



Network of reference laboratories and related organisations for  
monitoring and bio-monitoring of emerging environmental pollutants

## **The NORMAN network on emerging substances: status and future plans**

**[www.norman-network.net](http://www.norman-network.net)**

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# NORMAN network – Emerging Substances

**Former FP6 research project**

→ **Non-profit association since 2009**



**45 Members (8 Founding Members + 37 Ordinary members)**

Activities **funded by its members**: via annual membership fees + in-kind contributions

Focus on **synergies with** the various activities funded at the **national level** in the field of EP

Recent signature (Jun 2010) of **Collaboration Agreement** between **NORMAN** and **JRC**

Strong link with **DG ENV** (WFD CIS WG-E / CMEP)

# Environmental contaminants

## *“knowns and unknowns”*

- **Known knowns: “conventional” pollutants e.g. PCBs, metals, PAHs**
  - *We know how to measure them and we have sufficient data to assess the risks*
- **Known unknowns: e.g. PFCs, PPCP, nanomaterials**
  - *We suspect or know (increasingly) that they are present in the environment, but don't have enough data to assess risk*
- **Unknown unknowns: ???**
  - *We know they are present in the environment (causing effects, including as mixtures) but we don't know yet WHO they are (?)*

Adapted from Francis S. Collins, 2008

# *Known vs Unknown*

## Well investigated vs emerging substances

There is no place for emerging pollutants if risk is not demonstrated:

**TOP-DOWN approach**  
TARGET & select:  
PRIORITISATION of  
emerging SUBSTANCES

Data comparability:  
-Common Protocol for  
methods validation  
-ILS

Not monitored

**NORMAN**  
**strategy**

Not regulated

Data sharing / data ,  
info exchange  
-Databases  
-NORMAN Bulletin

**BOTTOM-UP approach**  
Identification of relevant toxicants via FIELD-  
BASED approaches  
Biological tools in combination with chemical  
analysis



# Setting priorities among emerging substances (*known unknowns*)

- **NORMAN Working Group N°1: Prioritisation of emerging substances**
  - NORMAN list: more than 700 substances identified in the scientific literature as «emerging substances»
  - Need to establish criteria for setting priorities among emerging substances : definition of action categories to fill current gaps
  - The result of this WG will help future NORMAN actions : investigative monitoring exercises, interlab studies, biological testing (WG on bioassais), etc.

# WG-1 prioritisation of emerging substances

## Substance by substance assessment

Emerging compounds cited in the literature

Exposure  
assessment



Hazard  
assessment

## Classification by action categories

Cat1

Cat2

Cat3

Cat4

Cat5

Cat6



Ranking within each category

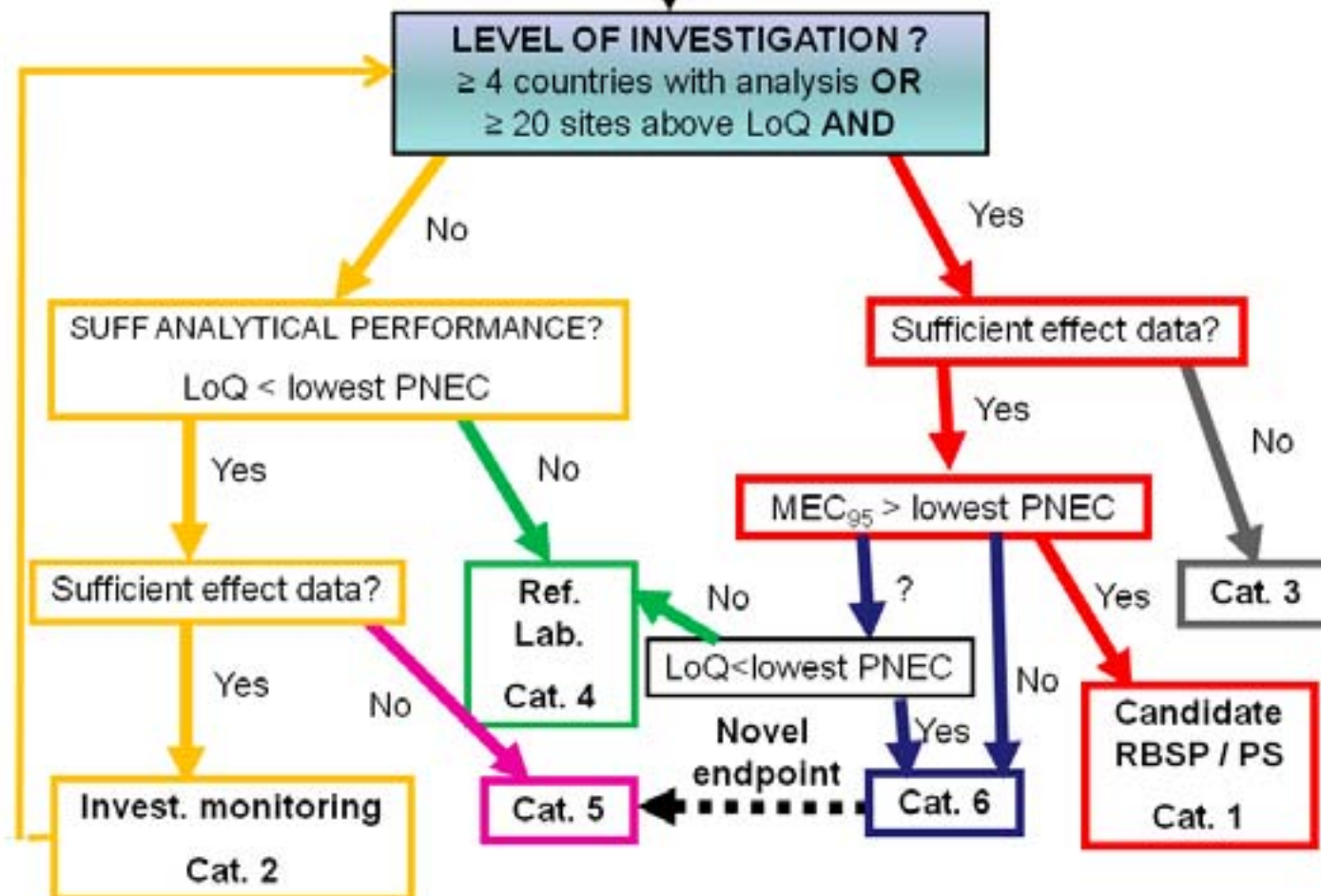
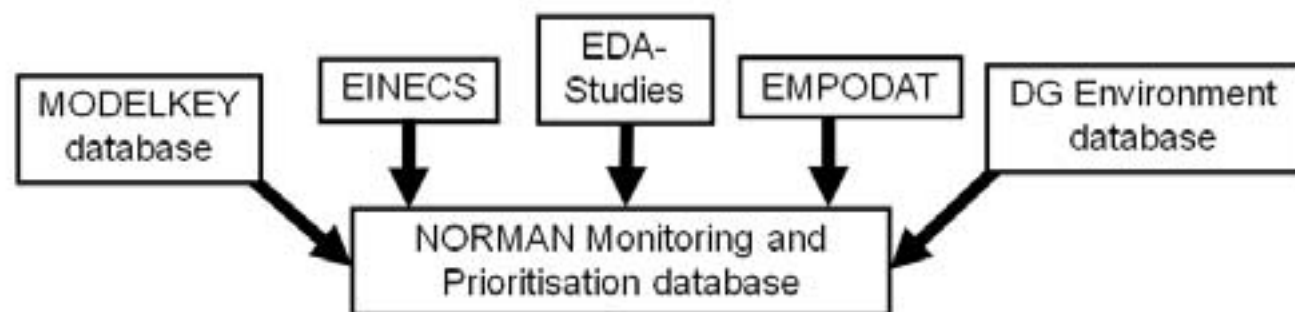


- Classification into action categories followed by ranking



## Six ACTION-CATEGORIES

1	There is already <b>sufficient evidence on exposure and effects</b> to prioritise them: <b>legally binding EQS should be derived, should be considered for routine monitoring.</b>
2	<b>First evidence of occurrence in hazardous concentrations</b> in the environment is available (e.g. field studies from research projects): should be considered for investigative monitoring.
3	<b>Measured</b> in the environment and are <b>suspected to have effects on ecosystems and human health</b> (e.g. exceeding P-PNEC), but <b>further hard evidence</b> (research) is <b>needed</b> : rigorous effect assessment needed
4	There is <b>evidence of hazard</b> but <b>observations in the environment are scarce</b> (substances <b>rarely looked for OR analytical capabilities not yet satisfactory - LoQ</b> ): development / validation of analytical methods needed.
5	No or few observations in the environment and no hard evidence on potential effects to ecosystem and human health: <b>BOTH analytical methods AND rigorous effect assessment required.</b>
6	Evidence that the exposure does not pose a hazard to ecosystem and human health. Compounds which should <b>NOT be considered for first priority action.</b>





# Environmental thresholds for risk assessment

- Exceedance of EQS / PNEC / P-PNEC:

Existing EQS

Derivation of PNEC

Derivation of P-PNEC

Based on experimental data  
PNEC acute & PNEC chronic

• If experimental data not available,  
estimate of LC50 based on read-across  
and QSARs

Lowest value

Compare against PEC

(95<sup>th</sup> percentile of the) maximum  
concentration in water at each site  
(recent years)

# Ranking substances within each action category

- Specific indicators and criteria adopted for each given action category
- Examples of criteria / indicators:
  - **Exposure assesment :**
    - Frequency of observations  $>$  LoQ
    - Annual usage (ranges), use pattern (classes of usage)
    - N° of observations in groundwater (YES/NO)
    - Potential for long range transport
  - **Hazard assesment:**
    - Low P-PNEC
    - PBT, vPvB like substances
    - Human health toxicity
    - Non-toxic endpoints: mutagenicity, genotoxicity, endocrine disrupt., etc.
  - **Risk assesment:**
    - Spatial frequency of exceedance of lowest PNEC – (based on MECsite)
    - Degree of exceedance of lowest PNEC – (based on MEC95 – all sites)

# Identification of relevant toxicants (*unknown unknowns*)

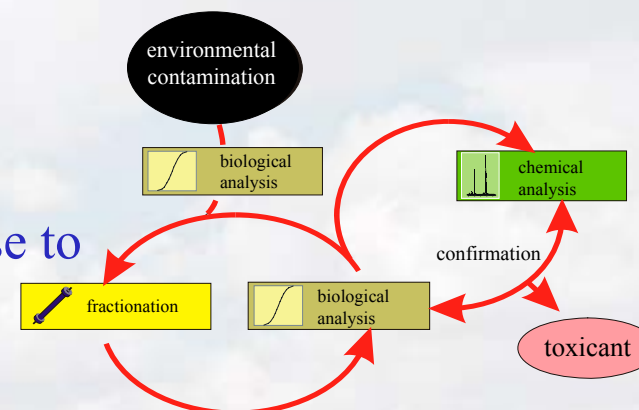
- Monitoring and modelling-based prioritisation can only partly solve dilemma of the complexity of contamination
- Two Working Groups dealing with effect-based analysis:
  - WG-2 “The value of bioassays / biomarkers in water quality monitoring: strategies for interpretation of results” (INERIS / IVM / RIVM)
  - WG-3 “Effect Directed Analysis – (UFZ) – kick-off meeting, Leipzig 19-20 Oct



# Identification of relevant toxicants (*unknown unknowns* + *confirmation of substances as pollutants*)

## – WG-3 Effect Directed Analysis – (UFZ) – kick-off meeting, Leipzig 19-20 Oct 2010

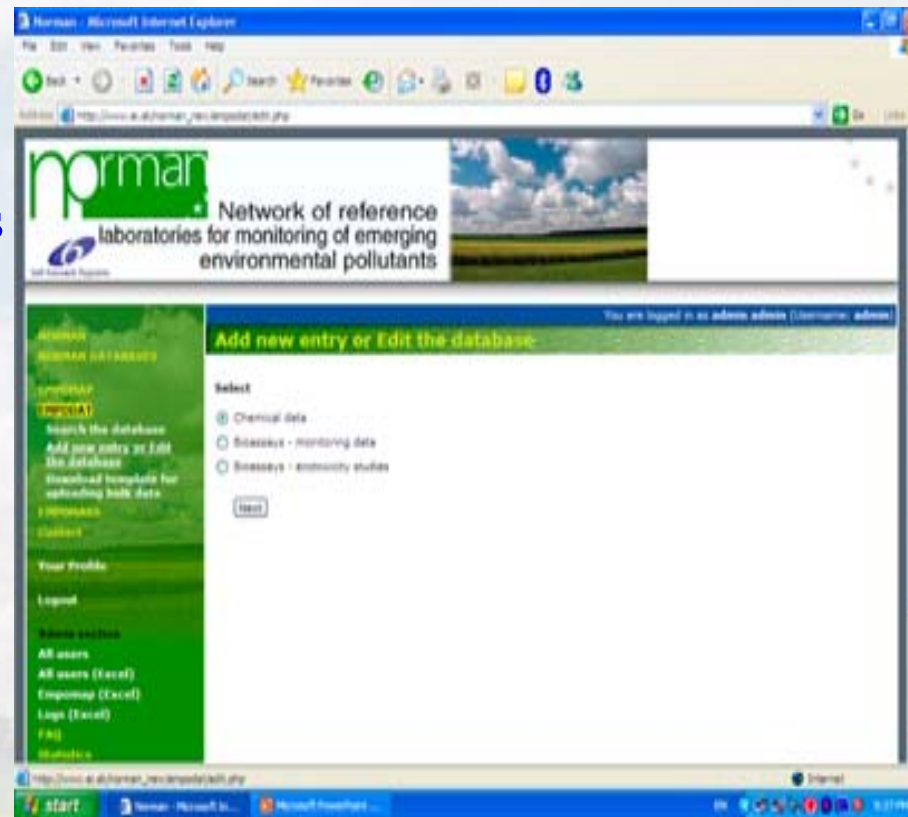
- Position paper on EDA applications and research needs
- Start-up for a common LC-MS/MS database to support the identification of unknowns
  - discussion on the needs, challenges and conditions for a common mass spectra database, who will supply spectra, development, maintenance of the DB
  - NORMAN EMPOMASS database: discussion about further development needed






# NORMAN databases

- NORMAN maintains three web-based databases:
  - **EMPOMAP**: experts, organisations and projects dealing with emerging substances,
  - **EMPODAT**: geo-referenced monitoring data + ecotoxicological information from bio-assays and biomarkers
  - **EMPOMASS**: mass spectrometric information on provisionally identified and unknown substances.

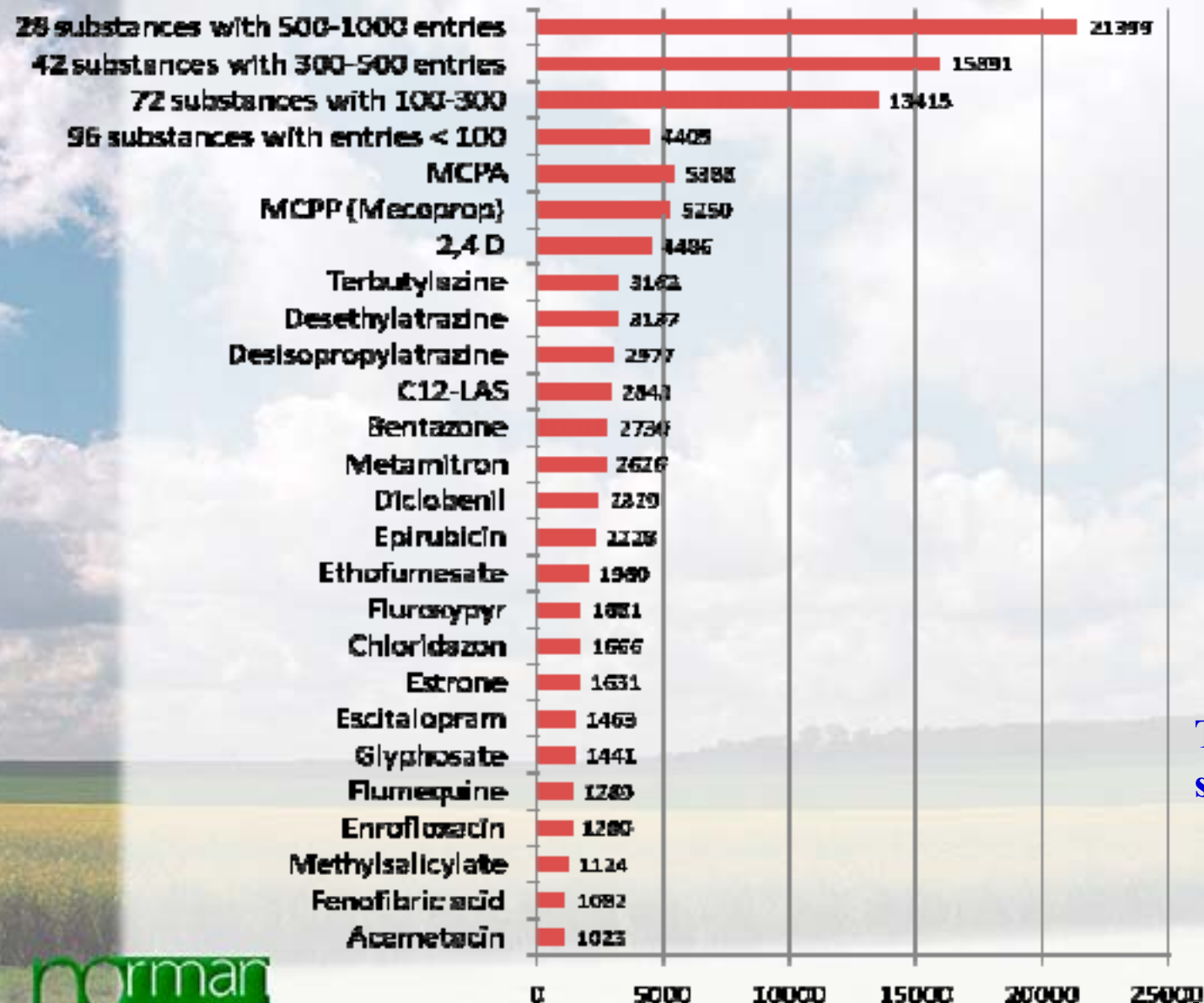


# **EMPODAT: Database of occurrence/monitoring data on emerging substances**

- Data entries uploaded
  - **ca. 10 000** (2008)                      **108 000** (2010)
- Three modules: 
  - **Chemical data** including sub-module on **nanoparticles**
  - **Bioassays - monitoring data**
  - **Bioassays - ecotoxicity studies**
- **Data entry**
  - Excel **Data Collection Templates** – **downloadable**
  - Metadata from the **Common template for data collection** (WFD PS, DG ENV)
  - Matrices: **water, sediment, SPM, biota, soil, sludge, (air)**
- **Data statistics**
  - Customised queries, data statistics, fact sheets

## Data entries per substance

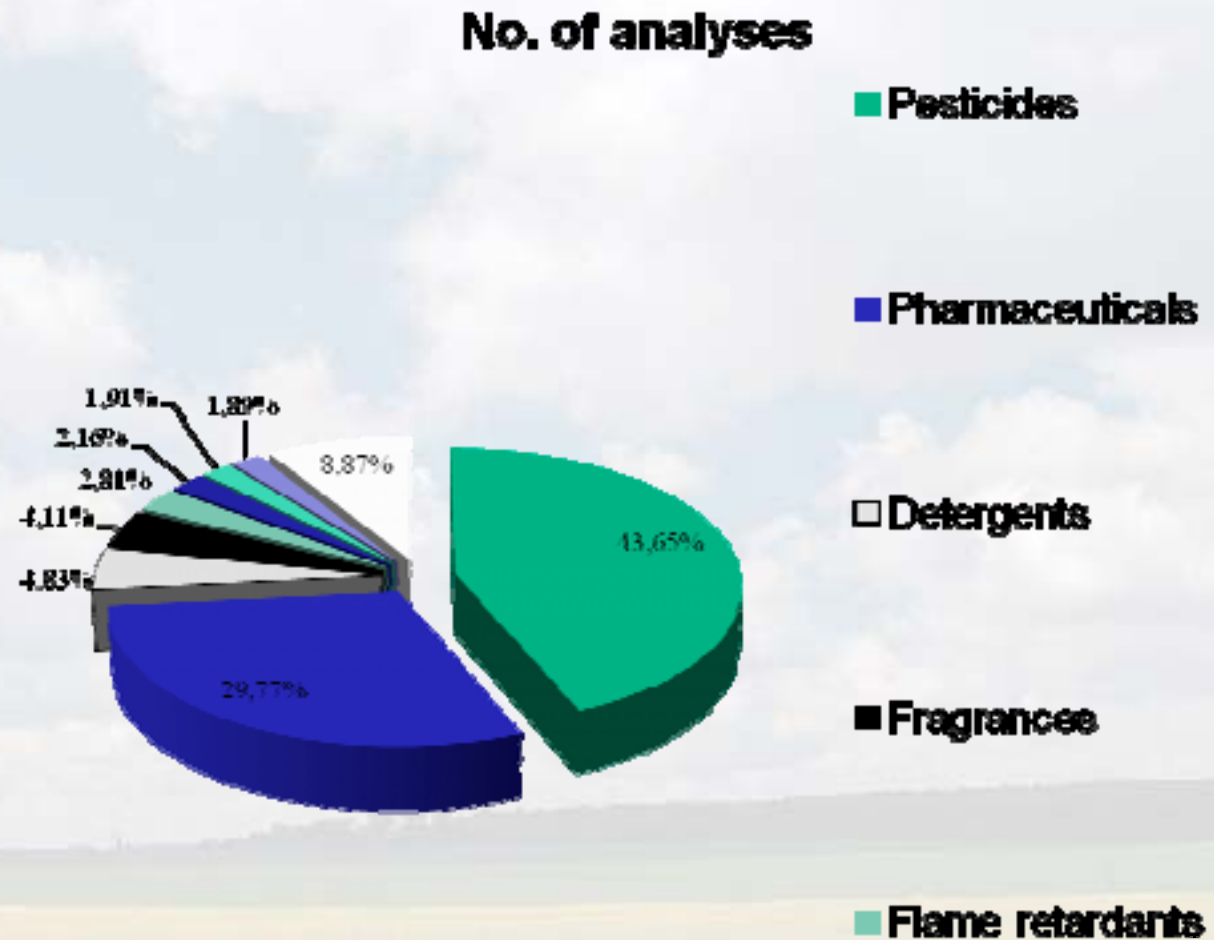
# EMPODAT



Total number of  
substances: 260

# EMPODAT

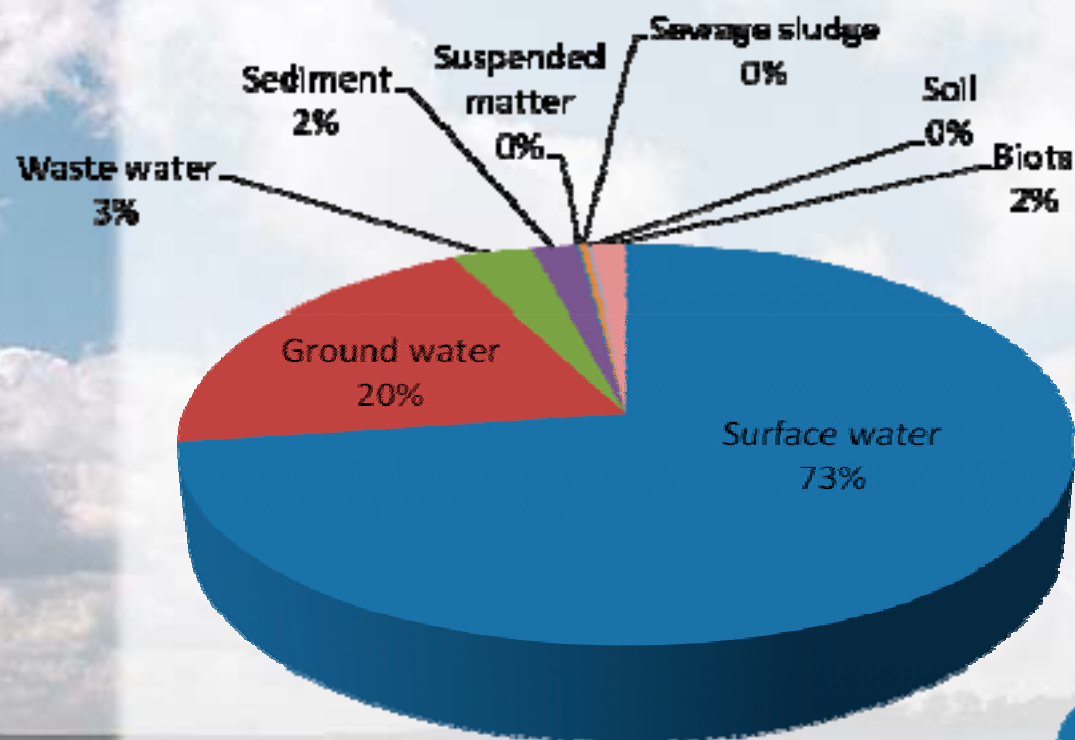
- Most data available: pesticides and pharmaceuticals



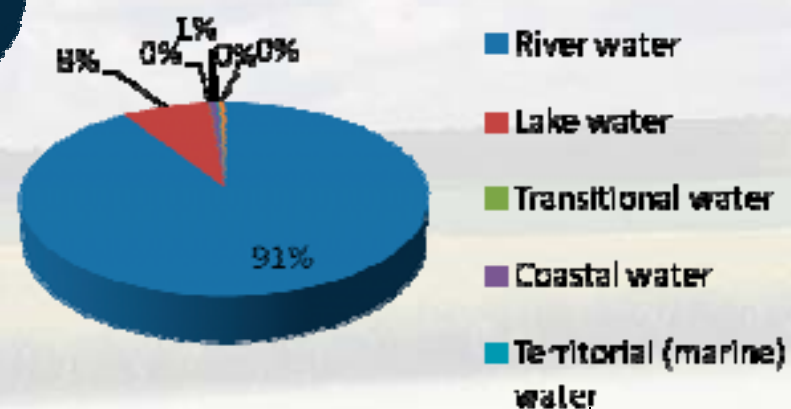


# EMPODAT

## Distribution of data by ecosystem/matrix



## Distribution of surface water data



# EMPODAT – Data scoring

Norman - Windows Internet Explorer  
http://www.ei.sk/norman/empodat/search.php

Norton Phishing Protection on Identity Safe Log-ins

## QA/QC information about chemical data

Limit of Detection (LoD): <

Limit of Quantification (LoQ): <

Analytical method/Detection: HPLC-MS or MS/MS GC-MS or MS/MS HPLC-UV

Analytical method/Detection: (other) GC-AED (atomic emission detection)

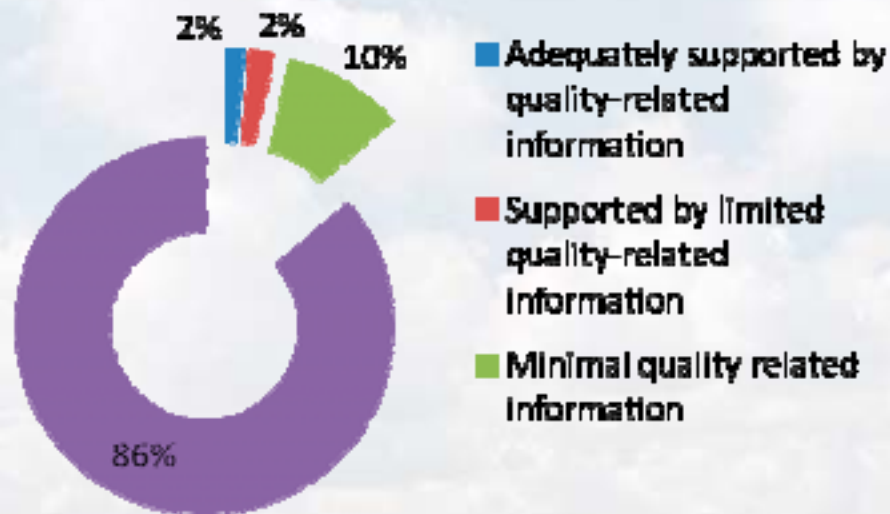
Show only data in the following category ([Instructions](#)):

- Adequately supported by quality-related information
- Supported by limited quality-related information
- Minimal quality-related information
- Not supported by quality-related information

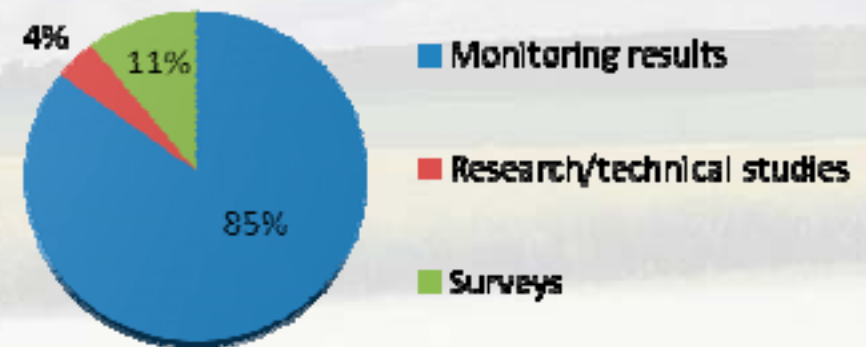
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# EMPODAT

**QA/QC category of data**



**Origin of data**



## Some considerations about available data on emerging contaminants

- Accessibility to data from research (as raw data) project still difficult (even after publication)
- Critical mass of data: very important for prioritisation
- We are going to produce a report assessing the content of the EMPODAT database - monitoring data for emerging substances
- Identification of the weaknesses, areas where to focus the efforts



# Proposals for improvement

- At the level of EU Commission - DG ENV and DG RTD
  - Mandatory uploading of data in NORMAN databases after completion of EU-funded projects (and data publication)
- At the MS level :
  - Results from nationally-funded projects, investigative campaigns: communication to NORMAN via Contact Points
- Harmonisation of reporting format with EEA databases / WISE / NORMAN - common format (metadata) to improve data collection / reporting



# Passive sampling –

## NORMAN Expert Group and Europe-wide harmonisation

- An innovative monitoring tool for the time-integrated measurement of bioavailable contaminants in water and sediment
- **Activities of NORMAN**
  - An expert group meeting in 2009
  - A position paper “*Passive sampling of emerging pollutants in the aquatic environment: state of the art and perspectives*” soon to be published
  - An interlaboratory calibration study under preparation for 2011
    - **present variability in data** by comparing results from various passive samplers sent by participating laboratories exposed to water at a single (reference) site
    - Target substances: polar pesticides, pharmaceuticals, biocides, steroid hormones, brominated flame retardants
    - will be open to participants from commercial, academic and regulatory laboratories



# **Forthcoming NORMAN workshop:**

## **Engineered Nanoparticles in the Environment**

### ***Analysis, Occurrence and Impacts***

**19 - 20 October 2010**

**German Federal Institute of Hydrology (BfG)  
Koblenz, Germany**