

Statistics and Spatial Approach to Quantify the Unmanaged Plastic Waste Generation from the Land to DKI Jakarta River, Indonesia

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DKI Jakarta, as the center of business and government activity in Indonesia, around 7,800 tonnes/day out of 8,397 tonnes/day waste processed at Bantargebang landfill. The generation of plastic waste at the source reached 21.6% or 1,813 tonnes/day and around 1,326 tonnes/day processed at the landfill. It indicates that 487 tonnes/day of plastic waste are unmanaged properly and can be dumped to the sea through the river channel. A spatial approach and questionnaire to the existing generation of plastic waste, plastic waste reduction facilities, plastic waste processing facilities, and landfills were formed to calculate the potential generation of plastic waste dumped into river. A spatial approach was developed to determine the index and weight of unmanaged plastic waste into rivers based on location, which can formulate regulations and strategies for reducing plastic waste into the sea.

Keywords: unmanaged plastic waste, DKI Jakarta, spatial approach, statistics

INTRODUCTION

The global model of plastic waste into the sea developed by Lebreton 2017 and Jambeck 2015 states that Indonesia is one of the largest contributors of plastic waste to the world's oceans and that several Indonesian rivers are declared highly polluted by plastic waste. However, the global model gives an 8-16x greater amount than the field data measured in 9 DKI Jakarta's estuaries (Cordova and Nurhati, 2019). It can be caused by several global model assumptions that are not suitable to be applied in Indonesia as an archipelagic country. Jambeck 2015 and Mc. Kinsey 2015 stated that it is estimated that 80% of marine plastic debris is generated from human activities on land. Baseline data is important to understand to formulate policies and strategies in reducing waste in DKI Jakarta Province. Therefore, unmanaged plastic waste in the land and ends up in rivers to the sea needs to be concerned.

MATERIALS AND METHODS

The detail of material and methods as can be seen in Table 1.

Table 1. Material and methods in this research

No	Phase	Data	Product	Source	Resolution
1.	Plastic waste in the source model	Plastic waste generation	Number of population Waste generation percapita	BPS Kota 2010-2019 SNI 19.3983-1995	-
		Plastic waste composition	Plastic waste composition percentage	Primary data, literature study	-
2.	Waste Reduction Facility	TPS 3R and Waste Bank Coordinate	SIPSN 2018	Ministry of Environment Indonesia	-
3.	Waste Handling Facility	Dump Sites coordinate	Recording of waste weight at TPST Bantargebang	DKI Jakarta Environmental Services	-
4.	Waste handling in the source	Social variables for plastic waste handling	Questionnaire	Primary Data	-
4.	Economic and social variables	Population	Geofabrik.de 2020	Open Street Map	300m
		LULC	ESA CCI-LC 2015	ESA	300m

No	Phase	Data	Product	Source	Resolution
		Night Light (GDP)	VIIRS 2019	NOAA	300m
		Topography	DSM 2019	GEE	300m
		Awakened area	IS 2019	GEE	300m
		Population distribution	Population Visualization 2019	GEE	300m
		Administration boundary	Peta Rupa Bumi Indonesia	Badan Informasi Geospasial (BIG)	-

RESULTS AND DISCUSSION

Figure 1 shows the spatial model developed in which an index of unmanaged plastic waste on land is layered with a map of the river in DKI Jakarta. The questionnaire results state that there are three indexes of the community's willingness to dispose of their waste, there are 100 meters, 500 meters, and 1,000 meters. A buildup result model is then obtained in which the orange color represents the large contributors and blue is otherwise.

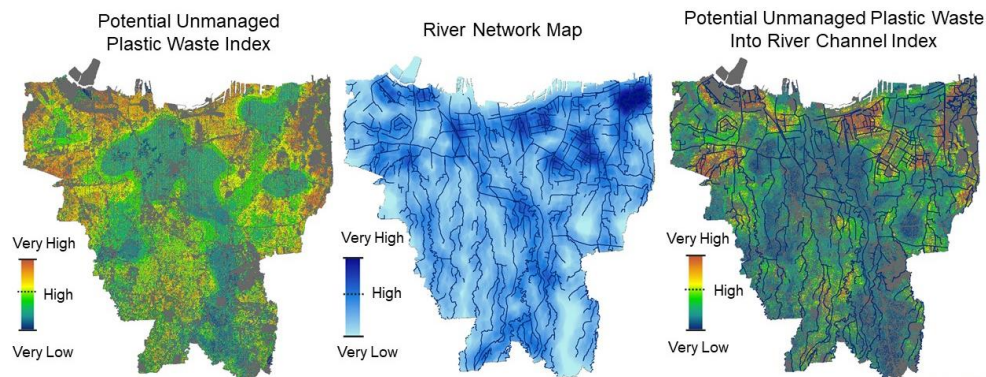


Figure 1. Potential unmanaged plastic waste into river channel index model

CONCLUSION

This study aims to formulate a methodology in quantifying the amount of unmanaged plastic waste into the sea through the river based on an area approach so that policies and strategies can be formulated on target.

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