



RISK ASSESSMENT OF CONTAMINATED SITES IN WB6

REPORT

Deliverable 3 of WP1-12 Depollution Soil: Inventory of contaminated sites

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ABBREVIATIONS

ALB	Albania
BIH	Bosnia and Herzegovina
EEA	European Environment Agency
EIONET	European Environment Information and Observation Network
EPA	Environmental Protection Agency
EU	European Union
GAWB	Green Agenda for the Western Balkans
IED	Industrial Emission Directive
IPA III	Instrument for Pre-accession Assistance III period 2021-2027
MKD	North Macedonia
MNE	Montenegro
REAWG	Regional Expert Advisory Working Group on Soil within the
RRD SWG	Regional Rural Development Standing Working Group in South-Eastern Europe
SRB	Serbia
WB	Western Balkans
WB6	Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, Serbia
WP	Work package
XXK	Kosovo* ¹

¹ * This designation is without prejudice to positions on status, and it is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo* declaration of independence.

1. EXECUTIVE SUMMARY

The Green Agenda for the Western Balkan contains 5 key pillars, one of them focusing on the depollution of Air, Water and Soil. Within EU4Green, the Environment Agency Austria supports the Western Balkan on the topic of soil contamination.

To develop a systematic contaminated site management, a stepwise approach is crucial. Such a tiered approach will ensure that limited capacities and financial resources are allocated to the most high-risk sites.

One of the first essential steps includes the identification of potentially contaminating activities² and a first identification of known sites (kick-off phase), which was discussed in a first EU4Green WP1-12 workshop in 2023 and illustrated in the first “Guidance for identification of key soil contaminating activities and contaminated sites in WB6”³.

A next important step involves the systematic approach to establish a register of those sites where contaminating activities have taken place. Within a second EU4Green WP1-12 workshop in 2024, registration and inventory systems and national surveys were discussed and led to a second “Guidance for a systematic approach for a register of contaminated sites in WB6”⁴.

Thus, these Guidance documents also focus on main pillars of the Green Agenda for the Western Balkans – monitoring and reporting. A register on (potentially) contaminated sites opens the door to combat land degradation and soil pollution while restoring degraded land, offering co-benefits also for solving other key environmental issues such as water pollution and biodiversity loss, thus working towards reaching climate adaptation objectives.

This monitoring of (potentially) contaminated sites leads to the next steps within the contaminated sites management system with the aim of filtering out those sites that might pose an unacceptable or significant risk to human health and the environment and which need to be further investigated: **preliminary risk assessment**.

This report contains a brief overview on carrying out preliminary risk assessment for (potentially) contaminated sites.

An exhaustive summary on risk assessment methods and approaches in various countries and regions within the contaminated sites regime will be given in the (draft) report “Support for implementing the EU Soil Strategy for 2030 - Task 1.6 Information and knowledge on risk assessment methodologies for soil contamination” (publication expected in 2026).

² Generally, in this guidance, the term contamination is for both contamination/pollution as synonyms, since the EU Soil Monitoring and Resilience Directive only uses the term contamination (e.g. soil contamination; potentially contaminating activities & contaminated site; indicative list of contaminants).

³ <https://eu4green.eu/library/>

⁴ <https://eu4green.eu/library/>

2. INTRODUCTION

Risk assessment of contaminated sites in the Western Balkans is still at an early, fragmented stage, with a limited but growing body of studies and guidance documents available. Existing work shows numerous high-risk hotspots, but systematic inventories, harmonised methods, and remediation remain largely incomplete in most economies.

Industrial and mining activities are identified as the dominant sources of soil and site contamination in the Western Balkans, including metal processing, coal and lignite power plants, oil extraction and refining, and chemical production. Additional sources include landfills, illegal dumps, fertilizer production, military/war-related sites, and waste from obsolete pesticides (for example HCH/lindane sites) are a regional, shared challenge.

A recent regional work (EC, JRC, 2024) underscores the urgent need for integrated soil protection policies to ensure healthy soils and sustainable land use in the Western Balkans and identified around 118 contaminated or potentially contaminated sites officially reported by Western Balkan economies, most related to industrial and mining sources, while acknowledging that the true number and total polluted area are unknown. Only a small fraction of these sites has undergone detailed investigation or remediation, and many lack clear information on status, responsible parties, and risk levels.

National inventories are partial or under development, and criteria for including sites vary between economies, which limits comparability and regional prioritisation. Several assessments stress the need to create or strengthen national registers of contaminated sites as a basis for systematic risk assessment and management, starting with the highest-risk locations.

In that light, the EEA IPA III soil project towards a “National survey of potentially polluted and polluted sites” aims to support Western Balkan economies / territories in identifying and assessing soil contamination hotspots. Within this IPA III project, a survey for collecting and exchanging more accurate information about local soil contamination in the economies has been set up and distributed to main stakeholders in the regions. Data collection has already started and first results are expected during 2026. Within EU4Green activities, synergies with this ongoing project have been established.

To achieve good soil health, it is essential to strengthen the capacities for restoring degraded soils and managing contaminated sites. This includes the identification of key soil polluting activities, which will support the identification of those sites that might pose a significant risk to human health and the environment. This process will lead to further steps within the contaminated sites management system, ranging from a preliminary risk assessment and potential prioritization to decision-making for further investigation and risk management measures, as well as reflection on funding mechanisms. A tiered and stepwise approach is crucial within this system (see Fig. 1).

To further support the identification, reporting and registration needs in the Western Balkan economies, two guidance documents have been developed within EU4Green WP 1-12 so far:

- Guidance for Identification of Key Soil Polluting Activities and Contaminated Sites in WB6 ([link](#)),
- Guidance for a Systematic Approach for a Register of Contaminated Sites in WB6 ([link](#)).

Prior to the development of these guidance documents, workshops were carried out within the EU4Green work package WP 1-12 “Inventory of contaminated sites” to discuss the various contaminated sites management steps:

- 16 October 2023 in Tirana, Albania: workshop on existing contaminated site management systems and methods for identification of contaminated sites and of key contaminating activities.
- 7 to 8 October 2024 in Skopje, North Macedonia: workshop introducing and discussing registration systems and national surveys as well as emerging contaminants relevant within contaminated sites.

The subsequent contaminated site management step within this tiered approach was discussed within a third workshop:

- 4 to 5 June 2025 in Klagenfurt, Austria: workshop on contaminated sites risk assessment of human health, environment and ecosystems for the media soil, groundwater and air in relation to the source-pathway-receptor paradigm.



Fig. 1: Stepwise approach: from potential contaminating activities over a systematic methodology to a register and management measures

3. RISK ASSESSMENT

Risk assessment of contaminated sites is usually done with standardized tools and models. Countries and regions with long contaminated sites management history have developed their individual and specific methods to assess and classify potential contaminated sites, following a similar and common tiered structure.

3.1. Risk assessment steps

Generally, three to four tiers within contaminated sites risk assessment are used. The assessment process involves progressively more detailed (investigation) steps as more information about the site becomes available. For example:

1. Initial risk screening: used to determine sites where potential contaminating activities have taken place → systematic register
2. **Preliminary risk assessment**: often only qualitative, used to verify whether significant contamination or a significant risk to human health or the environment is likely and thus further investigation is necessary
3. Site-specific risk assessment: generic quantitative, is applied to filter out sites with confirmed contamination, assessing the nature and extent of the risks or contamination (unacceptable/significant).
4. Detailed investigation and detailed follow-up assessment: evaluation of possible management or remediation measures.

3.2. Risk assessment receptors

Risk assessment of contaminated sites is organised around different receptors that can be adversely affected by contaminants. Human-health and environmental/ecosystems risk assessments use similar steps but focus on different receptors, endpoints and metrics. They guide the clean-up and management decisions:

- Human health risk assessment: estimation of nature and probability of adverse health effects in humans who may be exposed to contaminants. Key exposure routes are ingestion (soil, water, food), inhalation (vapours, dust), and dermal contact, typically quantified as doses to a person over time.
- Environmental risk assessment: risk based on e.g. water quality / soil quality
- Ecological risk assessment (possibly): estimation of the risk of contamination for ecosystems (e.g. habitats, plants, wildlife, biodiversity)

4. PRELIMINARY RISK ASSESSMENT

Preliminary risk assessment is one of the first, mainly qualitative steps in evaluating risks from potentially contaminated sites before more detailed investigations are carried out.

Considering the current respectively forthcoming use, the outputs of the preliminary risk assessment are mostly structured into:

- Further investigation is needed: significant contamination or significant risk is expected, the site may pose potentially unacceptable risks
- No further management steps are needed under the current use: probability of significant contamination is low and potential risk, if contaminated, is low. The sites are mostly kept in the register.

Within a preliminary risk assessment and following the source-pathway-receptor paradigm, this screening method is usually based on several pre-defined criteria (e.g. activity, size, duration, location, usage etc.) since often investigation results are not available.

This screening method is usually done by the following principles:

- **Identification:** desk study (review of historical maps, aerial photos, records, and previous reports), eventual site visits
 - significant contamination or significant risk **(most) likely**
 - ✓ YES: (most) likely -> site investigation needed
 - ✓ (NO: risks appear low, no further management steps urgent)
- **Prioritisation Criteria:** e.g.
 - Contaminants of concern (properties)
 - Environmental impact potential: according to size/volume, operation time etc.
 - Proximity to sensitive receptors: residential areas or critical infrastructure
 - Land use and ecological (natural resource) value
- **Ranking:**
 - Definition of a scoring system (scores and weights) and priority criteria for ranking at national/regional/provincial level

Various European countries and regions have developed their specific method to classify potential contaminated sites. The preliminary risk assessment methods often use conceptual site models focusing on pollutant linkages (source-pathway-receptor) and qualitative scoring. Thus, the initial conceptual site model is at a more qualitative level which is refined as more data become available in the subsequent management steps.

Common approaches for preliminary risk assessment prioritize sites based on historical data, site conditions and proximity to receptors. These tools range from qualitative screening checklists to complex numerical models for human health and environmental risk, for example:

Slovenia has established a potentially contaminated sites database in 2021 and developed a relatively straight forward and robust decision support model for priority treatment evaluation, which enables classifying of potentially contaminated sites according to their environmental sensitivity. The model includes four sets of criteria (population aspect, soil, water and environmental protection), within which a total of nine indicators were identified. Based on individual sets of criteria and corresponding indicators, a multicriteria decision support tool is used to define five priority classes to design and implement measures or decisions for site investigations (INTERNATIONAL CONFERENCE CONTAMINATED SITES, 12-14 October 2022, Proceedings).

Some European countries and regions use online tools, readily available or through registration, for example:

Italy (ISPRA) has developed a software called ROCKS (Risk Ordering for Contamination Key Sites) for relative risk assessment (priority settings) of potentially contaminated sites. The prioritisation criteria were developed through a collaborative process including 15 regions of Italy, one autonomous province, and 14 regional environmental protection agencies. The «base» version (ROCKS 1.3) is available on the dedicated ISPRA web page: [software-rocks](#). The ISPRA Handbook for priority intervention criteria can be downloaded [here](#).

An exhaustive summary on risk assessment methods and approaches in various countries and regions within the contaminated sites regime is given in the (draft) report “Support for implementing the EU Soil Strategy for 2030 - Task 1.6 Information and knowledge on risk assessment methodologies for soil contamination” (publication expected in 2026).

5. OUTLOOK

Preliminary risk assessment of registered sites as an early qualitative filter for potential high-risk sites. This will resume in the next step – the investigation of sites with a likelihood of being contaminated or possibly posing a risk to human health or the environment. This step is of particular interest for authorities in the WB6 economies to rank sites according to potential impacts on human health and the environment for planning further investigations.

Within EU4Green Depollution Soil WP1-12 a study tour is planned in spring 2026, which will give insights into principles and planning of investigations of potentially contaminated sites. A practical part will conclude the study tour, where investigation methods and sample taking on a site for soil, water and vapour are demonstrated in the field.

6. ANNEX

6.1. EU Directive on Soil Monitoring

In **Article 13** on *Risk-based and stepwise approach* within the Soil Monitoring Law, it is stated that (2) Member States shall establish a risk-based and stepwise approach for the following:

- (a) the identification of potentially contaminated sites in accordance with Article 14;
- (b) the investigation of potentially contaminated sites in accordance with Article 15;
- (c) the **site-specific risk assessment and management of contaminated sites** in accordance with Article 16.

In **Article 16** on *Site-specific risk assessment and management of contaminated sites*, it is stated that (1) Member States shall lay down the specific methodology for the site-specific risk assessment of contaminated sites. When establishing such methodology, Member States shall ensure that the phases and principles referred to in Annex V are taken into consideration.

Annex V includes a more general chapter on phases and principles for site-specific risk assessment.

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32025L2360&qid=1766052166409>

6.2. National and regional (preliminary) risk assessment

The (draft) report for the European Commission “Support for implementing the EU Soil Strategy for 2030 - Task 1.6 Information and knowledge on risk assessment methodologies for soil contamination” prepared by WSP E&IS GmbH with the assistance of the Environment Agency Austria presents the main findings regarding methodologies and tools for the risk assessment of contaminated sites, as well as policy guidance, and frameworks used in selected EU Member States and third countries, and some final considerations on potential EU guidance on risk assessment. It highlights the importance of knowledge exchange between stakeholders, including scholars, the industry, Member States and third countries competent authorities, and the Commission.

7. REFERENCES

EUROPEAN COMMISSION, 17 November 2021. *EU Soil Strategy for 2030*, [viewed 11 June 2025]. Available from: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0699>

EUROPEAN COMMISSION, JOINT RESEARCH CENTRE, Arias-Navarro, C., Vidojević, D., Zdruli, P., Yunta Mezquita, F., Jones, A. and Wojda, P., *Soil pollution in the Western Balkans*, Publications Office of the European Union, Luxembourg, 2024, [viewed 11 December 2025]. Available from: <https://data.europa.eu/doi/10.2760/21207>, JRC138306.

EUROPEAN PARLIAMENT, COUNCIL OF THE EUROPEAN UNION, *Directive (EU) 2025/2360 of the European Parliament and of the Council of 12 November 2025 on soil monitoring and resilience (Soil Monitoring Law), 2025*, [viewed 11 December 2025]. Available from: <https://eur-lex.europa.eu/eli/dir/2025/2360/oj/eng>

INTERNATIONAL CONFERENCE CONTAMINATED SITES, 12-14 October 2022. *Proceedings*, [viewed 18 December 2025]. Available from: <https://contaminated-sites.sazp.sk/wp-content/uploads/2022/11/CONFERENCE-PROCEEDINGS-2022-1.pdf>
https://cenia.gov.cz/wp-content/uploads/2022/11/Proceedings_ICCS_2022.pdf

ISPRA, *ROCKS (Risk Ordering for Contamination Key Sites) Software*, [viewed 18 December 2025]. Available from: https://www.isprambiente.gov.it/en/activities/soil-and-territory/contaminated-sites/priority-criteria-for-intervention/software-rocks?set_language=en

UMWELTBUNDESAMT GmbH, EU4GREEN, 2024. *Guidance for identification of key soil polluting activities and contaminated sites in WB6* [viewed 18 December 2025]. Available from: <https://eu4green.eu/library/>

UMWELTBUNDESAMT GmbH, EU4GREEN, 2024. *Guidance for a systematic approach for a register of contaminated sites in WB6* [viewed 18 December 2025]. Available from: <https://eu4green.eu/library/>