

# Towards a Review of the Intangible Impacts Of Flooding

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## 1. Introduction

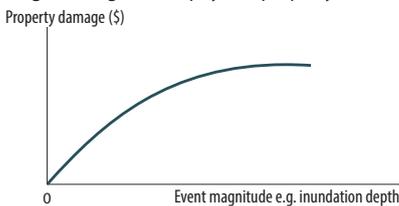
Floods are known to cause large monetary losses. However, their impacts extend far beyond these direct impacts:

- 1) Changes in physical health conditions, e.g. depression
- 2) Changes in well-being or life satisfaction
- 3) Changes in perceptions of responsibility, security etc.

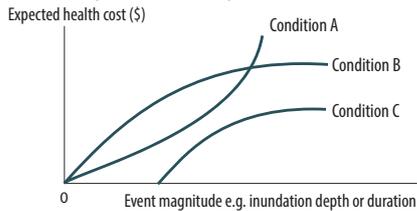
These impacts do not have pre-existing monetary values. Therefore, they tend to be ignored in decision making. This is a problem because risk management should be based on a full understanding of flood impacts.

If we find monetary values for these impacts, we can extend our methods. See below for example for health:

### A) Stage-damage curve (physical property)



### B) Dose-response curve (expected health costs)



(Martinez & Hudson, 2020)

## 2. SLR Methods

This review follows the PRISM guidelines for systematic literature reviews. Three search engines were used: Web of Science; Google Scholar; Scopus. As shown in Fig. 1, 12 different search terms were used in each search engine and refined with this inclusion criteria:

- ▶ Published between 2000/01/01 and 2019/07/31;
- ▶ Only peer reviewed journal publications;
- ▶ The study contained/reviewed empirical data at the household/individual level rather than aggregated study units;
- ▶ The hazard studied was explicitly stated to be flooding;
- ▶ The paper contained information on the magnitude an intangible flood impact, e.g. well-being impacts are \$10,000, mental health impacts last for 6 months, etc.

## 3. Initial summary of methods used

According to Martinez and Hudson (2020) the intangible health impacts are often valued via:

- 1) Life Satisfaction/subjective wellbeing approaches
  - ▶ Uses the trade off between an impact and happiness, and happiness and income; Direct proxy of welfare; a large deal of theoretical uncertainty
- 2) Willingness to pay/value of a statistical life
  - ▶ Uses what you would pay to avoid an impact; Actionable value for policy making; 'theoretically correct' value; subject to hypothetical and protest bias
- 3) Cost of Illness/Impact
  - ▶ Uses what you paid to recover from the intangible record; objective values; rapidly changes with treatment methods

## 4. Initial summary of monetary results

	Joseph et al. (2015)	Sekulova & van den Bergh (2016)	Hudson et al. (2019a)	Hudson et al. (2019b)	Joy et al. 2019
Study Area	England (n = 243)	Bulgaria (n = 600)	France (n=886)	Vietnam (n=1010)	Philippines (n= 392)
Impact studied	Property-level adaptation	Flood impacts and memory	Flood impacts	Flood impacts	Flood Impacts
Valuation method	Contingent Valuation	Life satisfaction	Life satisfaction	Life satisfaction	Life satisfaction
Size of impact	Intangible benefits between €550-€720	Experiencing ,heavy damages' is ~100% of monthly income	€100,000 about 2 times tangible impacts, dropping 50% after a year	€1900 falling to €430 5 years later	€1700, 1.4 to 1.7 times the tangible impacts

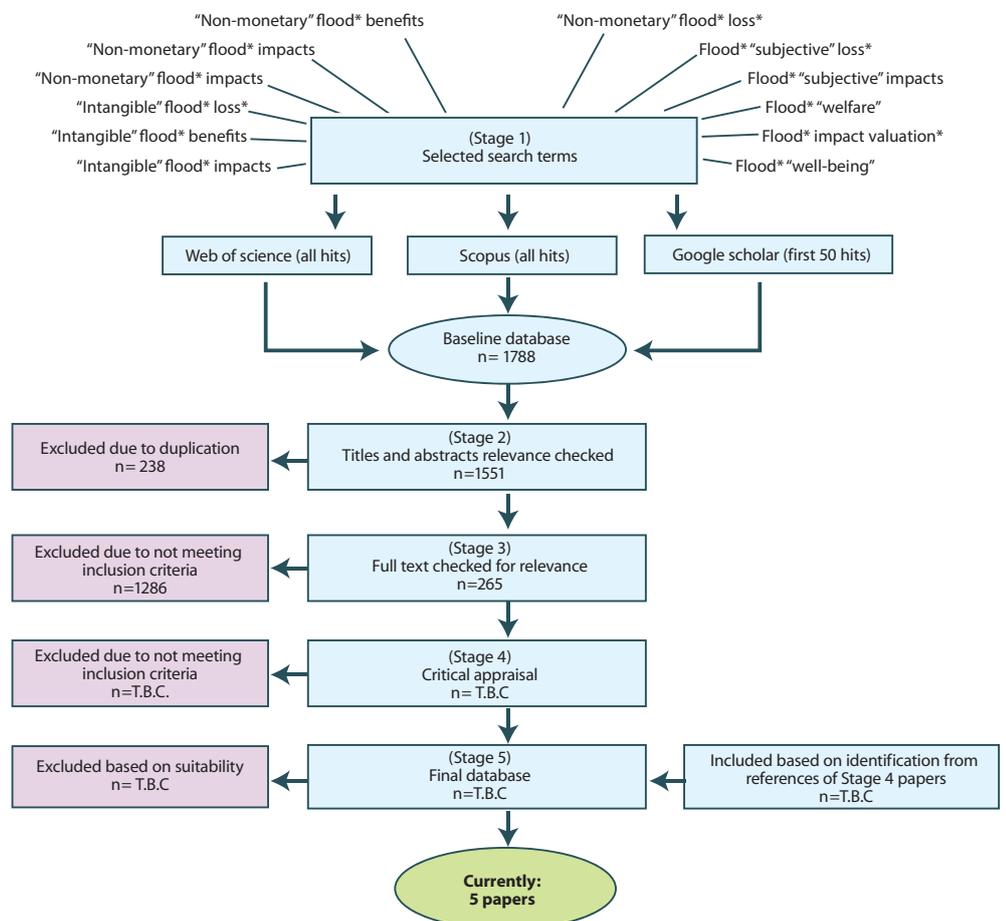


Fig. 1. PRISMA Flowchart of the structured literature review process

## 5. Open Questions

Open questions for feedback, suggestions, or anything that cross your mind:

- ▶ The search terms – anything useful missing?
- ▶ The inclusion criteria – are they sensible, too strict?
- ▶ The move forwards with all intangible impacts or just those measured with life satisfaction
- ▶ The search terms – anything useful missing?

Comments, suggestions, other opinions, etc., please send to 'phudson@uni-potsdam.de' if I am not here

Should we ignore intangible impacts in risk assessment?

The initial answer is no. The impacts appear large. We currently need to collect what robust information we have to extend current frameworks.