



Workshop Report

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Marine Litter and LCA: Global and Latin American Initiatives

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Marine Litter and LCA: Global and Latin American Initiatives

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Table of Content

Introduction.....	4
Insights from the Stakeholder Group Discussions	6
Policy Makers	6
Consumers	6
Manufacturers.....	7
Waste Managers.....	8
Insights from the Plenary Discussion on Marine Litter in LCA	9
Inventory.....	9
Impacts:	10
Summary	11

Introduction

The Forum for Sustainability through Life Cycle Innovation (FSLCI), the UN Environment Programme's Life Cycle Initiative as well as the Red Iberoamericana de Ciclo de Vida (RICV) organized a joint workshop on the subject of "Marine Litter and LCA: Global and Latin American Initiatives" on 16th July in Cartago, Costa Rica ahead of this year's *Conferencia Internacional Análisis de Ciclo de Vida* (CILCA 2019). The workshop was kindly supported by the organizers of CILCA 2019 and Braskem.

The objective of the workshop was to bring together international and Latin American experts to discuss potential solutions and next steps to address the regional challenges for Latin America with regards to the issue of marine litter from a life cycle perspective.

Marine litter is a global concern crossing country borders. A recent study has estimated that 4.8 to 12.7 million tonnes of plastic waste entered the oceans in 2010¹, linking it to insufficient waste management, littering and consumption behaviour: Estimated numbers vary, but it is clear that too much waste enter rivers, seas and oceans which have turned into the world's biggest landfill, causing environmental, economic, and social damage. About 388 million tons of plastics were produced in 2015 with 99.5% being fossil-based (UN Environment, 2018a²). There is also growing evidence that marine plastics represent a substantial challenge to marine biodiversity: over 500 species are known to be affected by entanglement, ingestion, and ghost fishing (UN Environment, 2018b³).

Plastics in the oceans have a negative effect not only on marine life and ecosystems overall, but they can also have a potential impact on human health, for example through the consumption of plastic fragments in seafood. And even before reaching the sea, mismanaged waste (litter, including plastic) has significant impacts on human health. Minimizing these impacts is crucial, as highlighted by the significant international attention to the topic: In March this of 2019, the fourth session of United Nations Environment Assembly (UNEA4) adopted resolutions calling for actions from governments, businesses and other relevant stakeholders to address plastics pollution. Significant legislative action is occurring in Europe, among other places: The European Single Use Plastics Directive, was voted by the Parliament on 24 Oct 2018, and brings forward a comprehensive set of new EU-wide rules targeting the 10 single-use plastic products most often found on Europe's beaches and seas.

¹ Jambeck JR, Geyer R, Wilcox C, Siegler TR, Perryman M, Andrady, Narayan AR, Lavender Law K (2015) Plastic Waste inputs from land into the ocean, *Science*, 347(6223): 768-771

² UN Environment (2018a) Mapping of global plastics value chain and plastics losses to the environment (with a particular focus on marine environment). Ryberg, M., Laurent, A., Hauschild, M. United Nations Environment Programme. Nairobi, Kenya, <http://gefmarineplastics.org/>, p.28.

³ UN Environment (2018b) Addressing marine plastics: A systemic approach - Stocktaking report. Notten, P. United Nations Environment Programme. Nairobi, Kenya, <http://gefmarineplastics.org/>, p.9

Marine Litter has also become a key issue for Latin America over the past few years. The Caribbean for example is the second most polluted sea in the world and many governments in the region have joined the UN's Clean Seas Initiative to turn the tide on plastic pollution (UN Environment 2018c⁴).

In 2017 the Medellin Declaration⁵ was developed at CILCA 2017 in response to an urgency voiced by regional life cycle stakeholders. The declaration highlighted that currently life cycle assessment (LCA), as one of the most widely used sustainability assessment tools for greening the economy (UNEP, 2012⁶), is not adequately addressing the impacts on the environment generated due to marine debris, such as plastics and microplastics. This workshop seeks to start looking at possible avenues forward.

During the workshop, a number of participants presented ongoing projects and activities with regards to addressing marine litter from various perspectives. Following these presentations, an interactive session was organized where participants split into smaller groups to discuss key issues around marine litter in Latin America from perspectives of the following four stakeholder groups; policy makers, consumers, manufacturers and waste managers. Following these discussions, a plenary discussion with a focus on key challenges for life cycle inventory data and impact assessment was organized.

On the following pages, this workshop report summarizes the outcomes of those group discussions. It does not seek to provide a scientific report on the status of marine litter in LCA.

⁴ UN Environment (2018c) Blue awakening as Latin America and Caribbean states say no to plastic, <https://www.unenvironment.org/news-and-stories/story/blue-awakening-latin-america-and-caribbean-states-say-no-plastic>

⁵ Sonnemann G and Valdivia S (2017) Medellin Declaration on Marine Litter in Life Cycle Assessment and Management, *Int J Life Cycle Assess* (2017) 22:1637–1639

⁶ UNEP (2012) Greening the Economy Through Life Cycle Thinking, Paris: https://www.lifecycleinitiative.org/wp-content/uploads/2013/03/2012_LCI_10_years_28.3.13.pdf

Insights from the Stakeholder Group Discussions

Policy Makers

Participants agreed that not one stakeholder group alone has the ability to address the issue of marine litter and plastics pollution. Instead, stakeholders in industry, consumers and policy makers need to work together to address the various causes contributing to the issue. It was also highlighted that marine litter is not just an issue of plastics, but any kind of material ending up in the oceans and thus solutions need to address any kind of littering that results in waste ending up in the oceans.

Workshop participants also noted that in order to enhance the information-basis for decision-makers, more (regionalized) data needs to be collected and made available, such as data and statistics on waste collection rates, littering behavior, waste pathways, material disintegration over time, as well as on impacts on ecosystems.

It was also highlighted that before taking decisions to ban specific materials for certain use cases, it would be important to have a good understanding of the sustainability performance of the materials or products which are used to substitute them in order to avoid unintended sustainability impacts in other phases of the life cycle or on other sustainability indicators. Using larger quantities of bio-based materials might lead - or not - to significantly bigger impacts when it comes to land use etc. Site- and case-specific LCAs should support improve the understanding and help decision-making in this regard.

Participants also agreed that for the most part there was a lack of available solutions, but of implementation and political will. Suggested measures to address the problem included:

- Implementing sustainable public procurement policies
- Enforcing extended producer responsibility policies
- Launching clean up and awareness campaigns to engage with and educate citizens
- Implementing tough fines on littering
- Reducing or ending subsidies for oil, which in turn would make plastic production a bit more expensive and thus help alternatives to become economically more viable

Finally, participants noted that due to the global nature of the issue, global coordination and collaboration is needed to avoid duplicating work and help scale up successful activities, projects and initiatives to create a bigger global impact.

Consumers

Participants agreed that it is not always obvious for consumers to identify the best purchase option from a sustainability perspective. They highlighted that consumers would often lack the knowledge to evaluate products' sustainability performance and would be faced with limited, incomplete or incorrect information on products' sustainability performance. In addition, too much, complex or misleading (e.g., green washing) information overwhelm consumers. Under this situation, a big segment of consumers gets paralyzed and decide not to change their unsustainable behavior

consumption patterns, while other consumer groups reinforce their impression that changes in their behavior would not have an impact anyway.

Participants also noted that most consumers would lack the awareness about pathways with regards to how and what parts of products they are using might end up in the ocean. This is especially true for micro plastics, which are emitted into the environment as part of many products intended use (e.g. tires, cosmetics, fibers etc.).

While educational campaigns and awareness raising efforts were considered to be important, participants agreed on the importance of identifying two or three key messages that could be communicated easily, similar to well-known messages like *drink 2 liters of water a day* or *avoid flying*. To this end, it was noted that such messaging is not meant to address all associated issues, but rather create general awareness for the subject.

Participants also suggested that a global campaign should be launched around these statements along with an information and engagement platform that would allow consumers to engage directly with experts and industry stakeholders. To further promote the uptake of more sustainable lifestyles and consumption patterns, participants suggested to:

- Simplify guiding information for consumers (e.g. through standardized labels)
- Use economic incentives to support sustainable purchasing decisions
- Stigmatize unsustainable behavior such as littering
- Use social media to create global awareness campaigns
- Identify global voices that can help spread the message (similar to Al Gore on climate; e.g. Sir David Attenborough)
- Work with youth initiatives that are emerging worldwide and are improving their communication platform with great success and are in cases already promoting 'no littering', 'cleaning the ocean campaigns' among others
- Work with media outlets and journalists to help them understand the complex issues and cover them in depth

Manufacturers

Participants identified various challenges with regards to product design, development and shipment, which contribute to the issue of marine litter. One major issue identified was packaging. It was agreed that currently, few companies design the packaging along with the product in mind, thereby often resulting in packing that is unnecessary big or uses unnecessary amounts of material. Furthermore, it was highlighted that packing materials in most cases do not have any value for consumers, thus are inherently single use and thereby create a lot of waste.

It was also noted that while a higher percentage of recycled material in new products would be important to achieve, using recycled material is often more complex because manufacturing equipment is usually highly sensitive to the material that is provided as input. This is especially true for plastic molding machines, which are not suited to be used with large quantities of recycled material. If processes would exist to enable recycled plastics to compete with virgin material from a

quality point of view for a wider range of products, there would be an economic incentive to reclaim the material, harvest waste from urban and marine mines and bring the material thus back into the loop. Currently, mainly plastic products with lower-requirements are absorbing secondary plastics (e.g. in the building sector, as new packaging but not for food products, etc.).

With regards to the actual manufacturing process, participants noted that production waste would usually be recycled internally and thus not constitute a major waste stream contributing to the issue of marine litter. Instead it was highlighted that marine litter is largely caused by post-consumer waste streams.

Looking at possible solutions participants highlighted that some industries have already started to standardize packaging for secondary and tertiary partners or have begun to implement reusable packaging options. In addition, some companies are also looking into alternative solutions to traditional packaging materials which are bio-based and disintegrate for example in water.

In some areas rethinking the product itself might be needed to decrease negative impacts. For example, in many cosmetic products such as creams, deodorants or perfume, mostly water is shipped and sold and thus innovation in terms of how to achieve the same function in different ways is needed. Creating value of packaging material might also be an option by enabling multiple uses. Shoeboxes could for example be used to form a shoe cupboard thanks to a more modular design.

In addition, extend lifetimes of products not only with regards to their durability, but also with regards to serving additional functions beyond their initial function should be considered. A good example could be the envisioned reuse of old electric car batteries that have a reduced charging capacity and are not suitable for cars anymore but can still be applied for stationary devices.

Waste Managers

Participants noted that municipal waste constitutes the biggest part of marine litter and thus waste management in urban environments is key to addressing the issue. With regards to waste management infrastructure and processes in Latin America participants agreed that there is a decent infrastructure for the beginning and intermediate waste management. Citizens usually collect waste in their households and an increasing amount they have begun to sort their waste. The waste is also collected at a relatively high rates of 80 - 95%, depending on the country. However, the main issue is not the waste collection, but the waste treatment after collection.

In most cases waste management is the responsibility of municipalities / regions and they often do not operate proper waste management facilities. Instead waste often is open dumped and/or incinerated in open landfills, which cause various sustainability impacts. Waste management infrastructure thus needs to be enhanced to focus on better waste management options such as recycling, incineration, or sanitary landfills. In this context participants highlighted the significant upfront investment costs for recycling or incineration plants, making their set-up a challenge.

With regards to recycling facilities, it was also noted that even if material is recycled, a market for recycled material would currently not exist in many countries of the world and in Latin America and thus recycling would not be an economically viable option.

Incineration plants on the other hand would be faced with the issue that in most major urban environments in the region waste would be composed out of 50 - 60% of organic material. Depending on the level of technology used, such a composition could not generate enough high temperature burning power for the plant to operate properly, unless the waste is presorted and thus the organic waste is diverted to composting.

Participants, thus, agreed that in order to address the issues caused by open dumping in a relatively short timeframe, the focus should be on scaling up the transition from open dumping to well managed sanitary landfills.

However, it was noted that most municipalities in the region would not only lack the resources needed to set up a sanitary landfill, but also lack the technical knowhow to operate and manage it. In order to address these issues, participants suggested that national governments in the region should look into supporting local / regional administrations in the process of upgrading their waste management infrastructure.

Participants also highlighted that there is no time to wait 10-20 years for regional governments and policy makers to act on their own or wait for everyone to properly sort their waste. It was thus concluded that in order to speed things up, authorities need to be pushed to act faster. Awareness campaigns should focus on pushing for nation-wide regulation on minimum waste management standards and collection and recycling rates. It was also suggested to work with major companies operating in the region who could become a driver to enhance waste management, especially if faced with public pressure through their customers.

In order to manage the needed investment costs, it was suggested that communities should work together to jointly create capacity and mobilize resources. Equally so, development cooperation agencies working in the region should not focus on spending significant resources for a limited number of advanced waste management facilities, but rather help scale up the transition from open dumping to sanitary landfills to have a bigger impact.

Finally, it was noted that waste collection in the region is often done informally – about 90% is collected by the informal sector – and, thus, that any change in the waste management sector needs to incorporate those who are generating their income through their work in the informal waste management sector today.

Insights from the Plenary Discussion on Marine Litter in LCA

Inventory

Participants agreed that the lack of information, knowledge and statistical data is the biggest challenge in order to create quality LCA Inventory Data. In addition to data derived directly from input streams such as waterways, regionalized data on littering and consumption behavior is needed. To this end it was highlighted that most research is still focusing on production, not consumption and thus a change of mindset among researchers is needed!

It was also noted that input-output data of regions would be helpful. It was acknowledged, that few data is available and that collecting input output-data on a regional level would represent a massive effort, given that material often does not come into a region in primary form, e.g. in the form of packaging. It was also noted that data on waste flows is highly limited and often not detailed enough to account for different types of waste. Statistical data on actual collection and recycling rates is also highly limited and available data is often of relatively low quality, making end of life modeling a challenge.

In order to address some of these issues, research is needed that essentially assesses the composition of waste which is found on the street / waterways / coastal areas and assesses a) what kind of products and b) in what quantity they are ending up in those environments in comparison to waste management infrastructure in the region. In this context it was noted that assessing composition based on individual products might not be possible, but product categories. Based on such data, intended use case scenario modelling could be done and coupled with a failure analysis to map the pathways of litter ending up in the oceans.

Impacts:

Participants agreed that it is important to differentiate between macro and micro plastics with regards to life cycle impact categories. In this context it was noted that existing categories might be used for micro plastic, for example by expanding the category on toxicity, whereas new ones might be needed for macro plastics. Participants also noted that it is not clear yet how to link or integrate these new categories into existing areas of protection and added that with regards to the depletion of resources, the logic of measurement might need to be changed.

With regards to particle size, participants highlighted the different size classifications (mega / macro / meso / micro / nano) and outlined that there is no consensus on whether or not the life cycle community also needs to address impacts from nano particles. With regards to macro plastics participants highlighted that not much research is currently available and thus called on researchers to focus also on macro plastic impacts.

It was agreed that impacts are quite different on biota depending on the size and also not linear from a physical perspective. It was also highlighted that degradation pathways are highly dependent on materials and that e.g. most thermal plastics would not become nano particles due to their low fragmentation energy. In this context it was also noted that a temporal perspective is essential to be incorporated.

Taking these points into consideration, it was concluded that method development would start from a foundation and not just from scratch. Furthermore, it was suggested that it might be useful to identify the fraction of the marine litter that is causing most impacts and then prioritize research on addressing it.

Summary

In summary, workshop participants highlighted a number of key messages that should be addressed by the various stakeholders needed to create an impact and address the issue of marine litter.

Participants called for the:

- Implementation of sustainable public procurement policies
- Use of economic incentives to support sustainable purchasing decisions
- Enforcement of extended producer responsibility policies
- Simplification of guiding information for consumers
- Stigmatization of unsustainable behavior such as littering
- Work with youth initiatives which are already promoting 'no littering', 'cleaning the ocean campaigns' among others
- Launch of global (social media) awareness campaigns
- Reduction of packaging materials or use of more sustainable alternatives
- Evaluation of products' functions and their design and re-design the packaging
- Extension of product lifetimes along with enabling reuse second life functionality
- Transition from open dumping to well managed sanitary landfills
- Implementation of nation-wide regulations on waste management standards
- Support of national governments for local / regional administrations when upgrading waste management infrastructure
- Incorporation of the informal waste management sector into any new waste management systems
- Creation of regionalized data on consumption, waste sorting and littering behavior
- Development of data on the actual composition of waste in urban and marine environments

In addition to these points, participants also agreed to call on researchers to focus more on impacts of macro plastic and to incorporate a temporal perspective into future methods to address marine litter within life cycle assessment. They also highlighted the importance to differentiate between macro and micro plastics with regards to life cycle impact categories, but concluded that method development could build on existing processes and methods and thus would not need to start from scratch.

In general participants highlighted that there is a huge urgency to act. Decision-makers in industry and governments are challenging the global scientific community to provide guidance. This guidance is needed urgently, yet method development takes time. Participants noted that a lot of the measures suggested can already be implemented and may help to address issues around marine litter in the short term. In addition, the various presentations during the workshop showed that the global life cycle community is actively working on addressing the subject, yet that scientifically sound methods need time to be developed due to the complexity and scale of the issue.