INVESTIGATION ON PLASTIC WASTE UTILIZATION AND MANAGEMENT IN FISHERY HARBORS OF SRI LANKA

P.M.S.R.Muhandiram

228044X

Degree of Master of Science in Civil Engineering

Department of Civil Engineering

University of Moratuwa

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P. M. S. R. Muhandiram

228044X

The thesis submitted in partial fulfillment of the requirements for the degree

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DECLARATION

I hereby declare that this thesis entitled "Investigation on plastic waste utilization and management in fishery harbors of Sri Lanka" is the result of my original work and has not been submitted in part or in whole for any other 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. All sources used in this thesis have been duly acknowledged and referenced.

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Signature	Date
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The above candidate has carried out research for the Master under our supervision.

Name of the Supervisors;

Prof. Rangika Umesh Halwatura

Signature;	Date;
…….	……

Prof. Karl S. Williams

Signature;	Date;
…….	21/09/2023

Prof. Champika Liyanage

Signature;	Date;
…….	…….

ABSTRACT

Fishery harbors (FH) are recognized as hot spots for coastal pollution as intensive anthropogenic activity takes place there. According to previous beach surveys conducted in the country, plastic was recognized as the major polluter. However, there are no studies being conducted which target plastic waste generation inside FH located in Western Province of Sri Lanka. The study was conducted from October 2022 to September 2023. For this study, weekly accumulation study method was followed along the land-water interface to collect primary data.

Throughout the study period, a total of 34,188 anthropogenic debris pieces weighing 2650.47 kg were recorded from 59 data collection points within five FH. Plastic has become the major polluter both by count and by weight. By count it was 29,141 (85.24%) and by weight it was 1578.07 kg (59.53%). Therefore, plastics was recognized as the major polluter in FH located in the Western Province of Sri Lanka. By count only, rubber, metal, glass, processed wood and fabric represented 7.99%, 1.98%, 1.95%, 1.78% and 1.06% of the total anthropogenic debris respectively. The spatial variation in plastic debris accumulation was statistically significant in all five FH, while seasonal variation was statistically significant at Beruwala, South Dikkowita and Panadura FH. Plastic debris accumulation rates were 1.45, 2.21, 1.57, 0.98 and 0.17 items/m^2/week for Beruwala, North Dikkowita, South Dikkowita, Panadura and Negombo FH respectively. The top ten debris, fishery industry related plastic debris, single use plastics and transboundary plastic products represented 84.64%, 10.71%, 60.94% and 0.27% of the total plastic debris collected from the five FH. Lower percentage of transboundary plastic products highlights that the problem is primarily a result of mismanagement of plastic waste within the harbor. There was a strong positive (r=0.883) correlation between number of plastic debris recorded and plastic weight. Correlation between monthly rainfall and monthly average number of plastic debris recorded had a very weak positive correlation for Beruwala, North and South Dikkowita FH whilst being negative for Panadura and Negombo FH. Correlation between the tide level and number of plastic debris recorded was weakly negative (r= -0.280). Stranding debris count was significantly higher than the floating debris at FH. Therefore, conducting cleanup projects at FH during low tide will be much more effective, with a priority on addressing stranding debris.

A Stakeholder workshop and a questionnaire survey were conducted as a secondary data collection method. This was to reveal the perceptions and, attitudes of stakeholders as well as to find policy gaps related with plastic debris generation inside FH. Over half of the fishermen (51%) believe that the poor waste management of plastic within the FH by the Ceylon Fishery Harbors Corporation is the primary contributing factor for large amount of plastic waste generation. It highlighted the requirement of improving awareness among fishery communities, properly implementation of existing regulations and integrated stakeholders involvement.

Key words: *Fishery harbors, Plastic pollution, Coastal environment, Coastal contamination, Anthropogenic debris*

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DEDICATION

This dissertation is dedicated to my loving parents and wife for their endless love, support, and encouragement!

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LIST OF ABBREVIATIONS

Abbreviation	Description
BFH	Beruwala Fishery Harbor
CC	Climate change
CFHC	Ceylon Fishery Harbor Corporation
EU	Europe Union
FH	Fishery harbor
GHG	Green House Gases
MPA	Marine Protected Area
MPW	Marine plastic waste
MT	Metric tons
NARA	National Aquatic Resources Research and Development Agency
NFH	Negombo Fishery Harbor
NDFH	North Dikkowita Fishery Harbor
NOAA	National Oceanic Atmospheric Administration
PFH	Panadura Fishery Harbor
SDFH	South Dikkowita Fishery Harbor
SDG	Sustainable Development Goal
SLCG	Sri Lanka Coast Guard
SUPs	Single Use Plastics
TBML	Transboundry marine litters
WP	Western Province
WMA	Waste Management Authority

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