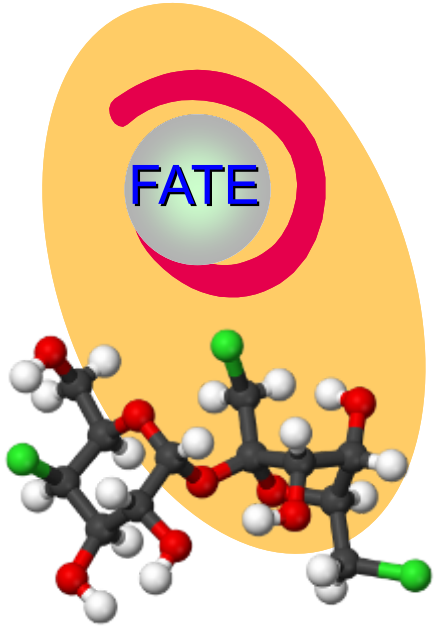
JRC
Environmental Monitoring Activities

Monitoring across policies and environmental media

Bernd Manfred Gawlik

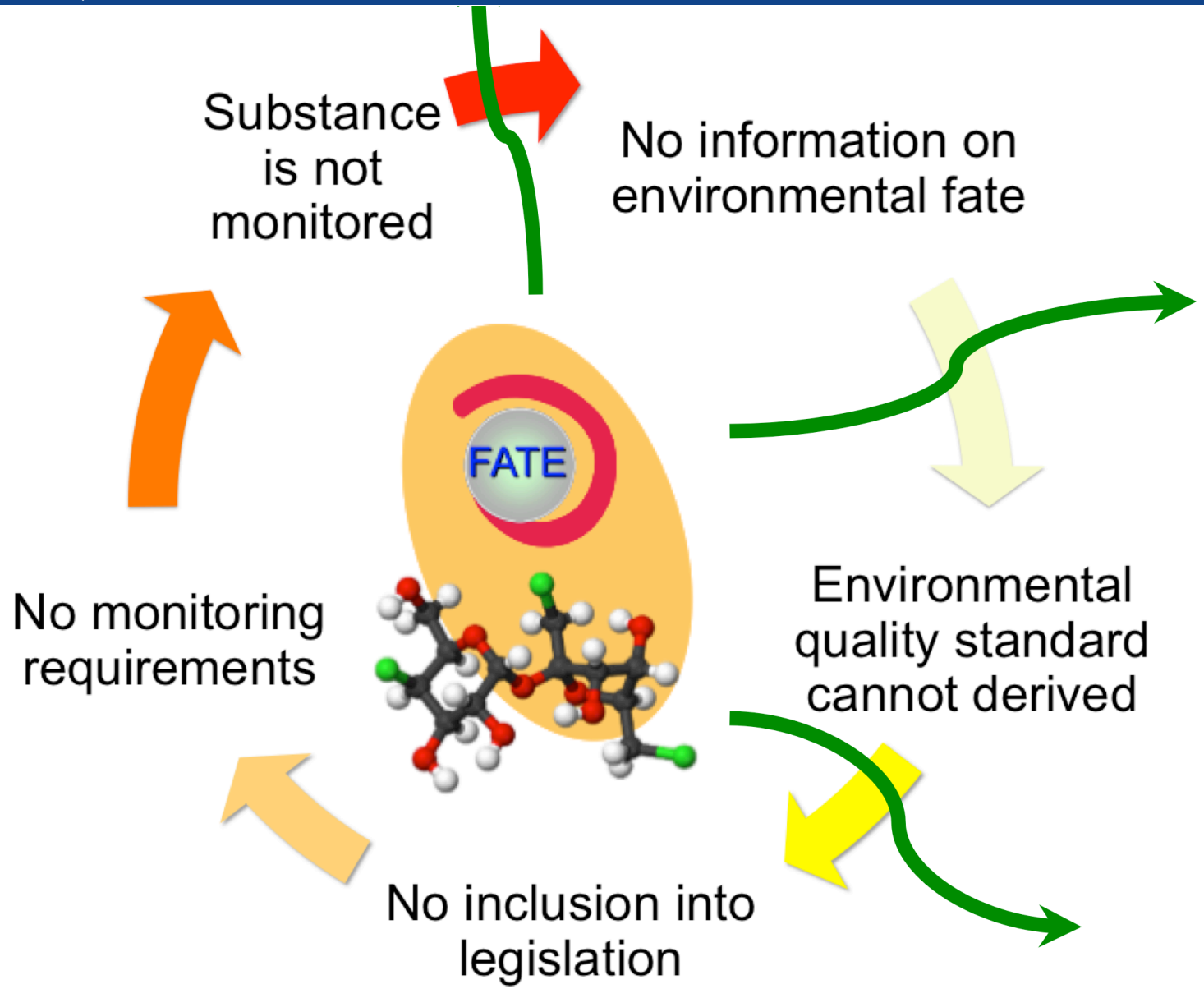


The JRC Action MAPLE

Monitoring across policies and environmental media

- Environmental pollution by substances does not stop at the boundaries of environmental media
- More and more substances raise concern
- Analytical resources are limited
- Not every substance is automatically a threat

- Bring laboratories together to work on the same samples
- Link regional monitoring activities
- Establish benchmarks
- Indentify and investigate viable options for monitoring in the policy making context


Substance is not monitored
No information on environmental fate
FATE
No monitoring requirements
Environmental quality standard cannot derived
No inclusion into legislation

The concept

Objective:

To produce evidence-based and independent data on the occurrence and fate of less-investigated and new chemical substances in the environmental media.

Work plan (2008 – 2011)

- Surface Water ✓
- Groundwater ✓
- Effluents and sewage sludge ✗
- Compost and biowaste ✗
- Coastal waters ☐
- The Lipid Project ✗

Characteristics:

- Concern-driven approach
- Integrative assessment
- Synchronisation and coordination of existing capacities
- Pan-regional assessments
- Non-probabilistic approach
- Multi-methods and -parameter
- Spatial (and temporal context)

Substance classes

- Pesticides
- (Candidate) priority substances
- Pharmaceuticals
- Personal care products
- Engineered nano-materials
- Trace elements
- …

The mechanism

National Laboratories

Synchronised sampling

Reporting

Environmental Chemicals

Priority Substances
REACH, Ecotoxicology
Emerging pollutants,
Multi-matrix,
Extremely low concentrations

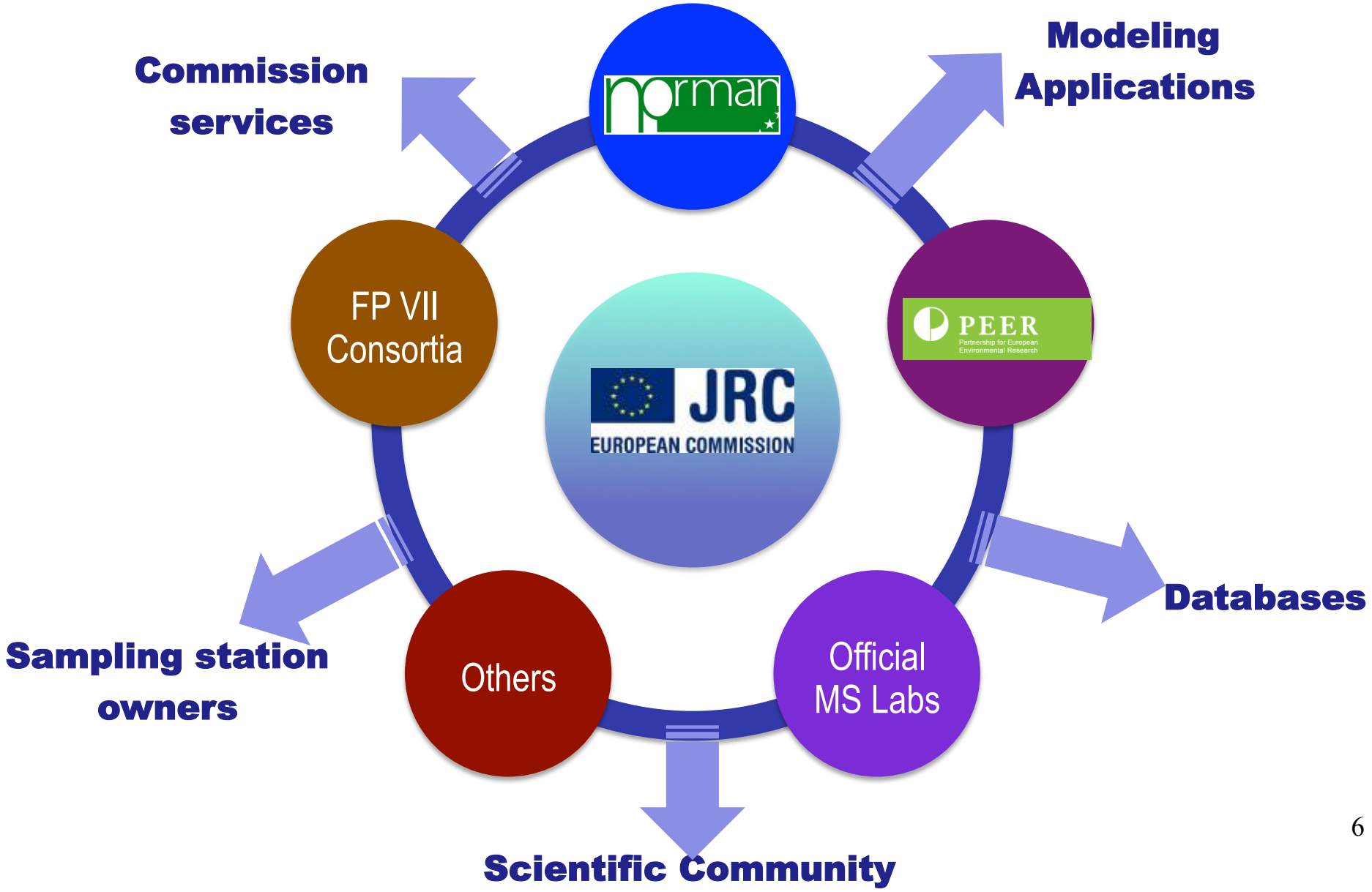
Dispatch logistics

Topic selection

Sampling stations

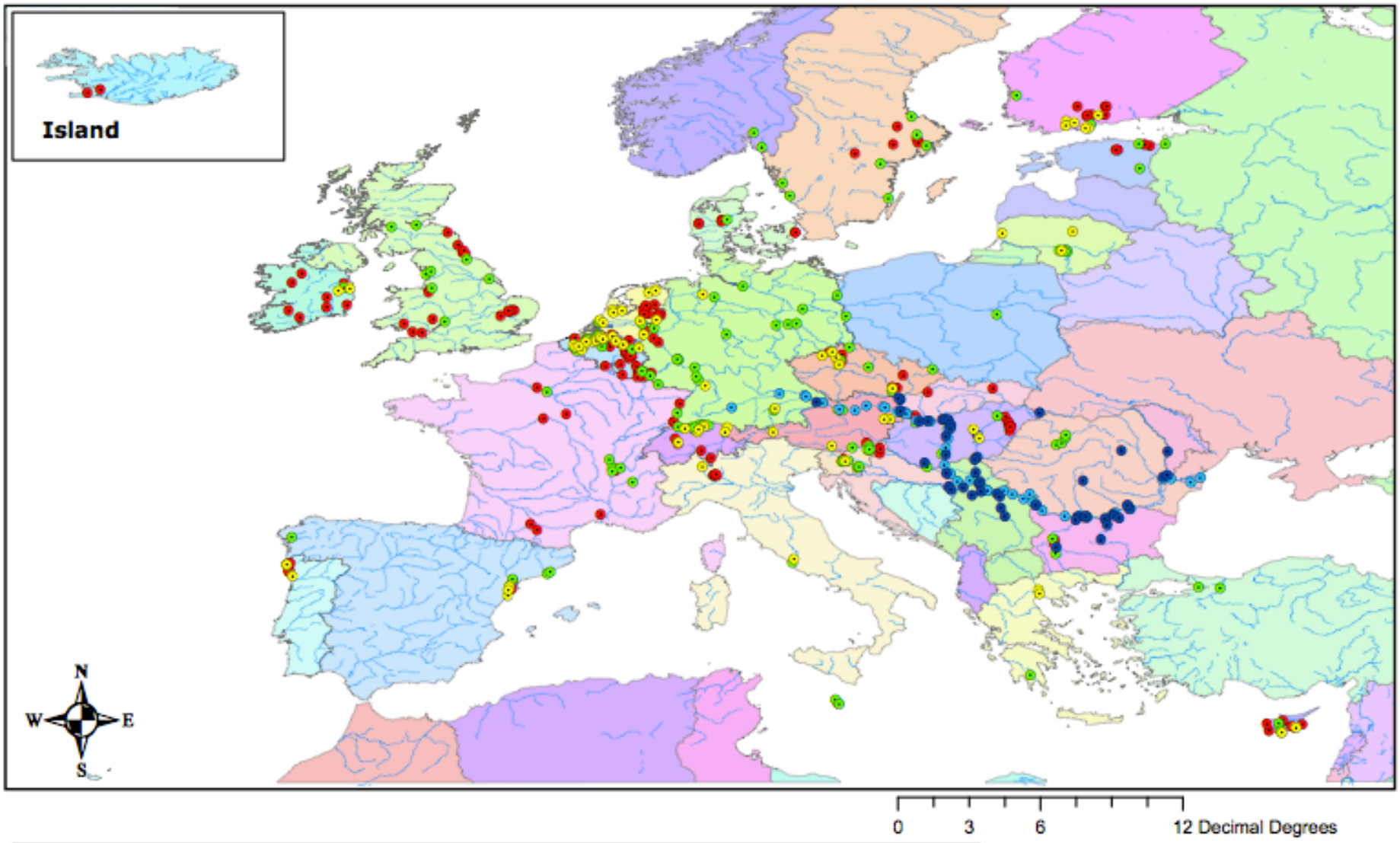
National programs

The partners



FATE EU-Wide Monitoring - European map

(Status: September 2010)

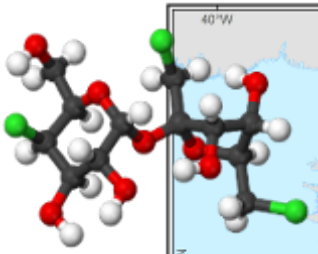


FATE EUMORE – Surface waters

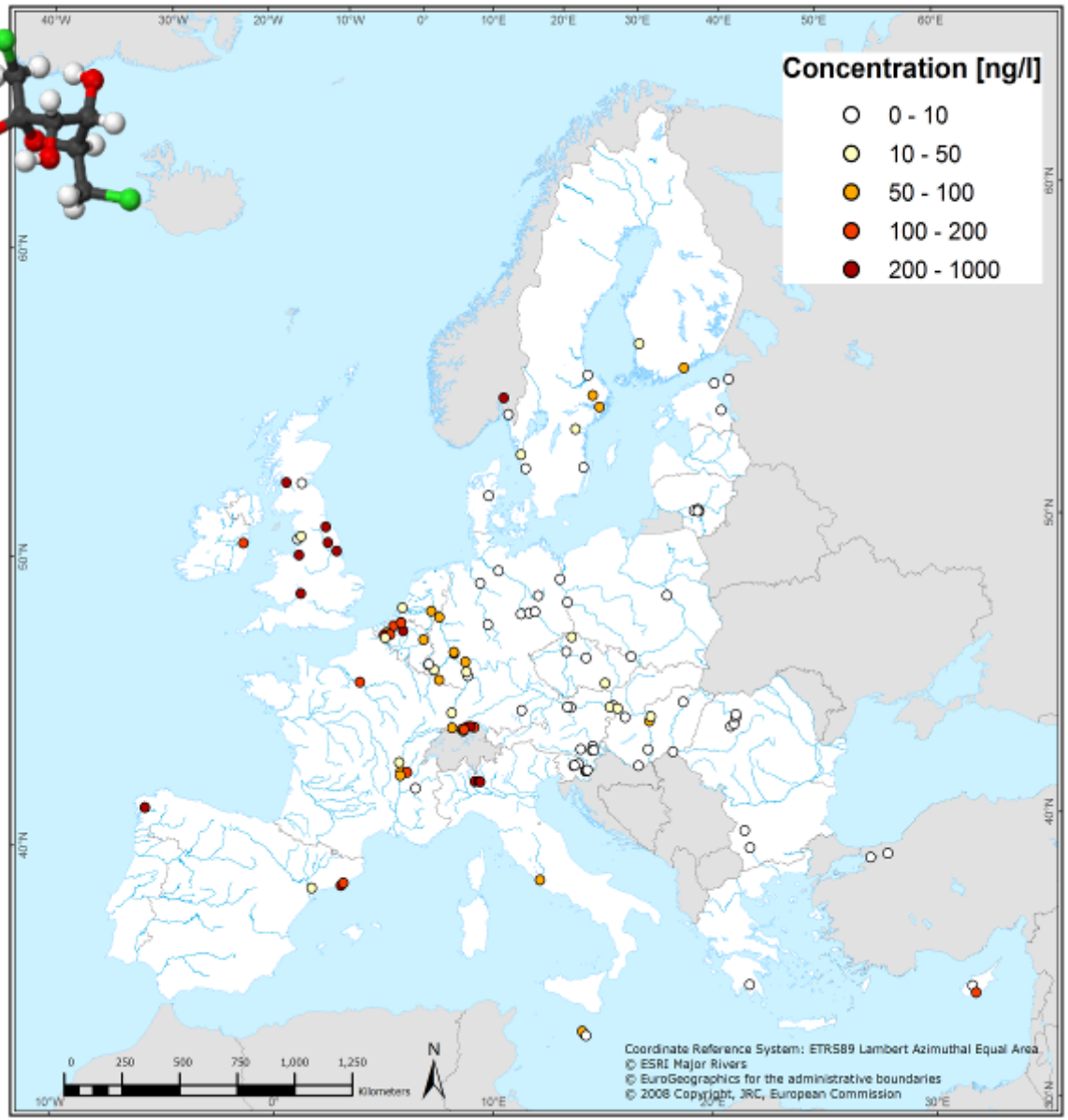
- **126 Sampling Stations** across Europe;
- Duplicate samples under cooled conditions to JRC;
- **36 polar organic compounds** and 1 inorganic priority substance;
- **46 participating labs**;
- **27 countries**;
- **Compounds**
  - Priority substances
  - Pesticides
  - Perfluorinated surfactants
  - Pharmaceuticals
    - Anti-flammatories
    - Antibiotics
    - Miscellaneous
  - Food additive (sucralose)
  - Mercury

FATE EUMORE - Sucralose

Sucralose (E995):



- Artifical sweetener
- 3 chlorine atoms
- VERY persistant
- Ecotoxicological effects unknown
- SE and NO report problems to EEA



Results:

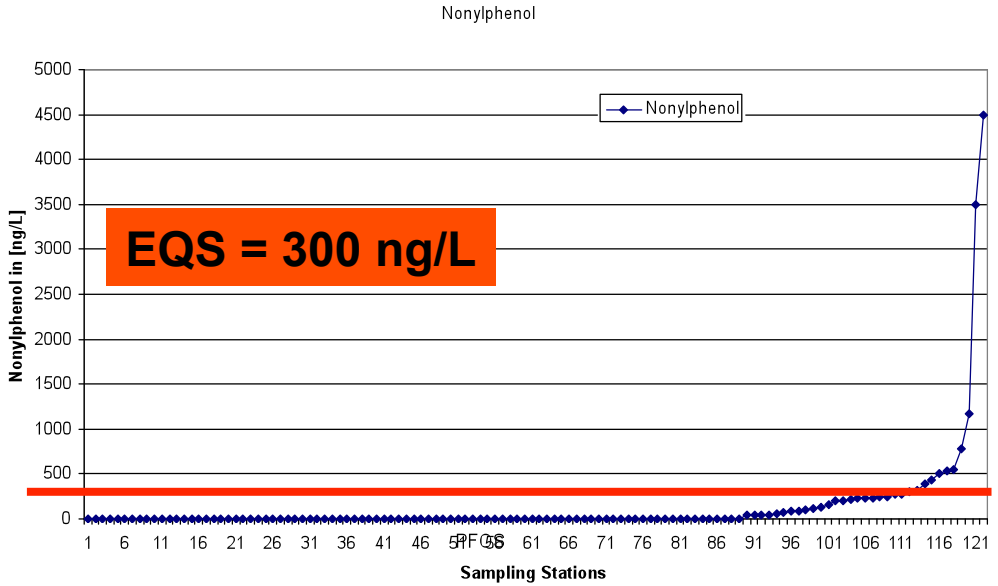
- **Quantifiable amount in samples from 18 European Countries**
- **Concentrations above 100 ng/L in samples from 8 countries**
- **50% of the samples were sucralose positive**

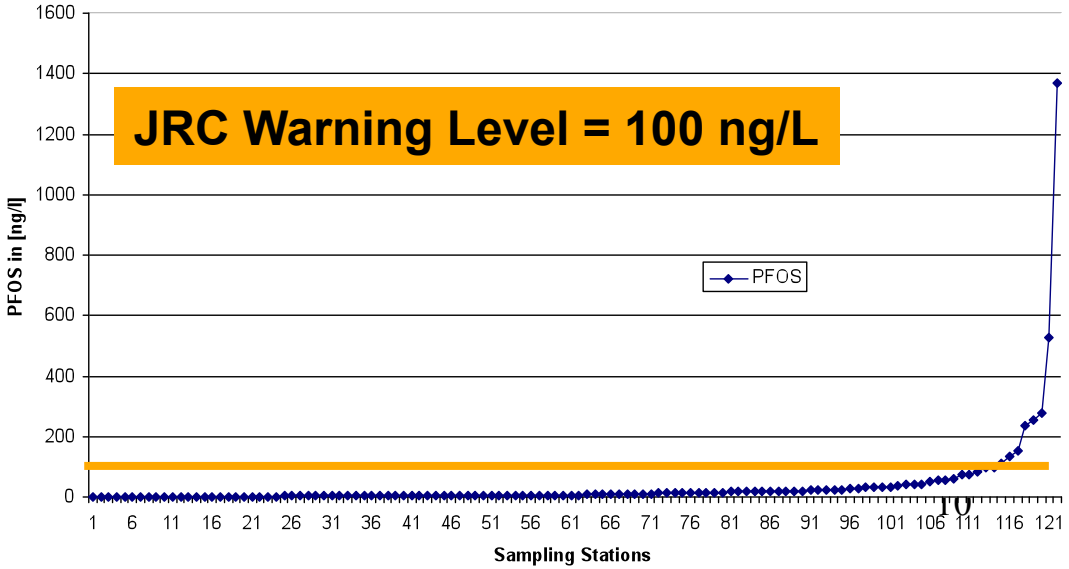
FATE EUMORE - Results

Priority Substance	EQS in ng/L	90th percentile In ng/L
Diuron	200	120
Nonylphenol	300	270
Isoproturon	300	90

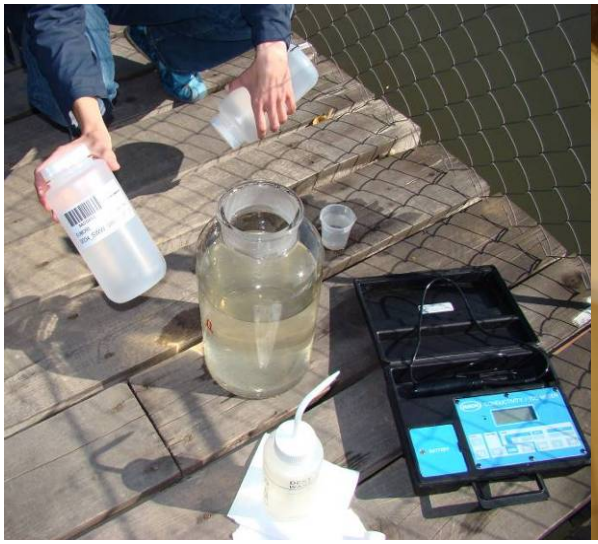
Emerging Pollutant	Warning level In ng/L	
PFOS	100	75
Bisphenol A	100	65

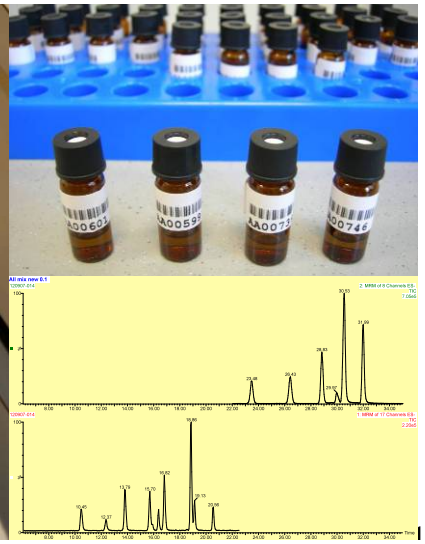
Results published:
R. Loos, B. M. Gawlik, G. Locoro, E. Rimaviciute, S. Contini, G. Bidoglio (2008)
Environmental Pollution,





FATE EUMORE – Some impressions

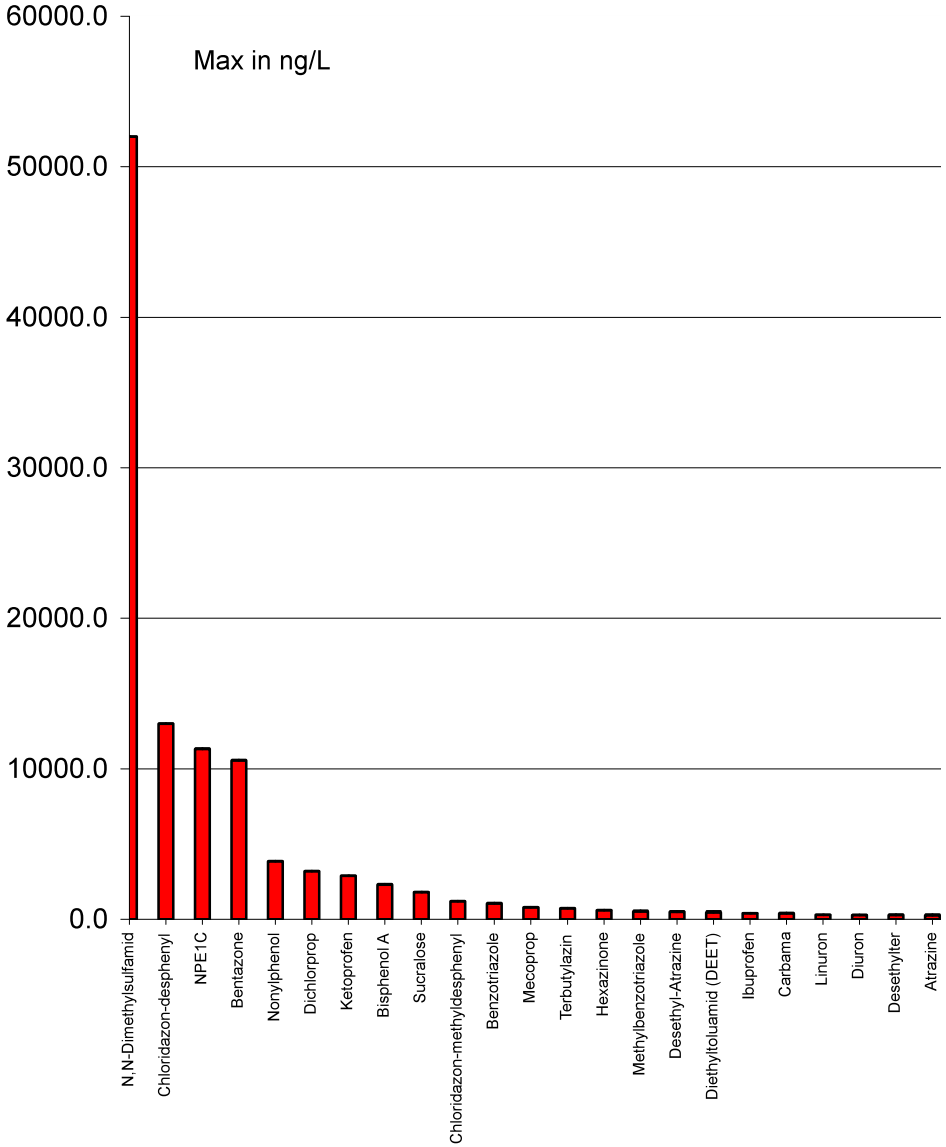


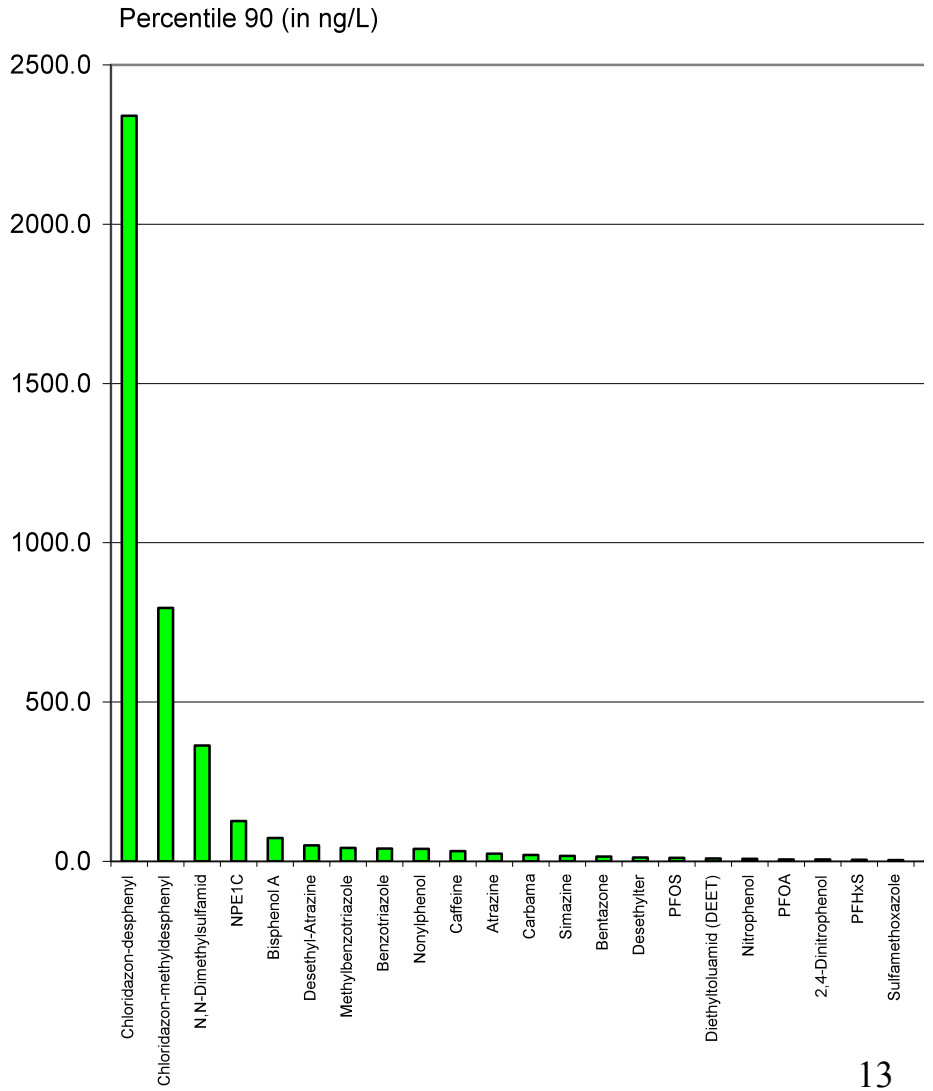


FATE GROWS – Overview on groundwater

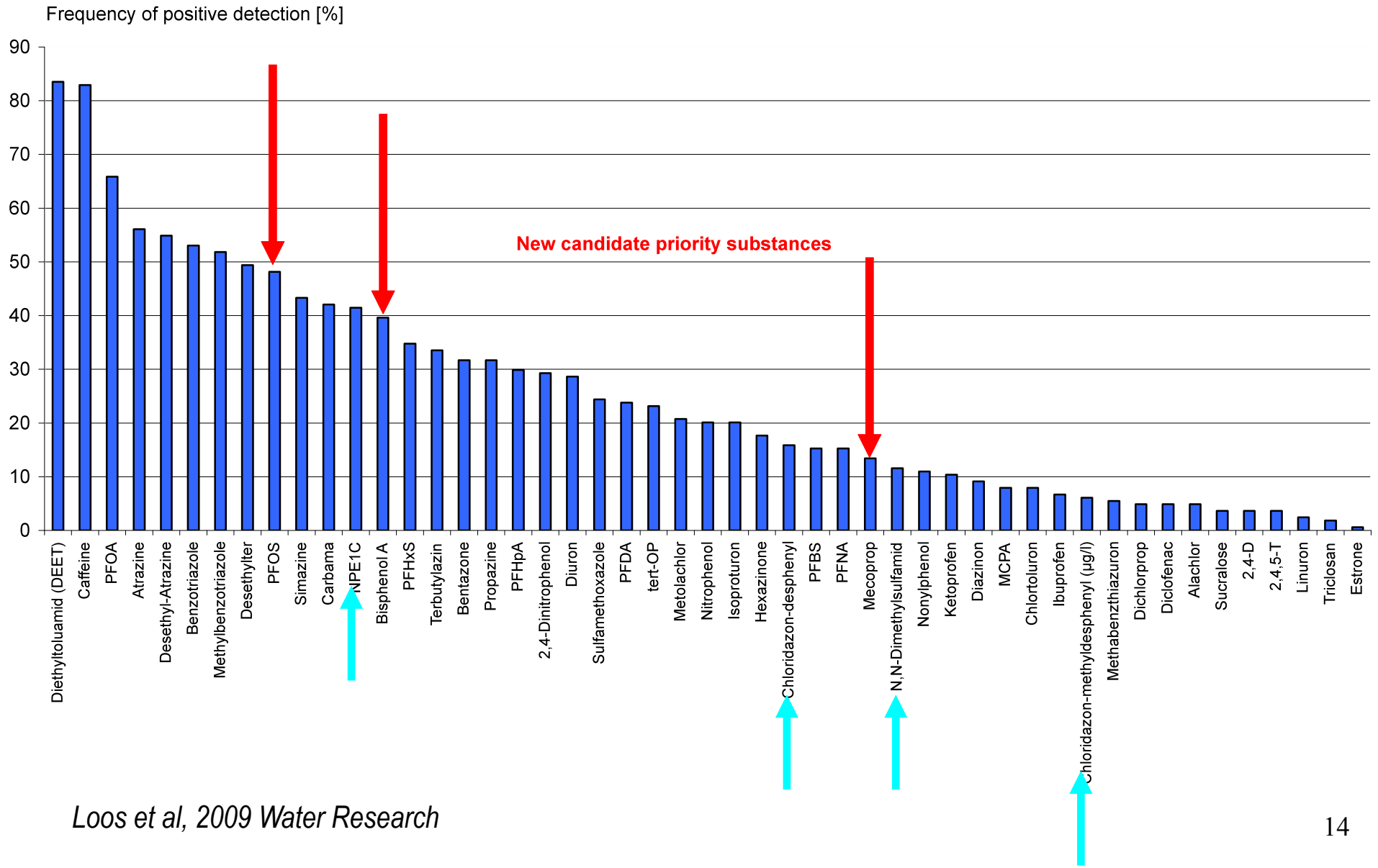
- 27 Countries among which Iceland, Norway and Switzerland (not all EU);
- 34 participants – 170 sampling stations – over 600 samples;
- 4 countries give analytical support:
  - Austria
  - Czech Republic
  - Germany
  - Italy;
- 78 organic compounds, 79 trace elements and androgenic/estrogenic behaviour;
- Results under preparation for publication;

Results (cont'd)



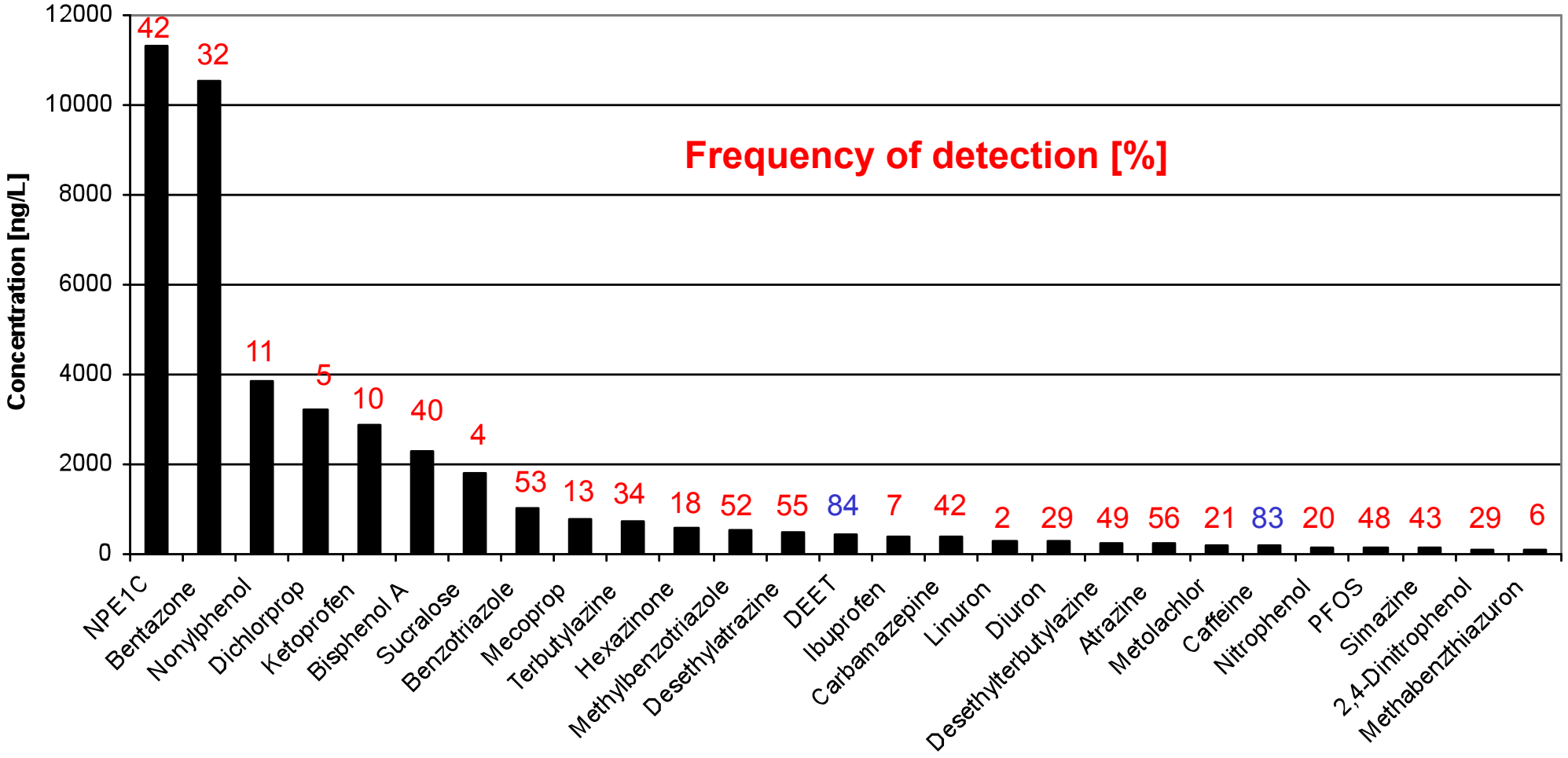


Groundwater campaign - Results



Loos et al, 2009 Water Research

Max. Concentrations and Frequency of Detection in Groundwater



Not included:
Dimethylsulfamid (max. **52 µg/L** in one sample; freq. 12%), Chloridazon-desphenyl (max. **13 µg/L**; freq. 17%), Chloridazon-methyldesphenyl (max. 1.2 µg/L; freq. 6%), PFOA (max. 39 ng/L; freq. **66 %**).

FATE-SEES and -COMES

Sewage sludge and **e**ffluents for **e**merging **s**ubstances

Compost and **o**ther bio-waste **m**atrixes for **e**merging **s**ubstances

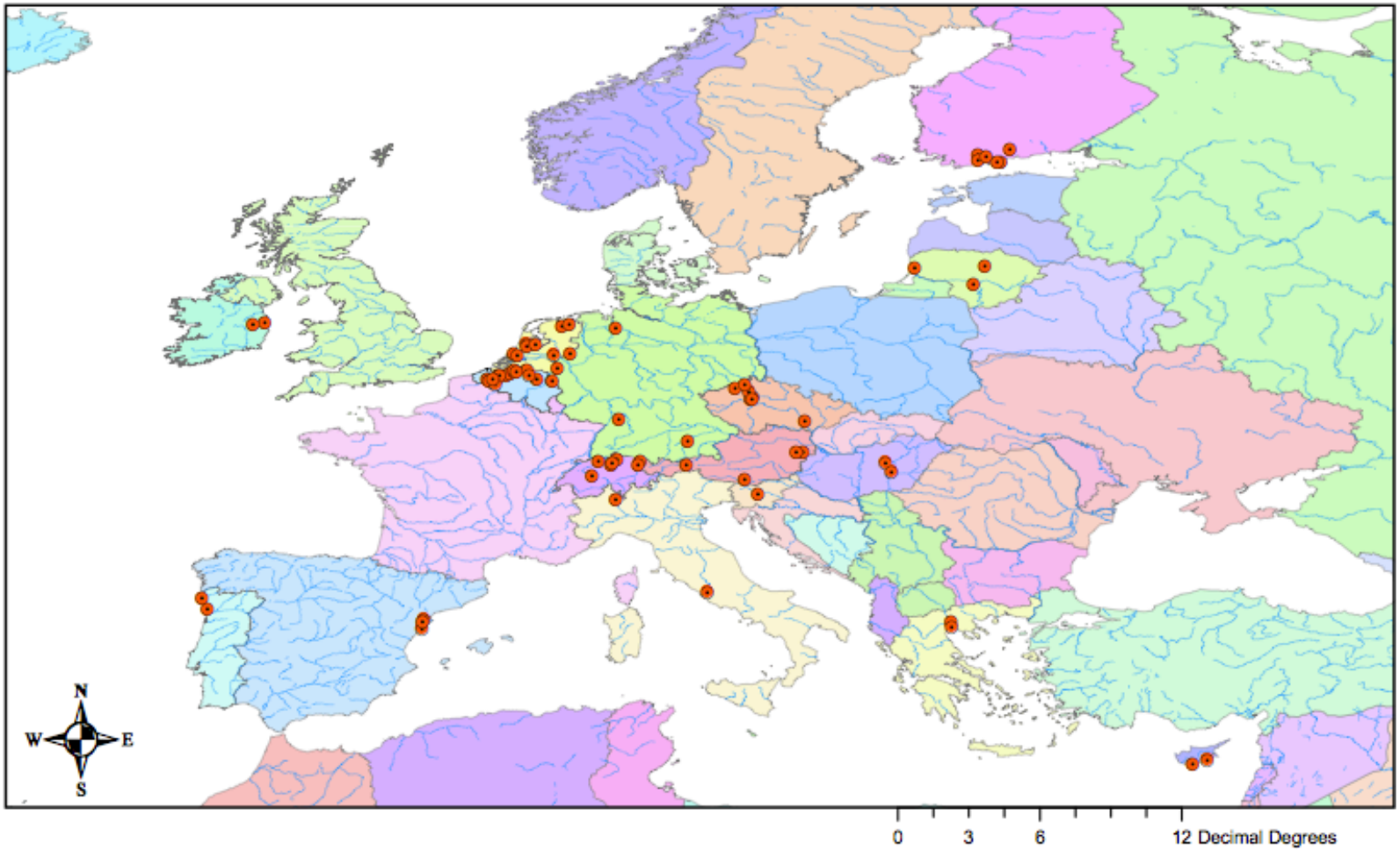
Background information

- Organised considering discussions around sewage sludge and bio-waste
- Officially announced to Member States
- Ca. 100 different sampling stations for FATE-SEES
- Same number of sampling stations of FATE-COMES (on-going)
- Up to a maximum of 150
- Involving 10 laboratories from 6 countries
- Bilateral arrangements are made with each plant owner (use of data)

Resources

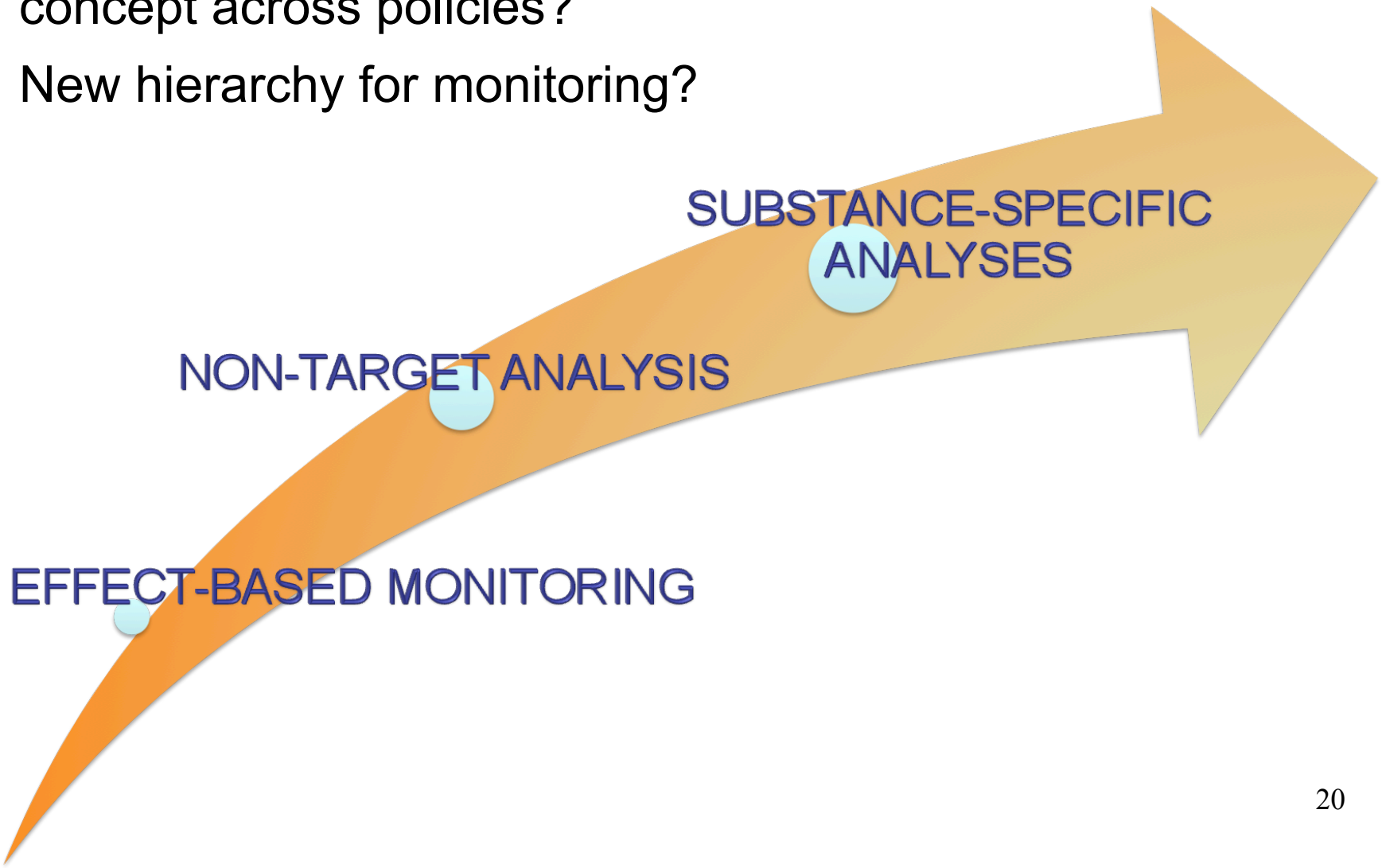
Laboratory	Compound / compound classes
JRC Institute for Environment and Sustainability, COM	trace elements, pesticides, per-fluorinated substances, pharmaceuticals, alkylphenols,
Umweltbundesamt, Austria	siloxanes, polycyclic musk compounds
VITO, Belgium	veterinary drugs
IWW, Germany	X-ray contrast agents (Gd)
Masaryk University, Czech Republic	endocrine activity
Biodetection System, The Netherlands	CALUX
Istituto Superiore per la Protezione e Ricerca Ambientale, Italy	PAH, PCB, PCDD/F
Stockholm University, Sweden	PFC, BFR
CNR Bari, Italy	PBDE

FATE SEES-EFFLUENTS



Develop the political dimension!

- Is it possible to introduce a substance-oriented monitoring concept across policies?
- New hierarchy for monitoring?



Towards effect-based monitoring

Activities on EDCs

Bio-Assay Development for EDCs

- Based on ***Mode of Action*** using model organisms
- ***Rationally Designed Aquatic Receptor***s integrated in label-free biosensor platforms

Chemical Monitoring

- Analyses of EDCs within the class of POPs
- Surface water, air, soil, effluents, marine environments, fish, mussels, sediment, food, emission
- Support to the Stockholm Convention and the Dioxin strategy

Support exposure assessment

- Provide data on Bisphenol A and Nonylphenol in European ground and surface water
- Perform EU-wide assessment of PCMs and PFOS in sewage sludges, effluents and biowastes

EU-wide ground water survey

Bisphenol A was one of the most relevant compounds detected in European ground waters, i.e. in terms of frequency of detection (40%), and maximum concentration levels (2.3 μg/L).

It appears that Bisphenol A is persistent under anaerobic conditions in ground water.

Nonylphenol: Frequency of detection (11%), maximum concentration levels (3.9 μg/L).

Octylphenol: Frequency of detection (23%), maximum concentration levels (41 ng/L).

In addition, nonylphenol monoethoxycarboxylate (**NPE1C**), a degradation product of NPEO surfactants, was among the most relevant compounds detected, with a frequency of detection of 42%, and a maximum concentration level of 11.3 μg/L.

NPEO carboxylates (NPECs) are persistent chemicals widespread in European ground waters.

Loos et al., Water Research 44 (2010) 4115-4126.

Other items

- Lipid Project (support to Stockholm Convention):
  - *G. Umlauf et al. investigate the possibility to use lipid-rich matrices for correlation with ERLAP Information*
- Sample Archiving → European Specimen Bank Network
- Integrative assessment, chemometrics
- Pan-regional study aiming at the Mediterranean Sea (under preparation).
- NORMAN collaboration agreement.
- Global Mercury Observation System (GEO/ GEOSS)
- Anthropogenic and engineered nano-materials as emerging pollutants (MARINA)

Thank you!

bernd.gawlik@jrc.ec.europa.eu

http://ies.jrc.ec.europa.eu