Summary of the case study on valuation of the forest ecosystem services

Title of the valuation study: **The benefits and costs of riparian analysis habitat preservation: A willingness to accept/willingness to pay contingent valuation approach**
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Reference: *Amigues, J.P.; Boulatoff, C.; Desaigues, B.; Gauthier, C.; Keith, J. (2002): The benefits and costs of riparian analysis habitat preservation: a willingness to accept/willingness to pay contingent valuation. Elsevier B.V., Ecological Economics 43 (2002): p. 17-31.*

Objectives of the study

Riparian forests mitigate flooding, serve as temporary reservoirs, stock the water surplus, prevent bank erosion, improve water quality and preserve habitat for many species. The contingent valuation method (CVM) was used to obtain the willingness to pay (WTP) of households for ecosystem services in the contiguous area of the Garonne River. Moreover, the willingness to accept (WTA) the provision a strip of riparian land for habitat preservation of landowners was examined. Furthermore, a comparison of the derived benefits (WTP) and costs (WTA) was made.

The aim was to do a full cost-benefit estimation including losses and benefits for the different parties involved in a biodiversity conservation program. Thus, the welfare gains to the general public and welfare losses to the landowners resulting from the implementation of a preservation program along the Garonne river were assessed.

Scope of the study

The ecosystem services valuated in this study were habitat services (local species, migrant species reproduction) and regulating services (limitation of soil erosion and water purification). The geographical scope covered was regional.

The Toulouse metropolitan area with 750 000 residents is located in the South and Central portion of France. The wetlands adjacent to the Garonne River are under pressure from agriculture through erosion and irrigation. The willingness to pay (WTP) site included the entire metropolitan area. The willingness to accept (WTA) site under study began north of Toulouse and continued approximately 100 km. About 400 households owned land along this section of the river. Owners were already legally required to leave an unused 3 m wide strip of land along the river. The proposed preservation program in the study suggested a strip of land from 10-50 m on a 70 km river section.

Valuation method(s) applied

The **contingent valuation method** (CVM) was used to determine the **willingness to pay** (WTP) of local residents and to estimate the **willingness to accept** (WTA), or minimum compensation, of the landowners.

WTP: A random sample of 402 representative households for the WTP questionnaire was selected in the study area. In the first scenario, the WTP for preserving a 10-50 m riparian strip with a length of 70 km in a 'natural' state was examined. The respondents were asked whether they were willing to participate financially in the restoration project through an increase in annual local taxes for five years. If the response was affirmative, the WTP was elicited in one of two formats: **closed-ended dichotomous choice** (with six values ranging from 10 to 500 FF) or **open ended**. The second WTP question was posed, based on a second scenario in which financial support was already available for only 20 km of restoration. Thus, the respondents were asked whether they would pay for the restoration of the remaining riparian area. Furthermore, standard **socio-economic data** was collected.

Four alternative estimations of the open-ended WTP were made: **linear, Tobit, Heckman**, and **semi-log**. For closed-ended WTP responses, a **logit model** was used.

WTA: Landowners were asked to choose if they want to participate in one of three 10 years-programs. Additionally, they were asked for their minimum amount of compensation to participate. Questions about the number, size, and use of parcels of land owned, as well as socio-economic characteristics were included in the questionnaire.

For the analysis, the **simple spike model was** used. Additionally, a **Heckman approach** was used and executed in **LIMDEP**. The initial estimation was a **probit model** to determine the probability of participating. The **inverse Mills Ratio** was calculated and carried out in order to adjust the estimated coefficients for the zero responses. Since there remained a significant number of zero WTA observations, a **Tobit model** was then applied. A final approach to solving the problem of zero WTA was to use a **log linear estimation**.

Key results

- The WTP study reaffirmed a relatively large difference in WTP between open and closed ended responses. Moreover, residents of the city of Toulouse tended to have lower WTP than non-residents. In all estimations, the socio-economic parameter 'donation last year' was highly significant to the WTP amount.

- The WTA results were constrained by relatively few positive responses. Farmers and older respondents were significantly more likely to participate in the program. The compensation demanded was reasonably consistent with payments being made for existing paid conservation (Table 1).

Table 1 WTA means and standards deviations

	Mean (WTA per ha)	Standard deviation
Total	584 FF ($114)	1639 FF ($321 USD)
All Farmers	1207 FF ($236)	2341 FF ($518 USD)
All Non-farmers	160 FF ($31)	640 FF ($125)
Total Participants	1324 FF ($260)	2241 FF ($440 USD)
Participating Farmers	1852 FF FF ($363)	2646 FF ($519 USD)
Participating Non-farmers	531 FF ($104)	1099 FF ($215 USD)
Total Non-0 WTA	2942 FF ($577)	2545 FF ($500 USD)
Farmer Non-0 WTA	3704 FF ($726)	2672 FF ($524 USD)
Non-farmer Non-0 WTA	1417 FF ($278)	1417 FF ($278 USD)

- The **minimum estimate of WTP was $7 USD p.p.** (250 000 persons over 5 years). Hence, the resulting undiscounted benefit stream was $8.58 million USD. A **less conservative estimation was $12 USD** (total undiscounted benefit $16.2 million USD). **At 5% discount rate, the present values of benefits were $7.4 million USD and respectively $14.0 million USD**.

- The comparison of the derived benefits (WTP) and costs (WTA) for habitat preservation in riparian forests of France suggested the possibility of a favourable a benefit-cost ratio. Nevertheless, the uncertainty associated with the CVM values (zero WTA) made a definitive conclusion impossible.