APPLICATION OF MATHEMATICAL MODELLING FOR PREDICTING COASTLINE EVOLUTION

By

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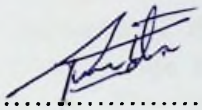
DECLARATION

I certify that this dissertation does not incorporate without acknowledgement of any material previously submitted for a Degree or Diploma in any University and to the best of my knowledge and belief it does not contain any material previously published or written or orally communicated by another person except, where due reference is made in the text.



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ABSTRACT

Increased river sand mining in the west of Sri Lanka has led to coastal erosion over the last few decades. Erosion has been particularly severe along the coast north of the Maha Oya. The CRMP project, which included structures and sand nourishment, was the most recent scheme to stabilize this coast. However, the shoreline to the north of the last structure began eroding just two years after the completion of this project.

The objective of this study was to set up and calibrate a mathematical model of shoreline change to understand this erosion and to evaluate options for future protection. The one-line model GENESIS was selected and an extensive sensitivity analysis carried out to assess the reliability of the results.

Available data – which includes shoreline surveys before, during and after the CRMP project and long term wave data recorded at Colombo – was augmented by measurements of the shoreline north of the last structure. Shore profiles and grain sizes were also obtained.

The model was applied to the shoreline changes observed between and northwards of the last seven groynes of the CRMP project both during and after construction. The model results were in reasonable agreement with observations. The high erosion rates north of the last structure were due to the reduced sand supply from the south, i.e. the structures to the south were trapping more of the nourished sand than expected in the design of the CRMP project.

The model was used to assess options – including the groynes constructed recently - for the protection of this shoreline. While different options were able to stabilize specific areas, erosion will continue somewhere until the sand supply is augmented by further sand nourishment.

The study demonstrated the utility of detailed, shoreline monitoring for the quantification of changes and the calibration of models.

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