



Financial aspects of CHC remediation projects

Study commissioned by the OVAM in the framework of the Interreg IVB project CityChlor, and realised by the VEB

Investing in Opportunities



This project has received European Regional Development Funding through INTERREG IV B.



INTERREG IVB





Who is VEB?

- Federation of Soil Experts in Belgium
- Main focus areas:
 - Increase Q in soil investigations
 - Exchange with authorities
 - Education and training





Why a study on the financial aspects ?

- CHC's are relatively soluble → big plumes
 - Higher density → downward migration in the soil
 - Remedial costs often elevated
 - Uncertainty on the remediation cost estimates → redeveloppers tend to be careful because of the financial risks
- What causes this uncertainty, and can it be reduced? **CityChlor-study realised by VEB**
- 6 participating soil experts: Antea Group, ARCADIS Belgium, Envirosoil, Mava, Tauw and URS



Literature review

- More “holistic” studies towards failure of remediations (*such as SKB (NL)*)
- No standard solutions for CHC remediations
- Continual monitoring and flexibility needed to manage costs



Methodology

Combination of “facts” and “expert judgment” of the participants:

1. Inventory finalised CHC remediations in Belgium
2. Preparation of a questionnaire for the selected remediations (costs, date investigation, applied investigation methods, remediation technique, duration, date of remediation design, ...)
3. Comparison cost estimate in design phase (RAP) with the total cost after realisation
4. Analyses of the parameters in the completed questionnaires
5. Expert judgment of the participating soil experts towards the causes for budget overruns



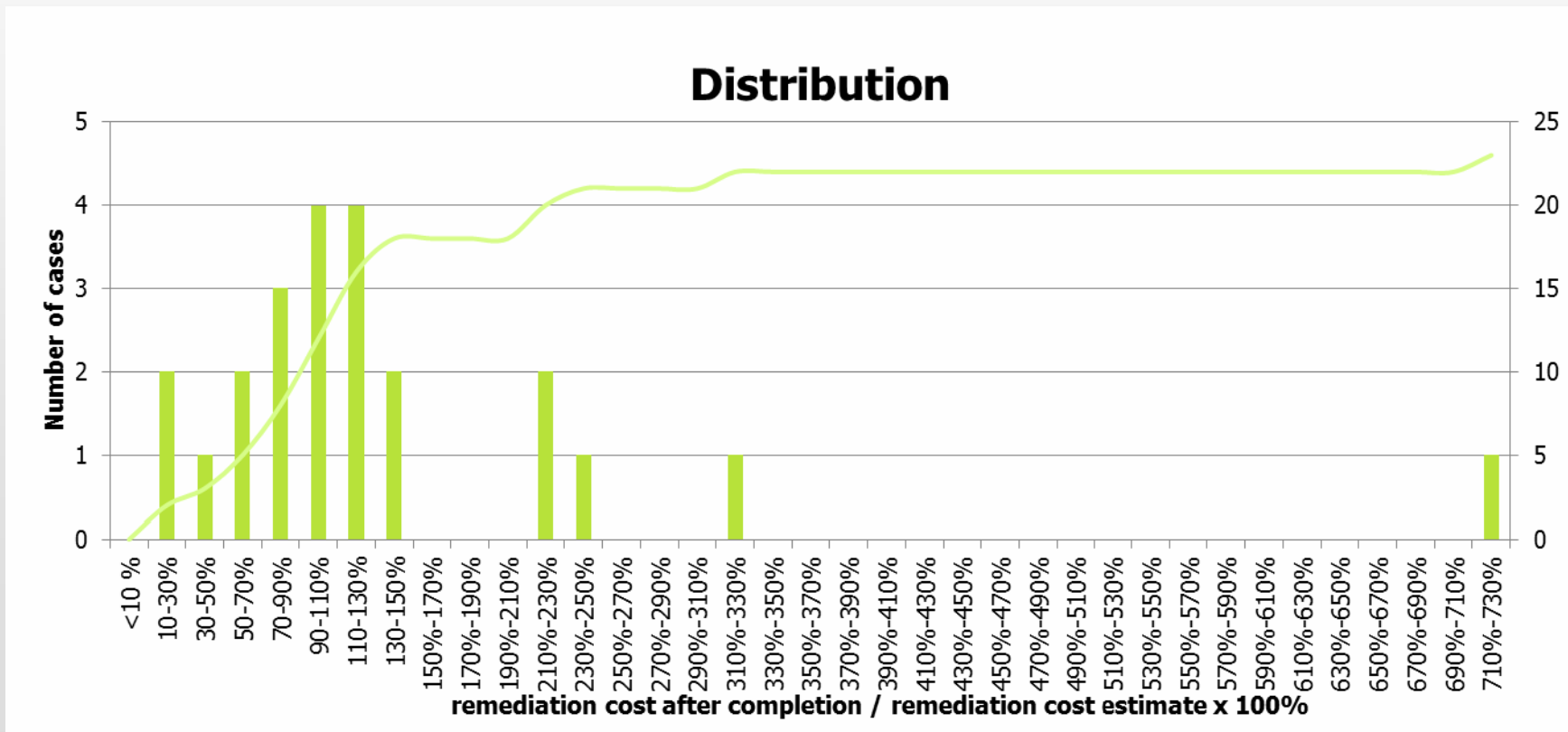
Methodology – limitations

- In total only 23 cases with enough data present: very few finalised CHC remediations exist!
- **Lost information** (old investigations, change of experts during the process, no input on contracting costs, ...)
- Deviations in budget often caused by multiple parameters
- CHC case that are (almost) finished → represent only the 'easier' cases, bias in the dataset?



Results – general

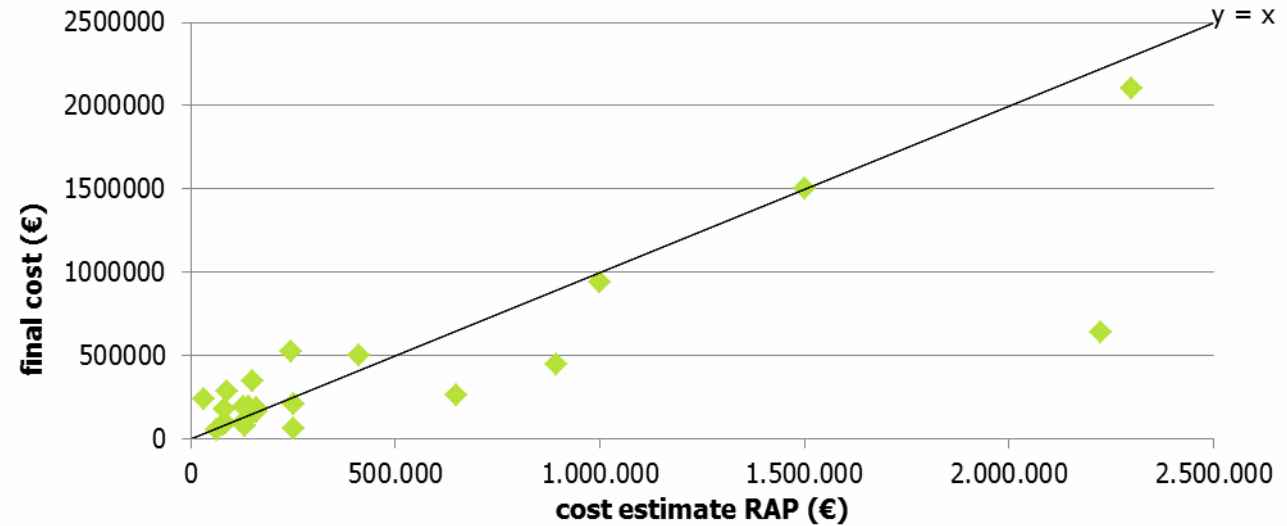
# cases	Number of budget overruns	Max. overrun (factor)	Max. underestimation (factor)	Average overestimation	Median
23	12	7,2	0,25	1,4	1,0



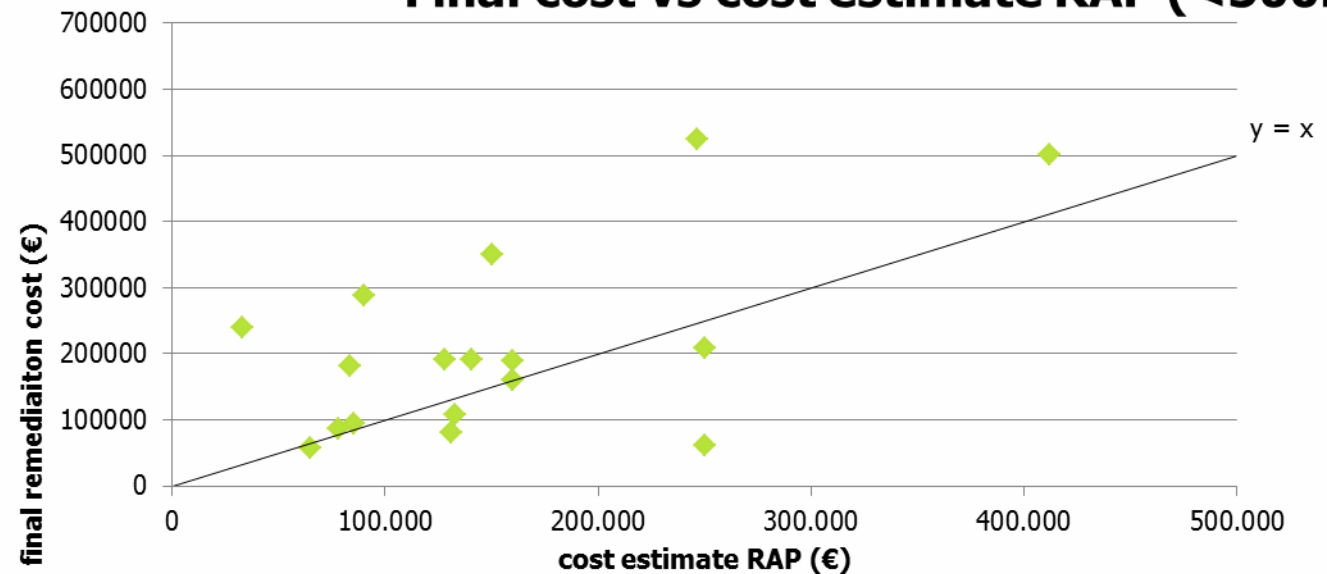


Results general

Final cost vs cost estimate RAP



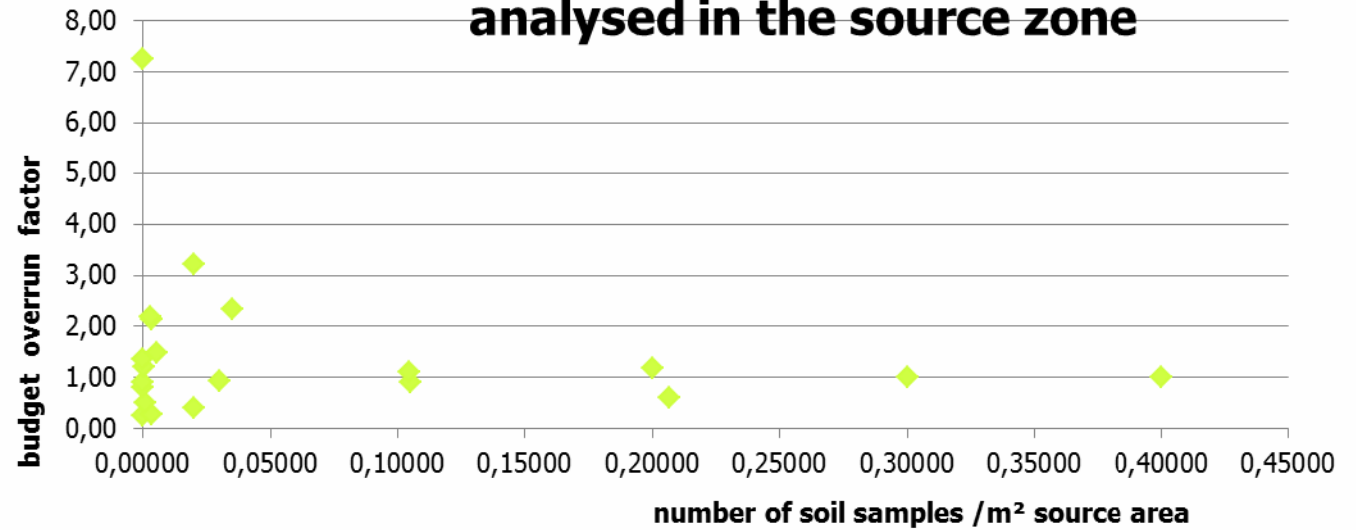
Final cost vs cost estimate RAP (<500k€)



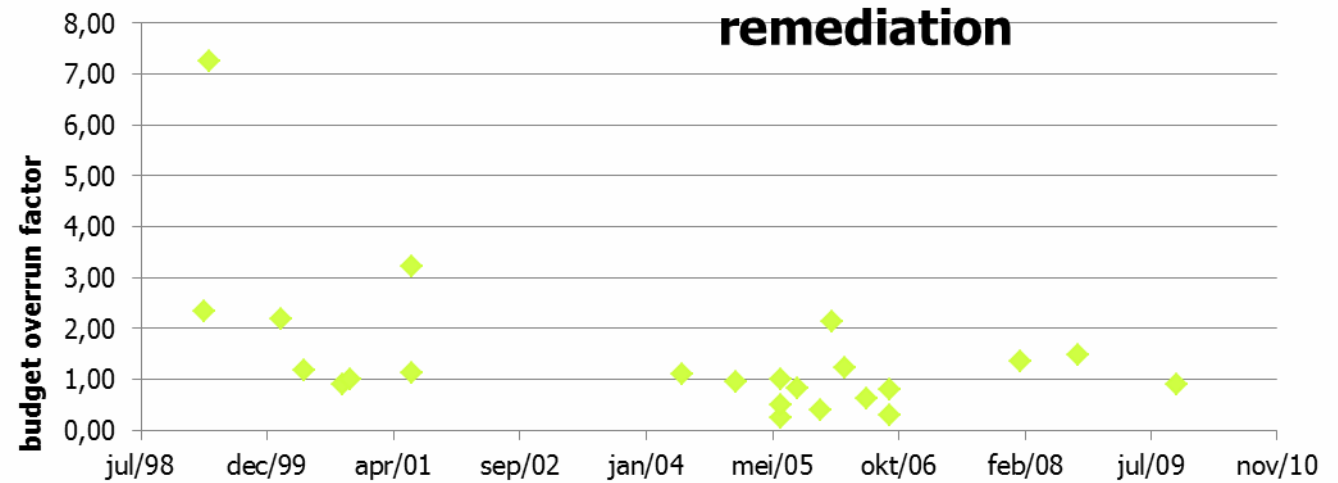


Results per parameter

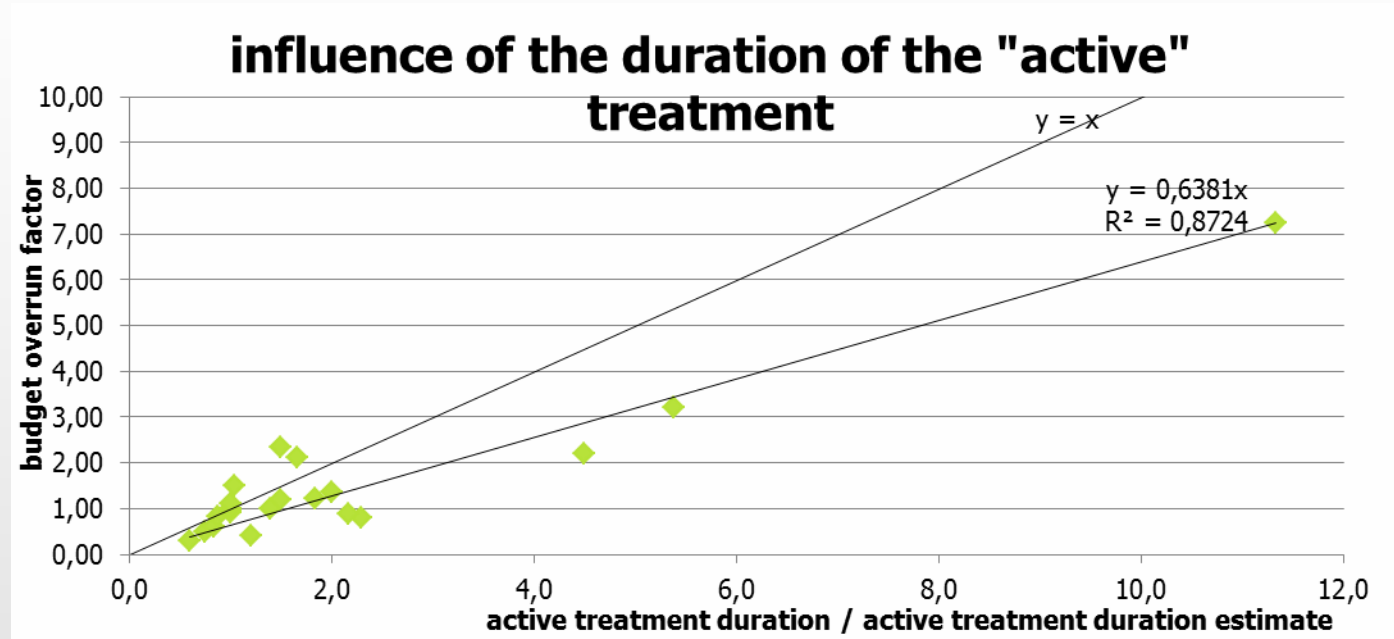
influence of the number of soil samples analysed in the source zone



influence of the starting date of the remediation

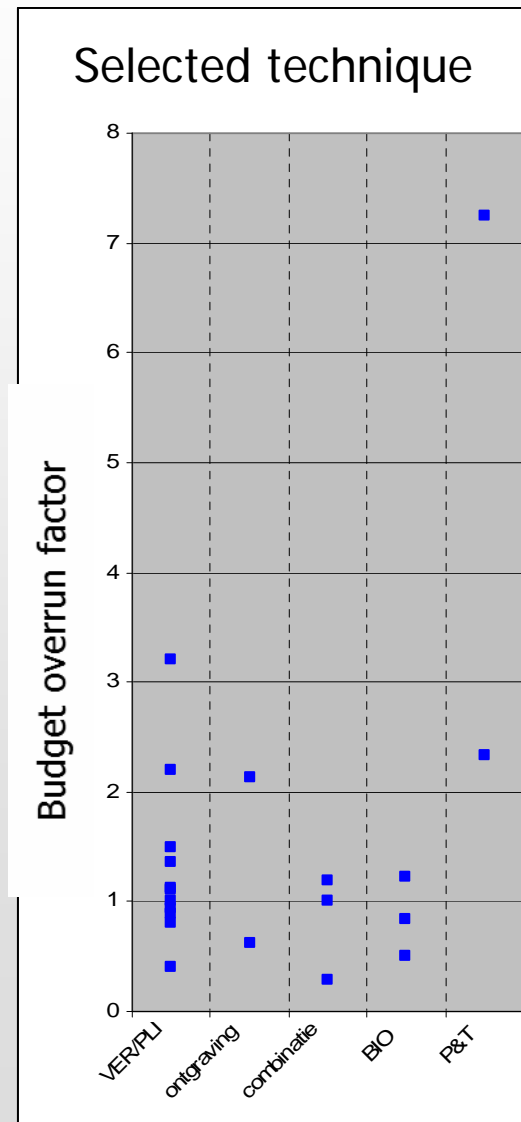
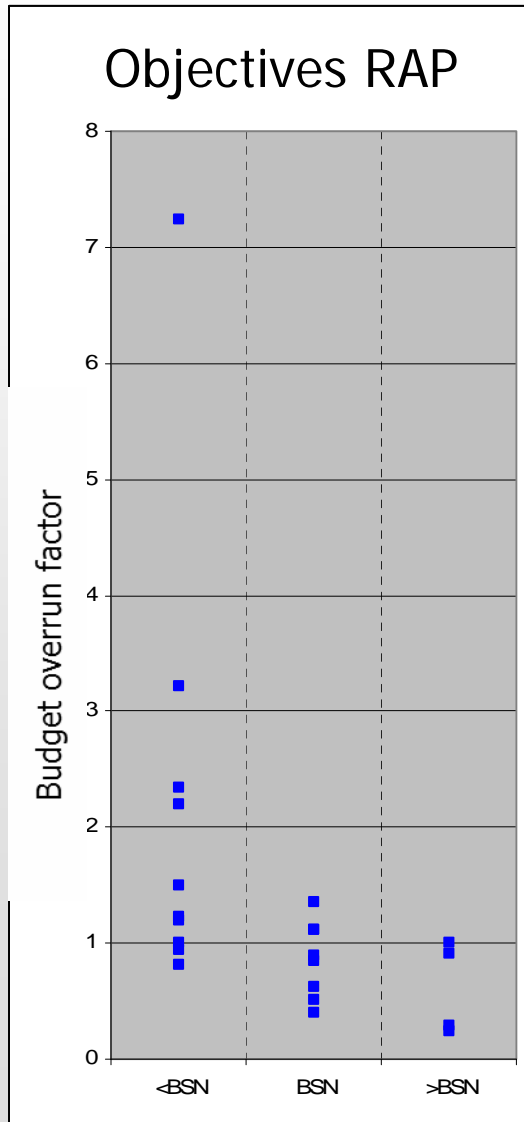


Results per parameter





Results per parameter





Main causes for deviations

Budget

- Remediation objectives too stringent
- Inaccurate conceptual site model
- Unrealistic estimate of remediation duration
- Limited knowledge/experience with some remediation techniques
- Insufficient follow up during the remedial works
- Technical specifications for the contractors not adequate



Conclusions

- CHC remediations are not consistent above budget, but there is room for improvement...
- Budget overruns are more common in smaller projects
- Not enough data available for a quantitative analysis
- Evolution as a function of time: We are all learning (experts, contractors and government)!
- Continuous process follow up and adaptation during remediation works is necessary
- A good characterisation study is necessary, additional remediation investigation may also be necessary!



Recommendations

- A detailed characterisation is absolutely necessary before starting remediation works
- Soil expert need to invest in knowledge and knowledge management
- Estimate of the remediation time: get a more accurate estimate based on field/pilot/tracer studies
- Remediation objectives should be subject to adaptations based on the field experience during the remediation works
- Provide enough time for follow up of remediation works; Dare to question the remediation works and improve!
- *Repeat the study in ca. 5 years!*



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Questions?



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