



United Nations Environment Programme (UNEP)
Balkans Task Force (BTF)

FEASIBILITY STUDY

PROJECT PROPOSALS AND DESCRIPTIONS

PANCEVO



FEASIBILITY STUDIES

PROJECT PROPOSAL – SUMMARY SHEET

City:	Pancevo
Location:	Petrochemical Plant
Problem definition:	Soil and groundwater contamination caused by leakage of 2,100 tonnes of 1,2-dichloroethane (EDC) into the soil and the wastewater canal due to the conflict. EDC is toxic to both terrestrial and aquatic life. Very high concentrations of EDC have been detected in the soil and groundwater at the VCM plant, but the extent of the contamination is not known.
Project title (PA.1):	EDC-contamination (1st step). Delimitation of the pollution and evaluating remediation techniques.
Proposed approach:	Additional sampling and analyses of soil and groundwater using mobile on-site screening combined with traditional drilling. This proposed project is a requirement for the following other proposed projects: <ul style="list-style-type: none">▪ EDC-contamination (2nd step): Remediation of EDC contaminated soil at VCM-plant to prevent further contamination of the groundwater.▪ EDC-contamination (3rd step): Remediation of EDC contaminated groundwater to prevent contamination of the Danube River and private wells.
Duration of work:	<i>3 months</i>
Priority:	1

FEASIBILITY STUDIES

PROJECT PROPOSAL – SUMMARY SHEET

City: Pancevo

Location: Petrochemical Plant

Problem definition: Soil and groundwater contamination caused by leakage of 2,100 tonnes of 1,2-dichloroethane (EDC) into the soil and wastewater canal due to the conflict. EDC is toxic to both terrestrial and aquatic life. High concentrations of EDC have been detected in the soil around the VCM-plant. As EDC is heavier than water, it will move downward through the soil and contaminate the groundwater.

Project title (PA.2): **EDC-contamination (2nd step): Remediation of EDC contaminated soil at the VCM-plant to prevent further contamination of the groundwater**

Proposed approach: In-situ remediation of the EDC contaminated soil.
This proposed programme is a continuation of the following other proposed project:
EDC-contamination (1st step): Additional investigations and sampling to delimit the area and depth influenced by the EDC-spill.

Duration of work: 30 months (approximately)

Priority: 1

FEASIBILITY STUDIES

PROJECT PROPOSAL – SUMMARY SHEET

City:	Pancevo
Location:	Petrochemical Plant
Problem definition:	Soil and groundwater contamination caused by leakage of 2,100 tonnes of 1,2-dichloroethane (EDC) into the soil and the wastewater canal due to the conflict. EDC is toxic to both terrestrial and aquatic life. Very high concentrations of EDC have been detected in the groundwater at the VCM plant.
Project title (PA.3):	EDC-contamination (3rd step): Remediation of EDC contaminated groundwater to prevent contamination of the Danube River and private wells. (Remediation of EDC contaminated groundwater)
Proposed approach:	In-situ remediation of the EDC contaminated groundwater. This proposed programme is a continuation of the following other proposed projects: -EDC-contamination (1 st step): Additional investigations and sampling to delimit the area influenced by the EDC-spill. -EDC-contamination (2 nd step): Remediation of EDC contaminated soil at the VCM-plant to prevent further contamination of the groundwater.
Duration of work:	<i>30 months (approximately)</i>
Priority:	1

FEASIBILITY STUDIES

PROJECT PROPOSAL – SUMMARY SHEET

City: Pancevo

Location: Petrochemical Plant

Problem definition: Soil and groundwater contamination caused by leakage of 2,100 tonnes of 1,2-dichloroethane (EDC) into the soil and wastewater canal due to the conflict. EDC is toxic to both terrestrial and aquatic life. Very high concentrations of EDC have been detected in the soil and the groundwater at the VCM plant, but the extent of the contamination is not known at present. To determine the potential risks from EDC contamination at the petrochemical plant, a monitoring programme is required.

Project title (PA.4): Groundwater monitoring programme on the petrochemical plant to determine short and long term effects of the EDC spill on the groundwater resources. (Groundwater monitoring programme on site)

Proposed approach: Establishment of a monitoring programme for the groundwater resources at the petrochemical plant. Sampling and analyses of groundwater.

Duration of work: 30 months (approximately)

Priority: 1



FEASIBILITY STUDIES

PROJECT PROPOSAL – SUMMARY SHEET

City:	Pancevo
Location:	Pancevo petrochemical plant (HIP PetroHemija)
Problem definition:	Soil contamination with mercury threatens ground and drinking water quality, and the health of petrochemical plant workers. Groundwater remediation with regard to mercury is hardly successful, if contaminated soil acts as a permanent pollutant source.
Project title (PA.5):	Remediation of highly contaminated soil (mercury contamination)
Proposed approach:	I) Delimitation of the pollution and evaluation of suitable remediation techniques <ul style="list-style-type: none">• Detailed mapping of soil contamination• Evaluation of several possible technologies II) Remediation of contaminated soil <ul style="list-style-type: none">• Excavation of seriously contaminated soil• Soil treatment by chemical or mechanical means• Refilling of excavated areas
Duration of work:	8-18 months
Priority:	1 and 2

FEASIBILITY STUDIES

PROJECT PROPOSAL – SUMMARY SHEET

City:	Pancevo
Location:	HIP-PetroHemija Petrochemical Factory: Waste water treatment plant
Problem definition:	The waste water treatment plant is out of operation because of serious oil-contamination. Vital process-units and equipment are damaged and have to be exchanged, repaired or cleaned. At present, untreated waste water is discharged directly into the Pancevo canal, threatening downstream drinking water supplies and aquatic life
Project title (PA.6):	Cleaning and repair of the wastewater treatment plant
Proposed approach:	<ul style="list-style-type: none">• Planning and design• Cleaning and repair of concrete structures• Cleaning and revitalisation of the biological trickling filter• Repair and replacement of process equipment
Duration of work:	4-6 months
Priority:	1

FEASIBILITY STUDIES

PROJECT PROPOSAL – SUMMARY SHEET

City:	Pancevo
Location:	Pancevo petrochemical plant
Problem definition:	Outside the fence of the petrochemical factory, next to the wastewater treatment plant, there is a sludge dump basin, which normally receives sludge from the waste water treatment plant. The dump, which is located in a swampy area about 1 km from the Danube, has no bottom lining. Free phase EDC, and high concentrations of mercury and oil constituents, most likely originating from the conflict, were found in this dump. Surface water in the swampy area around the dump was contaminated with mercury and EDC. There is a risk of leakage, so that EDC, mercury, and oil constituents would contaminate the ground and surface water outside the dump (including Danube).
Project title (PA.7):	Assessment of safety of the sludge dump, recommendations for action and monitoring programme
Proposed approach:	<ul style="list-style-type: none">▪ Geotechnical investigations of the bottom and the dam▪ Sampling and analysis of the sludge.▪ Ground water monitoring programme▪ Planning of actions
Duration of work:	6 months + 2 years monitoring
Priority:	2

FEASIBILITY STUDIES

PROJECT PROPOSAL – SUMMARY SHEET

City:	Pancevo
Location:	NIS Oil Refinery
Problem definition:	Soil contamination with oil and oil products threatens health of refinery workers. Leaching of soil contaminants will pollute ground water below the refinery, which can affect drinking water supplies in nearby villages. Groundwater remediation with regard to oil constituents is hardly successful, if contaminated soil acts as a permanent pollutant source.
Project title (PA.8):	Remediation of highly contaminated soil
Proposed approach:	<ul style="list-style-type: none">□ Detailed mapping of soil contamination□ Excavation of seriously contaminated soil□ Soil remediation using thermal treatment for highly contaminated soil, and microbiological treatment (biopiles) for less contaminated soil.□ Refilling of excavated areas
Duration of work:	2 years
Priority:	1 - 3

FEASIBILITY STUDIES

PROJECT PROPOSAL – SUMMARY SHEET

City:	Pancevo
Location:	NIS Oil Refinery.
Problem definition:	Due to the damage of storage tanks and oil pipe lines during the conflict, large quantities of crude oil and oil products leaked into the soil at the oil refinery. This contamination is creating a potential health risk to the workers of the oil refinery due to evaporation of volatile hydrocarbons to the atmosphere. There is also a potential risk that this contamination, via the groundwater, will reach and contaminate private wells south of the refinery. Groundwater contamination by oil products is at present mainly taking place due to the presence of free phase oil on the groundwater table.
Project title (PA.9):	Remediation of free phase oil on the groundwater table.
Proposed approach:	<ul style="list-style-type: none">- Additional sampling and delimitation.- In-situ test.- In-situ remediation.
Duration of work:	30 months (approximately)
Priority:	1

FEASIBILITY STUDIES

PROJECT PROPOSAL – SUMMARY SHEET

City:	Pancevo
Location:	NIS Oil Refinery.
Problem definition:	Due to the damage of storage tanks and pipe lines during the conflict, large quantities of crude oil and oil products leaked into the soil at the oil refinery. This contamination is creating a potential risk to the workers of the oil refinery due to evaporation of volatile hydrocarbons to the atmosphere. There is also a potential risk that this contamination will reach and contaminate private wells south of the refinery. To determine the potential risk from the oil contamination of the oil refinery, a monitoring program is required.
Project title (PA.10):	Groundwater monitoring programme on the oil refinery to determine short and long-term effects of the oil spills on the groundwater resources (and proposed remediation). (Monitoring programme on the refinery)
Proposed approach:	Establishment of monitoring programme for the groundwater resources at the oil refinery. Sampling and analyses of groundwater.
Duration of work:	30 months (approximately)
Priority:	2



FEASIBILITY STUDIES

PROJECT PROPOSAL – SUMMARY SHEET

City:	Pancevo
Location:	NIS Oil Refinery.
Problem definition:	Due to the damage of storage tanks and pipelines during the conflict, large quantities of crude oil and oil products have leaked out on the ground. Part of this oil is still left on the ground as oil sludge, which has not been removed mainly due to lacking storage facilities. By building a new basin for this oil sludge, the remediation of the oil contamination can be speeded up and thereby the risk to human health can be reduced.
Project title (PA.11):	Construction of a concrete basin for oil sludge.
Proposed approach:	Construction of a 1,700 m ³ concrete basin.
Duration of work:	2.5 months
Priority:	1

FEASIBILITY STUDIES

PROJECT PROPOSAL – SUMMARY SHEET

City:	Pancevo
Location:	NIS Oil Refinery
Problem definition:	<ul style="list-style-type: none">▪ Spilled oil has clogged the pipeline systems for oil and storm wastewater. Pipe sections are partly broken or damaged.▪ Large quantities of crude oil, oil products, and sand/gravel have clogged the two oil separators.▪ Leaking pipelines are a permanent source of soil and groundwater contamination with oil constituents.▪ Due to the malfunctioning of the oil separators, there is no pre-treatment of oily wastewater.
Project title (PA:12)	Cleaning and repair of sewer-pipelines and oil-separators
Proposed approach:	<ul style="list-style-type: none">▪ Preparation and planning▪ Cleaning and inspection of the pipelines▪ Repair and replacement of pipelines▪ Cleaning and repair of oil-separators
Duration of work:	6 - 8 months
Priority:	1

FEASIBILITY STUDIES

PROJECT PROPOSAL – SUMMARY SHEET

City:	Pancevo
Location:	Waste water canal connecting the industrial complex with the Danube
Problem definition:	The Danube river system is permanently and seriously contaminated with EDC and sediment-associated pollutants (e. g., mercury) from the waste water canal. This threatens downstream drinking water resources and aquatic life in the Danube. Some of the pollutants (e. g. mercury) will accumulate in the food chain.
Project title (PA.13):	Preventing the release of EDC and sediment associated pollutants into the Danube river system
Proposed approach:	<p>Step 1:</p> <p>a) Prevent the release of sediments to the Danube by closing the canal with two dams</p> <p>b) Dredge the sediment containing the free-phase EDC and incinerate the EDC sludge</p> <p>Step 2:</p> <p>a) Build a secure waste disposal site for the canal sediments (or provide other possibilities for disposal)</p> <p>b) Dredge the canal completely, and dispose sediments according to the solution of step 2a)</p>
Duration of work:	<p>Step 1: 10 to 12 months</p> <p>Step 2: 12 months</p>
Priority:	<p>Step 1: 1 (high)</p> <p>Step 2: 2 (medium)</p>

FEASIBILITY STUDIES

PROJECT PROPOSAL – SUMMARY SHEET

City:	Pancevo
Location:	Area outside the Pancevo industrial complex
Problem definition:	Spills of various chemicals (e. g. mercury, EDC, petroleum constituents) pose a serious risk to ground and drinking water quality in the whole area around the industrial complex. There must be an early-warning system with respect to the pollution of ground and drinking water resources.
Project title (PA.14):	Groundwater monitoring programme outside the industrial complex
Proposed approach:	<ul style="list-style-type: none">• Groundwater analyses (monthly or bi-monthly)• Soils, living organisms, vegetation analyses• Public health monitoring (urine analyses)• Gaz campaign, including mapping
Duration of work:	2 years
Priority:	1