Spatial clustering of contaminated agricultural parcels for efficient remediation in a post-accident situation.

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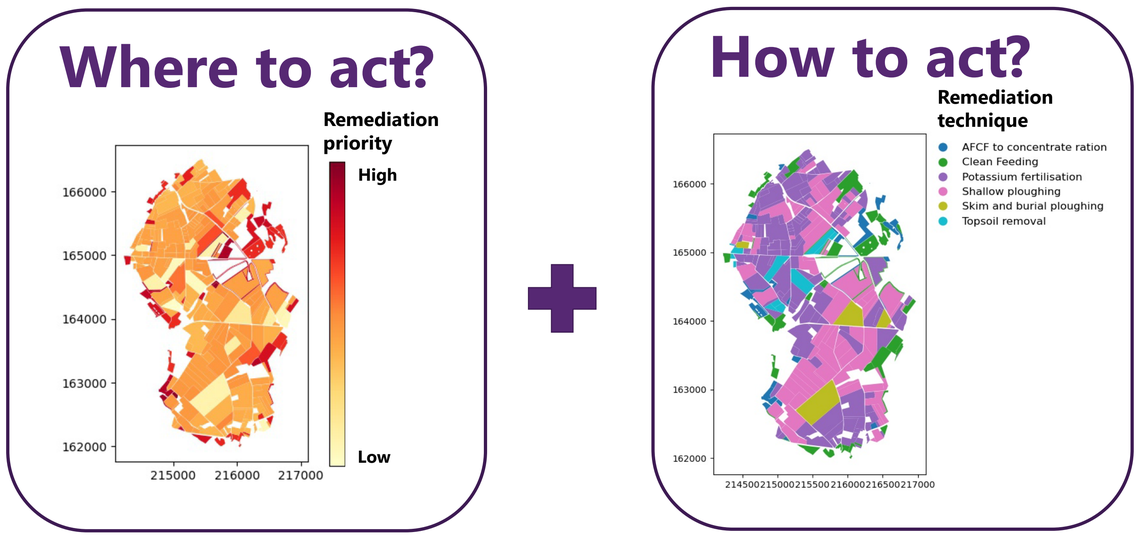
Introduction

Emergencies resulting from nuclear accidents may affect large agricultural areas through the deposition of radionuclides. The subsequent decision-making process can become overwhelming with traditional methods. This inevitably increases the response time and reduces the decisiveness of the measures. To optimise the post-accident decision-making process Operation Research (OR) techniques can be used to facilitate priority setting, which should minimise the overall damages for society and reduce the time to return to normalcy. Nevertheless, these methods currently lead to spatially distributed priorities and a patchwork of proposed remediation approaches, resulting in a 'theoretical' optimal but difficult to achieve remediation scheme.

Objectives

Determine the optimal spatial clustering to convert the patchwork of priorities and remediation actions into a more efficient and feasible remediation approach, by combining the priority scores of the parcel and remedial actions.

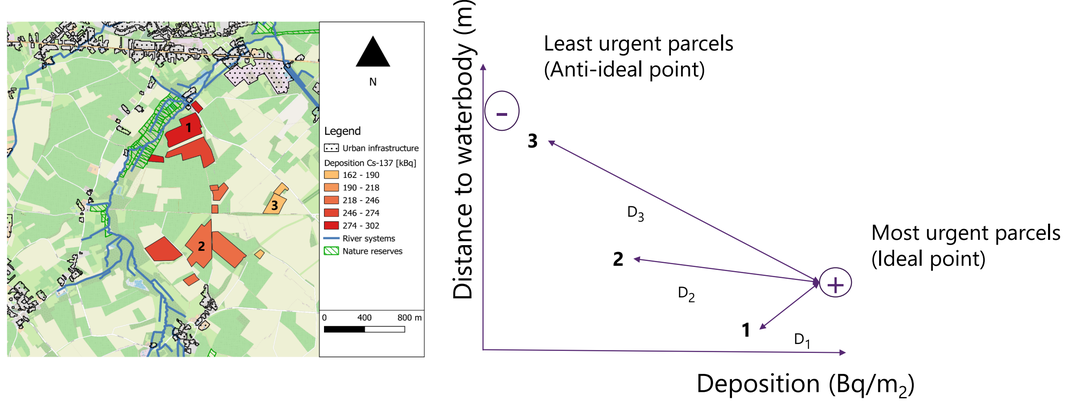
- **Where to act**: Prioritise the most urgent agricultural parcels to society
- **How to act**: Most optimal remediation technique for the specific agricultural field



Methodology

Compromise programming

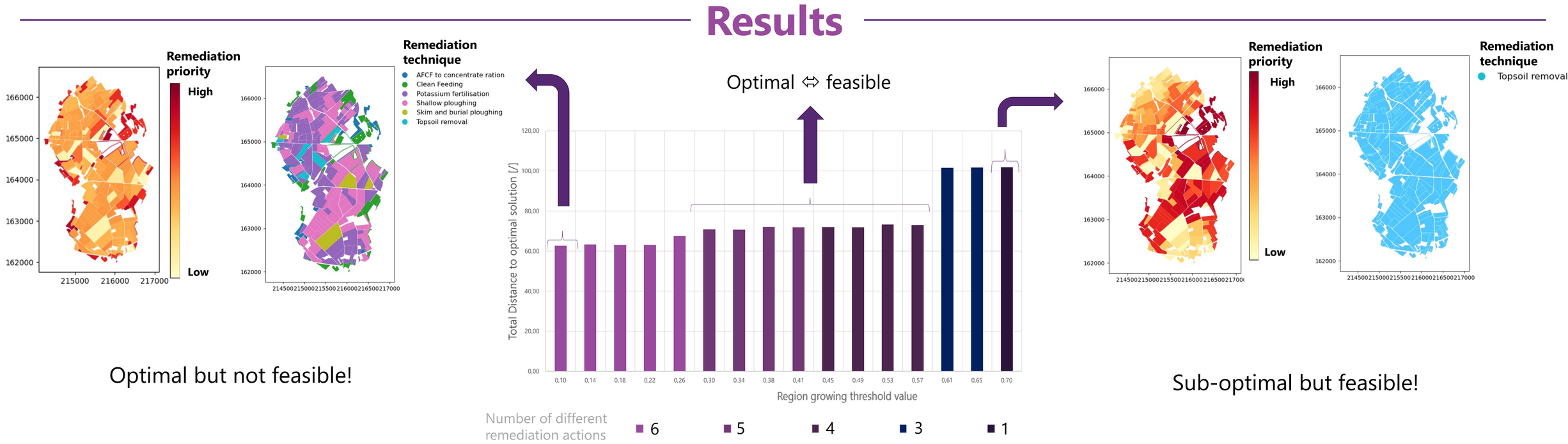
An OR approach to determine the priority of the alternatives, where the optimality of an alternative is determined by its distance to the ideal solution.



Region growing

Remediation clusters are formed based on a region growing approach taking into account adjacency of parcels. The growth of the cluster is based on the allowed difference in optimality between the cluster seed parcel and the adjacent parcels.

Results

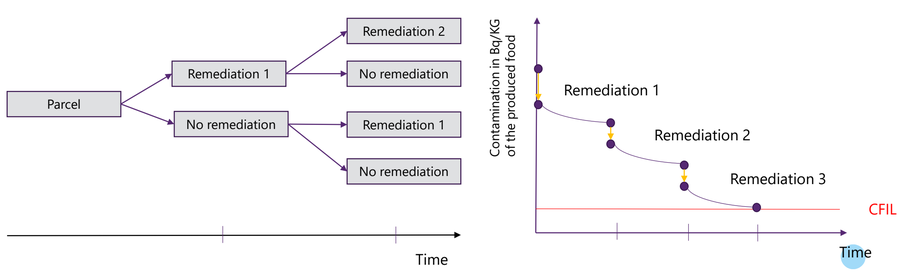


Conclusion

By introducing a spatial clustering to the proposed remediation scheme, larger continuous areas with equal remediation actions arise, ensuring a more feasible remediation campaign, while still insuring the most optimal solution from a holistic perspective.

Future work

- A remedial portfolio to optimize remediation in time.
- Integer programming (IP) approaches to automatically optimize remediation actions in the remedial portfolio



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