



CITYCHLOR – an european integrated approach for the tackling of soil and groundwater pollution with chlorinated solvents in urban environments

Summer school on Contaminated Soils
From characterization to remediation
June 18th-22nd 2012 - Univ. Paris-Est - France



Develop an integrated approach for remediation of **chlorinated solvent pollution** in urban areas.

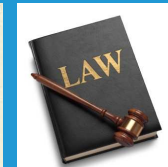
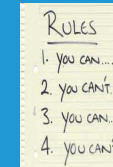
Encompassing:

- technical aspects;

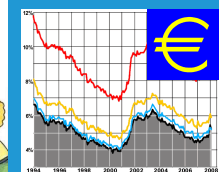


but also

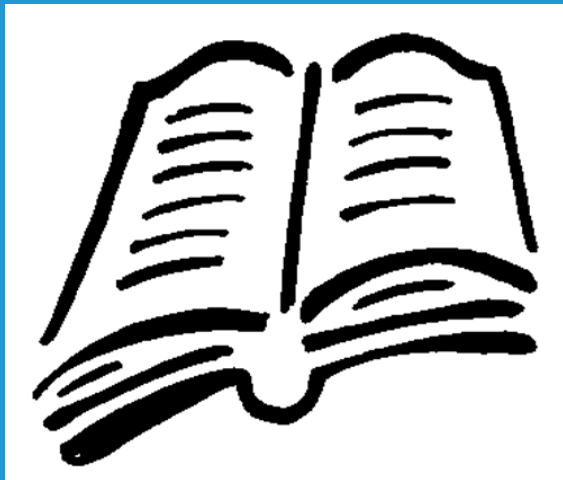
- aspects of communication;
- socio-economics;
- organizational aspects.



+



Develop an integrated approach for remediation of **chlorinated solvent pollution** in urban areas.



Final product:

European guidebook of best practices

Nine European partners

- OVAM (BE)
- ADEME (Fr)
- City of Stuttgart (DE)
- Senter Novem – Bodem+ (NL)
- INERIS (Fr)
- ITVA (DE)
- Utrecht (NL)
- Gent (BE)
- Mortsel (BE)



2010 – 2013 (3,5 years)

→ Budget: 5 262 k€ (50% INTERREG)

→ Work divided in 4 Workpackages

WP1: Review and integration

WP2: Characterization tools

WP3: Remediation tools

WP4: Socio-economic aspects

→ 7 “Pilot-test”



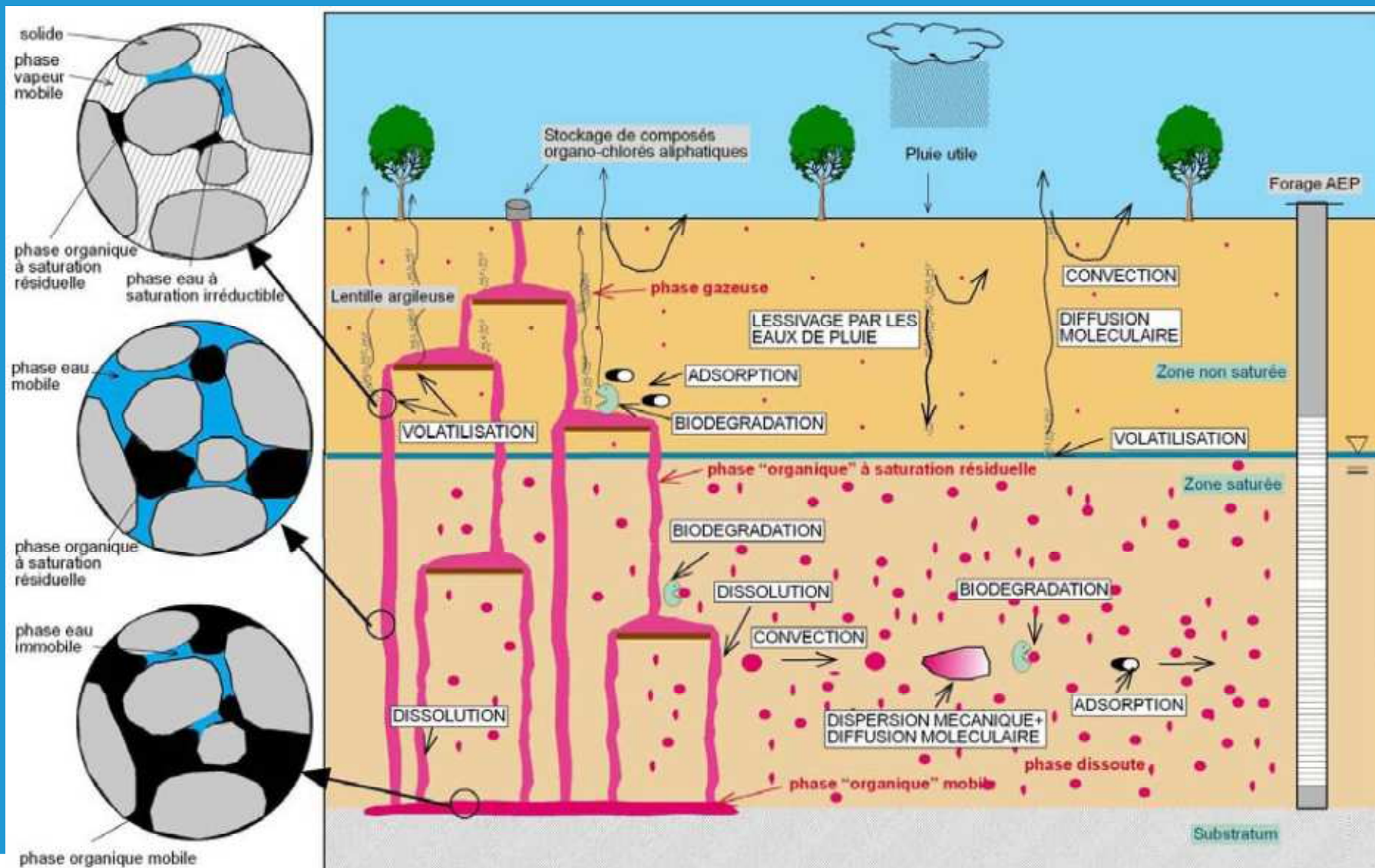


French Pilot Test

From characterization/remediation innovative techniques / risk assessment / communication to full integrated management

- Innovative characterization tools (determination of the source zone and the plume) and risk assessment
- Testing monitored natural attenuation (MNA): plume remediation demonstration
- Communication

Fate of chlorinated solvents in subsurface



- Innovative characterization tools
INERIS on the pilot site –
Urban issues → vapour intrusion into buildings
Characterization tools
Urban-friendly tools: constraint & space-sparing, quick, discrete

→ Groundwater characterization

Passive samplers

Environmental Cone penetrating test (CPT)

Downsizing the groundwater monitoring with time

→ Vapour intrusion into buildings :

Soil air sampling : well designs, protocol

Model development and verification

Attenuation of vinyl chloride in the vadose zone



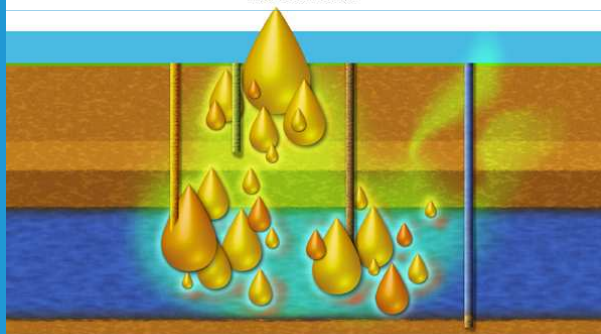


First full-scale implementation at European level of ADEME's recent MACAOH and ATTENA protocols for characterization, modeling and natural attenuation of groundwater polluted by chlorinated solvents in urban environment

MACAOH R&D Project (2001-2006)
(Modeling, Attenuation and Characterization in Aquifers of Organo-Halogenated compounds)

CHARACTERIZATION IN AQUIFERS OF A SOURCE ZONE COMPOSED OF CHLORINATED SOLVENTS

TECHNICAL GUIDE
Extended abstract



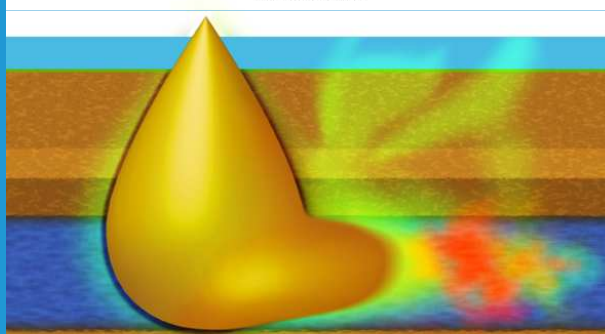
IMPROVE YOUR KNOWLEDGE BEFORE ACTING



MACAOH R&D Project (2001-2006)
(Modeling, Attenuation and Characterization in Aquifers of Organo-Halogenated compounds)

NATURAL ATTENUATION OF CHLORINATED SOLVENTS IN AQUIFERS

TECHNICAL GUIDE
Extended abstract



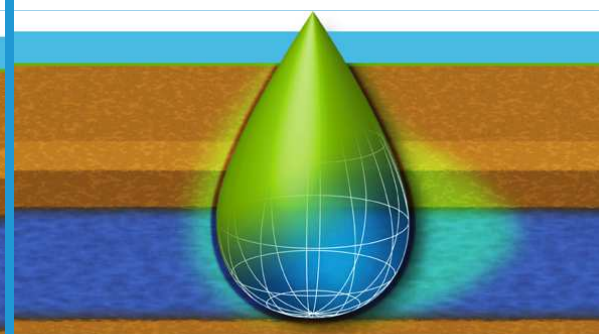
IMPROVE YOUR KNOWLEDGE BEFORE ACTING



MACAOH R&D Project (2001-2006)
(Modeling, Attenuation and Characterization in Aquifers of Organo-Halogenated compounds)

MODELING THE FATE OF CHLORINATED SOLVENTS IN AQUIFERS

TECHNICAL GUIDE
Extended abstract



IMPROVE YOUR KNOWLEDGE BEFORE ACTING





Some definitions: NA, MNA, EA ...

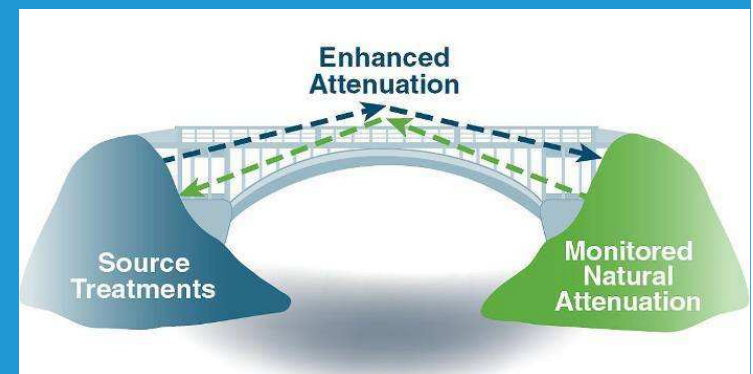
“Natural Attenuation” includes a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention **to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater.** These in-situ processes include biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biological stabilization, transformation, or destruction of contaminants

“Monitored Natural Attenuation” refers to the reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) **to achieve site-specific remediation objectives** within a time frame that is reasonable compared to that offered by other more active methods.

“Enhanced Attenuation”

Allows the use of **human intervention to boost natural attenuation processes**

Favorably manipulates the balance between mass loading and attenuation capacity in order to stabilize/shrink the plume





MNA: technologies and innovation ...

MNA is a site management tool and not a remedial technology:

Characterization (source, plume, NA mechanisms ...), risk assessment, modeling, and also communication, finance, ... are part of MNA demonstration and acceptance

MNA can incorporate all existing and even new technologies that will be developed in the future.

Ex- KORA: «An enclosed compilation of 85 validated and partly newly developed investigation methods provides a reference book for the management of contaminated sites and serves as a link to the technical guidelines of KORA



Open (scientific) questions regarding consideration and/or evaluation of MNA

KORA:

- Economic methods to characterize chlorinated solvent sources, particularly mass content and source architecture.
- Reliable concepts to use and evaluate effectiveness of in situ source remediation methods as well as their influence on subsequent MNA plume measurements.
- General prognoses concerning CAH degradation kinetics based on sufficient available hydrogeological boundary conditions and given by microbiological, hydro- and geochemical data (effect of so-called auxiliary substrates and inhibitors in groundwater)

MACAOH:

- Source zone characterization (saturation for organic phases from concentrations in soils, ...)
- NA mechanisms: biodegradation kinetics, practical tools for quantitative assessment of NA mechanisms, ground measures (multi-level concentration, flux, ...)
- Modeling (numerical development, ...)
- Risk assessment (vapor transfer toward buildings, ...)

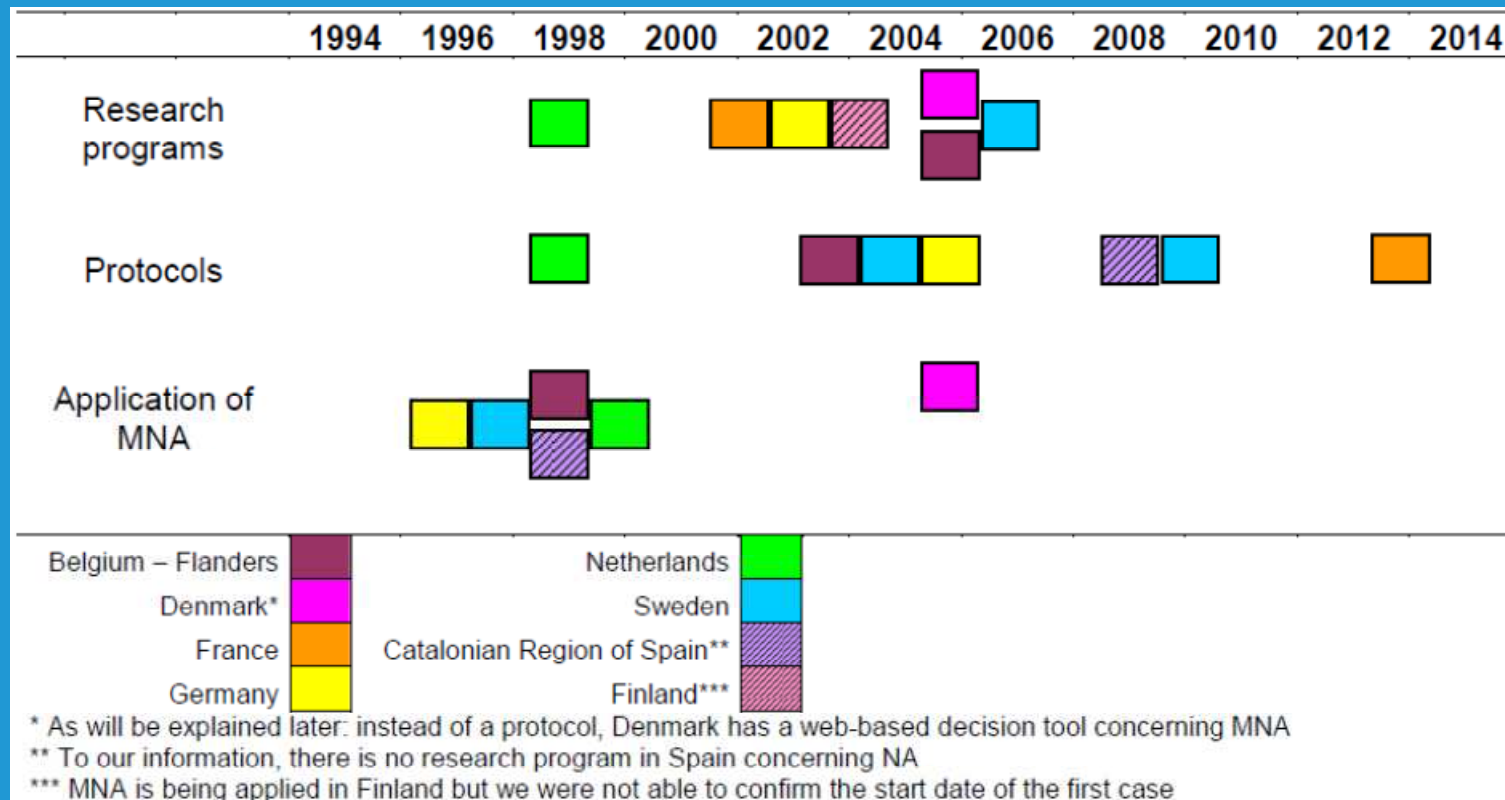


Why use MNA ?

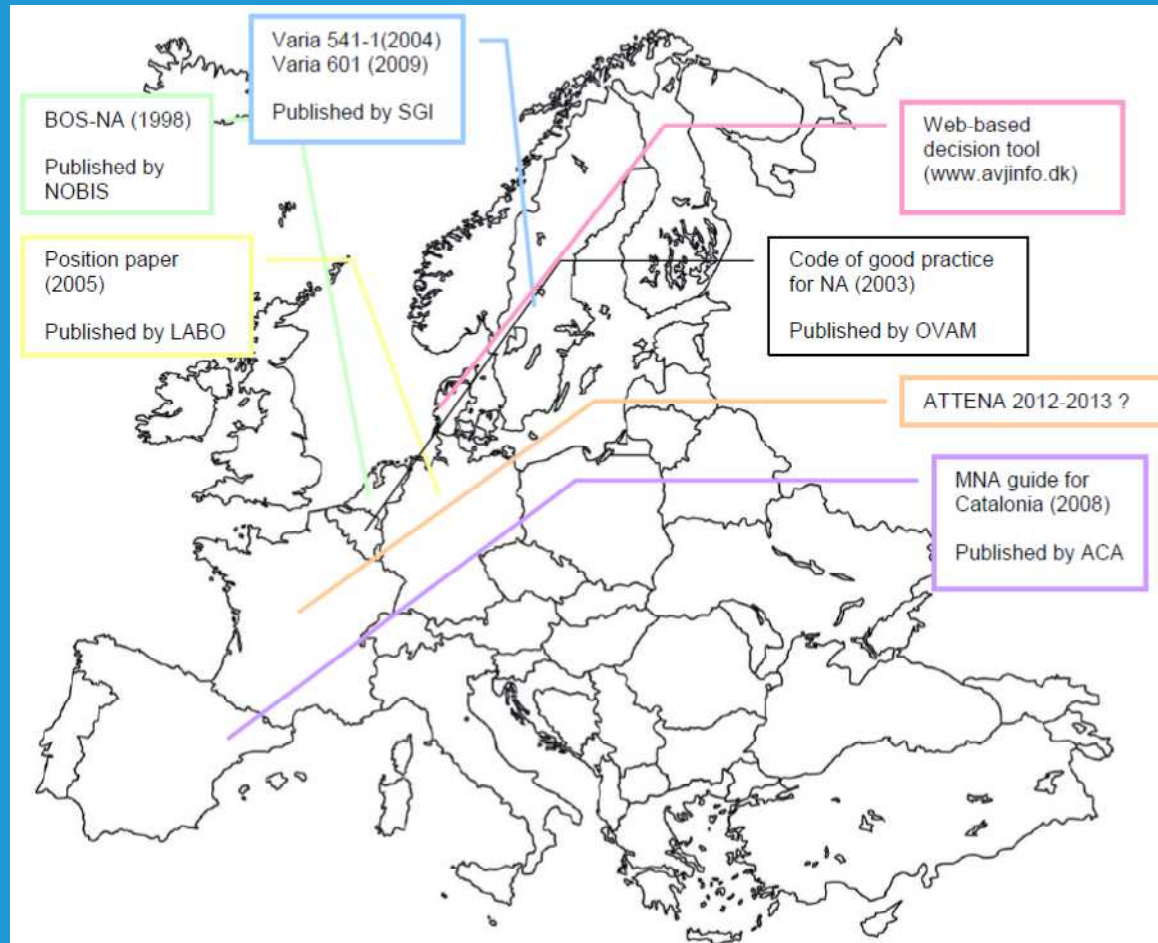
- Depending on the site, MNA may work just as well and almost as fast as other methods.
- Because MNA takes place underground, digging and construction are not needed.
- As a result, there is no waste to dispose of in landfills.
- This is less disruptive to the neighborhood and the environment.
- Also, it allows cleanup workers to avoid contact with the pollution.
- MNA requires less equipment and labor than most methods.
- Monitoring for many years can be costly, but it may cost less than other methods.

MNA history:

- Start dates of the main research programs?
- Publication dates of the primary protocols for MNA?
- Start dates of real-life application of MNA?



What are the different protocols for the evaluation of MNA as a remediation technique?



What are the different steps
in the protocols;
are they comparable?

1

A first consideration of MNA for remediation:

- checking already available data;
- going over technical, practical and economical aspects;
- developing a conceptual site model.



2

Demonstration of NA-effectiveness:

- investigations to show that NA-processes occur on site;
- prove that significant contaminant decreases are obtained;
- prove that the contamination will continue to decrease in the future as well.



3

Development of a monitoring program and taking the decision to implement MNA:

- checking to see that prerequisites are fulfilled;
- evaluation of the appropriateness of the solution;
- coming to an agreement between all parties.



4

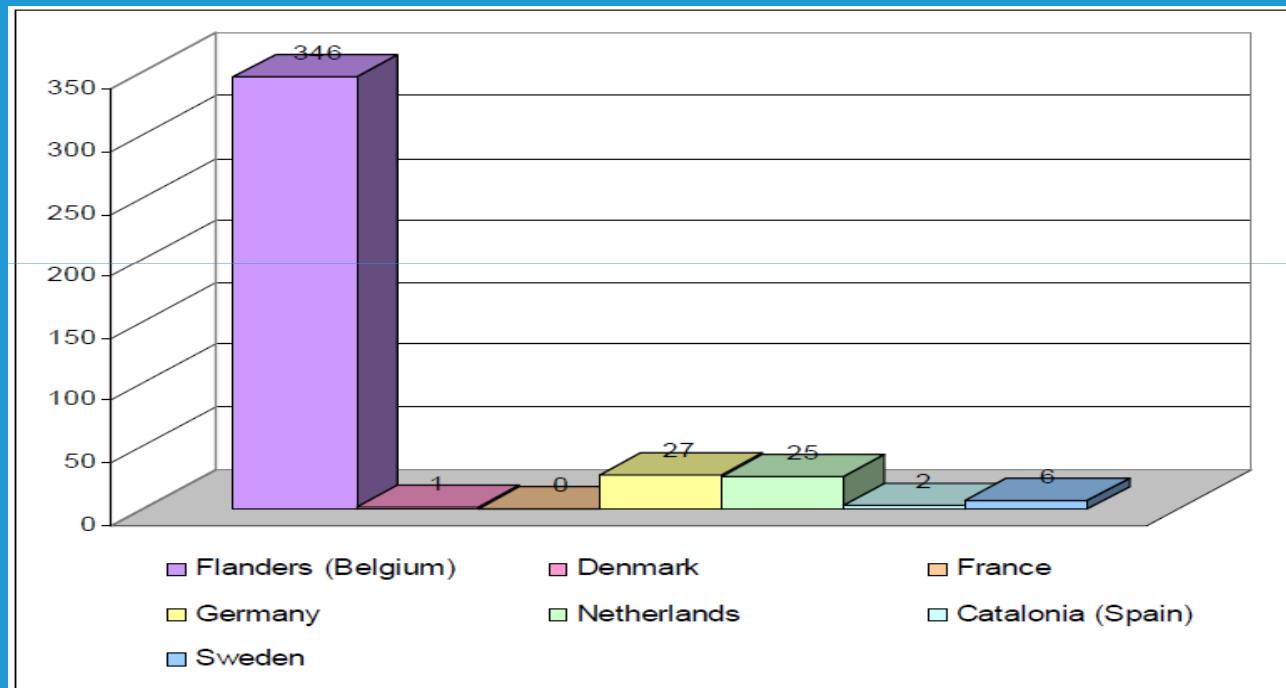
Implementation and assurance:

- monitoring;
- checking if desired results are obtained.



MNA in some EU countries: comparison

Is MNA part of real-life soil remediation projects in Europe?



MNA: how is it implemented (acceptance) ?

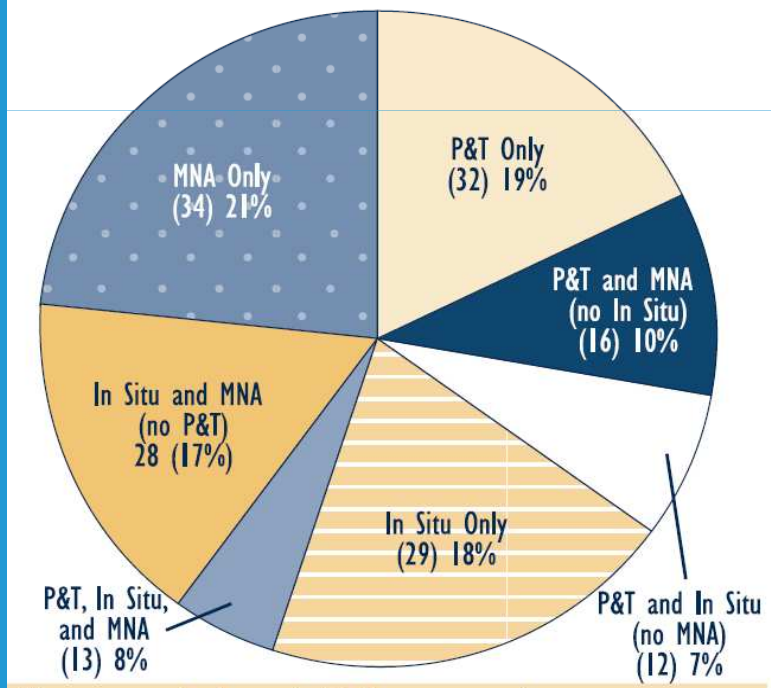
Difference between countries WHY ?
Legal aspects, communication,
technical aspects, economical...?.

Return of experience:
How did the policymakers decide on
protocol ?

USA

Figure 8: Sites with P&T, In Situ Treatment, or MNA Selected as Part of a Groundwater Remedy (FY 2005–08)

Total Number of Sites with Groundwater Treatment or MNA = 164



- MNA is a recent concept in Europe
- There is a certain level of heterogeneity that will continue to exist
- At the same time, similarities between the different countries exist
- Different ways to implement MNA (stand-alone/parallel/follow-up measure)
- Lack of return on experience!



CityChlor / SNOWMAN collaboration :

SNOWMAN dissemination initiative:

→ NA Workshop (2011 November 17, Paris)

- Based on case studies
- All aspects to be addressed (Legal / Technical / Financial /Communications)

→ Webinar MNA end 2012

in cooperation with CITYCHLOR / COMMON FORUM / NICOLE :

- the return of experience of implementation of MNA on real sites
 - Policy makers
 - Industries and Consultants
 - Scientist



What CC add value for MNA plume remediation guidelines ?

Output of interest for European decision makers targets:

- a comprehensive statement of contexts in each countries: main principles and existing documents, actors role and organization, juridical and acceptance situation, projects carried out ...
- clear view on common points and differences between countries approaches
- analyze return of experience for the (real) practices / reason of failure

On those basis

- formulate propositions for a European MNA concept evolution (supporting a guidance at may be different levels - regulators, site owners,... - (if relevant)
- recommendations on possibilities to use MNA for Urban Zones (multi sources, core source characterization and treatment not always possible – technical or economical -, delays, risk assessment – link with vapors intrusions...)



CityChlor technical outputs

❖ **Characterization**

- ➡ Passive Samplers (A5.1)
- ➡ Direct Push Technology (A5.2, A5.3 and A6.1)
- ➡ Long Term Monitoring (A5.4)
- ➡ Soil sampling for Chlorinated solvents (A6.2)
- ➡ Protocole for air sampling (A6.3)
- ➡ Construction of wells for air-sampling (A6.4)
- ➡ Sampling protocole for indoor air (A7.1)
- ➡ Models for measuring transfer to indoor air (A7.2)
- ➡ Attenuation of VC & DCE in the vadose zone (A7.3)
- ➡ Risk assessment (A8)
- ➡ Spatial approach for Groundwater (Investigation) (A9)

❖ **Remediation**

- ➡ Iron treatment for groundwater (A10.1)
- ➡ Bio-washing (A10.2)
- ➡ ISCO (A10.3)
- ➡ Thermal Treatment (A10.4)
- ➡ Plume remediation (A11)
- ➡ Integrated site remediation (A12)



CityChlor final conference

May 16 and 17, 2013 in Ghent, Belgium

❖ **An integrated approach for pollution with chlorinated solvents in urban environments**

❖ **Targets**

- ➡ Remediation experts
- ➡ policy-makers
- ➡ urban planners
- ➡ city representatives

❖ **Specific topics will be treated in detail in parallel technical sessions**

- ➡ techniques for characterization
- ➡ techniques for remediation
- ➡ urban planning
- ➡ Financing
- ➡ communication.

Programme & registration this autumn

Be sure to block May 16 and 17 2013 in your agenda!