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Research for Policy support

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Assessing the benefits of groundwater protection levels

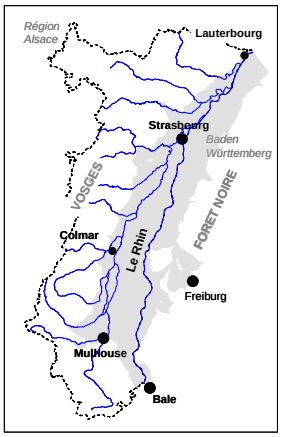
Results from a contingent valuation survey in the Upper Rhine Valley aquifer, France

The objective of the study is to assess population willingness to pay (WTP) for restoring 2 alternative levels of groundwater quality. The contingent valuation method is used in order to catch both use and non-use values. The results should be integrated in a costs-benefits analysis of the Water Framework Directive program of measures.

Case study

This cross-border alluvial aquifer, located between Germany and France, extends over 4200km². It is one of the largest fresh water reserves in Europe. Groundwater fulfils 75% of the drinking water needs and about half of the industrial water needs. More than 3 millions inhabitants of the Alsace Region (France) and the Land of Baden-Wurttemberg (Germany) directly depend on this resource for their water supply.

The Upper Rhine Valley aquifer is severely affected by four major pollutions: nitrates, pesticides, chloride and Volatile Organic Compounds (VOCs).



Location of the Upper Rhine Valley aquifer (shaded area)

Method

The questionnaire was sent by postal mailing. 2 questions are asked to respondents:

1. whether they are willing to pay for the proposed scenarios and

2. how much they are willing to pay.

A Logit model is used to identify significant variables of responses to question 1. OLS regressions and Tobit models analyze responses to question 2.
The elicitation format is a payment card and the payment vehicle is an increase of the water bill. The questionnaire includes additional questions on groundwater perceptions and uses and socioeconomic characteristics of the respondents.

The business as usual scenario assumes that in 2015:
• nitrates, pesticides and chlorides concentrations in groundwater should satisfy the potable standards thanks to the efforts to reverse the tendencies;

• without VOCs groundwater protection and remediation actions, VOCs pollution plumes would extend leading to the contamination of urban drinking water wells and to negative environmental impacts.

Chlorinated solvents concentrations – 1997 water quality survey

	Scenario 1	Scenario 2
Objective	**Restoring drinking groundwater quality**	**Restoring natural groundwater quality (no traces of solvents in the long term)**
PoM timing	**10 years**	**10 years**
Actions implemented as part of the scenario	**- Remediation measures implemented in historical contaminated sites located in areas where CS exceeds drinking water threshold value** **- Preventive measures applied (through regulation) in all enterprises using chlorinated solvents and located in areas** where concentrations in solvents exceed drinking water threshold.	**- Remediation measures implemented in historical contaminated sites located in areas where traces of solvents are detected** **- Preventive measures applied (through regulation) in all enterprises using chlorinated solvents and located in areas** where traces of solvents have been detected
Expected benefits	**- Drinking water quality level restored within** 10 years **but traces of CS remain in the aquifer, with risk of impacts on ecosystems.** **- Reduction in drinking water treatment cost.**	**- Natural quality restored, traces of CS disappear within** 50 years**: natural attenuation contribution.** **- Environmental benefits for ecosystems and water related species, absence of risk for humans using groundwater.** **- Heritage benefits (for future generations).**

Results

> The response rate (13.4%) is conforming to similar methods.

> 62% of the respondents accept to contribute to scenario 1: the mean WTP is 42.6€ per households. In scenario 2, 54% of the respondents are willing to contribute. The mean WTP is 77€ per household.

> Protest rate are high: 53% for the scenario 1 and 17% for scenario 2. Scenario 1 is perceived as inconsistent with the polluter pays principle or rejected because of the proposed payment vehicle.

> The variables *income*, *children*, *credibility of scenario* significantly affect the decision to contribute

> Unexpectedly, the *knowledge of the water bill* has a negative and significant impact on the WTP amount. *Income*, *water activities*, *groundwater pollution concern* are additional and recurring significant variables.

> After the WTPs were aggregated, the total benefits of groundwater protection are estimated at 31.3 million €/year for 10 years for scenario 1 (drinking quality level) and 49.3 million €/year for 10 years for scenario 2 (natural water quality level).

Conclusion

The study reveals that there is **no WTP statistical difference between households living above and outside the aquifer** (not using it for water supply). This suggests that groundwater option value and non-use value are significant, even if they were not assessed.

The population is very sensitive to the implementation of the **polluter pays principle**. The aggregated benefits will be compared to the costs of proposed scenarios.

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