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Using participatory Multi-Criteria Assessments for assessing disaster risk reduction measures

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ABSTRACT

This paper introduces a participatory Multi-Criteria Assessment (MCA) methodology developed through the Resilience Increasing Strategies for Coasts – Toolkit (RISC-KIT) project and implemented in nine case studies in Europe. The purpose of the MCA was to bridge the disciplinary divide between engineering sciences and social sciences, facilitate the communication and dissemination of local coastal risk assessments and Disaster Risk Reduction (DRR) measures' evaluation to a broad range of actors. The process addressed the importance of integrating scientific knowledge with stakeholders' knowledge to understand and assess the possible social, political and economic implications of different DRR measures, which could foster or hinder successful implementation. The paper discusses the methodological aspects and implementation of the approach which included visualizing risk reduction of DRR measures using paper-based cards to support interaction and negotiation among participants to select preferred strategic alternatives (SA), and a participatory MCA where stakeholders evaluated the SA against three (self-weighted) criteria: feasibility, acceptability and sustainability.

1. Introduction

Disasters are increasingly uncertain and complex due to rapid environmental and socio-economic changes occurring at multiple scales (Djalante et al., 2013). Adequate management responses able to address these challenges in coastal areas demands both a growing body of knowledge on coastal hazards and their impacts, as well as an understanding of local socio-economic and institutional preconditions (Adger et al., 2005). Approaches combining protective (e.g. dike protection) with preventive (e.g. spatial planning), and preparedness (e.g. early warning system) measures are crucial to be able to face current and future coastal challenges. However, the adequacy of DRR measures depends not only on the technical implementation of them, but also on an understanding of the physical, political and socio-economic contexts in which these measures are being proposed, as well as their potential benefits or drawbacks. To be able to assess the trade-offs between socio-political, environmental, and economic impacts of decisions in DRR, it is necessary to consider the various and sometimes divergent views of stakeholders involved in coastal management.

Institutional determinants, such as information and skills, economic resources, technological capacity, as well as the equitable distribution of and access to decision making, financial resources and capacity for flood alleviation, have a strong impact on the effectiveness of DRR measures and on the financial capacity for implementation at different governmental levels (Vulturius and Keskitalo, 2013). Here, local governments play a key role in coastal management, both as the main managers of socio-technical infrastructure and through their responsibility for long-term physical planning (Bulkeley et al., 2011). For instance, the extent of induced damage does not only depend on the extent of the hazard but also on the ability of social institutions and managing authorities to cooperate in the implementation of disaster prevention, preparedness and response measures (Penning-Rowsell et al., 2014; Schanze et al., 2006).

Besides institutional factors, daily experiences and local knowledge of people using resources in risk-prone areas, have proven to be detrimental for determining whether policies and measures will be accepted or not (Keskitalo, 2013), in generating support for initiatives for mitigation and adaptation (Lujala et al., 2014), and in making vulnerability mapping more locally relevant and reliable (Rød et al., 2012).[1] Thus, involvement of community members and key actors through participatory

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[1] In RISC-KIT vulnerability is understood as the conditions and capacities that make a system susceptible to harm as a result of a hazard (UNISDR, 2009a).

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methodologies are crucial for integrating opinions in the formal decision-making process because the ability to reduce risk from hazards will depend to a large extent on the political, economic and technological capacities that actors involved in coastal management have at their disposal. Furthermore, limits for adapting to climate change are endogenous to society and hence contingent on ethics, knowledge, attitudes to risk, and culture (Adger et al., 2009). This means that regardless of how effective scientific studies show a risk-reducing measure might be, changes will be implemented only if they are perceived as meaningful within a culture, feasible in the particular political setting, and socially accepted.

The present paper introduces the methodology developed and used in RISC-KIT to facilitate stakeholder involvement in the project. The methodology comprises of i) an interactive tool based on paper cards for presenting complex information on coastal risks and measures; and ii) a participatory MCA methodology to assess the feasibility, acceptability, and sustainability of the proposed DRR measures in each of the nine RISC-KIT cases: Kiel Fjord in Germany; North Norfolk in the United Kingdom; Porto Garibaldi and Bocca di Magra in Italy; Praia de Faro in Portugal; Kristianstad in Sweden; La Faute Sur Mer in France; Varna in Bulgaria; and Tordera Delta in Spain.

2. Multi-Criteria Assessments for evaluating DRR measures

MCA techniques include decision models which contain "a set of decision options which need to be ranked or scored by the decision maker; a set of criteria, typically measured in different units; and a set of performance measures, which are the raw scores for each decision option against each criterion" (Hajkowicz and Collins, 2007). MCAs provide a systematic methodology that combines technical knowledge on benefits and trade-offs of particular choices with locally-relevant criteria. They are most often used to quantify actors' considerations about (mostly) non-monetary factors in order to outweigh different courses of action (Huang et al., 2011). Cost Benefit Analysis or Benefit-Cost Ratios is another method/approach used to compare measures and justify investments (De Bruin et al., 2009). In contrast to Cost-Benefit analyses, MCAs are deemed suitable when the benefits (e.g. saving lives, biodiversity) cannot be quantified and valued purely in monetary terms (Lim et al., 2004).

An MCA will typically assess measures using different criteria or indicators which address the identified problem and defined objectives. It is used to help decision-makers compare and prioritize a range of individual or groups of measures, together with a group of actors. To do this effectively the problem must be identified and the objectives defined (Penning-rowsell et al., 2005). A participatory MCA can aim to achieve different levels of participation from the actors involved. Using the concept of 'ladders of participation' developed by Arnstein (1969) and adapted by Basco-Carrera (Basco-Carrera et al., 2017) for water resources management, possible levels of participation are; ignorance (non-participation), awareness, provide information, engage in consultation (low participation), two-way discussion, co-design or co-decision making (high participation). Typically a participatory MCA should aim for one of the steps in high participation; two-way discussion, co-design or co-decision making. While MCAs do not necessarily need to be participatory (Chitsaz and Banihabib, 2015), adopting a participatory approach ensures transparency, increases the likelihood of engagement, and provides a platform for moderated discussion (Haque et al., 2012; White et al., 2010).

MCA techniques have proven beneficial to, for example optimize policy selection in water and coastal resource management (Linkov et al., 2006), and to improve the transparency and analytic rigor of the decision-making process which leads to increased public acceptance of the proposed alternatives (Linkov et al., 2006; Dunning et al., 2000). MCAs can be helpful in socio-ecological evaluations (Saarikoski et al., 2015) because they can help structure an assessment of complex problems along both cognitive and normative dimensions, both of which are fundamental when evaluating social-ecological systems (Vatn, 2009); they facilitate comparison of ecological objectives with socio-cultural and economic ones in a structured and shared framework (Mendoza and Martins, 2006); they can facilitate multi-stakeholder processes, transparency and discussion about subjective elements in policy analysis, including the nature and scope of the problem related to decision-making, the selection and definition of options (i.e., measures), and the characterization and prioritization of evaluation criteria (Keune and Dendoncker, 2013); MCA techniques can facilitate dealing with incomplete information (often present in most environmental planning situations) by allowing the use of a mixed set of quantitative and qualitative information (Chan et al., 2012).

The aim of the MCA in RISC-KIT is to map the diversity of perspectives that may be taken on a particular set of measures, to highlight the key features underlying the differences in opinions and to provide a framework for debate. More specifically, the MCA in RISC-KIT is used in three ways: 1) as a way facilitate the communication and presentation of project results in a coherent and contextualized manner to various actors; 2) as a way to capture other types of knowledge, such as local every-day experiences, socio-economic and political factors that might affect how the proposed measures are perceived; and 3) as a way of facilitating interaction between actors and raising awareness of risks and potential measures.

2.1. Stakeholder selection

In this paper, we use the concept of stakeholders to refer to actors from different groups of society that directly or indirectly might affect or be affected by coastal risks, or have an interest in being included in the discussion. However, we use the concept cautiously and aware of critical approaches highlighting the neoliberal nature of the term (Pelling, 2007). In light of these discussions, we do not claim to involve all affected parties in the RISC-KIT project and we do not seek to achieve representativeness since the aim of the work being presented here is not to make a decision but to engage in an exercise that stimulates knowledge exchange.

Stakeholder identification is a crucial step in any participatory methodology (Challies et al., 2016; Thaler and Levin-Keitel, 2016). In MCA methodologies, the type of stakeholders involved in the process depends on the aims of the study and can thus be limited to decision-makers or can be open to other type of actors deemed relevant, including the private sector, citizens, or associations. However, there is an increasing recognition of the need to include a broad spectrum of stakeholders in decision making (not only decision-makers), especially in relation to urgent societal–environmental problems, such as adaptation to climate change (O'Neill, 2001; Renn, 2006). This recognition emerges from the acceptance of other forms of knowledge, not just scientific or technical, that allows policy-making to take into consideration traditional forms of knowledge and every-day experiences of people. In RISC-KIT we adopt this latter approach.

We depart from 9 main stakeholder groups (SH) identified through a stakeholder analysis carried out at the beginning of the project and further described in Table 1. The stakeholder groups included are; coastal managers, land use planners, civil protection authorities, academics, consultants, local residents, local citizen groups, local government authorities and private sector representatives. Because the role of each stakeholder will vary across contexts, we also defined different roles which stakeholders could potentially fulfil. For instance, coastal managers will probably not have the same role across case studies (e.g. not all coastal managers are decision-makers throughout the 9 RISC-KIT cases). While stakeholders could only represent one of the nine (stakeholder) groups, they could play more than one role. Also, it is likely that one of the roles is more predominant than the other. Seven potential stakeholder roles have been defined; decision-makers, lobbyists, informed receptors, overseers, implementers, experts and private sector. For instance a stakeholder representing the group "consultant" could have