

BOOK OF ABSTRACTS



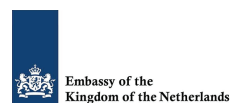
9th International Conference on

Water and Flood Management

with special focus on
Climate Extremes and Resilient Development



CEGIS
Center for Environmental and Geographic Information Services



**9th International Conference on
Water and Flood Management (ICWFM 2023)**

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Preface

Water management in general, and flood management in particular, is an interdisciplinary field that necessitates interdisciplinary knowledge from a variety of sub-disciplines, including hydrology, hydraulics, morphology, atmospheric science, climate, environmental pollution, ecosystem, agriculture, disaster, vulnerability, risk, gender, livelihood, and poverty. As climate change and anthropogenic interventions alter physical and socioeconomic risks, integrated approaches to evaluating these processes and their interactions, as well as incorporating nature-based remedies, are in demand of evidence-based research activities towards the allied topics.

To address these issues in a single platform, the International Conference on Water and Flood Management (ICWFM) has been organized by the Institute of Water and Flood Management (IWFM), BUET, biennially since 2007. The recent decades have experienced more frequent natural calamities and it is believed that the climate change is an important driving factor for such hazards, and the extreme events are occurring more frequently, which are imposing barriers against successful implementation of water centric programs and projects for disaster recovery, adaptations, and resilience development. It is high time for the world to take a closer look at the climate extreme events and incorporate appropriate management measures into the mainstreaming planning for resilient development. Therefore, the special focus of ICWFM-2023 is ‘Climate Extremes and Resilient Development’.

The conference seeks to bring forward research findings, case studies, recent advances in planning and design methodologies, success stories and examples of sustainable water use and management both in normal condition as well as in extreme condition. It is expected that the young researchers will be particularly benefitted from this conference as their interdisciplinary understanding of the use of water resource in a sustainable way towards resilience. I would like to express my sincere appreciation to all members of the publication committee and conference secretariate, for their wholehearted efforts in bringing out the book of abstracts in a timely manner.

The financial support provided by the Embassy of the Kingdom of the Netherlands, Dhaka, Japan International Cooperation Agency (JICA), Dhaka, Institute of Water Modelling (IWM) and Center for Environmental and Geographic Information Services (CEGIS), is gratefully acknowledged. Special thanks are also extended to the members of the different committees and partner departments and agencies inside and outside BUET, for their continuous support and cooperation during different stages including the abstract review processes.

Dr. Md. Munsur Rahman
Chair, International Conference on Water and Flood Management (ICWFM 2023) and
Professor, Institute of Water and Flood Management (IWFM), Bangladesh University of Engineering and
Technology, Dhaka, Bangladesh

Note from the publication committee

The conference received a total of 350 abstracts, out of which 286 were selected by a team of reviewers. Following the registration procedure, the number of selected abstracts was further cut to 218. The 'Book of Abstracts' comprises a collection of 218 abstracts, systematically organized based on the thematic categories of the conference.

The abstracts have been replicated verbatim from the authors' initial electronic versions of the articles, which were submitted using an online platform. Prior to publication, a thorough review was conducted to identify and rectify any glaring typographical problems. The abstracts have been appropriately revised and altered to adhere to the specified standards and rules for abstract writing.

The responsibility for the views, comments, and opinions expressed by the authors in their abstracts featured in this 'Book of Abstracts' does not lie with the Publication Committee.

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Sustainable Environment and Infrastructure Development

A SUSTAINABLE WASTE MANAGEMENT MODEL FOR PASSENGER SHIPS IN BANGLADESH: A STEP TOWARDS CLIMATE CHANGE ADAPTATION

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INTRODUCTION

The river network of Bangladesh consists of nearly 230 rivers, serving as crucial transportation routes for millions of passengers each year. Biswas et al. (2021) reported that globally, alarming quantities of sewage, oil, ballast water, and solid waste are being released into the water, with over 92% of these wastes remaining untreated and reaching coastal waters. Unfortunately, the absence of monitoring and implementation of effluent-releasing standards in Bangladesh has habituated the direct dumping of untreated waste into water bodies. As a consequence, Bangladesh suffers heavily due to marine pollution from an inadequate level of waste management. In addition, Bangladesh is one of the most vulnerable countries to climate change, according to the Intergovernmental Panel on Climate Change (World Bank, 2011). This paper aims to present a concept of waste management in passenger ships in Bangladesh, which promises to be sustainable and may help reduce Greenhouse Gas emissions (GHG) through the climate change adaptation strategy. It includes the development of a biogas and composting plant along with a plastic segregation chamber for storing the plastic waste. The biogas and composting plant will prevent the release of methane into the atmosphere. The plastic segregation chamber will make the supply chain pipeline easier for recycling by reducing the need for new plastic production to achieve lower CO_{2eq} emissions.

METHODOLOGY

This research starts with a comprehensive literature review. The review suggests significant areas for improvement in waste management policy, practices, and technology concerning inland water transportation in Bangladesh. This research paper focuses on biogas and composting plants, including an anaerobic digester with a water treatment facility for safe discharge to the river water, as shown in Figure 1. The waste storage unit receives continuous input of fecal matter, flush water, and bio-degradable kitchen waste from the ship's kitchen.

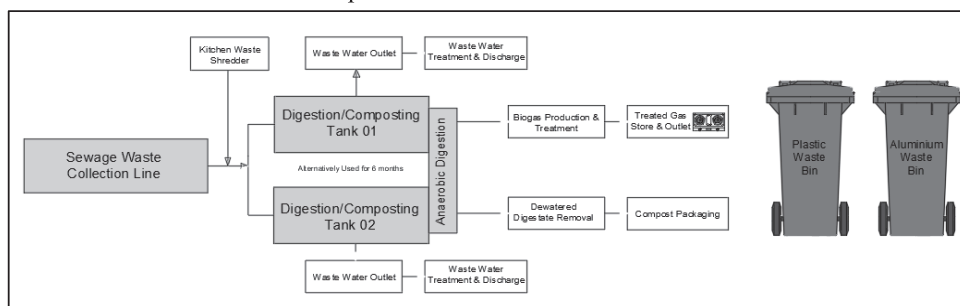


Figure 1: Schematic diagram of ship-generated waste management (Source: Author, 2023)

Two storage and digestion tanks are added below the main deck of the ship's centerline, operating alternately for six months and sufficiently sized to store solid sludge volume. The tanks will have a lining of geotextile fabric to trap solid sludge. The solid sludge will go through an anaerobic digestion process resulting in biogas production and can be utilized as a valuable energy source onboard. The treated gas will then be stored in a storage bag, and the outlet can be connected to the end users of the gas. Infiltrated water will be treated before discharge into the river (Hossain et al., 2023). For the plastic waste, there will be a plastic segregation chamber where all plastic and aluminum waste generated in the ships will be stored manually for subsequent sale to recycling companies.

RESULTS AND DISCUSSION

The proposed model demonstrates a concept for efficiently treating organic waste through anaerobic digestion. For example, considering a ship on a voyage from Dhaka to Barisal for 365 days with an average of 800 passengers daily, a substantial amount of fecal and kitchen/food waste is generated. The proposed waste management model suggests an impressive overall reduction of 34.59 tons of CO₂eq emissions annually per ship. That is, about 94.78 kg of CO₂eq emissions is significantly reduced daily. The model also yields a daily production of 8.6 cubic meters of biogas, which can replace 4 kg of Liquefied Petroleum Gas (LPG) per day for onboard cooking, leading to cost savings on energy. Furthermore, biogas as a cooking fuel offers enhanced safety as it dissipates in the air, unlike LPG, which can accumulate on the floor in case of leakage. These results are specific to a particular route to present the model's effectiveness, but they can be implemented in other navigational ways throughout Bangladesh. These findings highlight the significant potential of the proposed waste management model in terms of CO₂eq emissions, pollution reduction, and biogas production, highlighting its substantial benefits for the marine sector in Bangladesh.

CONCLUSION

According to the present waste management system and Bangladesh's vulnerability to climate change, it is necessary to develop a sustainable waste management model to safeguard the marine environment. This research addresses the urgent need for improved waste management in the maritime sector of Bangladesh because alarming quantities of untreated waste are being released into water bodies from inland ships. The results suggest a reduction of GHG emissions and providing free onboard cooking gas while prioritizing environmental protection. It is a viable alternative to LPG cylinders for cooking, minimizing foreign dependence on LPG imports in Bangladesh. Additionally, the sale of compost and segregated plastic waste provides an opportunity for generating revenue. By implementing this model, Bangladesh can mitigate the environmental impact of waste in the marine sector while contributing to climate change adaptation efforts. This model also aligns with several Sustainable Development Goals (SDGs) set by the United Nations (UN).

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International Conference on Water and Flood Management (ICWFM)

The International Conference on Water and Flood Management (ICWFM) has been held biennially since 2007 by the Institute of Water and Flood Management (IWFM) of Bangladesh University of Engineering and Technology (BUET), and ICWFM 2023 is the ninth event. Water management in general, and flood management in particular, is an interdisciplinary field that requires integrated knowledge from diverse fields such as hydrology, hydraulics, morphology, atmospheric science, climate, environmental pollution, ecosystem, agriculture, disaster, vulnerability, risk, gender, livelihood, and poverty. As physical and socioeconomic risks change as a result of climate change and anthropogenic interventions, integrated approaches to analyzing these processes and their interactions, as well as incorporating nature-based solutions, are gaining traction. This conference aims to serve as a common platform for bringing together the most recent developments in the aforementioned fields.

This year the central theme of ICWFM-2023 is 'Climate Extremes and Resilient Development'. In recent years, the world has witnessed unprecedented extreme events. Cherapunji (India) received its third highest rainfall in 122 years in 24 hours in 2022, while monsoon flooding submerged nearly 80-90% of the north-eastern districts of Bangladesh. Or the 2022 drought in Europe, which is seemed to be the worst drought in the last 500 years. Extreme events are occurring more frequently, and therefore, we believe, it is high time for the world to take a closer look at extreme events and incorporate appropriate management measures into planning efforts. We truly think that our hard and soft development strategies should be robust enough to withstand these climatic extremes.



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