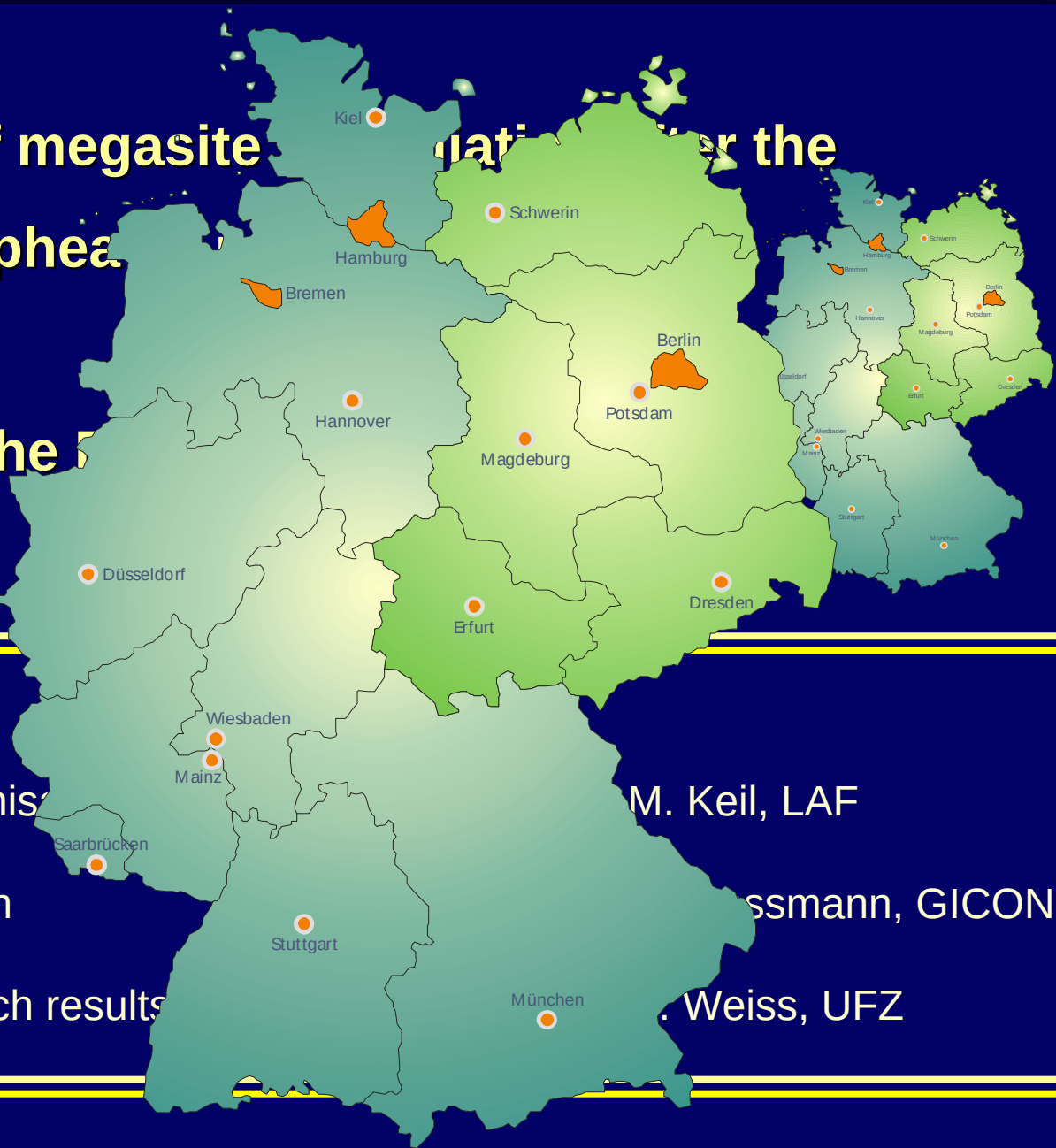
Management of megasite [illegible] the economic uphea[illegible]

– The [illegible]



Presenting:

Administrative, organis[illegible] M. Keil, LAF

Conceptual approach [illegible]ssmann, GICON

Integration of research results [illegible]. Weiss, UFZ

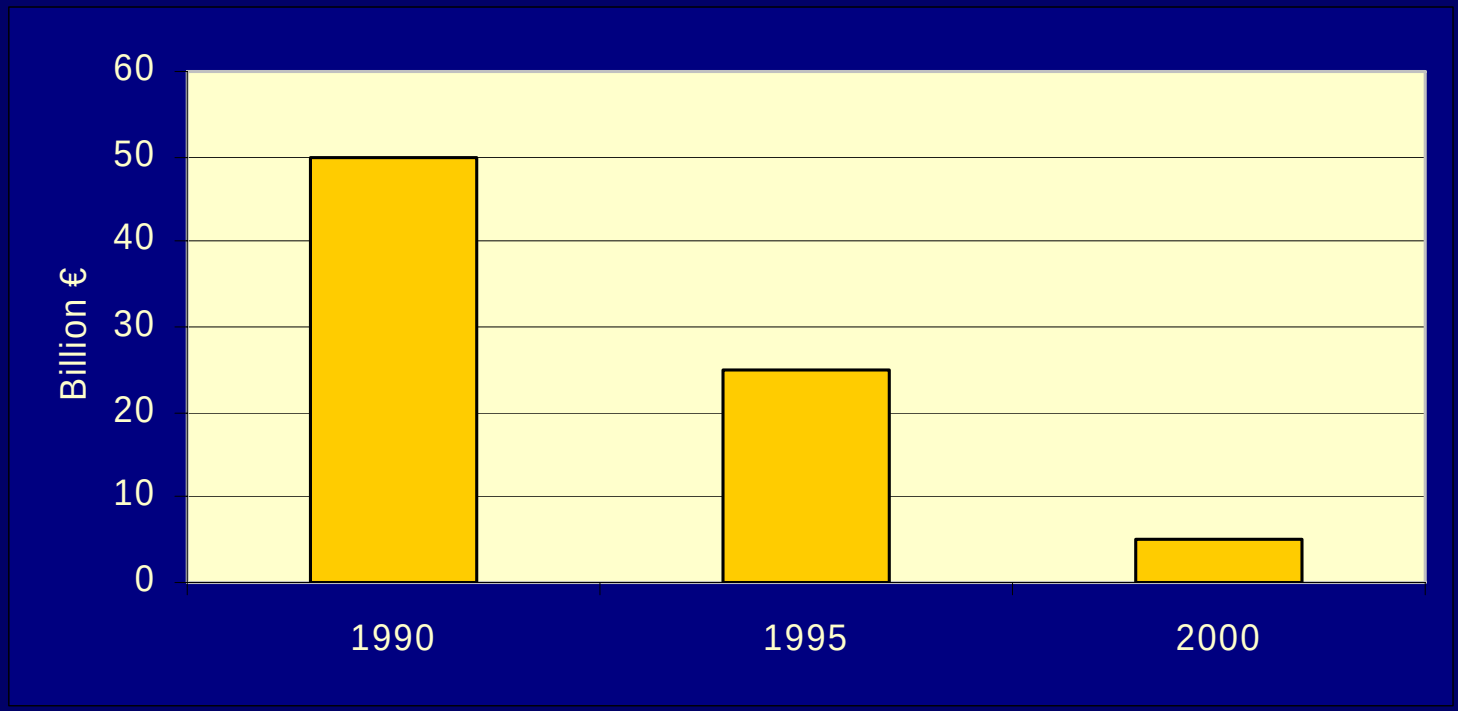
Economical consequences of the collapse of the former GDR – From planned economy to market economy –

- As result of the political and economical collapse of the former GDR, the *central-planned economy came to an end*
- *Market-economy* had to be established
- Enterprises in *public ownership* had to be transferred to *private ownership*
- *Private investors for former state-owned companies* had to be found

Investment restraint

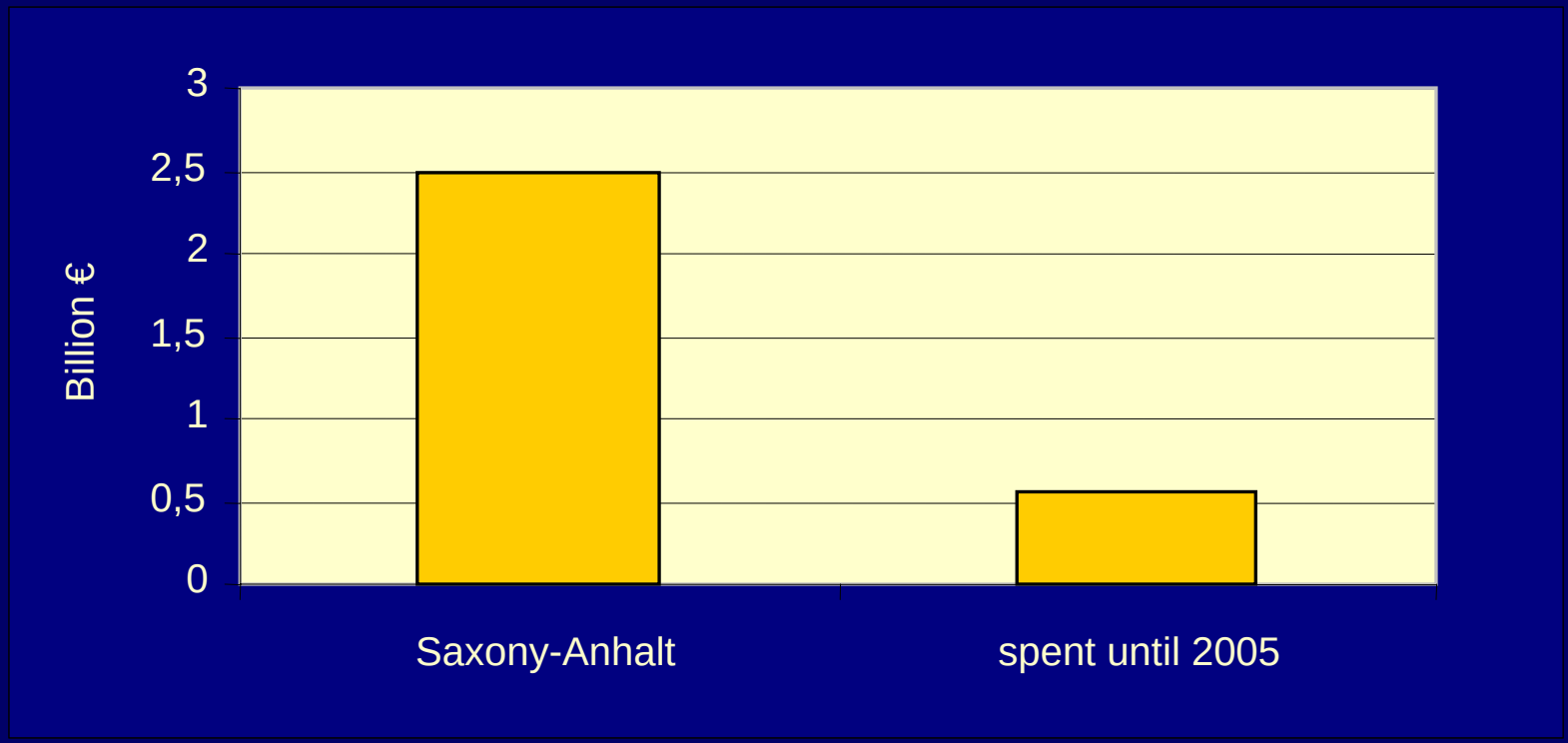
contaminated sites

Estimated remediation costs for contaminated sites in the former GDR



Reduction of the estimated remediation costs due to the conceptual approach since the early 90s.

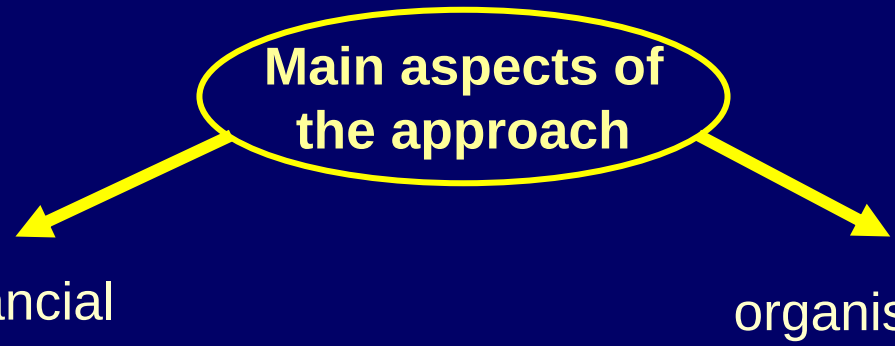
Remediation costs for contaminated sites in the State of Saxony-Anhalt



Remediation costs – obstacle for privatisation ?

Responsibility for process of privatisation → public institutions

Combination: privatisation and management of contaminated sites



Partial or complete exemption of investors from liability for residual pollution	Establishment of adequate management structures for site remediation

The Bitterfeld case – The European megasite

Mining activities since 18th century, increase in the 19th century considerable changes in the groundwater regime

End of 19th century: first settlements of chemical industry, mainly chloro chemistry

Later: additional production of aluminium, pesticides, fertilizer, tensides etc. in total 5000 products

Economic collapse of the region

- Stop of coal production
- Break-down of chlorine chemistry
- 70 % of the jobs lost

Consequences of the site use

Ecological problems:

- Contaminated groundwater
- Contaminated soil
- Raising groundwater table

Political decision:
Continuous site use instead of demolition

Parallel activities:

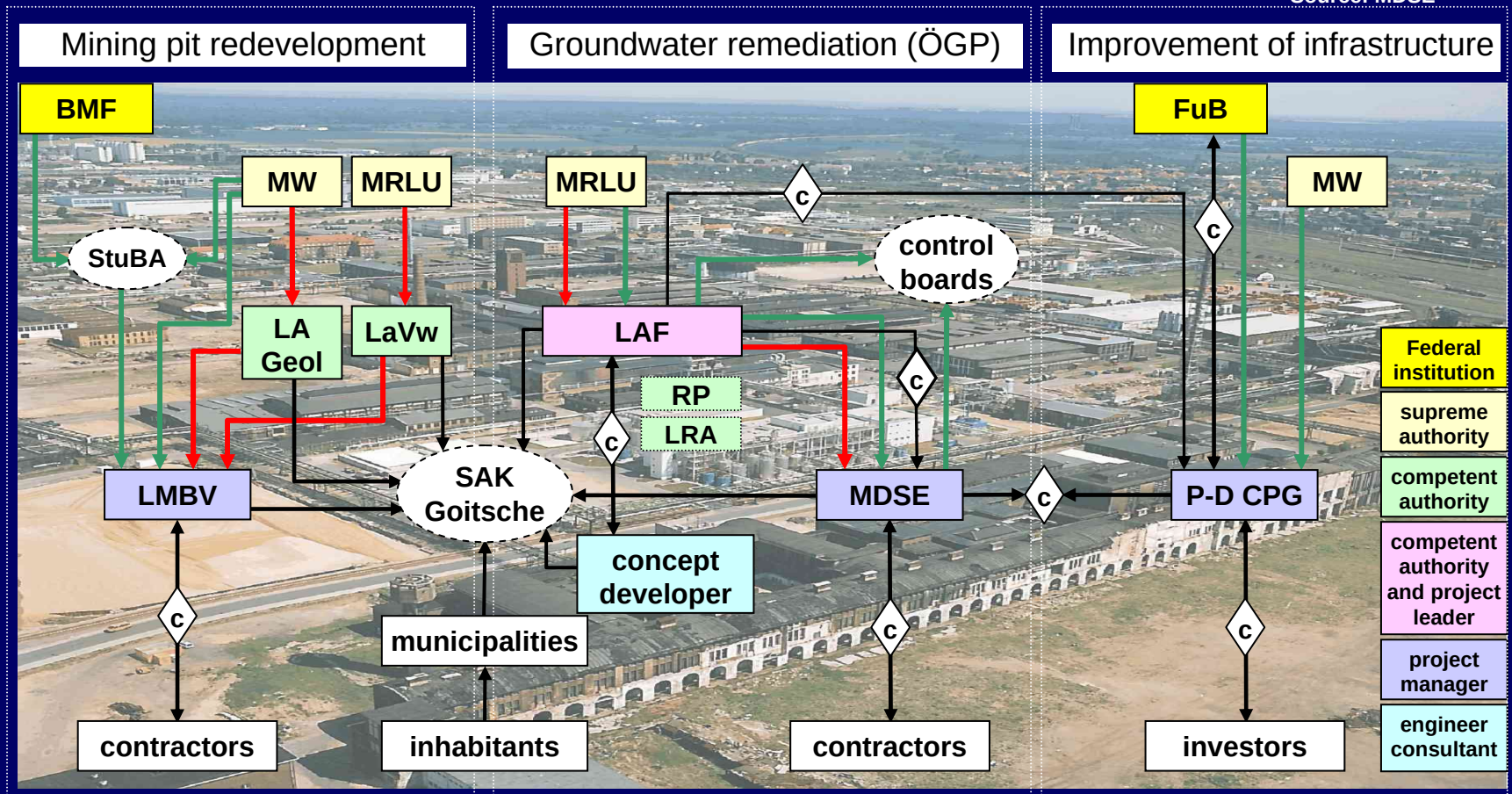
- Remediation
- Search for investors
- Industrial production

Need for parallel consideration of various interests

- Private investors
- Affected public
- Communal instances
- Regional instances
- Federal instances
- Recultivation of mining areas
- Groundwater management

Stakeholder organisation in Bitterfeld

Source: MDSE



Legend:

BMF: Federal Ministry of Finance
MRLU: State Ministry of Environment
MW: State Ministry of Economy
LaVw: Landesverwaltungsamt, Dessau
LRA: Landratsamt

FuB: Manager of Privatisation Contracts on behalf of Federation
LA Geol: Landesamt für Geologie und Bergwesen
SAK: special expert group for groundwater problems by Goitzsche refilling
StuBA: Tax and budget committee

=authority
= finance
stakeholder
board
c =contract

Administrative and organisational structures in Saxony-Anhalt today – considering remediation of contaminated sites –

- 2000/2001 transfer of complete responsibility to the State Saxony-Anhalt
- Payment of a lump sum of 1 Bill. € for remediation
- Establishment of special organisation LAF (State Authority for exemption from residual pollution liability)

Mission:

To overcome contamination as obstacle for investment

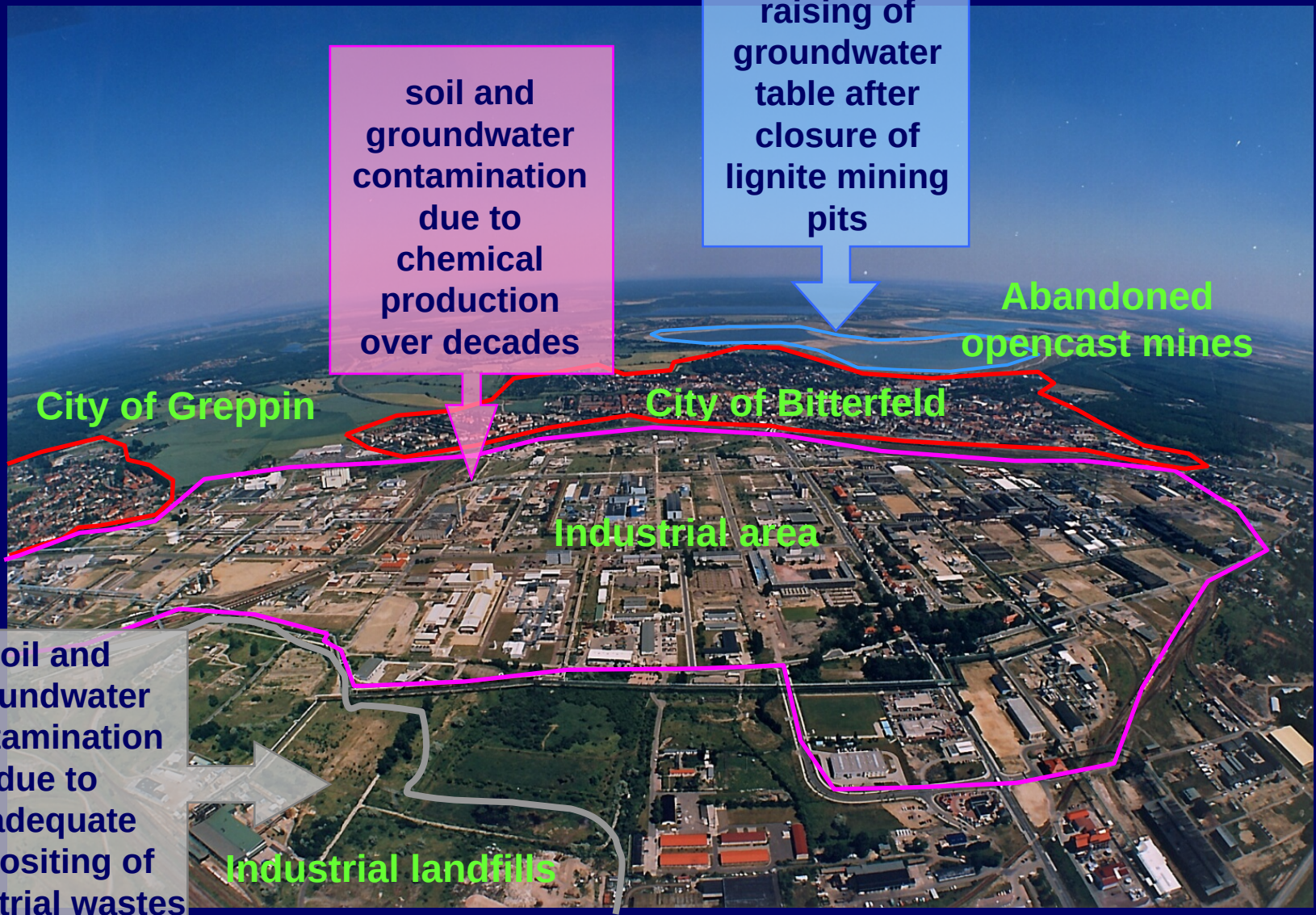
Management of contaminated megasites

Financial issues √

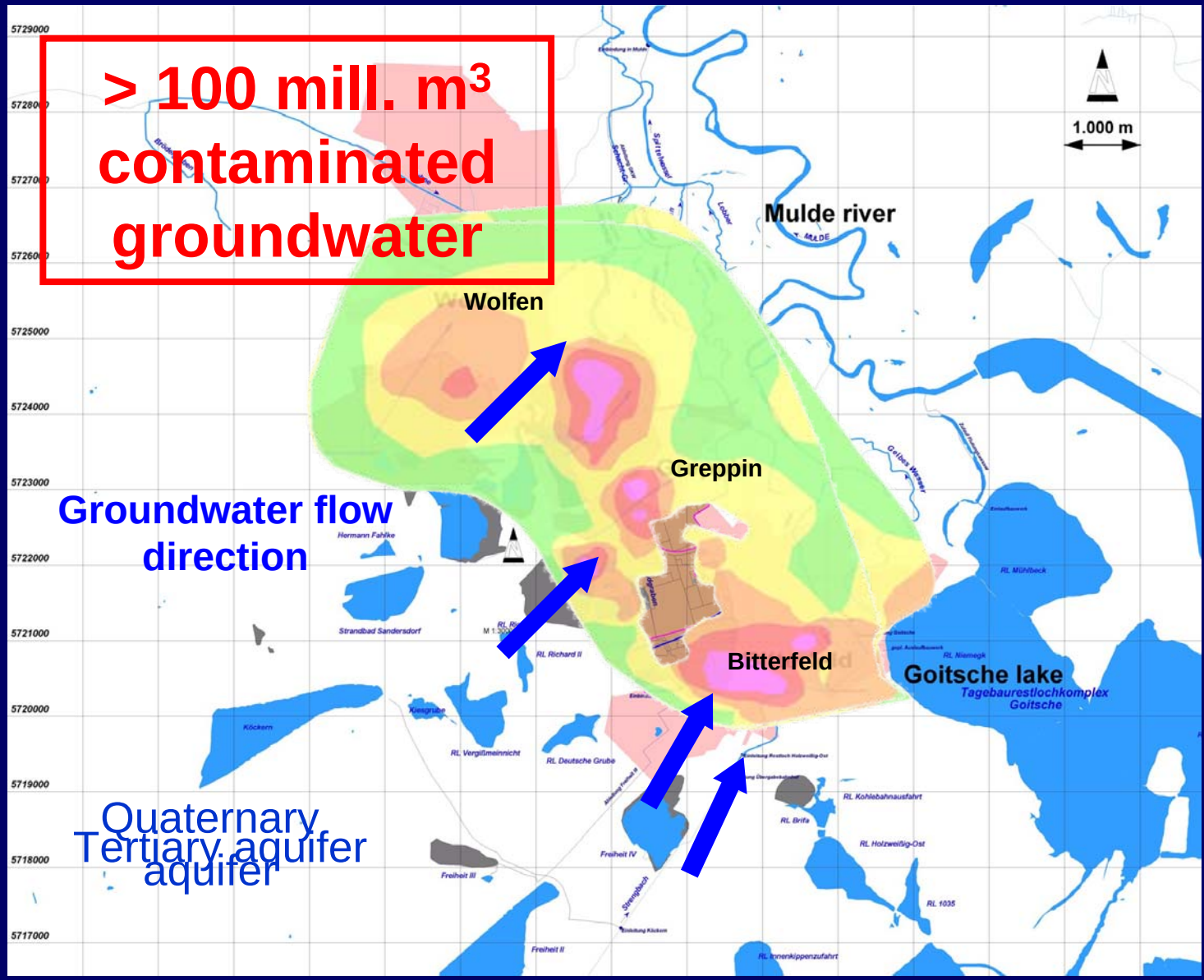
Administrative and organisational issues √

→ **Conceptual approach needed**

Problems at the Bitterfeld megasite



Contamination situation – quaternary / tertiary aquifer



Initial situation 1990

Problem:

- Large-scale soil and groundwater contamination
- No conceptual approach

Objectives:

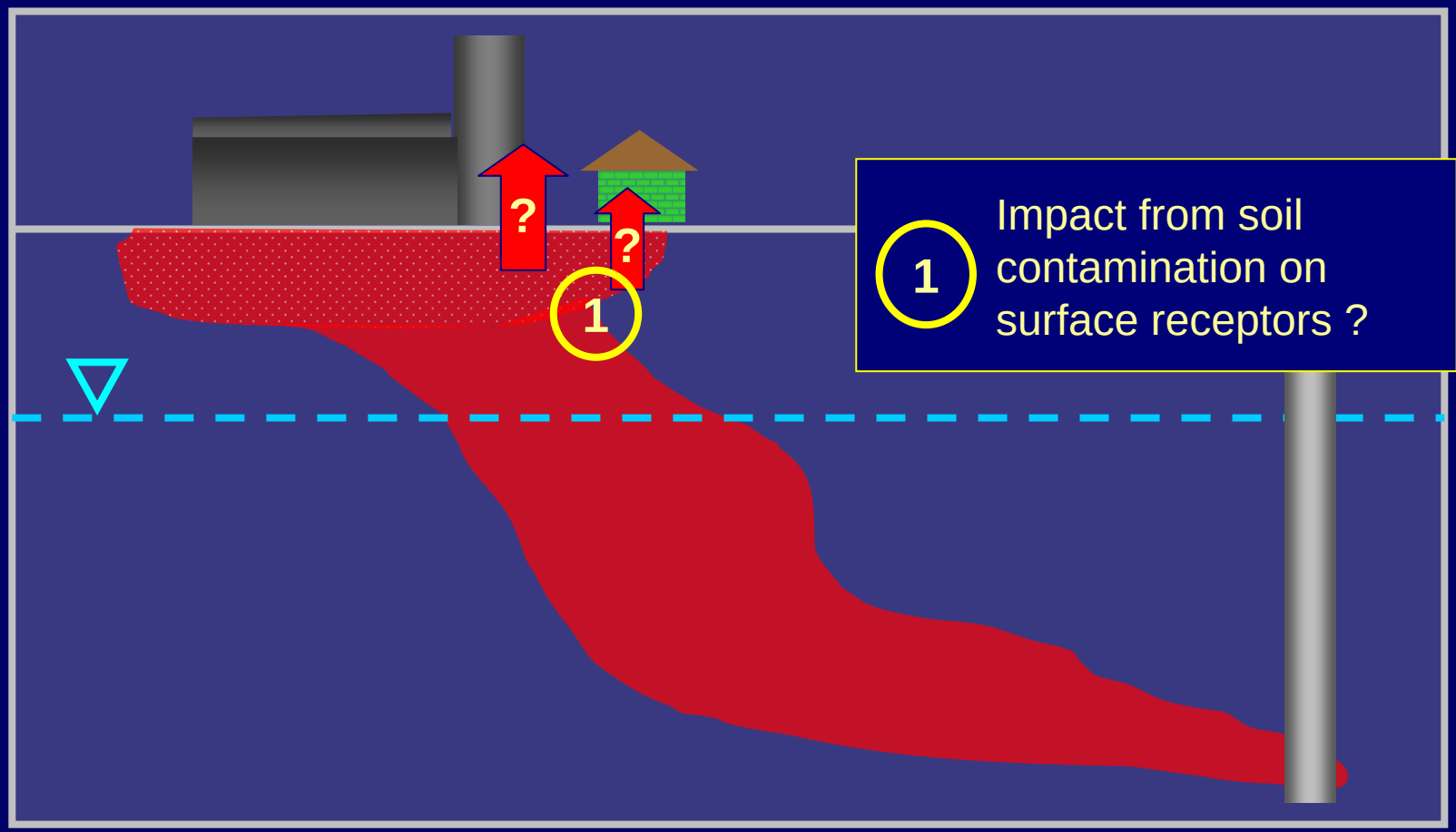
- Site re-use, new investments
- Maintenance of existing industrial areas

Conclusion:

- Maintenance of industrial site as base for a sustainable site remediation
- only „living“ sites provide financial means for long-term remediation

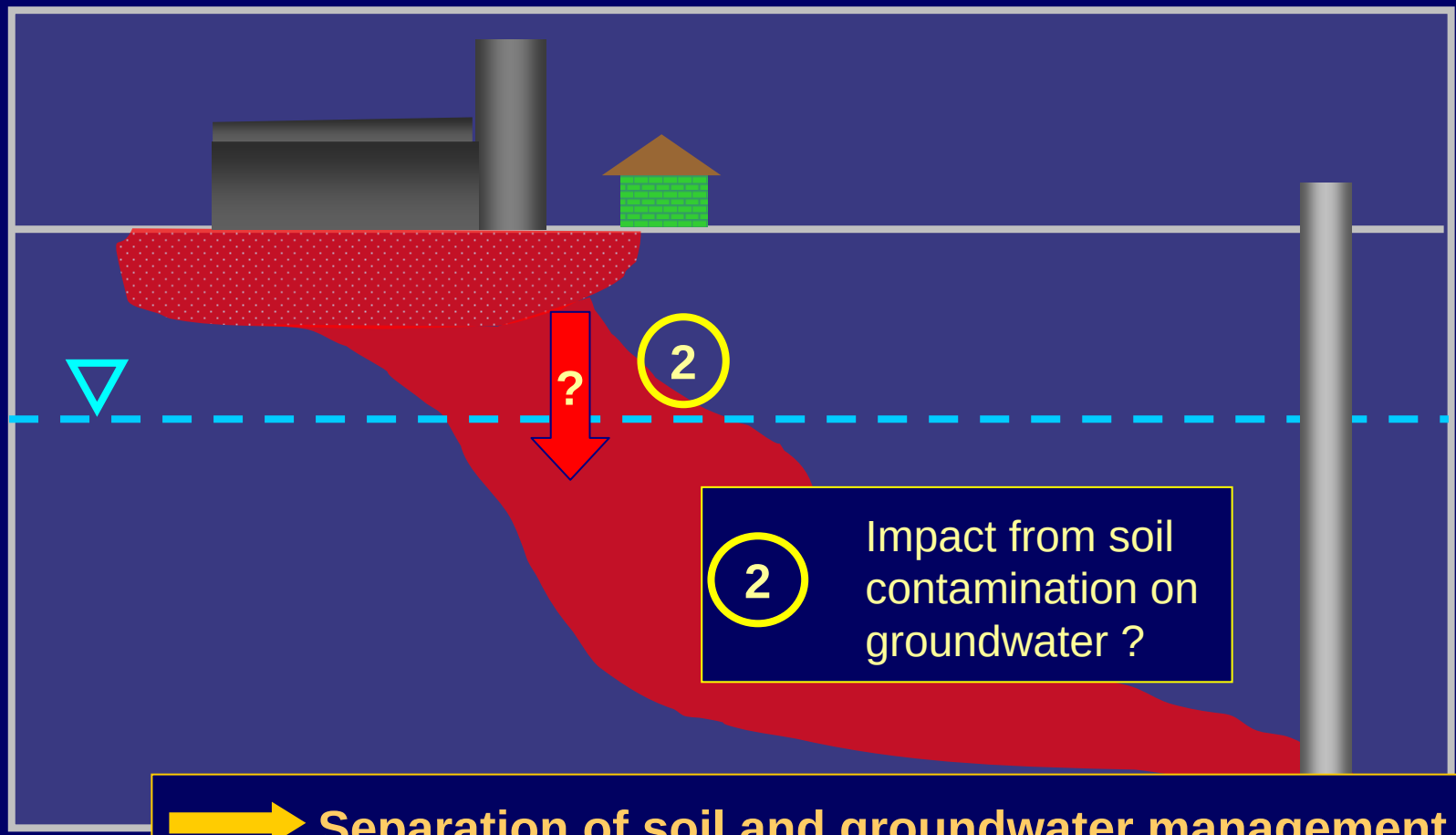
Conceptual approach to megasite management (1)

1. Crucial point: *Assessing the impact of the source in the soil on other recepetors than groundwater*



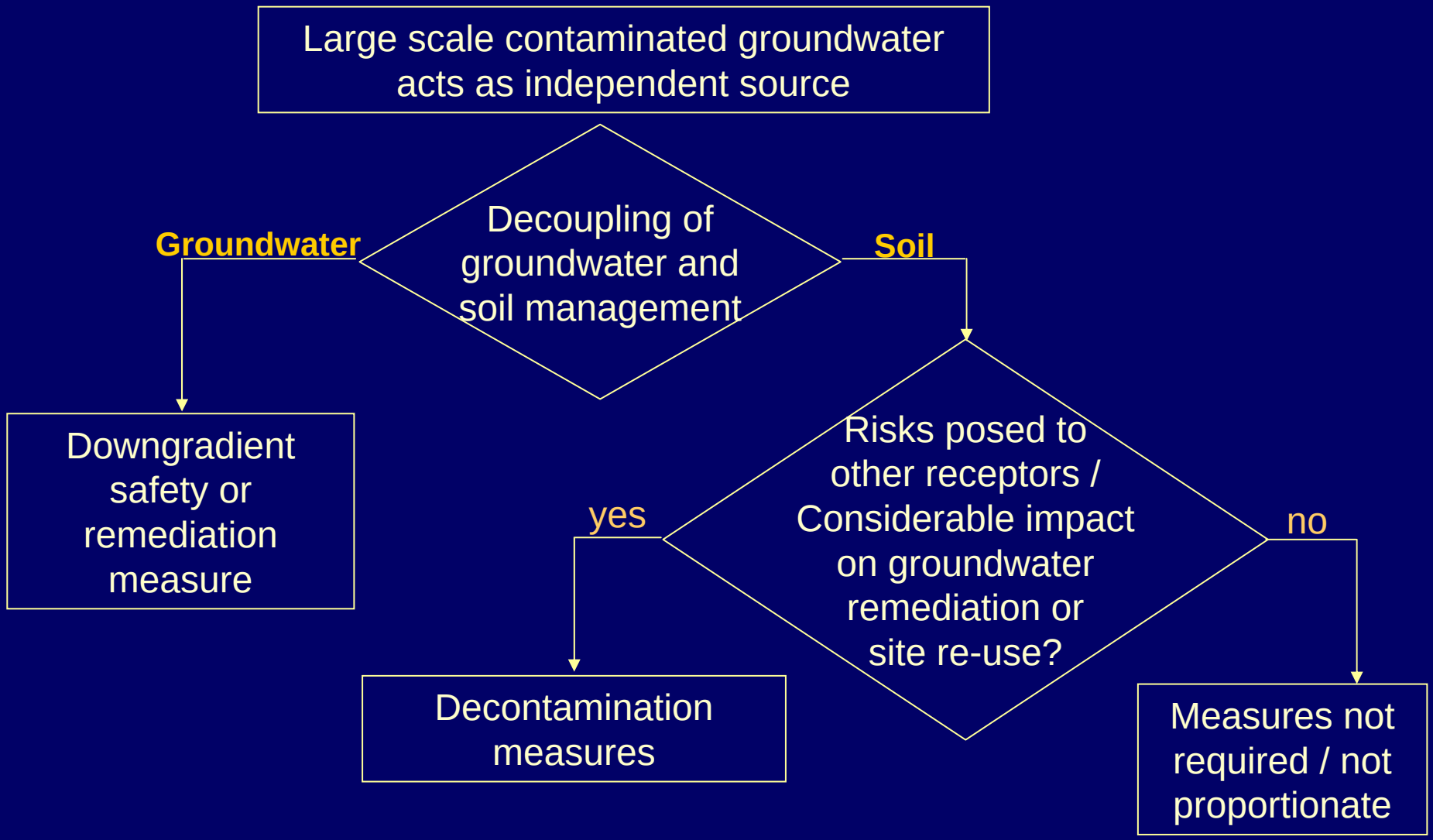
Conceptual approach to megasite management (2)

2. Crucial point: *Assessing the impact of the source in the soil on the already contaminated groundwater (plume)*

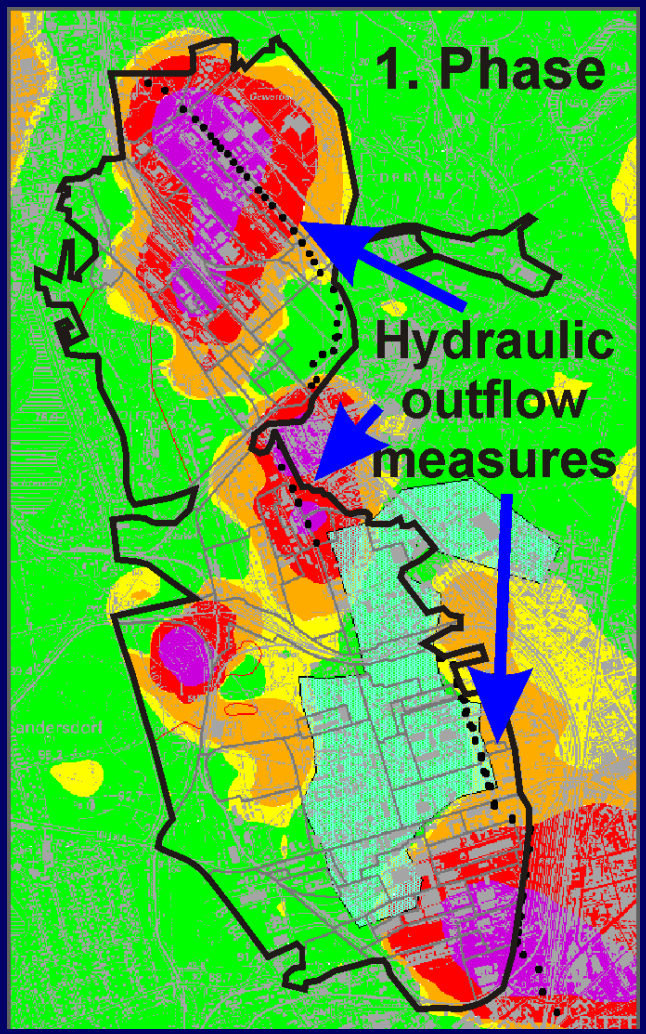


Separation of soil and groundwater management

Separation of groundwater and soil management



Remediation Framework Concept Groundwater for the Bitterfeld megasite



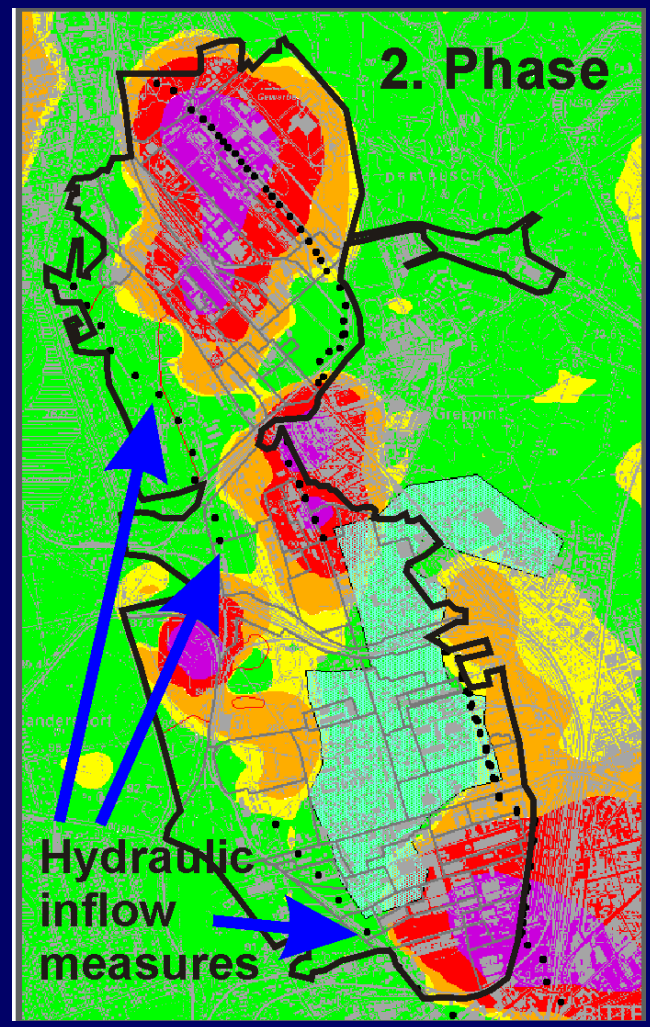
Phase 1 and 2

Down gradient

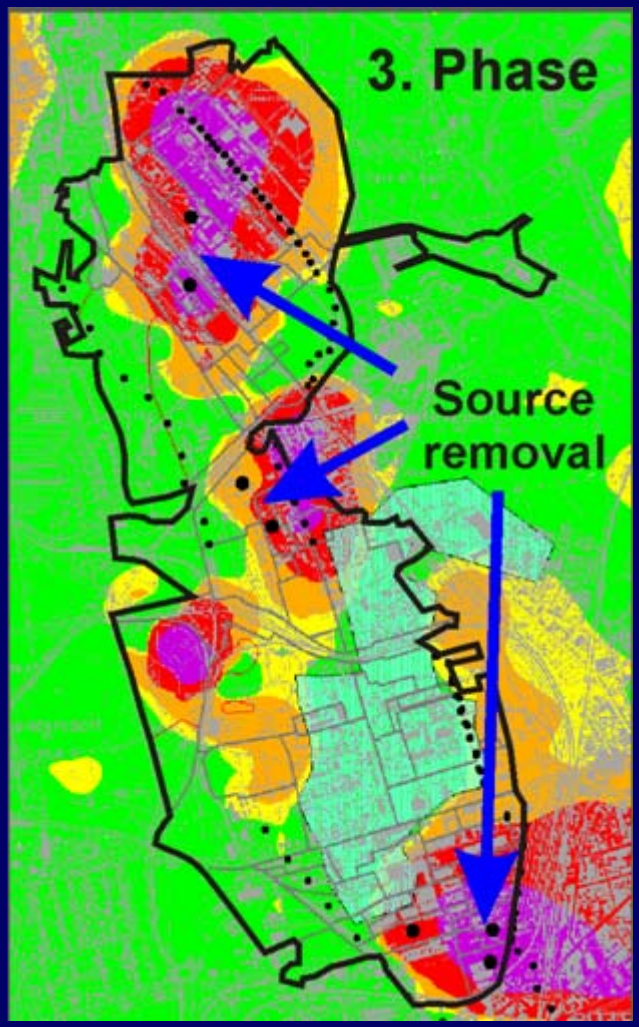
and

Up gradient

Hydraulic safety measures



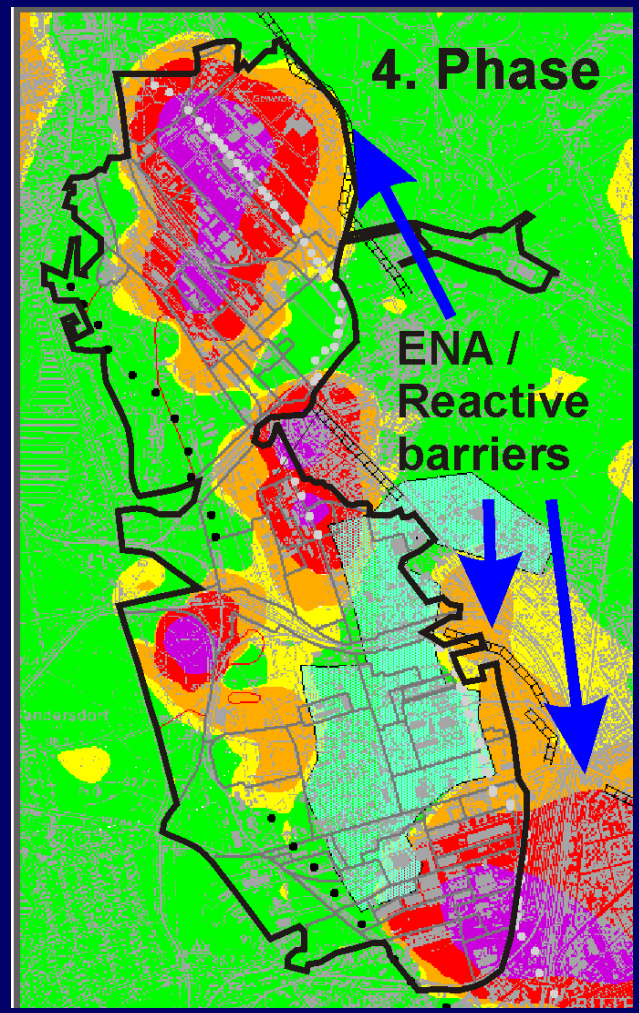
Remediation Framework Concept Groundwater for the Bitterfeld megasite



Phase 3 and 4

Source and plume

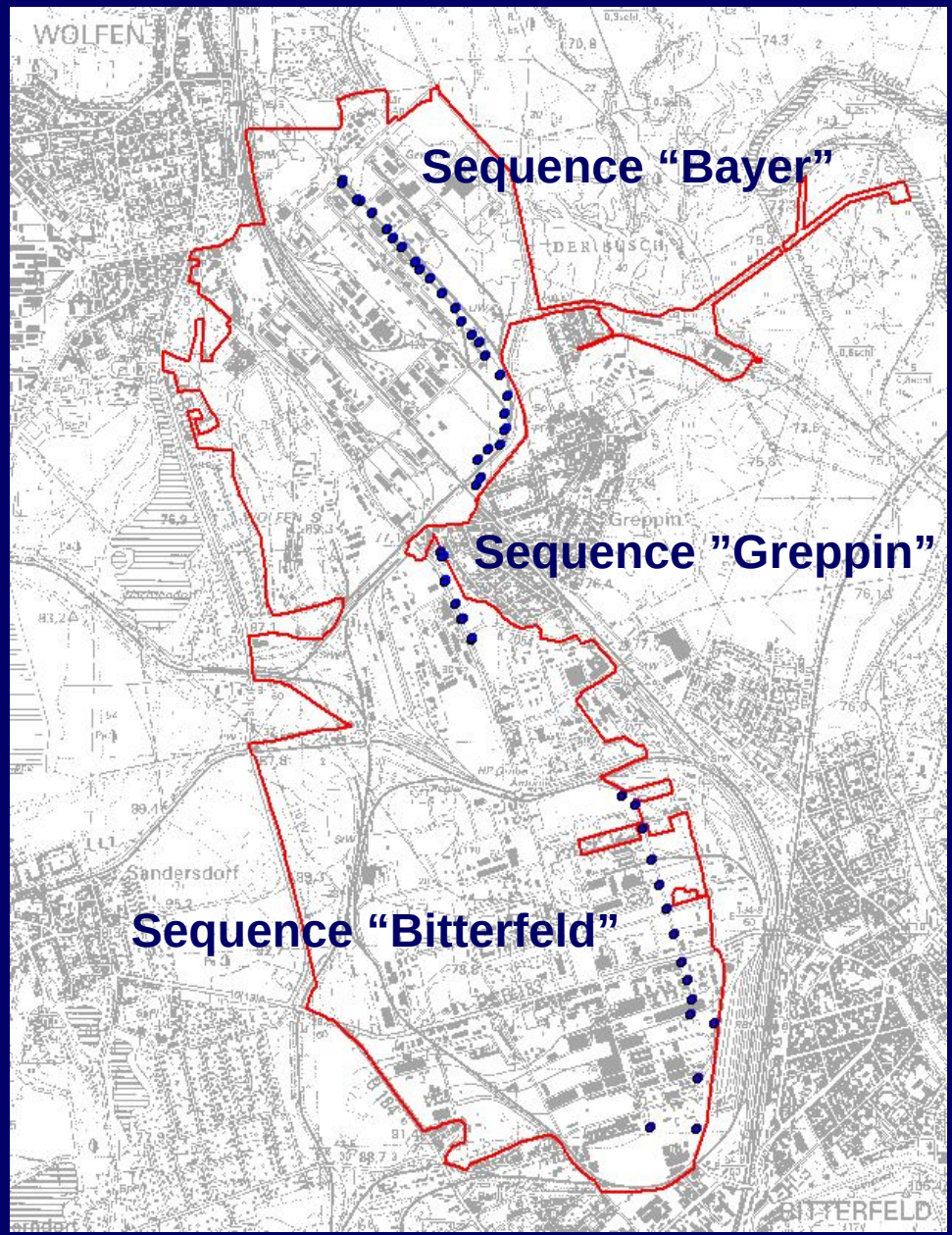
Decontami-nation measures

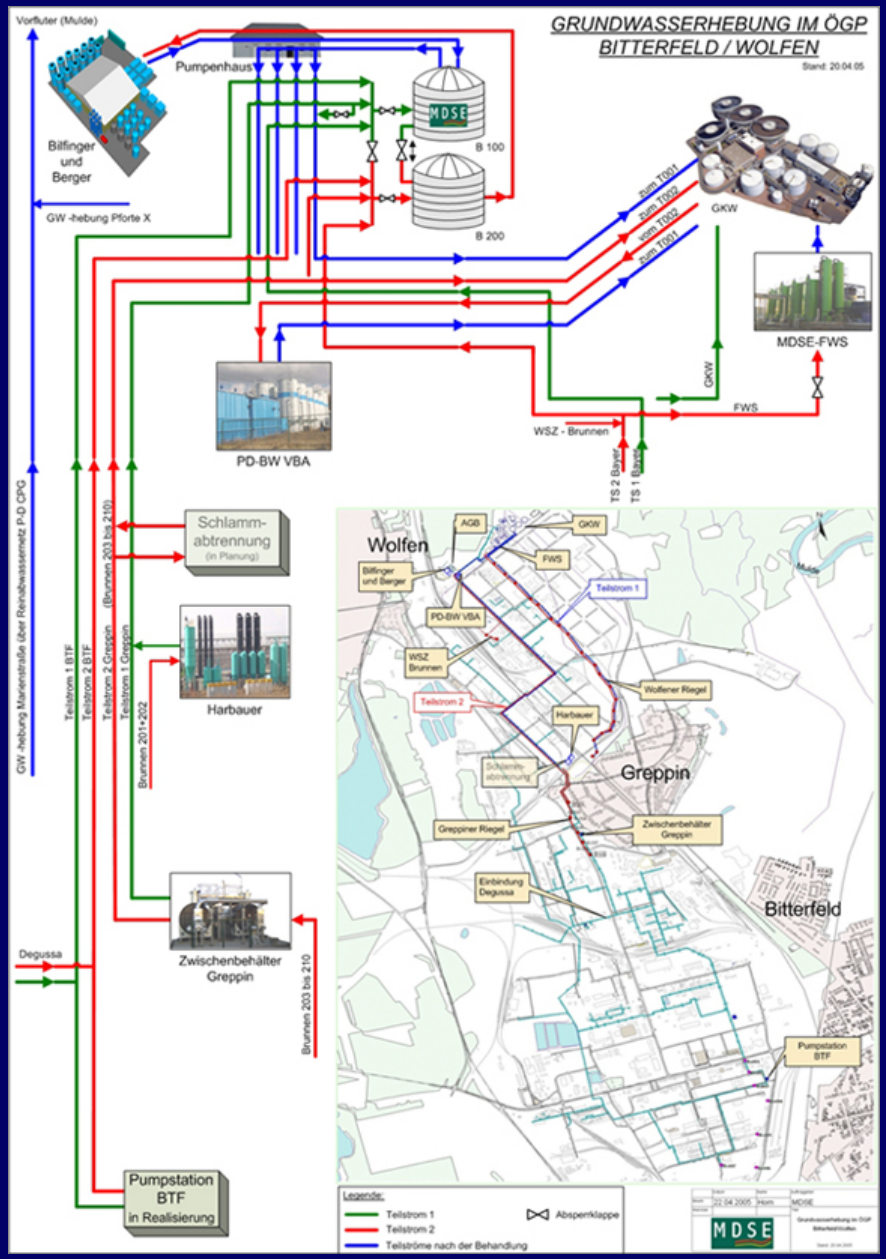


Down gradient hydraulic safety measures

→ **protected groundwater body**

(preconditions for separation of soil and groundwater management achieved)





Groundwater treatment in Bitterfeld

Interlinking remediation and site development (1)

CORUS at the Bitterfeld megasite

Interlinking remediation and site development (2)

MILTITZ AROMATICS at the Bitterfeld megasite

The industrial site Chemiepark Bitterfeld-Wolfen before and today

About 10.000 jobs; Operation of selected components of the existing chemical industry (before 1990) was continued

New industries was established on-site e.g.:

Akzo Nobel Chemicals GmbH
Ausimont GmbH
Bayer Bitterfeld GmbH
BNT Chemicals GmbH
Degussa AG
Heraeus GmbH
Hüls
Indulor Chemie GmbH
Miltitz Aromatics GmbH
Qcells GmbH
Sidra Wasserchemie GmbH
UmesterungsWerke GmbH

Megasite in Eastern Germany

Verification of the conceptual approach at EU-level and compliance check with EU-WFD

The WELCOME-project 2000-2004

Goal: *Development of a guideline for the management of contaminated megasites characterised by a large-scale groundwater contamination*

Landesanstalt für Altlastenfreistellung
GICON
MDSE
nok
TNO
Port of Rotterdam
WAGENINGEN UNIVERSITY AGROTECHNOLOGY AND FOOD SCIENCES
QUADRIGA
VITO
EBERHARD KARLS UNIVERSITÄT TÜBINGEN

The conceptual approach was successfully applied to other European megasites and transformed into a guideline

Complexity of the problem requires cooperation with research institutions

Integration of R&D results into megasite management

- SAFIRA – Research project; 15 partners
- funded by Federal Ministry of Research and Education
- co-financing by LAF
- first phase 1999 – 2004
- second phase 2005 – 2009
- decision support system as input to management system

Example:

Making the case for Natural Attenuation

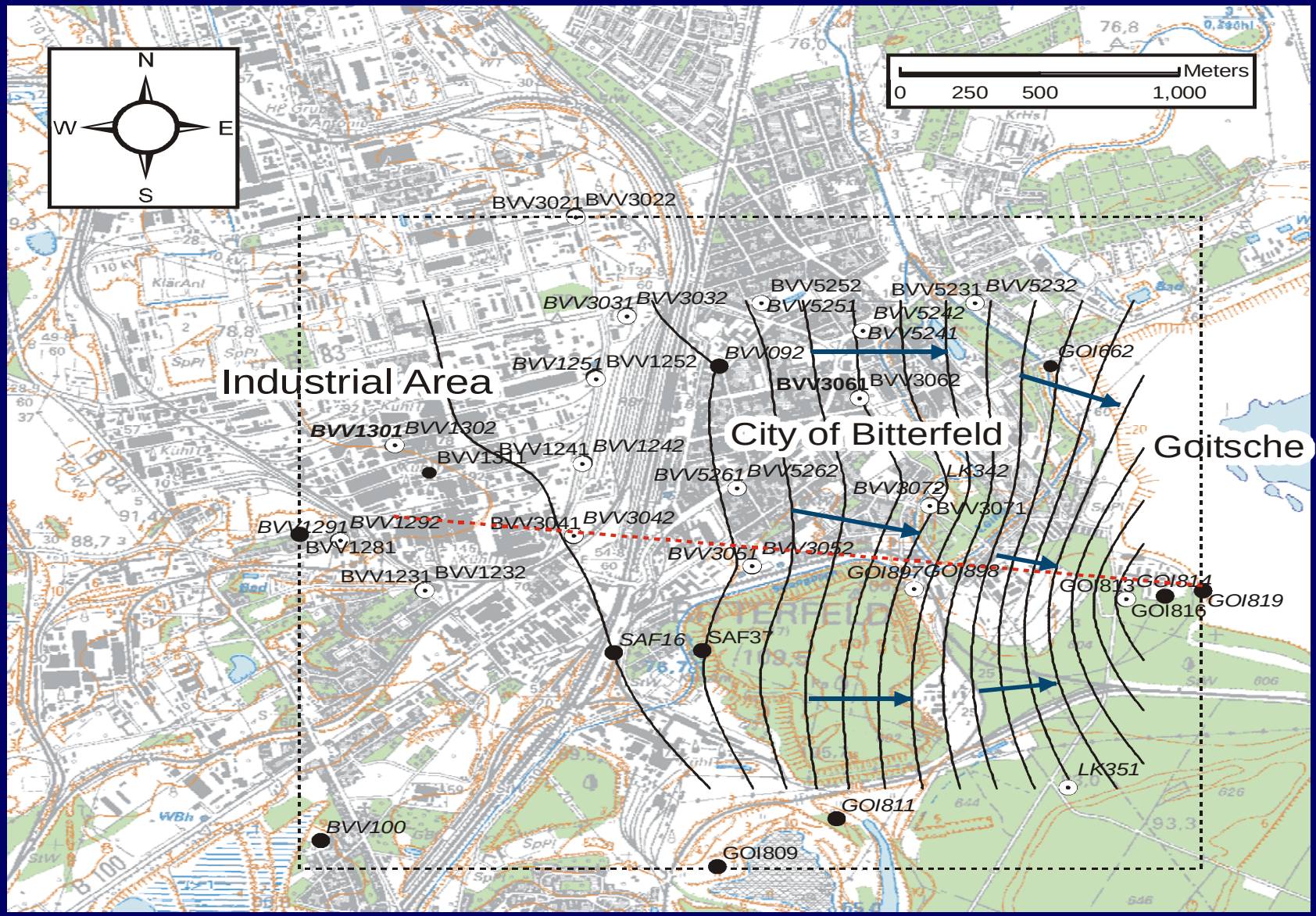
traditional approach (i.e. Wiedemeier, U.S. EPA):

- contaminant decrease
- geochemical footprints
- microbiological footprints

in addition, more recent & promising approaches:

i. metabolites
ii. stable isotopes
iii. multi-level sampling
iv. BACtraps
v. integrated pumping tests, mass fluxes
vi. modelling
vii. ...

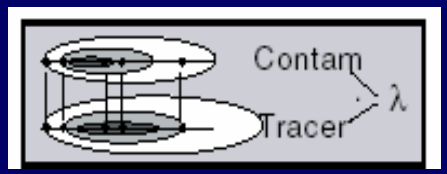
NA in Bitterfeld: Tertiary aquifer below the City

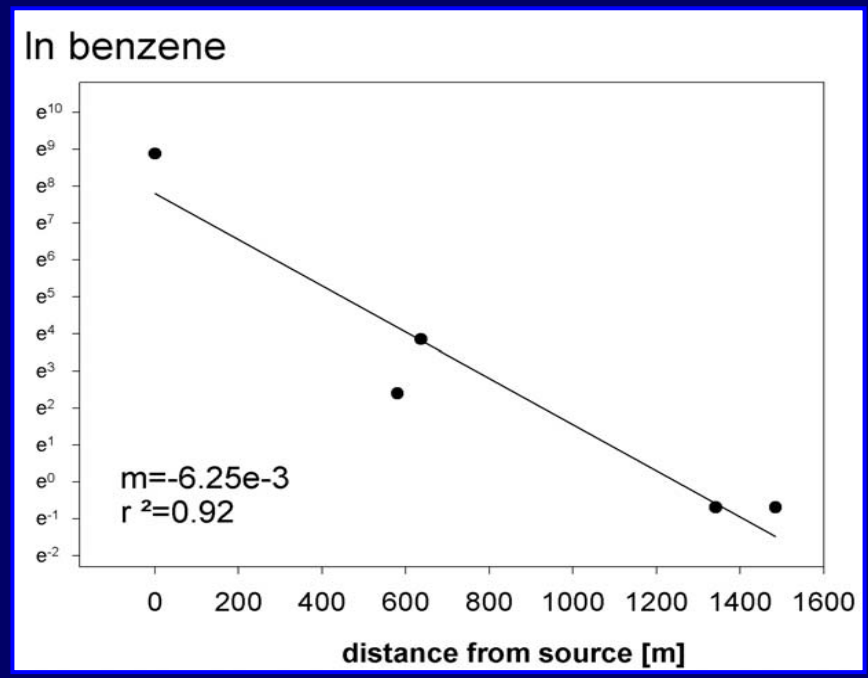


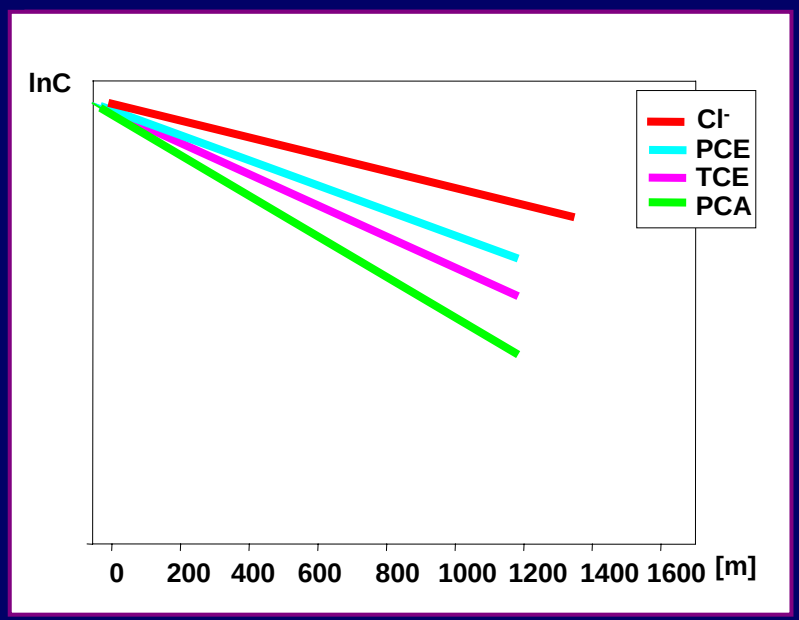
Approximation of NA-efficacy

Estimation of degradation rate in the field

1. NA_{total}= ln [contaminant] vs. distance ("bulk attenuation rate")
2. Normalized using tracer (e.g., chloride) ("degradation rate")







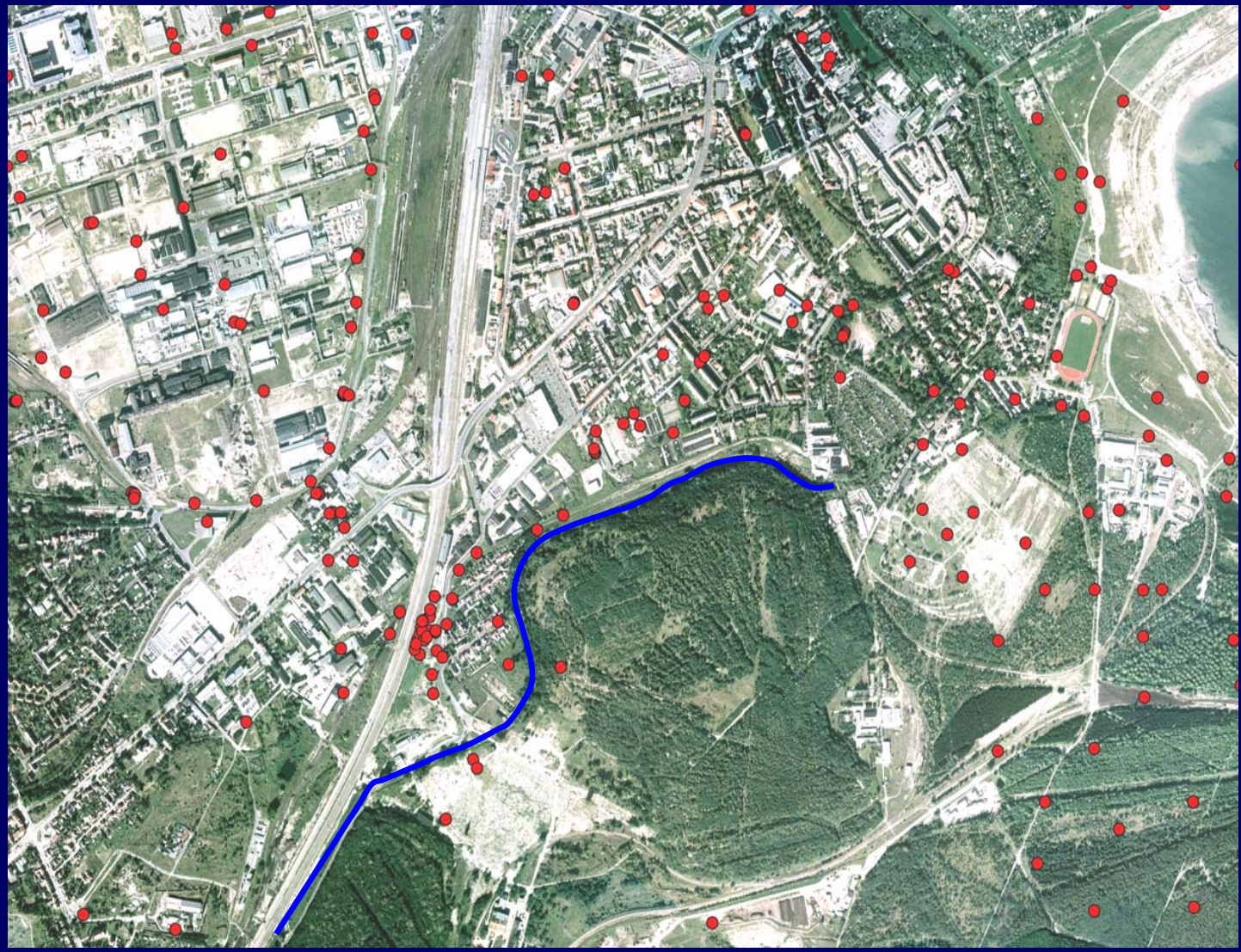
Halflives [y]:

	T	TB
TCE	8.7	7.7
PCE	8.5	13.4
PCA	8.9	4.6
Benzene	16.8	10.3
Toluene	9.8	
MCB	10.0	

Relatively long!

Kaschl *et al.*, 2004

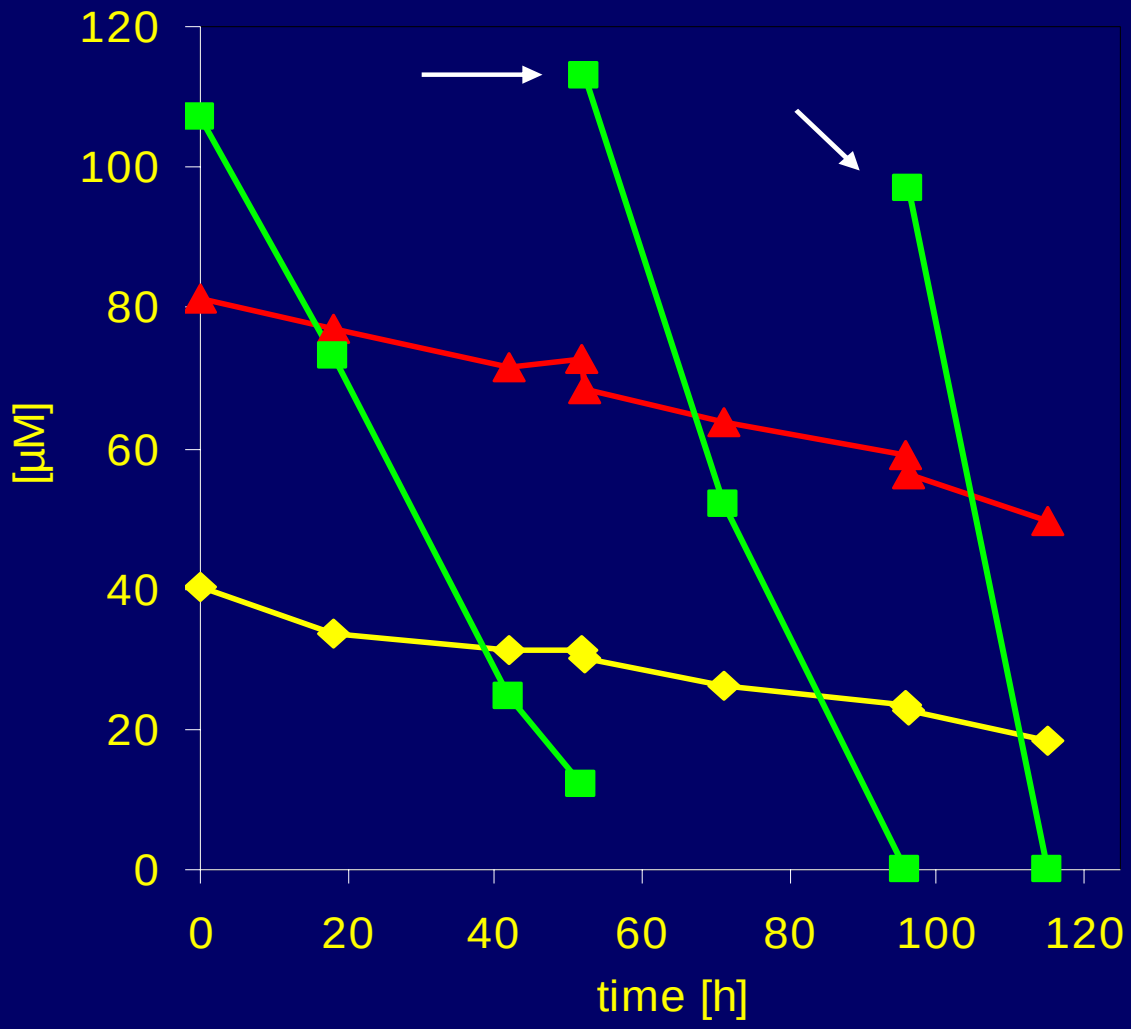
Interactions between ground- and surface water



Strengbach - discharge of contaminated groundwater

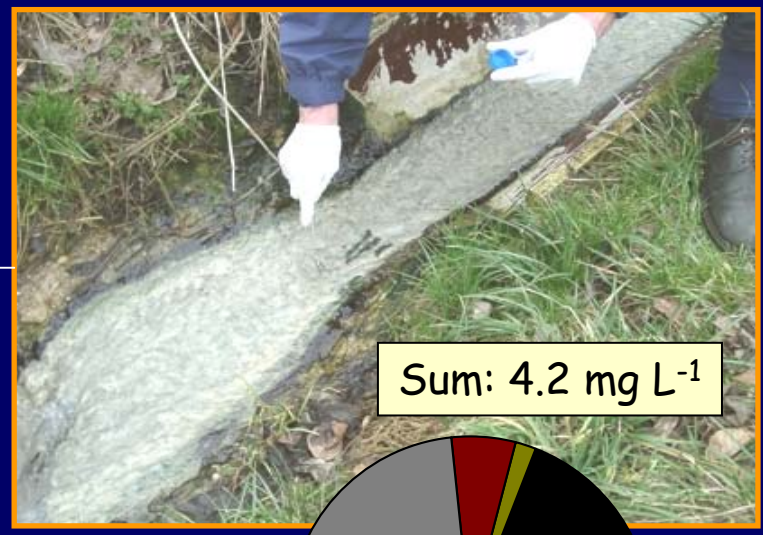
Disappearance or decontamination?

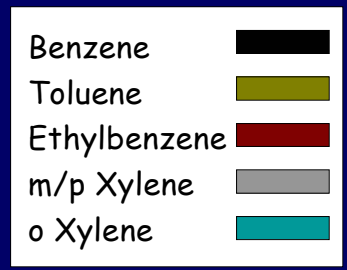
Biodegradation of chlorobenzene (green), cis- and trans-dichloroethene (red and yellow)



Lab and field experiments could prove and quantify rates of biodegradation and make temporarily discharge acceptable for authorities.

Input for ongoing projects using wetlands for decontamination





Engineering of Natural Attenuation to manage regional contamination !