

British Geological Survey (BGS)

Decision support systems (DSS) for coastal vulnerability assesments

BGS employs DSSs, decision support tools (DST), Decision support indices (DSI) and other outputs to address coastal vulnerability, with a strong focus on innovative projects like the Coastal Digital Twin. This initiative, part of the ESA Destination Earth program (2024–2026), aims at creating a highly accurate digital replica of Earth to simulate coastal processes and support decision-making for climate change adaptation, disaster preparedness, and environmental conservation.

Key DSTs include standard geospatial platforms (e.g., GIS), bespoke scripts (ODSAS, CliffMetrics, CoastalME), GroundHog Desktop software, the European Ground Motion Service (EGMS), Copernicus Data Ecosystem, and programs like the Open Clouds for Research Environments to enable the public private partnership (e.g. DiGBCoast dataset).

BGS started using indices (e.g. CVI) and then moved to a database (GeoCoast) as this was found more useful by stakeholders (Jenkins et al., 2016; British Geological Survey, 2022). GeoCoast Premium provides a range of geological and geomorphological properties that influence coastal vulnerability. They are provided as attributed 50 m grid cells around the coastline of Great Britain. A detailed suite of statistical data based on the underlying datasets is also provided. In addition, there is a tool to compare or share best practise at a regional scale and streamline the consideration of multiple underlying datasets through a simple, high-level scheme, presented as domains. Other outputs include software tools like the Coastal Modelling Environment software which enables dynamic modelling of coastal and nearshore landscapes under different climate and human intervention scenarios (Payo et al., 2017; Torrecillas et al., 2024). BGS also extracts metrics of ground motion from the EGMS, classifying the InSAR time series according to its pattern (non-linear or seasonal) over time.

For further information on the different approaches see Gómez-Pazo et al. (2022), Payo et al. (2018), Payo et al. (2024a) and Payo et al. (2024b). Input parameters mentioned in the figure may comprise multiple sub-parameters. For more information on the input parameters see Larsen et al. (2025; Table 1, p 17).

Further reading

British Geological Survey. (2022). User guide: BGS GeoCoast V1. British Geological Survey Open Report, OR/21/001, 48pp.

Gómez-Pazo, A., A. Payo, M. V. Paz-Delgado and M. A. Delgadillo-Calzadilla (2022). "Open Digital Shoreline Analysis System: ODSAS v1.0." Journal of Marine Science and Engineering 10(1): 26.

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Jenkins, G. O., Mee, K., Richardson, J. F. M., Lee, K. A., Westhead, R. K., Carter, G. D. O., & Hurst, M. D. (2016). User guide BGS Coastal Vulnerability Index version 1. Nottingham, UK: British Geological Survey, 16pp. (OR/16/039) (Unpublished).

Payo, A., Favis-Mortlock, D., Dickson, M., Hall, J. W., Hurst, M. D., Walkden, M. J. A., Townend, I., Ives, M. C., Nicholls, R. J., & Ellis, M. A. (2017). Coastal Modelling Environment version 1.0: A framework for integrating landform-specific component models in order to simulate decadal to centennial morphological changes on complex coasts. Geoscientific Model Development, 10(7), 2715–2740. <https://doi.org/10.5194/gmd-10-2715-2017>

Payo, A., B. Jigena Antelo, M. Hurst, M. Palaseanu-Lovejoy, C. Williams, G. Jenkins, K. Lee, D. Favis-Mortlock, A. Barkwith and M. A. Ellis (2018). "Development of an automatic delineation of cliff top and toe on very irregular planform coastlines (CliffMetrics v1.0)." Geosci. Model Dev. 11(10): 4317-4337.

Payo, A., G. O. Jenkins, J. Gafeira, C. Torrecillas, A.-L. Beck, H. Baxter, M. A. Taji, B. Coombs and M. Jones (2024a). Digital Great Britain coastlines (DiGBcoast v1.0): a dataset of the coastline position of Great Britain from 1984 to 2022 derived from publicly available optical satellite imagery. B. G. Survey. NERC EDS National Geoscience Data Centre.

Payo et al. (2024b). Digital Great Britain coastlines (DiGBcoast v1.0): a dataset of the coastline position of Great Britain from 1984 to 2022 derived from publicly available optical satellite imagery. Coastal and Offshore Science and Engineering. https://doi.org/10.53256/COSE_230206

Torrecillas, C., Payo, A., Cobos, M., Burke, H., Morgan, D., Smith, H., & Jenkins, G. O. (2024). Sediment Thickness Model of Andalusia's Nearshore and Coastal Inland Topography. Journal of Marine Science and Engineering, 12(2), 269. <https://doi.org/10.3390/jmse12020269>

