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On the modeling of significance for flood damage assessment

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ABSTRACT

Despite decades of research, flood loss estimation is still a challenging task. Drawing on recent research, a number of major problems can be identified among them the question of what specific damages under what circumstances are seen as significant? It is sensible that people would choose risk management strategies according to their capacity to reduce significant damages, disregarding those ones which mainly influence losses not seen as significant. The question arises as to what damage is significant when? The paper proposes and tests a model for assessing significance through case studies in Australia and Italy. Despite the explorative nature of this paper, results provide evidence for (i) the importance of its systematic analysis, as a first step of damage assessment as well as (ii) the need for a deeper knowledge of significance.

1. Introduction

Comprehensive estimation of losses is important both ex-ante and ex-post flood events. Ex ante, the interest lies in the identification of the most suitable mitigation measures; having a reliable figure of the "total damage" and also its "composition" due to direct physical, indirect and other types of damages on the several exposed sectors (see below), is important for appraising the cost-efficiency of alternative mitigation options. This is clearly a fundamental aspect of any "flood risk management plan" as required by the recent Flood Directive [1]. On the other hand, being able to estimate the "total loss" after an event is equally important to support the emergency management and to decide priorities for reconstruction and for compensating victims.

Ideally then, all flood damages should be taken into account in risk assessment; as set out in Table 1 which lists all types of likely damages from flooding. The table synthesizes current knowledge from available literature (for a review see [2,3]) and current practices (i.e. flood damage assessment software, e.g. HAZUS-MH, HEC-FIA, and established methodologies, e.g. [4]), and classifies damages according to both the exposed sector and their nature (i.e. direct/indirect/intangible). A pragmatic approach is adopted according to which damages are classified into direct and indirect, tangible and intangible losses [4–8]. Within each of these categories further classification is possible in line with sectors of affected items such as damage to the residential sector, industry, people, infrastructure, etc. [9]. Table 1 points out that flood damage consists of all the harmful effects of a flood on a community: impacts on people, their health and their belongings, impacts on public infrastructure, cultural heritage and ecological systems as well as impacts on industrial production and the competitive strength

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Table 1
Flood damages in case of flood, adapted from Molinari [28].

Sector	Types of damage	Examples
Residential	Structure+contents (direct) Indirect Intangible	Carpeting, painting, furniture Clean up, temporary housing Loss of memorabilia
Commercial	Structure+contents (direct) Indirect Intangible	Carpeting, painting, stock, machinery Loss of income, additional cost, sandbags, pumps Loss of memorabilia
Farming	Physical damage (direct) Indirect Intangible	Livestock, crops, machinery Loss of income, repair fences, remove debris Loss of memorabilia
People	Physical (direct) Intangible	Death, injuries Stress, anxiety
Public	Structure+contents (direct) Service interruption (indirect) Intangible	Carpeting, painting Health, school services Loss of "sense of community"
Infrastructure	Physical (direct) Service interruption (indirect)	Lines, bridges, water tanks, plants Electricity, water supply, traffic
Environment	Ecological (direct) Service interruption (indirect) Intangible	Ecosystems Tourism, recreational activities Loss of "sense of community"
Cultural heritage	Physical (direct) Service interruption (indirect) Intangible	Museums, churches, historical buildings Tourism, recreational activities Loss of "sense of community"
Event costs	Warning+emergency (indirect) Intangible	Evacuation, warning, shelters, sand bags Loss of trust

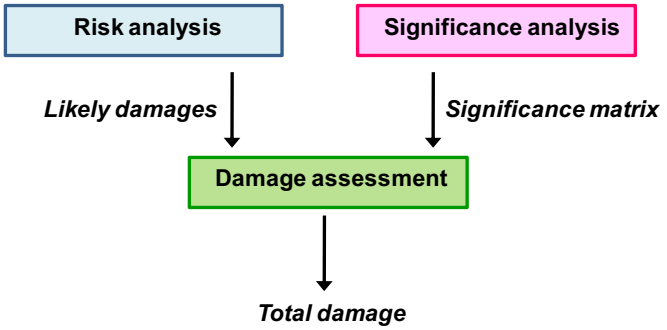

Fig. 1. Context of damage assessment (single column, color on the web only).

Table 2
investigated contexts and sample size

Context	Stakeholder (s)	Spatial scale (L)	Objective, temporal scale (o/T)	Number of interviewees		
				Italy	Australia	Total
A	Regional	Region/state	Ex-post, months to years	3	1	4
B	Regional	Affected area	Post-impact emergency, aftermath	3	1	4
C	Regional	Municipality	Planning, several years	0	1	1
D	Local/mayor	Municipality	Ex-post, months to years	1	0	1
E	Local/mayor	Municipality	Post-impact emergency, aftermath	1	0	1
F	Local/mayor	Municipality	Planning, several years	1	1	2
G	Provincial authority	Province	Ex-post, months to years	1	0	1