

UNIVERSITI TEKNOLOGI MARA

**BIOMASS AND CARBON STOCK
ESTIMATION OF MANGROVES IN
PULAU INDAH, KLANG, SELANGOR**

MUHAMAD HAFIZ AFHAM KHAINI

MSc

September 2020

AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This dissertation has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.


Name of Student : Muhamad Hafiz Afham Khaini

Student I.D. No. : 2018687252

Programme : Master of Science Applied Biology – AS730

Faculty : Applied Sciences

Dissertation Title : Biomass and Carbon Stock Estimation of Mangroves
in Pulau Indah, Klang, Selangor.

Signature of Student : 

Date : September 2020

ABSTRACT

Mangrove ecosystem is a natural fortress that acts as a defense mechanism for coastal communities helping mitigate climate change by sequestering and storing significant amounts of carbon. Globally, mangrove are threatened with reclamation and degradation for anthropogenic needs. The development plan of a biotech industry hub or “Selangor Bio Bay” (SBB) is expected to clear the remaining mangrove in Pulau Indah. The mangrove will be converted into industrial, residential and commercial unit. This study was conducted to determine the abundance of mangrove species, to estimate the mangrove biomass and carbon stock of the mangroves species and mangrove ecosystem at the proposed SBB project site in Pulau Indah, Klang, Selangor. Six mangrove species from three genera (*Avicennia*, *Bruguiera*, *Rhizophora*) were recorded namely *Avicennia alba*, *A. marina*, *Bruguiera gymnorhiza*, *B. parviflora*, *Rhizophora apiculata* and *R. mucronata*. The abundance of the mangrove species in Pulau Indah specifically at the SBB development site were quantified through basal area ($47.053 \pm 22.938 \text{ m}^2 \text{ ha}^{-1}$), density ($906 \pm 196 \text{ tree ha}^{-1}$) and frequency of occurrence. *R. apiculata* recorded the highest frequency (100%) while *A. marina* recorded the lowest frequency (44%). The mean biomass of mangrove ecosystem in the study area was estimated at $253.162 \pm 125.694 \text{ t ha}^{-1}$ where total aboveground tree biomass was $185.411 \pm 104.151 \text{ t ha}^{-1}$ and belowground tree biomass was $60.718 \pm 35.883 \text{ t ha}^{-1}$. The ecosystem carbon stock for Pulau Indah was estimated at $867.808 \pm 89.301 \text{ t C ha}^{-1}$. This study concludes that Pulau Indah mangroves hold a significant amount of carbon where approximately 86% is stored as soil carbon and the 14% of carbon stock is held by other components within the mangrove ecosystem. Removing the remaining carbon reservoir in Pulau Indah, Klang will emit a significant amount of CO₂-equivalent ($509,576.857 \text{ t ha}^{-1}$) to the atmosphere exacerbating global warming.

ACKNOWLEDGEMENT

Firstly, I wish to thank God for giving me the opportunity to embark on my MSc and for completing this long and challenging journey successfully. My gratitude and thanks go to my supervisor Dr Harinder Rai Singh for his guidance and assistance throughout the process.

My appreciation goes to all my co-supervisors, Dr Faezah Pardi and Dr Sahadev Sharma for their time and support. Not to forget my dedicated team namely Adibah, Amir Muiz, Safwan, Oliver and Maya who giving hand in making this project happened.

Special thanks to my colleagues and friends especially Adibah Mokhtar and Asyraf Rahim for vast-aiding me with this project.

My gratitude goes to the Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam and the Postgraduate Institute for providing all equipment and supplemented the meaningful voyage for me to accomplish this project. Also, my sincere thanks to Institute of Ocean and Earth Sciences, University of Malaya for providing field equipment for data collection and sampling.

Finally, this thesis is dedicated to my beloved parents, Khaini Hailani and Rosnani Abdul Razak for the vision and determination to educate me. This piece of triumph is dedicated to both of you. Alhamdulillah.

TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF ABBREVIATIONS	xi
CHAPTER ONE INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statements	3
1.3 Significance of the Study	4
1.4 Objectives of the Study	4
1.5 Limitation of the Study	4
CHAPTER TWO LITERATURE REVIEW	5
2.1 Introduction	5
2.2 Mangroves in Malaysia	5
2.3 Role of Mangroves	6
2.4 Mangroves Zonation	8
2.5 Threats to Mangroves	9
2.5.1 Degradation and Deforestation	10
2.5.2 The Impacts of Climate Change on Mangroves	11
2.6 Ecological Measurement	12
2.6.1 Tree Basal Area	12
2.6.2 Tree Density	13
2.6.3 Frequency	13
2.7 Mangrove Biomass	14