GLOBAL CLIMATE CHANGE: IMPACT ON THE COASTAL ZONE OF SRI LANKA

By

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Thesis Submitted in Partial Fulfillment of the Requirements for the Degree Master of Science

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DECLARATION BY THE CANDIDATE

I declare that this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any University or other institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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ABSTRACT

It is unequivocal that sea level is rising and it will further exacerbate the already existing problems in the coastal regions. With the increase of greenhouse gases, the global warming which is the main factor affecting the sea level rise has accelerated. Rise in sea level can cause many problems in the socio-economic activities and coastal eco systems due to coastal erosion, inundation, salt water intrusion, etc. Therefore countries having low lying coastal areas need to pay attention on this before the problems become worst.

This study was conducted in order to assess the shoreline variation due to SLR in southwest coast of Sri Lanka. Four coastal locations (Ambalangoda, Bentota, Kalutara and Lunawa) were selected which have different morphological features. Nearshore wave climates at those locations were established considering SLR scenarios established by IPCC (Intergovernmental Panel on Climate Change) in 2007. Offshore wave measurements were used for the analysis. In establishing nearshore wave climate MIKE21 Nearshore Spectral Wave Model was used and the shoreline recession was estimated for different scenarios by Bruun Rule. In addition change in wind direction and speed considered only at Lunawa.

The established nearshore wave climate shows a clear increase in significant wave height in both sea and swell waves at all the locations with the increase of sea level. However the changes in mean wave period and in mean wave direction at nearshore are not significant. Shoreline recession caused by sea level rise varies from place to place depending on the wave climate and the morphological features of the area. Generally shoreline recession is 50 to 120 times the sea level rise.

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LIST OF ABBREVIATIONS

CCD – Coast Conservation Department

CFC – Chlorofluorocarbon

d_c – Closure Depth

d_d – Dune Height

DMWD – Deviation from Mean Wave Direction

DSD – Directional Standard Deviation

EOF – Empirical Orthogonal Function

g – Acceleration due to gravity

GCC – Global Climate Change

GCRIO - Global Change Research Information Office

GDP – Gross Domestic Product

GHG – Greenhouse gas

GTZ – German Agency for Technical Cooperation

h – Sea Level Rise

H_{m0} – Significant Wave Height

H_s – Local significant wave height exceeded 12 hr in a particular time interval (seasonal or annual)

IPCC – Intergovernmental Panel on Climate Change

IPCC AR4 – IPCC Forth Assessment Report

MWD – Mean Wave Direction

n.d. – No Date

NSW – Nearshore Spectral Wave

R – Recession

RSPM – Revised Shore Protection Model

SLR – Sea Level Rise

SRES – Special Report on Emission Scenarios

T – Wave period associated with H_s

T_m – Mean Wave Period

x_c – Distance to the closure depth from shoreline

LIST OF APPENDICES