

### System Approach Framework process



The SSA10 stakeholder forum is a focus-group which includes the representatives of the local public bodies who are involved in freshwater management : Regional Water Agency of the Adour-Garonne basin, South-West of France (AEAG), Territorial Public Agency for the Management of the Charente River (EPTB), River Division of the Council of the Charente-Maritime Department (CG17), State local administration for spatial planning (DDTM), State local administration for agriculture and forestry (DRAF) and State local administration for maritime affairs (DDAM).

- The policy issue chosen by the stakeholder group is the quantitative management of the freshwater in the Charente river basin.
- The model has been developed by a highly multidisciplinary scientific team following the SAF methodology (Design – Formulation – Appraisal – Output) with regular inputs from the stakeholders.
- Meetings were dedicated to the building of scenarios, following a deliberation methodology based on transparent votes.

### Freshwater quantitative management



The regional plan for water management (SDAGE) dedicated to the Charente river addresses the issue of freshwater quantitative management according to the following objectives :

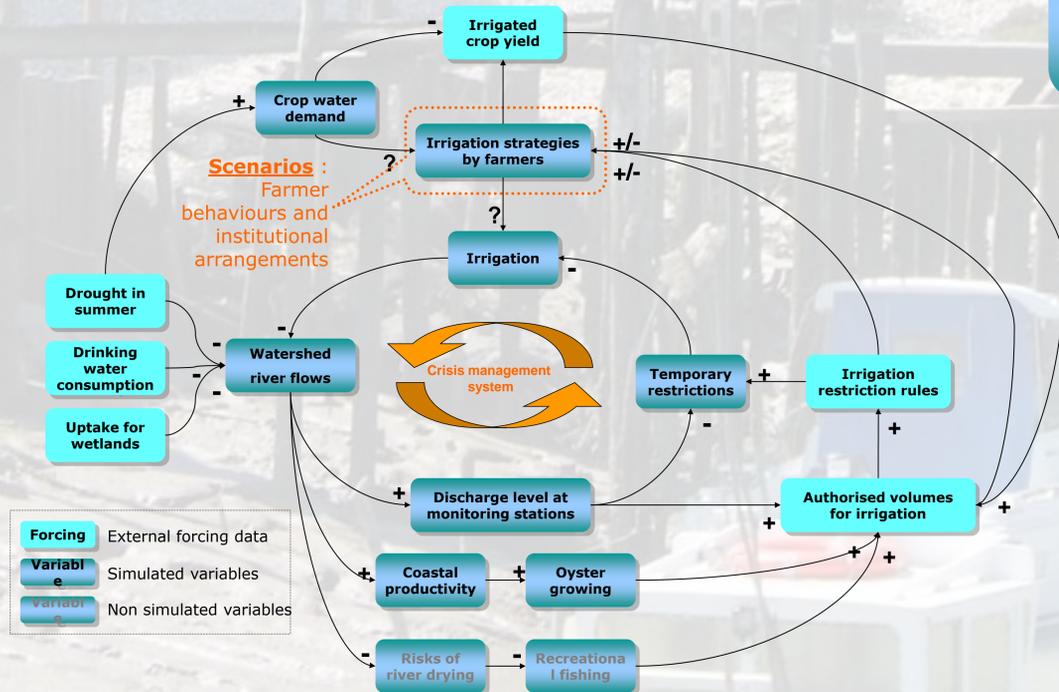
- the hierarchy of the freshwater uses :
  - good ecological status of the coastal ecosystems
  - drinking water for households
  - other uses: agriculture, shellfish farming...
- Reachable Discharge Thresholds at different control points on the river.

The land use has been highly modified during the last forty years : the irrigated surfaces have spread from 3 800 hectares in 1970 to 81 530 in 2000, 85% being used for maize cultivation.

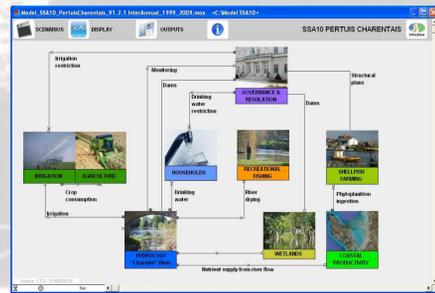
The oyster farming industry needs freshwater for spat production and river nutrients for oyster growth; this industry consists of about a thousand of businesses, and generates a yearly turnover of 110 Millions of Euros for 55 000 tons of sales.

Many controversies are still alive in the public arena. In a context of scientific uncertainty, when spring growth and spat collection is not sufficient, summer time represents an opportunity for oyster farmers to claim a share of freshwater.

### Ecology-Social-Economy model



The political debate is now focusing on the modification of the "authorised volumes of water" for each consumptive uses (drinking water for households and irrigation) and on the improvement of the restriction rules which apply during the periods of water shortage.

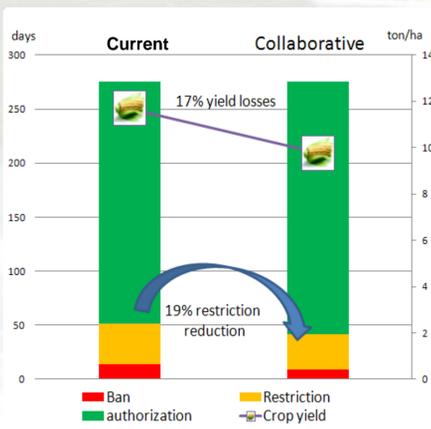


The simulation model was developed using ExtendSim modelling software. An integrated Ecological-Social-Economic approach was used, separated in three main steps:

- a participatory investigation toward the best achievable cognitive representation of the system
- the model components development choosing appropriate levels of complexity
- the development of adapted visualisation and documentation outputs for exploratory, learning and communication purposes.

### Simulation results

#### Results 1: Irrigation restrictions



The model allows the testing of different irrigation management strategies and climate evolution. It shows the tight interactions between hydrology, irrigation, agriculture production and shellfish farming.

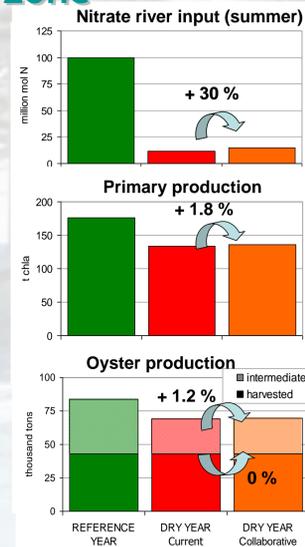
Two irrigation management scenarios are presented in the diagram:

- Current situation:** annual volumes for irrigation in the downstream part of the watershed / projected irrigation based on ten day periods upstream.
- Management test :** scheduled and collaborative management of irrigation for both sides of the watershed.

In terms of good ecological status of the river (low water level imposing bans or restrictions), the collaborative management scenario gives better results.

Contrarily, in terms of crop yield, the current management stays better.

#### Results 2: Productivity of the Coastal zone



The effect of irrigation governance on the nitrate input to the coastal zone is important (+30%). The economic assessment of oyster farming is carried out in spring, based on the following variables:

- oysters harvested during the year,
- additional costs of half-farmed and adult oyster to offset production losses = intermediate stock.

The summer additional input of nitrates in the Bay has a weak effect on the phytoplankton production, and consequently on the intermediate stock. Inter-annual variations of the climate are more impacting.

The impact of droughts on the spat production must be also investigated.

### Stakeholder group feedbacks

At this stage of the project, positive outcomes have been achieved from the work with the participant group:

- The water management agency for the Charente river (EPTB) foresees a high potential for exploration of different management scenarios and is now highly involved in the continuing development of the model. EPTB representatives are also very interested by the communication possibilities of the tool for future discussions and negotiations with other management bodies and local farmers.
- The use of a common software platform (ExtendSim) was time consuming but helped in acquiring a common language between scientists and managers from different backgrounds.

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