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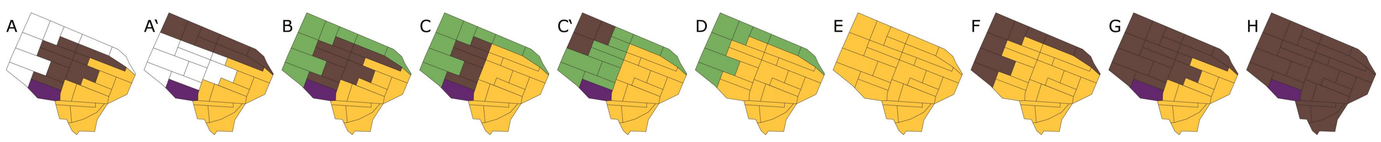
DECISION SUPPORT FOR THE INTEGRATED PLANNING AND ASSESSMENT OF SUSTAINABLE BROWNFIELDS REDEVELOPMENT ALTERNATIVES

The conversion of undeveloped land into settlement or traffic areas endangers biodiversity and food security. In Germany, for example recent rates of this so-called “land consumption” have been ~100ha/day – roughly the area of one soccer field in ten minutes – while about 1,500km² of former industrial or military sites are underused or not used at all. Investors tend to avoid these “brownfields” because of real or perceived risks which are mainly associated with the potential contamination of the sites.

We present a Decision Support System (DSS) which aims at fostering brownfields redevelopment by integrating methods that comprehensively compare the risks and benefits resulting from brownfields redevelopment. The GIS-based planning software evaluates (i) costs for clean-up of soil and groundwater, (ii) the sites’ economic value and market risks, and (iii) sustainable (re-) development for different land-use alternatives, thereby supporting the identification of beneficial spatial planning options.

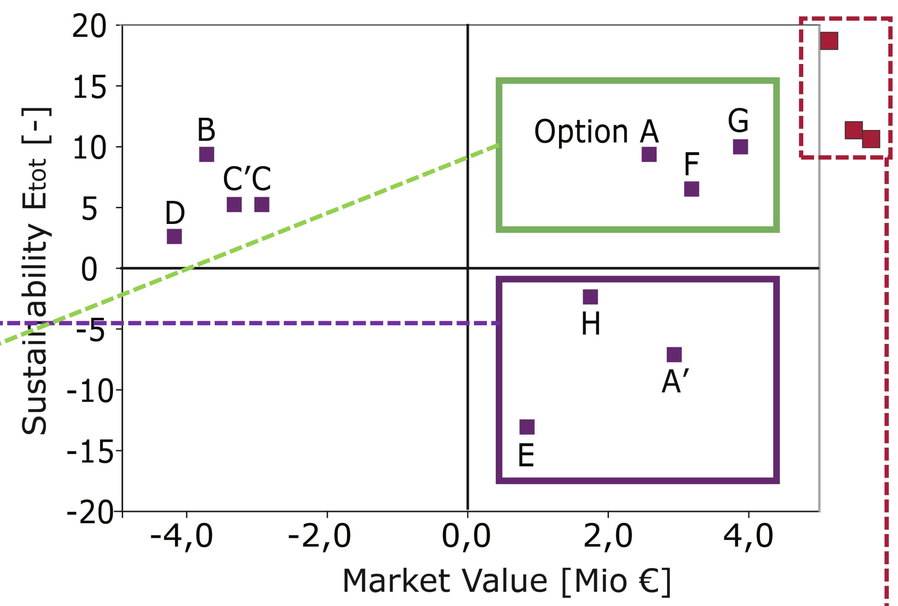
[Step 1] Iterative and participative planning of redevelopment options



A: designed by stakeholders

A’…H: iterations aim to improve individual planning aspects (e.g., remediation costs, market value, sustainability..

- Economically attractive redevelopment is not inherently sustainable (negative values)
- Sustainable options are not necessarily tied to additional costs.
- “trial and error” iterations are limited. Need to provide a deterministic alternative!



[Step 2] Deterministic design of planning options

Evaluating required remediation, economic risks and remaining value for uniform use (different land-use-types) => deterministically “optimized” land value (map 1). The initial planning option (map 2) corresponding to this simplistic optimum serves as a starting point for the first planning iteration. The latter is guided by a visualization of the monetary consequences to the reallocation of land-use-types on the site (map 3).

Evaluation of the different land-use-types’ contribution to sustainable development is providing the background for the 2nd planning iteration. This “final” planning option represents an optimal starting point for iterative and participative planning.

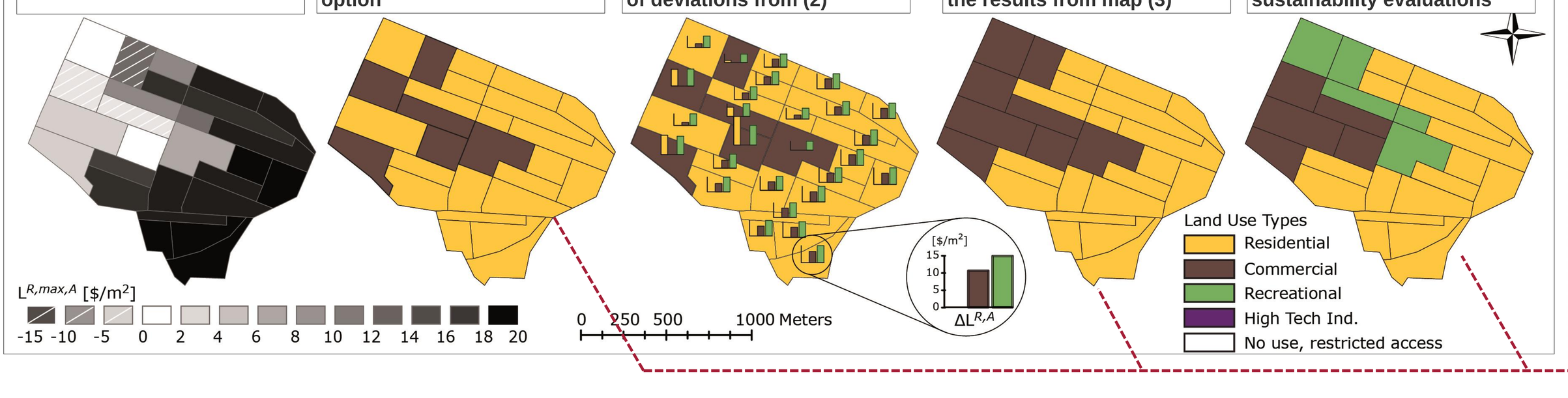
(1): optimum land value

(2): corresponding land use option

(3): monetary consequences of deviations from (2)

(4) 1st iteration considering the results from map (3)

(5) 2nd iteration considering sustainability evaluations



[Step 3]: A framework for the automated spatial evaluation of sustainability

As a third step we describe a framework that provides the automated spatial evaluation of existing sets of sustainability indicators, thereby enabling the integrated evaluation of the vast numbers of spatial land-use planning options that a computer can generate. Application of the framework increased our understanding of sustainable planning at the study site and enable the use of a genetic-algorithm-based optimization framework for sustainable land-use planning.

INTERESTED?

(1) M. Morio et al. present related work in session ThS E4

(2) Most of the methods presented here are implemented in the user-friendly software Megasite Management Toolsuite. Download the software & documentation:

www.d-site.de/index.php/software

References:

[Step 1] Schädler et al., Journal of Environmental Management 92 (2011), 827–837
[Step 2] Schädler et al., Journal of Contaminant Hydrology 127 (2012), 88–100
[Step 3] Schädler et al. , Landscape and Urban Planning 111 (2013), 34–45

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