

# Micro-pollutants in Water and Aquatic Environments in France: State of Play

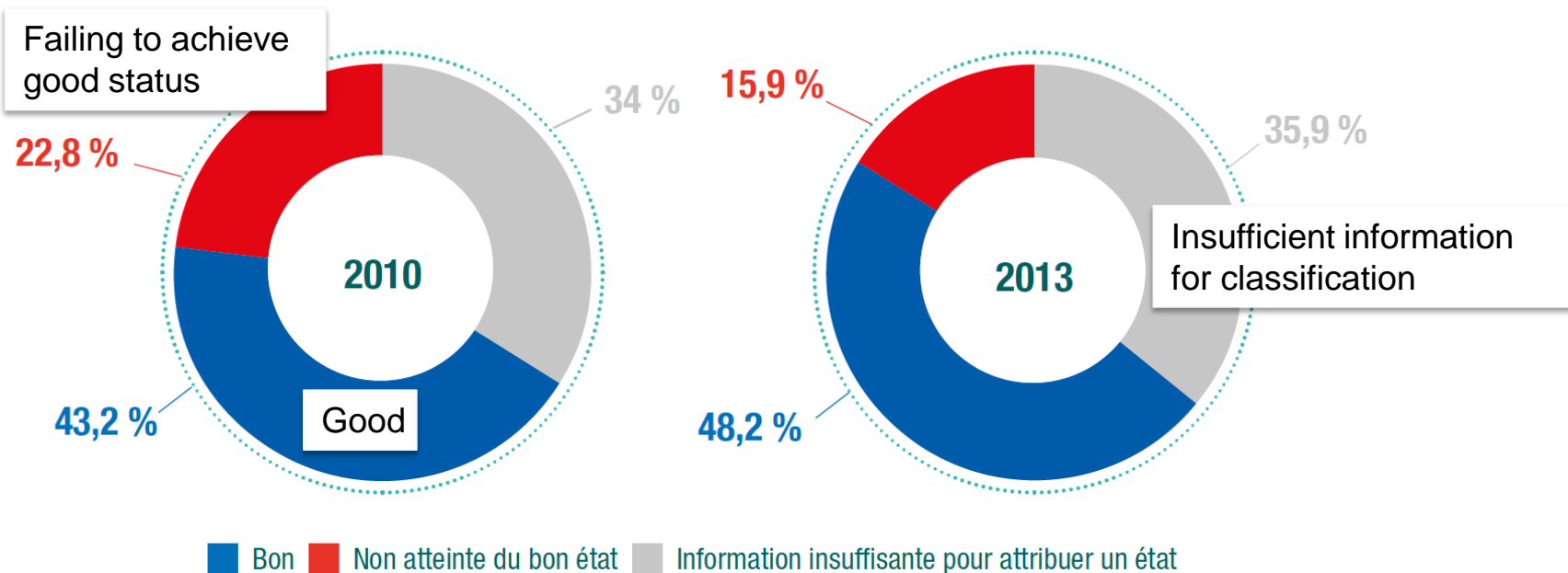
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Breakfast Meeting « Micropollutants in Water »  
*European Parliament, Strasbourg – 28 October 2015*

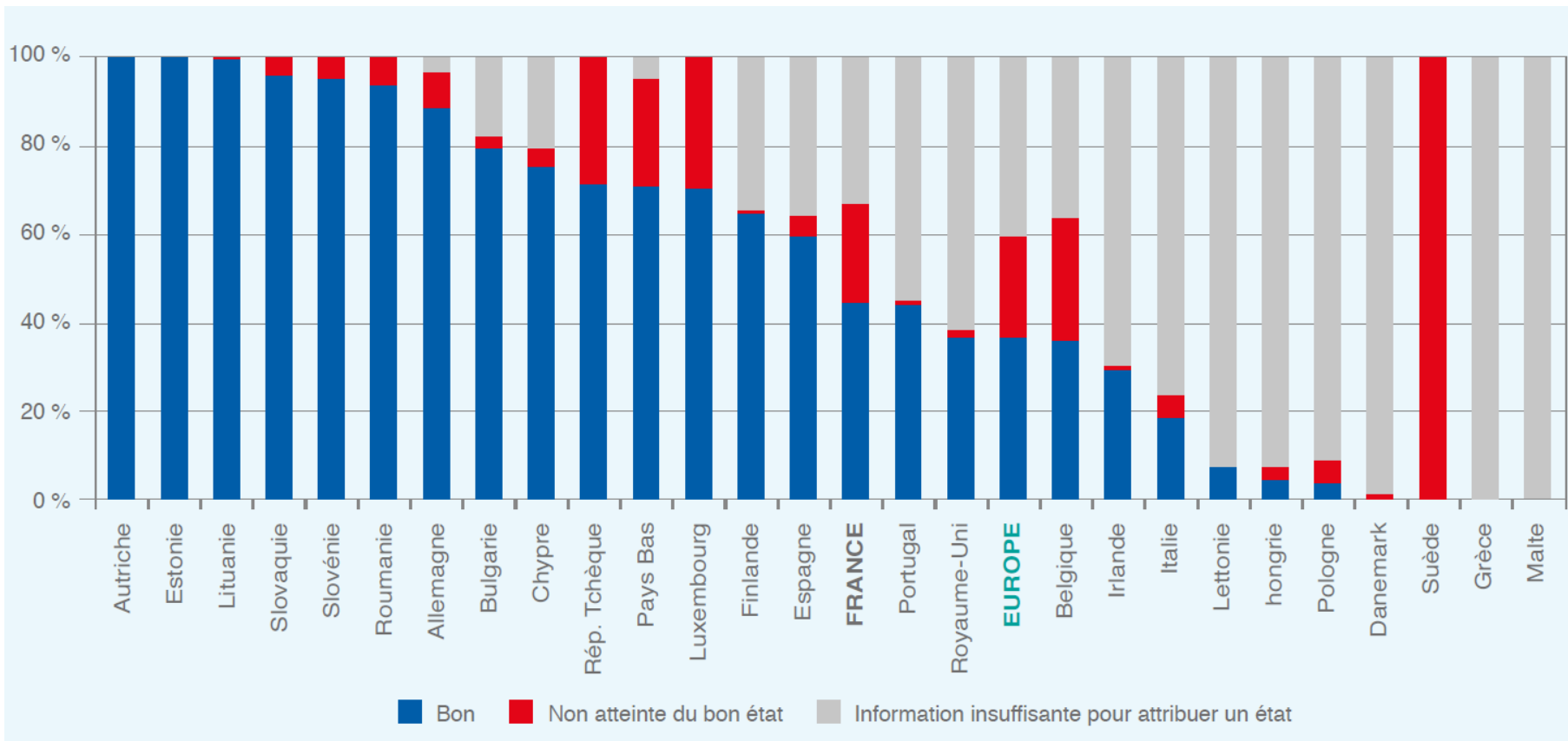
# The « Big Picture »: Chemical status of surface water bodies under the WFD



- 41 priority substances / priority hazardous substances routinely measured in surveillance monitoring networks (more than 2 000 sites)
- **Metals, pesticides and PAHs** are the parameters for which EQSs are the most frequently exceeded
- Chemical status is unknown for a large proportion of sites partly due to poor analytical performance

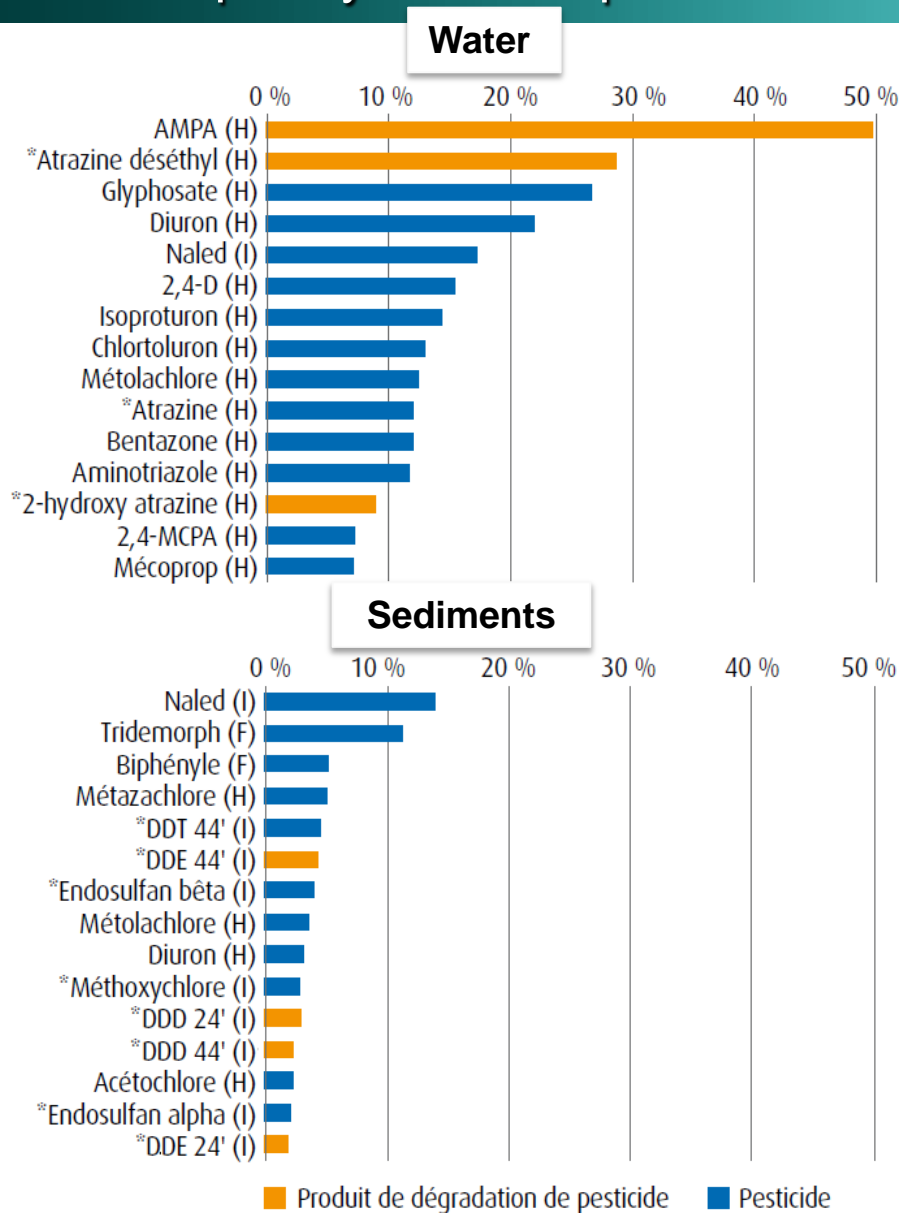
**Source:** *Synthèses EauFrance (2015). L'état des eaux de surface et des eaux souterraines*

# The « Big Picture »: How do we compare to other Member States?



**Source:** Synthèses EauFrance (2015). *L'état des eaux de surface et des eaux souterraines*

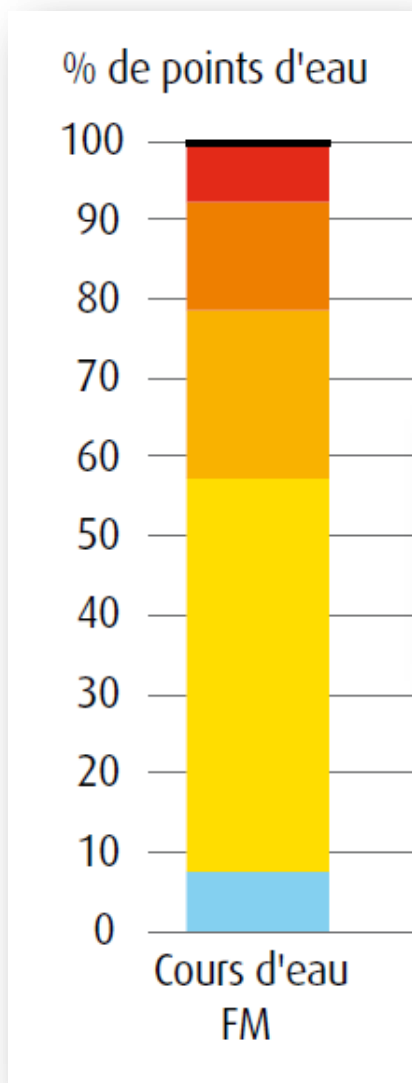
# The « Big Picture »: Most frequently detected pesticides in French rivers



- 92% of sites with at least one pesticide detected
- **In water** the 15 most quantified PPPs are (mostly) herbicides; **in sediments** pesticides that are the most detected are insecticides
- 3 out of the top 15 pesticides (or degradation products) found in water were already banned by 2007 (8 out of 15 in sediments)

**Source:** CGDD (2011). *Bilan de la présence des micropolluants dans les milieux aquatiques continentaux – période 2007-2009*

# Pesticides (and other micro-pollutants) occur in the aquatic environment as mixtures



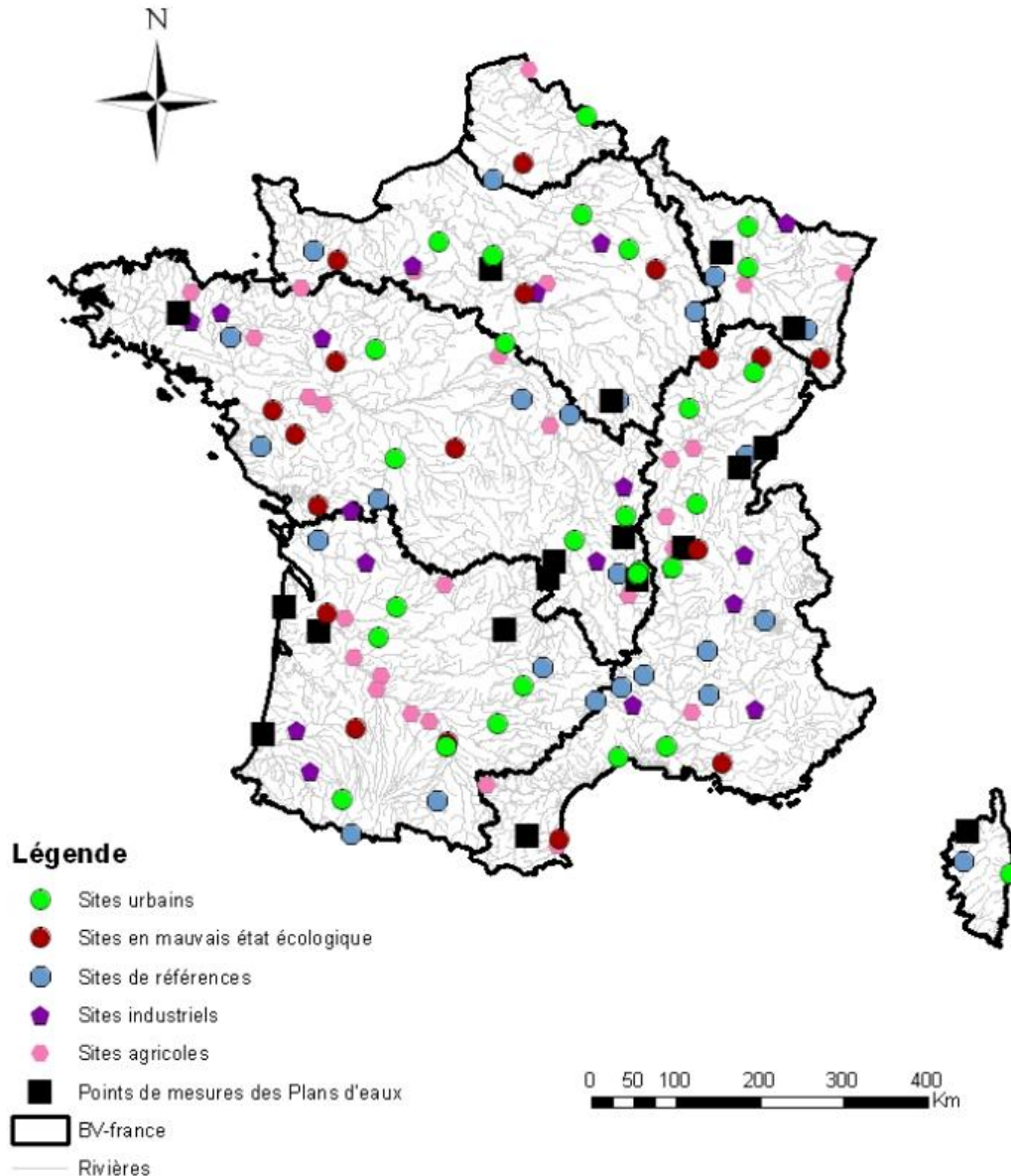
## Percentage of monitoring sites Freshwaters (running waters)

- 41 pesticides et plus
- de 21 à 40 pesticides
- de 11 à 20 pesticides
- de 6 à 10 pesticides
- de 1 à 5 pesticides
- aucune quantification

**Source:** CGDD (2011). *Bilan de la présence des micropolluants dans les milieux aquatiques continentaux – période 2007-2009*

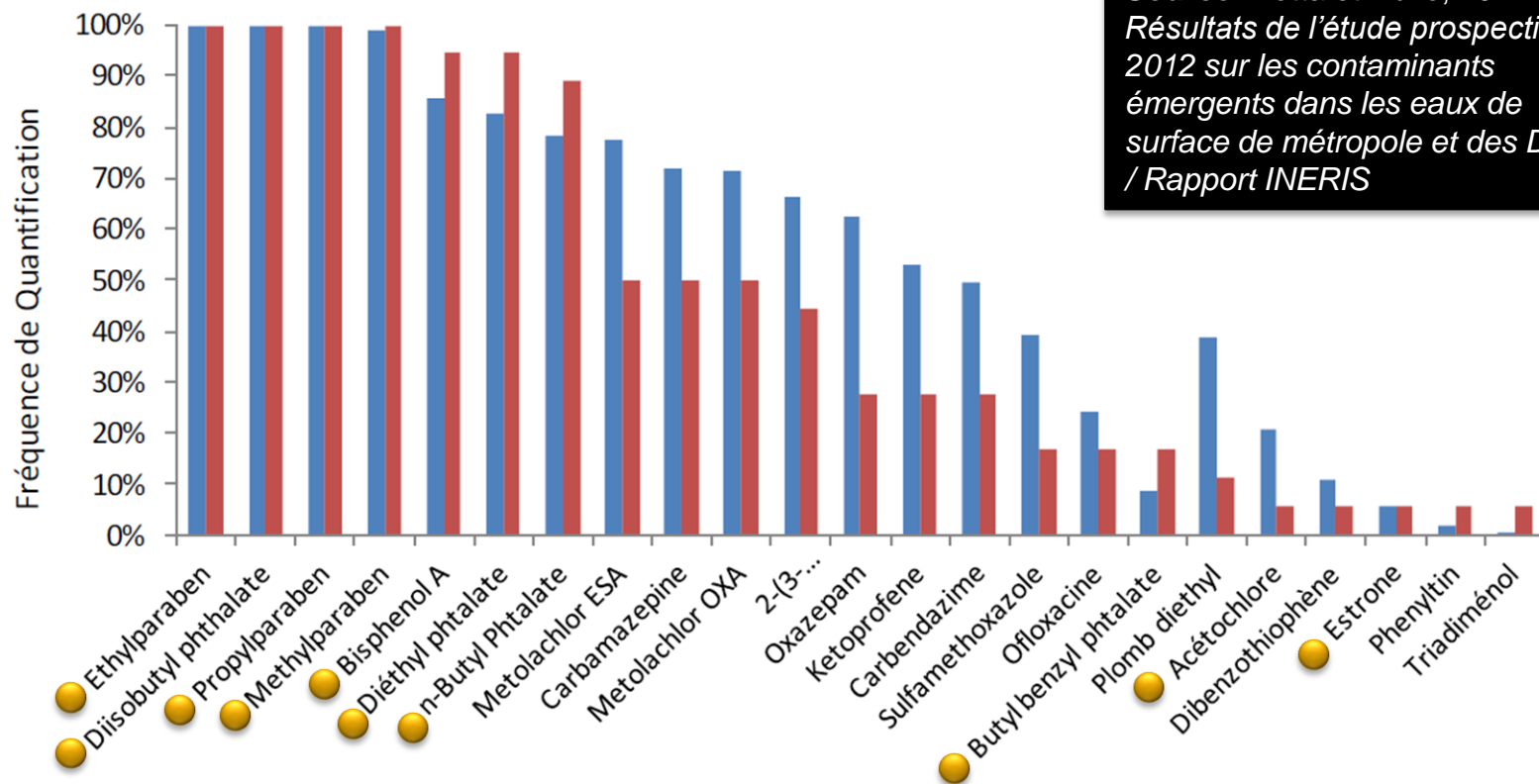
# What about contaminants of emerging concern?

## Nationwide survey for the detection of non-regulated chemical substances



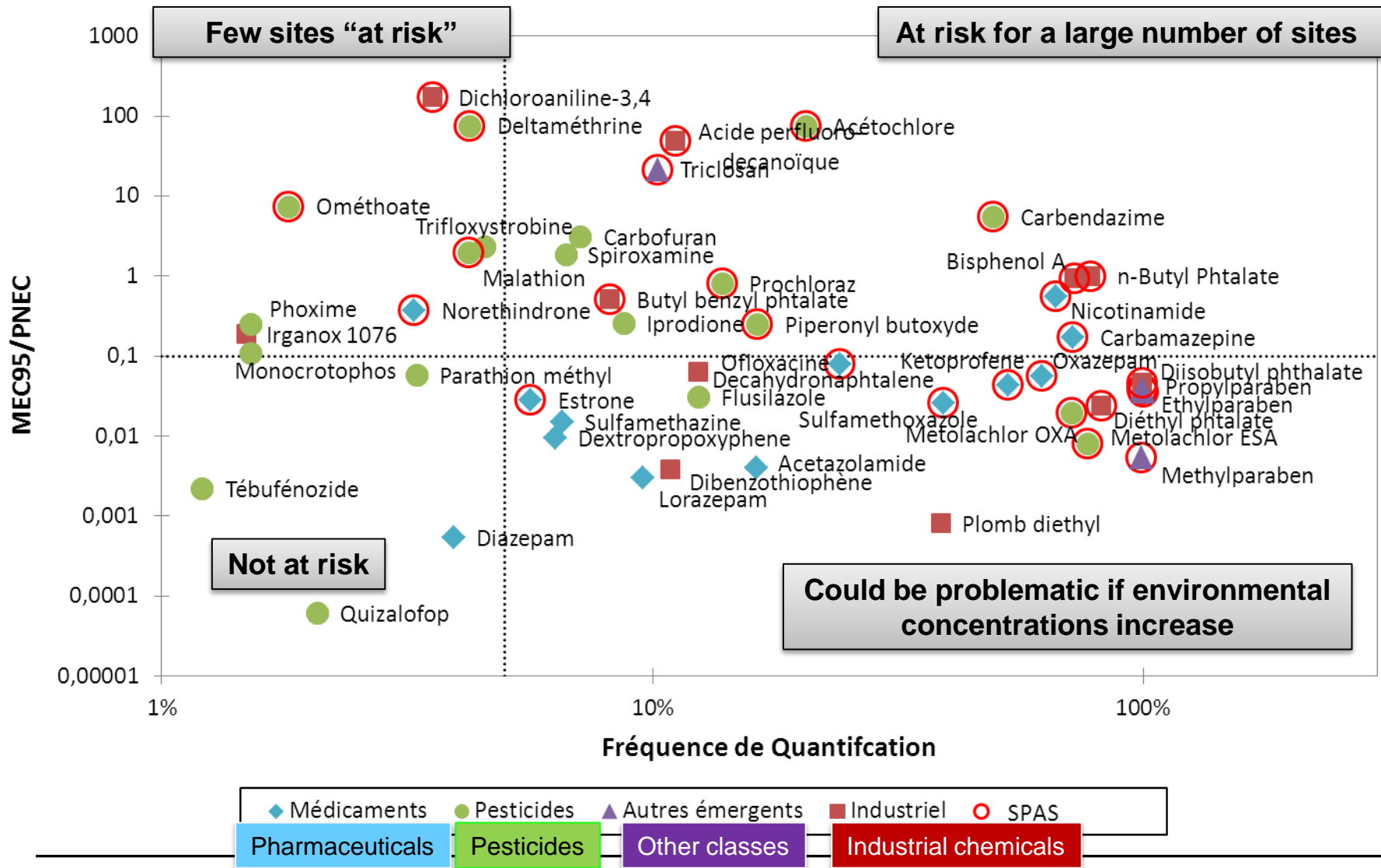
- ▶ 115 river sites, 18 lacustrine sites with contrasting pressures (both in type - **industrial, agricultural, urban** - and intensity)
  - 350 discrete (spot) water samples collected on 3 sampling occasions (spring, summer, fall)
  - 130 surficial sediment samples collected on one occasion (fall)
  - water samples filtered on a 0.7  $\mu\text{m}$  pore-size membrane
  - **100** chemical substances systematically analysed in water samples, **134** in sediments

# Focus on emerging compounds that are most frequently encountered in freshwaters



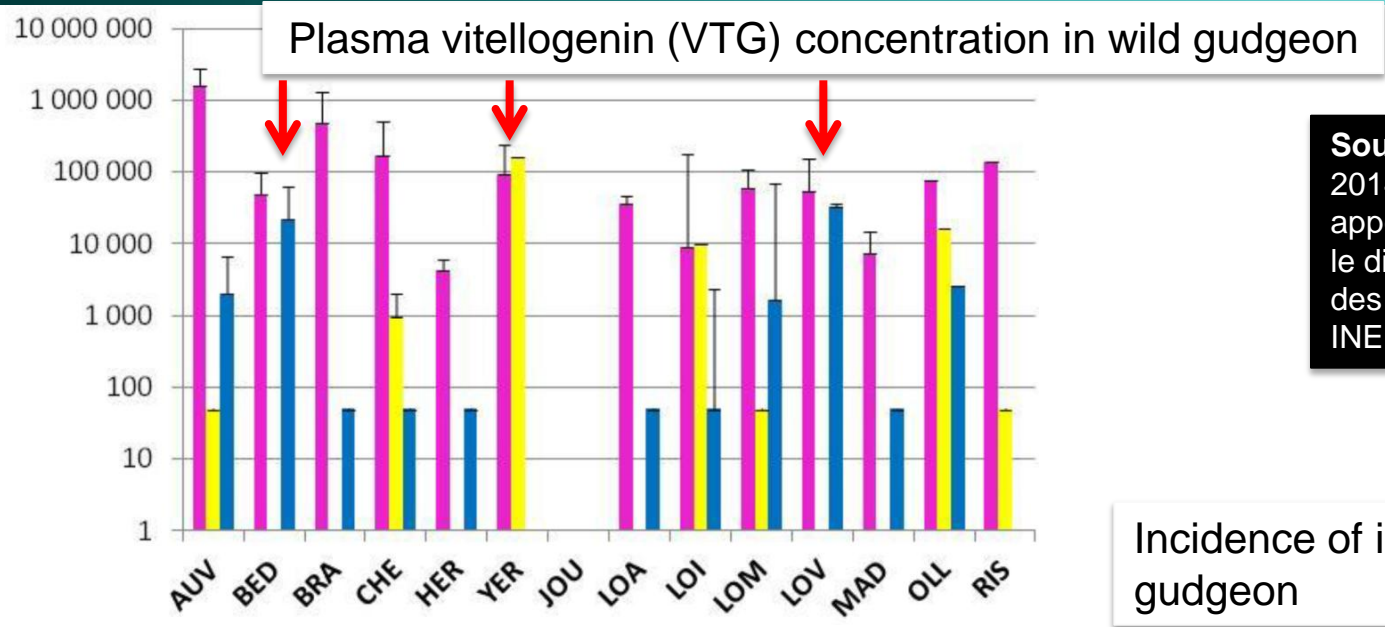
**Widespread contamination with know or suspected endocrine disrupting chemicals (EDCs)**

# Are some emerging compounds more problematic than others?



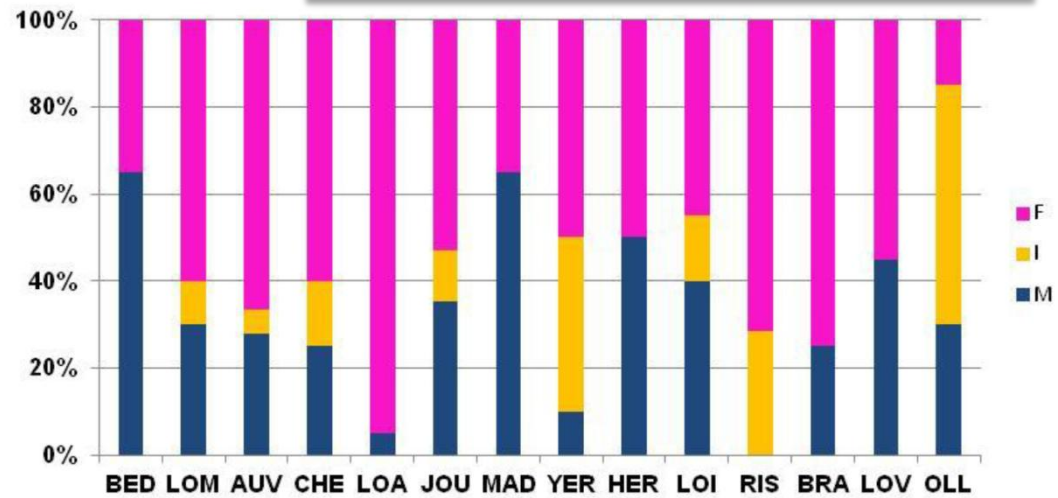
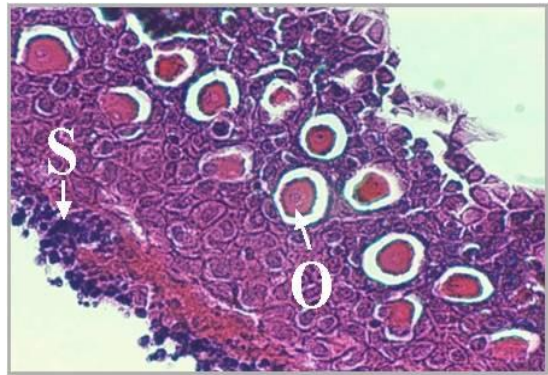


# Some evidence of negative impacts on wildlife

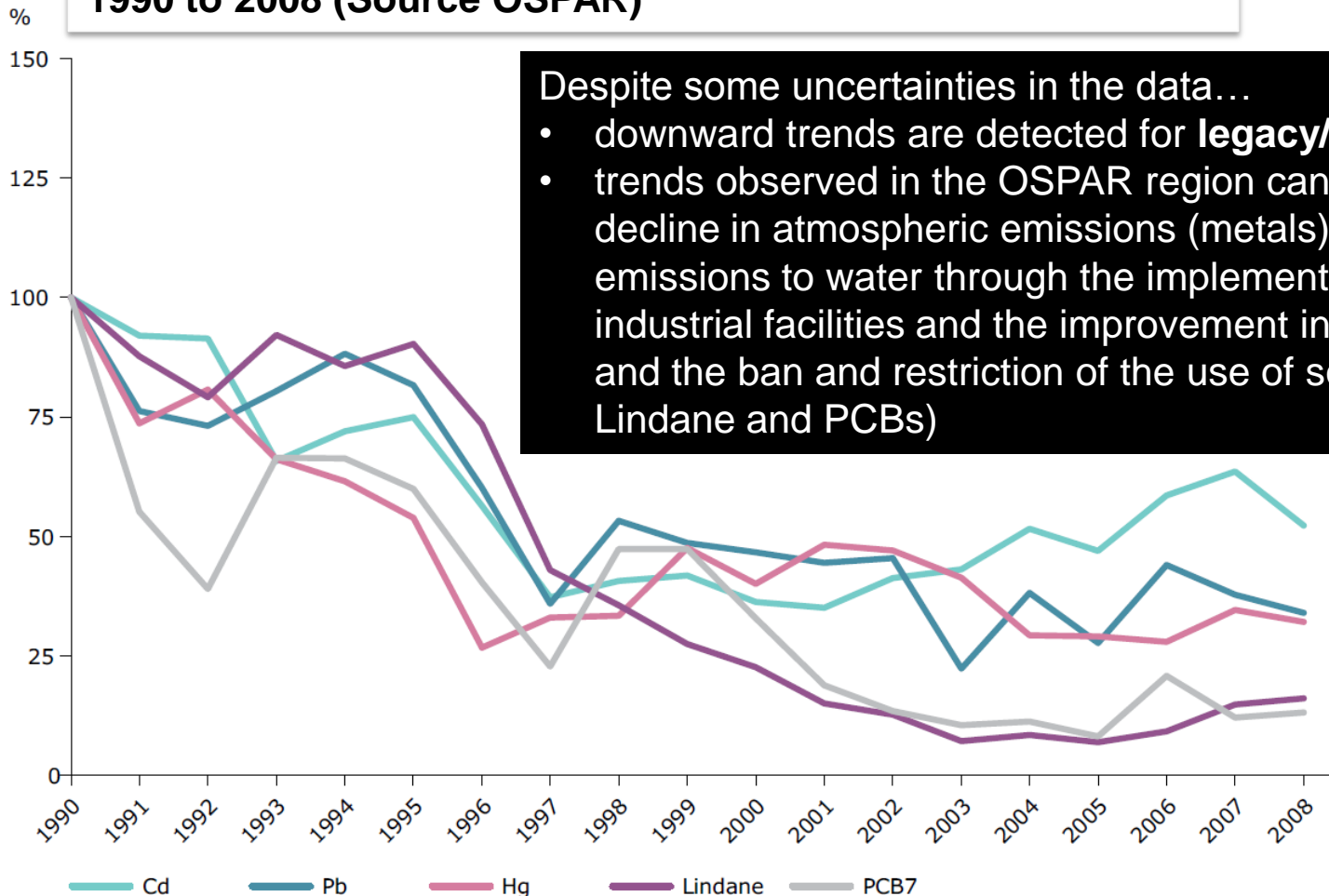


**Source:** Aït-Aïssa, Brion *et al.*, 2014. Etude prospective 2012: apport des outils biologiques pour le diagnostic de la contamination des milieux aquatiques / Rapport INERIS

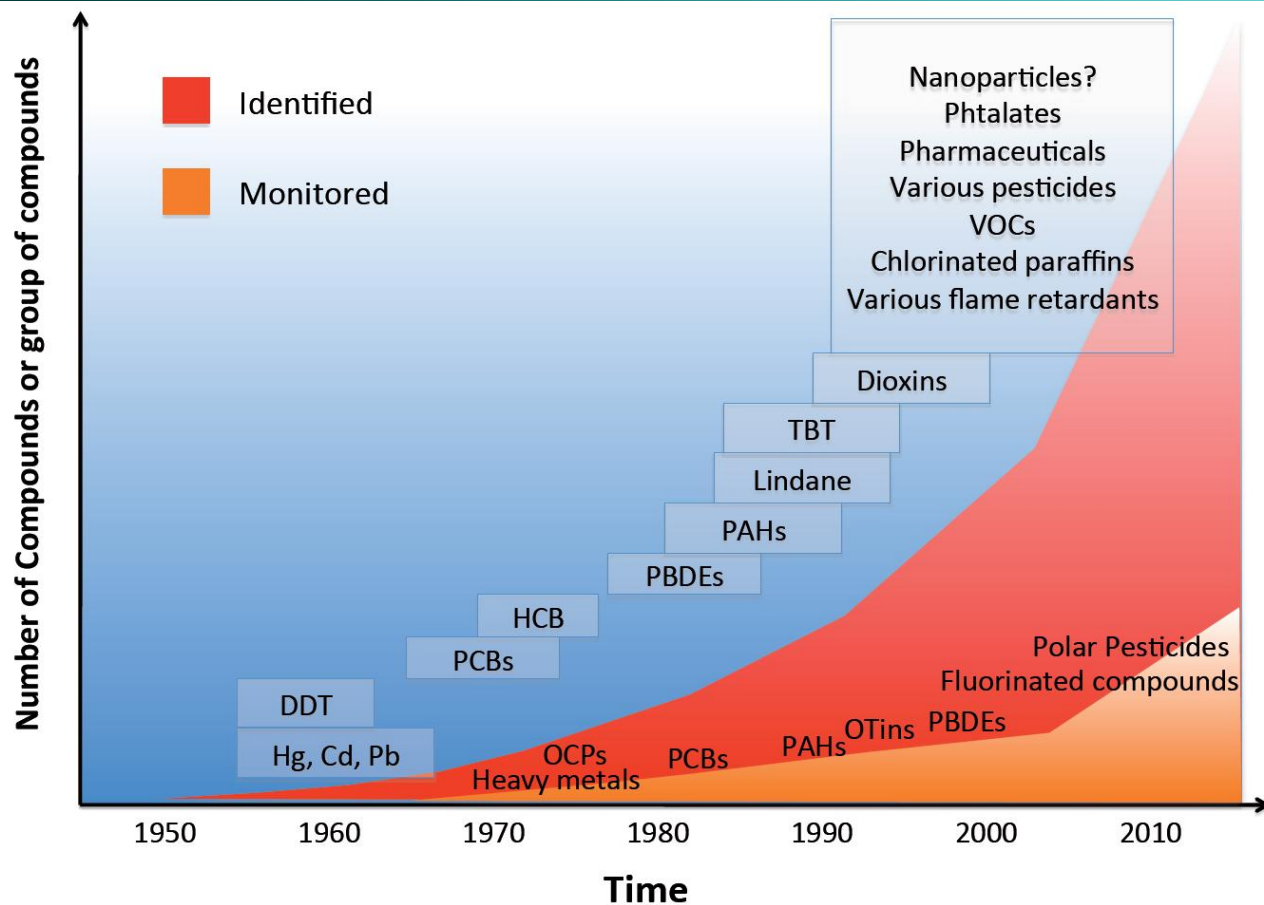
Incidence of intersexuality in wild gudgeon



## Inputs of hazardous substances via riverine loads and direct discharges into the North-Atlantic during the period 1990 to 2008 (Source OSPAR)



# Look at the problem from another perspective




- We are currently monitoring only a limited number of chemical substances through media-oriented regulations (WFD, MSFD, regional sea conventions)
- With the improvement of chemical analytical methods we are now capable of detecting a vast array of pollutants at very low concentrations (in the ng/L concentration range)

<sup>(6)</sup> Roose P., Albaigés J., Bebianno M.J., Camphuysen C., Cronin M., de Leeuw J., Gabrielsen G., Hutchinson T., Hylland K., Jansson B., Jenssen B.M., Schulz-Bull D., Szefer P., Webster L., Bakke T., Janssen C. (2011). Chemical Pollution in Europe's Seas: Programmes, Practices and Priorities for Research, Marine Board Position Paper 16. Calewaert, J.B. and McDonough N. (Eds.). Marine Board-ESF, Ostend, Belgium.

# Criticisms of current approaches to water-quality evaluation

- ▶ Evaluations based on “regulatory lists” with a limited number of chemicals (vs the capacity of the industry to develop substitutes for banned chemicals)
  - pace of assessment of toxic substances on the Priority Substances List will have to speed up (see the Watch-List mechanism)
- ▶ Characterisation of exposure is hindered by the lack of good quality data. Representativeness of discrete (spot) sampling is questionable
- ▶ Chemical risk assessment is based on individual chemicals but chemicals typically occur in the (aquatic) environment as complex mixtures (parent molecules and degradation products)
  - need to account for the combination effects of chemical mixtures (especially for EDCs)
- ▶ The case for Effect-Based Monitoring Tools (EBMT)?



CONSEIL DE  
L'UNION EUROPÉENNE

Bruxelles, le 23 décembre 2009 (05.01)  
(OR. en)

17820/09

ENV 921  
CHIMIE 103  
COMPET 530  
SAN 376

**NOTE D'INFORMATION**

du: Secrétariat général  
aux: délégations

Objet: **Effets de la combinaison de produits chimiques**  
- Conclusions du Conseil

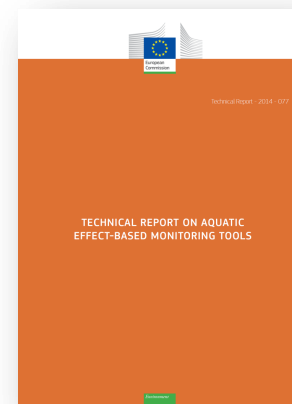
Les délégations trouveront en annexe à la présente note les conclusions visées en objet, qui ont été adoptées par le Conseil (Environnement) le 22 décembre 2009.

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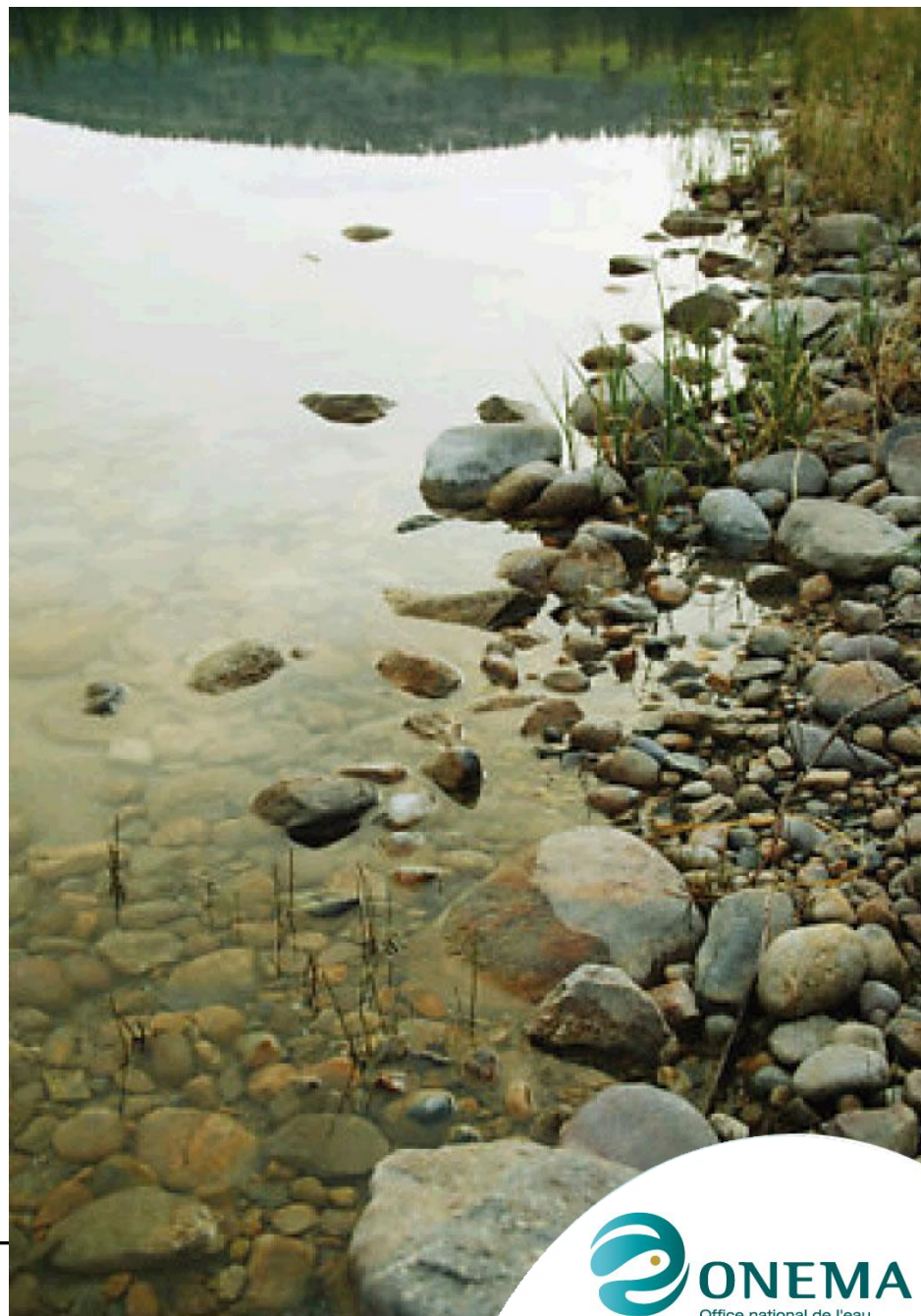
# A National plan to take action against the contamination of aquatic environments with micro-pollutants

- ▶ the French Ministry in charge of Ecology will launch by the end of 2015 a second action plan on micro-pollutants **to preserve the quality of water and aquatic ecosystems and to protect and conserve biodiversity**
  - incorporated within the framework of PNSE3, complementary to the ECOPHYTO plan for the reduction of the use of pesticides
  - overarching other “sectoral” plans (PCBs and Pharmaceutical residues in water)
  - more oriented towards preventive strategies rather than end-of-pipe solutions
- ▶ **1<sup>st</sup> objective:** “*reduce now the emissions of (well-)known micro-pollutants*” by
  - limiting the release of pollutants into the aquatic environment
  - educating stakeholders as well as the general public
- ▶ **2<sup>nd</sup> objective:** “*strengthen knowledge and improve understanding to respond to the challenge of micro-pollutants in aquatic ecosystems*” by
  - increasing knowledge on sources of emissions and predict the occurrence of micro-pollutants in receiving waters
  - better evaluate their impacts on the quality of water resources and their effects on biodiversity
- ▶ **3<sup>rd</sup> objective:** “*Identify and prioritise pollutants for which action is needed*”



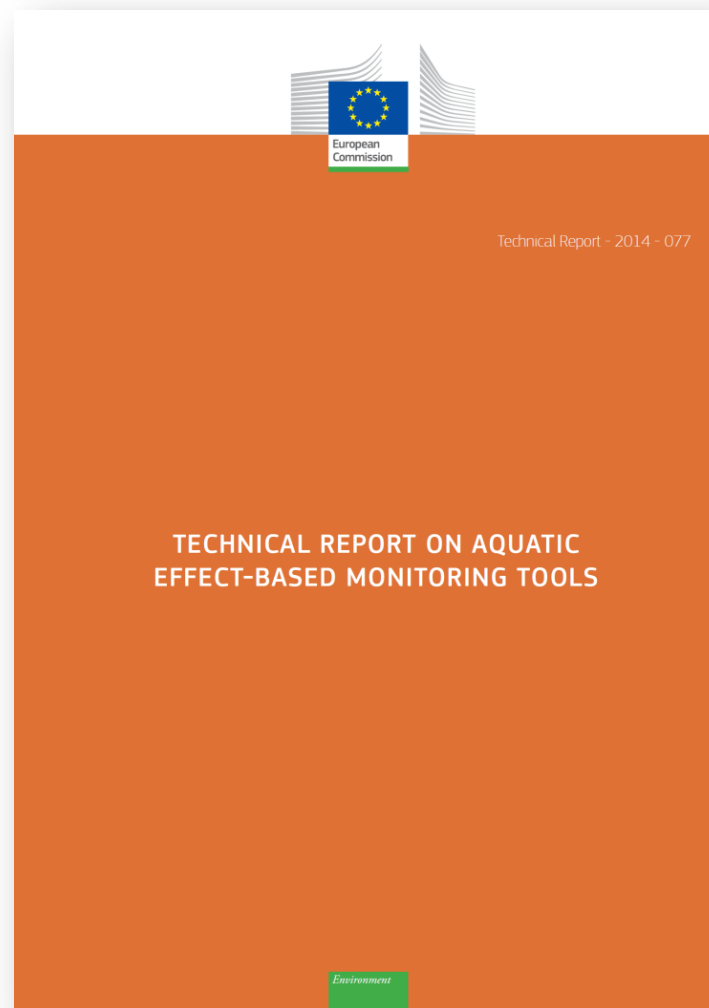
Thank you for  
your attention

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# A new paradigm to evaluate and monitor the quality of effluent discharges & aquatic environments

- ▶ In the context of the implementation of the WFD, **biomarkers** and **bioassays** (*in vitro* and *in vivo*) could be used
  - as screening tools, as part of the pressures and impacts assessment to help water managers to prioritise water bodies for further investigations
  - to establish early warning systems
  - to take into account the effects from mixtures of pollutants or chemicals that are not analysed in the first instance (e.g. to support investigative monitoring where causes of a decline of a species are unknown)
  - to provide additional support in water and sediment quality assessment



# Some recent data on WWTP

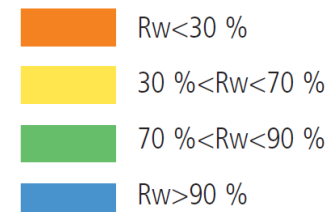
## What's the efficiency of different tertiary treatment processes in WWTP?

Granular activated carbon adsorption

O<sub>3</sub> alone

Advanced oxidation process (AOP)

Famille	Charbon actif en grain	Ozone	O <sub>3</sub> +H <sub>2</sub> O <sub>2</sub>
Beta Blockers	4	4	4
Antibiotics	1	5	4
Other pharmaceuticals	3	3	4
PAHs	6	7	8
Alkyphenols	4	6	4
Triazine herbicides and urea pesticides	2	2	2
pesticides (glyphosate, AMPA)	1	1	1
Metals	12	12	13



Additional abatement rate between secondary treatment outflows and tertiary treatment outflows

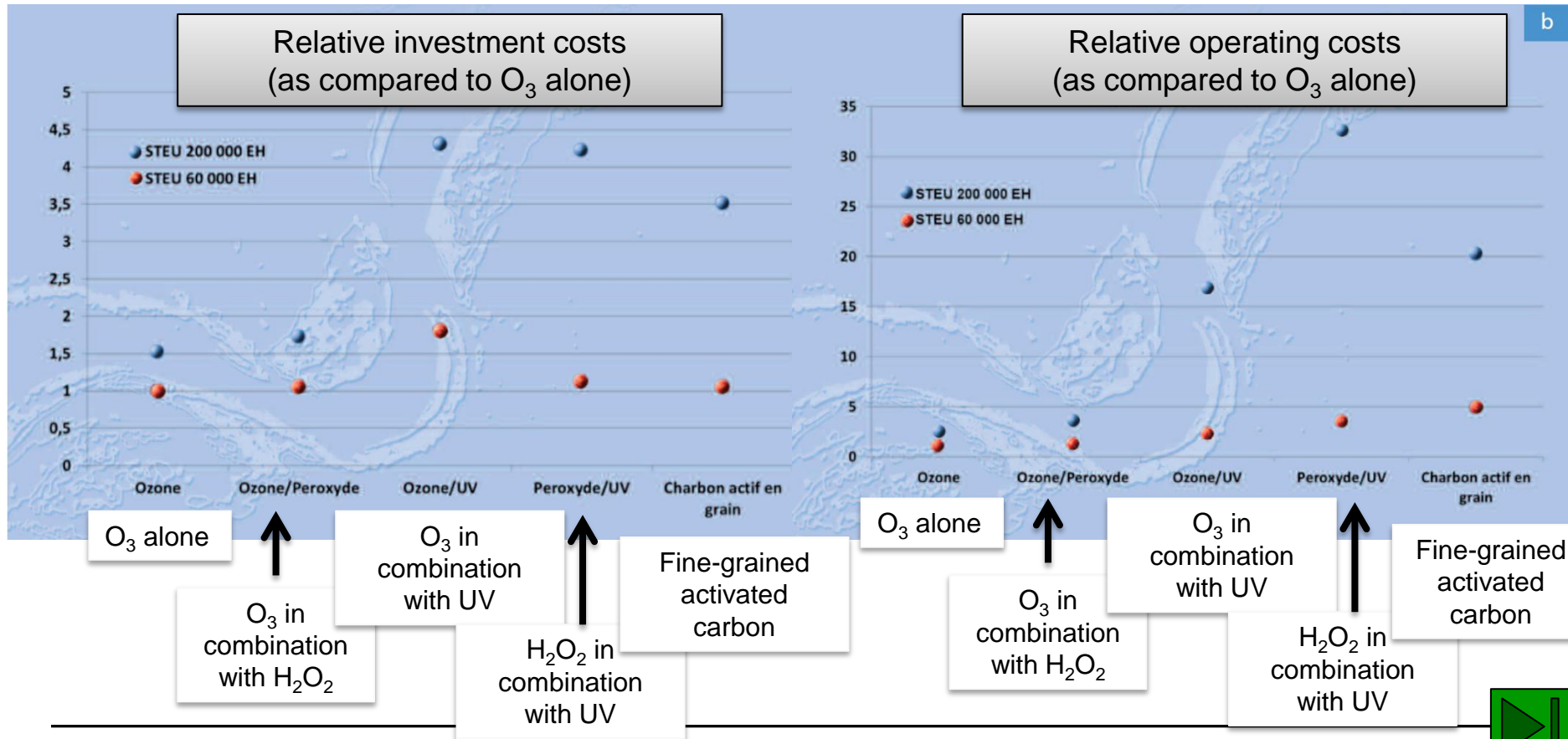
Source: Lacour and Lagarrigue (2014). *Quelle est l'efficacité d'élimination des micropolluants en station de traitement des eaux usées domestiques? Synthèse du projet de recherche ARMISTIQ. Comprendre Pour Agir, 12p.*



# Some recent data on WWTP

## Differences in investment and operating costs between treatments

Source: Lacour and Lagarrigue (2014). *Quelle est l'efficacité d'élimination des micropolluants en station de traitement des eaux usées domestiques? Synthèse du projet de recherche ARMISTIQ. Comprendre Pour Agir, 12p.*



# Some recent data on STP

What's left after tertiary treatment of municipal sewage effluents?

Source: Capdeville *et al.*  
 Platform presentation,  
 ECHIBIOTEB final restitution  
 workshop, Villeurbanne, 3  
 February 2015

32 water samples (filtered) / 6 STP

