

Towards a better assessment of human exposure to metal(loid)s in soils and the associated risks

AURELIE PELFRENE¹, JÉRÔME PETIT², YVONNE
OHLSSON³, MATILDA JOHANSSON³, LINDA DUNDER⁴,
MARIO OLIVEIRA SANCA⁴, MARTIN TONDEL⁴ AND
CHARLOTTA TIBERG³

¹Univ. Lille, IMT Nord Europe, Univ. Artois, Junia

²Institut Scientifique de Service Public (ISSeP)

³Swedish Geotechnical Institute

⁴Uppsala University Hospital

Soil contamination has become an increasing environmental and public health concern due to its direct and indirect risks to human health. A key factor in assessing these risks is the bioavailability and bioaccessibility of pollutants, which determine how contaminants enter biological systems and contribute to human exposure. When soil is ingested, only a fraction of the total contaminant content becomes available for absorption—the bioaccessible fraction. Standardized protocols for assessing oral bioaccessibility exist (e.g., ISO 17924:2019), and recent regulatory frameworks, e.g. [1,2], advocate incorporating bioaccessibility as an adjustment factor in risk assessment to improve the accuracy of exposure estimates needed for effective risk mitigation. However, several challenges remain, including the identification of appropriate conditions and best practices for its implementation.

The harmonization of bioaccessibility assessment aligns with the proposed EU Directive on Soil Monitoring and Resilience (EC, 2023). While EU member states rely on common toxicity assessments provided by EFSA, human health risk assessment (HHRA) methodologies vary across nations. To address these discrepancies, the *EXPOSED?* project—funded by a research grant from the Swedish EPA and led by Sweden in collaboration with France and Belgium—aims to improve the understanding of exposure from contaminated soils and develop alternative HHRA approaches. Therefore, measuring oral bioaccessibility provides a promising example for a harmonized procedure. As part of this effort, a dedicated work package in the *EXPOSED?* project is focused on developing operational guidelines for incorporating oral bioaccessibility of metals and metalloids into HHRA. The first step in this process involves a comprehensive review of the current bioaccessibility practices.

Our research seeks to deepen the understanding of oral bioaccessibility, particularly regarding metals and metalloids in soils, and to demonstrate how scientific advancements can support decision-making authorities and improve soil remediation strategies.

References

[1] MTES (2017), Méthodologie nationale de gestion des sites et sols pollués. Ministère de l'Environnement, de l'Energie et de la Mer.

[2] US EPA (2021), Guidance for sample collection for in vitro bioaccessibility assay for arsenic and lead in soil and