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YAM

The Flemish approach towards green and sustainable remediation

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Function

ICCL – October 4, 2011

Introduction

- Soil remediation works
  - are usually drastic an costly
  - can have a significant direct and indirect effects on the environment, through emissions, waste production, use of energy and material resources
- In Flanders
  - the choice of remediation technology is based on BATNEEC
  - guidelines for remediation projects include a multi-criteria analysis (MCA) for BATNEEC-evaluation
- However, the MCA
  - does not take into account CO_2-emissions
  - a sustainable use of energy and materials is only considered to a limited extent

Introduction (2)

→ The present MCA for BATNEEC-evaluation is under review to include aspects related to global warming and sensible use of energy and raw materials.

<u>Two literature studies:</u>

- 'Lifecycle-analysis (LCA) and soil remediation projects'
- 'A CO_2-calculator for soil remediation projects in Flanders'

(by VITO)

LCA and soil remediation projects

- Objective:

  An inventory of existing literature and practices regarding the use of LCA in soil remediation projects with the aim to obtain new insights to develop greener and more sustainable remediation options. Can they be incorporated in the existing BATNEEC-evaluation?

- Conclusions:
  - a complete LCA is complex and time consuming
  - not feasible to perform for every soil remediation project
  - LCA estimates the total environmental impact (CO_2 and other effects) of a remediation project, but does not take into account socio-economic and financial aspects
  - certain aspects of LCA (e.g. evaluation of production of non-reusable waste) can be used to improve the present BATNEEC-evaluation

A CO_2-calculator for soil remediation projects in Flanders

- Objective:

  An overview of existing literature and methodologies regarding the calculation of the 'CO_2-footprint' of a soil remediation project.

  Proposal of a CO_2-calculator that can be used in Flanders.

- Conclusions:
  - to calculate the 'CO_2-footprint' of a soil remediation project many details such as remediation parameters, conversion factors, energy and fuel consumptions by machines, … need to be collected
  - this process can be simplified by a CO_2-calculation tool
  - different internationally available tools were evaluated, and one tool was selected
  - the selected tool needs to be adapted to the Flemish situation

The present MCA for BATNEEC evaluation

- In the current MCA for BATNEEC evaluation of soil remediation projects three aspects are considered: – environmental
  – technical
  – financial
- The current BATNEEC evaluation focusses on local environmental issues (local risk reduction) and less on emissions during remediation and use of energy and raw materials

Example – Site contaminated with mineral oil

- Contamination of soil and groundwater with mineral oil, BTEX and naphtalene caused by a fracture in the lines towards two underground heating oil tanks

- 3 options for remediations (3 variants):
  - V1: excavation + removal of floating layer (MFE/VER) + P&T
  - V2: selective removal of floating layer (MFE/VER)
  - V3: P&T for removal of floating layer and groundwater remediation

Environmental	Weight	V1	V2	V3
Level reaching legal remediation objectives soil	**4,25**	6	5	4
Level reaching legal remediation objectives groundwater	**4,25**	7	6	2
Total reduction of contamination load	**4,25**	5,2	5,0	4,8
Restrictions for land use after remediation	**4,25**	5	6	4
Use of secondary raw materials during remediation	**4,25**	2	7	6
Direct emissions to other environmental compartments	**4,25**	3	6	6
Other environmental nuisance during remediation	**4,25**	3	6	6
Duration of remediation and policy objectives	**4,25**	5	5	5
	34	**154**	**196**	**161**
Technical				
Absence of additonal nuisance during remediation	**8,25**	4	5,5	5,5
Effective damage caused by remediation works	**8,25**	4	5,5	5,5
Potential damage caused by remediation works	**8,25**	4	5,5	5,5
Safety measures during remediation	**8,25**	4	5,5	5,5
	33	**132**	**182**	**182**
Financial				
Remediation costs	**22**	4,3	5,1	5,6
Value of residual contamination	**11**	7	5	3
	33	**171**	**168**	**156**
Total	**100**	**457**	**545**	**498**

RESULT (ton CO_2)	Variant 1	Variant 2	Variant 3
EXCAVATION SOIL	**122**	**0**	**0**
Excavation	3	0	0
Treatment	85	0	0
Materials	1	0	0
Transport	33	0	0
GROUNDWATER extraction	**34**	**21**	**35**
Installation	2	1,1	3
Pumping	31,7	19,8	32
Transport	0,5	0,2	0,2
GRONDWATER TREATMENT	**394**	**254**	**365**
Treatment installation	348,1	217,4	340,2
Additives	1,2	1	0,6
Waste	44	35,2	23,5
Transport	0,2	0,2	0,2
MFE	**37**	**55**	**0**
Construction	0,7	1,1	0
Maintenance	36,2	53,6	0
Transport	0,2	0,2	0
SUPERVISION AND AFTERCARE	**2**	**1**	**1**
Supervisor	1,33	1	1
Management	0,04	0,04	0,04
Environmental expert	0,11	0,04	0,04
Maintenance mechanic	0,04	0,04	0,04
TOTAL ton CO_2	**588**	**331**	**401**

Example

- same conclusion, better founded

Proposed changes for BATNEEC evalution

- The present MCA focusses on local environmental effects, expect for the aspect 'Use of secondary raw materials during remediation', which can be considered as a regional/global environmental effect.

Proposal: divide 'Environmental aspects' into two: 'local' and 'regional/global' environmental effects.

- A CO_2-calculator can be used to evaluate the 'regional/global environmental effects'
- Additional aspect to include in MCA: 'production of non-reusable waste'

Next phase

- Proposed changes to MCA need to be made, and suitable weighting factors need to found.
- Based on a sufficient amount of completed soil remediation projects an evaluation will be done. A optimum between local environmental benefits and global environmental effects must be found.
- Adjustment of a CO_2-calculator to the Flemish situation

These tasks will be done next year (2012).

After discussion with stakeholders the adapted MCA for BATNEEC evaluation will be implemented.

Conclusions

- Incorporating a CO_2-calculator and other aspects into the BATNEEC evaluation of soil remediation projects, will lead to the choice of the greener and more sustainable remediation variant.
- A CO_2-calculator provides a more objective tool to evaluate regional/global environmental impacts.
- Application of a CO_2-calculator gives more insight in the contribution of the different remediation subparts to the total CO_2-emission. It identifies the subparts for which technological improvements are appropriate.

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