

## Title

Accounting for psychological impacts in cost-benefit analysis of flood prevention programs

## Authors

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## Research questions

In France, the holders of flood prevention action programs (PAPI) must, for projects exceeding 2 million euros, carry out a cost-benefit analysis (CBA) to be able to apply to the award of a grant from the major natural hazards prevention fund. To date, psychological impacts from floods are not accounted for in these CBA. This is problematic since psychological traumas such as post-traumatic stress disorder and depression although represent the greatest health impacts from floods (Fewtrell and Kay 2008).

In this paper, we propose the monetarized DALY to evaluate the costs of psychological impacts from floods. We tackle the following research questions :

- What is the value of an avoided depression/post-traumatic stress disorder in France?
- How useful is the monetarized DALY approach to evaluate the avoided psychological damages from flood prevention programs?
- What are the trade-offs associated with using the monetarized DALY vs. willingness to pay approach to assess the cost of a psychological impact from a flood event?

## Methodology

We performed a literature review on all the sources of disability coefficients and QALY scores for the two most important psychological damages from floods (post-traumatic stress disorder and depression). We also reviewed the literature on the impact duration. From these two reviews, and using the french tutelary value for the value of a life year, we computed average estimates and sensibility intervals of the cost of psychological impacts

We also performed a systematic literature review on several sets of willingness to pay (WTP) studies : (1) WTP to avoid psychological impacts and (2) WTP to avoid an intentional shock (natural disaster) and non-intentional shock (aggression), to investigate the possibility of a benefit transfer.

Having tried these two approaches (benefit transfer and monetarized DALY), we are able to compare the advantages and drawbacks of each of them in the case of the monetarization of psychological impacts from floods.

## Preliminary results

### **What is the value of an avoided depression/post-traumatic stress disorder in France?**

We obtain a value of 26 051 € for an avoided depression and 32 143€ for an avoided PTSD, which includes treatment costs, cost of opportunity and intangible impacts.

## **How useful is the monetarized DALY approach to evaluate the avoided psychological damages from a flood protection project?**

These values can then directly be used for constructing a psychological damage function, using the existing methodology developed by the French Ministry of the Ecological and Inclusive Transition. This method links the hazard's characteristics to a number of inhabitants put in safety by a project. Using results from the literature, an additional intermediary step has been made to obtain the average numbers of psychological impacts among a flooded population.

The DALY makes it possible to take into account in monetary terms health impacts in CBAs. Indeed, as all health impacts are measured through a single indicator of healthy lost years of life, it is just necessary to have a monetary value for a year of healthy life to be able to value all impacts. project health. The tutelary value for a year of life recommended in France could be used (Commissariat Général à la Prospective et à la Stratégie. 2013). A limitation of this method is the assumption of a proportional impact of the severity and duration of the disease on the value of the health damage, which is not verified in the studies (Bureau 2018).

## **What are the trade-offs associated with using the monetarized DALY vs. willingness to pay to avoid a psychological impact?**

The monetarized DALY is easier to implement than the existing methods and makes it possible to better target the intangible benefits. Indeed, the main existing methods must directly ask the population about the amount that they would pay for a variation of an environmental or health component. As these surveys are expensive and require some expertise, the use of a WTP measured in another study is widely practiced. This transfer of WTP is, however, accompanied by a risk of overestimation or underestimation insofar as the contexts of the evaluation (scenarios used in the survey, socio-demographic characteristics of the population surveyed, etc.) influence directly the amount of the WTP. If the criteria for the applicability of the method are met and the scientific recommendations are correctly applied, the profit transfer method provides, at low cost, a value adapted to the context at stake. Neither the studies on the WTP for avoiding a shock, nor the studies on the WTP for the avoidance of psychological harm have enable us to perform a satisfactory benefit transfer.

- The studies on the WTP for avoiding a shock does not allow us to isolate the effect of the psychological impacts from the shock.
- The studies of WTP for the avoidance of psychological harm are rare and conducted far away from our context of interest. An additional limitation is the difficulty of isolating the intangible portion of the benefits, since the responses are likely to reflect all the costs borne individually, including medical costs (CGDD 2013).

## **References**

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