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# Robustness of statistical and geostatistical approaches for the radiological characterization of soils beneath a building

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## Abstract

The **INSIDER project** (2017-2021) developed and validated a new and improved integrated characterization methodology and strategy during nuclear decommissioning and dismantling operations (D&D) of nuclear power plants, post-accidental land remediation or nuclear facilities under constrained environments (1).

One significant part of this project was the implementation on several application cases. This paper is dedicated to the radiological characterization for use case 3 (UC3) dealing with contaminated soils, in the context of post-incidental remediation of a site. For this use case, the constraint environment comes from the difficulty to collect samples beneath a building on the one hand and the fact that samples were collected in the past with no possibility for additional samples. This task has been initiated by gathering prior knowledge for the contaminated site and analyzing the available dataset (historical assessment + available data from non-destructive and destructive analyses).

For accessibility reasons to the contaminated soils beneath the building without entering in the building, the measurement campaign uncommonly provided 7 horizontal drill holes of 25 meters on 2 horizontal layers at 0.5 and 1.5 m below lower concrete slab. These drill holes have been measured in laboratory to get about 30 samples on each of them.

Then two evaluation objectives were pursued: global estimates of total activity (source term) and local categorization of volumes according to a radiological threshold for waste acceptance. Several statistical and geostatistical approaches are compared to quantify the impact of model parameters such as dealing with measurement uncertainty and detection limits, sampling reduction, integration of gamma-scanning as an auxiliary measurement in a multivariate approach, integration of a nugget effect on the variogram… As full part of the INSIDER project, a specific focus is put on uncertainty quantification.

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## References

(1) The INSIDER project, http://insider-h2020.eu/