

Pesticides indicators for river water quality assessment

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GEO SYSTEMES

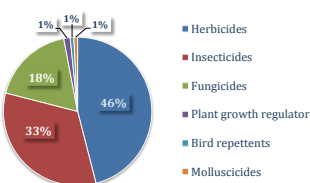
Context of the study

- The **Water Framework Directive (WFD)** requires that by 2015 all rivers have **good status**
- For surface waters, there are two separate classifications, **ecological and chemical status** : **Pesticides** constitute widespread causes of poor status in rivers
- Monitoring networks have been revised in **2007** to implement the WFD : **need to interpretate large and heterogenous pesticide data sets**
- Development of **pesticide indicators** for sites and substances to assess the **pesticide risk and manage surface water bodies**

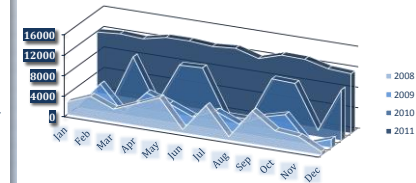
Data set : a problem of heterogeneity

- **99 sites** in the Artois Picardie water basin, **174 pesticides** (active substances or metabolites), **372,683 analytical results** for the period **2007-2011**

Monitored pesticides according to their use



Number of analyses per month between 2008 to 2011

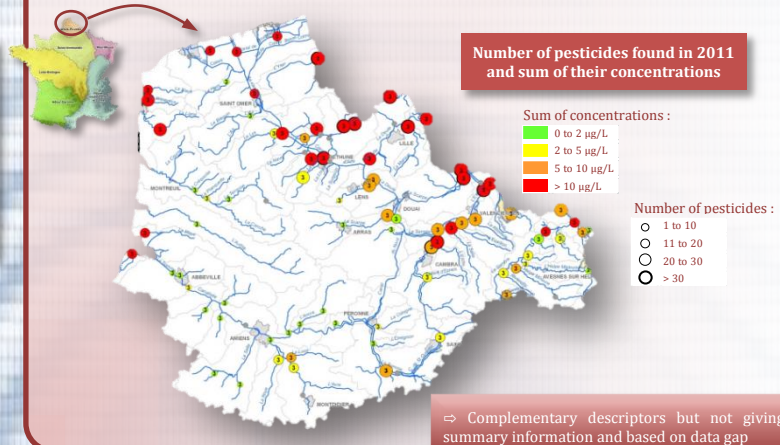


- Full assessments in 2011 (such as 2007) with 12 analyses per year
- Intermediate assessments the other years with 6 analyses per year : month concerned depending on pesticide application periods
- Several uses with a majority of herbicides

⇒ Large data **heterogeneity** concerning as well sites, substances, analysis frequencies, investigated months and analytical quality of data, due to : i. change of provider (new multi-residue method involving new analysed substances and new analytical limits) / ii. change of regulation / iii. different objectives according to surveillance networks and associated sites

Usual descriptors used by managers

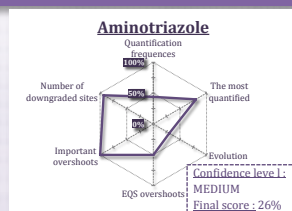
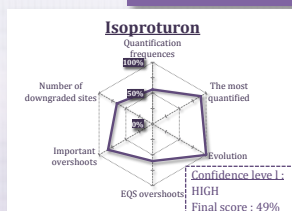
Descriptor	Description	Limits
Total or mean annual site concentration		Depend on the analytical performances of the laboratory
Nber of pesticides detected per site		
Quantification frequencies	Quantified analyses / total analyses	Only 98 pesticides on 174 studied have an EQS
Nber of exceeding Environmental Quality Standards (EQS)	Standards defined by European regulation or french proposition and based on ecotoxicology	
Diffused or ponctual contamination	Per pesticide : maximum conc. / total mesured conc.	
Interannual contamination trends		Depend on changes in quantification limit values and need homogeneous data sets



Pesticides indicators based on scoring

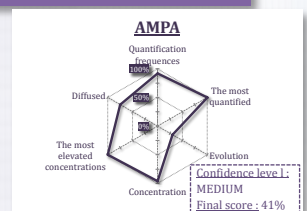
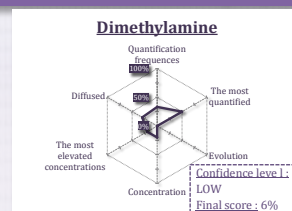
- Indicators developed for the two approaches : sites and substances
- Usual descriptors are scored and weighted according to a confidence level
- The confidence level depends on the quantity and the quality of available data
- The final score increases with the risk

Representation of attributed scores (in pourcent) to the different descriptors before weighting (substance indicator)



Pesticides with an EQS

- ⇒ The high final score of isoproturon is due to a high level of quantification, an increasing contamination trend (based on a large data set) and several EQS exceedings
- ⇒ Aminotriazole has a lot of large EQS exceedings but few data don't allow to confirm the diagnostic



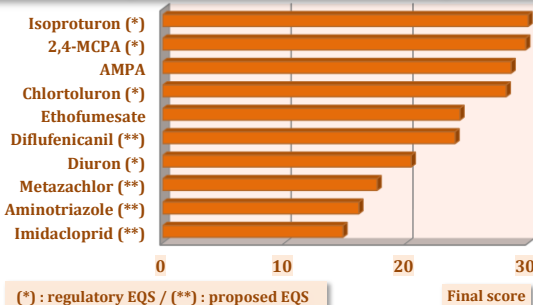
Pesticides without an EQS

- ⇒ The level of concentrations and the diffused contamination are taken into account
- ⇒ Concerning dimethylamine, the low confidence level doesn't allow to assess the pesticide risk
- ⇒ Indicators can be calculated for one year or for a period (mean final score on the period concerned)

Results

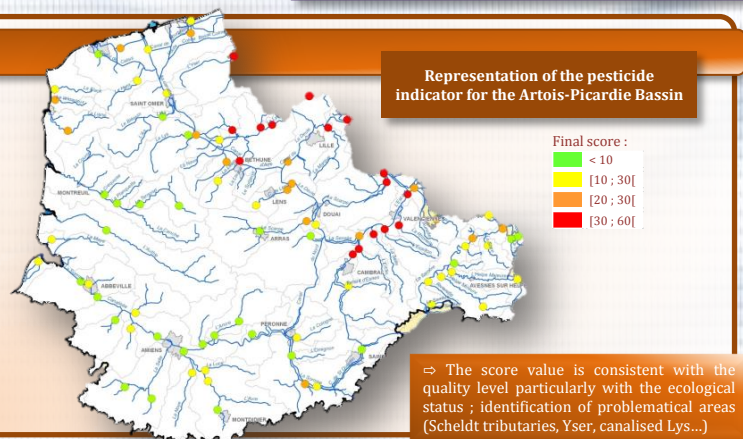
- ⇒ In the Artois-Picardie water basin, final score range between -1 and 30 for substances (possible range from -5 to 70), and between 2 and 59 for sites (possible range from 0 to 88)
- ⇒ The substances final score can be negative in the case of decreasing concentration trends
- ⇒ Four quality classes according to the value of the final score ; no very good quality class (blue) as no site has been identified without pesticides

Ten pesticides where the final scores are the highest



⇒ Score remain often low partly because the low level of confidence due to the frequency of analyses which can be of 6 per year. The 10 most problematical substances are herbicides. 4 are included in the WFD chemical status substances or in French ecological status substances : 6 are non regulatory substances amongst which AMPA (glyphosate metabolite)

Representation of the pesticide indicator for the Artois-Picardie Basin



Conclusion and perspectives

- ⇒ Pesticide indicators allow to identify high risk sites as well as problematic substances
- ⇒ Highlight the necessity to optimize the substance monitoring : decreasing of the number of substances for monitoring ; increase the monitoring frequency monitoring from 6 to 12
- ⇒ More informative than the total pesticide concentration assessment
- ⇒ Useful for managers as allow reliable diagnostics and policy actions
- ⇒ Allows to overcome the data gaps and to define pesticide interpretation methodology issues : avoid to have wrong or incomplete assessments