



## LIFE CYCLE THINKING



## COMBATTING MARINE LITTER

How LCA can help reducing plasticsmarine litter a knowledgeable and efficient way: managing is measuring

Guy Castelan,  
SETAC Vienna, September 2018

PlasticsEurope  
Association of Plastics Manufacturers

- Worldwide Estimation of plastics diverted into the sea from 6 to 12 Millions tons a year (production around 330 millions)
- US + Europe leak in the 2 to 4 % range:
  - important proportion of micro-plastic
  - Main cause of macro leak: behaviour, lack of waste management in some countries
- Asia, Africa, India:
  - mainly macro, the dominant factors are the lack of waste management and behaviour

It is urgent to act !

# Close leakage points through waste management, conscious & product design

## Proper Waste Management & Collection

Zero Plastics to Landfill by 2025  
Plastics are too valuable to be wasted

**Identiplast:** WM & Recycling conference, February 2017  
Vienna



## Mindful Product Design

Promote Innovative Packaging

and for **Microbeads:** Support voluntary efforts of cosmetics industry to phase out microbeads

## Conscious people behavior



## Pellet Loss Prevention



## Research for solutions:

Sources, fate & effects



## Knowledge sharing:



\* Projects have received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no [MARLISCO = 289042 & BIOCLEAR = 312100]



## Medellin Declaration on Marine Litter in Life Cycle Assessment and Management

Facilitated by the Forum for Sustainability through Life Cycle Innovation (FSLCI) in close cooperation with La Red Iberoamericana de Ciclo de Vida (RICV) on Wednesday 14 of June 2017

with further modifications until 17 July 2017 for submission to The International Journal of Life Cycle Assessment on 18 July 2017

# LCA interest to include Marine Litter in the environmental impacts dashboard

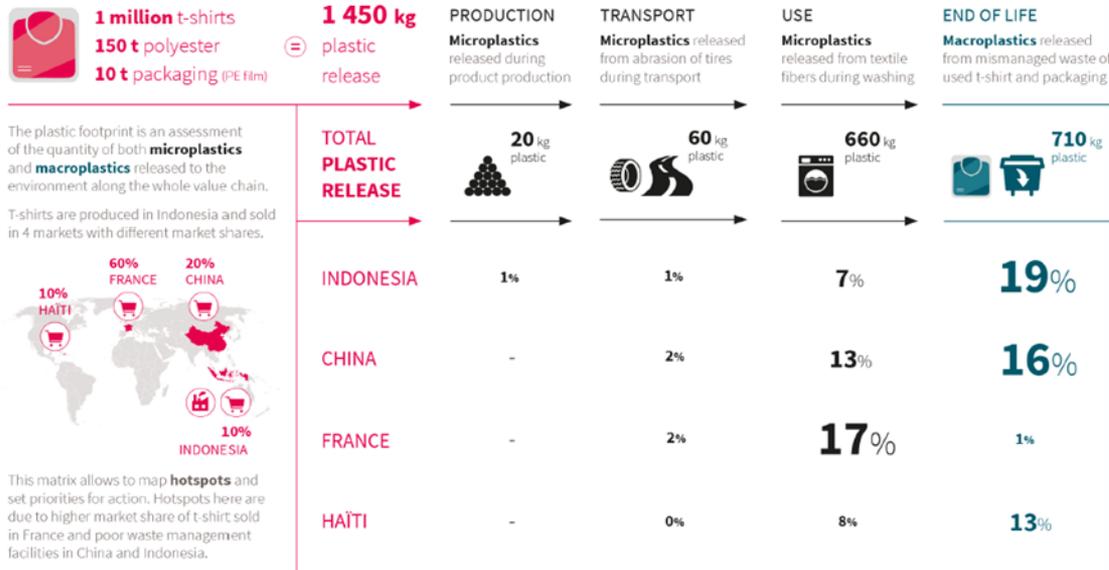
Stakeholders to take knowledgeable and informed decision to reduce plastic marine litter by bringing

- Eco design
- Policy decision

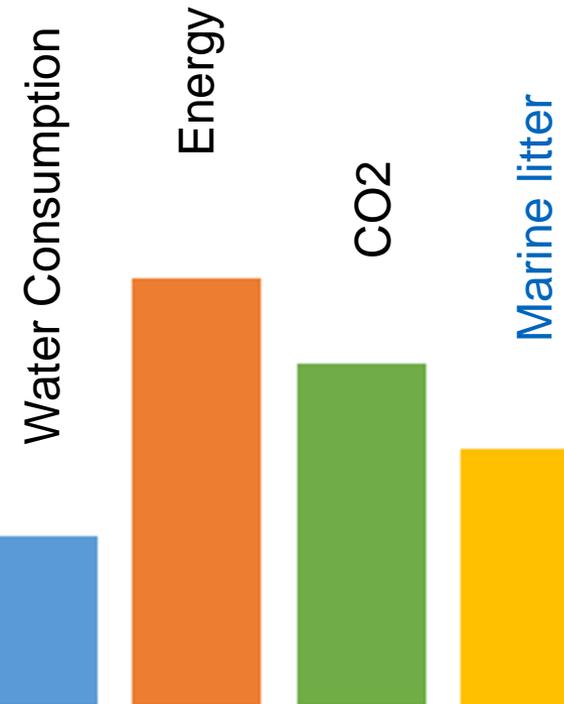
## Address hot-spot

## Avoid shift of burden...

### The plastic footprint of a Polyester T-shirt and its packaging



This matrix shows the contribution (in %) of the different life cycle stages and regions to the 1 450 kg plastic potentially released to the oceans.



# LCA and Marine Litter, how does this work ?

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- Inventory phase
  - Map the risk of leakage of plastics along the life cycle
  - a good basis can be developed in 1-2 years
  - then refined by LCA community (just like water, tox databases..)
  
- Impact phase
  - Model the fate of the debris
  - Model the different impacts
  - It is more 5 – 10 years long timeframe

# LCA and Marine Litter, how does this work ?

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Iteration between the impact models of characterisation development and the induced need on the inventory phase.

The elementary flows could go:

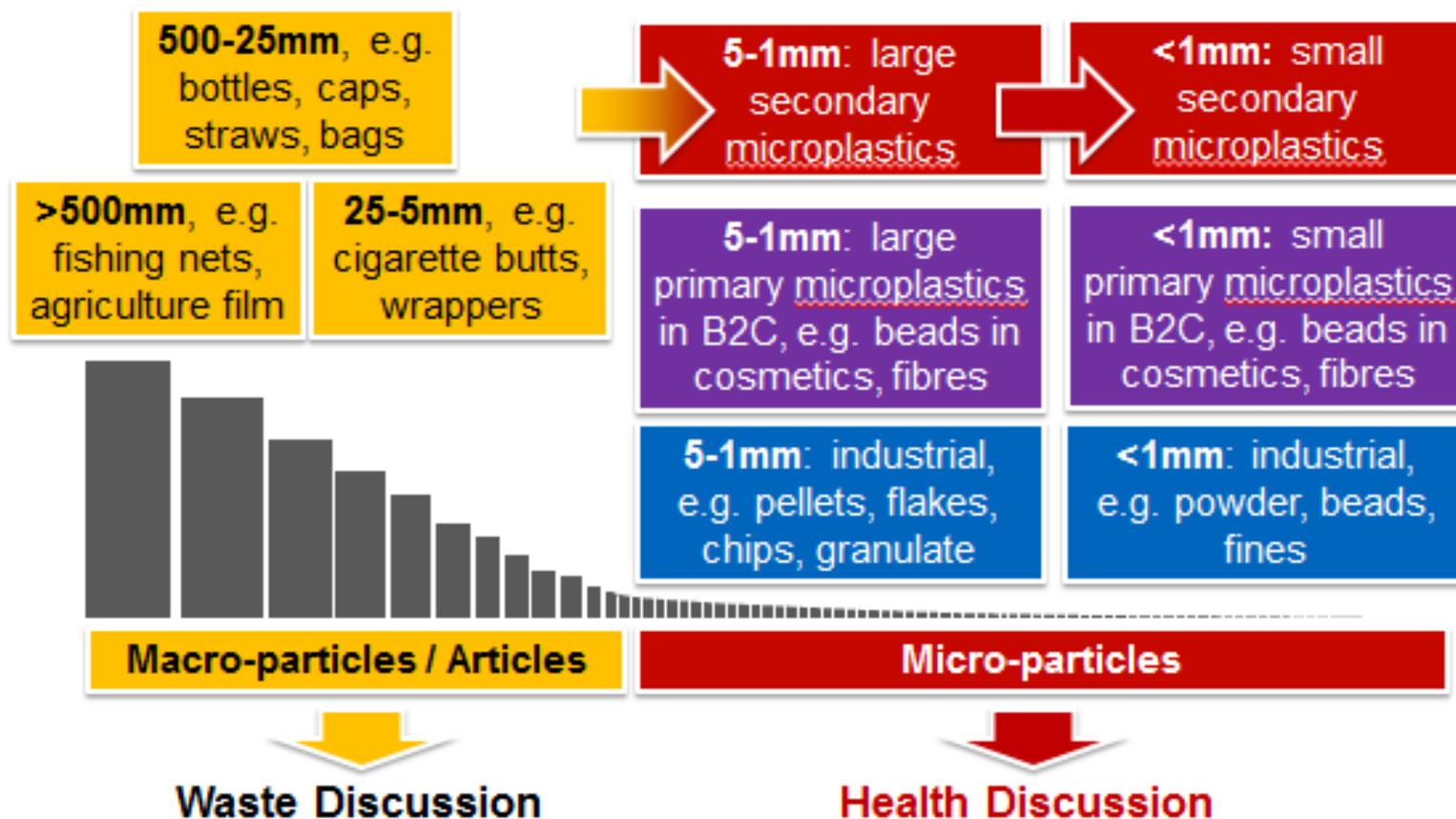
- from the simplest: plastic output to the sea
- to a much more complex granularity
  - Polymer type output,
  - Shape and dimension (micro, pellets, film, bottle, cotton bud, net...)
  - Emission place (then at what geographic scale ?)
  - Example:
    - PP\_ net \_ output to black Sea
    - HDPE - Crisp film – output to Lemman lake
- Or a compromise in between

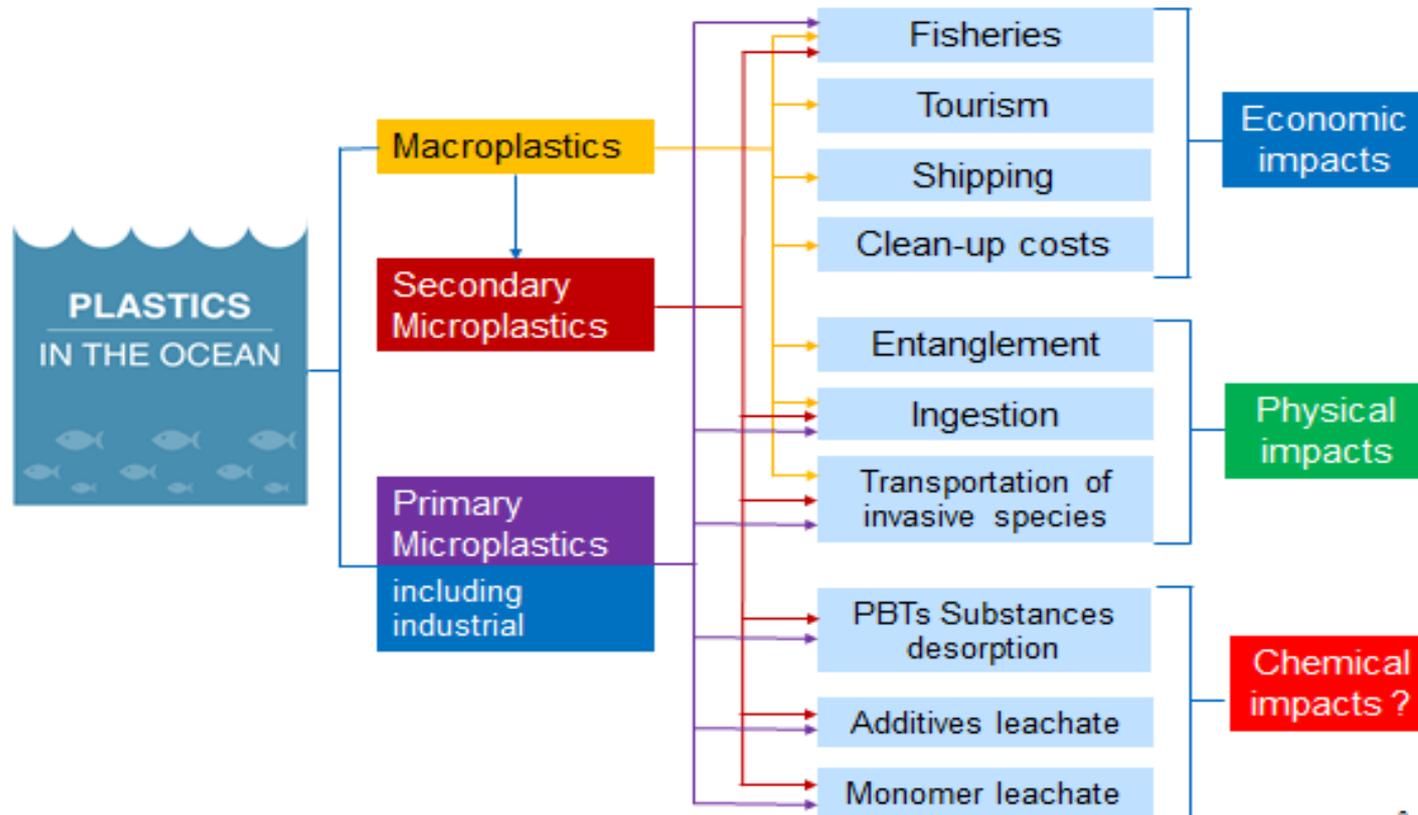
- From Macro view
  - e.g. Jenna Jembeck..., 'Plastic waste input from land into the ocean' (2015)
  - Coastal population 50 km band 192 countries
  - Population \* Per capita waste \* plastic waste content \* mismanaged waste \* ratio to the sea
  - Give a level of leak at country level
  - This is a great basis that could be further refined (application, pathway...)
- From what is collected
  - e.g. JRC: 'Identifying sources of marine litter' (2016)
  - « Matrix scoring technique »: link collected items characteristics, to the sources (in term of likelihood allocation) thanks to a local knowledge of geography, socio-economic activities and type of lost litter
- Combining the two

# Inventory, the risk of leak to the sea depends on...

- The life cycle stage
  - The form of product
  - The application and end of life cycle scenario
    - Consumer behaviour
    - Bin availability
    - Waste management (household, industrial, agriculture...)
  - The pathway from where it is discarded to the sea
- } Geographically dependant
- Abatement measures
    - Specific collection and recycling schemes implemented
    - Zero pellet Commitment (signature, implementation, pellet losses monitoring...)
  - Could accidental losses (container, tsunami) be averaged and included ?

## Categories of Plastics found in marine/coastal environment regarding size:





Overview based on UNEP report, Valuing Plastic, 2014.

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# LCA and Marine Litter... going forward !

PlasticsEurope involved in 4 initiatives



- 1 - PlasticsEurope, Braskem, Exxon sponsor a scientific workshop with 30 LCA/Marine litter worldwide experts on 22/23 May 2018 in Brussels. Outcome communicated. Further workshop. e-Platform.

<https://fslci.org/marinelitter/>



- 2 - Mapping the plastics value chain and identifying priority actions at national level, with a focus on marine plastics. Project financed by UNEP. Delivery early 2019.

# LCA and Marine Litter... going forward !



- 3 - Quantis/EA shaping « Plastic Leak » : 1 year consortium project to deliver a methodological framework with worldwide data for the inventory part of LCA



- 4 - Bordeaux University (ISM), PlasticsEurope proposes a 42 Month project to the French Ministry of Research with PhD's: Marine Litter in Life Cycle Assessment. Elaborate on LCI and work on impacts.