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THE HISTORIC CITY IN THE CLIMATE CHANGE. MIVES METHODOLOGY APPROACH

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KEYWORDS: Climate change; cities; methodological approach; MIVES; categorization.

ABSTRACT

A large number of historic structures are over risks in cities due to weather patterns and global climate change: sea-level rise, increasing frequency of storms and other extreme precipitation events. Conservation of urban areas of historic value implies the management of these changes, by ensuring the protection of social values as well as the authenticity and integrity of heritage sites. Disaster risk reduction and adaptation to climate change should be seen as components of conservation, as they all share the objective of addressing the challenges of sustainable urban development.

This research presents a methodological approach (MIVES - Integrated Value Model for Sustainability Assessment) for vulnerability and risk assessment, supported by an information strategy and a multi-scale urban model, in order to provide decision-making with objective and justified prioritization. A decision tree is built as a basis for future developments in specific urban case studies, supplying in present work some partial discussion by delivering a balanced solution in terms of accurate results and data requirements, by using a categorization method for urban modelling. The information is organized and structured in hierarchical levels, permitting the comparison of building vulnerabilities and risks through the use of a unique index, thus facilitating the decision-making that is needed for the prioritization of efficient interventions.

7.3. Calculation of risk levels

The risk index is therefore established by the ratio of the vulnerability index given by the sample building method and the real data on exposure. The risk level is given by considering, on the one hand, risk derived by flooding events caused by the increase of extreme precipitation events and, on the other hand, by flooding events caused by the increase in storm surge and sea-level rise. Figure 3 shows the distribution of the risk level for each lot (clear colour seems the lowest risk level).

Figure 3: Risk levels derived from extreme precipitation (left) and from storm surge and sea-level rise (right).

A survey campaign was carried out by authors and 100 buildings inspected, as a means of checking the accuracy of results obtained by using a limited amount of information. The results given by using real data and the categorization method were therefore compared and the margin of error resulted in a 9%. The largest difference was appreciated in the Loiola district blocks, where mainly single-family houses which presented diverse characteristics were analysed. The methodology has therefore presented its highest potential in districts which have been characterized by smooth development over time, such as the historic ones, providing a feasible and affordable solution for vulnerability and risk assessment in urban areas.

8. CONCLUSIONS

Now are summarized the main conclusions arising from present research:

1. Climate change and related natural hazards are impacting on cities and built-heritage assets located in coastal areas, with special regard to extreme precipitation and subsequent flood events, sea-level rise, and storms.
2. The vulnerability assessment methodology proposed, which is applied to sample buildings, has been based on the MIVES method. The impacts of flooding on buildings depend on the physical characteristics of the buildings and the social conditions of their inhabitants. A hierarchic structure based on a requirements tree has been established, in order to provide decision-making.
3. The methodology has been implemented in the city of San Sebastian, specifically in the area located nearby the boundaries of the Urumea River, comprising buildings of both a modern and a historic character. The data model has been built and the sample building method applied, generating 15 categories and representing 76% of the building stock. The information considered in this process can be easily obtained from public sources, providing an affordable and fast vulnerability assessment at urban level.

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