

## Cities and Sea Level Rise: A Roadmap for Flood Hazard Adaptation

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Coastal cities will face a range of increasingly severe challenges as sea level rises, and adaptation to future flood risk will require more than structural defences. Many cities will not be able to rely solely on engineering structures for protection and will need to develop a suite of policy responses to increase their resilience to impacts of rising sea level. The tools to promote flood risk adaptation are already within the capacity of most cities, with an assortment of policy tools available to address other land-use problems which can be refashioned and used to adapt to sea level rise.

This study reviews approaches for urban adaptation through detailed analyses of case studies of cities which have developed flood adaptation strategies that combine structural defences with innovative approaches to living with flood risk. The aim of the overall project is to produce a 'roadmap' to guide practitioners through the process of analysing coastal flood risk in urban areas. Methodologies and tools to estimate vulnerability to coastal flooding, damages suffered, and the assessment of flood defences and adaptation measures are complemented with a discussion on the essential impact that local policy has on the treatment of coastal flooding and the constraints and opportunities that result from the specific country or locality characteristics in relation to economic, political, social and environmental priorities, which are likely to dictate the approach to coastal flooding and the actions proposed. Case studies of adaptation strategies used by Rotterdam, Bristol, Ho Chi Minh City and Norfolk, Virginia, are used to draw out a range of good practice elements that promote effective adaptation to sea level rise. These can be grouped into risk reduction, governance issues, and insurance, and can be used to provide examples of how other cities could adopt and implement flood adaptation strategies from a relatively limited starting position.

Most cities will neither be able to defend all areas nor retreat entirely and will need to make a decision to retreat from certain locations or to relocate particular assets in areas at lower risk. We identify a series of specific questions which should be answered by city managers when selecting the most appropriate response for a particular location. The selection of options appropriate for building resilience does not depend entirely on the nature of the physical hazard and the accommodation space available, but also on the socio-political and environmental context in which adaptation decisions are made. The most important element in adapting to sea level rise is to have policies in place that incentivise risk reduction. The more comprehensively adaptation measures can be integrated into related policy areas and linked up with existing economic, social and environment measures, the more successful adaptation policies are likely to be. Changes to planning regulations, although resource-intensive, are the most cost-effective way of managing risk exposure over time. Flood insurance can also serve as a highly persuasive financial incentive for flood-resilient construction and locating businesses and homes in safer locations.