Knowledge programme

SUSTAINABLE REMEDIATION

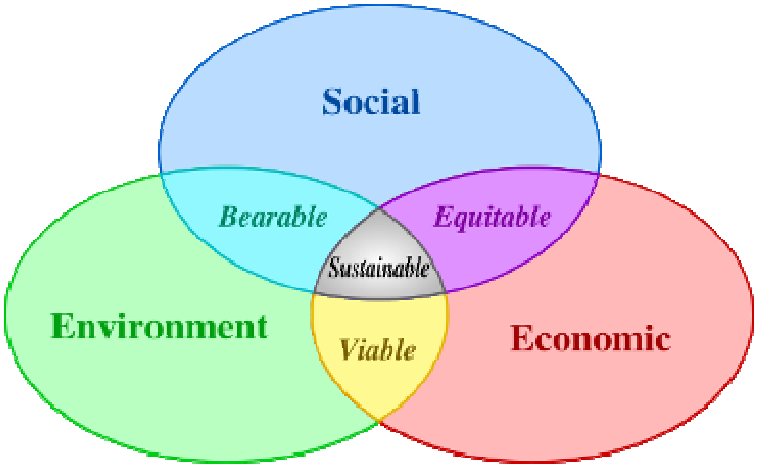
- Are we there yet?

Tomas Henrysson, Conviro AB

Kerstin Jansbo and Anna Richter, The Swedish EPA

Sustainable Remediation

- Dual meaning:
  - remediation carried out in an acceptable balance regarding environmental, economic and social aspects



  - a knowledge programme run by the Swedish EPA

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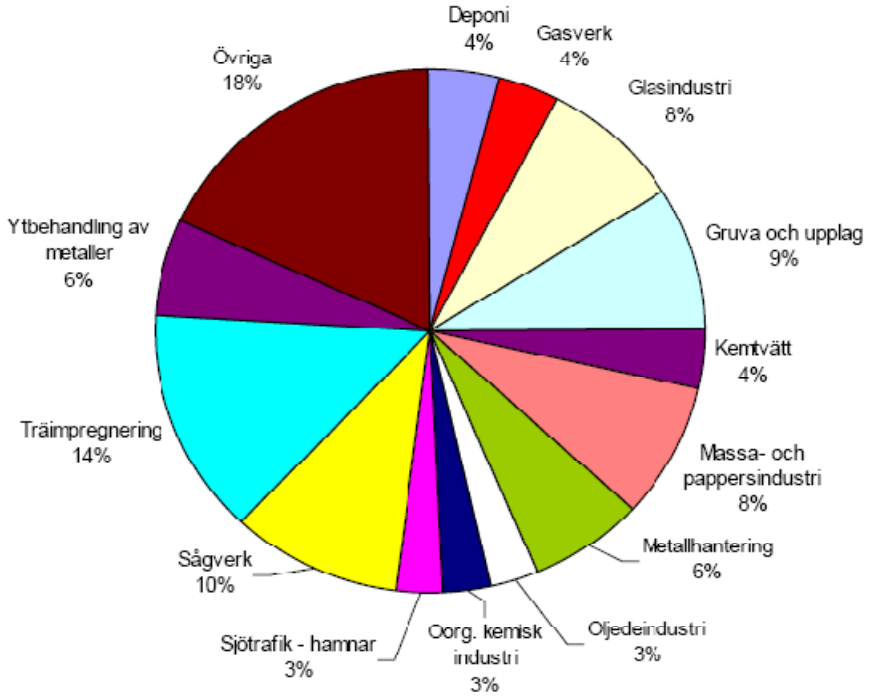
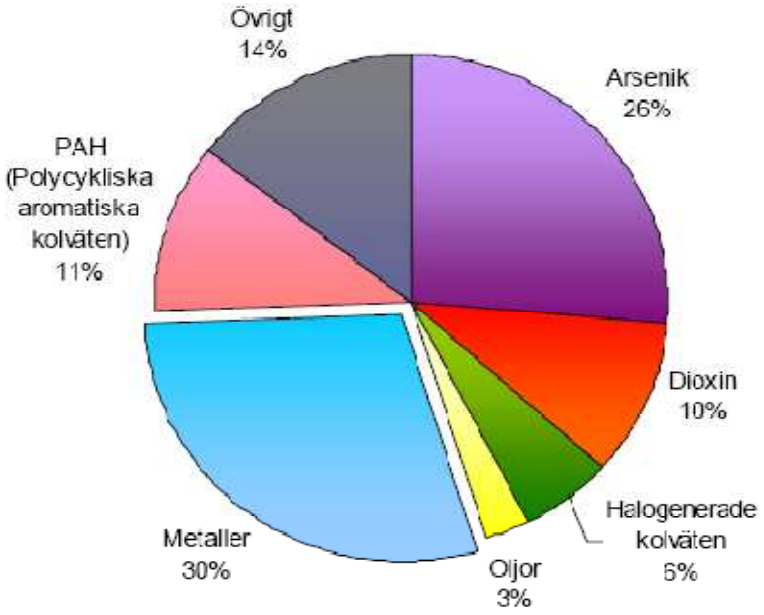
Contaminated sites in Sweden

- **80 000** potentially contaminated areas **identified**
  - At least **38** sites involve **acute** risks or pose an **imminent** threat
  - **1 500** are estimated as **major** environmental and human health risk
  - **22 000** are estimated as **high** environmental and human health risk





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Sweden's environmental objectives – for a sustainable society

- Solve our own environmental problems - not pass them on
- **A Non-Toxic Environment**
  - The environment must be free from man-made or extracted compounds and metals that represent a threat to human health or biological diversity
- **2 interim targets for contaminated sites** (out of 9)
  - acute risks or imminent threats solved by 2010

20 out of 38 acute sites will probably be "safe" 2010

  - enough measures by 2010 to solve the overall problem by 2050

Sites with major risk might be solved by 2050

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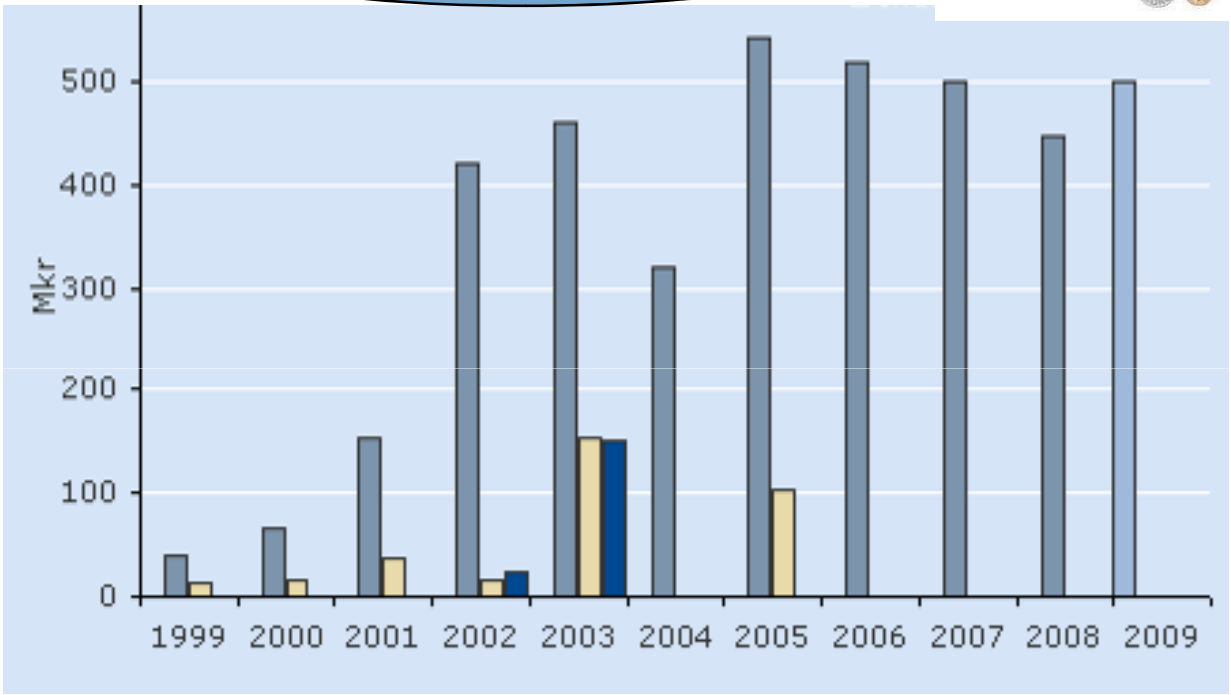
Governmental grants for remediation of contaminated sites

- Only sites
  - with no responsible or partly responsible
- Can be used for:
  - site investigations
  - liability investigations
  - risk assessments
  - other investigations
  - remediation
  - monitoring

~ 50 million € / year



500 out of 3 500 investigated by governmental grants

80 out of 1 600 remediated by governmental grants

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Why start a knowledge programme?

- Large need for knowledge support
- Decrease the risk that resources are spent the wrong way
- Develop tools for better prioritizations
- Make use of existing national and international knowledge
- Help to fulfill the environmental objective “A non-toxic environment”

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The knowledge programme – Sustainable Remediation

- Is part of the Swedish EPA's work to achieve "A non-toxic environment"
- Aim to reinforce the development and the dissemination of knowledge in the field
- Is to satisfy our need for knowledge, both in the short and the long term, and to promote relevant research
- Is a knowledge programme and not a research program

Started 2003
Will be finished 2009

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Calls and Projects

- Three calls (2004, 2005 and 2006) directed to fields with identified knowledge gaps or other obstacles for a sustainable remediation

An evaluation committee of 12 experts

- A total of 55 projects were funded in the fields:
  - Site investigation
  - Risk assessment
  - Risk evaluation/management
  - Risk communication
  - Remedial solutions

A total funding of 4 + 1 M €

- Funding to authorities, researchers and companies for various activities, such as:
  - Gathering of existing knowledge – ”state of the art”
  - Test or validation of existing methods
  - Description of or suggestions for new methods

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Results from Sustainable Remediation

- The results are published in reports from the Swedish EPA
- The reports are printed on demand or can be downloaded as pdf-files
- 35 reports so far and the rest will be published at the latest spring 2009

The reports are in Swedish with an English summary

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Results from Sustainable Remediation – Site investigation

- Strategies and methods for site investigations
- Evaluation of site investigations
- Analytical methods (bioavailability, dioxins)
- Leachability tests (state of the art + validation with models and lysimeters)
- Strategy for environmental monitoring

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Results from Sustainable Remediation – Risk assessment

50% of the projects and the funds

- Systematic risk assessment with interaction matrices
- Simple models for prediction of risk reduction
- Probabilistic risk assessment
- CalTOX
- Groundwater and transport models (6 reports)
- Site-specific eco toxicological risk assessment
- Strategies for health risk assessments
- Risk assessment for sediments
- Risk assessment for mercury
- Bioavailability

State of the art

Evaluation of methods

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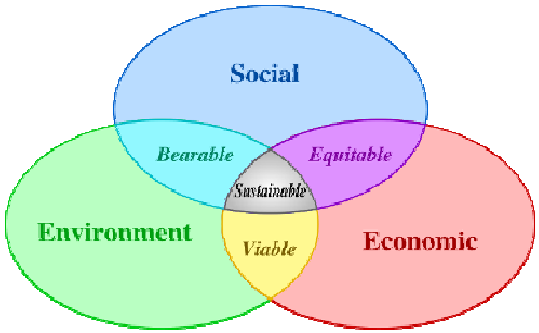
Results from Sustainable Remediation – Risk evaluation/management

- Different aspects of risk evaluation
- Risk evaluation in an early stage
- Multi-criteria analysis (MCA)
- Analytical hierarchy process (AHP)
- Cost-benefit analysis (CBA)
- Contaminated land in financial statements



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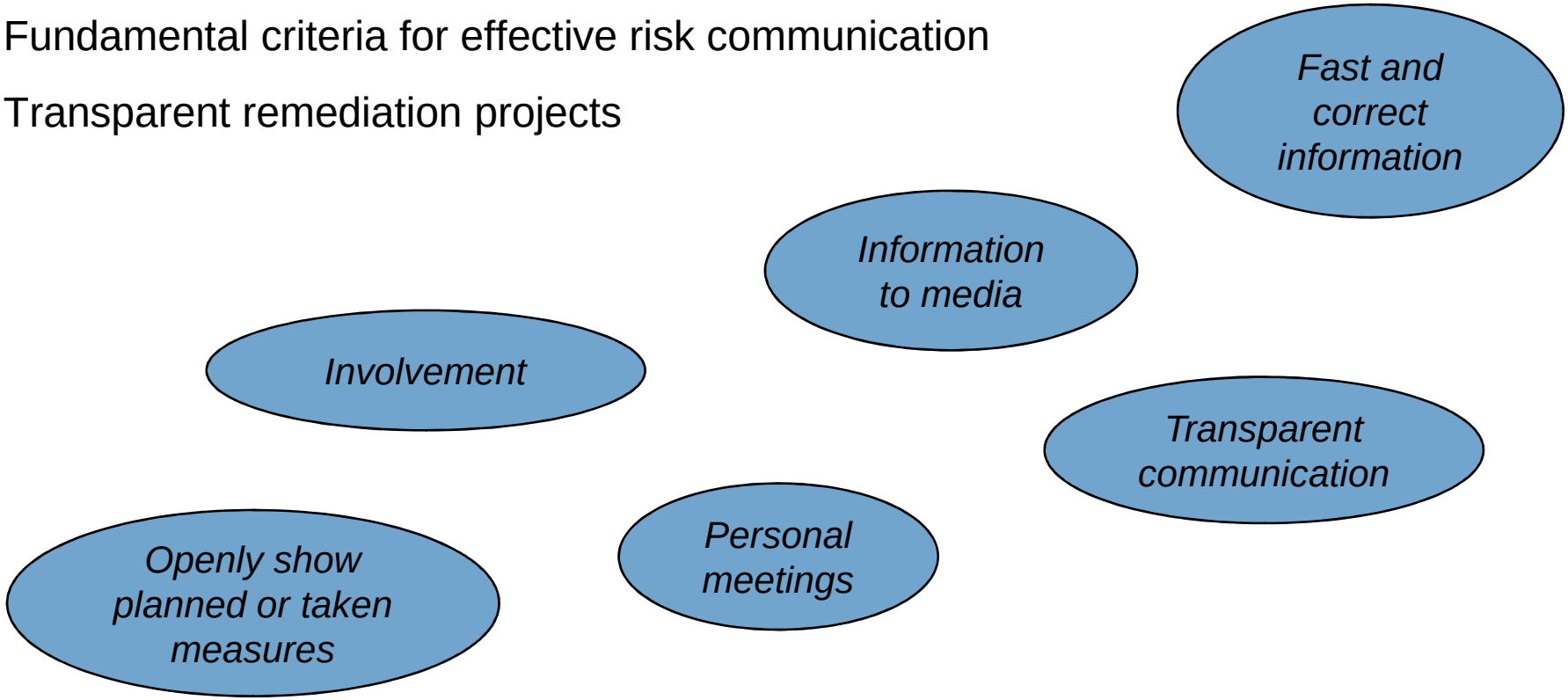
Results from Sustainable Remediation – Risk communication

- Practical advice for risk communication
- Fundamental criteria for effective risk communication
- Transparent remediation projects



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Results from Sustainable Remediation – Remedial solutions

10 % of the projects and the funds

- Experience and available methods in Sweden
- Long time effects of remediation
- Stabilisation and solidification
- Remediation of chlorinated solvents
- Monitored natural attenuation

Authors from Canada, USA, Denmark and Sweden

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A synthesis of the results from Sustainable Remediation

- The synthesis will be published on our web pages
- It will primarily function as a:
  - reading guide for the reports
  - short presentation of the most important results

Relation to existing knowledge and on going activities?

Useful results?

Knowledge gaps?

Experts do not agree?

Large uncertainties?

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Communication aims

- The primary target group should ***use the results*** from Sustainable Remediation in their daily work
  - The Swedish EPA
  - The Swedish Geological Survey
  - The Swedish Geotechnical Institute
  - The county administrative boards
  - Consultants
  - Universities/research institutes/funding organisations
  - Contractors

= key persons!

- The secondary target group should ***know about*** Sustainable Remediation and be aware of the knowledge available from them

Dissemination and embedding of the results

- The results are available on the web page
- Dissemination through
  - Advertising of the web page
  - Posters and oral presentations on meetings
  - Courses (reports etc. as course material)
  - Making key persons aware of the results
  - Encourage active use of the results
  - References to the reports from guidance material
- Embedding of the most useful results in guidance material

Embedding = the results will be used!

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Sustainable Remediation - Are we there yet?

- Necessary to have reliable tools and methods for the whole process
- We have a range of useful tools for risk assessment
  - still some knowledge gaps
- One weak link is probably the tools for risk evaluation
  - promising tools for risk evaluation have been tested
  - most of them need to be further developed
- Sustainability - a developing process ⇒ continuously adapt to new knowledge and new definitions

No sustainable methods only sustainable solutions

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Sustainable Remediation at NORDROCS

- Posters
  - The Knowledge programme – Sustainable Remediation
  - SNOWMAN – European research cooperation
  - Others which I hope use our logo

- Lectures
  - Effective Remediation of Chlorinated Solvent Mixtures in Groundwater via Biostimulation and Bioaugmentation
    - *Evan Cox, Geosyntec Consultants, Canada*
  - A Strategy For Environmental Risk Assessment Of Contaminated Sediments
    - *John Sternbeck, WSP Environmental, Sweden*
  - Methods to Assess Leaching and Transport from Contaminated Sites
    - *Mark Elert, Kemakta Konsult AB, Sweden*
  - Multi-Criteria Analysis as a Decision Support Tool for Remediation Alternatives at Contaminated Sites
    - *Pär-Erik Back, SWECO VIAK AB, Sweden*
  - Cost-Benefit Analysis for Comparing Remedial Actions at Contaminated Sites
    - *Lars Rosen, Chalmers University of Technology, Sweden*

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Nätverket Renare Mark

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The results from Sustainable Remediation will be presented on the Clean Soil Network - Spring Meeting (Renare Marks Vårmöte) in Stockholm 24-25 march 2009 **– be there!**

Read more on: **www.naturvardsverket.se/hallbarsanering**

More information in English will be published in the near future

Thank you!

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