



ICCL
international
committee on
contaminated
land

October 4-5, 2011 • Washington, DC Metro Area



Environmental Hot Spot Remediation

Dragana Vidojevic

Ministry of Environment, Mining & Spatial Planning
Environmental Protection Agency
Republic of Serbia

Republic of Serbia



The Republic of Serbia is located in southeastern Europe in the heart of the Balkan Peninsula, and covers the area of 88,361 km².

Soil management – Legal and Institutional Framework

**MINISTRY OF ENVIRONMENT, MINING
AND SPATIAL PLANNING**

**Environmental
Protection Agency**

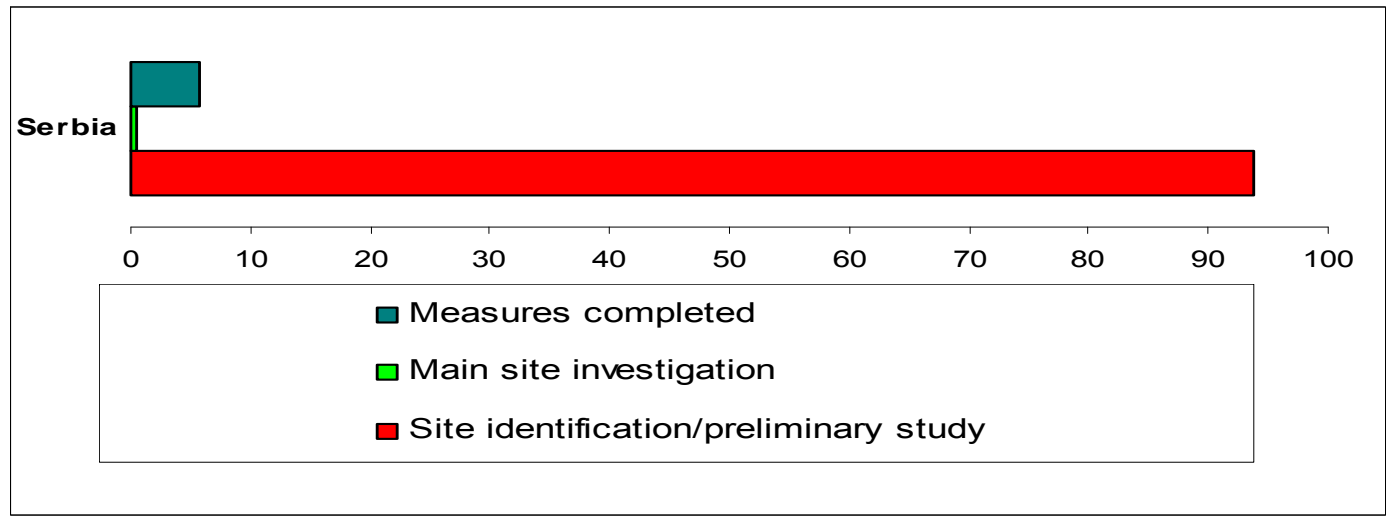
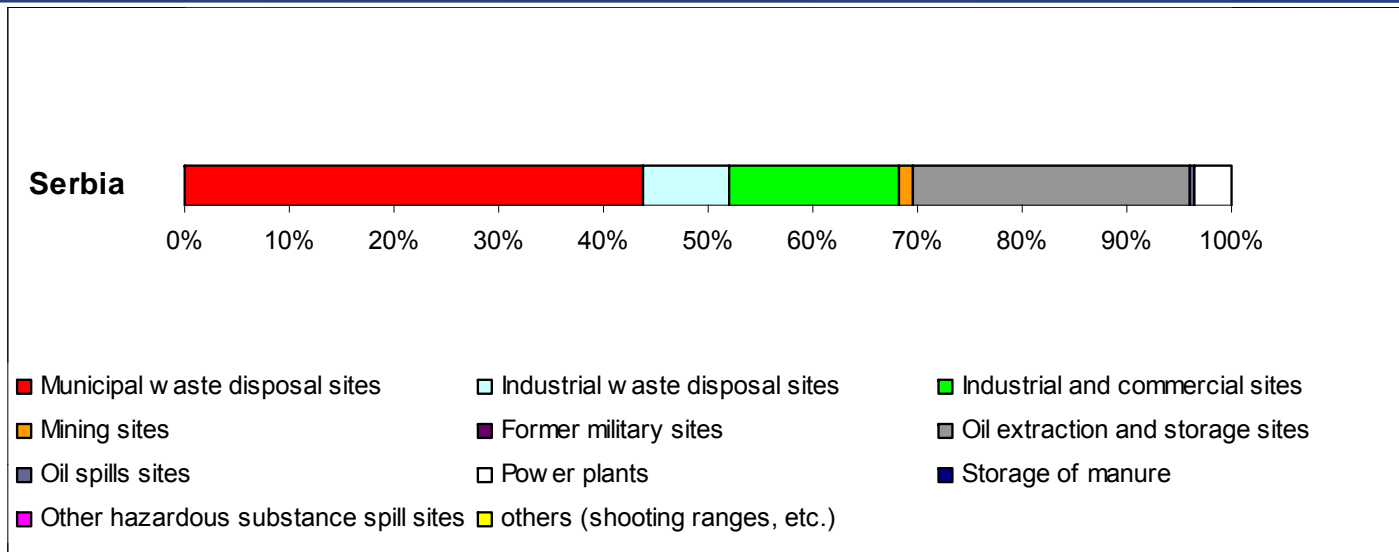
MINISTRY OF AGRICULTURE, FORESTRY AND WATER MANAGEMENT

Agricultural soil

- **Water resources**
- **Forests**

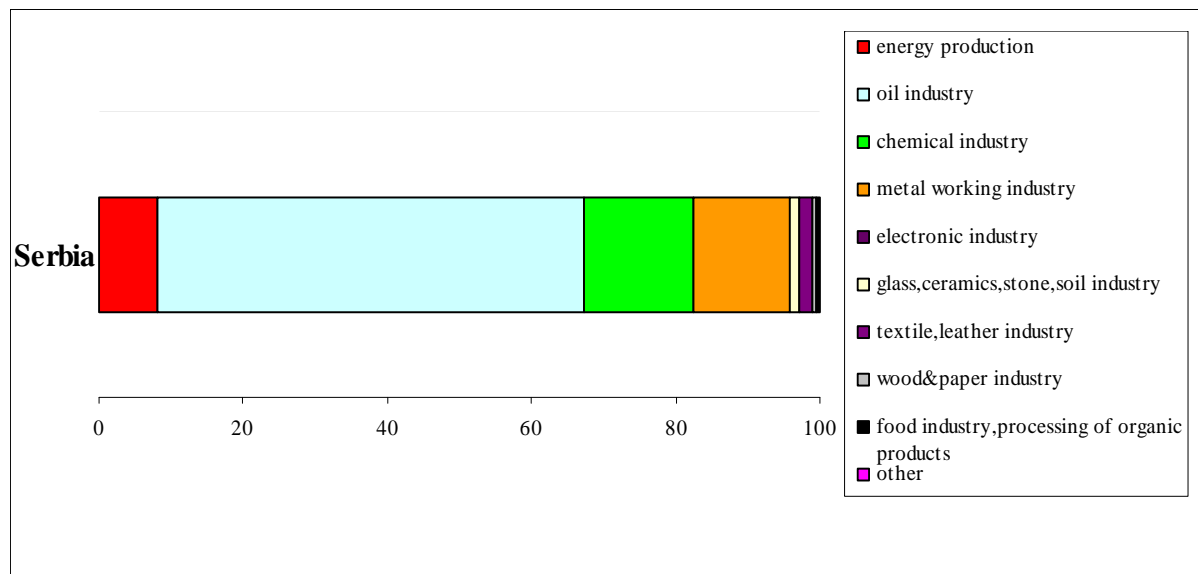
- Regulation on the programme for the systematic monitoring of soil quality, soil degradation risk assessment indicators and methodology for the development of remediation programmes (Official Gazette of RS, No. 88/10)
- Regulation on the establishment of criteria for the assessment of the status of highly threatened environment, the status of threatened environment and for the establishment of restoration and remediation priorities (Official Gazette of RS, No. 22/10)

Soil polluting activities from localized sources



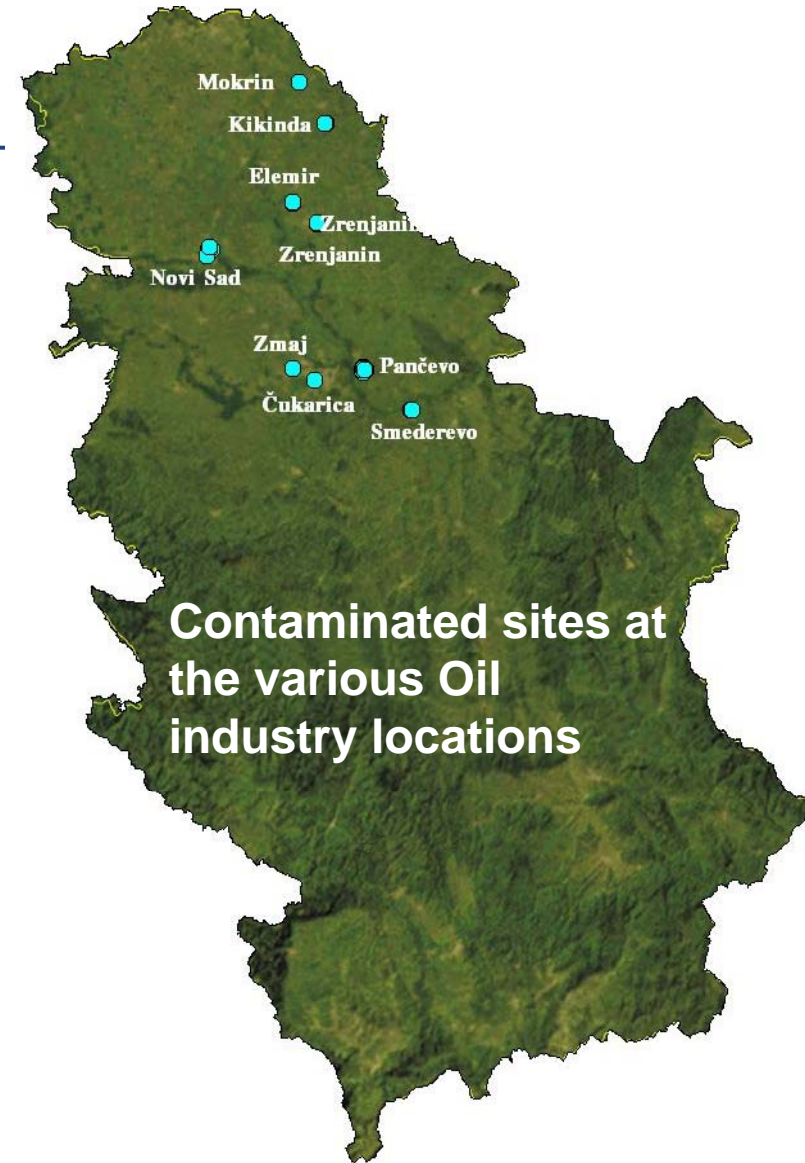
Industrial and commercial branches responsible for local soil contamination

The greatest part of identified polluted soil localities within the industry belongs to the oil industry (59.2%) and the metal working industry (13.3%)

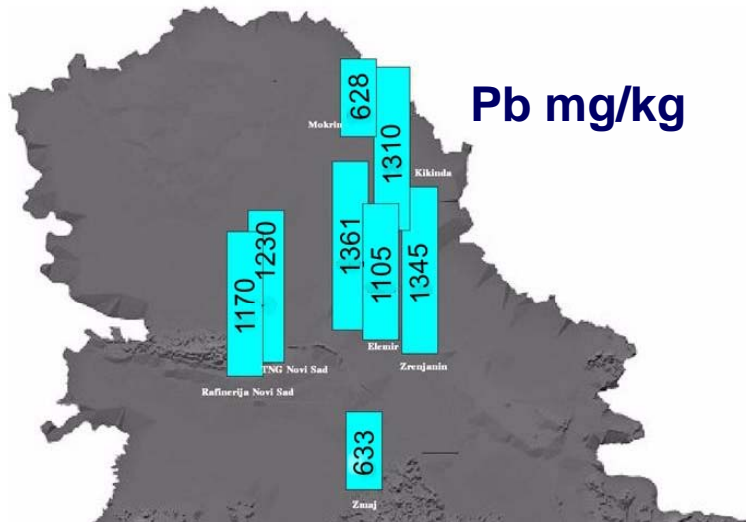


Database

	A	B	C	D	E	F	G	H	I	J	K	
1	Ido	Lokacija	Long	Lat	Cd	Pb	Hg	Ni	TPHTotalC<	TPHTotalC>	C6H6	
4	PO 1-03-S	Rafinerija Pančevo	44.82833333	20.69516667				14.91	629.72	283.76	1022.77	8.04
5	PO 1-04-S	Rafinerija Pančevo	44.82927778	20.69708333				10.27		4832.33	816.76	7.16
6	PO 1-05-S	Rafinerija Pančevo	44.82025	20.68688889					806.32		757.63	7.43
7	PO 1-06-S	Rafinerija Pančevo	44.82716667	20.692		97.31		10.46	662.82			6.50
8	PO 1-07-S	Rafinerija Pančevo	44.83188889	20.68455556								8.31
9	PO 1-08-S	Rafinerija Pančevo	44.83077778	20.68338889								5.31
10	PO 1-09-S	Rafinerija Pančevo	44.83125	20.69977778								17.26
11	PO 1-10-S	Rafinerija Pančevo	44.83447222	20.685								5.60
12	PO 1-11-S	Rafinerija Pančevo	44.83980556	20.68755556								8.35
13	PO 1-12-S	Rafinerija Pančevo	44.83688889	20.69030556								11.15
14	PO 1-13-S	Rafinerija Pančevo	44.83152778	20.69598333								3.61
15	PO 1-14-S	Rafinerija Pančevo	44.83980556	20.69375				5.12				4.13
16	PO 1-15-S	Rafinerija Pančevo	44.83625	20.69298333								6.65
17	PO 1-16-S	Rafinerija Pančevo	44.83213889	20.69236111								7.11
18	PO 1-17-S	Rafinerija Pančevo	44.83125556	20.69977778								7.92
19	PO 1-18-S	Rafinerija Pančevo	44.83038889	20.69275								5.32
20	PO 1-19-S	Rafinerija Pančevo	44.8309667	20.69730556								3.99
21	PO 1-20-S	Rafinerija Pančevo	44.83095556	20.685								3.13
22	PO 1-21-S	Rafinerija Pančevo	44.83402778	20.68944444								3.95
23	PO 1-22-S	Rafinerija Pančevo	44.8275	20.69198333								
24	PO 2-01-S	Rafinerija Novi Sad	45.276167	19.852472								
25	PO 2-02-S	Rafinerija Novi Sad	45.274167	19.853778					347.6	1456.25		
26	PO 2-03-S	Rafinerija Novi Sad	45.27667	19.855278								1.97
27	PO 2-04-S	Rafinerija Novi Sad	45.276750	19.856444					4832.39	20244.86		
28	PO 2-05-S	Rafinerija Novi Sad	45.27792	19.857250								1.22
29	PO 2-06-S	Rafinerija Novi Sad	45.275111	19.859111		700.20						2.76



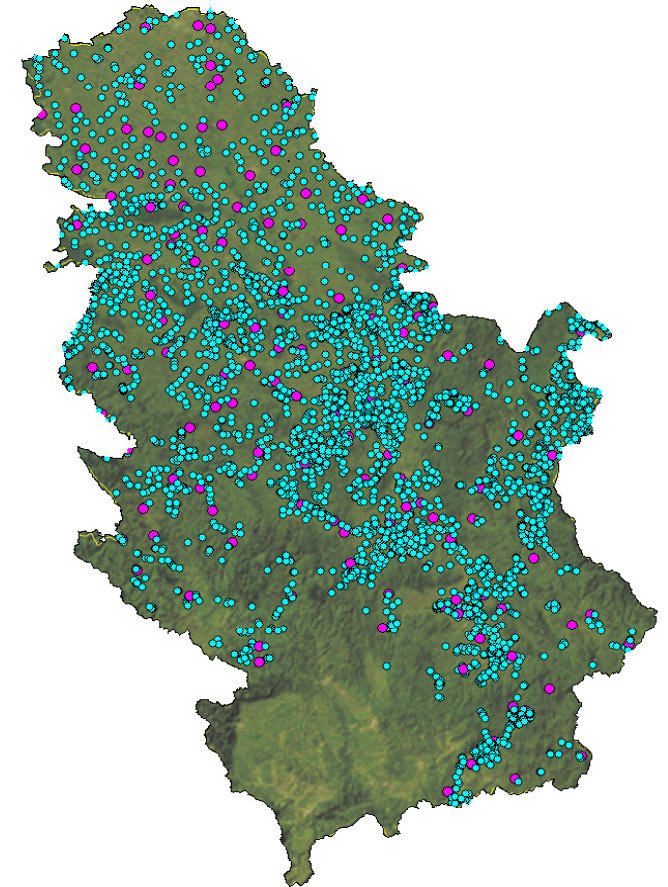
Contaminated sites at the various Oil industry locations



Illegal dumps and landfills



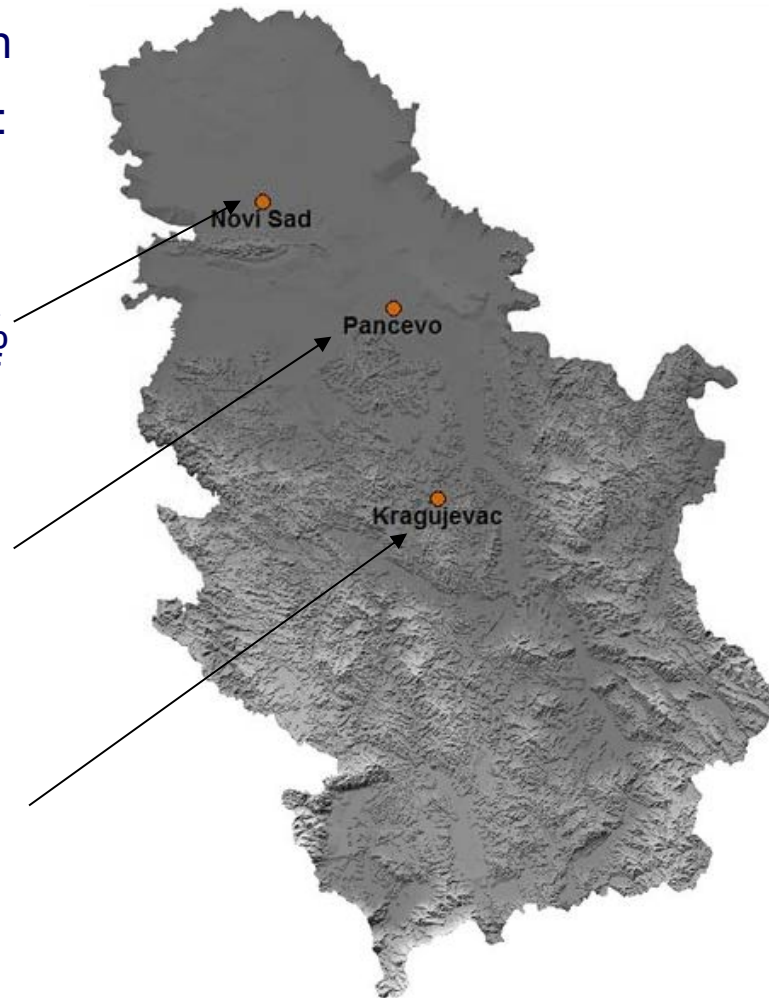
- 251 locations of illegal dumps
- 3528 municipal waste disposal sites
- 164 landfills (used by municipal public utility companies for waste disposal)



Environmental Hot Spot Remediation

Environmental Hot Spot Remediation in Serbia focus on the implementation of the projects in three hot spots localities: **Pancevo, Novi Sad, and Kragujevac.**

- Protecting the Ratno Ostrvo drinking-water wells in the area between Novi Sad oil refinery and the Danube River (the wells constitute approximately 40% of the water supply intake for the city of Novi Sad which does not have alternative water intake sources for equivalent volumes)
- Main environmental concerns identified at Pancevo petrochemical plant were serious spills of dichloride (EDC) and mercury.
- Zastava industrial complex in Kragujevac, all designed to reduce risks to the environment and human health arising from PCB contamination.



The experience of regeneration in Kragujevac – the remediation of FIAT Cars Factory site



FIAT Cars Serbia (ex Zastrava Car factory) is industrial conglomerate based in the City of Kragujevac, 138 km southeast of Belgrade. It is best known by car manufacturing, which began assembling in 1955 for Eastern European markets.

- FAS (FIAT Cars Serbia) covers an area of 126 ha.
- Besides FAS, at the site of the former GROUP "Zastava" there are 10 companies operating.
- The entire complex has a working area of 173 ha.
- All companies of the former Group "Zastava" are polluters of the environment (water, air and soil).



NATO bombing and the damage done to the environment

- During NATO's 1999 bombing, the " FIAT Cars Factory " was destroyed:
- 160,000 square meters of production lines.
- Two transformers that used **Polychlorinated biphenyls (PCB)** as coolant.



- PCB leaked out and caught fire.
- All quantity of PCB oil was poured out.
- The leaked PCB poured into the sewers and the existing technology pits.

Decontamination projects

For the decontamination project Contract was signed in 2001 between Zastava Cars and UNEP / UNOPS, after which the realization of defined and approved solutions followed.

Five projects have been carried out:

- Removal of PCB-contaminated concrete, adding a new layer of concrete in the paint hall.
- Cleaning of the water pits and decontamination of the water in the paint hall.
- Survey and monitoring on the extend of contamination of soils, surface and ground water in the surroundings of Zastava car factory.
- Removal of PCB-contaminated concrete and sand, adding a new layer of concrete at power station.
- Transportation and treatment of 242 tons of PCB and PCDD/F - containing waste abroad.

Remediation

Fiat Group Cars has signed a Memorandum of understanding with the Serbian government for the acquisition of Kragujevac's Zastava factory on 7th May 2008.

Feasibility study is produced.

The Contract with Italian 'Fiat' foresees that the State rehabilitates the polluted industrial zone of "Zastava car factory".

From 120 locations within the factory all waste was removed and the decontamination of certain parts of the plant or soil was performed.

Approximately 2,000 tons of waste paint were removed from the factory, which was the biggest environmental problem in Zastava for the past 20 years.

300 tons of partially oiled wooden cubes from the floors were removed.

What is done so far?

The following was recycled:

- 315 000 liters of six-valence chromium, the product that was produced during the galvanizing process.
- Large quantity of oil from the factory machines.
- So far, 40 out of 60 tones of electronic waste was recycled.
- 40 tons of waste glass.



What is done so far?

The investigative work showed that under a mechanical warehouses there is a pollution with hydrocarbons, which are a potential danger to workers.

Groundwater and soil are also contaminated.

The plan is to extract the soil which would be purified by thermal desorption.

The process involves heating the **soil**, which leads to evaporation of the hydrocarbons (i.e., neutralization), after which the soil would be returned to the location from which it was taken. Ground water would be treated in a similar manner.

During dismantling, waste containing asbestos is selected and separated, using all prescribed safety measures.

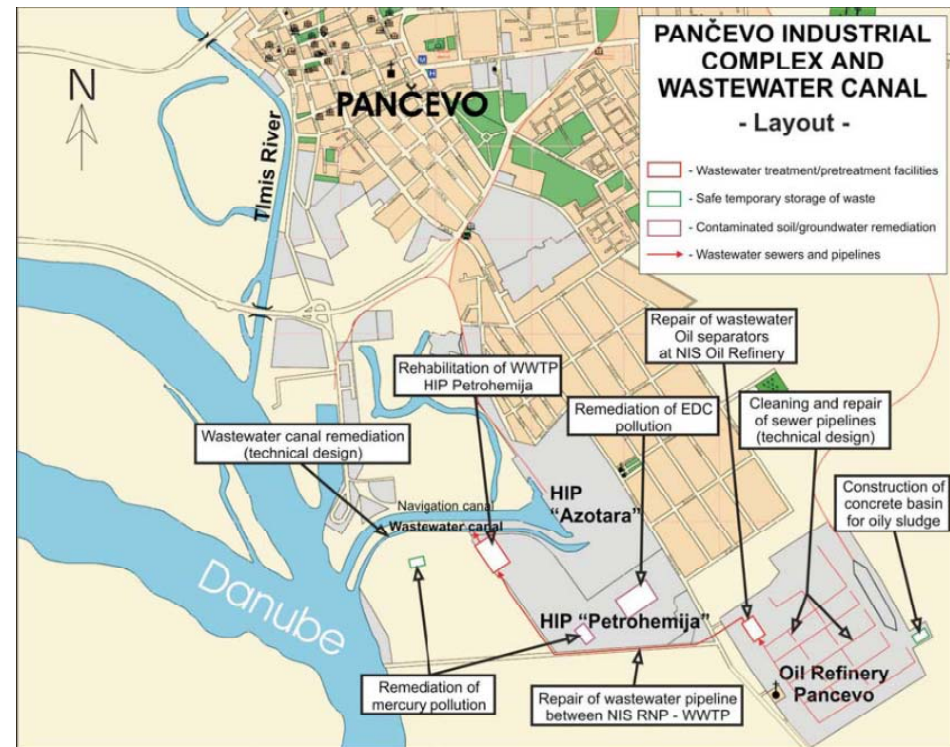
A new power block is under construction for which the EIA procedure is currently being done.

9.3 million euros were invested in the construction of the wastewater treatment facility.

The remediation of Pancevo site

- Remediation of soil and groundwater contamination at the petrochemical plant.
- Rehabilitation of wastewater treatment facilities to stop the continuous discharge of untreated industrial wastewater into the wastewater canal and the Danube River.
- Remediation of the wastewater canal. (In spite of a lack of funds for actual implementation of this project, preparation of technical designs proceeded while other funding options were explored).

Clean-up Projects at Pancevo industrial complex



Remediation of ethylene dichloride (EDC) pollution

- The 1999 air strikes damaged ethylene dichloride (EDC) storage tanks and 2,100 tons of EDC were spilled, half of which had reportedly entered the soil and half of which had flowed into the wastewater canal.
- The actual remediation system was established with the contamination plume in the upper aquifer delineated and the pump-and-treat technology selected and specified.
- By January 2004, the system had recovered and treated over 400 tones of EDC.

Destroyed VCM storage tank at petrochemical plant



Rehabilitation of the wastewater treatment plant

Damage to the VCM and chloro-alkali plants, and to the oil refinery resulted in the discharge of approximately 170,000 m³ of raw materials, products and fire-fighting water. This flow overloaded the WWTP's capacity, damaged process equipment, clogged the units with contaminated sludge, and cracked or otherwise damaged concrete retaining structures.

Groundwater remediation, pilot testing



Trickling filter reconstruction



Rehabilitation of the wastewater treatment plant and Wastewater Canal Remediation

- The project involved replacing mechanical and instrumental equipment, repairing of the trickling filter and pH regulation facilities, and rehabilitation of the activated sludge unit.
- The wastewater pre-treatment facilities at Pancevo oil refinery – including the oil separators – have been repaired and upgraded, and new mechanical and instrumental equipment has been supplied.
- The repair of the wastewater pipeline between the refinery and the petrochemical plant enables pre-treated wastewater to be transported from the refinery to the WWTP before discharge to the wastewater canal.
- UNEP investigations confirmed that high concentrations of industrial wastewater pollution, in part due to the Kosovo conflict, were present the canal.
- In order to prevent the discharge of dissolved and sediment-associated pollutants and to protect downstream drinking-water resources and the Danube River system itself, UNEP undertook remediation design activities.
- The sediments present at the site have been comprehensively characterized. Investigations confirmed that the canal held 41,000 m³ of sediment containing significant concentrations of mercury and mineral oils (550 tonnes of mineral oils and 260 kg of mercury) .

Thank you!

dragana.vidojevic@sepa.gov.rs