

IMPROVING
THE RESILIENCE OF UK
COASTAL COMMUNITIES



INTRODUCTION

Coastal policy documents increasingly talk about resilience as a goal, but they are often vague and unclear about what this means in practise. As a society we have been successful in reducing coastal risks from flooding and erosion since the 1953 disaster, but how can we enhance resilience to these same hazards? Building on developments by the US Army Corps of Engineers, the NERC 'CoastalRes' project has developed an approach to assess coastal resilience and this has been demonstrated for England. It shows how resilience to coastal flood and erosion hazard could be measured and applied within existing policy processes. As the extent of climate change impacts become apparent, adapting to evolving and less certain hazards, determining thresholds or trigger points, and balancing competing demands on the coast is increasingly important.

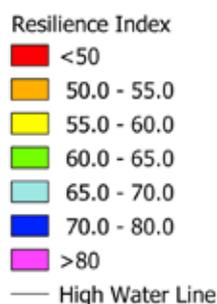
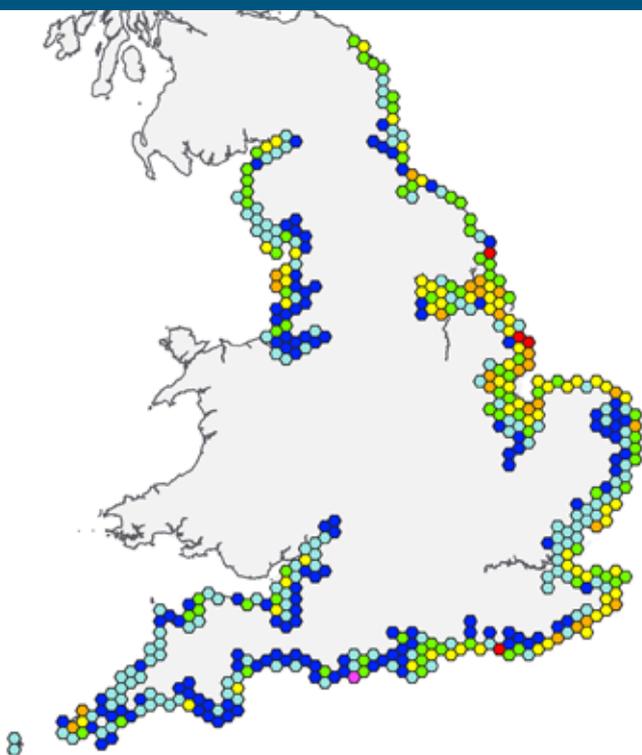
At the same time, it is also clear that some flooding and erosion will have to be tolerated and in many locations space for rising seas will have to be created. Resilience is a broad concept that incorporates, but goes beyond, risk to consider the ability to anticipate and recover from adverse events that will inevitably occur. Resilience and the enhancement of resilience is therefore becoming increasingly prominent in English policy documents.

However, the adoption of resilience as an overarching framework for strategic coastal hazard management has to date been limited.

FINDINGS

- Extending the current risk-based coastal management approach to one more grounded in the concept of resilience requires the development of new tools and techniques to measure and analyse potential futures and, importantly, incorporate stakeholder views and preferences. Fundamental to this is the quantification of resilience in a way that incorporates a multitude of physical, biota, social and economic components and behaviours.
- The framework and prototype coastal resilience model explored in the NERC 'CoastalRes' project show that, conceptually, a resilience approach works and quantification of coastal resilience in this way provides a powerful approach for time-dependent decision-making and management.
- Development of the methodology in partnership with stakeholders and using Multiple-Criteria Analysis also makes divergent views explicit and debatable prior to any management or policy decision.
- The methodology is flexible, can be applied using different combinations of resilience metrics and/or data sources, and could be adapted to address the specific needs of different areas, as well as diverse policy goals and contexts. It is flexible enough to be applied at any scale for which data are available.
- Consequently, it allows the comparison of results for different stakeholder perspectives over multiple scales – from local management unit to national analysis - adding an important dimension that can support the decision-making process.
- The method also has the ability to incorporate changing societal priorities and policies, updating any projection to reflect changing stakeholder preferences ensuring that the method can remain robust over time. Further exploration of suitable metrics and their representation within the model would be beneficial but may be restricted by the availability of data.

The illustrative results shown here demonstrate the practicality of formalising and quantifying resilience, and the insights obtained mainly concern this process of operationalisation.



Geographical variation in coastal Resilience Index (composite of economic, social and environmental perspectives) around the English coast. Hexagons are 90 km² output areas.

CONCLUSIONS/ RECOMMENDATIONS

From a policy perspective, a key issue in delivering resilience in practice is moving from a largely qualitative notion to a quantitative evidence-based framework allowing measurement and assessment to inform policy decisions. Pragmatically, this requires a clear definition and the integration of economic, environmental and social policy objectives for coastal areas, the selection of appropriate indicators and metrics. As the problem requires multiple indicators with different units the method requires scoring of the indicators and stakeholder weighting and priorities within a multi-criteria framework.

Hence the proposed framework for coastal resilience addresses the following steps:

1. Establish the decision-making context (policy aims, decision-makers, key stakeholders).
2. Identify clear objectives that are specific, measurable, agreed, realistic and time dependent
3. Define the available options that can realistically address the objective(s).
4. Utilise multi-criteria analysis to evaluate likely outcomes and measure performance.

Ideally, policy pathways should be developed alongside integrated models and relative weightings of a set of indicators to represent different stakeholder perspectives included in a transparent way, acknowledging that these weightings may vary according to different stakeholder views. These subjective weightings can then be used constructively to highlight the convergence/divergence that arises from differing stakeholder perspectives.

Refocusing national policy around enhancing resilience to coastal flooding and erosion requires firm commitment from government to develop a consensus methodology in which stakeholder values are explicitly considered, and incentives for coastal managers to engage with and apply this new approach. Such a transition might challenge existing governance arrangements nationally and locally, but would bring substantial reward in the form of a robust evidence-based framework for achieving more sustainable, equitable and societally acceptable adaptive responses to climate change and sea-level rise at the coast.

ABOUT THE STUDY

Resilience is defined pragmatically, in economic, environmental and social terms, integrating what is presently a disparate set of policy objectives for coastal areas. This definition includes several dimensions of resilience and a set of composite indicators are developed for each of these, grounded empirically with reference to available national geospatial datasets. A prototype coastal resilience model has been developed, which generates a quantitative resilience index both in space and in time (using appropriate scenarios).

In the 'CoastalRes' project, resilience was defined as "the ability of a system to prepare, resist, recover, and adapt to disturbances in order to achieve successful functioning through time".

Our prototype coastal resilience model uses the scores and weights to generate a quantitative resilience index. To apply this spatially, the coast is divided into units that capture the extent of erosion and flooding, allowing an index to be compiled at varying levels of resolution. This defines the state of resilience at a point in time. Changes in time can be examined by using scenarios to model how measures are likely to respond to changes in the natural environment (such as sea level rise) and the projected impact of policy responses. Human preferences are essential to evaluating resilience and a range of different stakeholder perspectives are captured using relative indicator weightings.

STEPS IN FRAMEWORK FOR COASTAL RESILIENCE



Establish the
decision-making
context



Identify clear
objectives



Define the available
options that can
realistically address
the objectives



Utilise **multi-criteria
analysis** to evaluate
likely outcomes and
measure performance



CoastalRes project website:

www.channelcoast.org/ccoresources/coastalres



UK Climate Resilience Webinar:

www.ukclimateresilience.org/news-events/coastal-resilience-to-flood-and-erosion-hazard-a-demonstration-for-england-webinar



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