

**INCORPORATION OF OFF-SHORE WIND POWER AS THE  
NEXT STEP OF NON-CONVENTIONAL RENEWABLE  
ENERGY IN SRI LANKA**

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Degree of Master of Science

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## DECLARATION

I declare that this thesis is my work and to the best of my knowledge and belief there is no any material incorporated therein previously submitted for a Degree or Diploma in any other University or institute of higher learning, without giving the proper acknowledgement to that effect. It also does not contain any material previously published or written by another person except where due acknowledgement is made in the text.

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N.H.M. Prabhath

2022/02/15

The above candidate has carried out the research for the Master thesis under my supervision.

Dr. Asanka Rodrigo  
Supervisor

Date: 2022/02/15

## ABSTRACT

With the current increasing trend for the non-conventional renewable energy (NCRE) in Sri Lanka, interest has been focused on retiring of thermal/coal power plants and getting the energy via renewable sources.

Since almost all the water sources have been used, the available options will be wind, solar, biomass etc.

From them, wind energy is more promising as it is having less intermittency and more efficiency compared to other sources. Offshore winds are more consistent than on shore winds as well as they are higher in speeds. Considering the Sri Lankan Sea territory massive energy can be harvested via offshore wind power with no or minimum affections to peoples' lifestyle, existing inland natural beauty, relocation of people etc. compared to the onshore wind power. With being no/extremely little amount of effort required to relocate people and taking over lands, offshore wind power can be quickly implemented.

However, development of offshore wind farms around Sri Lanka should be carefully and seriously studied as it can also have negative impacts on some areas. It includes marine mammals & fish, coral reefs, migratory pathways of birds, fishing industry, tourism industry etc.

In this research a method is developed to locate suitable sites around a country for offshore wind power considering its technical, environmental, regulatory constraints. The method mentioned in this research is universal and validated on Sri Lanka. Initially the intended area of research (part of the Country's Sea territory) was divided into equal areas. Then for each area the technical, environmental and regulatory constraints were analyzed using digitized maps. Creation of digitized maps using GIS software is also a part of this research.

Then weightage factors are developed for each constraints using a model developed in this research and a total value for each area is calculated. Then the intended area of study is linked with the values table for that particular study area using a GIS software to visualize the suitable sites.

*Keywords: Offshore wind power, constraints, GIS software, digitization of maps*

# DEDICATION

To my parents, my sister, and my beloved wife

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## List of Abbreviations

SL	:	Sri Lanka
NCRE	:	Non-Conventional Renewable Energy
LTGEP	:	Long Term Generation Expansion Plan
CEB	:	Ceylon Electricity Board
USA	:	United States of America
NREL	:	National Renewable Energy Laboratory
OWF	:	Offshore Wind Farm
DFIG	:	Doubly Fed Induction Generator
UK	:	United Kingdom
UN	:	United Nations
EEZ	:	Exclusive Economic Zone
HSZ	:	High Security Zone
GIS	:	Geographical Information System
USD	:	United States Dollars
MW	:	Mega Watts
kV	:	Kilo Volts
GW	:	Giga Watts
FPSO	:	Floating Production Storage and Offloading