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Editorial

Climate change for coastal areas: Risks, adaptation and acceptability

Coastal areas are attractive for people and activities worldwide, because of globalization (90% of global trade is seaborne trade), leisure and weather conditions. For example, 23% of the worldwide population is living at less than 100 km of seashore and under 100 m high above sea level (Small and Nicholls, 2003). In consequence, its population density rate is 112 km⁻² compared to a worldwide density rate of 44 km⁻². Coastal areas are still attractive and it is projected that coastal population increase of 35% between 1995 and 2025 (TEICU, 2006). So far, many stakes are exposed to consequences of sea level rise: 15 of 20 biggest cities in the world are located along coasts (Small and Nicholls, 2003), among whom 13 are harbors (Hanson et al. 2011). People, buildings and infrastructure placed in some of these coastal areas are subjected to various progressive and extreme events that affect their safety, e.g., coastal flooding, coastal erosion, tsunamis, hurricanes, increased deterioration, etc. Nowadays, 76 million people live in a coastal flood prone area which represents 1.3% of worldwide population (Muis et al. 2016). Due to sea level rise, this figure could reach 200 million people exposed to weather related risks (Nicholls, 2011; Climate Central, 2019).

Studies on climate change (IPCC, 2013) indicate that the vulnerability of coastal settlements could be largely affected by the increase of deterioration rates in structures, changes in intensity and frequency of extreme events such as hurricanes (Salman et al. 2017, 2020), coastal flooding (Creach et al., 2020), etc. Therefore, mid- and long-term adaptation (Bastidas-Arteaga and Stewart, 2019) will complement the current mitigation actions to ensure more resilient coastal territories. Adaptation is not an easy task because the proposed strategies should provide an efficient vulnerability reduction, and at the same time, it should be economically feasible and socially acceptable.

This special topic invited contributions related to risk assessment and adaptation of coastal areas in a broad sense. Two articles (Martinez et al. 2020; Merschman et al. 2020) were invited after the international multidisciplinary conference OCEANEXT (<https://oceanext-2019.sciencesconf.org/>) that took place in Nantes, France in July 2019. This special

topic covers the fields of risk assessment and adaptation for several hazards (coastal flooding and erosion, hurricanes, and timber decay) and countries (Australia, Colombia, Germany, Philippines, Portugal, and USA).

Martinez et al. (2020) carried out an analysis of several cultural aspects for local risk management measures in coastal areas in Germany and Portugal. The selected areas are subjected to similar hazards (coastal erosion and floods) but they are very different from the cultural, economic, social and political points of view. The authors found that the risk management measures implemented in the past are highly influenced by local context for each location. Based on this finding, Martinez et al. (2020) suggested that the successful formulation and implementation of new risk management measures to deal with climate change related hazards should consider both local specificities as well the participation of communities.

Lemée et al. (2020) studied the willingness to accept and implement protective behaviors against flooding risks based on vulnerability indicators. The study was carried out in Cartagena, Colombia, which is a highly vulnerable low-lying coastal city in case of sea level rise. Lemée et al. found that the willingness to protective behaviors is not related with the characteristics of the housing that is generally perceived as a safe place. In contrast, the willingness to protective behaviors is mostly associated to the implementation of measures in the public area that visually remain the existence of a risk (shelters, dams, etc.). These results also highlight that education and communication actions are crucial to increase the adoption of protective behaviors for this community.

Wang et al. (2020) discussed the progresses and constraints for climate change assessment and adaptation of built environment subjected to coastal flooding in Australia and Philippines. They introduced first a risk-based framework that considers, in a rational way, the different sources of uncertainty related to the problem and that could be used to assess the vulnerability of coastal assets and population located in these areas. This risk approach is also extended to evaluate the cost-effectiveness of adaptation strategies. A particular focus is given to the problems of under- or over-adaptation that could reduce the effectiveness of the adaptation strategy or increase unnecessarily costs. Wang et al. (2020) also

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highlighted the importance of harmonizing adaptation planning and policy development at national level but taking into account for local particularities.

Merschman et al. (2020) investigated the repair and durability of timber poles subjected to decay and hurricanes under a changing climate. Decay rates and hurricanes' intensity and frequency could be modified by climate change that affects, in turn, the vulnerability of electric power distribution systems. Inspection and maintenance of these timber poles become therefore paramount for ensuring the serviceability and safety of power distribution systems. The study of Merschman et al. (2020) used a probabilistic framework to evaluate the effectiveness of a repair technique where the poles are reinforced by fiber-reinforced polymer. They considered three locations in United States: Miami, FL, Charleston, SC, and New York City, NY. They found that climate change could significantly affect the vulnerability of timber poles depending on the location. The increase in hurricane intensity due to climate change was identified as the most important factor affecting failure risk. From this vulnerability analysis, they provide recommendations for the optimal repair times that vary depending on the location and climate change scenario.

The articles collected in this special topic provided useful findings to the management of coastal settlements under a changing climate. Concerning assessment of climate change effects, Wang et al. (2020) and Merschman et al. (2020) illustrated how risk-based approaches and comprehensive modeling are powerful tools to account for the uncertainties related to each considered problem and the potential occurrence of multiple hazards, respectively. The results could be used to determine effective or cost-effective technical adaptation strategies depending on given climate change scenarios. Martinez et al. (2020) and Lemée et al. (2020) highlighted that adaptation should not only be based on economic and technical issues but also to account for human factors. Past experiences and participation of communities are crucial to adopt protective behaviors and to formulate and successfully implement measures that will reduce the vulnerability of coastal settlements. All studies showed that even if adaptation should be supported by national/international policies, local specificities (weather related hazards, community characteristics, risk management policies, etc.) should be considered to formulate feasible and acceptable solutions.

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