

# Joint Research Centre

The European Commission's in-house science service

**(Biocide) monitoring in  
European legislation**

**- The WFD example**

***Bernd Manfred GAWLIK***

***Robert LOOS***

*Directorate H – Institute for Environment and Sustainability  
Water Resources Unit*





- **Directive 91/414/EEC on plant protection products**
- **Directive 98/8/EC on biocidal products\***
- **Water Framework Directive (WFD) 2000/60/EC**
- **Environmental Quality Standards (EQS) Directive 2008/105/EC**
- **Directive 2009/90/EC on technical specifications for chemical analysis and monitoring of water status (QA/QC)**
- **Proposal for a new Directive on priority substances from January 2012 (COM(2011) 876 final)**
- **Communication The combination effects of chemicals – Chemical mixtures (COM(2012)252 final)**

*\* Defines in article 2a "biocidal product"*

- Protection of aquatic ecosystems
- “No deterioration” principle
- Water management based on river basin districts
- Environmental quality standards and emission controls
- “Phasing out” of priority hazardous substances
- Integration of other directives related to water issues

## **Objective:**

**To achieve good water status (ecological and chemical) by December 2015**

# Priority Substances



## Priority Hazardous Substances

**Anthracene**  
**Brominated diphenylethers**  
**Cadmium and its compounds**  
**C10-C13-Chloroalkanes**  
**Di(2-ethylhexyl)phthalate (DEHP)**  
**Endosulfan**  
**Hexachlorobenzene (HCB)**  
**Hexachlorobutadiene (HCBd)**  
**Hexachlorocyclohexane**  
**Mercury and its compounds**  
**Nonylphenols**  
**Pentachlorobenzene**  
**Polyaromatic Hydrocarbons (PAHs)**  
**Tributyltin compounds**  
**Trifluralin**

## Priority Substances

**Alachlor**  
**Atrazine**  
**Benzene**  
**Chlorfenvinphos**  
**Chlorpyrifos (ethyl)**  
**1,2-Dichloroethane**  
**Dichloromethane**  
**Diuron**  
**Fluoranthene**  
**Isoproturon**  
**Lead and its compounds**  
**Naphthalene**  
**Nickel and its compounds**  
**Octylphenols**  
**Pentachlorophenol**  
**Simazine**  
**Trichlorobenzenes**  
**Trichloromethane**

## Other specific pollutants

**DDT / *p,p'*-DDT**  
**Aldrin**  
**Dieldrin**  
**Endrin**  
**Isodrin**  
**Carbontetrachloride**  
**Tetrachloroethylene**  
**Trichloroethylene**

**Toxic, persistent, liable to bioaccumulate**



## All surface waters

- Rivers, lakes, artificial waters
- Transitional waters (partly saline)
- Coastal waters (up to one sea mile)
- Groundwaters (no upward trends)

## Types of Chemical Monitoring

- Surveillance (12 samples per year )
- Operational
- Investigative

## Parameters

- Priority Substances  
(Compliance with EQS)
- "Other pollutants" at river basin level  
(Compliance with national EQS)
- Physico-chemical parameters supporting interpretation of biological data
- Parameters required for interpretation of the results of chemical measurements  
(e.g., DOC, Ca, SPM)

- All methods should meet minimum performance criteria
- Standardized or validated methods
- Validation according to ISO 17025
- Laboratories: Demonstrate their competence by participation in Interlaboratory Studies
- Analysis of Certified Reference Materials (CRMs)
- LOQ < 30% of EQS
- Relative target uncertainty at EQS level: < 50 %



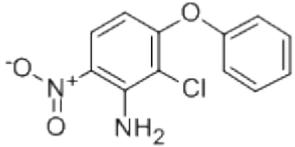
- **15 additional Priority Substances (PS)**
- **Pesticides and biocidal products**
- **Industrial chemicals (POPs)**
- **Pharmaceuticals**
- **Stricter EQS for four existing PS**
- **Biota standards for several substances**

# Pesticides

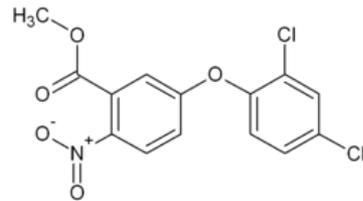
## Biocidal products



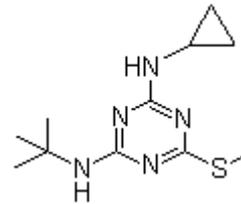
**Aclonifen**  
(Herbicide)



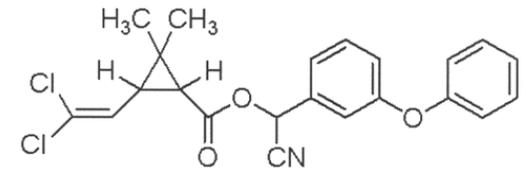
**Bifenox** (Herbicide)



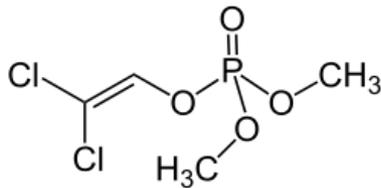
**Cybutryne = Irgarol**  
(Triazine herbicide = algicide)



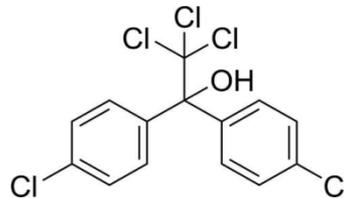
**Cypermethrin**  
(Pyrethroide Insecticide)



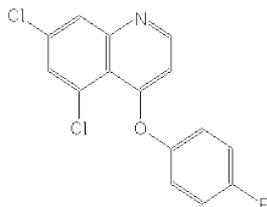
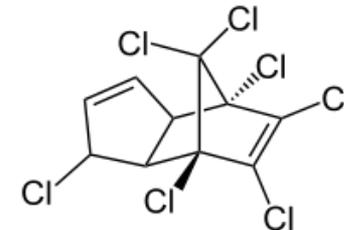
**Dichlorvos**  
(Phospho-ester Insecticide)



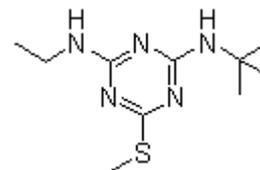
**Dicofol**  
(Miticide)



**Heptachlor (epoxide)**  
(Insecticide)

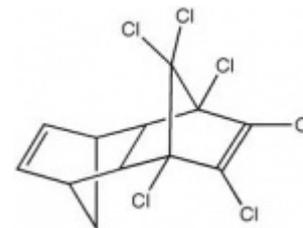
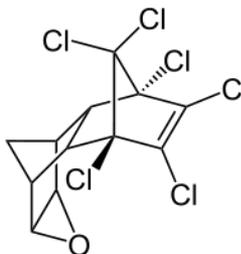
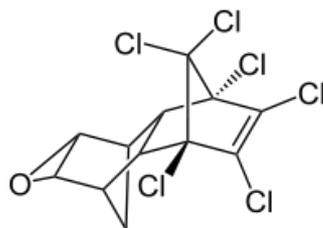
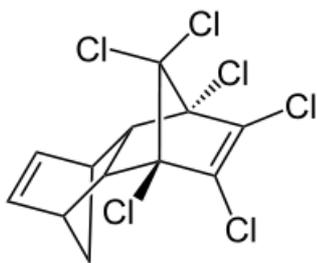


**Quinoxifen**  
(Fungicide)



**Terbutryn**  
(Triazine herbicide = algicide)

## Aldrin, Dieldrin, Endrin, Isodrin



**EQS Directive (2008)**

**AA-EQS**

**Sum: 0.01 µg/l**

**Sum 0.005 µg/l (for other surface waters)**

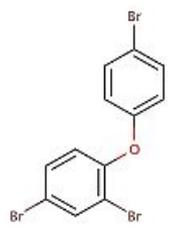
**Proposal 2012**

**No change; no biota EQS**

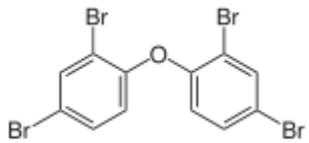
# Brominated Diphenylethers



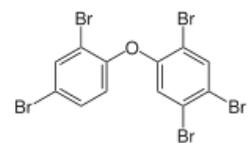
Commercial "pentaBDE" is a technical mixture of different PBDE congeners, with **BDE-47** (2,2',4,4'-tetrabromodiphenyl ether) and **BDE-99** (2,2',4,4',5-pentabromodiphenyl ether) as the most abundant.



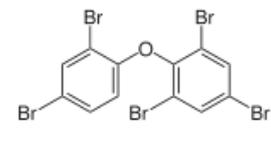
BDE28



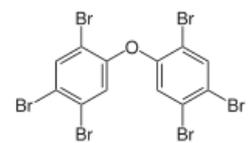
BDE47



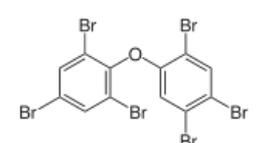
BDE99



BDE100



BDE153



BDE154

## EQS (2008)

### AA-EQS:

Fresh water: 0.5 ng/l

Salt water: 0.2 ng/l

## Proposal 2012

### AA-EQS:

49 fg/l

2.4 fg/l

### MAC-EQS:

Fresh: 0.14 µg/l

Salt: 0.014 µg/l

Σ BDE28, BDE47, BDE99, BDE100, BDE153 and BDE154  
Σ BDE28, BDE47, BDE99, BDE100, BDE153 and BDE154

**Biota: 0.0085 µg/kg**  
**= 8.5 ng/kg**

# Problematic Chemicals (EQS in pg/l range)



- **Cypermethrin: 80 pg/l (8 pg/l for coastal salt waters)**
- **Dichlorvos: 0.6 ng/l (60 pg/l in coastal waters)**
- **Dicofol: 1.3 ng/l (32 pg/l in coastal waters)**
- **17-alpha-ethinylestradiol: 35 pg/l (7 pg/l in coastal waters)**
- **17-beta-estradiol: 0.4 ng/l (80 pg/l in coastal waters)**
- **Heptachlor/Heptachlorepoide: 0.2 pg/l (10 fg/l)**
- **PFOS: 0.65 ng/l (0.13 ng/l in coastal waters)**
- **Dicofol, Heptachlor/Heptachlorepoide, PFOS: biota EQS**

## 2000 to 2008 (spring) data

- 1151 substances
- 19946 stations
- 547161 individual samplings
- 14 602 873 analyses

## Water types

- 96% River Water
- 2% Transitional Water
- 1% Lake Water
- 1% Coastal Water

## Matrices covered

- 93% whole water
- 6.3% sediment
- 0.7% biota

## Benzene

- Total measurements: 26737
- LOQ missing: 9.7%
- LOQ not compliant: 2.6%
- Compliant: 87.8%

## Cadmium and its compounds

- Total measurements: 100302
- LOQ missing: 40.3%
- LOQ not compliant: 58.7%
- Compliant: 1% (1039)

## Pentabrominated diphenyl ethers

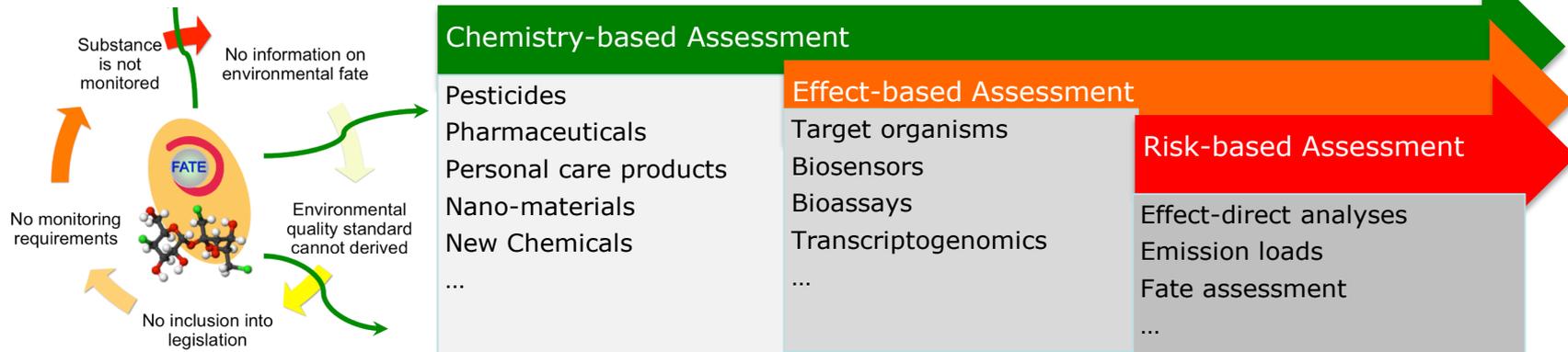
- Total measurements: 536
- LOQ missing: 1.5%
- LOQ not compliant: 98.5%
- Compliant: 0%

# Pan-European Screening



## Objective:

*To produce independent data on the occurrence of less-investigated and new contaminants in environmental media on a manageable sample set (up to 300) by sharing and synchronising available resources.*



## Characteristics:

- Concern-driven approach
- Integrative assessment
- Coordination of existing capacities
- Pan-regional assessments
- **Known data quality**
- Multi-parameter
- Few experts - same samples

## Example: WWTP Effluents

- 91 WWTP effluents analyzed
- 168 organic chemicals and 20 trace elements
- 134 out of the 168 compounds were detected
- Effect-based:
  - Estrogenicity was detected in one third of the samples and
  - Dioxin-like toxicity were detected in a quarter of the samples.





Name of country	Number of stations
France	18
Germany	18
Spain	17
Italy	15
United Kingdom	15
Poland	13
Sweden	12
Finland	11
Romania	11
Netherlands	10
Czech Republic	9
Austria	8
Belgium	8
Greece	8
Hungary	8
Portugal	8
Bulgaria	7
Denmark	7
Ireland	7
Slovak Republic	7
Latvia	6
Lithuania	6
Estonia	5
Slovenia	5
Cyprus	3
Luxembourg	3
Malta	3
<b>TOTAL</b>	<b>248</b>

Non EU	
Ukraine	11
Turkey	9
Norway	8
Bosnia and Herzegovina	7
Croatia	7
Albania	6
Iceland	6
Serbia	6
Macedonia, FYR	5
Switzerland	5
<b>TOTAL</b>	<b>70</b>

**Taking into account a max. size of 250 stations and country size, population and energy use.**

<b>AT - Umweltbundesamt GmbH</b>	Acesulfam, Benzotriazole	80 ready, 172 in process, 41 pending
<b>BE - Vlaamse Milieumaatschappij</b>	Boron, Silver	159 ready, 60 with JRC for pre-treatment
<b>NL - Rijkswaterstaat</b>	MTBE	Update pending
<b>CZ - Povodí Labe</b>	Glyphosate and AMPA	154 ready, 67 pending
<b>DE - Bundesanstalt für Gewässerkunde</b>	Triclosan, bisphenol A,	Update pending
<b>UK - NLS</b>	MTBE, Glyphosate	75 ready, 64 in process (Total 139) Sed and biota in second priority TCPP: 75 ready, 112 in process PFPr (all in process, minor issue with column) Cl: all in process
<b>EC - JRC</b>	Decabromodiphenylethane (sed and biota) TCPP, Perfluoropropionic acid (PFPrA), Chloride , Sulfamethoxazol, Carbamazepin incl. Metabolite,	Pharmaceuticals: 112 ready, 108 in process

# Sampling bill

## Digital Photo



## JRC EU wide monitoring – Watch List Pilot Exercise Sampling Location card

**Country:** Latvia

**City:** Latvian Institute of Aquatic Ecology, Riga

**River / Sampling Location:** Kisezers Lake

**Code:** 0049\_SWW\_00092

**Geographic coordinates:**

Geographic coordinate system: UTM/UPS Map Datum: WGS 84

**Latitude:** N 57°00.624

**Longitude:** E 024°10.155

**Sampling date:** 08 May 2012

**Sampling time:** 11.00

**Sample type:**  Sea water  River water  Lake water

**Water Depth:** cm 300

**Comments:**

Lake can be affected by brackish water.

Air temperature 16.7 °C

**Water pH:** 8.16 (16.2°C)

**Water Conductivity (µS/cm):** 420

**Water temperature (°C):** 14.3

**Salinity:**

*Latest development*

## **Platform for Chemical Monitoring Data**

- Promoting a more coherent approach to the generation, collection, storage and use of chemical monitoring data in relation to humans and the environment,
- Creation of a platform for chemical monitoring data
- Help to identify links between exposure and epidemiological data
- In order to explore potential biological effects and lead to improved health outcomes

# Conclusions

- WFD Monitoring Requirements are challenging
- Biocidal products (as well as pharmaceuticals) are gaining importance for monitoring
- Monitoring has been identified as key priority for water management → European Innovation Partnership on Water
- Better data management and access to data are needed → the NORMAN experience, Regional Sea Conventions, Vertical legislation
- Technical and Regulatory Innovation are the key!