



# Strategic approaches to pollution of water by pharmaceuticals from:



Comprendre le monde,  
construire l'avenir®

## France



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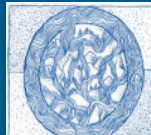
ACADÉMIE  
DES TECHNOLOGIES  
POUR UN PROGRÈS RAISONNÉ, CHOISI ET PARTAGÉ



Académie nationale de  
Médecine



Académie nationale  
de Pharmacie



Académie de l'Eau

# A large variety of hazards



Plasticizers

Radio-elements

Pharmaceuticals

Pesticides



Detergents  
Biocides

Low doses  
Wide variety  
Chronic exposure  
Mixtures  
Various effects  
...

Personal care



Metals



Solvents



Hydrocarbons

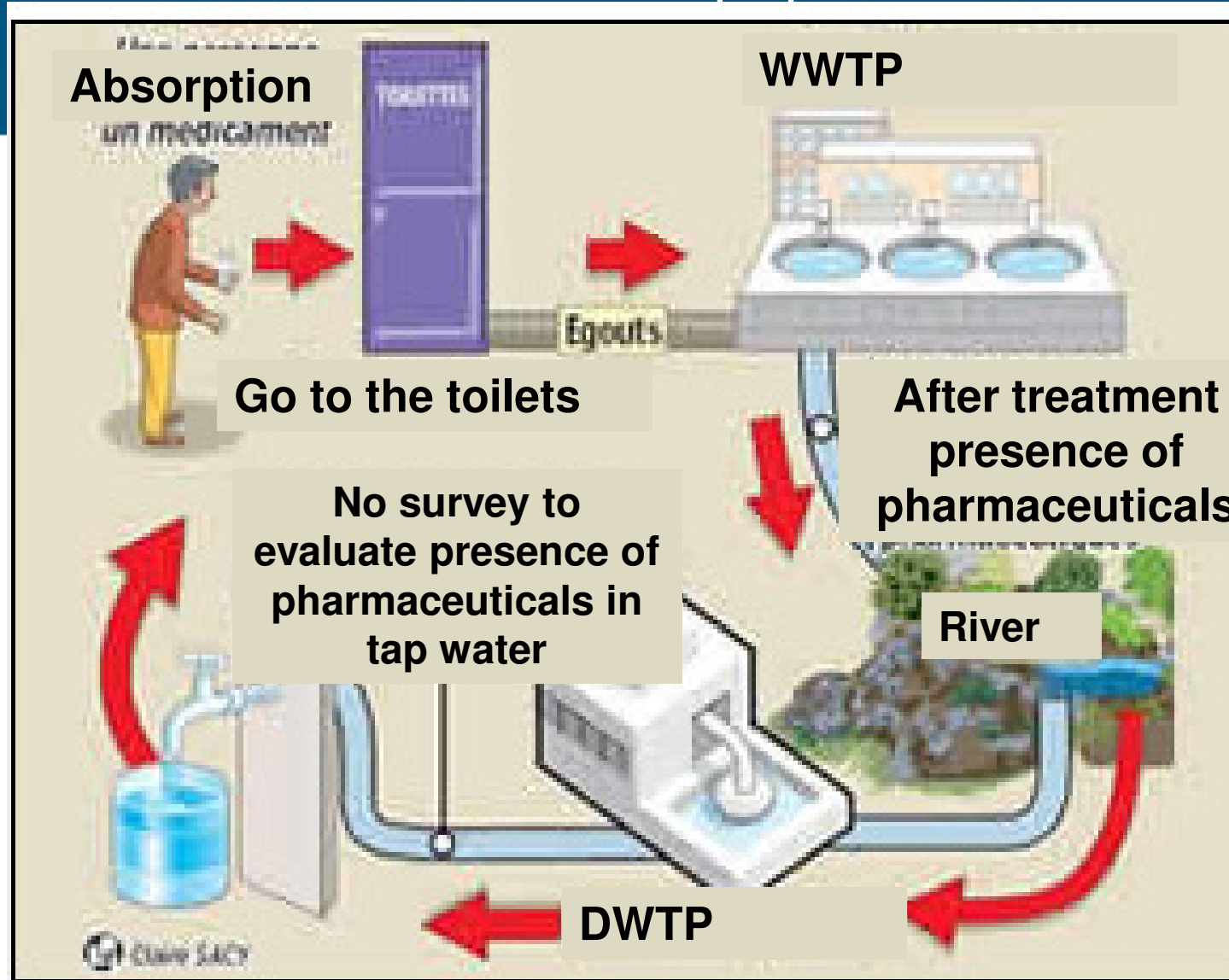
Nanoparticles



Disinfection by  
products



# Vision of a french newspaper

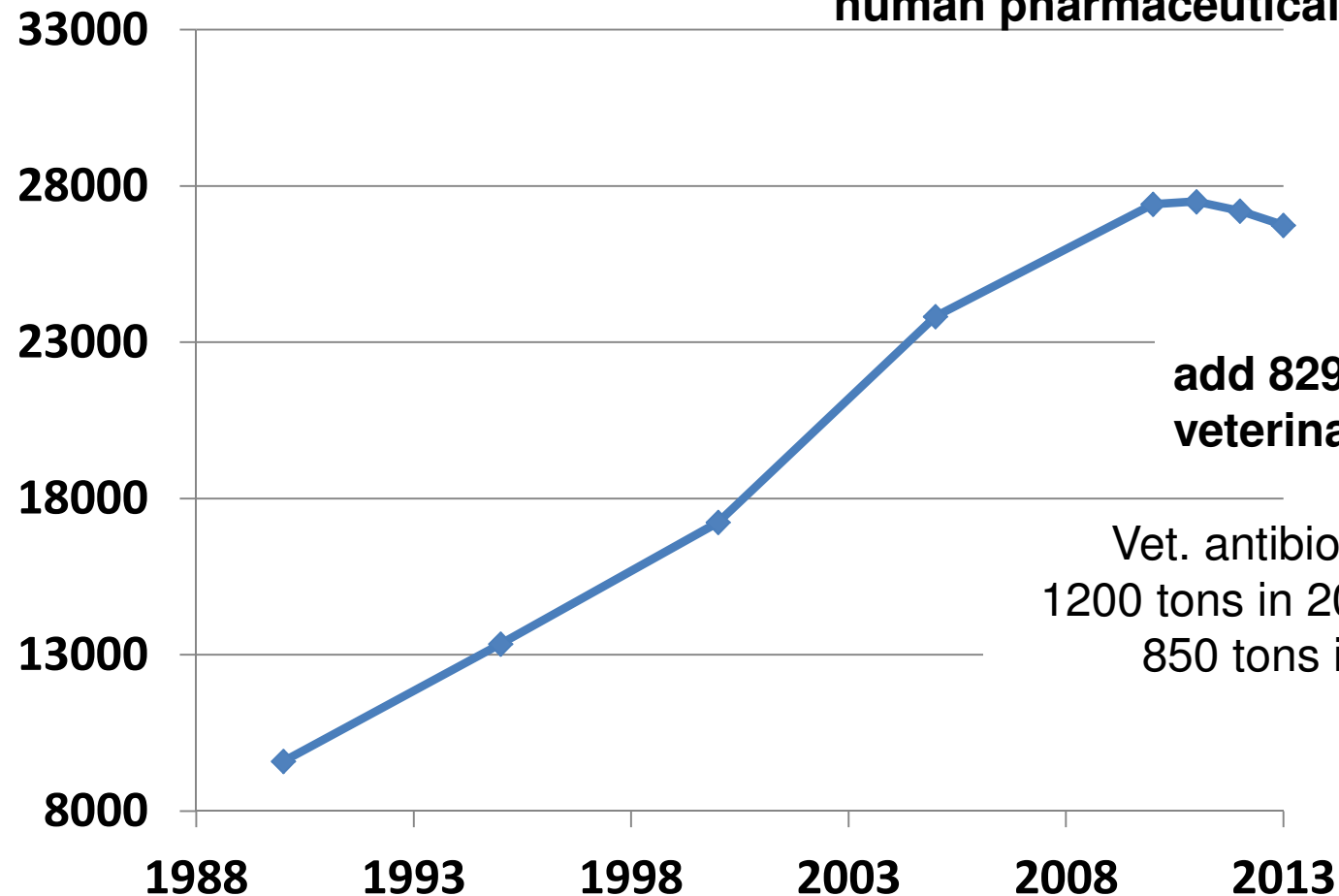


Topic frequently addressed by journalists (more than pesticides, lead or nitrates)  
« Emerging pollutants = pharmaceuticals = change of fish sex-ratio »

# Turnover of pharmaceuticals in France

Millions euros

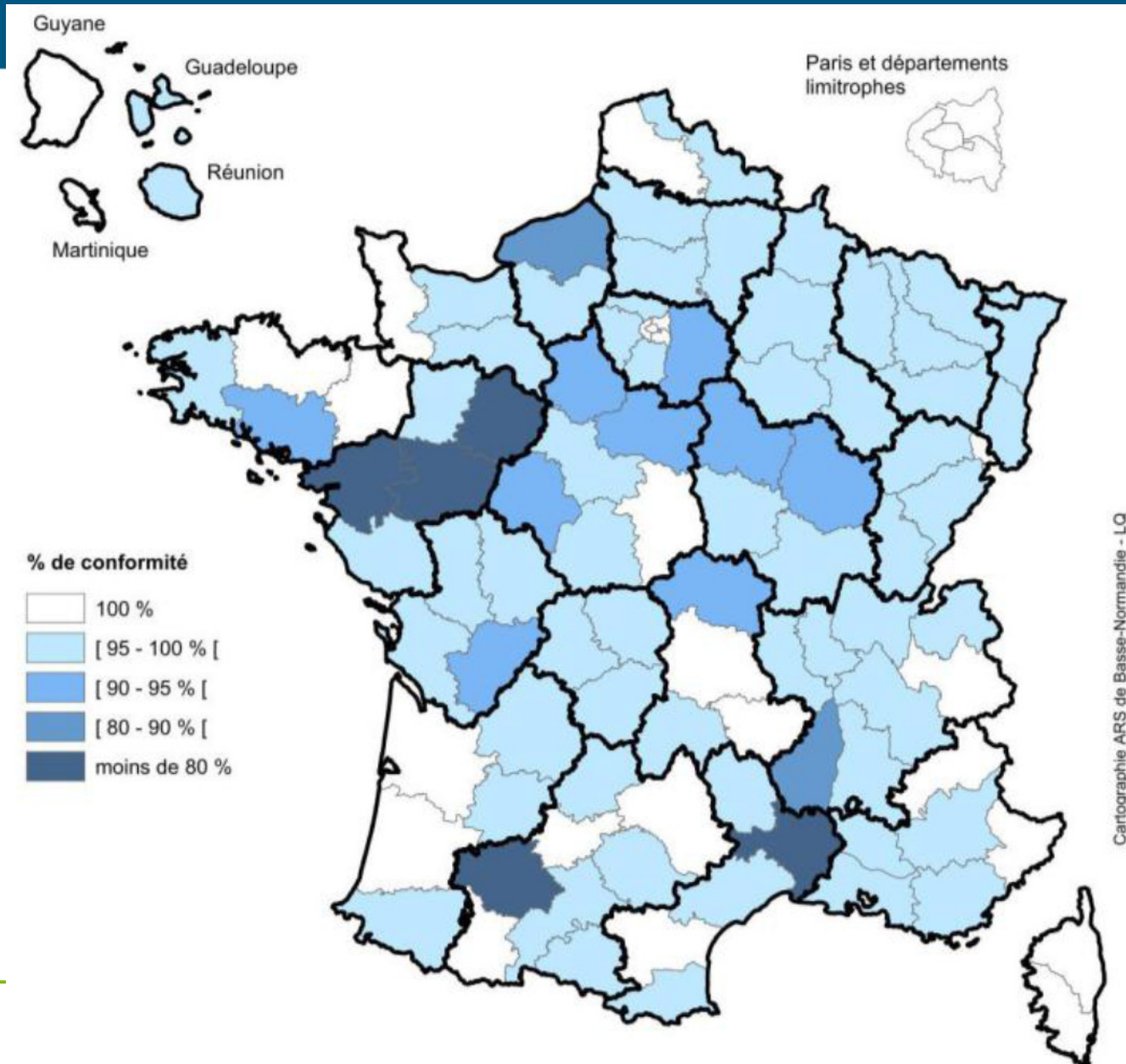
About 4,4 % of the world market of  
human pharmaceuticals



Data: LEEM

# Pesticides above limit in tap water

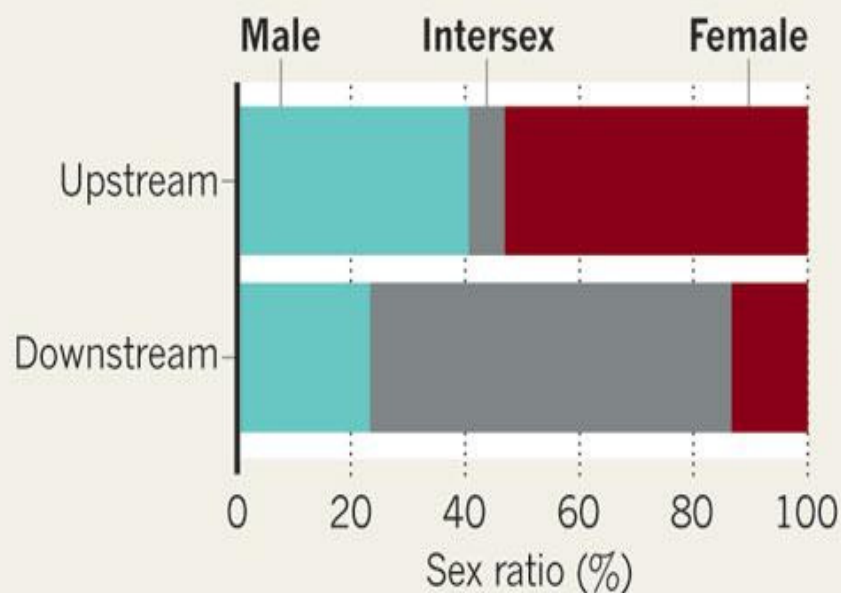
Level of  
accordance  
with  
standard  
limit for  
pesticides in  
drinking  
water



# A pharmaceutical factory discharge impact

## FISHY FIND

Fish downstream of a French pharmaceutical factory were much more likely to show characteristics of both sexes (intersex) than those upstream.



ELSEVIER

Environment International

Volume 37, Issue 8, November 2011, Pages 1342–1348



### Adverse effects in wild fish living downstream from pharmaceutical manufacture discharges

Wilfried Sanchez<sup>a</sup>, William Sremski<sup>b</sup>, Benjamin Piccini<sup>a</sup>, Olivier Palluel<sup>a</sup>, Emmanuelle Maillot-Maréchal<sup>a</sup>, Stéphane Betoulle<sup>c</sup>, Ali Jaffar<sup>f</sup>, Sélim Ait-Aissa<sup>a</sup>, François Brion<sup>a</sup>, Eric Thybaud<sup>d</sup>, Nathalie Hinfray<sup>a</sup>, Jean-Marc Porcher<sup>a</sup>

Improvements done for the WWTPs of this company

Nature 476, 265 (2011)

## 2007: national “Environment Round Table”



*le Grenelle  
Environnement*

Key points of government policy on ecological and sustainable development issues for the next five years.

5 colleges: the State, unions, employers, NGOs and local authorities.

### **-Restoring the environmental quality of water while ensuring it is renewable**

- **Prevention:** Eliminating or restricting as much as possible the use of [extremely] worrying **chemical pollutants**
- **Eliminating the most worrying pesticides:** Carcinogenic, Mutagenic and Toxic to reproduction cat. 1 and 2, Persistent Organic Pollutants (POP), Bioaccumulative and Toxic (PBT),

### **- Controlling the risks associated with **pharmaceutical residues****

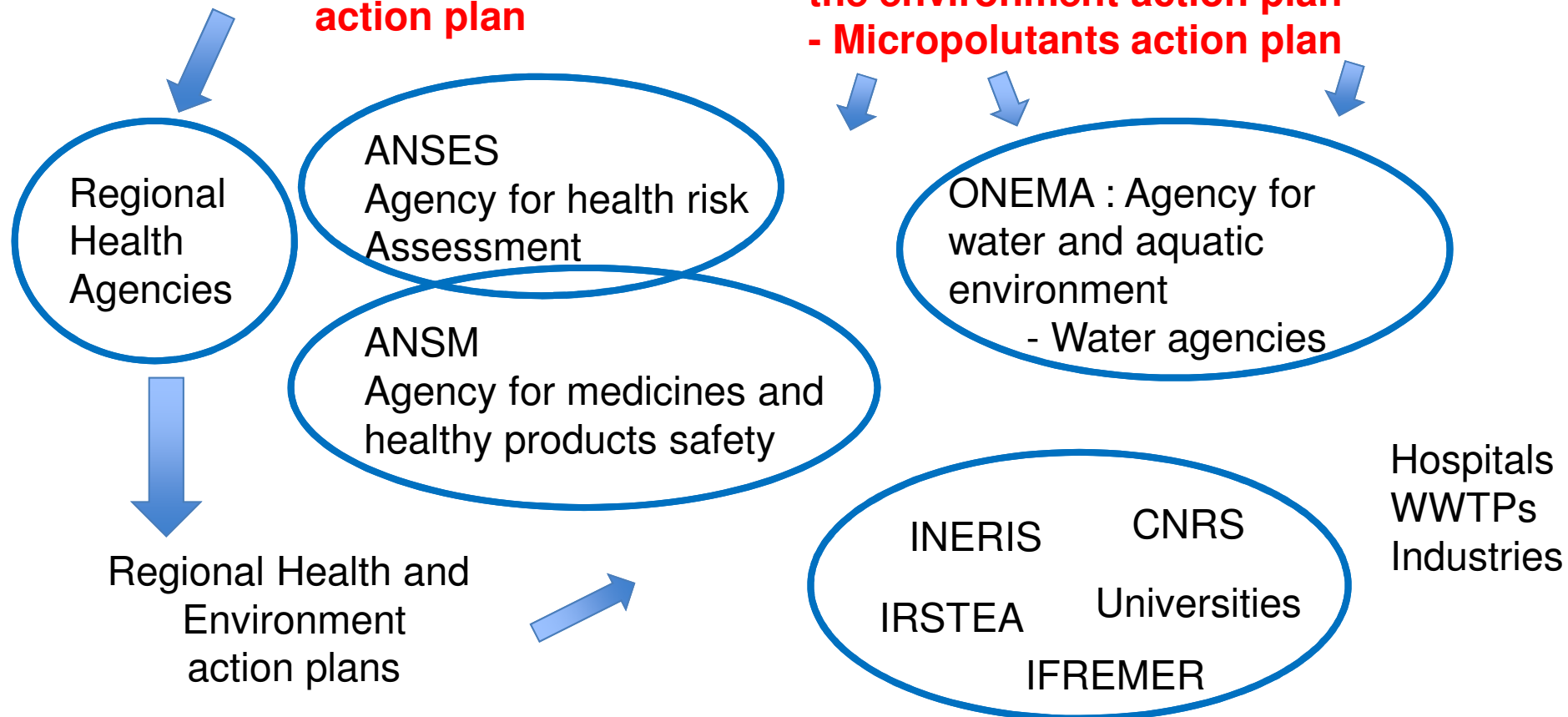
**“A program will be implemented and will improve knowledge in particular environments using sentinel species and develop prevention at several levels: consideration of the impact on the environment in human drug approvals, management of human waste and veterinarians wastes, from production plants and wastewater effluents....”**

Ministry of health

Ministry of environment

**Health and Environment  
action plan**

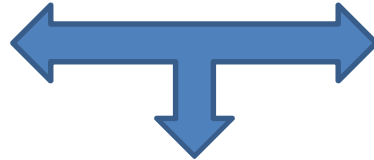
**- Pharmaceuticals in  
the environment action plan  
- Micropolutants action plan**



Academies: medicine, pharmaceutical sciences, veterinary



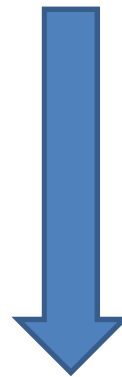
**Ministry of health**



**Ministry of environment**

**National action plan to reduce pharmaceuticals in waters  
Launched in may 2011**

**Steering committee:** public authorities,  
companies, consumers associations ...



R&D program  
←

**Scientific Support  
Group:** academic,  
experts, public  
institutes for health, risk  
...



# Priority goals of the action plan

- Priority list
- Improve analytical and toxicological methods
- Create national data base on pharma sales / watershed

Evaluate national contamination level

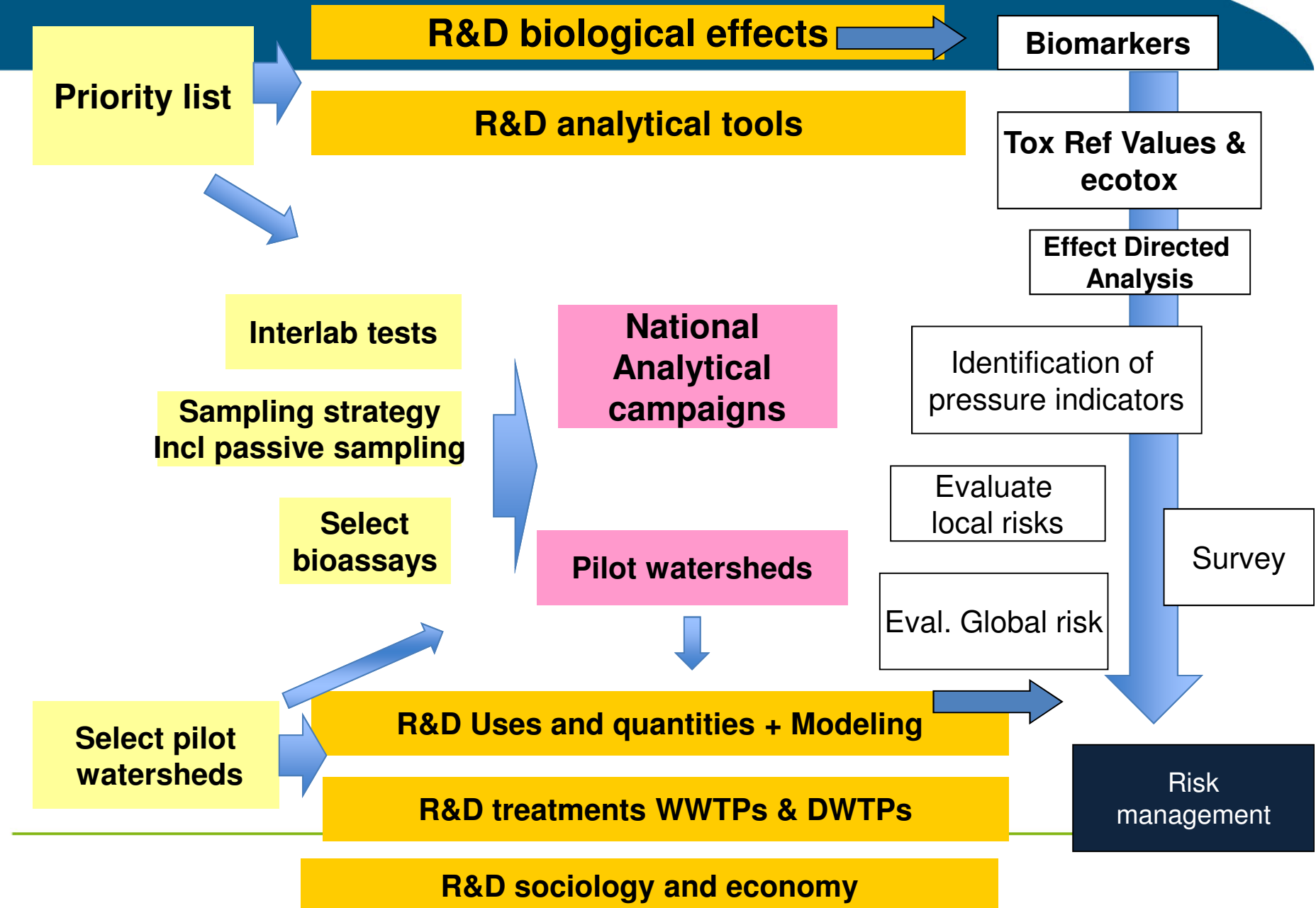
Improve research and modeling on specific pilot watersheds

Promote R&D in toxicology/ ecotoxicology  
Social sciences

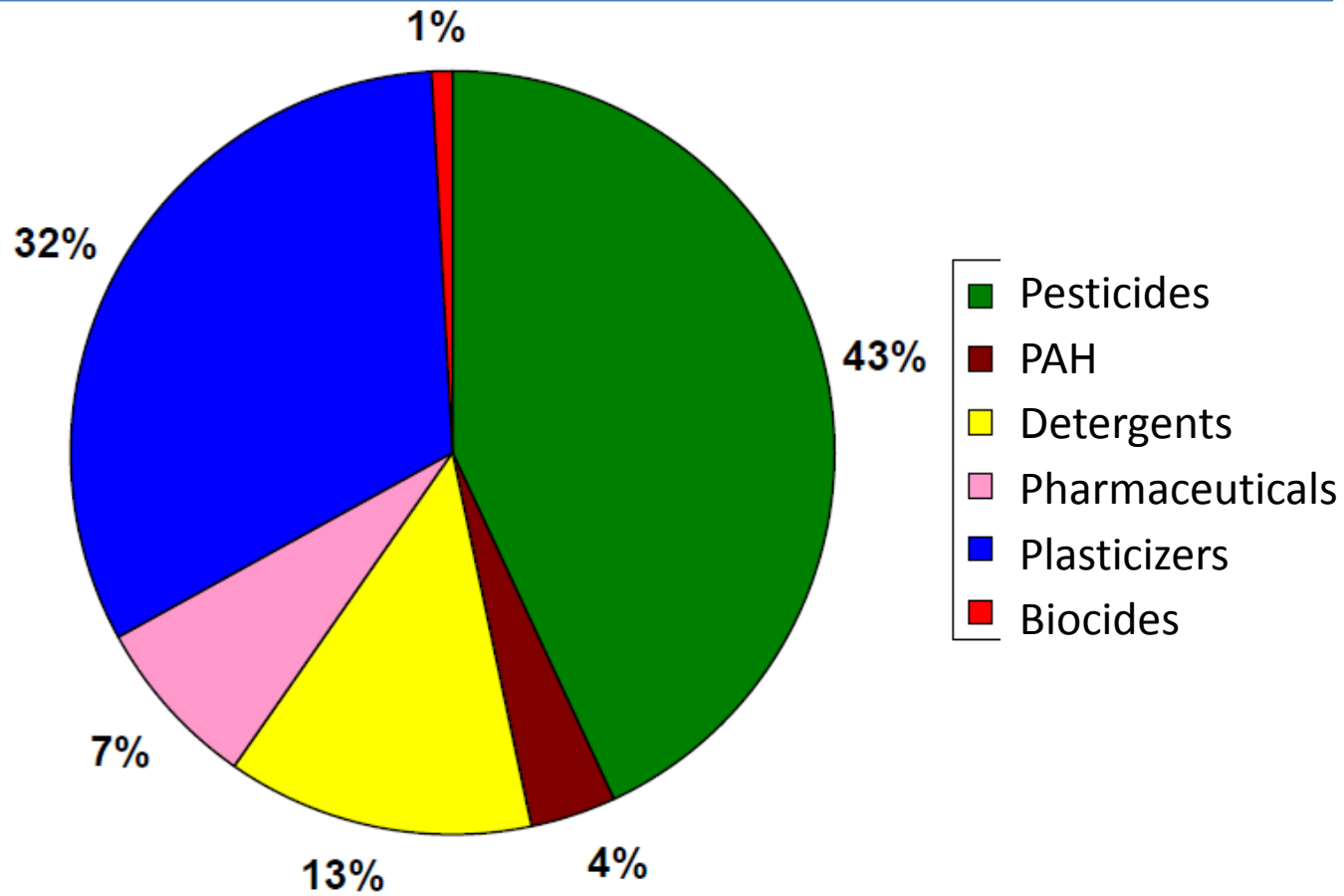
Improve water treatments

Risk assessment  
Management strategies

# Main lines of action



# Detection frequency in coastal water 2014 – IFREMER/ONEMA



# Situation

Good analytical lab facilities ... but  
need more “round robin” tests

Interdisciplinary research  
programs on different pilot  
catchments

Good R&D potential  
Ecotoxicology, analytical chemistry  
Treatment technologies

Risk assessment methodology  
ANSES

Draft guideline for pharmaceuticals  
wastes in hospitals (Ministry of  
health)

-Task force on antibioresistance  
- Interesting studies on sites (Sipibel,  
Flash)

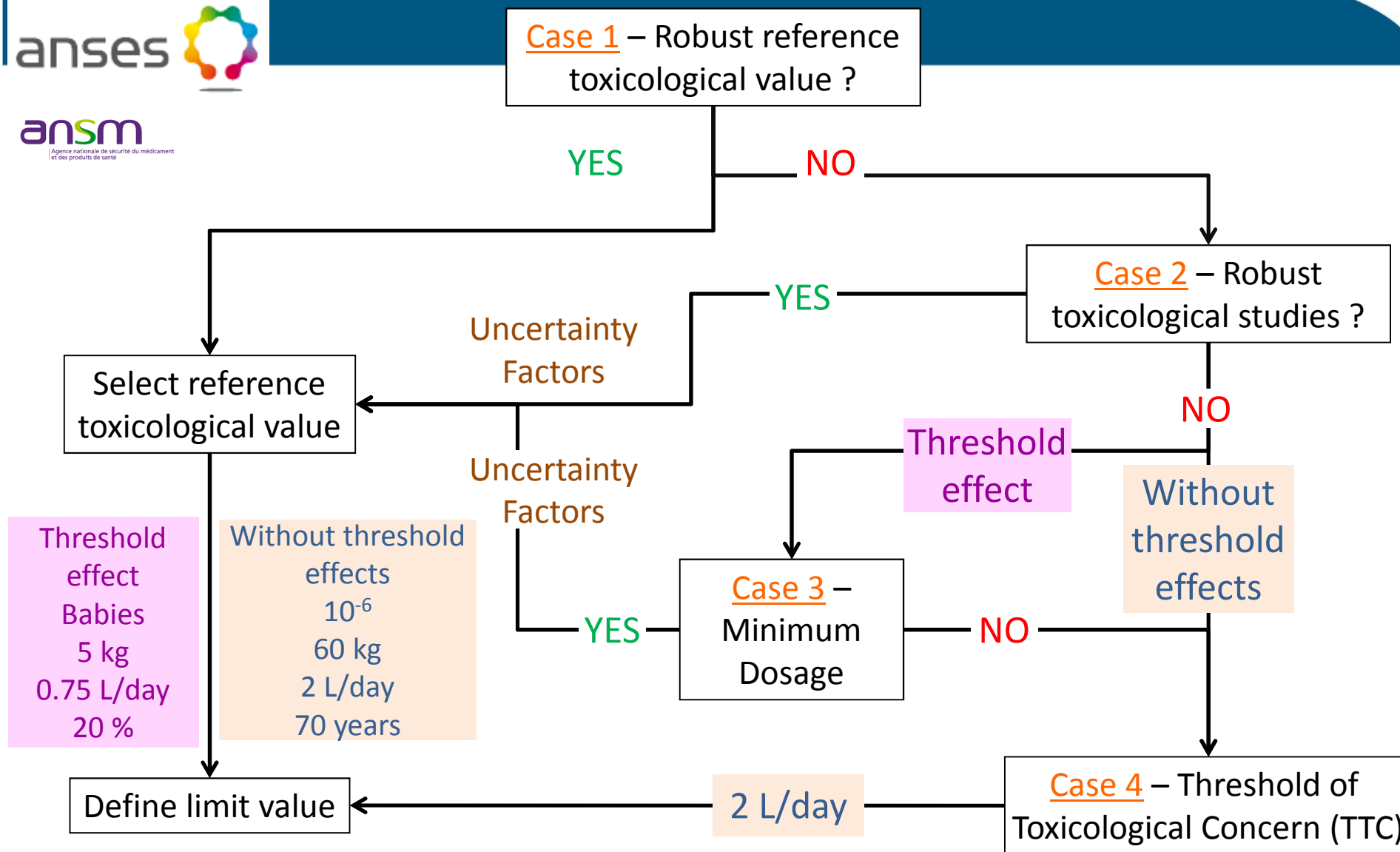
Private groups R&D  
- Pharmaceutical  
- Environmental

Working group of academies about  
the experiment, in France, of the  
Stockholm guide for environmentally  
classified pharmaceuticals







Models to predict hospital loads

One hospital with specific wastewater  
treatment (Tahiti – French Polynesia)

# Guideline for standard limit values for tap water



# Some needs

-  Stop media and public confusion between endocrine disruptors and pharmaceuticals
-  Obtain data on pharmaceuticals sales (human and veterinary) for each catchment. Data are expensive et no free or low cost access for public research labs.
-  Help hospitals about strong local pressure for on site sewage treatments: irrational, commercial, lack of knowledge...
-  Evaluate mixture effects, if possible in vivo and in real aqueous matrix
-  Be able to combine/associate the different deadlines from policy makers, engineers (water treatments improvements) and scientists (toxicology, ecotoxicology, exposure, risk assessment).
-  Define, if possible at European level, the real health and environmental risks to help to manage the best investments.

# Conclusion

- Social acceptance needs a great confidence regard to experts, public agencies and treatment processes: data transparency, education, high research level, independent expertise, confidence on the results...
  - New innovative strategies exist but public need to understand real risks and accept the solutions/cost.
  - Are we in a preventive or precaution situation? Do we need to remove all the pollutants above the detection limits? Do we have to transform WWTPs into DWTPs ?
  - Works are underway to obtain a robust risk assessment. Is it necessary to apply Thershold of Toxicological Concern concept (TTC) or management values (like pesticides) ?
-



Thanks for your attention

