dam collapses, the result could be catastrophic.

Table 4-4 Results of Site Survey at Open-Pit Pond

Category	Summary
Site condition	- A 100-m deep pond was formed in the abandoned mining pit by accumulated stormwater and groundwater. The lake area is around 125,000 m^2. - After the site was abandoned, there have been no rehabilitation measures in the area. The abandoned machinery had been left in the open-pit, and was later submerged after the pond was formed. Around the pond, there are several abandoned buildings and pieces of equipment that were used during the mining operation. - The ownership of this site has not been resolved.
Key results of survey	Water quality: - The concentrations of heavy metals are somewhat high, but not higher than the background data. Sediment quality: - Concentrations of some heavy metals are higher than the Canadian PEL, but the background data had already exceeded the PEL.
Proposed remediation plan	Proposed measures consist of (i) development of a detailed design, and (ii) biological recultivation. Technical recultivation may be needed before biological recultivation. In addition, regular environmental monitoring is suggested. Rough estimate of remediation cost is BAM 321,000.

Source: JET

Table 4-5 Results of Site Survey at the Abandoned Processing Plant

Category	Summary
Site condition	- The facilities are partly or completely demolished, except for a few settling tanks that still hold water and are considered usable if needed in future production process. - Several metal barrels of the flotation agent are stocked in an open space over a small concrete platform.
Key results of survey	Surface soil: - Cd: max. 27.3 mg/kg (reference value at 10 mg/kg) - Pb: max. 3,005 mg/kg (reference value at 500 mg/kg) - Concentrations of Ni, Zn, Mn, and As were also higher than the reference values.
Proposed remediation plan	Proposed measures consist of (i) development of remediation plan, (ii) decommissioning and demolition of existing buildings, and (iii) excavation and disposal of contaminated soil. This site has been purchased by a mining company, and contaminated soil may be reprocessed if the processing plant would be rehabilitated. Rough estimate of remediation cost is BAM 845,000.

Source: JET

Table 4-6 Results of Site Survey at the Tailing Pond and Dam

Category	Summary
Site condition	- The dam was supposedly designed and constructed as a homogeneous dam, built with a 15 m high central clay core constructed and backfilled with rocks. - The crest was damaged probably by wind and water erosion. In addition to sheet erosion, traces of rill and gully erosion are also evident.
Key results of survey	Water quality: - Concentrations of Cd, Pb, Cu, and Zn exceed the surface water quality criteria in FBiH although the levels are close to the criteria. It is assumed that these concentrations were caused by naturally-occurring phenomena. Soil and sediment at the dam: - The levels of Cd, Pb, Zn, and As exceed the reference values.

Category	Summary
Proposed remediation plan	Proposed measures consist of (i) geotechnical investigation, (ii) detailed design, (iii) civil and other works, and (iv) other measures for rehabilitating the dam and constructing two interception ditches. Rough estimate of remediation cost is BAM 520,000.

Source: JET

4.5 Major Issues Identified through the Site Survey

Below are some of the issues identified through the site survey, which are similar to those identified in the review of legal and institutional background.

- Management of environmental information on contaminated sites should be improved.
- Because the pollution mechanism in and around a contaminated site is often complex, it is important to design an efficient survey plan considering the pollution mechanism.
- To ensure the quality of a remediation project, it is recommended to develop a system of quality control, such as certification and/or licensing of investigators, analytical experts and laboratories, and technical guidelines and best practice guidance on different steps of site investigation.
- Further studies on methodologies, uncertainties, and limitations of risk assessment are needed.
- In FBiH, readily available remedial technologies are limited, which make speedy remediation difficult.
- Contaminated site is not defined by the current laws in FBiH. It has to be defined in order to control contaminated sites legally.
- Although there are many regulations governing related fields in environmental management, issues of contaminated sites are different from the typical settings of such regulations. Thus, it is necessary to either develop new regulations or reframe the existing regulations in order to control contaminated sites.
- In some cases, governmental intervention should be considered.
- Funding for remediation projects seems to be limited. Funding mechanisms should be improved.
- Roles and responsibilities of stakeholders should be streamlined and mechanisms for information sharing and stakeholder involvement should be established.

Chapter 5 Draft Master Plan

Considering the issues identified through the review of legal and institutional background and the site survey, a draft master plan was developed as described below.

5.1 Goals of the Draft Master Plan

In accordance with the polluter-pays-principle, remediation of environmental hotspots in FBiH should be carried out by the party responsible for remediation. However, to make this possible, FBiH has to develop technical and regulatory systems. Also, many sites have been left abandoned for years, and environmental risks of priority sites must be controlled urgently. These tasks require efforts of trained professionals and support of other stakeholders. Hence, this draft master plan was developed to support the relevant authorities of FBiH to:

- Develop technical and regulatory framework for remediation of environmental hotspots
- Remediate some of the priority sites
- Develop capacities of environmental officers and other stakeholders.

5.2 Target Year

The target year is set as 2020.

5.3 Target Sites

The draft master plan will cover, in principle, all sites contaminated with hazardous substances, which include the following:

- Industrial sites
- Mining sites
- Waste disposal sites
- Others (such as military sites, dry cleaning shops, sites polluted with PCBs and other POPs, hazardous materials storage sites, sites with large leaking underground storage tanks).

5.4 General Framework

Figure 5-1 shows the overall framework of the draft master plan. The draft master plan consists of the following five components:

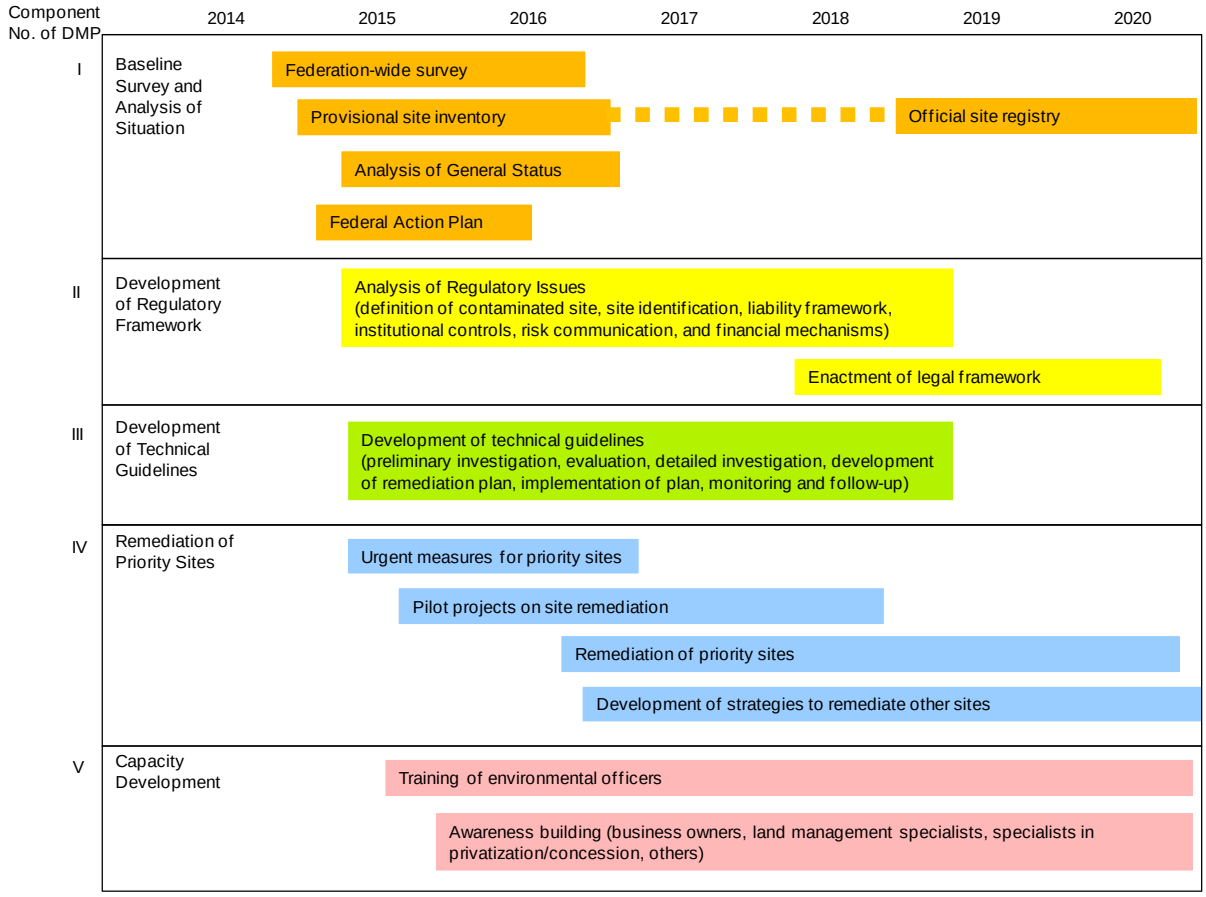
I. “Baseline survey and analysis of situation” to grasp the overall situation of contaminated sites in FBiH

II. “Development of Regulatory Framework” to establish regulatory framework to clean and remediate contaminated sites

III. “Development of Technical Guidelines” for systematic investigation, evaluation and remediation of contaminated sites

IV. “ Remediation of Priority Site” which requires immediate application

V. “Capacity Development” to implement these activities.

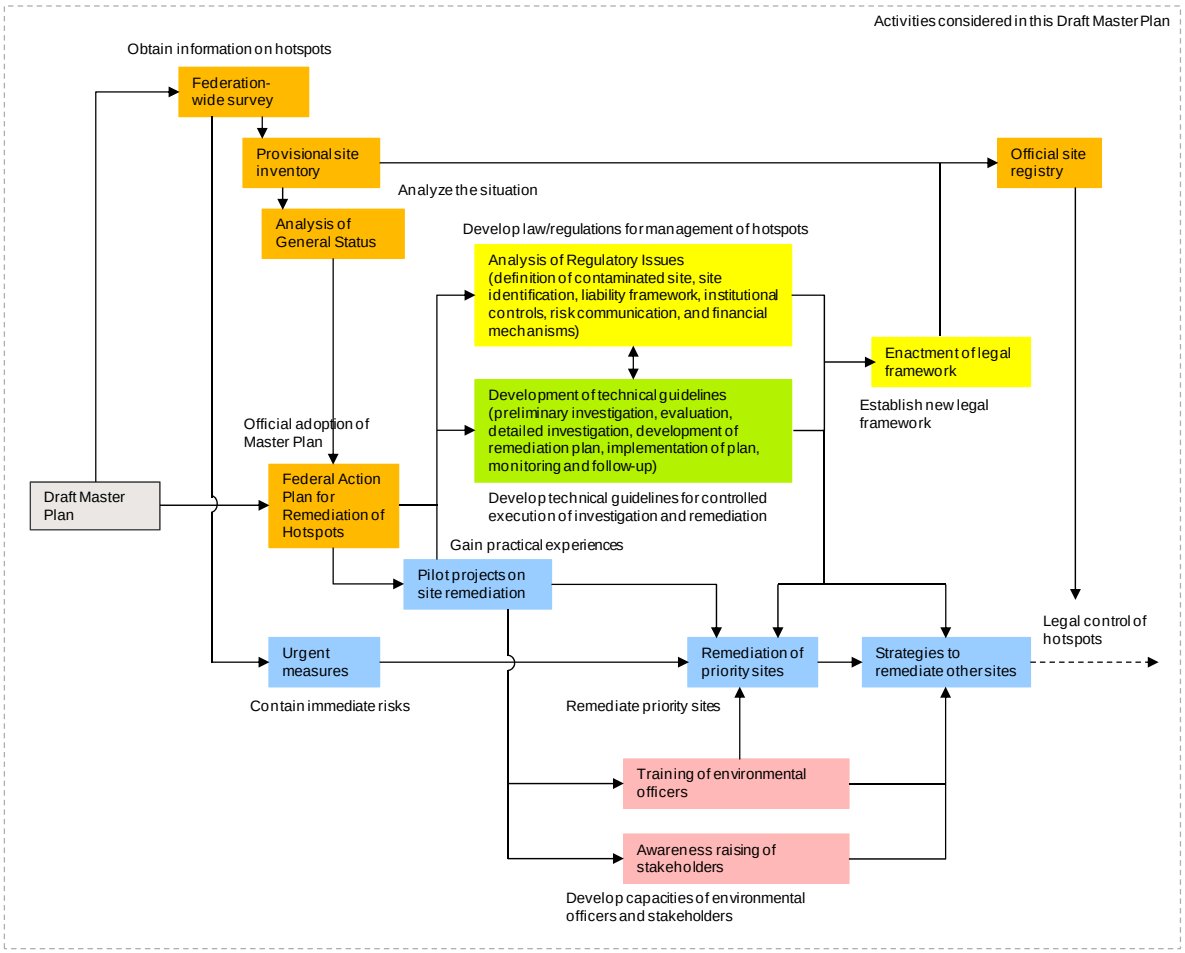


Source: JET

Figure 5-1 Overall Framework of the Draft Master Plan

5.4.1 Activities Proposed in the Draft Master Plan

Figure 5-2 summarizes how activities proposed in the draft master plan indicated in Figure 5-1 are inter-related. Each activity is then discussed in detail.



Source: JET

Figure 5-2 Activities Proposed in the Draft Master Plan

5.4.2 Baseline Survey and Analysis of Situation

This component proposes the following activities to investigate the general situation of contaminated sites in FBiH and develop an inventory/registry of contaminated sites:

- Federation-wide survey of contaminated sites
- Development of provisional site inventory and official site registry
- Analysis of general status of contaminated sites in FBiH
- Development of the Federal Action Plan for Remediation of Environmental Hotspots.

The proposed activities for baseline survey and analysis of situation are summarized in Table 5-1.

Table 5-1 Activities Related to Baseline Survey and Analysis of Situation

Category	Period	Activities
Federation-wide survey of contaminated sites	2014-2016	Broadly identify situations of potentially contaminated sites in FBiH by both questionnaire survey to environmental officers at the federation, canton, and municipality levels and basic site surveys.
Development of a provisional site inventory and an official site registry	2014-2016	Develop a provisional registry of contaminated sites by using general information collected above.
	2018-2020	After the regulatory framework is established, an official registry will be developed.

Category	Period	Activities
Analysis of general status of contaminated sites in FBiH	2014-2016	Based on the information in the provisional site inventory, the overall extent of the problems of contaminated sites in FBiH should be identified. Then priority sites that require emergency measures, policy and regulatory issues to be investigated associated with methodology for site investigation and risk assessment, approaches to risk communication and environmental liability will be identified.
Development of the Federal Action Plan for Remediation of Environmental Hotspots	2014-2015	Thoroughly review the draft master plan as well as the general status of the contaminated sites, and develop the Federal Action Plan for Remediation of Environmental Hotspots so that activities proposed in the draft master plan can be implemented officially.

Source: JET

5.4.3 Development of Regulatory Framework

This component covers analysis of the following institutional issues and subsequent development of relevant laws and bylaws:

- Definition of contaminated sites
- Site identification
- Liability framework for contaminated sites
- Institutional controls
- Risk communication and stakeholder involvement
- Financing of remediation projects
- Enactment of the legal framework

The proposed activities for development of regulatory framework are summarized in Table 5-2.

Table 5-2 Activities Related to Development of Regulatory Framework

Category	Period	Activities
Definition of Contaminated Sites	2016-2018	In order to legally control contaminated sites, define what site is considered "legally" contaminated by introducing screening values. Consider giving limited discretional power to the environmental authorities in order to accommodate the concept of risk assessment in the definition of contaminated sites.
Site Identification	2015-2017	In principle responsibility of identification of contaminated sites is taken by land owners; however, it is important to clarify exactly who should be legally responsible for site identification for different types of sites such as industrial sites, mining sites and waste disposal sites under different situation. The method of site identification, reporting procedures and registration system should be developed.
Liability Framework for Contaminated Sites	2015-2018	It is recommended to organize a team of environmental lawyers and other specialists to examine the key issues associated with liability which is not covered by current legal frameworks, such as exemption or legal support for innocent site owner for innocent site owner who did not cause pollution to the site, retrospective liability of previous site owners, and who is responsible to prove the damage caused by pollution.
Institutional Controls	2015-2018	Develop an appropriate framework for institutional controls such as land use control and water use control will be developed in order to ensure effectiveness of engineering measures and environmental safety of the site.
Risk Communication and Stakeholder's Involvement	2016-2018	Organize a team of environmental specialists and examine how to respond to typical concerns of local residents related to liability, health risk and remediation measures and how to disclosure information.
Financing of Remediation Projects	2016-2018	Financial sources for remediation include private financing, governmental budget, environmental protection fund and international cooperation. Examine how such sources may be utilized for remediation considering the polluter-pays-principle and the general legal framework of liability. Also consider when governmental intervention is appropriate, and also how to improve funding capacities.
Enactment of the Legal Framework	2018-2020	Related to the issues above, enact and/or amend associated law and regulations.

Source: JET

5.4.4 Development of Technical Guidelines

The draft master plan proposes development of technical guidelines and best practice documents for different stages of remediation so that in the future, all remediation projects can be implemented in a structured and well-controlled manner. These technical guidelines and best practice documents may be developed through the proposed pilot projects. The following stages of remediation project will be covered:

- Preliminary investigation
- Preliminary evaluation of contamination
- Detailed investigation
- Development of remediation plan
- Implementation of remediation plan
- Monitoring and follow up.

The activities related to development of the technical guidelines are summarized in Table 5-3. In addition, the checklist to manage all the site activities of contaminated sites and the references of remediation technologies are summarized and annexed to the draft master plan.

Table 5-3 Activities Related to Development of Technical Guidelines

Category	Period	Activities
Preliminary Investigation	2015-2017	In most of the sites, unevenly distributed contamination and complicated pollution mechanism make the preliminary investigation difficult. To avoid failing to detect contamination due to the limited number of samples, adopting the rigorous methodologies in other countries is desirable. However, it is very costly to densely cover a site and analyze many samples. Thus, one should understand the tradeoff between a rigorous approach that has less chance of missing contamination and a less-rigorous approach that has higher risk of not detecting contamination. To make this process structured, development of a technical guideline based on the approach of seven-step Data Quality Objectives (DQO) for hazardous waste site investigation is suggested. In addition, start mandating a conceptual site model in remediation projects in order to introduce the concept of risk assessment in near future.
Preliminary Evaluation of Contamination	2014-2017	In the draft master plan, introduction of legal definition of contaminated sites was proposed. In order to support site owners and others to analyze whether a site is legally contaminated or not, develop a technical guideline for the new legal definition of a contaminated site. Also, develop best practice guidance documents on how to evaluate results of preliminary investigation with respect to contamination source, pathway and risk to receptor.
Detailed Investigation	2015-2017	In the stage of detailed investigation, it is required to collect necessary information to design remediation plan that satisfies the remediation goal. Using the pilot projects and DQO process, review and examine practical approaches to investigation, and develop a general guideline on detailed investigation.
Development of Remediation Plan	2015-2018	In this stage, it is necessary to develop and organize standard ways for setting remediation goals and evaluate its validity, selection of appropriate remediation technology, as well as development of monitoring plan to ensure proper implementation of remediation along the plan and to confirm the completion of the plan. Thus, develop a standard format of a remediation plan, such as the standard table of contents, and key items to be described in a remediation plan on some details. This is done through the pilot projects. For selected sectors in which many remediation projects are expected, it is suggested to develop a prototype remediation plans. It is also recommended to discuss introduction of risk-based approach for the management of contaminated sites to harmonize the policy of FBiH with EU Acquis.
Implementation of Remediation Plan	2015-2018	Develop a prototype Quality Control (QC) plan in order to make sure that in the future a remediation work is implemented according to the plan, the remediation goal is achieved, and secondary contamination is prevented.
Monitoring and Follow-up	2015-2018	Develop a prototype monitoring and maintenance (M&M) plan that describes the plan of verification, timeframe, required maintenance activities, required monitoring activities, reporting, corrective actions to be taken if the result deviated from the expected behavior and removing the site from register of remediation site.

Source: JET

5.4.5 Remediation of Priority Sites

In parallel to the development of regulatory framework and technical guidelines, some priority sites in FBiH should be remediated as soon as possible. Hence, the draft master plan suggests the following activities based on the results of the Federation-wide survey:

- Urgent measures for priority sites
- Pilot projects
- Remediation of priority sites
- Development of plans for other sites.

The activities related to remediation of priority sites are summarized in Table 5-4.

Table 5-4 Activities Related to Development of Plans for Remediation

Category	Period	Activities
Urgent Measures for Priority Sites	2014-2016	In order to reduce environmental risks, land owners or regulators implement urgent measures such as prohibition of someone to enter the restricted area and placement of fences, covering of contaminated site with appropriate materials, safety measures for workers at/near the contaminated site (mask, glove, safety glasses, etc.) and stop of water intake if downstream water use is confirmed..
Pilot Project	2015-2018	In order to gain experience on implementing the entire course of site remediation, starting from preliminary investigation to final remediation at several representative sites, select the pilot project sites based on the results of Federation-wide survey and analysis of general status of contaminated sites in FBiH. It is proposed to select the following types of contaminated sites: a chemical factory site, a mining site, a former dumping site, and one more site of interest. Implement preliminary investigation, detailed investigation, risk assessment, development of remediation measures, and implementation of measures. The practical experiences gained through pilot projects could be used to develop regulatory and technical frameworks for management of contaminated sites.
Remediation of Priority Sites	2016-2020	Based on the results of the preliminary survey and analysis of general status of contaminated sites and practical experience through the pilot projects, it is suggested to begin remediation of priority sites identified as part of the activity of analysis of general status of contaminated sites in FBiH. Follow the standard processes for site remediation specified in the technical guidelines to be developed.
Development of Plans for Remediation of Other Sites	2016-2020	Plans for remediation of other sites are developed based on experiences gained through implementation of urgent measures, the pilot activities, remediation of priority sites, among others. Remediation of large number of waste disposal sites should be implemented in a systematic manner within the same program based on the Federal Strategies for Waste Management 2012-2017. Many industrial sites are privately owned and the remediation should be implemented under the responsibility of land owners. Some sites in urban area or urban fringe might have a potential to be redeveloped as a commercial or industrial complex. For the mining sector, it is suggested that the Federal Ministry for Energy, Mining and Industry works closely with FMoET, and provide general guidance to mining companies as well as local environmental authorities.

Source: JET

5.4.6 Capacity Development

Remediation of contaminated sites requires the efforts of many stakeholders, and the following capacity development activities are included in the draft master plan:

- Capacity development of environmental officers
- Awareness building of stakeholders.

The activities for capacity development are summarized in Table 5-5.

Table 5-5 Activities Related to Capacity Development

Category	Period	Activities
Capacity Development of Environmental Officers	2015-2020	At least two types of programs should be developed considering the needs of different groups of environmental officers, as follows: General program: This is for a wide range of environmental officers to become familiar with different stages of site remediation, such as site investigation, risk assessment, development of remediation plan, implementation and monitoring. This program may be implemented within the pilot projects. Specific programs: These are programs tailored for specific needs of policy makers, permit issuers, environmental inspectors, and others. These should be given as parts of the proposed activities of development of regulatory framework.
Raising Awareness of Stakeholders	2015-2020	Different types of programs should be developed considering the needs of different stakeholders using different types of media to reach out to stakeholders, such as administrative guidance, guidebooks, brochures, and websites.

Source: JET

Chapter 6 Social and Environmental Considerations

The potential environmental and social issues that might arise from implementation of the draft master plan were identified and the safeguard measures to be built into the draft master plan were suggested, although this Project is classified as Category C in JICA Guideline for Environmental and Social Consideration (April, 2004) (hereinafter referred to as JICA Guideline) because it is likely to have minimal or little adverse impacts. This task was done based on the JICA guideline, and not based on Law on Environmental Protection (Official Gazette of FBiH, Nos.33/03 and 38/09) or other relevant law in FBiH, or requirement of Protocol on Strategic Environmental Assessment (Kiev , 2003).

Since the draft master plan is a kind of guiding document for policy development, and it does not make any specific site level project or activity, the concept of Strategic Environmental Assessment (SEA), which is applied at the stage of policy, plan and program, was applied to this Project rather than a project-level EIA (Environmental Impact Assessment) in order to avoid or mitigate any adverse social and environmental impact caused by the draft master plan and derived projects.

As a part of SEA study, a stakeholder meeting was organized on 18 March 2014 in Sarajevo in order to present the draft master plan and exchange opinions about the various aspects of the draft master plan.

6.1 Major Environmental and Social Issues

The draft master plan is composed of more than 20 activities in total under the five components as mentioned in the previous chapter. Therefore a variety of impacts or issues which might be caused from those activities is expected. Likely environmental and social issues, both positive and negative, were identified for each component of the draft master plan. The following activities were considered the most important as they represent the key actions for hotspot remediation which might cause substantial impacts.

- Preliminary (Federation-wide) survey of contaminated sites and development of provisional site inventory and official site registry
- A series of activities for development of regulatory framework and technical guidelines
- All the site investigation and remediation activities for the pilot project, priorities sites and the other sites.

The following table lists only major negative issues for each category of activities above as a result of the review of environmental and social background, review of legal and institutional framework and review of draft master plan.

Table 6-1 Identification of Major Environmental and Social Issues

No.	Possible Negative Impact
Development of a provisional site inventory and an official site registry	
1	Anxiety and panic within the local communities or the general public after the revelation of a seriously contaminated site or/and environmental issue
2	Decrease in the asset value of neighboring land plots/structures
3	Serious damage to the image of the polluting company
Development of regulatory framework and development of technical guidelines	
4	The requirement of investigation and remediation is too strict for compliance.
5	The investigation cost is too expensive in compliance with the new regulation and technical guideline.
6	The remediation cost will be very expensive due to the new legal requirement that remediation will not be promoted.
7	The task of administration (related federal and cantonal government and agencies) will increase.
8	After many sites have been defined as “contaminated site”, brownfields in FBiH might increase. Economic and land development might be inhibited. Note: If the land owner cannot pay for the remediation cost and if the remediation cost is higher than the land

No.	Possible Negative Impact
	price, the land cannot be sold and the land owner would leave the contaminated site not remediated. This issue is called as "brownfield issue".
9	The number of litigation cases will increase.
Site investigation and remediation activities	
10	Hazardous waste will increase, while there is no place for the treatment of contaminated soil or waste in FBiH.
11	Soil and groundwater contamination during the site survey including sampling and remediation activities. e.g. The construction of a monitoring well might unexpectedly contaminate groundwater.
12	Hazardous work environment including work safety during the site survey, sampling activities, and remediation.
13	During the remediation activities, the following might occur: - Air pollution such as soil dust, exhaust gases, and asbestos fibres in the air due to earthworks, construction works, vehicle, etc.; - Surface water pollution due to suspended solids or discharged material containing potentially hazardous chemicals; - Noise and vibration due to construction works and vehicles; and - Offensive odour.
14	Natural environment (sensitive and protected flora and fauna and hydrological situation) near or downstream of a hotspot might be harmed as a result of any kind of negative impact caused by remediation activities
15	Other kinds of social problem might arise at the regional community. For example: - Land acquisition due to temporary expropriation for construction works might be necessary; - Vulnerable groups tend to be more affected by negative impacts; - Conflict of local interest about land use, etc. might arise; - Living environment of residents might be harmed as a result of any kind of negative impact mentioned above; and - Historical and cultural heritage near the target site might be damaged.

Source: JET

6.2 Mitigation Measures

With respect to the identified negative impacts, the mitigation measures were proposed with the aim to eliminate or reduce the negative impacts to the greatest extent possible. Most of the negative impacts caused by site investigation and remediation activities will be minimized by the existing framework of environmental impact assessment which is currently adopted for the remediation works. Therefore, the institutional and legal measure to mitigate the negative impact to the site neighbors and site workers shall be emphasized in SEA. To ensure those consideration sufficiently, the stakeholder engagement plan needs to be prepared to have enough opportunities to reflect their opinions.

6.3 Stakeholder Engagement Plan

The draft stakeholder engagement plan includes arrangements for consulting the relevant stakeholders for different steps of the draft master plan implementation. Special attention needs to be given to affected vulnerable groups and local residents and communities. The draft stakeholder engagement plan was prepared on the basis of both the existing required procedures in FBiH as well as recommended disclosure procedures.

The activities which require the stakeholder involvement related to the draft master plan are basically categorized as follows:

a) Process of development of regulatory framework and technical guidelines

b) Information-sharing of the result of Federation-wide survey and site inventory/registry

c) A series of activities of the investigation and remediation for each environmental hotspots

Regarding item a), there are opportunities for holding a public hearing when the new environmental laws and bylaws are prepared in accordance with the current procedures. At the public hearing, the opinion of citizens, interested bodies, scientific and expert institutions of the draft law or bylaw will be collected. Also, the SEA for those policies and programs will be is used to ensure the stakeholder engagement for each related plan, program and strategy when they are developed. Although these chances of stakeholder involvement will be secured by the existing regulations, it is important to have

the cross-sectoral consulting to develop the feasible output considering the relevance with the other areas of framework, financial and technical problems, assignment of human resources and so on because the hotspots issues generally involve more sectors and government than other types of issues.

The item of b) listed above is related to the information disclosure on the contaminated site. It should be developed carefully and appropriately since those information could have a great impact on public reaction, the market value of related areas and government administration. The breadth and depth of disclosed information and its means should be examined.

The whole process of individual site investigation and remediation indicated in item c) above will be covered by the existing procedure of EIA in most cases. Since their activities are directly involved with the interest and/or conflict of site neighbors, community involvement in its early stages is very important. The key responsible party would be the land owner or polluter which is in charge of the management of hotspots. They need to have interactive communication and efforts to establish a good relationship with the local residents in order to proceed with site remediation. The significant point to be emphasized is that not only the risk information but also the information which the site neighbors need to know should be shared. The responsible authorities should lead the formation of the community involvement by technical guideline or administrative guidance.

The suggested adverse impacts and their countermeasures including the stakeholder engagement and information disclosure were reflected into the draft master plan.

Chapter 7 Lessons Learned and Recommendations

7.1 Lessons Learned

7.1.1 Project Period

The project period in BiH (July 2013–April 2014) was very short, and the actual project activities started in late September 2013. This left the team with only four months to review the regulatory and organizational systems, implement the site survey, and develop the draft master plan. Despite the tight schedule, all activities of the Project were implemented due to the active participation of the counterpart members. Considering that a lot of time and effort have been put into the development of the Project, and considering that the Project has just started producing various useful results together with the active involvement of many stakeholders, it is unfortunate that this Project has to end. The BiH side is strongly encouraged to continue the efforts initiated by the Project and improve the management of contaminated sites.

7.1.2 Legacy Pollution as Main Focus of the Project

The main focus of the Project is the remediation of legacy pollution sites where polluters liable for site remediation no longer exist and government-led initiatives are required. However, through the period of joint ownership and privatization, many high priority sites in FBiH are now owned by private companies. Under the current liability regime, these current site owners have the primary responsibility to remediate their site, and it is difficult to define legacy pollution. Recognizing this complexity, the draft master plan developed in this Project covers a much wider scope than originally envisioned.

7.1.3 Remediation of Contaminated Site

The Project investigated and developed remediation plans for four environmental hotspots in FBiH. Through these activities, various practical experiences and knowledge were gained. If further efforts were made to actually remediate some sites through the Project, it would probably be possible to gain even more experiences and contribute more to the remediation of environmental hotspots in FBiH. It was difficult to conduct in this Project because remediation should be done by the party responsible for remediation (e.g., site owner) in accordance with the laws in FBiH, and a donor cannot assume responsibility for such actions. Nevertheless, all key members are now onboard to coordinate activities, discuss issues with responsible parties, and realize remediation. It is hoped that the BiH side will take up the challenges of actually remediating priority sites as envisioned in the draft master plan.

7.2 Recommendations

7.2.1 Adoption of the Draft Master Plan

The BiH side is strongly recommended to thoroughly review the draft master plan, and adopt the proposed activities in order to improve the management of environmental hotspots. Issues of environmental hotspots are likely to have significant impacts on society because many people could potentially become liable, and the real estate market could be influenced by how contaminated sites are regulated. This is well-known from the experiences in Japan, the US, and many European countries where the legal definition of a contaminated site, liability framework, site registration and information disclosure, and support mechanisms for innocent site owner, are among the issues that could affect a large number of people. Because the site remediation could affect many stakeholders, proper investigation, setting of an appropriate remediation goal, as well as high-level of quality control during site remediation that will also be important. All of these components are covered in the draft master plan.

7.2.2 Securing Enough Administrative Resources to Fulfill Legal Responsibilities

As discussed in Chapter 3, the number of environmental officers in FBiH is surprisingly small considering the work load required to manage environmental issues. Many cantons have only a few environmental officers and only one environmental inspector. The entity level-organizations share the same problem. This could make the management of environmental hotspots difficult. Because disputes over environmental hotspots, such as on those who polluted the site or who should pay for remediation, are often escalated into environmental litigation, environmental authorities should be prepared to deal with such issues. Each government should review their legal competency again, and secure sufficient staff and budget to fulfill its responsibilities and to support victims, site owners and other stakeholders involved in issues of environmental hotspots.

7.2.3 Technical Committee and Unit of Technical Specialist

Remediation of environmental hotspots requires concerted effort of many organizations, which is one of the key factors for a successful remediation. The Technical Committee organized in this Project is a perfect arena to discuss issues that require coordination among different organizations, since nearly 40 people from key organizations are represented. The FBiH side is urged to continue its activities in the future. Also, remediation of environmental hotspots requires expertise in the various fields of environmental engineering, civil engineering, analytical chemistry, toxicology, hydrology, law, social science, etc. Most environmental authorities in FBiH are very much understaffed, and it is not easy to mobilize a large number of experts who can deal with highly technical issues in different disciplines. Hence, instead of dealing with the issues one by one by different organizations in an uncoordinated manner, it is better to organize ad-hoc units of capable technical specialists from academics, consulting companies, and waste management companies, and call them in whenever problems of environmental hotspots arise. After working on several cases, they will become highly experienced experts who can provide good technical services. Meanwhile, environmental officers should build broader knowledge and experiences in dealing with different aspects of hotspot management.

7.2.4 Creating More Opportunities

The Project provided valuable opportunities to learn from real activities of site investigation and development of remediation measures. To provide further opportunities for learning, the draft master plan proposed the implementation of pilot projects which will be used to identify practical issues important for developing a regulatory framework, technical guidelines and best practice documents. The FBiH side can easily create similar opportunities. For example, remediation projects supported by the Environmental Protection Fund of FBiH are good candidates. Every opportunity should be used not only to remediate sites but also to learn and improve the ways of managing environmental hotspots. Of course, implementing more international projects and sharing experiences with neighboring countries are highly recommended.

7.2.5 Exploring Possible Opportunities in Problems

This Project has focused on how to control and remediate environmental hotspots in FBiH in order to protect people and the environment from negative impacts. Because many priority environmental hotspots in FBiH have been left unattended, remediation of these sites are absolutely necessary and have to be done urgently. However, site remediation is often very expensive, and often requires further support and stimulation for it to be realized. This is why the issue of remediation should be seen from a wider perspective. For example, some sites have high economic potential if they are cleaned up; thus, site remediation may be pursued within a local redevelopment project. Similarly, waste material from a contaminated site might have some economic value, or at least can be used in beneficial ways. Hazardous substances may be sold if there is an appropriate technology to recover them. A low-risk waste material could be used on-site in the remediation project, or as construction material if it is used in a controlled manner. Such approaches have become very important in Japan, the US, and many

European countries where numerous contaminated sites have to be remediated. FBiH should explore many ways to turn the problem of environmental hotspots into an opportunity.

Attachments

Attachment 1: Project Implementation Structure

Attachment 2: Photos

Attachment 1: Project Implementation Structure

A 1.1 Steering Committee (ST/C)

The members of the ST/C are listed in below.

Table A 1.1-1 List of Steering Committee Members

No.	Name	Title	Name of Organization	Note
Members of Bosnia and Herzegovina Side				
1	Ms. Nermina Skejovic Huric	Senior Advisor for Programs and Projects	Ministry of Foreign Trade and Economic Relations (MoFTER)	-
2	Mr. Admir Softic	Advisor – Head of Deputy Minister Cabinet	Ministry of Foreign Trade and Economic Relations (MoFTER)	-
3	Mr. Mladen Rudez	Assistant Minister	Federal Ministry of Environment and Tourism (FMoET)	-
4	Mr. Mehmed Cero	Assistant Minister	Federal Ministry of Environment and Tourism (FMoET)	-
5	Ms. Fadila Muftic	Official	Federal Ministry of Environment and Tourism (FMoET)	-
6	Mr. Armin Djuliman	Advisor	Federal Ministry of Energy, Mining and Industry (FMoEMI)	-
7	Ms. Mirela Uljic	Head of Department of Water Management	Ministry of Agriculture, Forestry and Water management, Tuzla Canton	-
8	Mr. Goran Misic	Assistant Minister	Ministry for Spatial Planning and Protection of Environment of Tuzla Canton	-
9	Mr. Nedzad Alic	Chief of Lab for Geology and Civil Engineering	Faculty of Mining, Geology and Civil Engineering, University of Tuzla	-
10	Mr. Edin Terzic	Minister	Ministry of Spatial Planning, Transport and Communication and Environment of Zenica-Doboj Canton	Until February 2014
11	Mr. Sead Cizmic	Assistant Minister	Ministry of Spatial Planning, Transport and Communication and Environment of Zenica-Doboj Canton	-
12	Mr. Brano Surkic	Expert Associate for Economic Development	Vares Municipality	-
13	Ms. Kemal Kurevic	Chief Advisor for Communal Works	Tuzla Municipality	-
14	Mr. Jozo Tunjic	Chief Advisor	Lukavac Municipality	-
15	Mr. Nedim Mujkic	Coordinator for Infrastructure Works	Lukavac Municipality	-
Members of Japanese Side				
16	Mr. Toshiya Abe	Resident Representative	JICA Balkan Office	-
17	Mr. Itaru Okuda	Team Leader /Environmental Management	JICA Expert Team	-
18	Mr. Hisamitsu Ohki	Hazardous Waste Management	JICA Expert Team	-
19	Ms. Masako Teramoto	Soil Pollution Control /Pollution Risk Analysis	JICA Expert Team	-
20	Ms. Tomoe Takeda	Environmental Pollution Survey /SEA/Coordinator	JICA Expert Team	-

Source: JET

A 1.2 Technical Committee (T/C)

The members of the T/C are listed in below.

Table A 1.2-1 List of Technical Committee Members

No.	Name	Title	Name of Organization	Note
1	Ms. Nermina Skejovic Huric	Senior Advisor for Programs and Projects	Ministry of Foreign Trade and Economic Relations (MoFTER)	-
2	Mr. Admir Softic	Advisor – Head of Deputy Minister Cabinet	Ministry of Foreign Trade and Economic Relations (MoFTER)	-
3	Mr. Mehmed Cero	Assistant Minister, Environment Sector	Federal Ministry of Environment and Tourism (FMoET)	-
4	Mr. Dragan Sulovic	Advisor to the Minister for the Environment	Federal Ministry of Environment and Tourism (FMoET)	-
5	Mr. Mladen Rudez	Assistant Minister, Sector of Environmental Licenses	Federal Ministry of Environment and Tourism (FMoET)	-
6	Ms. Fadila Muftic	Official, Environment Sector	Federal Ministry of Environment and Tourism (FMoET)	-
7	Ms. Suada Numic	Expert Advisor	Federal Ministry of Environment and Tourism (FMoET)	-
8	Mr. Josip Dolusic	Advisor to the Minister for the Environment	Federal Ministry of Environment and Tourism (FMoET)	-
9	Mr. Armin Djuliman	Expert Advisor on Energy Facilities	Federal Ministry of Energy, Mining and Industry	-
10	Mr. Sedin Alispahic	Geologist	Federal Ministry of Energy, Mining and Industry	-
11	Mr. Stjepan Mijac	Head of Mining Department	Federal Ministry of Energy, Mining and Industry	-
12	Ms. Azra Slijepcevic	Advisor in Mining Department	Federal Ministry of Energy, Mining and Industry	-
13	Ms. Redzic Zijada	Expert Advisor for Water Protection	Federal Ministry of Agriculture, Forestry and Water management	-
14	Mr. Salih Krnjic	Advisor to Director for Technical Issues	Agency for Sava River Watershed	-
15	Mr. Enes Alagic	Advisor to Director for Technical Issues	Agency for Sava River Watershed	-
16	Ms. Mirela Uljic	Head of Water Management Department	Ministry of Agriculture, Forestry and Water management, Tuzla Canton	-
17	Ms. Anto Bosankic	Advisor	Ministry of Spatial Planning and Environmental Protection, Tuzla Canton	-
18	Mr. Goran Misic	Assistant to the Minister for the Environment	Ministry of Spatial Planning and Environmental Protection, Tuzla Canton	-
19	Mr. Bojan Bosnjak	Minister	Ministry of Agriculture, Forestry and Water management, Zenica-Doboj Canton	Until February 2014
20	Ms. Branka Pavlic	Expert Advisor for Agriculture	Ministry of Agriculture, Forestry and Water management, Zenica-Doboj Canton	-
21	Ms. Senada Malicbegovic	Expert Advisor for Water-Management Affairs	Ministry of Agriculture, Forestry and Water management, Zenica-Doboj Canton	-
22	Mr. Edin Terzic	Minister	Ministry of Spatial Planning and Environmental Protection, Zenica-Doboj Canton	Until February 2014
23	Mr. Cizmic Sead	Assistant Minister	Ministry of Spatial Planning and Environmental Protection, Zenica-Doboj Canton	-
24	Ms. Amra Pojskic	Expert Advisor	Ministry of Spatial Planning and Environmental Protection, Zenica-Doboj Canton	-
25	Mr. Brano Surkic	Expert Associate for Economic Development	Vares Municipality	-
26	Mr. Kemal Gutic	Faculty Dean	Faculty of Mining, Geology and Civil	-

No.	Name	Title	Name of Organization	Note
			Engineering, University of Tuzla	
27	Mr. Nedzad Alic	Chief of Lab for Geology and Civil Engineering	Faculty of Mining, Geology and Civil Engineering, University of Tuzla	-
28	Mr. Zoran Ilickovic	Vice Dean for Science	Faculty of Technology, University of Tuzla	-
29	Mr. Franc Andrejas	Associate Professor	Faculty of Technology, University of Tuzla	-
30	Mr. Ibro Kulin	Environmental sector	Federal Inspectorate	-
31	Mr. Omer Causevic	From Environmental sector	Federal Inspectorate	-
32	Mr. Ferid Osmanovic	From Mining sector	Federal Inspectorate	-
33	Mr. Muamer Hajdarevic	Environmental Inspector, Tuzla Canton	Cantonal Inspectorate for Tuzla Canton	-
34	Ms. Elvedina Delic	Environmental Inspector, Zenica-Doboj Canton	Cantonal Inspectorate for Zenica-Doboj Canton	-
35	Mr. Toni Nikolić	Federal Office for Geology	Federal geological Survey	-
36	Mr. Sanja Pandur Bosiljcic	Head of Department for the preparation and monitoring of the project implementation	Environmental Protection Fund	-

Source: JET

A 1.3 Assignment Schedule

Table A 1.3-1 summarizes the assignment schedules of the experts in BiH and in Japan.

Table A 1.3-1 Assignment Schedule of the JICA Expert Team

	No.	Position	Name	2013											
				6	7	8	9	10	11	12	1	2	3	4	5
Assignment in BiH	1	Team Leader/Environmental Management	Itaru OKUDA		■		■	■	■		■	■	■	■	
	2	Hazardous Waste Management	Hisamitsu OHKI		■			■	■		■	■		■	
	3	Soil Pollution Control/Pollution Risk Analysis	Masako TERAMOTO				■	■	■		■	■		■	
	4	Environmental Pollution Survey /SEA/Coordinator	Tomoe TAKEDA		■		■	■				■	■	■	
Assignment in Japan	1	Team Leader/Environmental Management	Itaru OKUDA	□										□	□
	2	Hazardous Waste Management	Hisamitsu OHKI	□											
■ : Assignment in BiH □ : Assignment in Japan			Report	△ Ic/R									△ DFR		△ FR
			S/C, T/C, SM, S				○ S/C		○ T/C			○ T/C	○ SM	○○ S/CS	

S/C: Steering Committee, T/C:Technical Committee, SM: Stakeholder Meeting, S:Seminer
IC/R: Inception Report, DF/R: Draft Final Report, F/R:Final Report

Source: JET

Attachment 2: Photos

	
1st Steering committee (Sarajevo, 20 September 2013)	Sampling survey (Former chemical factory site, Tuzla Canton, 21 October 2013)
	
Sampling survey (Former soda factory site, Tuzla Canton, 21 October 2013)	Sampling survey (Lake Modrac, Tuzla Canton, 22 October 2013)
	
Sampling survey (Abandoned mining sites, Zenica-Doboj Canton, 24 October 2013)	1st Technical committee (Sarajevo, 14 November 2013)

2nd Technical committee
(Sarajevo, 25 February 2014)

Stakeholder meeting
(Sarajevo, 18 March 2014)

Final seminar and 2nd Steering committee
(Sarajevo, 23 May 2014)

Source: JET