

Ecofilae, a french consulting society, develops tools to assist decision-makers and project managers in implementing wastewater reuse projects on their territories. Ecofilae works with G-EAU research unit of IRSTEA on the economic issues of wastewater reuse.

## Cost-Benefits Analysis (CBA), a method for decision-making...

CBA is a well-known methodology but is scarcely carried out for treated wastewater reuse projects. CBA are implemented:

- to assess projects' economic profitability for a community on a specific territory;
- to identify which stakeholders win/lose and the actions to implement to reach win/win solutions.

The methodology includes the following successive steps:

1. Identification of the different reuse scenario, single option is possible;
2. Analysis sphere characterization (geography and stakeholders involved);
3. Business as usual scenario (no reuse) characterization (including future charges);
4. Time horizon setting (from 30 to 50 years);
5. Costs and benefits identification and assessment for the reuse and business as usual scenarios;
6. Net benefits and NPV calculations (considering discount rate) to compare scenarios;
7. Sensitivity analysis of NPV to the main parameters.

### Focus on Step 5:

Most of costs and benefits are easy to identify and to monetize (added value, investments, charges, etc.) but some are more difficult to assess like knock-on effects on upstream and downstream chain or on employment evolution. Some other costs and benefits are difficult to monetize like the environmental externalities and the individual satisfaction but requires the implementation of more complex and time-consuming methods..

Specific economic methods are developed to assess all those costs and benefits. Mastering economic concepts and time to carry them out are then needed.

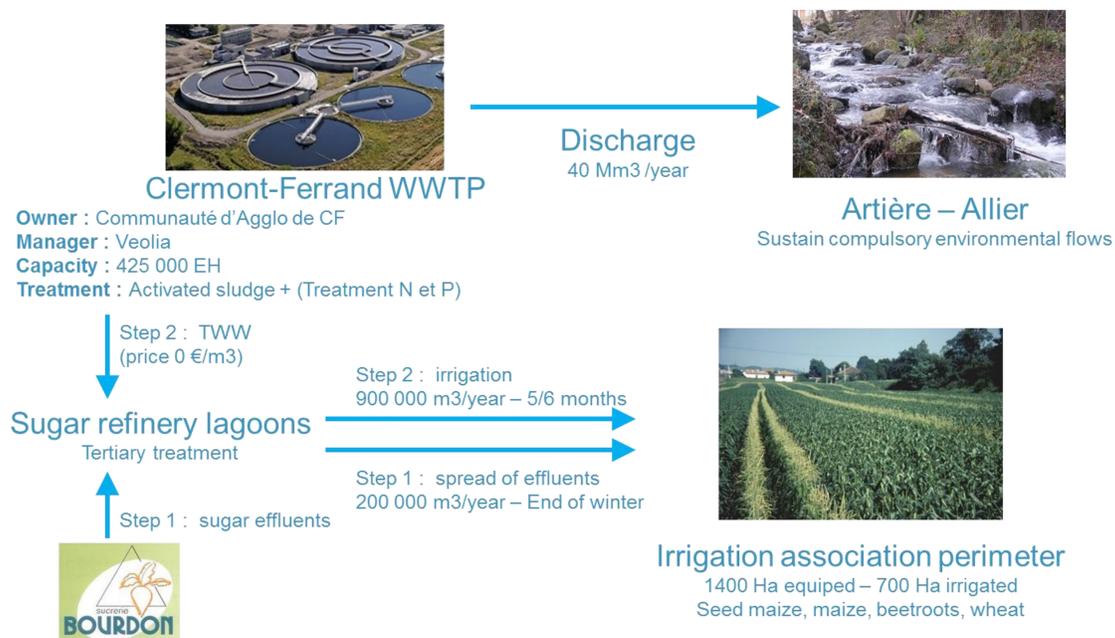
## ... Implemented on Clermont-Ferrand case study

An ex-post analysis was carried out on a treated wastewater reuse project implemented in 1996 in Clermont-Ferrand.

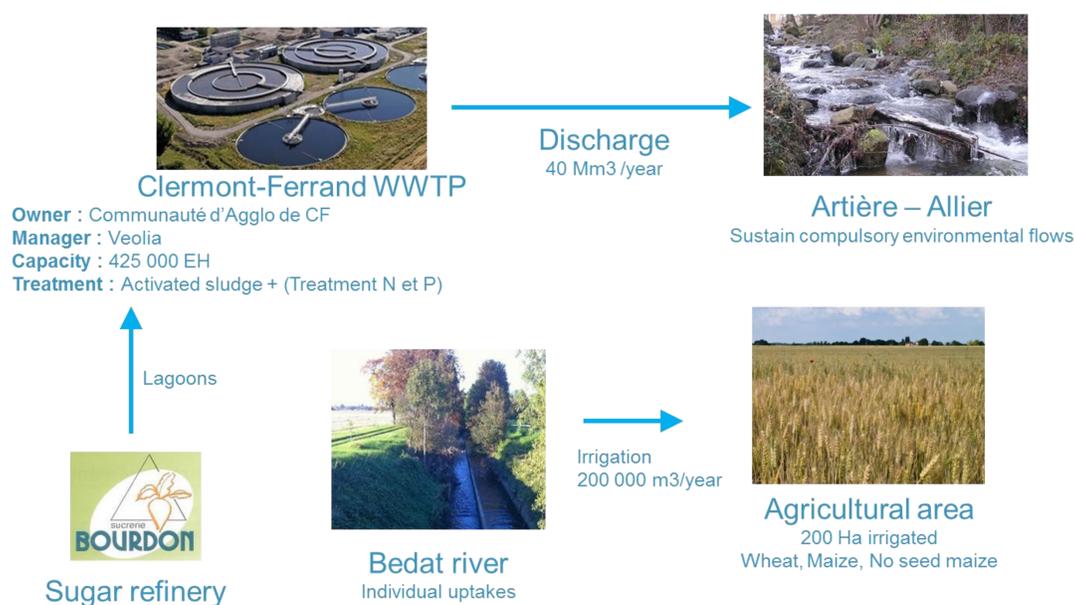
Main parameters used for the assessment (main costs and benefits) are:

- Investments (irrigation material, lagoons rehabilitation, distribution network, etc.);
- Annual charges (operational and maintenance costs, energetic costs, etc.);
- Agricultural gross margin and yields are different between scenarios as cultivated crops are not the same;
- Avoided costs of treatment for sugar factory effluents in reuse scenario;
- Subsidies from funding agencies (Department, Water Agency, State, EU) in reuse scenario.

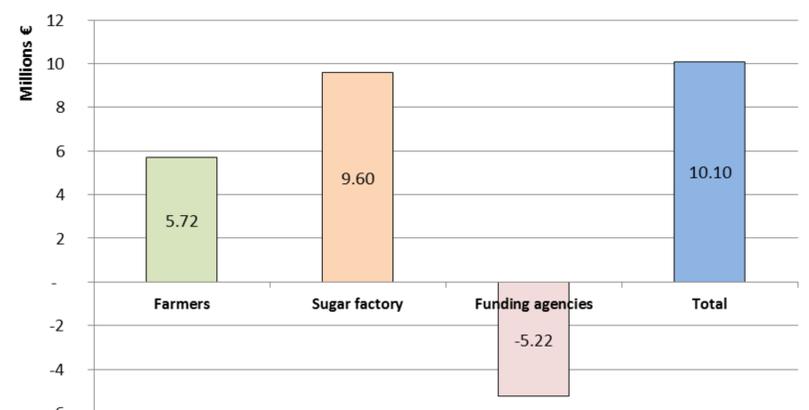
### TWW reuse scenario



### Reference scenario (no TWW reuse)

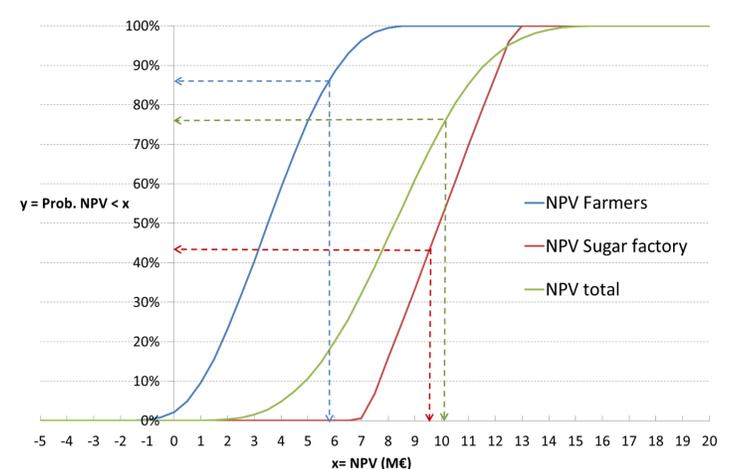


### Results



- **Economic NPV of the reuse project is positive and around 10 M€**, the project is sustainable for the community and it was worth subsidizing it. The 2 stakeholders involved (farmers and the sugar factory) also get a financial NPV;
- These results could not integrate and monetize the benefits derived from maintaining **agricultural activity on the territory only possible because of the provision of a new water resource**. Total (community) and farmers' NPVs would have been more important;
- Since the CBA is an ex-post one, some differences exist between the original plan and the observed situation. Hypothesis have been made for the concerned parameters (evolutions of prices of energy and crops production, water needs for irrigation, sugar factory's costs of treatment in 2020, etc.). A sensitivity analysis has then been carried out to assess the NPV dispersion. A Monte-Carlo method has been used (successives random draws for the values of some parameters).
- The NPV of the project would be still positive without public subsidies and the benefits sharing among the two agents is largely in favour of the sugar factory.

### Sensitivity analysis



- No combination of parameters leads to negative NPV for the sugar factory and for the community, while only 3% would lead to a negative NPV for farmers;
- NPVs are below the deterministic NPVs calculated before in almost 85% of the cases for farmers, 43% for the sugar factory and 76% for the community.

## Conclusions

CBA methodology enables to make a value judgement on the economic profitability of wastewater reuse projects and to seek opportunities to increase development of wastewater reuse projects.

Economic profitability has been demonstrated for Clermont-Ferrand case but economic incentives could be implemented to allocate equally the collective net benefit. Some benefits and costs are difficult to quantify such as the advantages for the community and for farmers to maintain agriculture on the territory and to reduce risks.

The sensitivity analysis is necessary. It demonstrates here the robustness of the deterministic results calculated during the CBA.