Storm Surges Congress, Hamburg, Germany
13–17 September 2010
SSC2010-42

Evaluation of Intangible Losses due to Coastal Floods: Applicability of Available Economic Valuation Methods

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Background

Storm surges in the North Sea have caused massive floods in Germany and are expected to occur more frequently due to climate change. The German XtremRisK project was started with the main objective to determine flood risks in estuarine areas and at open coasts in Hamburg and Sylt Island, due to extreme storm events in the North Sea. The risk is estimated using the definition 'product of probability and the expected damages' (Oumeraci, 2004). The expected damages are either tangible, generally evaluated in monetary terms (Smith and Ward, 1998; Jonkman and Vrijling, 2008) or intangible. Evaluation of intangible damages such as health impacts, cultural and environmental damages in monetary terms is extremely difficult (e.g. Tapsell et al., 2002; Messner et al., 2006), but cannot be omitted when calculating the overall risk. Therefore, the main focus of this research is to determine the applicability of available valuation methodologies to evaluate intangible damages induced by floods in an estuary and at open coast, represented by Hamburg and Sylt Island, respectively.

Methodology

First, the possible intangible losses due to coastal flooding are identified. Further, the available valuation methodologies for each loss category are defined. Then, the applicability of available methodologies to evaluate the possible losses in the study areas is investigated and critically discussed.

Results

Intangible losses are divided here into two categories; social and environmental losses.

Valuation approaches associated with social losses basically include stated preference methods such as Contingent Valuation Method (CVM) and revealed preference methods such as Travel Cost Method (TCM) and Hedonic Price Method (HPM). CVM, which is a survey approach, in which, the willingness to pay is determined by asking the respondents to value the assets (Klose, 1999), represents the most applicable method for the evaluation of health impacts due to flooding. The most appropriate methods for the valuation of cultural losses, however, are TCM, which depends on the time and travel cost that people spend to visit a specific location (Navrud and Ready, 2002), and HPM, which values a location according to its neighbourhood characteristics (Rosen, 1974). Having a thorough knowledge on the advantages and the limitations of these methods, the applicability of these methods will be examined for evaluation of social losses in Hamburg, in which, the social losses are assumed to be dominant. The results of this analysis will be presented at the conference.

For the evaluation of environmental losses, the applicability of the aforementioned methods and the market based valuation approaches such as Replacement Cost Method (RCM), which measures the cost of man-made substitute (Heal, 2000) is investigated. Sylt, being a touristic island, includes several recreational activities related to environment and therefore, more focus is given to environmental damages. The different ecosystems on Sylt and their services will be identified and the possible damages due to flooding will be determined. Then the

applicability of the available methods to evaluate the damage to the ecosystem services will be investigated.

The results of the analysis of the applicability of the available valuation approaches for the evaluation of intangible losses in the study areas, Hamburg and Sylt Island, will be presented at the conference.

Acknowledgement

Financial support provided for the first author by German Academic Exchange Service (DAAD) is greatly acknowledged. The German Federal Ministry of Education and Research BMBF (Project No. 03 F 0483 A) is gratefully acknowledged for their financial support for the project XtremRisK.

References

Heal, G. (2000) Valuing Ecosystem Services. Ecosystems 3, pp. 24–30.

Jonkman, S.N. and Vrijling, J.K. (2008) Loss of life due to floods. Journal of Flood Risk Management 1, pp. 43–56.

Klose T. (1999) The contingent valuation method in health care. Health Policy 47, pp. 97–123.

Messner, F., Penning-Rowsell, E., Green, C., Meyer, V., Tunstall, S. and van der Veen, A. (2006) Guidelines for Socio-economic Flood Damage Evaluation, Integrated Flood Risk Analysis and Management Methodologies. FLOODsite Project Report, HR Wallingford, UK.

Navrud, S. and Ready, R.C. (2002) Valuing Cultural Heritage, Applying Environmental Valuation Techniques to Historic Buildings, Monuments and Artifacts. Edward Elgar, Cheltenham, UK.

Oumeraci, H. (2004) Sustainable coastal flood defences: Scientific and modelling challenges towards An integrated risk-based design concept. Proc. First IMA International Conference on Flood Risk Assessment, IMA-Institute of Mathematics and its Applications, Session 1, Bath, UK, pp. 9-24.

Rosen, S. (1974) Hedonic Prices and Implicit Markets: Products Differentiation in Perfect Competition. Journal of Political Economy 82, pp. 34–55.

Smith, K. and Ward, R. (1998) Floods: Physical processes and human impacts. John Wiley and Sons, Chichester, UK.

Tapsell, S.M., Penning-Rowsell, E.C., Tunsall, S.M. and Wilson, T.L. (2002) Vulnerability to flooding: health and social dimensions. Phil. Trans. R. Soc. Lond. A 360, pp. 1511-1525.