A National Coastal Erosion Risk Assessment for Scotland

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Introduction
Coastal areas have historically been utilised for human settlement on account of an abundance of the natural resources required for survival and development. In the UK, living close to the coast remains desirable today as a consequence of the range of ecosystem services and benefits that coasts provide.

The geography of Scotland, with a highly undulating hinterland, long and indented coastline, together with a large number of islands, means that much of the economic, social, and cultural assets are largely located at the coast. Approximately 70% of the Scottish population (ca. 3.5 million people) live within 10 km of the coast (Scottish Executive, 2005). Approximately, 20% of the Scottish coast is thought to be ‘soft’, along which 33% of all buildings and infrastructure are located. The Climate Change Risk Assessment for Scotland states that “maps of past erosion, current state and future erosion conditions are required”.

The Climate Change (Scotland) Act 2009 requires Scottish Ministers to develop a Scottish Climate Change Adaptation Programme. Coastal erosion has implications for agriculture, tourism industry, transport sector, infrastructure, buildings, urban environment along with cultural and natural heritage interests. Only 9% of Scotland’s shoreline (six local authorities (LAs)) have, or are developing a Shoreline Management Plan. Government, Agencies and LAs have obligations to incorporate coastal erosion within their work. Therefore, a pressing need exists to improve the understanding of coastal erosion within Scotland at a national scale, so that the potential direct and indirect impacts on coastal populations and assets can be fully assessed to inform sustainable coastal management decision making.

Methodology

Coastal erosion susceptibility models have been used to estimate the rate and extent of erosion, using a range of approaches. Models such as the Susceptibility Model (CESM) have been used to assess the susceptibility of coastal areas.

The present study used the Coastal Erosion Susceptibility Model (CESM) to assess the susceptibility of coastal areas in Scotland. The CESM is a national coastal erosion susceptibility model for Scotland that incorporates a wide range of variables to assess the susceptibility of coastal areas.

Results

Physical Susceptibility: Once the four ranked data layers (Figure 2) are summed together an aggregate score is achieved (the UPSM). Areas which are highly susceptible to erosion have a high aggregate score (the maximum score is 17.5). Figure 3 shows a local scale example of the UPSM at St Andrews (west coast of central Scotland). To integrate the influence of defences and sediment accretion into the UPSM, a handicap value was assigned to these two datasets. For areas that benefit from the presence of coastal defences a handicap value of -5 for ‘hard’ defences and -3 for ‘soft’ defences was deemed appropriate. Figure 4 shows the CESM at St Andrews. See jmfitton.xyz/cesm_scotland for a webmap of the UPSM and CESM.

Conclusions

The research presented here uses models of the physical environment and vulnerability of the population to assess the assets and communities potentially exposed, and at risk, from coastal erosion in Scotland. Prior to this research, this holistic and national approach to assessing coastal erosion risk had not been undertaken. Coastal managers now have available a dataset that will support more sustainable, and socially just, decision making. However, to further prioritise management, the locations where erosion and accretion are currently on going, is required, and will be delivered as part of the National Coastal Change Assessment (NCCA, see dynamiccoast.co.uk). However, a method to communicate the susceptibility exposure, vulnerability and risk aspects of the coastal erosion hazard is needed, that is informative to coastal manager and the public, whilst minimising the potential negative impacts (e.g. property blight) of releasing such information.

References