IJCRT.ORG ISSN : 2320-2882
INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)
An International Open Access, Peer-reviewed, Refereed Journal

DEVELOPMENT OF MODEL TO REMOVE FLOATING MATERIALS FROM RIVER

[1]Mr. Sayam Rahman Majaz Ahmed, [2]Mr. Sagar Shivaji Kakade, [3]Mr. Parag dipak kokare, [4]Mr. Shivprabhu Atul Gaikwad, [5]Prof. Supriya Shinde

[1]Student of APCOER, [2]Student of APCOER, [3]Student of APCOER, [4]Student of APCOER, [5]Asst Prof APCOER
[1]Civil Engineering Department
Anantrao Pawar Collage of Engineering & Research

***Abstract**:* Globally, there is trending for more population density in metropolitan regions. As many people move to cities, human settlement up and developments is intertwined with availability of natural resources. This pattern is evident in Indian metropolitan cities too. However, quick urbanization led to significant depletion of natural resources. To same this problem, a victorious floating material removal model could play a key role in enhancing river water quality. By clearing extra floating material from the river, its overall quality can be improved. For this investigation, parameters specific to context will be considered, and a model system will be developed. The study will involve findings from both the model and observation sites, resulting in recommendations to encourage public use of top-quality water in Pune Metropolitan Area. Today, almost all manufacturing processes are automated to speed up product delivery. Automation is crucial in mass production. In this project, we built a remote-operated river-cleaning machine. The main goal is to develop a model for river cleaning time consumption. We automated the river cleaning operation using a motor and conveyor belt arrangement. Some automation needs are described below. Here, using RF transmitter and receiver to control the model.

***Index Terms* -** Component, formatting, style, styling, insert.

I. Introduction

Improving river quality is like, super important worldwide. Bringing rivers back to life is an on-and-off mission in growing countries. Setting up a nice space for water creatures, exploring cool new tech and rules, stopping gross pollution leaks, a bit of sustainability for the rivers. Plastic trash is, like, a total earth issue, popping up all over: look at Photo No. 1.1 displaying floating stuff on a brook The term plastic has Greek roots, meaning it can keep its shape in bunch of forms.

Midway is the second largest rapidly developing urban agglomeration in Maharashtra and ranks eighth and the national level. In Midway Urban Corporation (MUC) primary sources of waste are local households, business pioneers, vegetable marts, inns, resto fronts, and medical centers.

Midway Urban Corporation endeavors a huge amount of solid waste. The quantity of waste generated per day is about 1400 to 1500 metric tons (approximately generation per cappy per day is 500 grams). This large amount of waste is poorly disposed of and untreated.

Plastic is part of our daily life and worldwide we use 4 zillion plastic bags annually and 1 thousand plastic bottles every second. Plastics have become an integral part of daily life over the past few decades due to their highly versatile nature. However, the propensity of its universal use also makes plastic a significant part of solid waste. According to Roland Geyer et al. (2017), approximately 6300 million metric tons of plastic waste had been generated as of 2015 globally, out of which 9% is recycled, 12% is incinerated and 79% ends in landfills or discarded into the natural environment.

Photo No: 1.1

II. LITERATURE REVIEW

Aishwarya N A et al. [2017]1

The authors explained the problem of floating wastes on water bodies and how they affected the environment and human health. They proposed a project to detect and remove such wastes using infrared sensors and GSM communication. The authors presented the block diagram of their system, which consisted of a Renesas microcontroller, LCD, IR sensors, DC motor, GSM module, and flow sensor. They described the working principle and the components of their system. Additionally, the authors provided some background information on plastic pollution and its impacts on wildlife, wildlife habitat, and humans. They also mentioned the historical origins of pollution and the role of industrialization. The system included a high-performance, low-power microcontroller that controlled and coordinated the whole system. A 2x16 LCD showed the message when floating wastes were detected. Infrared sensors detected the floating wastes and sent the signal to the microcontroller. A low-cost DC-geared motor operated the floating barricades to remove the waste. A module used GSM technology to communicate with the authority via SMS. Additionally, a sensor measured the water flow rate and detected any blockage caused by the waste. The project utilized Cube Suite, an integrated development environment that provided simplicity, security, and ease of use in developing software for Renesas microcontrollers.

Ram Proshad et al. [2018]2

The global production of plastics increased from 1.5 million metric tons in 1950 to 260 million metric tons in 2007, and the per capita consumption of plastics also rose in different regions. Most of the plastic waste was disposed of in landfills or incinerated, which caused environmental pollution and health hazards. Only a small fraction of plastic waste was recycled or reused. Plastic debris could accumulate in terrestrial and aquatic ecosystems, where they cause physical and chemical impacts on wildlife and habitats. Plastic particles could also transfer toxic substances to the food chain. Plastic contains various chemicals that could leach out and contaminate food, water, and air. Exposure to these chemicals could cause adverse effects on human health, such as endocrine disruption, cancer, and reproductive problems. The section discussed the roles and responsibilities of various Bangladeshi agencies and authorities in ensuring the sustainable production, use, and disposal of plastic materials. It also mentioned the Environment Conservation Act of 1995 and its amendments in 2002 that banned or restricted the use of harmful plastic products. The section summarized the main findings of the study, which revealed the negative consequences of plastic on human health and the environment due to exposure to toxic chemicals. It also suggested some recommendations for the government, law implementing agencies, health authorities, and companies to reduce plastic consumption and toxicity. Additionally, it called for more information and awareness about the chemicals in consumer products.

Joana Correia Prata et al. [2019]3

The authors reviewed the current methods for collecting, separating, digesting, and identifying microplastics in water and sediment samples, and suggested improvements and alternatives. They compared different methods of sampling water (e.g., nets, pumps, sieves) and sediment (e.g., beach collection, seabed collection) and discussed their advantages and disadvantages in terms of representativeness, reproducibility, and contamination. The authors evaluated different methods of separating microplastics from organic and mineral matter, such as filtration, sieving, density separation, elutriation, and oil extraction, and recommended the use of NaI as a high-density solution for density separation. They examined different methods of digesting organic matter, such as oxidative, enzymatic, and alkaline digestion, and highlighted their effects on different types of polymers and fibers, as well as the need for validation and optimization of digestion protocols. Additionally, the authors described different methods of identifying and quantifying microplastics, such as visual inspection, staining dyes, FTIR, Raman spectroscopy, SEM, GC-MS, and XRF, and emphasized the importance of chemical characterization and quality control. They also reviewed the current methods used for sampling and detection of microplastics in water and sediment, identified flaws, and suggested alternatives. Furthermore, the authors discussed the advantages and disadvantages of different methods for collecting water and sediment samples, such as nets, pumps, sieves, filters, and specialized equipment. They evaluated the efficiency and suitability of various methods for separating microplastics from samples, such as filtration, sieving, density separation, elutriation, and oil extraction. Lastly, the authors discussed the methods for identifying and quantifying microplastics, such as visual inspection, staining dyes, FTIR, Raman spectroscopy, and other unusual methods.

P. Meganath et al. [2019]4

The authors designed and fabricated a manually powered river cleaning machine that used a waterwheel-driven conveyor mechanism to collect and remove waste debris from water bodies. They were motivated by the problem of water pollution caused by various sources of waste, such as sewage, toxic materials, plastic, etc. Their goal was to reduce the environmental and health impacts of water pollution and provide a low-cost and user-friendly solution. The machine consisted of a boat chassis, a crank wheel with a pedal, a turbine, a conveyor setup with collecting links, and a waste-collecting chamber. Human pedaling force activated the turbine and the conveyor simultaneously. This non-conventional, environment-friendly, easy-to-operate, and low-maintenance system could reduce water pollution in rivers, ponds, lakes, and other water bodies. It could also be used to remove sediments from swimming pools. The project aimed to address river cleaning and was designed to be cost-effective and accessible for society. The method minimized manual effort and ensured stability in rivers. The project made a significant contribution to environmental conservation, particularly in collecting plastic bottles (approximately 70% of all waste around the river). The waste particles included wood, cloth, and other debris. The system could lift waste particles weighing between 2 kg and 20 kg, and its storage capacity could accommodate up to 500 kg of waste, depending on the product size. Importantly, the system operated without pollution, smoke, or environmental defects.

Colin van Lieshout et al. [2019]5

The authors presented the problem of quantifying plastic pollution on surface water and highlighted the limitations of current monitoring methods. They proposed an automated method based on deep learning and video cameras to detect and count floating macroplastics in rivers. The authors described the data sets used for training and evaluating their method, which consisted of images of the water surface and labels of plastic objects collected at five locations in Jakarta, Indonesia. They also utilized a data set of human visual counting for comparison. The core of their method involved two stages: a segmentation stage that selected promising image regions using a Faster R-CNN, and a detection stage that classified the regions as plastic or not using an Inception v network. The authors reported the results of three experiments to assess the precision, generalization, and comparison of their method. They demonstrated that their method achieved a reliable estimate of plastic density, generalized well to new locations with some retraining, and matched or exceeded human counting methods.

Tim van Emmerik et al. [2020]6

The author discussed the problem of plastic debris in rivers, which affected both riverine and marine environments, and posed risks to ecology, wildlife, and human health. They provided information about the types, production, and usage of plastics, explaining how they became an environmental hazard due to their durability and improper disposal. The sources, pathways, and processes influencing the transport and distribution of plastic debris in rivers were described, with variations in space and time. The author's paper reviewed the methods and challenges of measuring and estimating the amount and characteristics of plastic debris in rivers, offering examples of reported values from different regions. They highlighted the need for harmonized data collection, analysis, and reporting tools for riverine plastic debris, as well as a global river plastic database to benefit the scientific community and beyond. An overview of the current state of the science on riverine plastic transport was provided, along with the identification of knowledge gaps and methodological challenges that needed to be addressed in future research.

P. Abdha Caroline et al. [2020]7

The author presented a project that aimed to address the problem of plastic and other waste polluting the oceans and rivers. The project involved designing and building a floating robot that could collect and remove trash from the water surface using a net-like structure. Additionally, the robot was capable of removing oil from the water layer using a special filter. Powered by solar energy through photovoltaic cells and a rechargeable battery, the robot offered a low-cost, safe, and effective means of floating trash removal. Its easy controlling and monitoring system and low maintenance costs made it a promising solution for cleaning water bodies and protecting aquatic animals and the environment.

Emma Schmaltza et al. [2020]8

The authors created a comprehensive inventory of technologies that fell into two categories: prevention or collection of plastic pollution. They conducted a systematic search of internet resources, scholarly literature, patents, and expert consultations to identify and categorize the technologies by their type and target plastics (i.e., macroplastics, microplastics, or both). The authors found that most technologies (59%) focused on collecting macroplastic waste already in waterways, while few technologies attempted to prevent plastic pollution leakage, and those that did were limited in scope. They concluded that a comprehensive approach was needed that combined technology, policymaking, and advocacy to prevent further plastic pollution and the subsequent damage to aquatic ecosystems and human health. The authors discussed various technologies to prevent and collect marine plastic pollution, which is a global environmental and health problem. They created a comprehensive inventory of 52 technologies that fell into two categories: prevention or collection of plastic pollution. This inventory could be used as a roadmap for researchers and policymakers to compare and evaluate different solutions. The authors identified some gaps and limitations of the current technological approaches, such as the lack of focus on preventing plastic leakage, the low capacity and implementation of collection technologies, and the need for more research on the impacts and effectiveness of the technologies. They suggested that technological developments should be combined with policy, advocacy, and education to address the plastic pollution problem holistically and sustainably. Additionally, they highlighted the role of governance and funding in facilitating and incentivizing the use of technologies.

D. Barcelo et al. [2020]9

The authors discussed different aspects and presented case studies of micro and macroplastic litter pollution in coastal waters and rivers, along with potential solutions involving new removal technologies and policy actions. Their paper reviewed several studies that demonstrated the distribution, sources, and impacts of macro and microplastics in various coastal environments worldwide, including beaches, sediments, and fish. The authors highlighted the role of rivers as carriers of microplastics from land to sea, considering the factors influencing their transport and fate. Additionally, they provided examples of riverine anthropogenic litter in Europe. The paper outlined various initiatives and strategies aimed at reducing the presence of plastics and microplastics in the environment. These approaches included legislative, social, scientific, and technological measures. Furthermore, the authors identified knowledge gaps and research needs in this field. To illustrate the occurrence, distribution, sources, and impacts of plastic litter in different environmental matrices, the paper presented case studies from various regions worldwide, including India, Mexico, Australia, Europe, and the Nordic Sea.Regarding technologies for removing microplastics from wastewater and drinking water, the paper reviewed both current and emerging methods. These included membrane treatments, filtration, coagulation, photocalysis, constructed wetlands, and microbial degradation.As part of policy solutions to reduce plastic pollution, the authors suggested measures such as banning single-use plastics, implementing circular economy systems, promoting citizen science initiatives, and developing bioplastics

Sagar Choudhary et al. [2021]10

The author addressed the environmental problem of garbage and waste accumulation in lakes and rivers, which caused water pollution, flooding, and health hazards. The objective was to design and create a floating river cleaner—a floating boat model that could automatically collect garbage from the water surface using solar power and a chain-driven mechanism. The author described the design and construction process of the floating river cleaner, including the selection of materials, the calculation of power, torque, buoyancy, belt length, and stress, as well as the modeling and analysis of the components. The paper also presented the results of testing the prototype model in a water tank and discussed its advantages, limitations, and future scope.The river floating cleaning machine was an easy, effective, economical, and environmentally friendly system designed to address the global crisis of drainage cleaning. It offered several advantages over existing technologies for cleaning spilled water. Notably, it could efficiently clean drains, prevent choking, and operate autonomously using solar power. By reducing human effort, it ensured faster and more efficient trash collection. Additionally, it effectively mitigated the hazardous effects of plastic waste. In summary, this solar-based trash cleaning machine served as a crucial tool in combating the global pollution crisis.

Hadeel Al-Zawaidah et al. [2021]11

The authors reviewed the latest knowledge of riverine macroplastics processes, transport, and impacts, and identified the knowledge gaps and future research directions. The paper outlined various sampling methods and transport mechanisms of microplastics in rivers, including floating, suspended riverbed, and riverbank macroplastics. They described the main factors influencing the horizontal and vertical hydrodynamic transport processes of microplastics in rivers, such as physical characteristics, water temperature, degradation, flow, wind, and obstructions. The paper contained many references to support the findings and arguments. Macroplastics, which are large plastic debris, can harm riverine systems and eventually reach the oceans. The authors reviewed the current knowledge and challenges of riverine macroplastic research, such as quantification methods, transport dynamics, and impacts. They suggested future research directions, including developing global protocols, physical modeling, and data analytics, to obtain a riverine macroplastic budget model.

Yadav Sandesh M. et al. [2022]12

The authors presented a design and fabrication of a river waste cleaning machine that used a waterwheel-driven conveyor mechanism to collect and remove waste debris from water bodies. They stated that the current situation of the national rivers in India was alarming, as they were polluted with sewage, toxic materials, debris, etc., adversely affecting aquatic life and the environment. The authors reviewed some existing works on river cleaning machines, including a machine that used a belt drive mechanism, a machine that used a solar panel and a DC motor, and a machine that used a paddle wheel and a conveyor belt. Their context contained many references to support the authors' claims and arguments. The drafting model presented a 3D model of their device, which consisted of a lower basement, a collecting box, a chain, a sprocket wheel, a motor, a bend plate, two rollers, a belt drive, and perforated buckets. The authors explained how their device worked to collect floating waste from rivers and seas. The device was placed across a water body so that only river sand could get through the lower basement. The floating waste was lifted by the lifters and stored in the collecting box. The bend plate was used to level the river surface. The perforated buckets were mounted on the belt drive and rotated inside the drainage block. These buckets picked up the waste material and allowed water to flow out. Ultimately, the waste was collected in a storage collector behind the belt drive.

O. W. C. Wamelink, et al. [2021]13

The authors introduced the problem of plastic pollution in African rivers and motivated the need for its removal. They outlined the paper's structure and the main categories of benefits: environmental, health, and economic. The authors provided statistics on the amount of plastic contributed by Africa to the ocean and explained the reasons behind inadequate plastic waste management. Notably, the Niger and Nile rivers were identified as the top two rivers with the highest plastic content in Africa. Discussing the harmful effects of plastic on animals, the authors highlighted issues such as ingestion, starvation, and poisoning. They also explained how plastic can disrupt the food chain and impact water quality. Furthermore, the authors delved into the effects of plastic waste on fishermen's income and nutrition, the tourism sector, and the costs associated with marine vessel damage. Acknowledging the market value of recycled plastic, the authors recognized the potential for plastic removal as a business opportunity. They also acknowledged that some people in Africa rely on plastic waste for scavenging food or valuable items, or for participating in small projects that pay them to collect waste. An example cited was Project Butterfly, which aims to educate and facilitate clean-up activities. Connecting the three categories of benefits (health, environment, and economic), the authors discussed their interrelations.

Rohan Sawant et al. [2022]14

The authors identified untreated sewage and small-scale industry as the main causes of water pollution in Pune. They also mentioned pesticides and fertilizers as contributors to the problem. The authors discussed the negative effects of water pollution on human health, economic growth, and environmental quality. They cited various studies and statistics to support their claims. Additionally, the authors suggested some possible solutions to control water pollution, such as installing sewage treatment plants, managing solid waste, and creating awareness among the public. They recommended further research and collaboration among stakeholders. Regarding oil droplets, the type and size affected the choice of separator technology. Emulsified oils needed to be cracked by lowering the pH of the water matrix. Sedimentation methods were used to remove most solids, but ultrafiltration or filtration might have been needed for solids with low density or fine size. Water pollution harmed humans, animals, and plants. It resulted from various physical, chemical, biological, and radiological contaminants. It could lead to various diseases and environmental problems.

Dr. Tamilselvan et al. [2022]15

The author stated the problem of water pollution caused by floating garbage and oil, which affected the environment and aquatic life. They also mentioned the difficulties and risks of manual cleaning methods. The author explained the methodology used for designing and fabricating the trash removal system, which consisted of a chain-driven conveyor mechanism, a DC motor, a battery, a lifter, and an oil skimmer belt. They also presented the diagrams and specifications of the components and the working principle of the system. The trash removal system could effectively clean water bodies from solid waste and oil, reducing health hazards and environmental impacts of water pollution. Additionally, the author suggested some future improvements and applications for the proposed system. The floating river cleaner effectively collected solid waste from water surfaces, benefiting both the environment and aquatic life. By automating the process, people no longer needed to manually clean every corner of the water. Ongoing work focused on enhancing the oil skimmer's capacity to handle heavy waste, with promising improvements, including increased oil recovery rates. This initiative highlighted the urgency of environmental issues for governments and society.
variables for the period of 5 years. The data collection period is ranging from January 2010 to Dec 2014. Monthly prices of KSE -100 Index is taken from yahoo finance.

Concluding remark

The toxicity of plastic is a problem in nature on a universal scale, from the individual level to the level of the population.The study reveals the negative consequences of plastic on human health and the environment as a result of exposure to toxic chemicals used in the production of plastics.A full of information about all existing chemicals in consumer products must be required so that people become aware of to use of those products.The main sources of plastics are rivers (terrestrial sources), with the majority input in the northern Indian Ocean particularly the Bay of Bengal

References

1.Aishwarya N A, Arpitha M, Chaithra K, Chira Shankar, Navyashree D, "Detection and Removal of Floating Wastes on Water Bodies, "International Journal of Research and Scientific Innovation (IJRSI) | Volume IV, Issue VI, June 2017, ISSN 2321–2705.

2.Comparative study of effect of infill walls on fixed base and base isolated reinforced concrete structures Manthan H. Vasani, Satyen D. Ramani, Journal of Emerging Technologies and Innovative Research (JETIR). 2018

3.D. Barcelo, Y. Pico, "Case studies of macro- and microplastics pollution in coastal waters and rivers: Is there a solution with new removal technologies and policy actions? ", Case Studies in Chemical and Environmental Engineering 2 (2020) 100019 Volume 144, November 2020, 106067

4.Dr. Tamilselvan N, Jijithprasanth S, Pankaj Yadav, Habib Dhuniya , Prabin Mahato, "Design of Trash Removal System in Water Bodies Using Oil Skimmer", ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538 Volume 10 Issue IV Apr 2022.

5.Emma Schmaltza, Emily C. Melvina, Zoie Dianaa, Ella F. Gunadyb , Daniel Rittschofa , Jason A. Somarellib,c , John Virdind , Meagan M. Dunphy-Dalya "Plastic pollution solutions: emerging technologies to prevent and collect marine plastic pollution", Environment International

6.Hadeel Al-Zawaidah, Diego Ravazzolo and Heide Friedrich, "Macroplastics in rivers: present knowledge, issues and challenges ", Environ. Sci.: Processes Impacts, 2021, 23, 535–552

7.Joana Correia Prata, Joao P. da Costa, Armando C. Duarte, Teresa Rocha-Santos, "Methods for sampling and detection of microplastics in water and sediment: A critical review "Trends in Analytical Chemistry volume 110, January 2019, Pages 150-159.

8.O. W. C. Wamelink, "Benefits of plastic removal in African rivers", April 23, 2021

9.P. Meganath, P. Sakthivel, V. Mohan Jeeva, S. Parthipan, P. Vijayakumar, "FLOATING PARTICLES REMOVAL IN RIVERS BY USING PEDALING MECHANISM", second international conference on nexgen technologies 8-9 march 2019 1098-1108.

10.P. Abdha Caroline P. SowmiyaP. Atchaya,R. Sharmila, Student of ECE Department, ".Robotic trash removal system in water bodies", international journal of creative research thought Volume 8, Issue 3 March 2020, ISSN: 2320-2882.

11.Ram Proshad, Tapos Kormoker, Md. Saiful Islam, Mohammad Asadul Haque, Md. Mahfuzur Rahman, Md. Mahabubur Rahman Mithu, "Toxic effects of plastic on human health and environment: A consequences of health risk assessment in Bangladesh ", International Journal of Health, 6 (1) (2018) 1-5.

12.Sagar Choudhary, Deepak Singh, Prasad Barathe, Pranav Chikale, Mukesh Mane, "Design and Development of River Floating Cleaner", International Journal of Advanced Research in Science, Communication and Technology (IJARSCT) Volume 7, Issue 2, July 2021

13.Sawant, Rohan, Deepa A. Joshi, Menon, Radhika, "Case Study on River Pollution of Pune City and Waste Management", EVERGREEN Joint Journal of Novel Carbon Resource Sciences & Green Asia Strategy, Vol. 10, Issue 04, pp2620-2631, December 2023

14.Sonali A. More, "Interlinking of Rivers", International Journal on Arts, Management and Humanities 3(2): 14-20(2014)

15.Tim van Emmerik, Anna Schwarz, "Plastic debris in rivers ", WIREs Water. 2020;7: e1398.

16.Yadav Sandesh, Yewale Rushikesh, Samant Mayur, Wannalwar Sainath, "Design & Fabrication of River Water Cleaning Machine", JETIR August 2022, Volume 9, Issue 8.

17.Yannic Fuchs, Susanne Scherbaum , Richard Huber , Nils Rüther and Arnd Hartlieb, "Removing PlasticWaste from Rivers: A Prototype-Scale Experimental Study on a NovelRiver-CleaningConcept",Water2024, 16, 248. https://doi.org/10.3390/w16020248