ASSESSMENT OF CLIMATE CHANGE WITH SPECIAL REFERENCE TO THE MAGNITUDE AND TEMPORAL VARIABILITY OF THE EXTREME CLIMATE EVENTS ACROSS SRI LANKA

S.W.M.J.D. Premarathna

(228094A)

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Department of Civil Engineering

University of Moratuwa

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Srinarayana Wijayabrahmana Mudiyanselage Janith Deshan Premarathna

228094A

Thesis submitted in partial fulfilment of the requirements for the degree of Master of Science in Civil Engineering

Department of Civil Engineering

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Sri Lanka

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DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgment any material previously submitted for a Degree or Diploma in any other University or 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 acknowledgment is made in the text.

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Name of the Supervisor: Mr. T.D.C. Pushpakumara

Signature of the Supervisor: Date: 2024.12.20

Name of the Co-supervisor: Dr. H.K. Kadupitiya

Signature of the Supervisor: Date: 2024.12.20

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ABSTRACT

Assessment of Climate Change with special reference to the magnitude and temporal variability of the Extreme Climate Events across Sri Lanka

Climate change has emerged as a critical global challenge, characterized by increasingly frequent and severe extreme weather events. This research focuses on the impacts of climate change on extreme rainfall events in Sri Lanka, a country highly dependent on agriculture and particularly vulnerable to climate-induced natural disasters. Recognizing the limitations of traditional methods for identifying extreme precipitation trends, this study adopts an innovative approach by integrating multiple ETCCDI indices. By combining these indices, the research provides a holistic and nuanced understanding of extreme rainfall patterns, offering valuable insights that are beneficial across sectors such as agriculture, disaster management, and climate policy.

The study addresses the evolving challenges of agricultural planning by re-demarcating Sri Lanka's Agro-Ecological Zones (AEZs). This re-demarcation incorporates a range of critical factors, including yearly catchment runoff, irrigation infrastructure, land use dynamics, and administrative boundaries. By integrating these diverse elements, the research establishes a comprehensive and adaptive zoning framework that better reflects contemporary climatic, hydrological, and socio-economic conditions. The refined AEZs aim to optimize land use, enhance agricultural productivity, and improve disaster risk management.

The findings of this study hold significant implications for climate adaptation and sustainable development. They provide actionable recommendations for targeted interventions and evidence-based policy-making, helping to build resilience among vulnerable communities and sectors. Ultimately, this research contributes to a deeper understanding of climate change impacts and offers pathways for addressing its challenges effectively.

Keywords: Climate change, Extreme precipitation, Agroecological Zones

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AEZ - Agro-Ecological Zones

AHP - Analytical Hierarchy Process

CDD - Consecutive Dry Days

CWD - Consecutive Wet Days

DEM - Digital Elevation Model

ETCCDI - Expert Team on Climate Change Detection and Indices

FAO - Food and Agriculture Organization

GIS - Geographic Information System

IPCC - Intergovernmental Panel on Climate Change

LULC - Land Use Land Cover

NBRO - National Building Research Organization

NDVI - Normalized Difference Vegetation Index

NDWI - Normalized Difference Water Index

PM10 - Particulate Matter with a diameter of 10 microns or less

R95p - Precipitation exceeding the 95th percentile

R99p - Precipitation exceeding the 99th percentile

RClimDex - Software for climate indices calculation

Rx1day - Maximum one-day precipitation total

Rx5day - Maximum five-day precipitation total

SDII - Simple Daily Intensity Index

SPI - Standard Precipitation Index

VTCS – Village Tank Cascade System

WMO - World Meteorological Organization