Investigation of potentially contaminated industrial sites in Serbia

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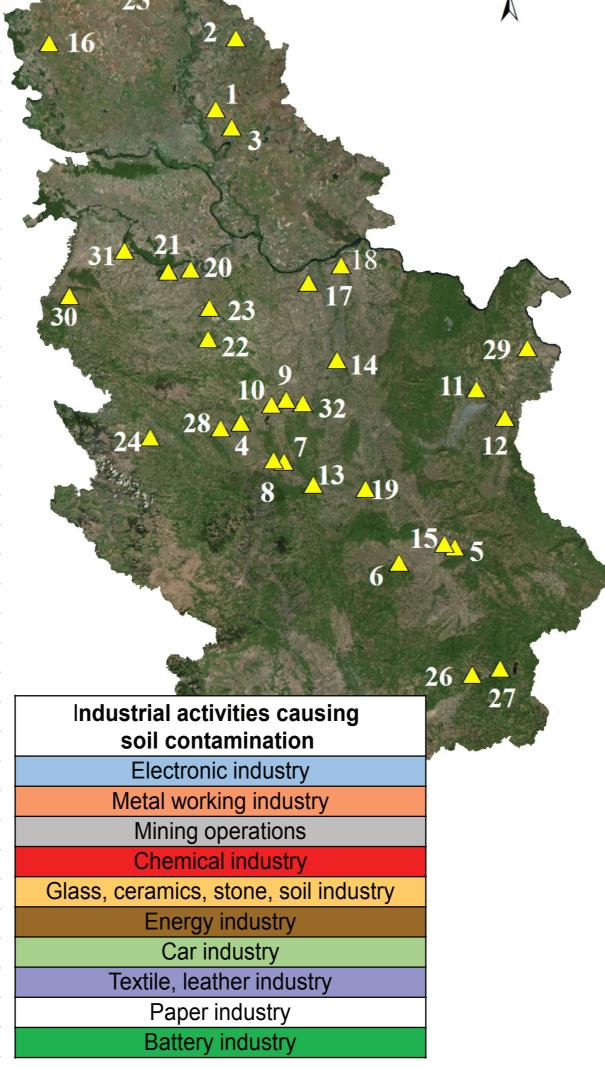
Introduction and context

Investigation of potentially contaminated industrial sites is a part of the GEF-funded project "Enhanced Cross-sectoral Land Management through Land Use Pressure Reduction and Planning" which is implemented by United Nations Environment Programme (UN Environment) with the support of the Italian Ministry of Environment, Land and Sea and in close cooperation with the Ministry of Environmental Protection of the Republic of Serbia and Serbian Environmental Protection Agency (SEPA) in the period 2015-2018.

Materials and approaches

32 potentially contaminated industrial sites have been selected from the database managed by SEPA. Data and information on previous land use, type of industry, surface area, type and quantity of hazard-ous substances at the location and on the surrounding area, soil and groundwater quality, as well as geological, pedological and hydrological features were collected from previous studies and though numerous consultations. In 2017, 264 soil samples were collected and undergone physical-chemical analysis, analysis of heavy metals content and specific pollutants such as: TPHs, PAHs, PCBs, cyanides, pesticides etc. (Figure)

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INDUSTRIAL SITE		
Exceeded limit values	Exceeded remediation values	
1. "Factory of synthet	ic rubber" - Zrenjanin	
Ni	/	
2. "Toza Markovic" - Kikinda		
Cu, Pb, Ni, C10-C40	Zn	
3. "a.d. Radijator" - Zrenjanin		
Cr, Cu, Zn, Ni, C10-C40	PCB	
4. "Papirpak" - Čačak		
As, Cd, Cr, Cu, Ni, Pb, Zn	1	
5. "Elektronska industrija Niš" - Nis		
Cd, Cu, Ni, C10-C40	Pb	
6. "Factory of non-ferro	ous metals" - Prokuplje	
As, Cd, Pb, PCB, PAH	Cr, Cu, Ni, Zn, C10-C40	
7. "Wagon factory" - Kraljevo		
Cd, Cr, Zn, PCB, PAH, C10-C40	As, Cu, Pb, Ni	
8. "Magnohrom" - Kraljevo		
Cr, Pb, Zn, C10-C40	As, Ni, Cu	
9. "Šumadija Itd" - Kragujevac		
Cr, Cd, Pb, PAH, C10-C40	As, Cu, Ni, Zn	
10. "Zastava truck" - Kragujevac		
As, Ni, Pb, Zn PAH, C10-C40	Cu	
11. "RTB Bor" - mining site		
Pb, Zn, Ni, C10-C40	As, Cu	
12. "Leather-textile combine Koza" - Zajecar		
Cu, Ni, C10-C40	As, Pb, Cr	
13. "Prva petoletka" - Trstenik		
Cr, Pb, C10-C40, PAH	As, Cd, Cu, Ni, Zn	
14. "TE Morava (power plant)" - Svilajnac		
As, Cu, Pb, Zn, C10-C40	Ni	
15. "Machine industry Nis" - Nis		
Cd, PCB, PAH, C10-C40	As, Cr, Cu, Ni, Pb, Zn	
16. "Battery factory" - Sombor		
As, Cd, Cu, Ni, Zn, PAH	Pb, C10-C40	



	INDUSTRIAL SITE		
	Exceeded limit values	Exceeded remediation values	
	17. "Hesteel Serbia Iron factory"	- surrounding area - Smederevo	
	Cr, Ni, Pb, C10-C40	1	
	18. "TE Kostolc (power	er plant)" - Pozarevac	
	Cr, Cu, Ni, Pb, Zn	1	
	19. "Cl Zupa	" - Krusevac	
	C10-C40, PAH	As, Cr, Cu, Cd, Ni, Zn, Hg, Pb	
	20. "TENT A (power	plant)" - Obrenovac	
	Cr, Ni		
	21. "TENT B (power	plant)" - Obrenovac	
	Ni, C10-C40	1	
	22. "RB Kolubara (mir	ning site)" - Lazarevac	
	Ni, As	1	
	23. "TE Kolubara (power plant)" - Lazarevac		
	Ni, Pb, Zn, As, Cr, C10-C40	1	
	24. "Copper mill" - Uzice		
	Cr, Cd, C10-C40	Ni, Cu, Zn	
Ì	25. "Cl Zorka" - Subotica		
	Cd, Ni, Pb, PAH	As, Cu, Zn	
	26. "Paper and packaging factory" – Vladicin Han		
	As, Cd, Cr, Cu, Ni, Pb, Zn, C10-C40	/	
	27. " Factory of steel panels, r	nachine and steel" - Surdulica	
	As, Cu, Ni, Zn, C10-C40, PAH	1	
1	28. "PKS Latex" - Cacak		
	As, Cr, Cu, Zn	Ni	
	29. "Cl Elixir – old phospho	-gypsum landfil" - Prahovo	
	Hg, Cd, Cu, Ni, Zn, C10-C40	As	
	30. "Cl Viskoza" - Loznica		
	Cr, C10-C40	As, Cd, Cu, Ni, Pb, Zn	
Ţ	31. "Zorka - Non-ferroເ	s metallurgy" – Sabac	
	PCB, C10-C40	As, Cd, Cr, Cu, Ni, Pb, Zn, DDE/DDD/DDT, PAH	
	32. "21. oktobar" - Kragujevac		
•	As, Cd, Pb, C10-C40, cyanide complex	Cr, Cu, Ni, Zn	

Outcomes

The result of the project is the list of prioritized sites for clean-up and remediation. Out of 32, 14 locations need to be remediated according to the gathered information and investigation. For most of the remaining location, detailed investigation of the contamination extent is needed. It is expected that the next step forward will be the development of remediation projects for priority sites.

Transferability

Beside expected future detail investigation of contaminated locations and remediation projects, it is important to develop the National Strategy for Management of Contaminated Sites. Establishment of a legal framework for contaminated sites will be crucial in ensuring a faster and more efficient response to the problems related to the contaminated sites. It is also necessary to strengthen the institutional capacities to enable adequate management.

