

Comparative application of risk-based DSSs for brownfield rehabilitation: DESYRE and SADA application to a Romanian case study

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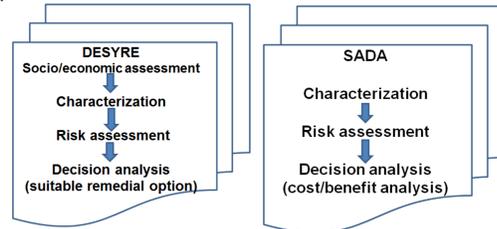
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INTRODUCTION

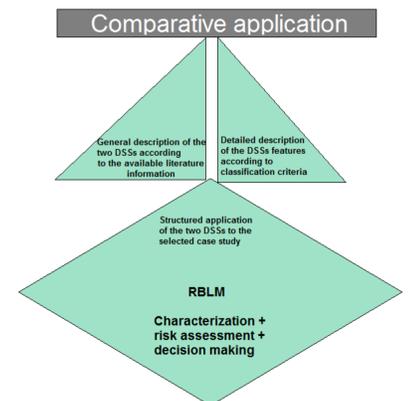
Brownfield rehabilitation is an essential step for sustainable land use planning and management in the European Union. When dealing with brownfield regeneration processes, legacy contamination plays a significant role, firstly because the persistent nature of contamination in soil or groundwater means that problems can occur now, or might occur in the future, as a result of actions which took place many years ago, and secondly, problems from legacy contamination are often more difficult to manage than contamination which might result from new activities. According to these considerations risk-based contaminated site rehabilitation processes need smart, cost-effective and sustainable management tools and practiced which avoid the further increase of environmental impacts and socio-economic costs. Due to the complexity associated with the management of brownfields, Decision Support Systems (DSSs) have been developed to support experts, local authorities and decision making to deal with all the phases of the rehabilitation process. Despite the large number of available DSSs, only a very few were analysed making a comparison of their features based on common case studies applications.

METHODOLOGY

The objectives of the comparative application of the two DSSs (SADA and DESYRE) were to identify similarities, differences and complementarities and thus, to provide indication on optimized integrations of the two DSSs to support the entire rehabilitation process for contaminated sites.



For both the DSSs, the human health risk assessment exercise has been conducted for the entire area of the site (surface soil, 1 m deep), for all the substances of concern and for the residential exposure scenario.



The application description includes the case study main information, the input data used in the different modules and all the provided output data. *Note: the socio/economic assessment in the case of DESYRE was not included in the application, but only in the comparative analysis of the two DSSs functionalities).*

CASE STUDY LOCATION



Figure 1. Regional and areal location of the analyzed case study

EXPOSURE SCENARIOS

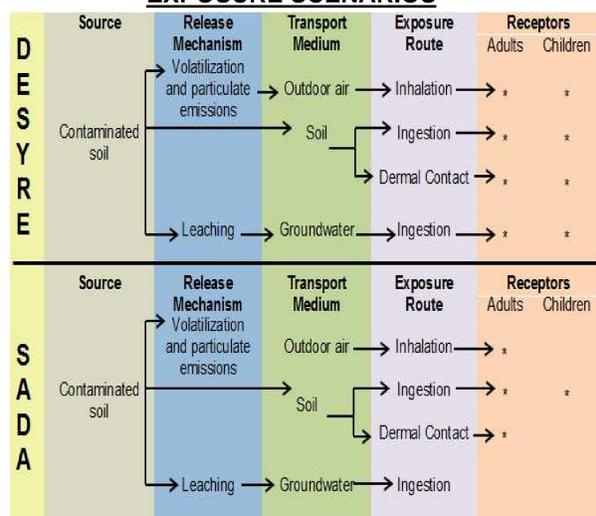


Figure 3. Exposure diagram considered in DESYRE and SADA, respectively

RISK ASSESSMENT RESULTS

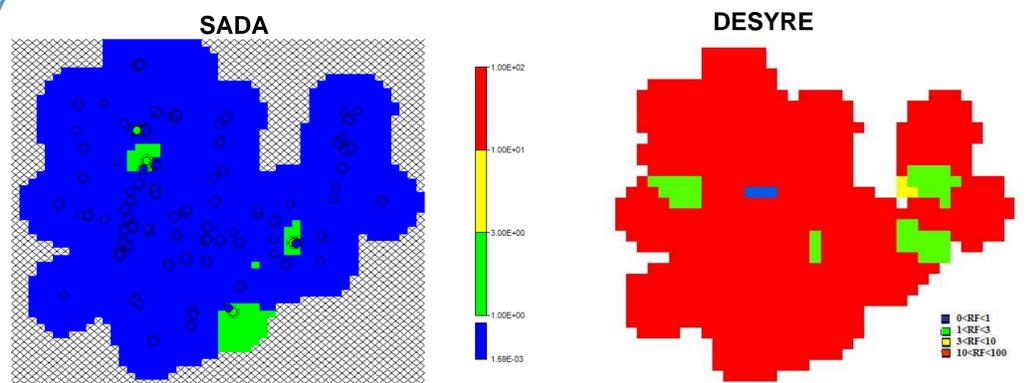


Figure 2. Spatial maps representing the total Risk Factor for DESYRE and the total risk for SADA according to the Residential scenario and the Adults receptors. Similar colors represent similar classes of risk

REMEDIAL TECHNOLOGIES ASSESSMENT

No. Crt.	Remediation Technology	Remediation technologies ranking for Fuels	Remediation technologies ranking for Inorganics
1	Enhanced bioremediation	3.404	
2	Soil vapour extraction in situ	3.599	
3	Biopile	2.620	
4	Separation	2.484	
5	Soil washing	3.138	3.265
6	Landfill cap	1.756	1.819
7	Electrokinetic separation		3.206

Table 1. Remediation technology selection and ranking in DESYRE for the case study

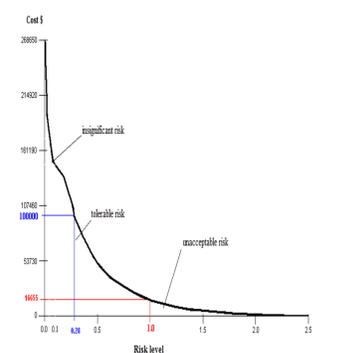


Figure 4. Cost/benefit analysis result in SADA for the case study

CONCLUSIONS

Having as departure point the question: "Does a comparison of DSSs features support the stakeholder to decide which best applies and suits to his/her decision making needs?" two DSSs, SADA and DESYRE were classified and compared.

The comparison showed that successful decision support approaches tend to involve a tiered iterative approach, rather than providing conclusions in a single step, and both the compared DSSs can be considered as being suitable for the decision making process as they involve the use of individual or connected modules.

Although, as a final consideration, a suitable combination of the functionalities provided by the two DSSs could lead to a more efficient assessment since the integration of the modules and functionalities provided by the two DSSs can effectively cover all the contaminated sites remediation phases from the development of the site-specific sampling plan in the characterization phase to the selection and evaluation of the best remediation technologies to be applied to the site.

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