Organizing the information for the management of protected areas at embedded scales: an approach by scenario using data warehousing

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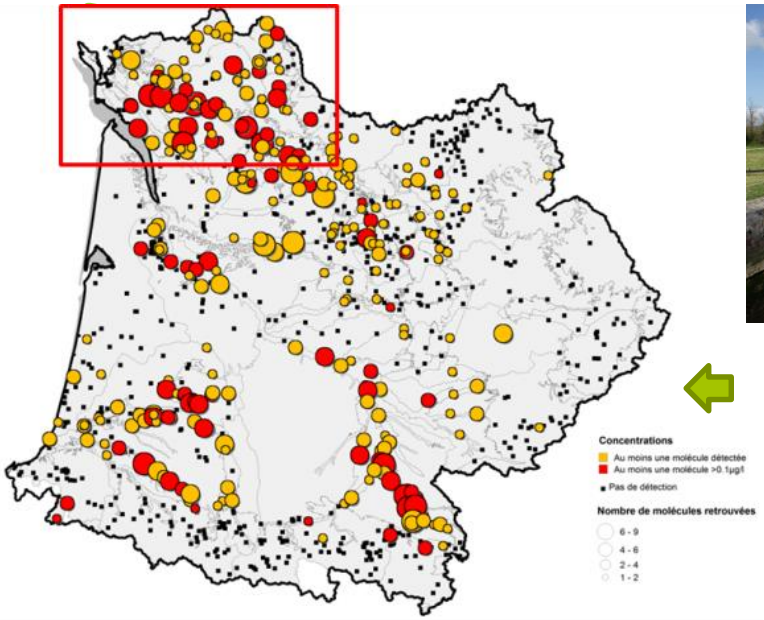
AGRICULTURES & TERRITOIRES
CHAMBRE D'AGRICULTURE POITOU-CHARENTES

AGENCE DE L'EAU ADOUR-GARONNE
ETABLISSEMENT PUBLIC DU MINISTERE DU DEVELOPPEMENT DURABLE

LuWQ 2015
International Interdisciplinary Conference on
Land Use and Water Quality
Agricultural Production and the Environment
Vienna, Austria, 21-24 September 2015



Pesticide concentration in groundwater (2011) Source : River basin Agency

Context of the work

- **Water quality is still getting worse,** despite decades of public policy attempting to reverse this decline.
- **There are more than 1,000 pesticide products used in intensive agriculture**. They generate potentially hazardous residue.
- **An evolution to alternative agricultural systems (innovative, organic) is needed**
- **A number of reports have highlighted serious shortcomings** in the way areas at risk from water pollution are assessed

-> lack of methods and tools to provide, organize and use relevant pieces of information in order to define pesticide action plans.

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How can we help water managers and stakeholders?

Help needed at each step of the action plan

Hypotheses of evolution

Action plan

Diagnosis of the area

Mitigation measures

Capitalisation of expertise and data for future action plans

Current state of rivers and groundwater

BAU,S1…n

Change in pesticide concentrations

Pressure from economic activities

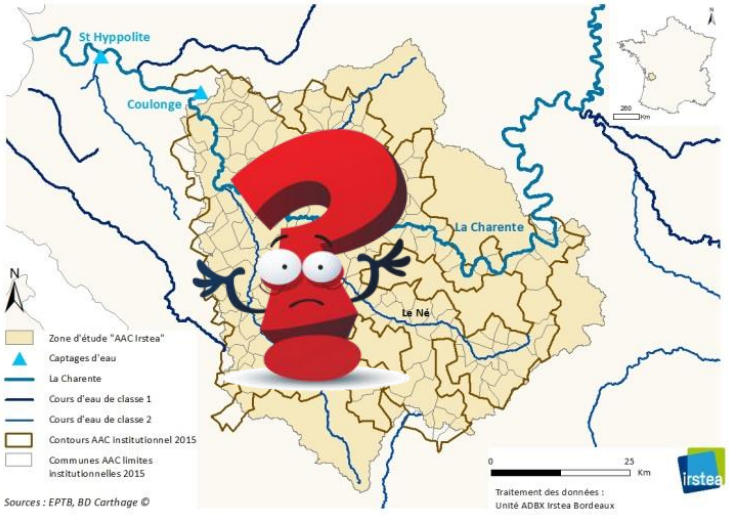
BAU,S1…n

Change in practices, systems and associated pressure

Key points

- **Identify what information is used when devising pesticide “action plans”.**

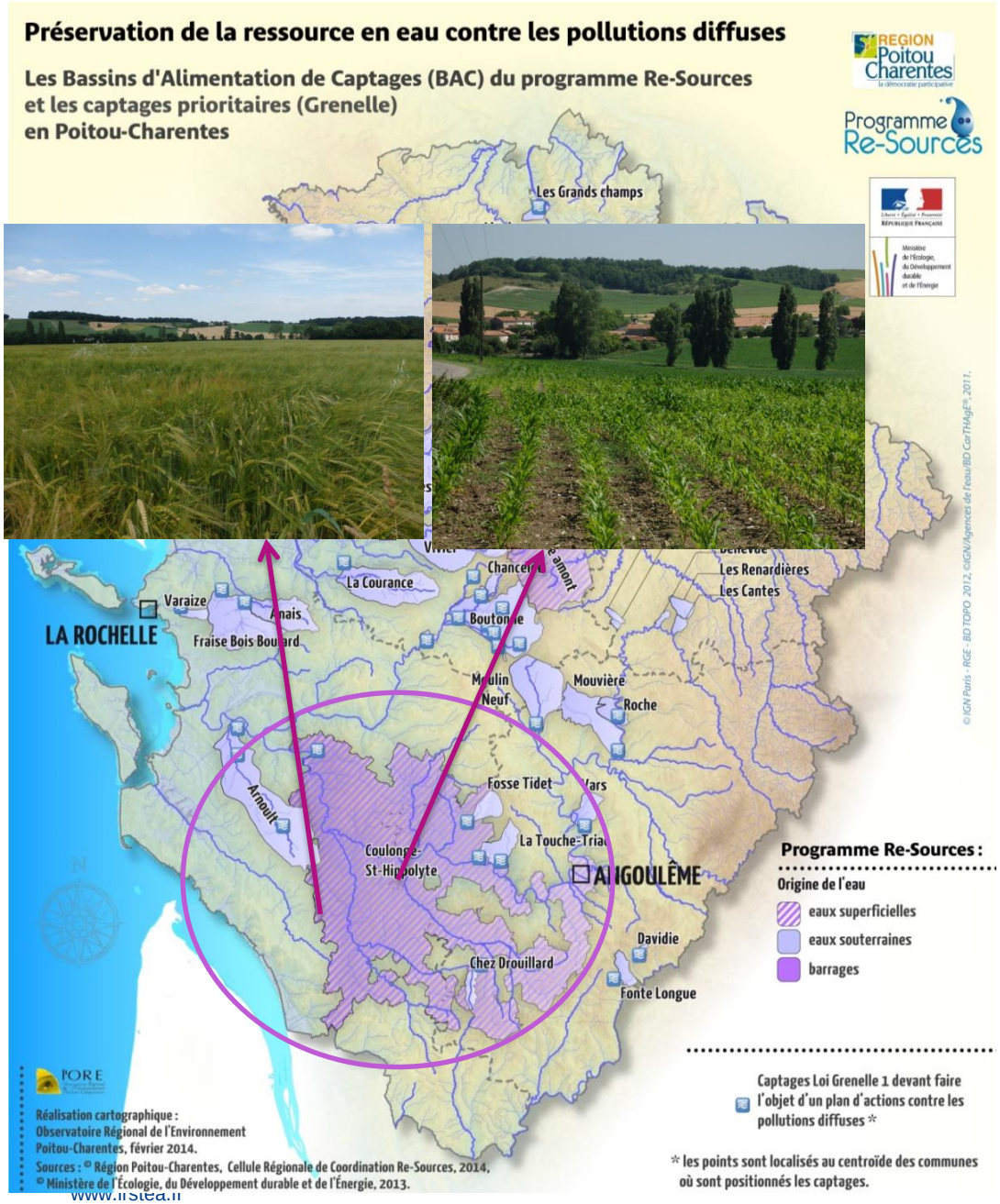
- **Use the results of this analysis to create an environmental information system capable of:**



- Characterising agricultural systems and practices in areas at risk from pesticide pollution

- Helping water managers to choose the most efficient measures and their location

Study site

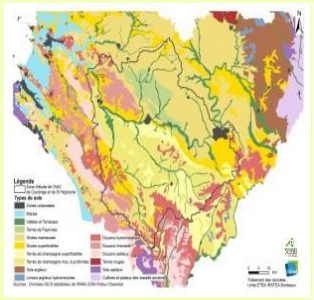


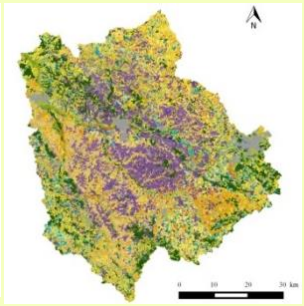
The Coulonges water supply area covers some 260,000 hectares of crops and vines and provides drinking water for all the coastal area.

The aim of the Modchar project is to develop an integrated assessment method to evaluate Action Plans relating to water quality (pesticide impact).

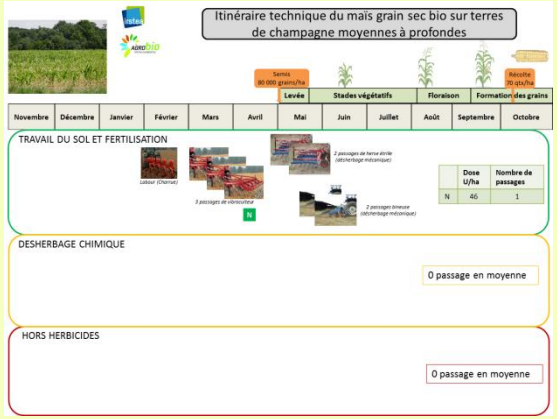
Focus on the building of a data warehouse for decision makers.

First step: building a ‘reference’ scenario

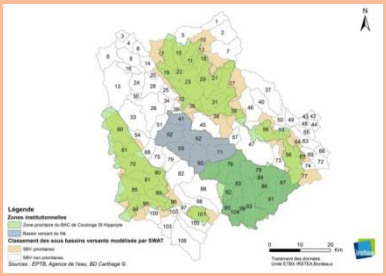




Soil + crop rotation + crop
=
crop management sequence



Total area



Sub-basin and
groups of sub-basins

RPG plots

- Identify the scales used to provide information with managers and stakeholders
- Use institutional data and expertise to apply crop rotations to RPG plots
- Define current agricultural systems and practices
- Choose an initial set of indicators useful for managers and stakeholders

Second step: building alternative scenarios for the area with stakeholders and agricultural experts

Reference scenario

S0	M	M	S	W
S0	MI	MI	MI	
S0	S	W	R	W

Innovative systems (longer crop rotations, new crops)

S2	M	M	S	W	Lu	Lu	Lu
S2	MI	MI	MI	B	Lu	Lu	Lu
S2	S	W	P	B	R	W	

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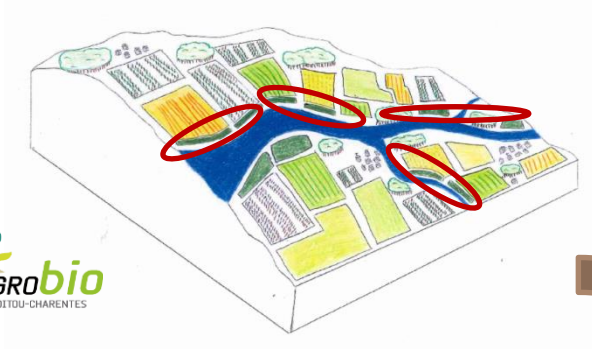
Grasslands located along rivers



Organic systems (no pesticide)

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Scenarios can be applied to the total area or priority areas

Or Combined, ex. 25% organic crops and 75% productive agriculture with targeted measures MAET

Indicators and models

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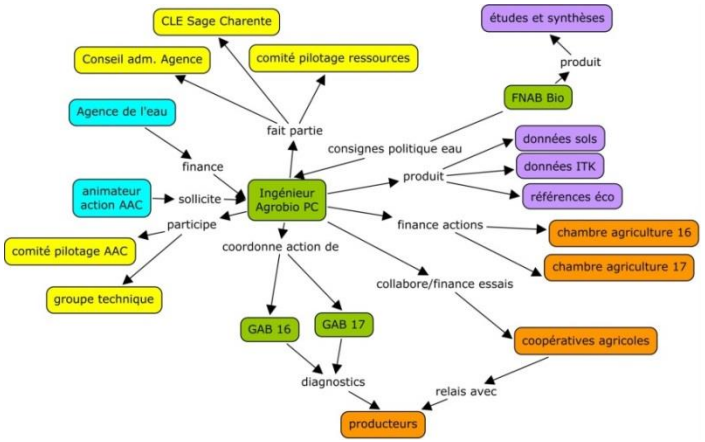
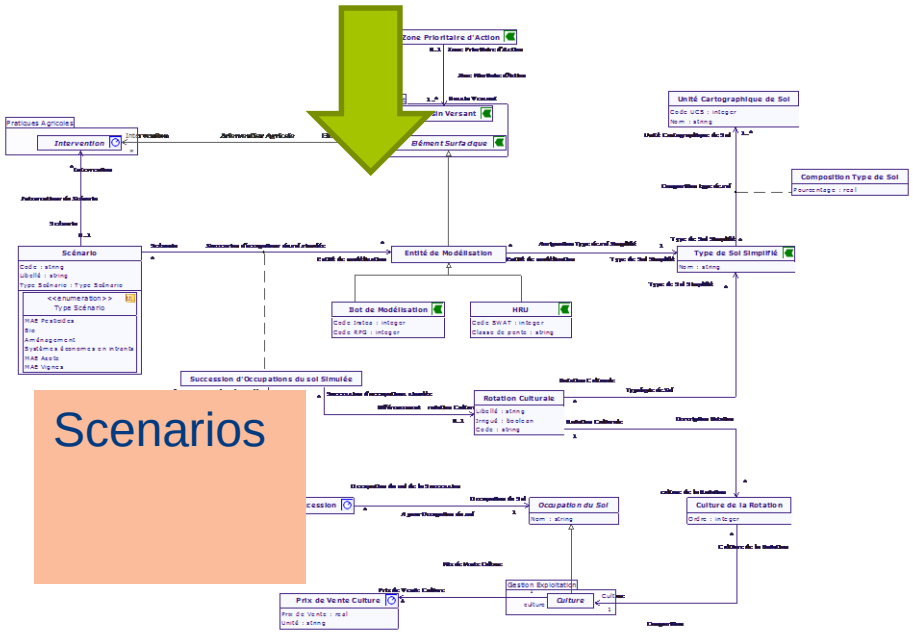
Step 3: mapping the role of stakeholders and organizing information





Scenarios

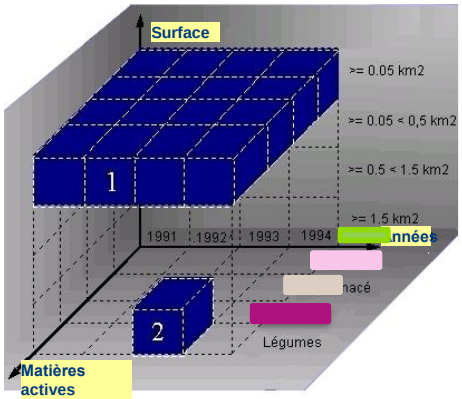
We used surveys to identify the information used and the role of stakeholders in providing and using information

We do not focus on the decision process itself, but examine the role of information in the way decisions are taken.

The mind maps built for key stakeholders are 'translated' into UML and linked with the SIE scenario model*

Vernier, F., Miralles, A., and al. (2013). EIS Pesticides: An environmental information system to characterize agricultural activities and calculate agro.environmental indicators at embedded watershed scales. Agricultural Systems, Vol. 122, pp. 11.21.

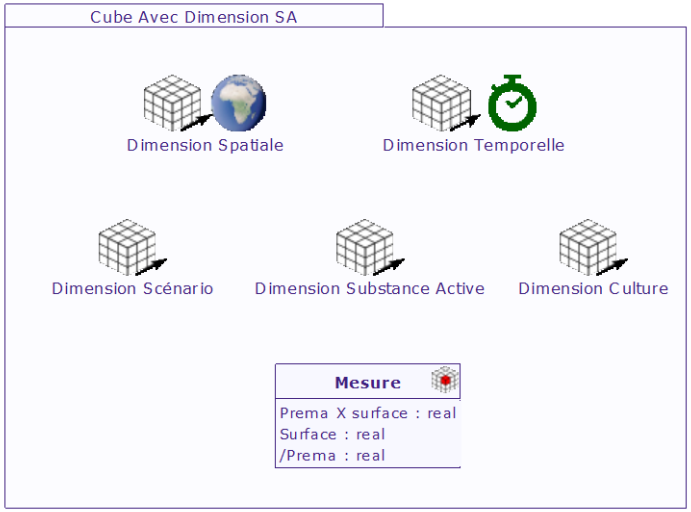
Defining the dimensions and analytical perspectives of the data warehouse



UML (Objecteering software + specific spatial module)

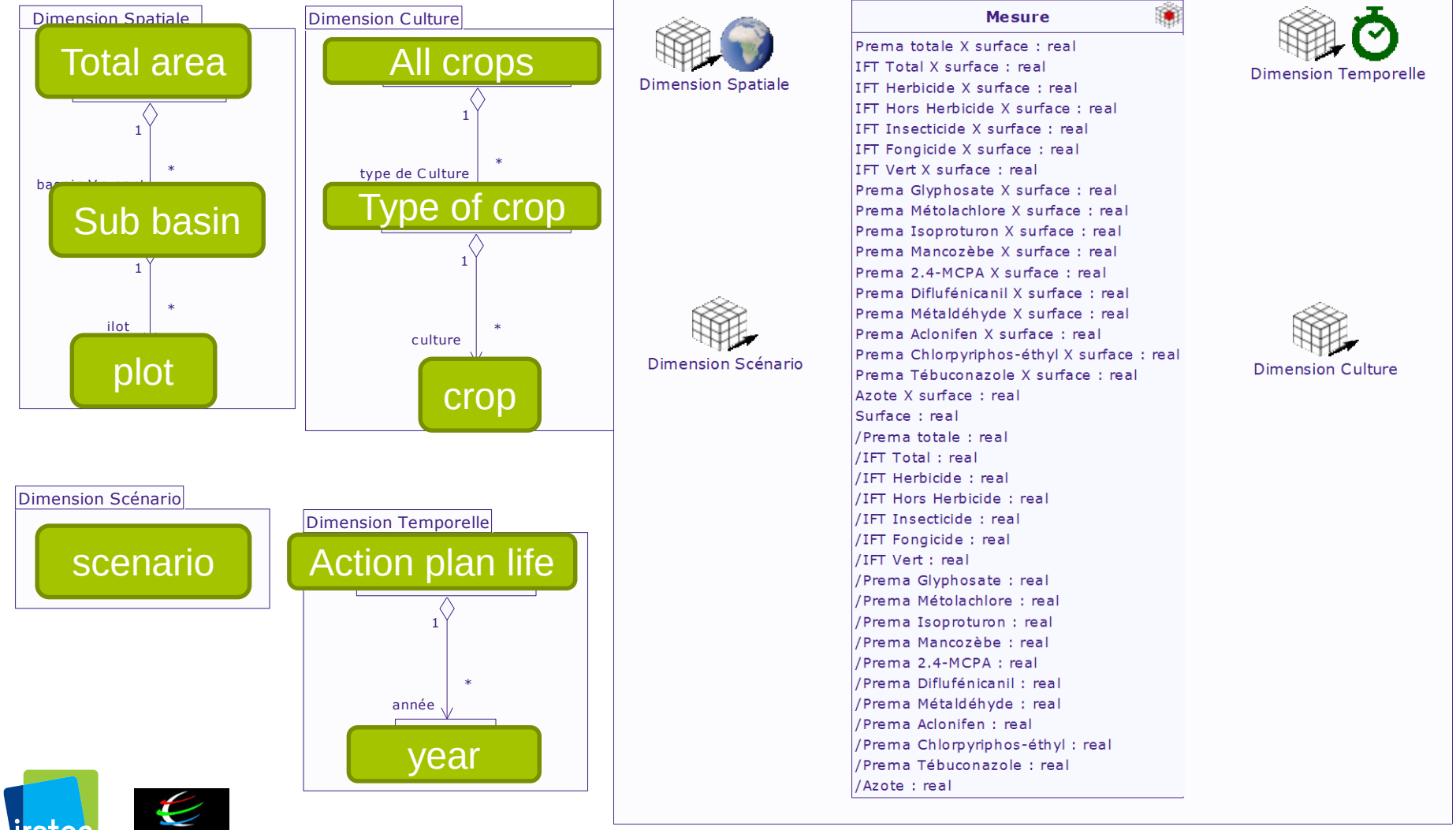
Why a data warehouse ?

- Able to manage huge volume of data
- Able to manage several temporal, spatial and thematic aggregation levels
- Reporting as well as analysis
- Maintains historical information



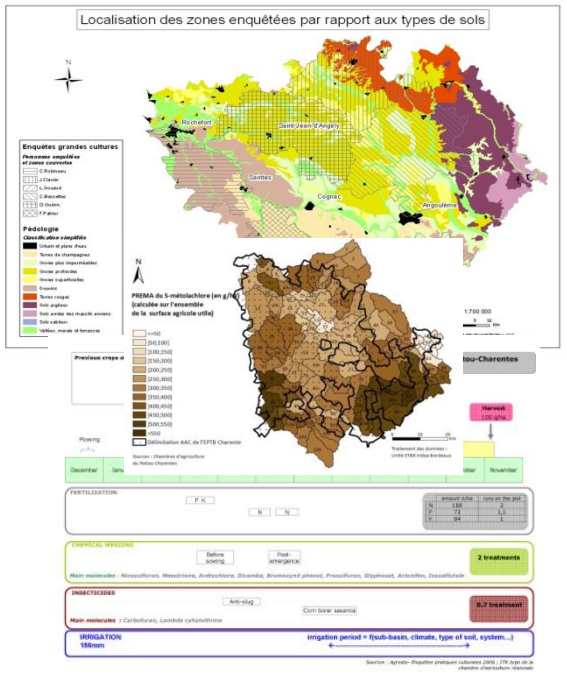
F Vernier/ A Miralles, 2015

Dimensions and axes for one of the cubes



Integration of the ‘real’ data of Coulonges area

- Soils/rivers
- Land use and practices/scenario
- Indicators
- Simulation results :Concentrations/costs



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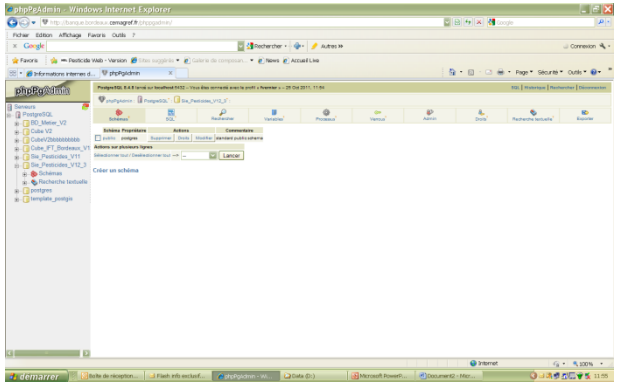

Postgres SQL database

Setting cube

data at the lowest level

Exchange with Stakeholders

Producing Indicators and maps

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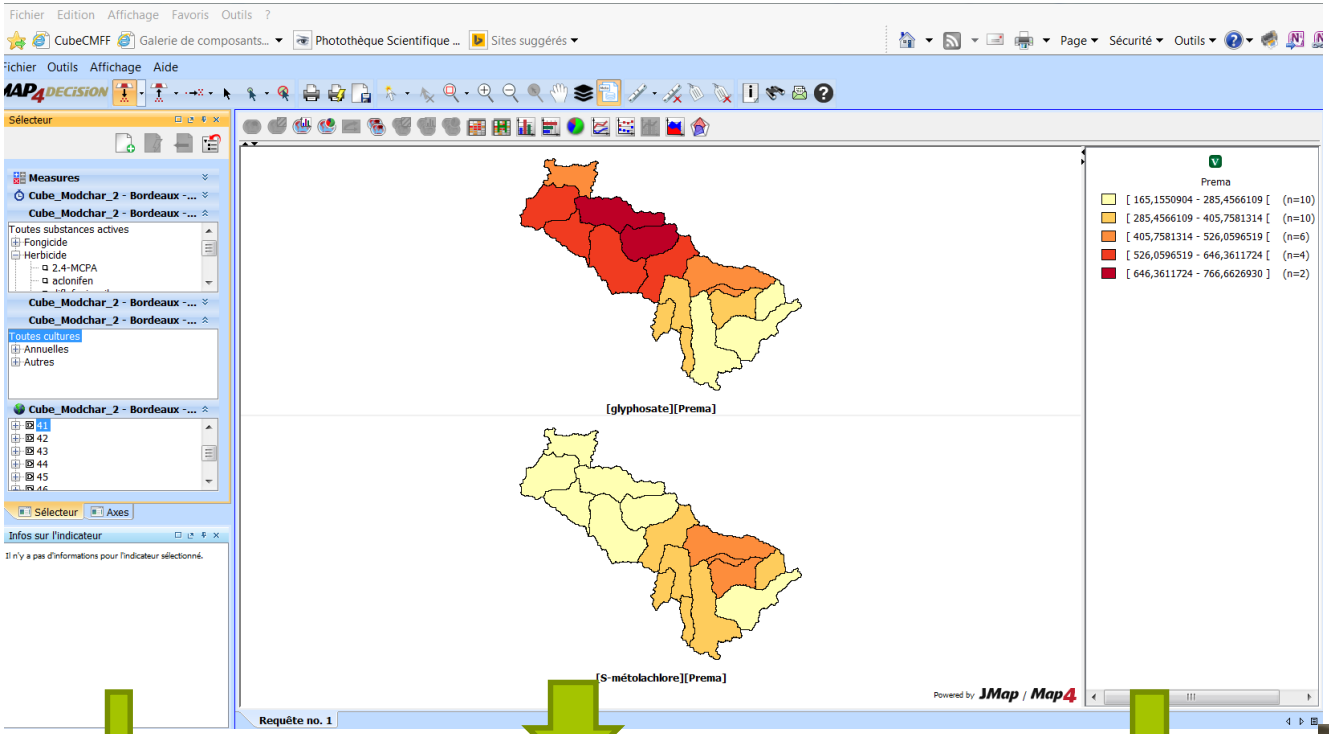
Providing relevant information to managers and stakeholders -> immediate answer with SOLAP tools!

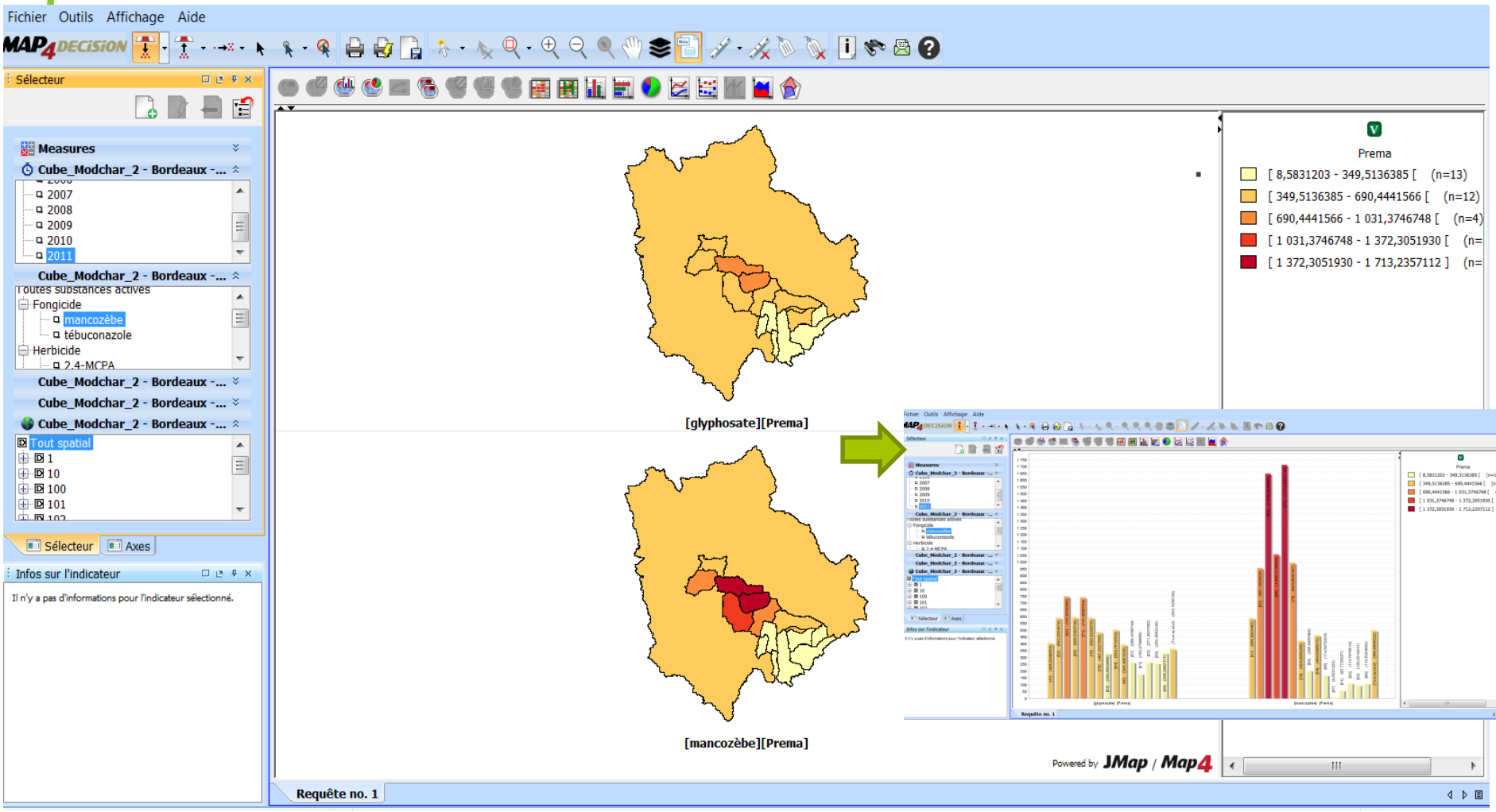


- Explore the impact of mitigation measures depending on their location
- Choose the best scenario
- Follow the action plan once implemented on the area

Choose a set of sub-basins and scenarios

Choose maps or graphs or charts

Choose a set of Indicators or an indicator (glyphosate and S metolachlor pressure in this example)



Pressure pesticide indicator (fongicide) for the sub-basins of the Né watershed (specific action plan SIAH)

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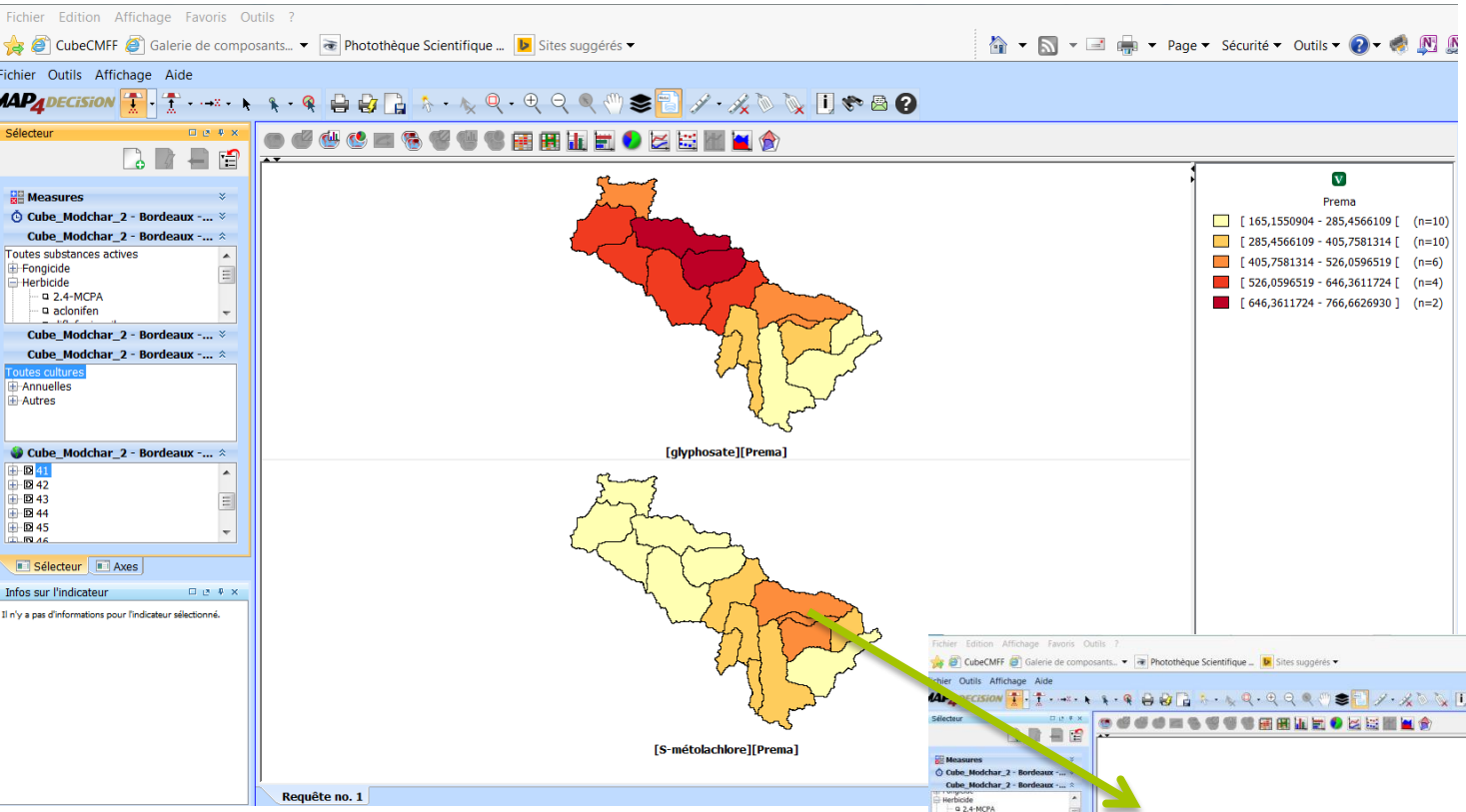
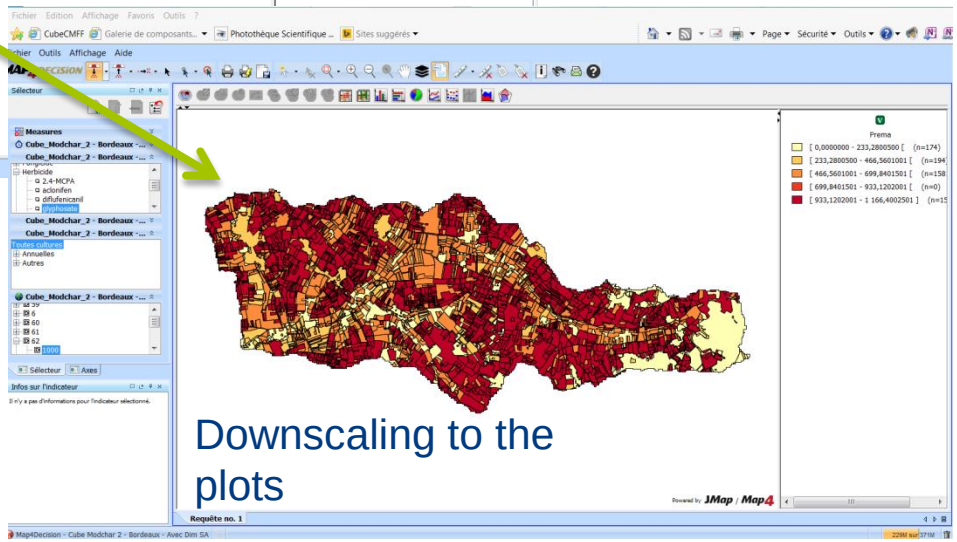
Glyphosate and Metolachlor in the Né watershed and sub-basins





Downscaling to the plots

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Conclusions

Managers and stakeholders need relevant information at several spatial scales, related to pollution pressure and potential impacts of mitigation measures on water quality

They need an interactive and evolving system throughout the life of the action plan

-The datawarehouse is an appropriate answer:

- manages a huge volume of data (ex, data from Coulonges),
- provides various indicators for all the spatial and temporal scales defined
- capitalizes the information and knowledge

- Limits : pre-analysis of the needs of stakeholders (but cubes can be broken and rebuilt).

Perspectives :

- Use the stakeholder feedback to improve the system
- Apply the system to other protected areas (2016)

Thank you for your attention!

Photo Irstea ETBX

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