

Science for Environment Policy

New framework to assess brownfield development potential

Researchers have proposed a new framework to assess the potential for redeveloping large contaminated brownfield sites. The framework applies a range of spatial assessment methods to analyse remediation costs, economic value and the sustainability of different land-use types, and to recommend suitably mixed land-use options for redevelopment.

Redeveloping brownfields can address health, ecological and economic threats from contaminated land and leads to a more sustainable use of valuable [land](#) resources. However, remediating the complex below-surface contamination often present at brownfields is expensive: The combined cost of restoring all large European brownfield sites likely exceeds €100 billion. At large and complex brownfields, so-called 'megasites', the involvement of a large number of stakeholders adds further complexity to the process. Effective Decision Support Systems (DSSs) are therefore needed that can manage complex spatial information of such projects, provide transparent results for a range of stakeholders, and conveniently integrate an assessment of sustainability for different planning options.

The study proposes a DSS framework that fulfils these requirements. It allows the deterministic creation of land-use options for specific brownfield sites by integrating different models that consider ecological, social and economic aspects of redevelopment in order to provide a full 'sustainability' assessment¹. These included:

An identification of **clean-up requirements** using spatial data on contamination and planned future land use, as well as data on concentration thresholds above which contaminants must be remediated:

- An estimate of **costs for the remediation** of [soil](#) and groundwater and deconstruction of derelict buildings
- An **assessment of the market value** of the site based on the quality of location (e.g., proximity to public transport, schools and amenities) and financial risks associated with the investment
- A summary **monetary assessment** based on the remediation costs and market value (see above)
- A **sustainability evaluation** based on the sustainability goals of local government planning policies

Within the framework, these models are applied to an integrated spatial assessment² of different uniform uses of the site. Thereby, those locations at the site are identified where different land-use types can most conveniently be allocated. The results are visualised in terms of maps that show economically optimal land-use allocations and guide further planning iterations. The research applied this framework to a case study site on the outskirts of Potsdam, Germany, where previous military use (petrol stations and dry cleaning facilities, among others) had led to severe subsurface contamination. Three land-use types were considered for the planning of redevelopment options at the site: residential, recreational and commercial. The study first mapped out an optimised layout of land-use types by trading-off high land values and low remediation costs. At the study site, this resulted in a rather patchy land-use layout with no recreational areas, which was unlikely to be a realistic option for planners. On this basis, two guided iteration steps led to improved land use alternatives which—although more expensive—were significantly more sustainable.

The proposed framework provides a deterministic derivation of suitable brownfield development options, and enables a transparent communication of results in terms of comprehensive maps. Thereby it facilitates the initiation of constructive discussions amongst stakeholders and provides preliminary planning steps that can be fine-tuned to the priorities of the area.



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1. See: Schädler, S., Morio, M., Bartke, S. *et al.* (2011) Designing sustainable and economically attractive brownfield revitalization options using an integrated assessment model. *Journal of Environmental Management* 92: 827-837. Doi: 10.1016/j.jenvman.2010.10.026

2. See: Schädler, S., Finkel, M., Bleicher, A. *et al.* (2013) Spatially explicit computation of sustainability indicator values for the automated assessment of land-use options. *Landscape and Urban Planning* 111: 34-45. Doi 10.1016/j.landurbplan.2012.12.002