Case study
Nicole Roadmap and SuRF-nl position on a railway yard in Eindhoven

Tom Nicolaes
Hans Slenders
Chris van de Meene

AquaConSoil, 16-19 April 2013
Barcelona, ES
Introduction

1. Introduction
   Frameworks for sustainability appraisal (NICOLE and SuRF-NL)

2. Case: Working with the roadmap and playing with sustainability aspects and indicators for the “railway yard Eindhoven”
Sustainability in appraisals

Sustainable remediation

Green remediation

- Including aspects outside remediation
- Aspects: nuisance, spatial development, health and safety
- Aspects: Energy consumption, CO₂-footprint, renewable commodities
- Minimize environmental impacts

Traditional remediation

- Most effective remediation option
- aspects: time, efficiency, risks, costs etc.

13 May 2013  
© 2011 ARCADIS
The appraisal in four steps condensed for NL

1. Identify parties and agree on sustainability aspects (headline categories) and options (objectives)

2. Making the aspects measurable/comparable with indicators (scope)

3. Sustainability appraisal based on decisive benefits and burdens (analysis)

4. Justification rule (agree on findings)
Case Study “Railway yard Eindhoven”
Step 1a:
Stakeholders and Priorities (categories/aspects)

- SBNS
- NS-Poort
- Municipality
- Competent authorities
- Residents

Sustainable Remediation Indicators

Environmental Indicators

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>CATEGORY</th>
<th>ISSUES THAT INDICATORS MIGHT NEED TO CONSIDERED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental 1</td>
<td>impacts on air</td>
<td>Emissions that may affect climate change or air quality, such as greenhouse gases (e.g. CO₂, CH₄, N₂O), NOₓ, SOₓ, particulates (especially PM5 and PM10), O₃, VOCs, ozone-depleting substances, etc. (Note: Does not include any odorous effects, bioaerosols, allergens or dust, as these are included in &quot;Social 3: Impacts on neighbourhoods or regions.&quot;)</td>
</tr>
<tr>
<td>Environmental 2</td>
<td>impacts on soil and ground conditions</td>
<td>Changes in physical, chemical, biological soil condition that affects the functions or services provided by soils. May include soil quality (chemistry), water filtration and purification processes, soil structure and/or organic matter content or quality; erosion and soil stability, geotechnical properties, compaction and other damage to soil structure affecting stability, drainage, or provision of another ecosystem good or service. Impacts on geological SSSIs and geoparks.</td>
</tr>
<tr>
<td>Environmental 3</td>
<td>impacts on water</td>
<td>Release of contaminants (including nutrients), dissolved organic carbon or silt/particulates, affecting suitability of water for potable or other uses, water body status (under WFD) and other legislative water quality objectives, biological function (aquatic ecosystems) and chemical function, mobilisation of dissolved substances. Effects of water abstraction included, such as lowering river levels or water tables or potential acidification. (Note: Does not include any water abstraction use or disposal issues.</td>
</tr>
</tbody>
</table>
Step 1b: Remediation options

Passive
- **Scenario 1**: No remediation only 2 years of monitoring
- **Scenario 2**: 10 years of monitoring followed by 5 years to conclude on a stable plume

Active
- **Scenario 3**: in-situ biosparging
- **Scenario 4**: excavation (reality)
**Step 2a:**

Translation to measurable or comparable Indicators

### Important indicators

<table>
<thead>
<tr>
<th>Duration remediation and after care (year)</th>
<th>Load removal</th>
<th>Risk Reduction</th>
<th>Employment</th>
<th>Carbon footprint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
<td>Increase of land use</td>
<td>Added value real estate</td>
<td>Production of waste, dust, sound and nuisance</td>
<td></td>
</tr>
</tbody>
</table>

### Indicators added by ARCADIS

<table>
<thead>
<tr>
<th>Risk of failure</th>
<th>Accident risk</th>
<th>Legal responsibilities</th>
</tr>
</thead>
</table>
Step 2b: Sorting indicators in benefits and burdens (ROSA NL)

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Risk reduction</th>
<th>Increase of land use</th>
<th>Legal responsibilities</th>
<th>Load removal</th>
<th>Added value real estate</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burdens</td>
<td>Costs</td>
<td>Risk of failure</td>
<td>Duration remediation and aftercare</td>
<td>CO₂ production</td>
<td>Production of waste, dust, sound and nuisance</td>
<td>Accident risk</td>
</tr>
</tbody>
</table>
Step 3: 

Selection of decisive arguments

- Paired comparison
- Focus on priorities
- Focus on differences
- Comparison benefits and burdens
### Step 3a: comparison benefits

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No remediation and limited monitoring</td>
<td>Monitoring</td>
<td>In situ biosparging</td>
<td>Excavation</td>
</tr>
</tbody>
</table>

#### Increase landuse

- Railway: None
- Redevelop: None

- **Positive**

- **Neutral**

- **Limited**

#### Load removal (soil and groundwater)

- Railway: 0%
- Redevelop: 0%

- **Positive**

- **Neutral**

- **Limited**

#### Added value real estate

- Railway: Neutral
- Redevelop: Neutral

- **Positive**

- **Neutral**

- **Limited**

---

*Image 1989834094922796519779624331291127952966050488454492105957370884642927838495612378838828973887557277044636103446650000042606723601946819127904649071956937844187095098175565779446437850360135251078254318651587308301081187492889615138095999208236011666282739765659954888969926686049754017354058039296x5535342487744571657369313238938619520421250908068181186956411237320318890737510733981879537156651863787066012120497726363495070123266322480585087984604232848469964612031423129447878782111766148015946535216196570386718620644116785237214673836533509579982825156718040341445487142721523867746676101873664 to -1794862193841266021718859058691754325330949611528519548819509269473808097284679097434607650036730465026211877492850810111770365289863658680822408614280361816004480459593543844427250983853573813776287258929042568447678313592852857630807409937089003317654845382436576393356677677655373332126596333568x5863775091458515179804103826265944581201011002029914675686056122686229411121316213803213948540492639188104852964365057864310095483147631194470514847592528436008750159281079817346849535639114384408409591847371458068662647358719371072689817033328102518581450414031651343856736237313194930904787717193728 |
## Step 3b: Comparison of Burdens

### Burden Scenarios

<table>
<thead>
<tr>
<th>Burden</th>
<th>Scenario 1: No Remediation and Limited Monitoring</th>
<th>Scenario 2: Monitoring</th>
<th>Scenario 3: In-situ Biosparging</th>
<th>Scenario 4: Excavation (reality)</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Railway'</td>
<td>€ 47,000.00</td>
<td>€ 151,000.00</td>
<td>€ 916,000.00</td>
<td>€ 1,973,000.00</td>
</tr>
<tr>
<td>'Redevelop'</td>
<td>€ 45,000.00</td>
<td>€ 149,000.00</td>
<td>€ 364,000.00</td>
<td>€ 902,000.00</td>
</tr>
</tbody>
</table>

### Costs
- **'Railway'**
  - Average / high
- **'Redevelop'**
  - Average / high

### Risk of Failure
- **'Railway'**
  - Average / high
- **'Redevelop'**
  - Average / high

### Duration Remediation and After Care (year)
- **'Railway'**
  - 10 jaar
- **'Redevelop'**
  - 15 jaar

### CO₂ (ton)
- **'Railway'**
  - 1.7
- **'Redevelop'**
  - 1.5

### Production of Waste, Dust, Sound and Nuisance
- **'Railway'**
  - Negligible
- **'Redevelop'**
  - Low

### Chance on a Fatal Accident ($10^{-6}$)
- **'Railway'**
  - 40
- **'Redevelop'**
  - 40

© 2011 ARCADIS

13 May 2013
Step 4: Justification rule

Justification rule “railway plot”

Excavation has very limited benefits, but is 13 times more expensive than passive scenario 1 and has as negative side effects production of waste, CO² and risk of a fatal accident which is 2 to 100 times higher.

Therefore a passive scenario is preferable!
Step 4

**Justification rule**

**Justification rule “redevelopment plot”**

Excavation has some preference because of an increase in all benefits (land use, load removal and real-estate value). But it is uncertain whether the increase in value of the property will cover the extra remediation costs of about €1.000.000,--.

Retrospective view!
By the acutely preformed excavation a large burden from the past is removed!
Lessons learned

1. Include all stakeholders
2. Transparent proces with go / no go moments
3. Don’t go in to detail to quick!

STATEMENT:

*With a little bit of effort and some down to earth reasoning in each project, small or large, a sustainability appraisal should be made because all the parties involved benefit from it!*
Imagine the result

Tom Nicolaes
‘s-Hertogenbosch, Netherlands
+31 627061079
tom.nicolaes@arcadis.nl