Integrated Strategy to stimulate application of *in-situ* remediation approaches

TNO | Knowledge for business

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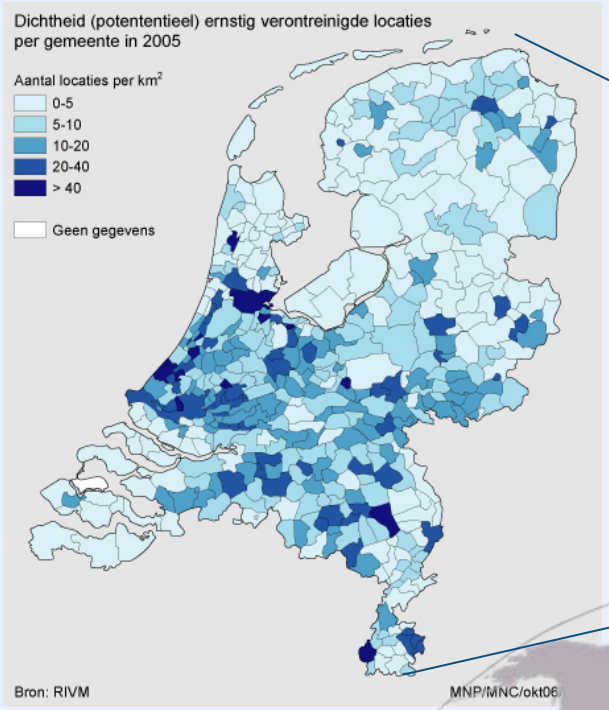
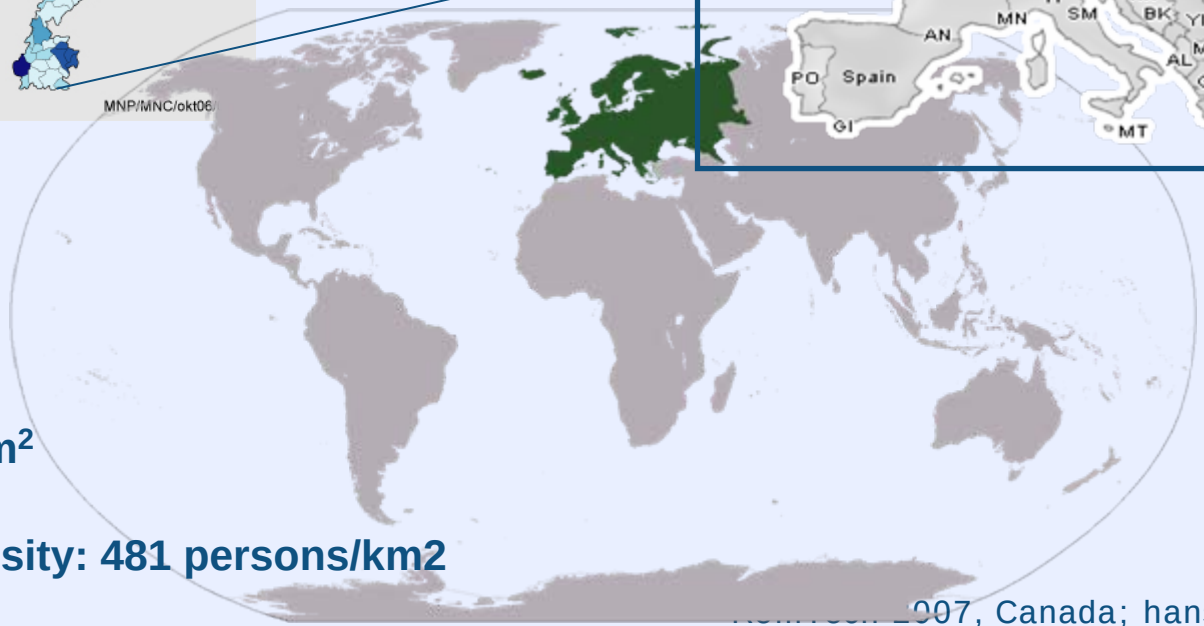
Holland In-Situ Proeftuin

hip

Contaminated sites in The Netherlands per municipality - 2005



600.000 potentially contaminated sites



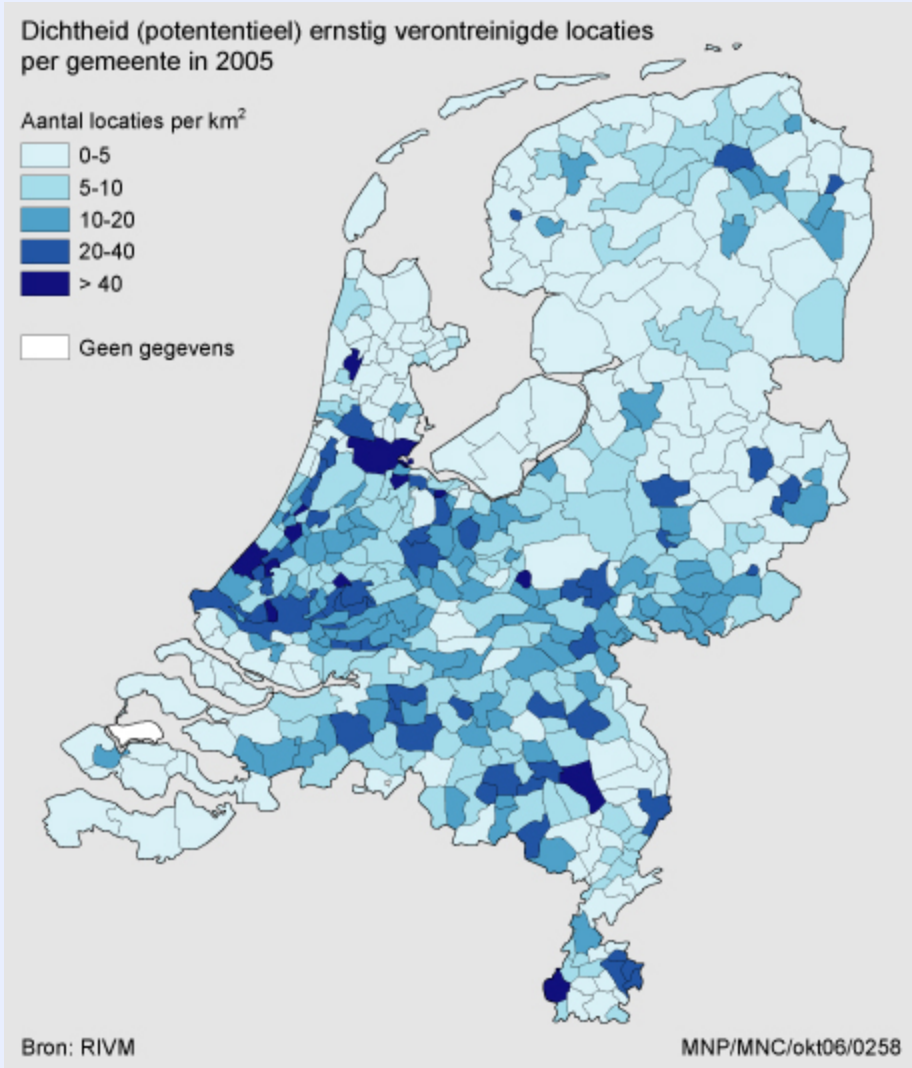
Area: 42.000 km²

Population density: 481 persons/km2

Gas Works Facility (1962)


[redacted]
MILIE
VERBOD
TOEGAN
15
BODEMSANERING
MELDEN BIJ
UITVOERDER

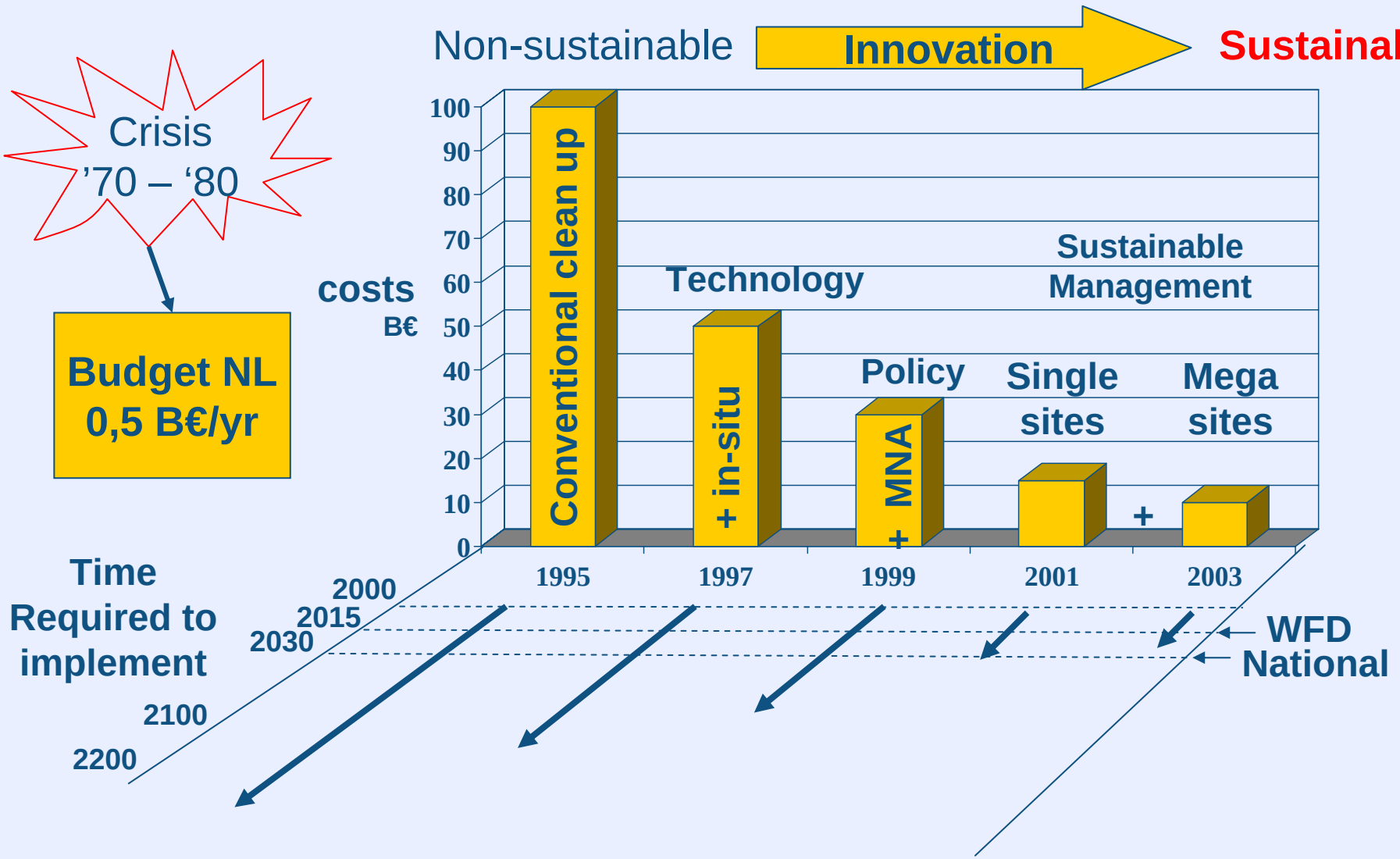
Number of Potentially Contaminated Sites per Municipality 2005



- Total Surface: 41.526 km²
- 600.000 sites are suspected of soil pollution
- 58.000 need remediation
- 12.000 urgent remediation (< 2015)

http://www.milieuennatuurcompendium.nl/onderwerpen/nl0016-Milieubeleid-en-milieumaatregelen.html?i=16

Soil and Groundwater Remediation: More than just technologies



Brief History

- Legislation
- Inventarisation of the problem
- Remediation
- Soil Contamination perceived as risk

<1980

>1980

Lekkerkerk 1980

- No soil policy
- No funding
- No awareness

- 1983 Soil Remediation Law
- 1995 Soil Remediation in Soil Protection Law
- 2005 New Policy in Soil Protection Law
- 2007 New Policy in Soil Protection Law

Lack of confidence in-situ remediation technologies

- In-situ techniques not fully matured
- In-situ techniques insufficiently demonstrated in back yard
- No standardized approach to remediate common situations

- Mind set of competent authority/regulators lacks confidence in in-situ techniques:
  - “Outcome uncertain and risks difficult to manage”
  - Insufficient flexibility to deal with risks and uncertainties
  - Processes (authorisations etc.) with soil remediation too complex (many stakeholders, red tape)
  - Lack of knowledge and experience at daily practice level

Why Holland In-situ Program (HIP)?

Growing attention in (sub-)urban brownfields to:

- Provide building space in a densely populated area
- 600.000 contaminated sites, 90% in urban environment

- Ministry of Environment adjusted its policy for the soil remediation plan until 2030
  - Adopting risk based approach: only the “immediate risk” sites to be remediated
  - Risk driven clean-up plan:
    - 15.000 high priority risk sites, in 10 years
    - 60.000 risk carrying sites, in 30 years
  - Shallow contamination needs to be remediated;
    - Targets made flexible (land use, costs and risks)
    - Industrial sector oriented programs
    - From 900 to 2000 sites/yr remediated

Innovation added to full scale projects

- Duration 3 years (2007-2010), 24 in-situ projects,
- 10 contracting firms with financial contribution
- Biological-, physical-, and chemical technologies and combinations
- Development of standardized in-situ technologies for situations with a high occurence (a high repetition factor, low costs, good market position)
- Process pilots
- Decision support tool - Soilection

Towards standardized reliable and accepted in-situ technologies: the “Holland In Situ Demo” project (HIP).

Site Characteristics		Occurrence (% of total)
Contaminant type (C)	C.1 Chlorinated Hydrocarbons	45
	C.2 Aromatics/Oil/MTBE/Cyanide	45
	C.3 Other	10
Geo-hydrology (G)	G.1 Permeable (sandy)	45
	G.2 Layered, permeable and impermeable layers	45
	G.3 Other	10
Built Environment (B)	B.1 Urban	70
	B.2 Industrial	25
	B.3 Other	5

HIP technical pilots

- In situ bioremediation of a creasote contaminated site by DNAPL extraction and stimualted biodegradation
- Example of a suite of in situ technologies at a dry-cleaning contaminated site in the Netherlands
- Monitoring enhanced anaerobic bioremediation at contaminated sites in the Netherlands; The use of specific monitoring tools

Mega Site Approach –Rotterdam project

More Information on: http://www.euwelcome.nl/kims/

In-Situ Remediation Approach
Contaminant **Source → Plume → Receptor**

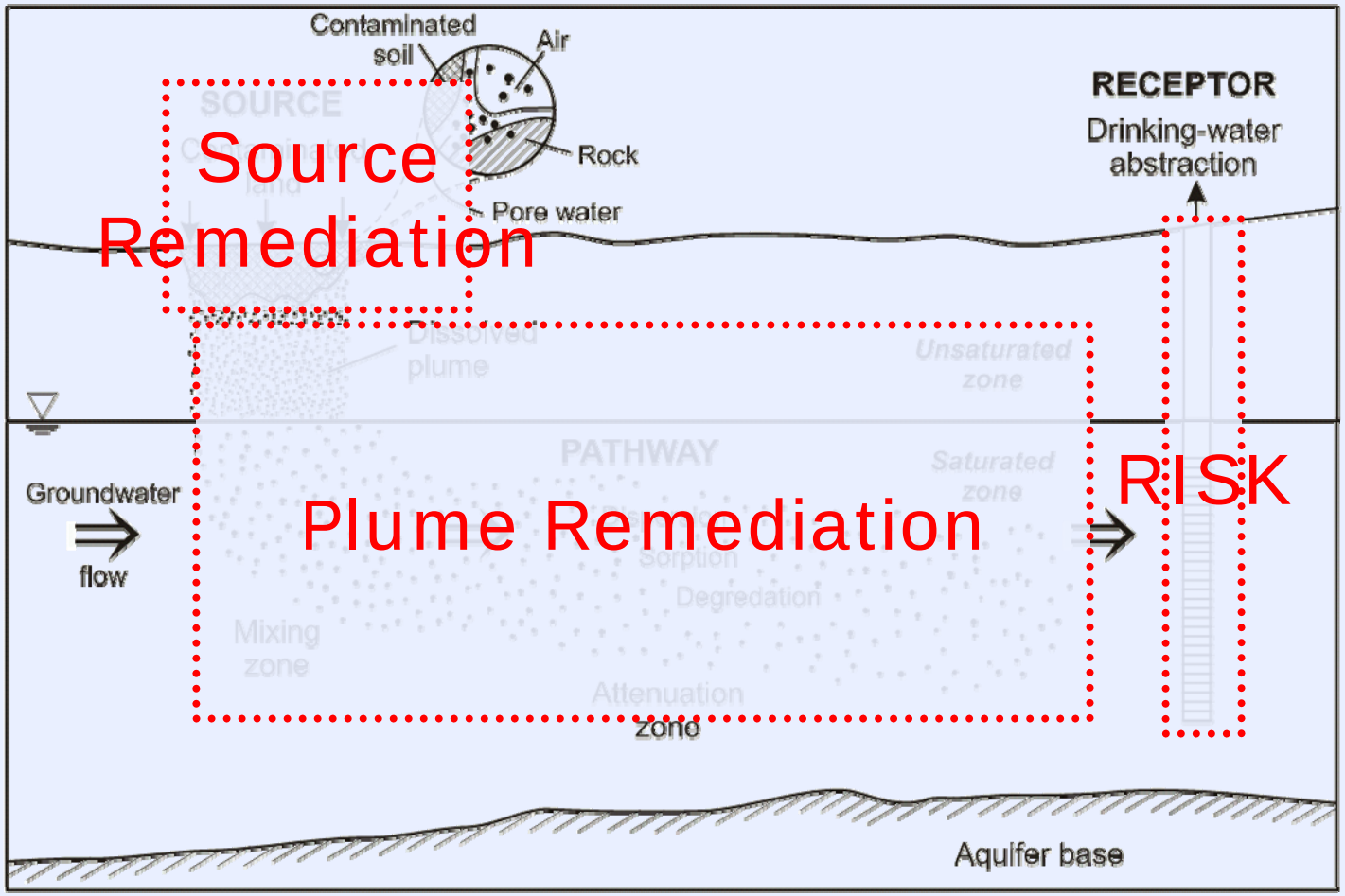


Figure 4.2. Classical contaminant conceptual model.

M. Rivett, J. Drewes, M. Barrett, J. Chilton, S. Appleyard, H. Dieter, D. Wauchope and J. Fastner

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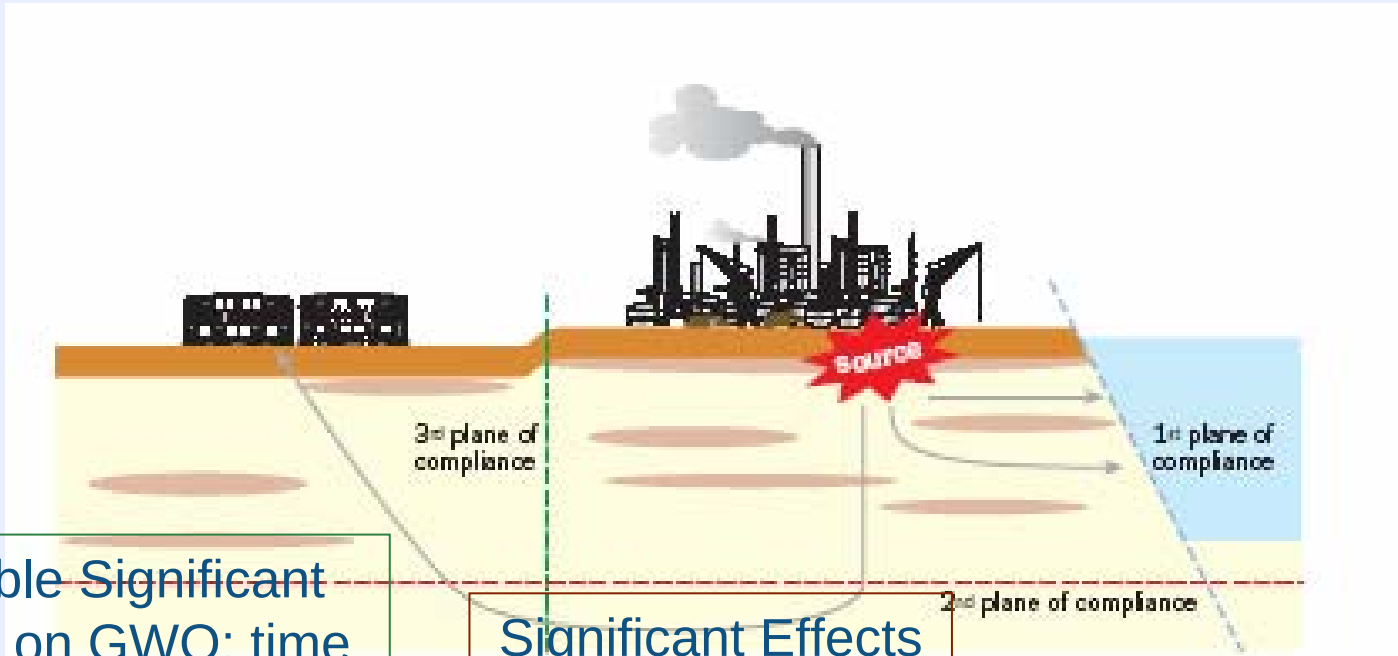
Remediation Approach

- Cost-effective technologies
- Split source and plume remediation

Integrated Management Strategy

1 Identifying Risks (Site Characterization + Risk Assessment)
2 Determining the degree of contamination removal required
3 Calculation of necessary investments
4 Selection of most cost effective scenario



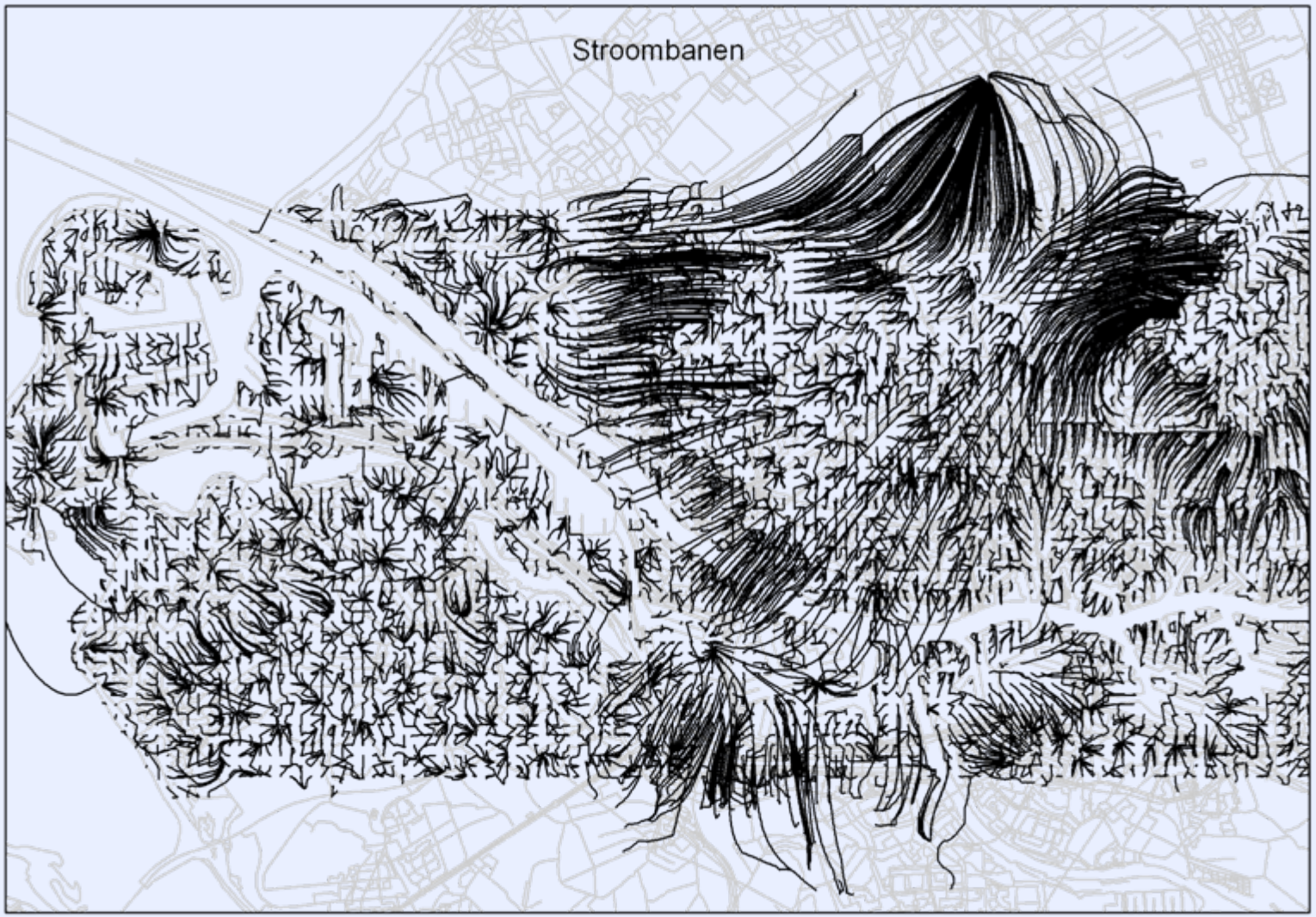
Possible ~~Significant~~ Effects on GWQ; time frame, 2020-2060. Contribution NA??

Significant Effects on GWQ; time frame, 2005-2040

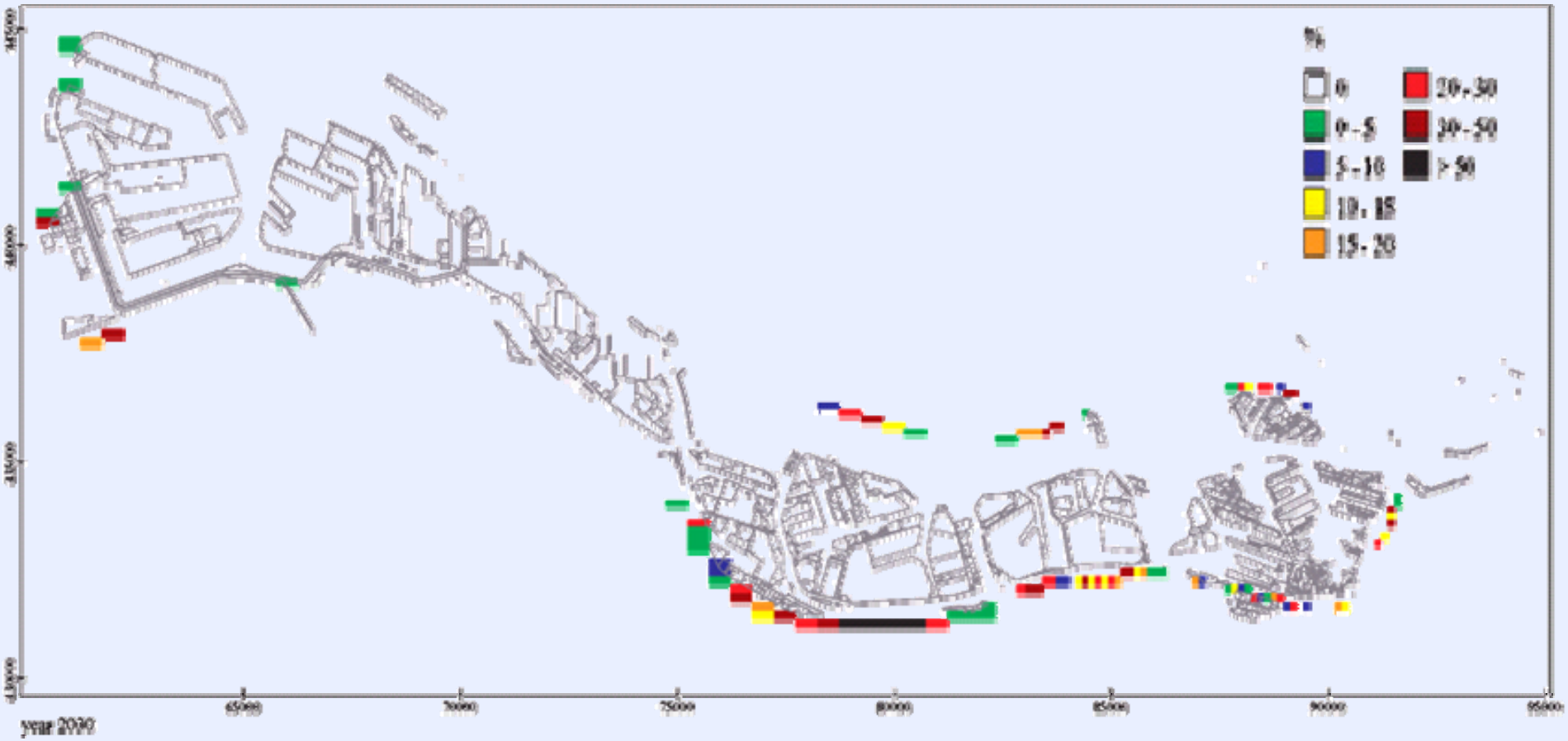
No significant Effects on SWQ


3rd plane of compliance

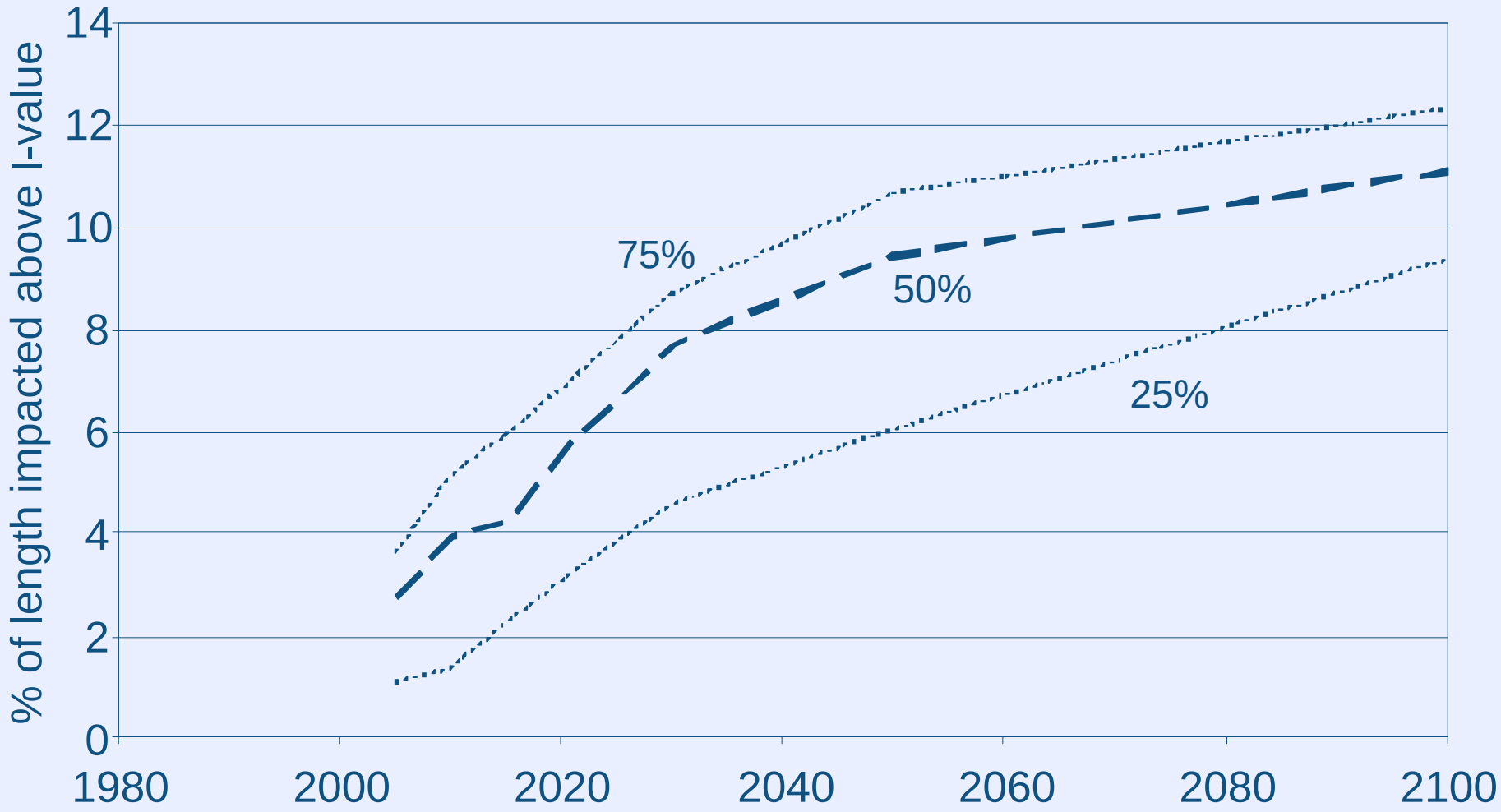
Regional Groundwater flow



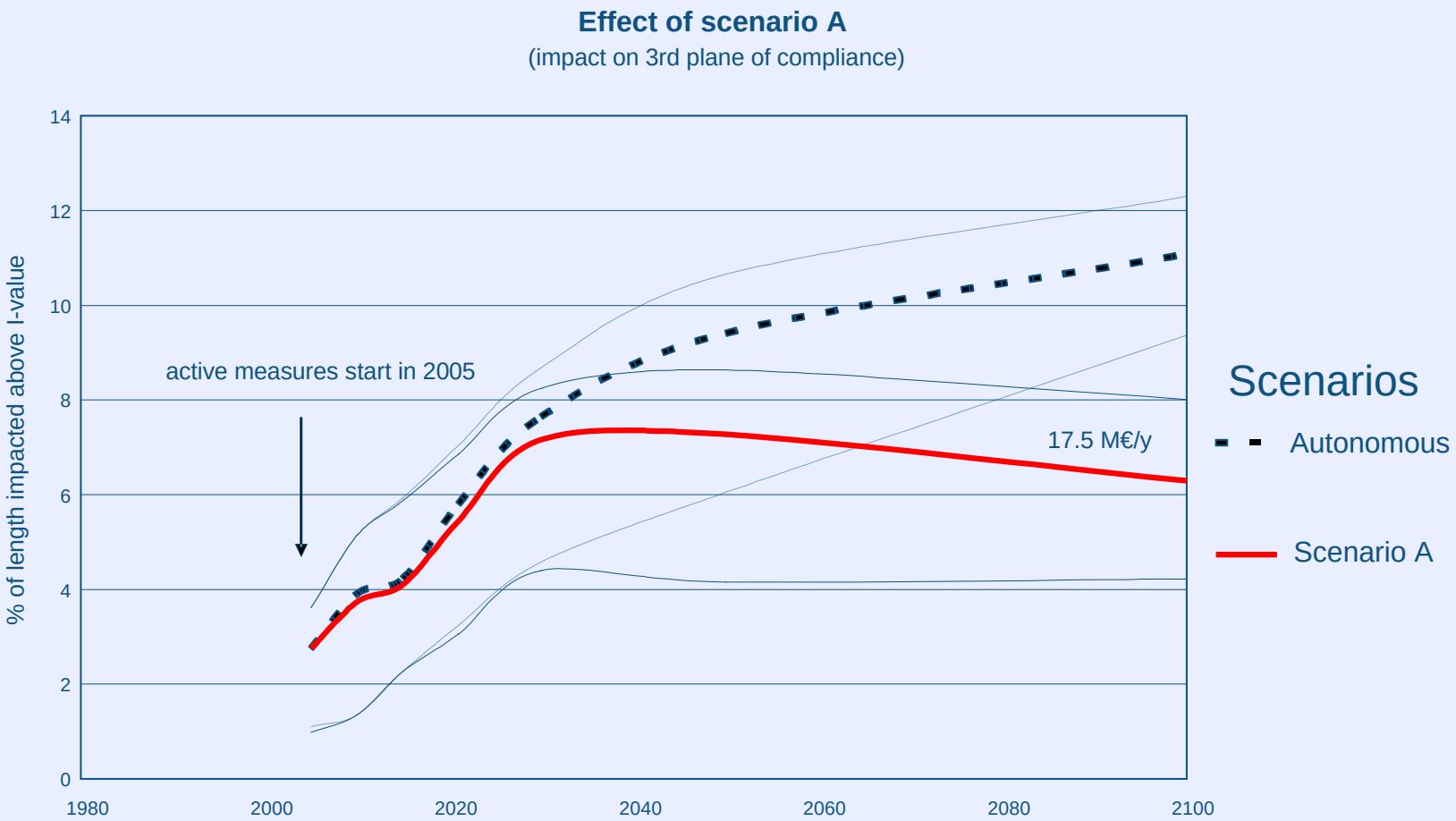
2030: Chance of exceeding intervention value at 3rd Plane of Compliance



Autonomous scenario (impact on POC 3)



Scenarios for effect of risk management measures (e.g. source removal, NA, Isolation)



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