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# Strengthening Capacities in Kosovo to Address Environmental Hot Spots

*Artana/Novo Brdo Mine  
Stan Tërg/Stari Trg Mine*

## Environmental Monitoring and Field Surveillance



## Aims of Monitoring

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- Assessment of environmental situation and risks for the public and the environment
- Reduction/minimization of risks and hazards, increase in operational safety
- Proof of success of mitigation measures and remedial actions



# Monitoring Methods

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- measurements, e.g.

- *air quality: e.g. PM10 concentration: SO2, NOx, CO2, deposition, climate..*

- *surface water: e.g. flow rate, pH, TDS (dissolved major anions and cations); heavy metals/ metalloids, chemistry..*

- *ground water: e.g. level, pH, TDS (dissolved major anions and cations); heavy metals/ metalloids, chemistry..*

- visual inspection/control, e.g.

- *leakages in process circuits,*
  - *dam seepage,*
  - *cover erosion*

- institutional control, e.g.

- *prohibition of specific land use, water abstraction, access, etc.*

# Who has performed the environmental monitoring at Artana/NBrdo Mine and Mitrovica area

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- Artana/NBrdo Mine:
  - Ministry of Environment, Trepca Management, University
- Mitrovica area:
  - Ministry of Environment, WHO, KFOR, Trepca Management, University
- Other (different local institutions, MonTec, international institutions and companies etc)



# I. Artana/Novo Brdo Mine

## Present pollution of Krivareka river

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- At both dump locations, the material has slumped into the stream bed, and added considerably to the pollution of the river. Pb, Zn, Cd
- The mine discharge is strongly acidic and contains a significant metal load
- Elementary School is located nearby (100m) Tailings T1 and mine
- Next settlements\houses are located 200m to 400m close to Tailings T2
- Downstream the mine, the water is not usable for drinking or irrigation (at least for 11 Km)
- ***Action undertaken by UNDP: River bad protection at Tailings T2***

# Artana/Novo Brdo Mine - Tailings No2





# Present pollution of Krivareka river

## Monitoring

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- Measures conducted by Trepca

### Mine waters:

- pH 2 to 3
- metal load: Pb (0.8 mg/L), Zn (20 mg/L), Cd (0.24 mg/L)
- volume: about 250 m<sup>3</sup>/h
  
- Water samples from tailings No1: pH values of 2.5, and contained 0,035mg/l As, 0.58 mg/l Pb and 75mg/l Zn.
  
- The domestic well sample actually came from groundwater spring(s) serving as the local water supply in the area, and does not meet WHO drinking water standards because of elevated Hg, Cr, Fe and Pb values

# Tailings 1 and Tailings T2, Artana/Nbrdo Mine



# Monitoring of water quality of the Krivareka River before/after Artana Mine (in mg/L except pH)



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<b>(05.06.2005)</b>	<b>pH</b>	<b>dissolved matter</b>	<b>undissolved matter</b>	<b>Pb</b>	<b>Zn</b>	<b>Cd</b>	<b>Ca</b>	<b>Fe</b>	<b>SO4</b>
before Mine	6.32	400	4.6	0.38	0.03	<0.02	29	<0.1	337
after Mine	6.40	300	130	0.50	1.2	0.11	37	0.24	493



# Artana/Novo Brdo Mine

## RECOMMENDATIONS FOR A MONITORING PLAN

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With respect to surface water bodies and mine water the following monitoring measures are proposed: (*regular intervals*):

-flow rate:

- Krivareka river (upstream and downstream of Artana mine)
- mine water

-water quality (e.g. pH, TDS, Pb, Zn, Cd, As, Cu, turbidity)

- Krivareka river upstream Artana mine
- Krivareka downstream tailings site
- Mine water
- Krivareka at nearest potential water users



## II. Stan Tërg/Stari Trg Mine Zharkov potok-Present pollution

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- Source of environmental problems is metal loading (Pb, Zn, Cd, As)
- Air-Dust remains one of the biggest environmental problem:
  - contamination of air by dust blown from the tailings during high wind events in dry weather periods
  - contamination of agricultural soil by deposition of suspended dust from tailings impoundments
  - contamination of residential soil by deposition of suspended dust form tailings
- ❑Tailings are reported to contain up to 1% Pb and 0.5% Zn, contamination of agricultural soil nearest the tailings impoundment via airborne dust could be significant.
- *Action undertaken by UNDP: Dam Crest Rehabilitation*

# Stari Terg/Zharkov potok Tailings

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# Average (7 days) concentrations of TSP and heavy metals monitoring stations in the Mitrovica area

Station Description	TSP [ $\mu\text{g}/\text{m}^3$ ]	Pb [ $\mu\text{g}/\text{m}^3$ ]	Cd [ $\mu\text{g}/\text{m}^3$ ]	As [ $\mu\text{g}/\text{m}^3$ ]
• Residence, S.Mitrovica near market	271.7	0.40	0.0046	0.028
• Adriatic Hotel roof, S. Mitrovica, collocated	177.2	0.39	0.0042	0.028
• Adriatic Hotel roof, S.Mitrovica, primary	174.4	0.38	0.0042	0.029
• Mitrovica Industrial Park	139.7	0.21	0.0037	0.013
• Prison, N. Mitrovica	91.3	0.37	0.0045	0.025
• Danish Camp, Doljane,	76.3	0.14	0.0021	0.015
• Zvecan Smelter	65.0	1.00	0.0017	0.056
• <i>WHO Air Quality Guidelines,2000</i>	<i>N/A</i>	<i>0.5</i>	<i>0.005</i>	<i>0.0015</i>



# Annual average concentration Pb in Mitrovica city; MESP-study

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- The 37 mm quartz filter samples were pre-and post-weighed to determine Total Suspended Particulates (TSP) concentrations and analyzed to determine airborne lead and selected heavy metal concentrations.
- samples were conducted at 6 locations in the Mitrovica area

<u>Monitoring sites</u>	<u>Pb [micro.gr/m3]</u>
• Sh.f. "Bedri Gjina"	0.65
• Faculty-FXM	0.62
• Sh.f. "1 Maji"- Shupkovc	0.57
• Bair - Monopoli	0.31
• Sh.f. "Eqrem Çabej"	0.56
• OJQ "Mitrovica"	0.59
• Maximal value	0.65
• Minimal value	0.31

# Spatial Distribution of Deposited Dust in the Mitrovica city – University and MESP study

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- Dust deposition sampling was conducted using a Frisbee Dust Deposit (FDD) gauge, developed by the Stockholm Environment Institute.
- dust deposition during years 2006 and 2007, ranged from 79 to 2303 mg/m<sup>2</sup>/day.
- south-east part of city has very high level of pollution.
- maximum value reaches 5560 mg/m<sup>2</sup>/day, which exceeds WHO recommended values for 20 times. (WHO: 300 mg/m<sup>2</sup>/day).
- in the area of 1m<sup>2</sup>, the level of pollution is average 542.3 mg per day.
- population of the region is exposed to this pollution during the entire day.



# Water quality data of the Ibar River Mitrovica City

- Water quality data of the Ibar River immediately downstream from Zvecan and the Gornje Polje tailings (i.e. about 2 to 3 km downstream of Zharkov Potok) measured between 1985 and 2002 { **mg/l (except pH)**}

Parameter	Year of measurement				
	1985	1986	1991	1992	2002
pH	4.9	5.2	6.0	6.0	6.0
SO <sub>4</sub>	480	328	13	11	65
Cl	28	32	9	7	67
Fe	29	20	<0.4	0.4	0.44
Cd	0.31	0.04	<0.1	<0.1	0.1
Cu	2.8	1.5	<0.15	<0.14	0.06
Pb	2.5	1.4	<0.4	<0.4	0.06
Zn	98.5	70.2	0.1	0.09	0.09



## Some more data regarding pollution and monitoring in Mitrovica area

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- Zvecan Smelter: from 58 children tested, 34 (58.6 %) of them were with enhanced blood lead levels.
- Study made in 2000 shows that, among 496 residents and workers tested in the Mitrovica area, 324 had blood lead levels higher than WHO standards permit.
- More than 65% of soil at Mitrovica with enhanced lead concentration.
- The WHO air quality guideline of 2000 determines a limit value for lead in the air of  $0.5 \mu\text{g}/\text{m}^3$ . At the meteorological station near the Zvecan smelter, a lead concentration of  $1 \mu\text{g}/\text{m}^3$  was measured in 2002

# Stari terg Mine/Zharkov potok Potential Monitoring Measures

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- Air quality/dust deposition monitoring:
  - background measurement
  - down wind from tailings sites (most frequent wind directions)
  - close to nearest settlements

# Stari Terg/Zharkov Potok Tailings

## RECOMMENDATIONS FOR A MONITORING PLAN

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Monitoring measures proposed with respect to the air quality around the Zharkov Potok tailings:

- meteorological data

- concentration of airborne particulates:

installation of a low-volume sampler with combined inlets for the continuous determination of total suspended particulates.

- dust deposition rates:

installation of dust deposition gauges (e.g. ISO gauges, Frisbee Dust Deposition (FDD) gauges, or Bergerhoff gauges) in the surroundings of the tailings.

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*Thank you*