Increasing the Capture of Plastic Waste in the Mangrove Area of the East Coast of Surabaya

Rachmawati Novaria[1(✉)], Suko Istijanto[2], I Putu Rippa Sogawa[2], and Sefty Maharani Devi[1]

[1] FISIP Universitas 17 Agustus 1945 Surabaya, Surabaya, Indonesia
nova@untag-sby.ac.id
[2] Architecture Universitas 17 Agustus 1945 Surabaya, Surabaya, Indonesia

Abstract. From day to day the existence of plastic waste in the Mangrove Area of the East Coast of Surabaya is currently increasing and has become one of the problems faced by the people and the city government of Surabaya to be able to handle it. The city of Surabaya is an urban area where most of the land is directly adjacent to the coast, so many mangrove plants can be found there. Mangroves that grow in the city of Surabaya are along the East Coast. The problem is: the large amount of plastic waste that exists and gets stuck in the roots of mangrove trees when the sea water recedes and this becomes a threat to mangrove forests if not cleaned up immediately and endangers the safety of beaches and ecosystems on the East Coast of Surabaya so efforts are needed to overcome them and policies that support in efforts to increase the capture of disturbing plastic waste in the area. This study uses a qualitative research type with a descriptive type, namely to describe how to increase the catch of plastic waste in the East Coast Mangrove area of Surabaya. Data collection techniques were carried out using observation techniques, interviews, research documentation, FGDs and audio and visual materials. The informant determination technique was carried out purposively and snowball. The output can provide data related to the amount of waste that can be collected as material for consideration in making policies to address the presence of plastic waste in the East Coast mangrove area of Surabaya, besides encouraging community enthusiasm to increase the capture of plastic waste and the need for supporting policies to protect the area. Mangroves from plastic waste pollution.

Keywords: Capturing Plastic Waste · Community Participation · Waste Policy

1 Introduction

Coastal areas have a high diversity of natural resource potentials and are very important for social, economic, cultural, environmental development and for supporting national sovereignty (RI Law No. 27 of 2007 concerning Management of Coastal and Small Islands). Basically, coastal areas are composed of various ecosystems, such as mangroves, coral reefs, estuaries, sandy beaches, and others, which are interrelated, and do not stand alone.

Y. Sulaiman et al. (Eds.): ICoSPACS 2022, ASSEHR 774, pp. 142–149, 2024.
https://doi.org/10.2991/978-2-38476-106-7_18

Strategic aspects of the East Coast Mangrove area of Surabaya: 1). Based on Surabaya City Policy on mangrove management, including: Law Number 26 of 2007 concerning Spatial Planning, Surabaya City Regional Regulation Number 8 of 2018 concerning Surabaya City Regional Spatial Planning 2014–2034 (adjustments to the Surabaya City Regional Spatial Plan so that Regional Regulation of the City of Surabaya Number 3 of 2007 concerning Spatial Plans for the City of Surabaya). 2). The role and function of the Mangrove Area is not only as a conservation area. 3). The importance of mangroves for the city of Surabaya. 4). The development of spatial use in Pamurbaya (the growth of housing in Pamurbaya and the reclamation of coastal areas), 5). The construction of the infrastructure for the eastern outer ring road of the city of Suirabaya (OERR Outer East Ring Road), 6), this area is considered very strategic, because the area is close to the airport and landing and fish auctions in Tambak Oso and Gisik Cemandi in Sidoarjo district, 7). It has the potential to become the gateway to the city of Surabaya from the east (Sidoarjo district).

According to Zulfaidah, waste is goods that are not used or something that is thrown away that comes from human activities. Sources of waste come from several waste-producing places as a result of existing activities/activities such as households, markets, industry, trading activities, public spaces or others. Apart from that, in their daily activities, humans can also generate waste that may contain hazardous waste.

Darma Yuliana said that waste is a scourge for the environment because it can pollute the soil and sea, and is not easily biodegradable. Marine debris (marine debris) is a global problem that needs serious attention [1].

The results of research conducted by Jenna R. Jambeck from the University of Georgia, in 2017 there were 286 million tons of plastic waste generated worldwide. Most of the waste as follows 4.9–12.8 million tons pollutes the sea. Indonesia's 188.5 million coastal population produces 3.52 million tons of plastic waste that is not managed properly, of which around 0.9–1.25 million tons of waste has polluted the sea.

This shows that environmental pollution caused by human-made waste is a complicated and complex problem, especially in big cities. One of them is in the city of Surabaya, where the area has the potential to become a landfill for waste in suburban areas [2].

Suryono said, one of which is the coastal area. Like the coastal beaches in Surabaya, to be precise, in the Mangrove Area of Gunung Anyar Tambak Village. Apart from being used as a tourist destination, the Mangrove Area is directed to always maintain the image of a beautiful and clean area by always maintaining cleanliness, especially from plastic waste carried by river water and ocean waves [3].

That mangrove trees are relatively resilient to partial burial by plastic waste. However, mangrove stands are likely to deteriorate eventually if plastic continues to accumulate [4].

The increasing amount of plastic waste on the coast is becoming a serious problem. In an effort to reduce and prevent an increase in the number of marine debris that settles on the sidelines of thriving mangrove trees, this cannot be separated from the pro-active efforts of community elements in catching marine debris every day [5].

At present, around 2 to 3 tons of plastic waste can be collected per month, which is scattered along the banks of the mangrove forest. Cooperation with CSR (Corporate Social Responsibility) PT. PLN (Persero) with the local community (Shofiyatul Muntazah, 2015:4). Abbreviated as BSBM (Bintang Mangrove Garbage Bank) is a solution to help facilitate the community in collecting and selling the collected waste. To realize the face of a cleaner and healthier area and to move the caring spirit of the surrounding community to environmental conditions that are polluted by marine debris [6].

Based on previous research conducted by Darma Yuliana, the role of waste banks is able to empower the community because they have succeeded in educating the public about the importance of protecting the environment by not throwing garbage in the river. And form a sense of care so that people participate in waste bank activities or programs [1].

Participation is the process of facilitating the community together for the common good and measuring one's ability to use resources to achieve the desired results. But specifically, empowerment is defined as a comparison (ratio) between expenditure and income [7].

Empowerment is related to work results and the time unit needed to produce a product from labor Solving this problem is focused on efforts to provide socialization to increase public awareness of reducing expenses and assisting in waste management for the community, so as to obtain higher profit margins [8].

2 Methods

The research was conducted in the city of Surabaya, the mangrove forest area of the East Coast of Surabaya was chosen as the research location after considering various aspects. Among them, the East Coast of Surabaya has many mangrove forests that grow along the coast and as a port city with large capital in commercial activities. At the same time, the role of the government, community and commercial players is involved in caring for and participating in catching plastic waste in mangrove areas and policies are needed that can support this activity.

The data used is in the form of primary and secondary data. Data on mangrove potential was carried out using a qualitative descriptive approach which was validated by field data and field surveys and using several informants, namely fishermen who catch plastic waste, community leaders and residents who care about the environment. Data on the potential input of plastic waste is carried out by conducting direct sampling in the mangrove forest area on the east coast of Surabaya. The results of the analysis are used in an effort to plan the management of plastic waste capture in the mangrove area (See Fig. 1).

Fig. 1. Condition of plastic waste attached to the roots of mangrove trees.

3 Results and Discussion

Ocean plastic pollution is a problem we can't solve yet. Millions of tons of plastic waste litter our coastlines and oceans, from the surface to the deep sea. Simply put, we are creating and using plastic much faster than we can sustainably manage our plastic waste. As a result, more and more plastic is finding its way into the ocean, impacting marine wildlife and ecosystems around the world.

Jenna R Jamberk.et al.- Study of Marine Pollution in Pub Data, estimates of the mass of plastic waste carried by certain waterways range from 1 kg per day (Hilo, HI) to 4.2 MT (4200 kg) per day (Danube River) (10, 11). Because of their dependence on local watershed characteristics, these results cannot easily be extrapolated to a global scale. The researchers presented a framework for calculating the amount of mismanaged plastic waste generated annually by populations living within 50 km of coasts around the world that has the potential to enter the ocean as marine debris. For each of the 192 littoral states with at least 100 permanent residents bordering the Atlantic, Pacific, and Indian oceans, and the Mediterranean and Black Seas, the framework includes: (i) the mass of waste generated per capita each year; (ii) percentage of waste in the form of plastic; and (iii) percentage of mismanaged plastic waste. Total annual waste generation is largely a function of population size, with the top waste producing countries having some of the largest coastal populations.

Various types of marine debris threaten the mangrove and seagrass ecosystem by covering its roots and leaves, slowing down its growth rate, and even killing them. (3) Based on Surabaya City Regional Regulation No. 12 of 2014, regarding the PlanSpatial Planning of Surabaya City in 2014 – 2034:• Article 42 paragraph 2 "The coastal border area as referred to in paragraph (1) letter a is an area that can be utilized for green open space activities, development of natural and artificial structures, to prevent coastal disasters, recreational activities, marine tourism and ecotourism, research and education, customary interests and local wisdom, defense and security, transportation or communication". Article 42 paragraph 3 letter d "The coastal border area as referred to in paragraph (2) is determined on the coastal border of the City of Surabaya, including: d. The coastal border area is in Mulyorejo District, Sukolilo District, Rungkut District and

Gunung Anyar District. Article 42 paragraph 4 letter d "Efforts to manage the coastal border area as referred to in paragraph (2) are carried out by: d. Developing the coastal border area as referred to in paragraph (3) letter d, as a protected area in the form of a mangrove forest that is integrated with coastal ecosystems and nature tourism;" Article 44 paragraph 1 letter a: "Nature conservation and cultural heritage areas as referred to in Article 40 letter d include: a. Mangrove forested beach area developed on the coastal border in the north and east of the city and around the Suramadu bridge; Article 44 paragraph 2 letter a: "Efforts to manage mangrove forested coastal areas as referred to in paragraph (1) letter a are carried out by: a. establish a mangrove forested coastal area with the main function as a protected area that is integrated with ecotourism and science activities; Article 44 paragraph 2 letter c: "Efforts to manage mangrove forested coastal areas as referred to in paragraph (1) letter a are carried out by: c. carry out improvement and rehabilitation efforts in the form of replanting mangroves in mangrove forested coastal border areas in the Mulyorejo, Sukolilo, Rungkut and Gununganyar Subdistricts with a width of at least 130 (one hundred and thirty) times the average value of the annual difference between the highest and lowest tides, measured from the lowest tide line towards the land". Article 89 paragraph 2 letter a: "General provisions of zoning regulations for mangrove forested coastal areas as referred to in paragraph (1) letter a contain provisions concerning: a. Utilization of space in mangrove forested coastal areas for the development of mangrove forest protected areas, animal preservation, ecotourism and scientific development: Article 89 paragraph 2 letter b: "General provisions of zoning regulations for mangrove forested coastal areas as referred to in paragraph (1) letter a contain provisions concerning: a. Provision of infrastructure and facilities for securing mangrove forest protected areas, wildlife conservation, ecotourism and scientific development [9].

Development based on community dynamics is to create empowered and cultured communities. Empowerment allows a society to survive and develop itself to achieve progress. Most empowered people are individuals who have physical, mental health, are educated, strong and cultured. Cultivating the community is increasing the dignity of the layers of society who are in a condition unable to escape poverty, ignorance, unhealthy and underdevelopment. To encourage empowered communities by creating a climate or atmosphere that allows the community's potential to develop [10].

This power development is carried out by encouraging, motivating, and raising awareness of the potential of the community. This strengthening includes providing various inputs and opening access to various opportunities that exist. Communities are the main actors of development, with the core of empowerment being the transformation of community management towards shared prosperity. Empowerment is a powerful tool to get out of poverty, ignorance and underdevelopment towards common prosperity.The advantages of community-based development lead to development of: (1) Public awareness of the importance of participation in the development process; (2) The concept of appropriate technology, indigenous technology, indigenous knowledge and indigenous institutions as a result of the failure of the technology transfer concept; (3) Guidance from the world community regarding human rights, justice and legal certainty in the development process; (4) The concept of sustainable development, which is an alternative to a new development paradigm; (5) Non-governmental organizations; (6) Increase

Fig. 2. Condition, type and process of waste management.

awareness of the importance of the approach community development in development praxis [11].

The results of observations of the types of plastic waste that dominate in the mangrove area are plastic wrap and Styrofoam. The management design for capturing plastic waste consists of several elements, namely the objective elements, the required program, the affected community, program constraints, desired changes, and related agencies. The management plan is to prevent the entry of plastic waste and tackle the input of plastic waste from rivers and its accumulation in the mangrove ecosystem. The implementation of the arrest plan involves local government agencies and Perhutani companies such as outreach activities to groups of women and entrepreneurs, as well as involving fishermen groups in cleaning activities in the mangrove forest area. According to The Royal Netherlands Institute for Sea Research (Nederlands Institute voor Zeeonderzoek/ NIOZ) field research related to plastic waste pollution on the north coast of Java Island. Their research report has been published in 2021 in the journal Science of the Total Environment [12].

The results show that the restoration of the condition of the mangrove forest area in the northern region of Java is impossible without better waste management. Celine van Bijsterveldt, a researcher from NIOZ, has been monitoring the accumulation of plastic waste in Indonesia's mangrove forests for years [2] (See Fig. 2).

Most of the plastic waste, including household waste, is carried from the hinterland to the coast by local rivers. Finally, the plastic waste is trapped in the last area between land and sea. Bumping in estuaries bordering rivers and seas, including those which are mangrove forest areas [13].

4 Conclusion

1. Even though the city of Surabaya already has rules regarding waste, based on existing problems, to increase the capture of plastic waste there is still no policy needed to regulate plastic waste in mangrove areas and its coasts.
2. Community participation is still needed, and plastic waste collection groups in the Mangrove Area, which are supported by government programs.

3. Socialization and environmental awareness training for people in the mangrove area is urgently needed in changing a clean lifestyle starting from the smallest family so that they are more understanding and aware of the importance of protecting the mangrove forest area from the dangers of plastic waste and trying to catch more plastic waste and continue
4. Provide education and training so that the community around the mangrove area raises awareness for catching plastic waste which results are collected for cleaning and has a better selling value, as well as being given the skills to process plastic waste into goods that can be used and recycled so that they can get increased income family economy.
5. There needs to be a waste policy for managing mangrove areas in coastal areas so that it is maintained, and a program facilitated by the city government in carrying out activities to capture plastic waste
6. Try to replant mangrove trees on a regular basis

Based on the problems experienced by the community in increasing the capture of plastic waste, there are several aspects that must be considered in supporting success, namely: (1) The economic aspect, namely the policies that are given and must be socialized to the community from the mangrove forest area. (2) The functional aspect, namely the training program and skills in capturing plastic waste must be able to carry out its main function, namely being able to manage plastic waste and facilitate the community in the cleaning process. (3) Education and Training Aspects. Need to be given socialization and additional environmentally conscious knowledge. (4) Monev. During program implementation, it is necessary to monitor and evaluate the stages of its implementation. From the socialization of the program used to search for, accommodate and clean up waste, monitoring and evaluation activities are continuously carried out to ensure the utilization of the results of this program continues in the future.

Based on the research results, the next step is to analyze the data and information that has been obtained. From the analysis carried out, it was found that the first problem was the lack of public understanding of environmental awareness, not littering and awareness to participate in catching existing plastic waste and sticking to the roots of mangrove trees.

References

1. Yuliana D, Rahmasari A, Yulianto H, Damai A.A.: Coral Reef Fishes Biodiversity In Pahawang Island, Pesawaran District Lampung. AQUASAINS. 9(1), 1 (2020).
2. Cózar A, Sanz-Martín M, Martí E, González-Gordillo JI, Ubeda B, Á.gálvez J.: Plastic accumulation in the mediterranean sea. PLoS One, 10(4), 1–4(2015).
3. Suryono D.D., Afi Ati R.N., Setiawan A, Syakti A.D, Rustam A., Salim H.L.: Distribution of macro plastic debris in Muaragembong coastal bay during the east moonson and the east to west monsoon transition in 2020. E3S Web of Conferences. 324(2021).
4. van Bijsterveldt C.E.J., van Wesenbeeck B.K., Ramadhani S., Raven O., van Gool F.E., Pribadi R.: Does plastic waste kill mangroves? A field experiment to assess the impact of macro plastics on mangrove growth, stress response and survival. Science of the Total Environment. 756(2021).

5. Sucipto C.D.: Teknologi Pengolahan Daur Ulang Sampah. Teknologi Pengolahan Daur Ulang Sampah. Gosyen Publishing, Yogyakarta (2009).
6. Ruslinda Y.: Pengelolaan Sampah Kering Layak Jual Dengan Sistem Bank Sampah Di Kampus Universitas Andalas Padang. Jurnal Dampak, 11(2), 1 (2014).
7. Linda R.: Pemberdayaan Ekonomi Kreatif Melalui Daur Ulang Sampah Plastik (Studi Kasus Bank Sampah Berlian Kelurahan Tangkerang Labuai). Jurnal Al-Iqtishad. 12(1), 1(2018).
8. Novianarenti E, Ningsih E. Upaya Peningkatan Nilai Ekonomi Sampah Plastik Dengan Program Bank Sampah Di Simo Jawar Baru Kecamatan Sukomanunggal Surabaya. JPP IPTEK (Jurnal Pengabdian dan Penerapan IPTEK). 2(2), 1(2018).
9. Samad A.P., Agustina P., Herri M.: Kajian Nilai Ekonomis dan Dampak Sosial Keberadaan Ekosistem Mangrove Terhadap Masyarakat Pesisir. Jurnal Ekonomi dan Pembangunan. 11(1), 1-10 (2020).
10. Howlett M, Newman J.: Policy analysis and policy work in federal systems: Policy advice and its contribution to evidence-based policy-making in multi-level governance systems. Policy Soc. 29(2), 123–36 (2010).
11. Ely A.J., Tuhumena L., Sopaheluwakan J., Pattinaja Y.: Strategi Pengelolaan Ekosistem Hutan Mangrove di Negeri Amahai. Triton: Jurnal Manajemen Sumberdaya Perairan. 17(1), 1–10(2021).
12. Eriksen M., Lebreton L.C.M., Carson H.S., Thiel M., Moore C.J., Borerro J.C.: Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea. PLoS One, 9(12), 1(2014).
13. Wright S.L., Kelly F.J.: Plastic and Human Health: A Micro Issue? Environ Sci Technol. 51(12), 6634–47(2017).