



Tackling the Problem of Soil Contamination in Denmark

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Numbers on contaminated sites in DK

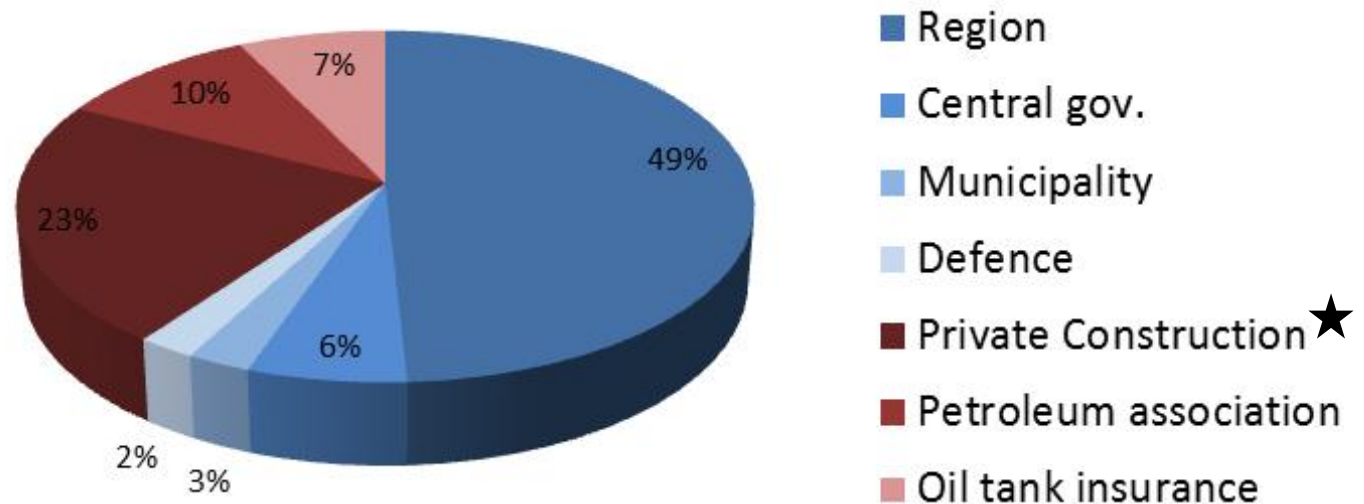
	Total sites 2003 estimate	2009 status
Potentially contaminated sites	55,000	27,000
Of which to be confirmed contaminated	23,000	14,000
Of which to be cleaned up	8,500	(2000)

Total 2003 estimate: 2 bill. €

The job is expected to be completed by 2060-2090

Expenses

2009 expenses on soil contamination Total: € 120 mio.



★ Estimated € 15 – 40 mio.

The Funding Mechanism for Remediation of Petrol Stations

- Operated since 1995 by of Danish Petroleum Association
- Near completion in 2011
- 10.000 former petrol stations has been risk assessed
- Costing appr. 260 m €
- Financed by adding 0,5 cent / l. petrol

Scaling DK numbers

- Population: 1 % of EU (5.4 mio)
- Area: 1 % of EU (43,000 km²)
- Economy: 2 % of EU (GDP 230 bn €)

Multiply by 100 to get EU no. and by 50 to get EU €

National multiplication factors:

15

10

10

3

2

DK → EU

DK numbers scaled to EU:

- 5.5 m potential sites
- 2.3 m proven cont.
- 850,000 sites to clean

DG ENV estimate:

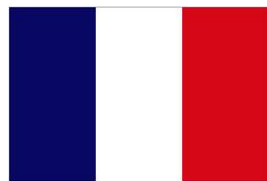
- 3.5 m potential sites
- -
- 500,000 sites to clean

Total cost: € 100 billion

National multiplication factors



15



10



10



3



2

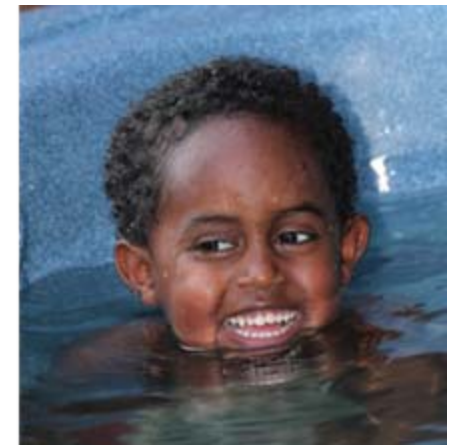
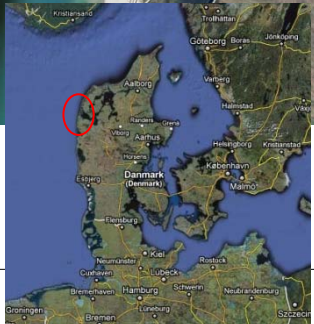
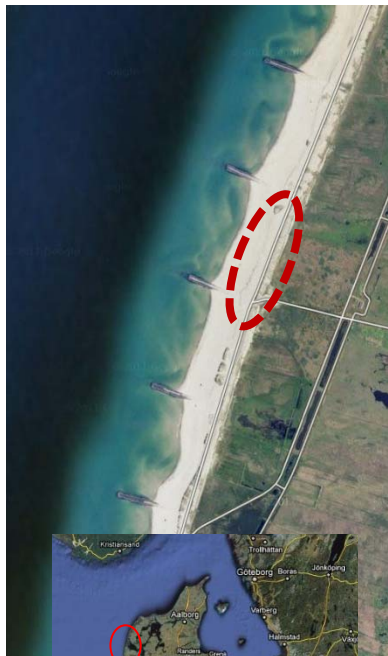
Value created by the subsector

Direct value

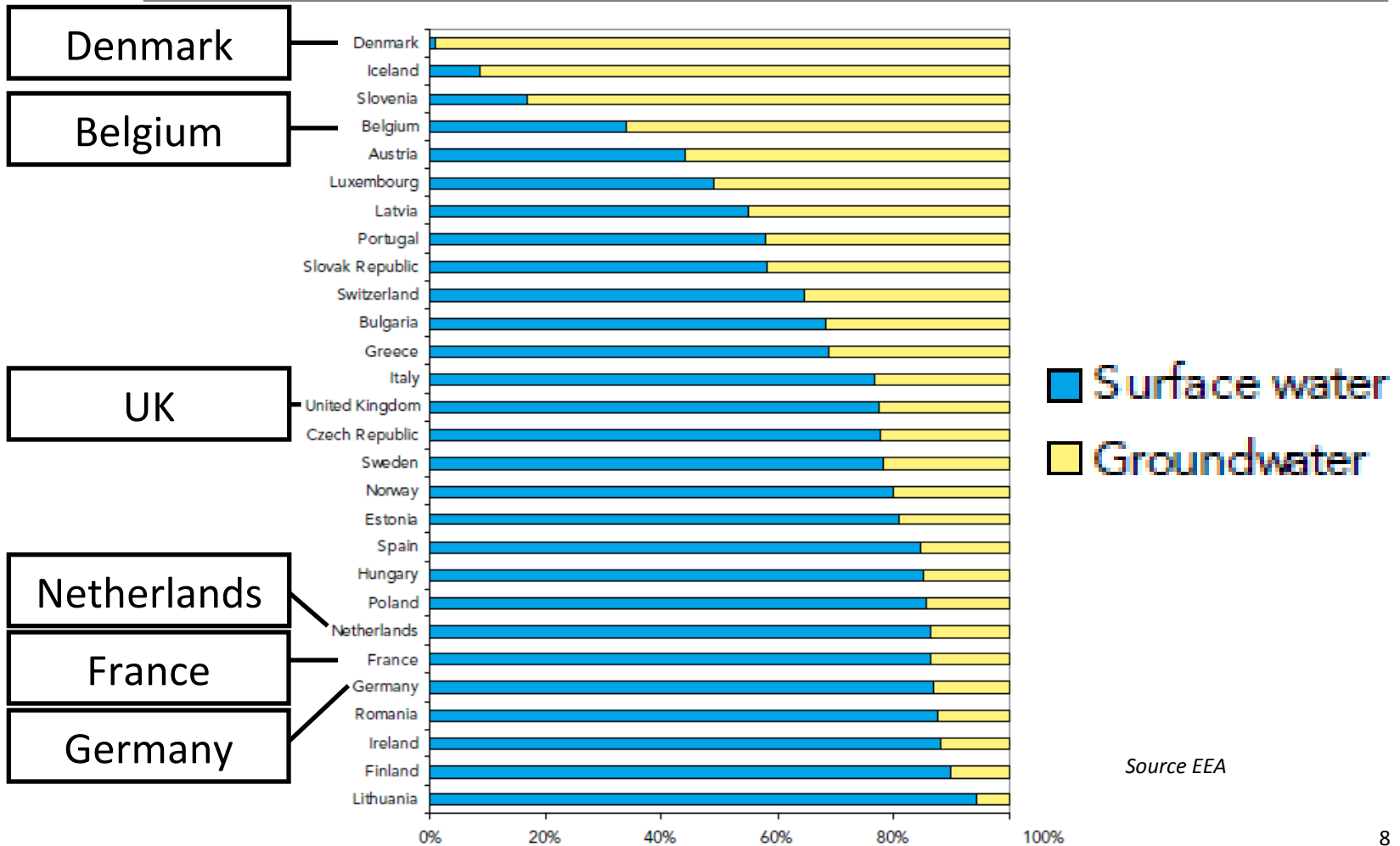
- Increase in property value & Brown Fields
- Clean drinking water
- Health of citizens
- Citizens feeling secure irt contamination
- Ecological value

Derrived benefits

- Jobs
- Research
- Export (potentials)

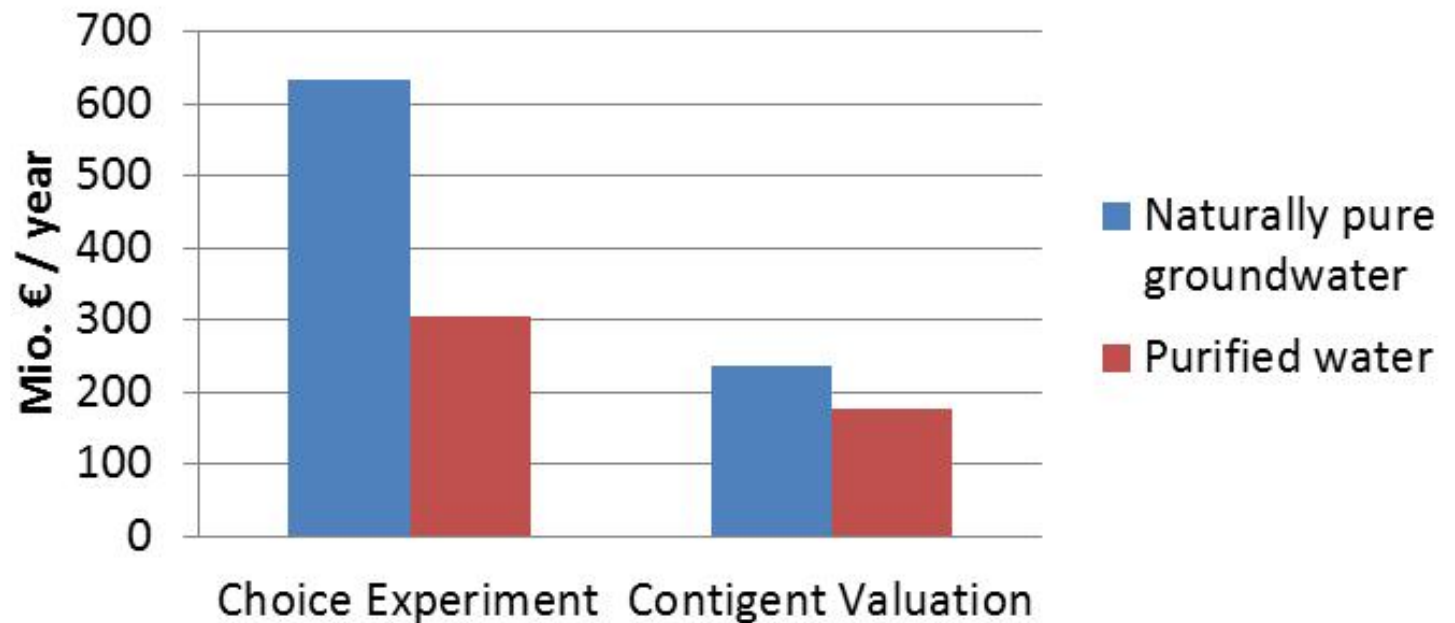


Clean Drinking Water



Value of naturally pure and purified ground water

Calculated willingness to pay for protection of groundwater and purification of water respectively

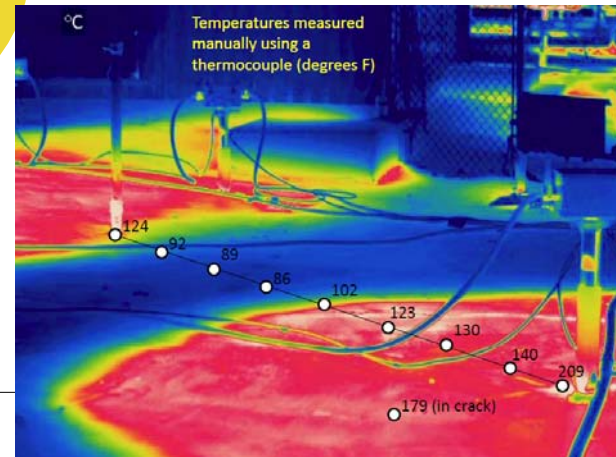


Value created by the subsector

Derived Benefits

- Jobs (appr. 1,000 in public adm. and consultants)
- Research; (appr. 30 people), 'Danish Model'
- Export (potentials)

‘Danish Model’ Applied R & D



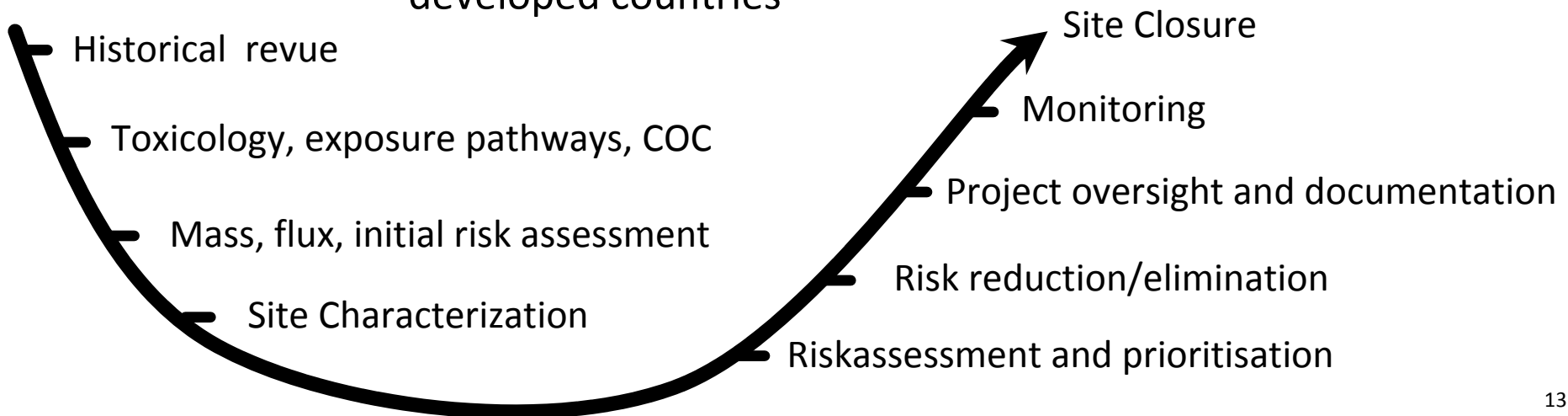
Company	Country	Type of project
Bioclear	NL	Enhanced Reductive Dehalogenation of chlorinated ethenes
Logisticon	NL	Enhanced Reductive Dehalogenation of chlorinated ethenes. Rent of bioreaktor from contractor
Geosyntec	USA	Collaboration on a number of Danish field projects, remediating chlorinated solvents: Enhanced Reductive Dehalogenation of chlorinated ethenes. Biological degradation of polare solvents. Remediation of molybdaen contamination. Electrokinetic enhanced remediation of PCE
SIREM	USA	Laboratory studies of Enhanced Reductive Dehalogenation of chlorinated ethenes, free phase PCE, polare solvents
TRIAD Env. Solutions	USA	Field laboratory, Site Characterisation in DK at 4 sites
Redox-tech	USA	Direct GeoProbe-injection for remediation by Enhanced Reductive Dehalogenation and In Situ Chemical Oxidation
Verutek	USA	Remediation by Chemical Oxidation, S-ISCO (Surfactant enhanced in situ chemical oxidation) of PCE and heating oil
GeoSolutions	USA	ZVI Clay v. soil mixing – remediation of free phase PCE by Chemical Oxidation
Adventus	USA	In Situ Chemical Reduction (ISCR) of POP (pesticides)
Sogreah /ARTELIA	FR	Partner in the Strategic European Expertise Network, SEEN
Witteween+Bos	NL	SEEN partner. Subconsultant on water as an element in modern cities
Université de Neuchâtel	CH	Laboratory analyses of stable isotopes (Chlorinated Ethenes and BTEX)
The University of Umeaa	SE	Joint EU-project with Ph.D studerende
Ivey International	USA	Laboratory tests investigating accelerated remediation of jetfuel by surfactants
Geoprobe	USA	Collaboration on develloping a new probe that combines hydraulic and contaminant measurements
Colorado State University	USA	Collaboration on development of the ZVI-Clay technique (Soil Mixing) for remediating chlorinated ethenes
TerraTherm	USA	Coorporation on remediation of a number of sites using, thermal technologies: ISTD, Steam and ERH

Export of Soil Contamination Competences - Value & potentials

CAN EXPORT OF SOIL REMEDIATION COMPETENCES
POTENTIALLY CREATE SIGNIFICANT VALUE ??

YES!

- Potentials for large cost savings in MANY developing and developed countries



Export of Soil Contamination Competences - Value & potentials

IS SOIL REMEDIATION DRIVING ECO BUSINESS ??

NOT REALLY!

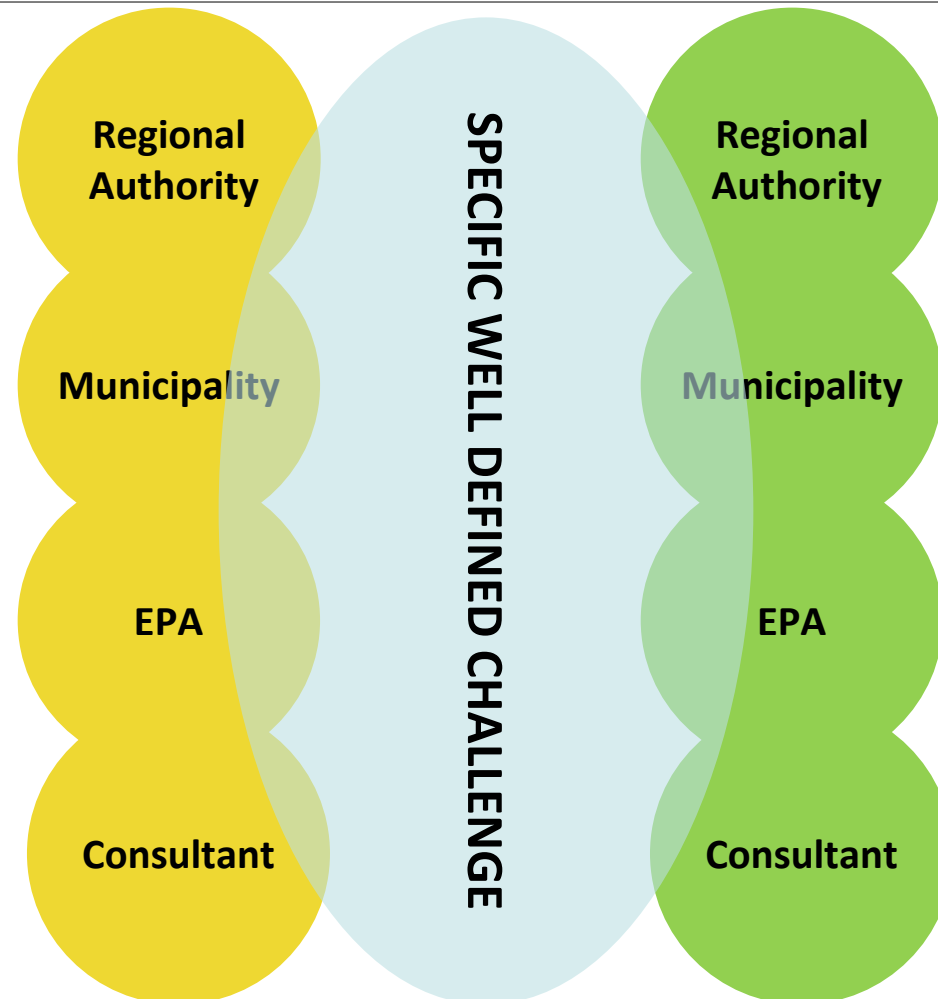
- Concepts/knowledge is hard to export commercially
- Only wealthy countries enforce the environmental legislation
- Commercial interest can drive remediation
- Multinational companies with CSR
- Otherwise; must be local, add competitive advantage

What would it take?

- Enforcement of regulations
- Demand for Best Available Technology
- Consumers pushing CSR
- Efficient exchange of knowledge between countries

A suggestion

- Knowledge Exchange at the Public Level





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