



Assessing KwaZulu-Natal coastal vulnerability to sea-level rise

Government: KwaZulu-Natal (KZN), South Africa

Region: Africa

Sector: Resilience

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Summary

The coast of KwaZulu-Natal stretches over 580 kilometers along the southeast of South Africa. As well as being a popular touristic area, the province’s economic activity and human settlements are also concentrated here, with some communities living in poverty. On average, coastal municipalities have a population density five times higher than inland municipalities. This disproportionate concentration coupled with rapid infrastructure development and extreme storms, has changed the coast’s natural functioning. In 2007, a storm caused extensive erosion, loss of property and significant changes to the seabed profile that reduced the coastal system’s ability to respond to severe storm erosion.

A Coastal Vulnerability Index (CVI) is a simple and widely used method to assess coastal vulnerability to sea-level rise. However, one key limitation is its inability to address socio-economic characteristics beyond physical vulnerability. In 2011, The Oceanographic Research Institute (ORI) in partnership with the Department of Economic Development, Tourism and Environmental Affairs (EDTEA) set up a long-term project to address this by developing its own technique to determine a CVI for KwaZulu-Natal that could not only identify coastal physical vulnerability but determine which populations and infrastructure are potentially at risk.

KZN’s CVI technique divides the coast into sections and applies a five-step procedure. It starts by assessing the coast’s physical vulnerability to future coastal erosion or extreme storm events by ranking sections of the coast into three categories: “Risk” (lowest risk category), “Moderate Risk” and “High-Risk”. To assess the vulnerability of social, economic and ecological features, the technique (i) lists the resources and services located within 100 meters of the sea level at high tide; (ii) locates the features on the coast; (iii) identifies the services’ vulnerability relative to “High-Risk” sections; and (iv) provides actions to mitigate the risks. It also integrates an interactive map that allows users to see the CVI results among other data.



Results

- Findings from the CVI showed that 30% of KZN's coast is at "Risk", 47% at "Moderate Risk" and 23% at "High-Risk" level of potential damage and impact from future coastal erosion and storm events.
- Social, economic and ecological features identified by KZN's technique are mostly located in two zones ranked as "High-Risk": in the littoral active zone and adjacent to or inland of the littoral active zone. Examples include 100% of turtle nesting sites (ecological feature) and 98% of swimming beaches (social feature).
- A set of management intervention options has been proposed for each risk category, for example new infrastructure development in "Risk" areas must be set back appropriately to maintain the natural functioning of the coast. It is expected that findings from the CVI study coupled with further modeling will inform the determination of coastal management lines – areas where building restrictions or prohibitions are applied – to mitigate the risks identified.

Enabling conditions

South Africa enacted the Integrated Coastal Management (ICM) Amendment Act (36 of 2014) which devolved powers to provincial and local government to ensure the development of Coastal Management Programs, including the strategies and plans for effective ICM implementation such as the establishment of coastal management lines.

Challenges

The biggest challenge faced during the development of the CVI was limited data availability and lack of funds to source the appropriate data. In response, the ORI and the EDTEA conceived KZN's CVI as a quick, simple and cost-effective method of assessing relative coastal vulnerability using remotely-sensed data.

Municipalities' limited internet access meant the CIV tool could not be web-based but rather through a self-install software (CD). However, distributing updates to all users became challenging and the software was not compatible with all operating systems, so efforts to transfer the tool to a web platform are now underway.

Key lessons learned

- Although useful for identifying coastal risk zones, the simplicity of the CVI fails to provide a broader picture for holistic decision making. KZN's technique will continue to be refined and improved to better assess the zone of impact, by considering other factors such as predicted shoreline change.
- The technical nature of the CVI required to develop a user-friendly tool (map viewer) for government officials. Training sessions were also provided to explain the CVI process, its applicability and results' interpretation for management and decision making.

More information

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Research paper:

https://www.researchgate.net/publication/282061343_Preliminary_coastal_vulnerability_assessment_for_KwaZulu-Natal_South_Africa