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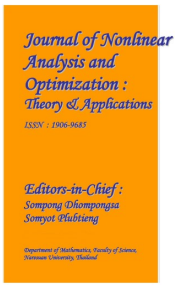

MITIGATING FLOATING WASTE: A COMPONENT OF THE NAMAMI GANGA INITIATIVE

R.ROHIT BABU[1], G.SUDHEER[2], G.P.DHARMA SAI[3], G.SRINIVAS[4], G.BHANUHAR1[5],K.SOMA KRISHNA PRASAD[6]

Assistant Professor, Department of Civil Engineering, Vignan's Institute of Information Technology(A), Vishakhapatnam.
Email:rongalarohithbabu@gmail.com
Students Department of Civil Engineering Vignan's Institute of Information Technology(A), Vishakhapatnam, India.
Email: sudheergollu007@gmail.com,dharmasai425@gmail.com,somakrishnaprasad95@gmail.com, srinivasreddy0687@gmail.com, bhanuharigullipalli123@gmail.com

Global plastic pollution is a serious issue. Both the land and the seas are impacted. On the other hand, monitoring plastic contamination on land is much easier than on water.

ABSTRACT: Rivers such as the Ganga, Indus, and Brahmaputra serve as crucial conduits for plastic pollution, funneling millions of tons of debris into the oceans annually. The proliferation of plastic waste poses a severe threat to aquatic ecosystems, human health, and marine life. In response to this pressing issue, innovative solutions are imperative. This feasibility report explores the potential of implementing The Ocean Cleanup Array in major river systems to mitigate plastic pollution [1,2,3]. Leveraging computer models and ocean circulation data, the study evaluates the efficacy of floating barriers in intercepting and concentrating plastic debris. By strategically deploying passive systems such as System 001 and MR. Trash Wheel along these river channels, significant volumes of plastic waste can be captured before reaching the oceans. [4,5,6]Collaborating with offshore specialists and utilizing existing technology, the construction and installation of these systems are within reach. The Ocean Cleanup's mission, driven by cutting-edge technology and a commitment to sustainability, aims to eliminate up to 90% of ocean plastic pollution[7,8,9].

Keywords: *SYSTEM 001, MR. Trash Wheel, Interceptors, INDUS, NAMAMI GANGA PROGRAMME, Environmental Cleanup.*

INTRODUCTION

In the context of ocean cleaning, the more effective and efficient use of systems to remove plastic from rivers and oceans. Micro, macro, meso, and nanoplastics are among the plastics found in the ocean water [10,11].
In this project, we clear plastic out of waterbodies. The aim is to get rid of plastic waste from rivers and other waterbodies using
In light of this, it's crucial to reevaluate our approach to mitigating plastic pollution in rivers like the Ganga, Brahmaputra, and Indus.[12,13,14] Despite not being among the top emitters globally, these rivers still play a significant role in the regional context. The Ganges, for instance, holds immense

cultural and ecological importance, and addressing plastic pollution in this river is paramount for the well-being of millions who depend on it [15,16,17].
Given the scale and complexity of the issue, it's imperative to adopt a multifaceted approach. This includes improving waste management infrastructure, promoting public awareness and education, implementing policies to reduce plastic consumption and encouraging recycling and sustainable practices [18,19].
In conclusion, while recent findings have reshaped our understanding of ocean plastic pollution, rivers like the Ganga, Brahmaputra, and Indus still demand attention and concerted efforts to address plastic pollution within their basins, considering both their regional significance and their interconnectedness with global environmental concerns.

The major contribution of ocean plastic comes from Asia in which the rivers are mainly from India and China.

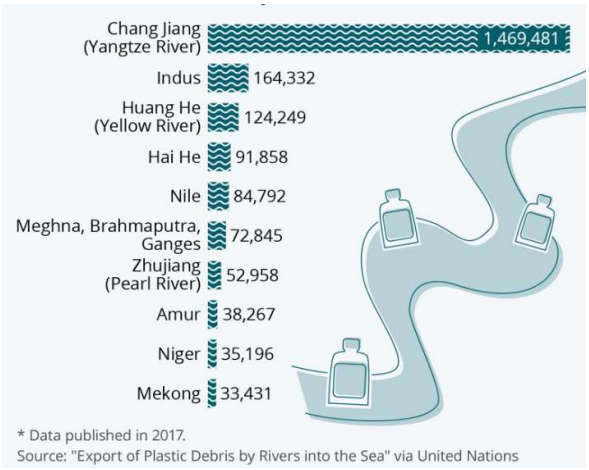

Figure 1.1: The rivers filling the oceans with plastic

THE MAJOR RIVERS OF EMITING PLASTIC IN INDIA

RIVER GANGA: You could depict the Ganges River flowing through the Indian subcontinent, with plastic waste either floating on its surface or littering its banks. To emphasize its significance, you might include iconic landmarks along the river's course, such as Varanasi, and illustrate how plastic pollution affects these areas [20,21].
RIVER BRAHMAPUTRA: Similar to the Ganges, you could illustrate the Brahmaputra River meandering through the landscapes of India, Bhutan, and Bangladesh, with plastic waste visible along its shores or in its waters. Include notable features like the Brahmaputra's confluence with the Ganges and Meghna rivers, or the lush forests and agricultural lands it passes through [22,23].
RIVER INDUS: The Indus River flows through Pakistan, India, and parts of China. You could depict its journey from the Himalayas through the arid landscapes of Pakistan to the Arabian Sea. Illustrate plastic waste in the river, perhaps with a focus on urban areas like Karachi, where the river meets the sea.[24,25]
Effects of floating debris present in waterbody

Due to plastic pollution and urbanization, overuse of riverine resources, and habitat degradation brought on by water level drop, the aquatic fauna of the Ganga basin, especially the main stem

Ganga River, is in danger. A steady decline in the populations of several species, including the commercially exploited hilsa and golden mahseer as well as other catfish and minnows, has been observed in the populations of aquatic animals, particularly fishes. These factors include the growing human population, industrial development, deforestation, fragmentation of river systems by various barriers, water scarcity, and reduced water flow due to diversion and unregulated abstraction. The system shift has a significant effect on obligatory aquatic species as well, such as island nesting birds and aquatic birds [26,27].

METHODOLOGY

- The interceptor has large mesh sizes that let little marine species like plankton to flow through.[28,29]
- To allow marine life to swim out of the system safely, escape aids—openings on the underside of the mesh. [30,31]
- Collecting waste using the design of existing interceptor we got an efficiency of 60%. In order to reduce the over flowing of waste from the top and bottom of the net we increased the height of the net from 3m to 5m.
- We monitored the entire collection process 24/7 to reduce the tangling of aquatic animals inside the net.[32,33]
- After all the improvisations made the efficiency increased from 60% to 80%.

TO REDUCE THE PLASTIC WASTE FROM ENTERING INTO THE RIVER BODIES

1. Implement robust waste management practices and infrastructure to reduce plastic waste generation and improve recycling.
2. Promote public awareness and education campaigns to foster responsible consumption and disposal habits.[35,36,37]
3. Enforce regulations and policies to restrict the use of single-use plastics and promote sustainable alternatives.[38,39,40]
4. Enhance international cooperation and collaboration to address plastic pollution at its source and prevent its entry into river systems.

CONCLUSION:

Data collection efforts along the Ganga, Brahmaputra, and Indus rivers are essential for understanding the complex nature of plastic pollution and devising effective solutions to safeguard these vital water resources. By leveraging multidisciplinary approaches and collaborative partnerships, we can work towards mitigating the impact of plastic pollution and preserving the ecological integrity of these iconic river systems for future generations.

REFERENCES

1. Lebreton, L., Slat, B., Ferrari, F., Sainte-Rose, B., Aitken, J., Marthouse, R., et al. (2018). Evidence that the Great Pacific Garbage Patch is rapidly accumulating plastic. publications by scientific reports (22 March 2018).

2. Slat boyan, Agnes Ardiyanti, Emile Arens, Evelien Bolle, Hyke Brugman, Holly Campbell, Pierre-Louis Christiane, Bill Cooper, Marijn Dekker. How the oceans can clean themselves: a feasibility study. HOAX Graphic Design (June 2014).
3. Nelms, S. E. and associates (2021). Fisheries-related riverine plastic pollution: Perspective from the Ganges River basin. Environment.
4. Microplastics' characteristics and spatial distribution in the water and sediment of the lower Ganga River were studied by Singh, N. et al. Bull. Polluted Mar. (2021)
5. Chaudhary, M. and Walker, T.R. (2019). River Ganga pollution: Causes and failed management plans (correspondence on Dwivedi et al., 2018. Ganga water pollution: A potential health threat to inhabitants of Ganga basin. Environment International, 117: 327-338). *Environmental International* 126: 202-206.
6. Barnes D, Galgani F, Thompson R, Barlaz M (2009) Accumulation and fragmentation of plastic debris in global environments. Philos Trans R Soc Lond B Biol Sci 364:1985–1998.
7. Keshav, Vasanth, and Sudhir Vummadisetti. "Non-rectangular plates with irregular initial imperfection subjected to nonlinear static and dynamic loads." *International Journal of Advances in Engineering Sciences and Applied Mathematics* 15, no. 4 (2023): 155-158.
8. Vummadisetti, Sudhir, and S. B. Singh. "The Influence of Cutout Location on the Postbuckling Response of Functionally Graded Hybrid Composite Plates." In *Stability and Failure of High Performance Composite Structures*, pp. 503-516. Singapore: Springer Nature Singapore, 2022.
9. Sathi, Kranthi Vijaya, Sudhir Vummadisetti, and Srinivas Karri. "Effect of high temperatures on the behaviour of RCC columns in compression." *Materials Today: Proceedings* 60 (2022): 481-487.
10. Vummadisetti, Sudhir, and S. B. Singh. "Buckling and postbuckling response of hybrid composite plates under uniaxial compressive loading." *Journal of Building Engineering* 27 (2020): 101002.
11. Vummadisetti, Sudhir, and S. B. Singh. "Postbuckling response of functionally graded hybrid plates with cutouts under in-plane shear load." *Journal of Building Engineering* 33 (2021): 101530.
12. Vummadisetti, S., and S. B. Singh. "Boundary condition effects on postbuckling response of functionally graded hybrid composite plates." *J. Struct. Eng. SERC* 47, no. 4 (2020): 1-17.
13. Singh, Shamsher Bahadur, Sudhir Vummadisetti, and Himanshu Chawla. "Development and characterisation of novel functionally graded hybrid of carbon-glass fibres." *International Journal of Materials Engineering Innovation* 11, no. 3 (2020): 212-243.
14. Vummadisetti, Sudhir, and S. B. Singh. "Buckling and postbuckling response of hybrid composite plates under uniaxial compressive loading." *Journal of Building Engineering* 27 (2020): 101002.
15. Singh, S. B., Himanshu Chawla, and Sudhir Vummadisetti. "Experimental and Analytical Studies of Failure Characteristics of FRP Connections." In *Recent Advances in Structural Engineering, Volume 2: Select Proceedings of SEC 2016*, pp. 755-757. Springer Singapore, 2019.

16. Singh, S. B., Sudhir Vummadisetti, and Himanshu Chawla. "Assessment of interlaminar shear in fiber reinforced composite materials." *Journal of Structural Engineering* 46, no. 2 (2019): 146-153.
17. Singh, S. B., Himanshu Chawla, and Sudhir Vummadisetti. "Experimental and Analytical Studies of Failure Characteristics of FRP Connections." In *Recent Advances in Structural Engineering, Volume 2: Select Proceedings of SEC 2016*, pp. 755-757. Springer Singapore, 2019.
18. Singh, S. B., Sudhir Vummadisetti, and Himanshu Chawla. "Influence of curing on the mechanical performance of FRP laminates." *Journal of Building Engineering* 16 (2018): 1-19.
19. Rakesh, Pydi, Padmakar Maddala, Mudda Leela Priyanka, and BorigarlaBarhmaiah. "Strength and behaviour of roller compacted concrete using crushed dust." (2021).
20. Barhmaiah, Borigarla, M. Leela Priyanka, and M. Padmakar. "Strength analysis and validation of recycled aggregate concrete." *Materials Today: Proceedings* 37 (2021): 2312-2317.
21. Padmakar, M., B. Barhmaiah, and M. Leela Priyanka. "Characteristic compressive strength of a geo polymer concrete." *Materials Today: Proceedings* 37 (2021): 2219-2222.
22. Priyanka, Mudda Leela Leela, Maddala Padmakar, and BorigarlaBarhmaiah. "Establishing the need for rural road development using QGIS and its estimation." *Materials Today: Proceedings* 37 (2021): 2228-2232.
23. Srinivas, K., M. Padmakar, B. Barhmaiah, and S. K. Vijaya. "Effect of alkaline activators on strength properties of metakaolin and fly ash based geo polymer concrete." *JCR* 7, no. 13 (2020): 2194-2204.
24. Mathew, Rojeena, and M. Padmakar. "Defect development in KDP Crystals produced at severe Supersaturation."
25. Sathi, Kranthi Vijaya, Sudhir Vummadisetti, and Srinivas Karri. "Effect of high temperatures on the behaviour of RCC columns in compression." *Materials Today: Proceedings* 60 (2022): 481-487.
26. Jagadeeswari, Kalla, Shaik Lal Mohiddin, Karri Srinivas, and Sathi Kranthi Vijaya. "Mechanical characterization of alkali activated GGBS based geopolymer concrete." (2021).
27. Srinivas, Karri, Sathi Kranthi Vijaya, Kalla Jagadeeswari, and Shaik Lal Mohiddin. "Assessment of young's modulus of alkali activated ground granulated blast-furnace slag based geopolymer concrete with different mix proportions." (2021).
28. Kalla, Jagadeeswari, Srinivas Karri, and Kranthi Vijaya Sathi. "Experimental analysis on modulus of elasticity of slag based concrete." *Materials Today: Proceedings* 37 (2021): 2114-2120.
29. Srinivas, Karri, Sathi Kranthi Vijaya, and Kalla Jagadeeswari. "Concrete with ceramic and granite waste as coarse aggregate." *Materials Today: Proceedings* 37 (2021): 2089-2092.
30. Vijaya, Sathi Kranthi, Kalla Jagadeeswari, and Karri Srinivas. "Behaviour of M60 grade concrete by partial replacement of cement with fly ash, rice husk ash and silica fume." *Materials Today: Proceedings* 37 (2021): 2104-2108.
31. Mohiddin, Shaik Lal, Karri Srinivas, Sathi Kranthi Vijaya, and Kalla Jagadeeswari. "Seismic behaviour of RCC buildings with and without floating columns." (2020).
32. Kranthi Vijaya, S., K. Jagadeeswari, S. Lal Mohiddin, and K. Srinivas. "Stiffness determination of alkali activated ground granulated blast furnace slag based geo-polymer concrete." *Mater. Today Proc* (2020).

33. Srinivas, K., M. Padmakar, B. Barhmaiah, and S. K. Vijaya. "Effect of alkaline activators on strength properties of metakaolin and fly ash-based geo polymer concrete." *JCR* 7, no. 13 (2020): 2194-2204.
34. Borigarla, Barhmaiah, and S. Moses Santhakumar. "Delay Models for Various Lane Assignments at Signalised Intersections in Heterogeneous Traffic Conditions." *Journal of The Institution of Engineers (India): Series A* 103, no. 4 (2022): 1041-1052.
35. Barhmaiah, Borigarla, A. Chandrasekar, Tanala Ramya, and S. Moses Santhakumar. "Delay models for Signalised Intersections with Vehicle Actuated Controlled system in Heterogeneous Traffic Conditions." In *IOP Conference Series: Earth and Environmental Science*, vol. 1084, no. 1, p. 012038. IOP Publishing, 2022.
36. Borigarla, Barhmaiah, Triveni Buddaha, and Pritam Hait. "Experimental study on replacing sand by M− Sand and quarry dust in rigid pavements." *Materials Today: Proceedings* 60 (2022): 658-667.
37. Singh, Sandeep, BorigarlaBarhmaiah, Ashith Kodavanji, and Moses Santhakumar. "Analysis of two-wheeler characteristics at signalised intersection under mixed traffic conditions: A case study of Tiruchirappalli city." In *13th Asia Pacific Transportation Development Conference*, pp. 35-43. Reston, VA: American Society of Civil Engineers, 2020.
38. Brahmaiah, B., and A. Devi Prasad. "Study &Analysis Of An Urban Bus And Metro Route Using Vissim Simulated Data." *International Journal of Latest Trends in Engineering and Technology* 8, no. 1 (2017): 406-412.
39. Brahmaiah, B., M. Tech-IITR, A. D. Prasad, and K. Srinivas. "A Performance Analysis Of Modelling Route Choice Behavior On Urban Bus And Multi Mode Transit Route." *Int. J. Adv. Inf. Sci, Technol* (2017): 11.
40. Brahmaiah, B., and A. Devi Prasad. "PERFORMANCE ANALYSIS OF AN URBAN BUS AND METRO ROUTE USING COMMUTER SURVEY & TRAFFIC DATA."