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Plastic Credits – Financing the Transition to the Global Circular Economy

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Baseline Assessment Report on the pilot regions Goa, Maharashtra, Kerala

rePurpose

Wuppertal Institut

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1 Introduction

Plastic dominates modern life. It offers extraordinary properties which ease industrial as well as daily life processes including packaging solutions and the transportation of goods and products. As a result, it can also help reduce food waste. However, through mismanagement of plastics and plastic waste, plastic pollution has become one of humans´ biggest pressing issues. The consequences are negative effects on the environment, human health and social justice.

In India, where the issue of plastic waste pollution emerges especially in rural regions, it is often the lack of financial support that hinders the collection and environmentally friendly end-of-life processing of plastics. In recognition of this, the jurisdictions of India´s plastic waste management rules (2016)[1] have been expanded to rural areas with the responsibility for implementation handed to the local administration, also known as "Gram Panchayats" (GP). However, little improvement has been monitored so far, which can be led back to a lack of dedicated investments. In order to support these ambitions, an EPR (Extended Producer Responsibility) scheme had been introduced by the Union Ministry of Environment, Forest and Climate Change (MoEFCC) under the Plastic Waste Management Rules 2016. [2] Although multiple amendments have been made on the regulatories (in 2018, 2021, as well as 2022), it yet has been unsuccessful in driving the required finances towards the improvement of waste management in India. For this, various reasons and explanations are discussed. Certain challenges will for instance remain for smaller companies, in e.g. small villages, to meet the high targets foreseen[3], followed by the challenge to held producers accountable.[4] Consequently, as the implementation of this EPR regulation is expected to face some short-and mid-term obstacles and challenges particularly in rural areas of India, generating plastic credits can assist tackling the challenges around traceability, accountability, and compliance, while serving a solution for required finance mechanisms.

[1] Ministry of Environment, Forest and Climate Change. (2016a). Notification [Published in the Gazette of India, Part-II, Section-3, Sub-section (i)]. http://www.mppcb.nic.in/proc/Plastic%20Waste%20Management%20Rules,%202016%20English.pdf & Ministry of Environment, Forest and Climate Change. (2016b). Notification [Published in the Gazette of India, Part-II, Section-3, Sub-section (i)]. https://cpcb.nic.in/displaypdf.php?id=cGxhc3RpY3dhc3RlL1BXTV9HYXpldHRlLnBkZg==

[2] Ministry of Environment, Forest and Climate Change. (2022, February 18). Government notifies Guidelines on Extended Producers Responsibility on plastic packaging under Plastic Waste Management Rules, 2016. https://pib.gov.in/pib.gov.in/Pressreleaseshare.aspx?PRID=1799170

[3] Siddharth, G. S. (2021, December 6). Draft extended producer responsibility policy: How gaps in achieving fundamental goals can be closed. DownToEarth. https://www.downtoearth.org.in/blog/waste/draft-extended-producer-responsibility-policy-how-gaps-in-achieving-fundamental-goals-can-be-closed-80551

[4] Abraham, B. (2022, February 22). EPR For Plastic Packaging Waste Is A Step In The Right Direction But Has Set Impossible Targets. IndiaTimes. https://www.indiatimes.com/news/india/epr-guidelines-for-plastic-packaging-recycling-562665.html

Definition of Plastics Credits

"A plastic credit is a transferable unit representing a specific quantity of plastic pollution removed from the environment and/or put into the circular economy (i.e. collected and/or recycled) in excess of what would have happened in the absence of the credit-generating activity (i.e. business as usual). Plastic credits reduce the amount of plastic in the environment (or that which would have ended up in the environment) and increase the circularity of plastics through funding waste collection and/or recycling activities."[5]

1.1 Project overview

Against this background, the project "Plastic Credits – Financing the Transition to the Global Circular Economy" aims to finance the implementation and improvement of a waste management structure in India´s rural regions, focusing on pilot areas in Goa, Maharashtra, and Kerala. The creation of an end-to-end supply chain for waste collection and processing is expected to go hand in hand with the improvement of local employment and working standards through, among others, the creation of income streams for informal workers. Throughout this project, low-value plastics (i.e. MLP) will be monetized on the market creating an incentive for its collection and processing. This will be done through the creation of plastic credits, which is currently discussed as a key solution towards tackling the problem of plastic pollution. In addition to the collection of plastic waste, the concept promises to have positive implications on societal as well as environmental aspects. However, due to the novelty of this concept, scientific literature validating the promising additionalities are yet missing. This is why this project will undertake an Environmental Impact Assessment (EIA) with the data gathered in those three pilot regions.

The following report provides an overview of the baseline assessment conducted against the three pilot regions by reflecting on the data availability and quality. The report then presents first results on plastic waste (i.e. MLP) generation and processing situation as well as a description of the methodological fundament for the analysis of the project's additionality, and thereby, the additionality of plastic credits.

[5] 3R Initiative, EA - Environmental Action, South Pole, Quantis (2021). Guidelines for Corporate Plastic Stewardship, p. 20.

1.2 Data and Methodology

The data in this baseline report is based on data collected by rePurpose[6] from publicly available scientific, governmental, peer-reviewed sources, and/or interviews. RePurpose stresses the poor data basis on plastic waste and MLP in India. Since data collection is often incomplete and the available data often show discrepancies, the figures used are mostly based on estimates and assumptions. Moreover, it has to be taken into account that the data refer to different reference years. This is indicated in the respective sections of this report. A detailed description of data availability by rePurpose can be found in the annex.

In order to verify the environmental as well as social impacts of this project and the collection of plastic waste (low value plastic, i.e. MLP) that it comprises, an EIA will be conducted. The evaluation will be based on the data of this baseline assessment as well as on the data gathered throughout the project implementation phase. For this procedure, an Environmental Impact Assessment Matrix[7] will be used, which comes along with various benefits as it allows a clear structure of the considered environmental and social factors and enables the visualization of cause-effect links between project activities and potential impacts. A matrix brings along further advantages that include for instance traceability and reproducibility of the analysis. Table 1 shows an example of an Environmental Impact Assessment Matrix that lists the project activities on the horizontal and potential impacts on the vertical axis. Note that both - the activities as well as the impact factors - are only exemplary as they will be decided later on in the process.

[6] rePurpose. (2021a). Baseline Report. India (Multi Layered Plastics), November 2021 and rePurpose. (2021b). Plastic Credits Project Baseline Report. Malappuram District, Kerala, India.

[7] Morris, P., & Therivel, R. (Eds.). (2001). Methods of environmental impact assessment (Vol. 2). Taylor & Francis.

Table 1: Example of an Environmental Impact Assessment Matrix

Project activities/ Environmental components	Collection of plastic waste	Co-processing of plastic waste in cement kilns	Reprocessing of plastic waste
Physical / Chemical			
GHG emissions	□	□	□
Usage of primary resources	□	□	□
Biological / Ecological			
Marine Wildlife	□	□	□
Terrestrial Wildlife	□	□	□
Sociological / Cultural			
Standard of living	□	□	□
Economic / Operational			
Operational costs	□	□	□

Due to the scope of this project, linkages identified within the matrix will mainly be described qualitatively. In case of sufficient data availability, the method however allows the analysis of certain criteria in a quantitative manner as well. Sufficient data quality implies that data is gathered, either by official or research entities, that data is of sufficient resolution concerning time and location and that the data is correct. In this way, the analysis follows a holistic approach while enabling a more in-depth assessment for certain factors. For instance, the project aims at an evaluable linkage between the set-up of a value chain for the treatment of plastic waste and the reduction of CO_2 emissions. Last but not least, the approach will facilitate the identification of other quantifiable impact factors as well as of needs for further research along the assessment.

2 Data on plastic waste in India and the specific issue of MLP

To generate data on municipal solid waste (MSW) in India, urban population statistics and average waste generation rates were combined by the project partner rePurpose resulting in 129 million metric tonnes (Mt) of MSW per year.[8] Data on the generation of plastic waste has been derived from data on total waste generation and an estimated proportion of this waste being plastic (15 %). The assumption of 15 % is based on an average of different sources, which indicate a share of plastic in the MSW of between 7 % and 34 %.[9] Repurpose (2021) assume a 60 % MLP share of plastic waste. This number is an average of assumptions from other sources, which range from 53 %[10] to 67 %[11]. Data for India has thereby been extrapolated from countries with a similar level of national income[12]. As shown in Table 2, this volume is estimated to be around 19 Mt.

Table 2: Waste Generation Estimates for India per year (2020)

Region	MSW Generation	Plastic Composition of MSW (%)	Plastic Waste Generation	MLP Composition of Plastic Waste (%)	MLP Generation
India (Urban)	129 Mt (2020)	15	19.4 Mt	60	11.6 Mt

Source: RePurpose (2021), p. 23.

Multi-Layer-Plastic (MLP) plays a crucial role in packaging design. "*Its structure consists of more than one layer of distinct materials where the components are layered to form flexible packaging (pouches, bags, shrink films, other pliable products) or rigid ones (trays, cups, containers, other rigid plastic sheets).*"[13] *This type of packaging is known to be "widely applied in the Fast Moving Consumer Goods industry, used for items with a relatively low-cost price and with a relatively short lifespan, like beverages, food, and toiletries."*[14] It is

[8] rePurpose (2021a), p. 21.

[9] rePurpose (2021a), p. 48.

[10] In 2018, the Global Alliance for Incinerator Alternatives (GAIA) found that 53 % of plastic waste in 250 sites across 15 Indian cities was MLP.

[11] The Confederation of Indian Industry (CII) published an ITC WOW study that reported MLP making up 67 % of plastic waste in their 2020 report.

[12] OECD. (2019). Improving Resource Efficiency to Combat Marine Plastic Litter. https:// www.oecd.org/g20/summits/osaka/OECD- G20-Paper-Resource-Efficiency-and-Marine- Plastics.pdf

[13] Soares, C. T. de M., Ek, M., Östmark, E., Gällstedt, M., & Karlsson, S. (2022). Recycling of multi-material multilayer plastic packaging: Current trends and future scenarios. Resources, Conservation and Recycling, 176, 105905. https://doi.org/10.1016/j.resconrec.2021.105905

[14] Soares et al. (2022), p. 2.

also known to contribute to longevity and stability of food and pharmaceuticals, that's why it accounts as a key driver for the expansion of consumer goods. However, due to its low-value on the market, MLP is also known for its environmental leakage into the environment.

Due to lack of data, the overall volume of low value plastic and especially MLP is yet unknown. An assessment by the project partner rePurpose, which is based on secondary literature and industry reports, estimated a share of 60 % of the overall plastic waste that can be allocated to MLP (11,6 Mt).[15] From that, around 424 thousand tonnes are assumed to be collected, representing a penetration rate of 3.6 % (see Table 3).

Table 3: Estimated MLP collection and penetration rate in India for 2020, based on 2018 and 2019

Region	MLP collection (t)	MLP generation (t)	Penetration rate[16]
India	424,356	11,645,013	3.6%

Source: RePurpose (2021), p. 36.

The penetration rate is thereby being calculated as follows:

$$\text{MLP Penetration Rate (Pr)} = \frac{\sum \text{Volume MLP Collection}}{\sum \text{Volume MLP Generation}}$$"[17]

The term "collection" thereby refers to the amount of MLP that is either (1) co-processed or (2) reprocessed and is calculated based on the equation below:

$$\text{MLP collection} = \sum(\text{Co-processing}) + \sum(\text{Reprocessing})$$"[18]

(1) Co-processing entails the use of MLP waste as a resource-derived fuel (RDF). In this case, cement manufacturers use MLP as an alternative fuel. According to rePurpose, it is estimated that the current thermal substitution rate will increase via plastic waste, reaching a share of 25 % by 2025.

(2) Reprocessing on the other hand entails the incorporation of MLP waste into the production of new materials or processes. In this case, MLP is used in the bituminous mix laying out streets in India.

In the following, the presented indicators will be broken down into the regional level, providing an overview of each pilot region.

[15] rePurpose (2021a), p. 23.

[16] The penetration rate of Collection Activities was evaluated as per the requirements of the Plastic Credit Protocol by rePurpose.

[17] rePurpose (2021a), p. 36.

[18] rePurpose (2021a), p. 27.

3 Pilot regions

3.1 Pilot region Goa

Goa is located in the southwest of India and its mainland has a 105 km coastline on the Arabian Sea. The capital of Goa is Panaji. With an area of 3,702 square kilometers, it is the smallest state in India in terms of area.[19] The population was almost 1.5 million at the last census in 2011, while about 62 % lived in urban areas.[20] Important economic branches in Goa include agriculture, the fishing industry and the tourism sector.[21] Goa's GSPD is estimated at ₹ 7,741,348 million (approx. US$ 115,000 million) in 2018-2019. It has the highest per capita state income of all Indian states at ₹ 435,959 (approx. US$ 5,500) in 2018-2019.[22]

3.1.1 Waste management in Goa

The "Report of the Comptroller and Auditor General of India"[23] published by the Government of Goa identifies solid waste management in Goa as a major challenge, especially given the growing population. In 2018, a performance audit of 'Solid Waste Management in Goa' was conducted for the period 2013-14 to 2017-18. It was found that steps have been taken to formulate policies, identify regional waste processing sites, develop infrastructure and rehabilitate old landfills. However, it was noted that these measures would need to be intensified.

Deficiencies were mentioned towards the distribution of responsibilities for solid waste management, the methods for estimating waste generation, the collection of waste, the availability and capacity of waste processing facilities, and waste landfilling. In the case of waste processing and disposal facilities, safety aspects, lack of protective equipment for workers and missing environmental standards were pointed out.

Regarding the cleaning of beaches, for which the Tourism Department is responsible, it was observed that no segregation of the collected waste took place by the contractors. Furthermore, burning and disposal in nature took place, while the overall amount of collected waste has not been recorded.

3.1.2 Waste generation in Goa

In 2019, nearly 280,000 tonnes of municipal solid waste (MSW) were generated in Goa. Assuming a 15 % share of plastic waste in MSW, this amounts to approximately 42,000

[19] Wanmali, S. V., & Lodrick, D. O. (2022, July 19). *Goa*. Encyclopedia Britannica. https://www.britannica.com/place/Goa

[20] Reserve Bank of India. (2021). Handbook of Statistics on Indian States. https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/0HSIS241121FL7A6B5C0ECBC64B0ABF0A097B1AD40C83.PDF

[21] Wanmali & Lodrick (2021).

[22] Government of Goa (2020): Economic Survey 2019-2020, http://www.goadpse.gov.in/Economic%20Survey%202019-20.pdf

[23] Government of Goa (2019). Report of the Comptroller and Auditor General of India. https://cag.gov.in/uploads/download_audit_report/2019/Report_No_2_of_2019_Government_of_Goa.pdf

tonnes per year (see Table 4). Given a 60 % MLP share of plastic waste, this results in approximately 25 thousand tonnes of MLP per year in Goa.[24]

Table 4: Waste Generation Estimates for Goa, 2020

Region	MSW Generation (TPA)	Plastic Composition of MSW (%)	Plastic Waste Generation (t)	MLP Composition of Plastic Waste (%)	MLP Generation (t)
Goa	279,590 (2019)	15	41,939	60	25,163

Source: rePurpose (2021a), p. 23.

Against the generation of 25 thousand tonnes of MLP, about 2,650 tonnes are assumed to have been collected in 2020, resulting in a penetration rate of 11 % for Goa (see Table 5).[25]

Table 5: Estimated MLP collection and penetration rate in Goa for 2020, based on 2018 and 2019

Region	MLP collected (t)	MLP generated (t)	Penetration rate
Goa	2,651	25,163	11%

Source: rePurpose (2021), p. 36–37.

One part of the plastic waste is used in co-processing e.g. cement production) for energy and resource recovery.[26] This share is estimated to cover 9 % of the collected plastic waste, which equals to about 3.8 thousand tonnes. The amount of MLP co-processed in Goa is estimated to be about 2.3 thousand tonnes (see Table 6).[27]

Table 6: Estimated co-processing of plastic waste in Goa

Region	Estimated share of total plastic waste that is co-processed	Volume of PW being co-processed (t)	Volume of MLP being co-processed (t)
Goa	9%	3,774	2,265

Source: rePurpose (2021a), p. 26, based on based on Government of Goa (2019)

[24] rePurpose (2021a), p. 49.

[25] rePurpose (2021a), p. 36–37.

[26] rePurpose (2021a), p. 12.

[27] rePurpose (2021a), p. 26; Government of Goa (2019).

Another part of the collected plastic waste is reprocessed, i.e. used in construction materials such as paving tiles and plastic bricks, as well as in road construction or other commodities with commercial value.[28] For Goa, 2 % of plastic waste is assumed to be reprocessed, which corresponds to 839 tonnes of plastic and 503 tonnes of MLP (see Table 7).[29]

Table 7: Estimated reprocessing of plastic waste in Goa

Region	Estimated share of total plastic waste that is reprocessed	Volume of PW being reprocessed (t)	Volume of MLP being reprocessed (t)
Goa	2%	839	503

Source: rePurpose (2021a), p. 27, based on Government of Goa (2019).

3.2 Pilot region Aurangabad, Maharashtra

Maharashtra is a state in the west of India with Mumbai as its capital. With regard to the area, Maharashtra is the third largest state in India with 307.762 square kilometers. It borders the Arabian Sea to the west. Maharashtra had a population of about 112 million at the last census, making it the state with the second highest population in India. Approximately 45 % of the population lived in urban areas.[30] Important sectors for Maharashtra are textile and other agricultural industries, finance and foreign trade. The estimated nominal GSDP for 2021-2022 is ₹31.97 trillion (US$ 420 billion), the highest among all Indian states. The estimated per capita state income was ₹225,073 (US$ 3,000).[31] The pilot region Aurangabad had a population of almost 1.2 million in 2011. Overall, Aurangabad is an important industrial hub and a popular destination for tourists.[32]

3.2.1 Waste management in Aurangabad, Maharashtra

Waste management presents a growing issue in Aurangabad. After decades of waste dumping in the outskirts, local residents are refusing to accept more waste in the city.

[28] rePurpose (2021a), p. 12.

[29] rePurpose (2021a), p. 27; Government of Goa (2019)

[30] Reserve Bank of India. (2021).

[31] Government of Maharashtra. (2022). Economic Survey of Maharashtra 2021-22, https://mahades.maharashtra.gov.in/ESM1920/chapter/English/esm2122_e.pdf

[32] Mookerjee, S., & Wanmali, S. V. (2021, October 6). Maharashtra. Encyclopedia Britannica. https://www.britannica.com/place/Maharashtra

Currently, there is no waste treatment infrastructure in place, leading to both health and environmental problems. There is a waste collection system in the city of Aurangabad that separates biodegradable and non-biodegradable waste, while no further segregation tooks place. Against the current infrastructure, which entails an inefficient amount of bins and irregular empty schedule, a proper waste collection is being hindered.[33]

3.2.2 Waste generation in Aurangabad, Maharashtra

According to estimates, about 146 thousand tonnes of municipal solid waste (MSW) were generated in the pilot region Aurangabad, Maharashtra in 2016. Assuming a 15 % share of plastic waste in MSW, this amounts to approximately 22 thousand tonnes per year. Given a 60 % MLP share of plastic waste, the generation of MLP accounts to approximately 13 thousand tonnes (see Table 8).

Table 8: Waste Generation Estimates for Aurangabad, Maharashtra in 2016

Region	MSW Generation (TPA)	Plastic Composition of MSW (%)	Plastic Waste Generation (TPA)	MLP Composition of Plastic Waste (%)	MLP Generation (TPA)
Aurangabad, Maharashtra	146,000 (2016)	15	21,900	60	13,140

Source: rePurpose (2021a), p. 23.

According to rePurpose, no MLP has been collected in Aurangabad by 2020. Accordingly, the penetration rate of collection activities is 0 % and no MLP and also no plastic was co-processed or reprocessed (see Table 9 – Table 11).

Table 9: Estimated MLP collection and penetration rate in Aurangabad, Maharashtra, based on 2016

Region	MLP collected (t)	MLP generated (t)	Penetration rate
Aurangabad, Maharashtra	0	13,140	0.0%

Source: rePurpose (2021a), p. 36.

[33] Kallawar, G., Tiwari, R., Jadhav, S., & Joshi, M. (2018). Solid Waste Management: A Case Study of Aurangabad, Maharashtra. International Journal of Science, Engineering and Technology, 6(4). https://doi.org/10.2348/ijset04180182

Table 10: Estimated co-processing of plastic waste Aurangabad, Maharashtra

Region	Estimated share of total plastic waste that is co-processed	Volume of PW being co-processed (t)	Volume of MLP being co-processed (t)
Aurangabad, Maharashtra	0%	0	0

Source: rePurpose (2021a), p. 26, based on Kallawar, G., et al. (2018).

Table 11: Estimated reprocessing of plastic waste Aurangabad, Maharashtra

Region	Estimated share of total plastic waste that is reprocessed	Volume of PW being reprocessed PW (t)	Volume of MLP being reprocessed MLP (t)
Aurangabad, Maharashtra	0% of plastic waste is reprocessed	0	0

Source: rePurpose (2021a), p. 27, based on Kallawar, G., et al. (2018).

1.

3.3 Pilot region Kerala

Kerala is a state on the (southwestern) Malabar Coast of India. It is divided into 14 districts with the capital Thiruvananthapuram. It is the 21st largest Indian state by area but the second-most urbanized major state in the country, with 47.7 % urban population according to the 2011 Census of India. With 33 million inhabitants (as per the 2011 census), Kerala is the 13th-largest Indian state by population. The economy of Kerala is the 8th-largest in India with ₹8.55 trillion (US$110 billion) in gross state domestic product (GSDP) and a per capita net state domestic product of ₹222,000 (US$2,900).

3.3.1 Waste management in Kerala

According to rePurpose´s investigation, the current waste management systems in Kerala are either absent or severely lacking in their efficiency. The state recorded the lowest collection efficiency in solid-waste management among all states and Union territories for 2018-19 and 2019-20, as per the data presented in Lok Sabha by the Minister of State for Environment, Forest and Climate Change, Ashwini Kumar Choubey. The solid waste management capacity in Kerala is currently constrained by limited primary collection and transportation systems, low capacity of community-level bio-waste treatment facilities, and lack of centralized processing and disposal facilities. According to a survey carried out by the Kerala government in 2018, over 70 % of the water sources in Kerala are contaminated, with

over half of the pollution originating from solid waste in households, markets and hotels. Recognizing the urgency for improving solid waste management services, the Government of Kerala has taken several measures, such as a state-wide cleanliness mission (Harith Kerala Mission), which includes solid waste management as one of its core priorities; promoting a decentralized approach by asking local governments to improve source segregation, providing subsidies to households for managing biodegradable waste through composting or bio-digestion; and engaging women self-help groups for primary collection of plastic waste.

The activities of our project focus on the district Malappuram, which is one of the 14 districts in the state of Kerala. It comprises 94 Gram Panchayats ("GPs") or village administrative units with a population of 41 million inhabitants. For the project activities, 5 GPs have been selected based on their proximity to the ocean putting them into an imminent risk of marine littering. The following GPs have been selected: Chungathara, Pulpatta, Morayur, Porur, and Thiruvali.

Within those GPs, interviews have been conducted by rePurpose with identified key stakeholders. Those interviews revealed that there is no official or a regular collection system established at the GPs so far. The GPs would sometimes pay local street sweepers to collect waste from the establishments and bring it to a central storage facility. It furthermore has been stated that, although Extended Producer Responsibility (EPR) provides subsidies for collection and disposal of low value plastics, the subsidies are marginal and insufficient to cover the total cost of collection and processing. Across all 5 GPs, 2.600 commercial establishments have been counted - a sample study with 175 commercial shops revealed that approximately half of the shops are selling recyclable waste to local scrap dealers. This recyclable waste represents high-value waste and is assumed to cover 5 % of the total dry waste generated. When it comes to households, the interviews revealed that households would openly dump their waste or burn it in their backyards as the waste is not being sold to local scrap dealers.

3.3.2 Waste generation in Kerala

Based on those interviews, rePurpose estimated that 20 % of plastic waste consists of shampoo, water or other bottles and would therefore be recycled. A major percentage (70 - 80 %) however, is estimated to be non-recyclable covering low-value plastics such as soap covers, shampoo sachets and carry bags. As those low-value plastic types have no commercial value, they mainly remain non-purchased by local scrap dealers and uncollected by the GP´s established system.

Overall, the investigation on site done by rePurpose revealed the following waste estimates for the 5 GPs in Kerala: around half of the generated waste consists of plastic (55 %), of which around 20 % consists of MLP and another major part (57 %) of low value plastic (LVP) (see Table 12).

Table 12: Estimated waste material and plastic types in Kerala

Dry waste material type	% Composition
Plastic	55%
SCF	28%
Glass	7%
Bio-Medical	1.50%
E-Waste	0.50%
Metals	0.50%
Mixed Papers	5%
Inert & Residues	2.50%

Plastic waste type	% Composition
MLP	21%
Carry bags and films (LVP)	57%
HDPE	4%
LDPE	9%
PET	4%
Other Hard Plastics	1%
Others	4%

Source: rePurpose. (2021b), p. 15.

4 Additionality of the project

As part of the assessment, we will evaluate the positive additionality of the project in comparison to its baseline. The determination of additionality will influence the EIA in the way that for the final evaluation only the parameters will be considered that were previously determined as additional. In order to approach the topic of additionality, it is necessary to clearly define what is understood under both terms - *additionality* and *baseline*. This will be done in the following chapter first in a theoretical approach to then insert the definitions back into the context of this project. Following the line of thought, we will formulate two hypotheses that need to be tested in order to show that the project activities are additional and discuss how these hypotheses can be proven to be true. Finally, the considered baseline for the three pilot regions is explained.

4.1 Setting the terms Additionality and Baseline

As shown by Gillenwater, several slightly different definitions of *additionality* are being used today. He criticizes a commonly used *circular* definition in which only one factor has been identified as the cause as well as the effect and presents a definition of additionality himself:

> *"Additionality is the property of an activity being additional. A proposed activity is additional if the recognized policy interventions are deemed to be causing the activity to take place. The occurrence of additionality is determined by assessing whether a proposed activity is distinct from its baseline."* [34]

In 2001, the IPCC[35] defined additionality in its glossary and refined it later in 2007 as *environmental additionality*[36] :

> *"[...] Environmental additionality refers to the environmental integrity of the claimed amount by which greenhouse gas emissions are reduced due to a project relative to its baseline. A project activity is further additional, if the incentive from the sale of emission allowances helps to overcome barriers to its implementation."*

[34] Gillenwater, M. (2012). What is additionality—Part 1: A long standing problem. Greenhouse Gas Management Institute. https://ghginstitute.org/wp-content/uploads/2015/04/AdditionalityPaper_Part-1ver3FINAL.pdf

[35] IPCC (2001). Climate Change 2001: Mitigation—Contribution of Working Group III to the Third Assessment Report of the Intergovernmental Panel on Climate Change. IPCC. p. 708. https://www.ipcc.ch/site/assets/uploads/2018/03/WGIII_TAR_full_report.pdf

[36] IPCC (2007). Climate Change 2007: Mitigation of climate change: contribution of Working Group III to the Fourth assessment report of the Intergovernmental Panel on Climate Change. (2007). Cambridge University Press. p. 809. https://www.ipcc.ch/site/assets/uploads/2018/03/ar4_wg3_full_report-1.pdf

The assessment of both definitions revealed that none of them fully fit into our project environment; while the first definition focuses on the assessment of policy interventions, the second reduces the measurement of additionality to the reduction of greenhouse gas emissions. However, in this project, the intervention is created through a financial incentive (i.e. plastic credits) and the amount of collected plastic waste is next to the reduction of GHG emissions an important variable of concern. Yet as parts of Gillenwater´s definition have been found to be feasible, based on his work, a broader definition has been put in place by the Wuppertal Institute:

> *Additionality is the property of an activity being additional. An activity is additional if a) an external trigger causes the activity to take place and b) the resulting state of the system it acts upon is different in one or more variables of concern from the state that the system would have adopted to without the external trigger.*

This mentioned state to which the system would have adopted without the external trigger is known as the *baseline*. It is defined by Gillenwater in the following way:

> *"A baseline is a prediction of the quantified amount of an input to or output from an activity resulting from the expected future behavior of the actors proposing, and affected by, the proposed activity in the absence of one or more policy interventions, holding all other factors constant (ceteris paribus). The conditions of a baseline are described in a baseline scenario."* [37]

The general definition used for this project implies that a baseline is needed to confirm additionality and the requirements for this baseline can be derived from the definition. Therefore, the baseline will not be defined as such, instead the requirements that it needs to fulfil will be discussed in the paragraphs below.

4.2 Hypotheses

In the definition of additionality in the previous chapter, the terms **activity** and **trigger** are used as rather abstract concepts, but have a concrete counterpart in the project discussed here. To make the concepts easier to grasp and facilitate the process of thought, the terms will carry the following meaning in the context of this project:

- **activity**: the activity carried out in this project is the collection of MLP,

[37] Gillenwater, M. (2012). What is additionality—Part 1: A long standing problem. Greenhouse Gas Management Institute. https://ghginstitute.org/wp-content/uploads/2015/04/AdditionalityPaper_Part-1ver3FINAL.pdf

- **trigger**: the trigger, also referred to as incentive in the following text, is understood as the funds people receive from German taxpayers by funding this project and from companies buying plastic credits in continuation to the collection of MLP during the project phase.

To prove additionality as defined in this report both conditions - a) and b) - have to be true. Integrating this idea into the context of the project means that the following hypotheses need to be true and will therefore be tested:

H1) The funding and financial support through plastic credits leads to the additional collection of MLP within the pilot regions Maharashtra, Goa and Kerala, which would not have taken place otherwise.

H2) For each region, the resulting system is different in at least one variable of concern, which are defined by the investigator, from the respective baseline.

- **Theoretical approach for validating H1**

Showing that H1) is true, can be assessed by one of the following:

- by comparing the system of the considered region with an appropriate baseline and showing that the activity has not been carried out within the baseline scenario. In contrast to H2) where a baseline is used to prove that the activity changes the state of the system it acts upon, here the baseline is "only" used to show that the activity would not have been taking place without the financial incentive as a trigger. If we find H1) to be true, we can only say that the activity has been taking place as a result of the financial incentive but we cannot make a statement whether the activity changes anything in the system.
- by logical deduction suggesting that the activity would not have been carried out otherwise.

If we apply the latter to our case, we would need to show that there is no incentive - especially not a financial one - for the collection of MLP. At the same time, if it can be shown that a considerable amount of a resource (e.g. time) is needed as input from the people collecting MLP, it is very unlikely that this activity would have taken place without an external stimulus.

Another approach to validate H1) would be to show that the activity of collecting MLP has not taken place in the past. If no other external stimuli can be detected, it would be appropriate to assume that the collection is triggered by the incentive given in this project.

Similarly, H1) could be considered as true, if at the time that the project is implemented similar regions have not been starting to collect MLP. These regions then act as an approximated baseline for the region of concern.

- **Theoretical approach for validating H2**

The most straightforward way to prove H2) to be true, would be through the comparison of the variables of concern in the baseline system and in the system under consideration. For the region of concern, this could for example imply comparing the amount of collected MLP during the implementation of the project to the amount of collected MLP before the start of the project. One can either assume a steady state for the short time of the project or corrections might have to be made in order to capture seasonal or other trends. A history of observational data for the variable of concern, e.g. “collected amount of MLP”, helps to judge the feasibility and exactness of these approaches. All deviations from the baseline which is derived as described below would then be attributed to the project activities.

If the baseline is not established by comparing different periods of time in the same region, it could also be established by comparing the amount of collected MLP in the region of concern to the amount of collected MLP in a comparable region at the same time. In order to cater for different sizes of the regions it would of course be necessary to compare intensive or specific variables such as “change of MLP-collection in %” instead of using an extensive quantity such as “total amount of collected MLP”. Differences between the regions would then be counted as additional.

The impact of MLP collection on the total amount of collected waste, a quantity measured by public authorities, will probably be neglectable since the amounts of collected MLP are small in comparison to the total amount of waste. A change in this variable should not be expected. On the other hand, the amount of collected MLP is registered by rePurpose, so accuracy here can be expected to be very high. If we can assume that there was no collection of MLP before, the changes are clear and well quantifiable.

4.3 Baseline of the three pilot regions

Measuring a baseline with 100% accuracy is hardly possible, just as it is for the environment considered in this report. It is therefore necessary to discuss appropriate assumptions and approximations in order to result in a feasible definition of the “baseline”.

Data that serves as a quantitative baseline for this assessment has to meet the following requirements:

- **accuracy** - the amount of collected MLP must be detectable in the margins or error of the data. This requirement disqualifies the total amount of waste collected in the respective regions. Hence, it cannot be used as an indicator for the baseline. A better suited indicator is the amount of collected MLP which is tracked as part of the project.
- **resolution in time** - to track changes in the baseline indicator its "update frequency" must match the duration of this project. This disqualifies all official data sources that are only published on a yearly basis.
- **resolution in space** - in the best case scenario the data used as baseline is gathered exactly for the areas where the MLP collection activities are carried out. A broader region can be used as well but will have an impact on the accuracy relative to the collected amount.
- **scope** - the data that serves as baseline must include the amount of collected MLP. Data that includes other indicators might be used, but here the accuracy relative to the collected amount will decrease as well.

Considering the discussion on MLP collection made by rePurpose[38] it is quite clear that no data source exists able to cover all requirements. Nevertheless, the data assessed for the baseline can still be used to evaluate the additionality of MLP collection.

In the case of Aurangabad, Maharashtra, the data shows that no MLP was collected so far. Any amount collected through this project can therefore be seen as additional under the assumption that this status can be extrapolated into the future and no other trigger would have stimulated the collection.

In the case of Goa, an estimated amount of 2,265 t (or 9%) of the MLP waste is co-processed, and 503 t (or 2%) of the MLP waste is assumed to be reprocessed. Assuming that these amounts equal the amount of collected MLP, this sums up to a total of 2,768 t of collected MLP. We will assume that this number is not changing during the implementation phase of the project and will therefore use it as a baseline for this report. It is estimated that an amount of MLP in the order of a hundred tons will be collected, which is rather low in comparison to the amount that is already collected in the region. Hence, assessing additionality is not as straightforward as in the case of Aurangabad but nevertheless feasible. The assessment will need to take a deeper look into where and how the MLP is collected, as well as into the incentives for its collection, in order to distinguish these quantities from the collection of MLP in our project. If no correlations between places, methods and incentives for the collection exist, additionality can be assumed.

In the case of Kerala, a review of different sources revealed no direct data on the amount of MLP or LVP collected so far. Some data on the setup of the waste collection system

[38] rePurpose (2021a), p. 23-27.

exists, which can be used to deduct some general assumptions, but does not suffice for a quantitative or qualitative baseline on the MLP or LVP collection quantities. For now, it is assumed that no major quantities of MLP or LVP are collected for reprocessing or co-processing and the activities of this project will therefore be additional.

2. Final remarks on data quality

While the tracking of waste collection for this project is set up to be reliable and accurate, the quality of other data sources that could function as a baseline need to be interpreted carefully. As mentioned by rePurpose and the "Report of the Comptroller and Auditor General of India"[39] some of the data sources contradict each other while others are based on approximations extrapolated from very few data points. These numbers will be used as indicators in this project due to lack of data availability. Nevertheless, the reader should be aware of the limitations and inaccuracies this brings along. It is therefore worth noting the limitations of the baseline assessment stated by rePurpose:

Data limitations stated by rePurpose

"There is an existing issue of accuracy of waste management audits reported. The CPCB has consistently reported waste values for an entire state that in reality only represent the urban population. There are criticisms about waste volumes incorrectly accounted for. Some of the most recent data is from 2017-2018 which is close to the data age threshold. Other data was missing or went unreported for 5+ years. Even the latest PWMR is from 2018-2019. State-level data is reported but equates to the approximate values of only the major city of the state. The majority population of the state is missing any reliable estimates for waste generation so this report chose to model the urban contribution, which indeed produces more than their rural counterparts."

"One of the key issues in the management of plastic waste has been the lack of credible, actionable data and information[40]. Determining the amount of MLP waste generated was tedious due to discrepancies in data reported for total waste generated and varying total plastic and MLP composition estimates."

"Cement kilns only reported the amount of plastic waste incorporated into their fuel streams, not how much MLP exactly, so the assumption of 60%

[39] rePurpose (2021a); Government of Goa (2019)

[40] Centre for Science and Environment. (2020, September 24). Plastic waste is India's and the world's most formidable environmental challenge today, and the COVID-19 pandemic has made matters worse: CSE. https://www.cseindia.org/plastic-waste-is-india-s-and-the-world-s-most-formidable-environmental-challenge-10375

MLP makeup of total plastic waste was applied to determine how much of plastic waste is MLP. It is difficult to discern where the MLP waste is going, most sources simply say "collected" but this report assumes that co-processing and reprocessing are currently the only two end destinations for MLP that are active. This work demonstrates that MLP has a low penetration rate across the board and this particular material flows inefficiently through the waste management regime."

Source: Repurpose (2021a)

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