



**OCEAN
WISE**

Reducing
EPS marine litter
in the North East
Atlantic

Circularity Assessment Methodology for EPS/XPS products



Sustainnn

4th Stakeholders Workshop
**“Solutions to stop EPS/XPS
marine litter”**

Online
20th October 2021

 **Interreg**
Atlantic Area
European Regional Development Fund  EUROPEAN UNION

WP6 ACTIVITIES SCOPE

How to prevent EPS/XPS from reaching the marine environment?

Marine Litter perspective

How to keep EPS/XPS in the system?

Circular Economy principles

- Aim of WP6** is to develop Circular Economy-oriented methodologies to analyze **Circularity of current solutions** for **EPS** (Expanded Polystyrene) and **XPS** (Extruded Polystyrene) **products and applications** and to select the most sustainable (economic, social, environmental) and circular alternatives

	ACTIVITY 6.1.	ACTIVITY 6.2.	ACTIVITY 6.3.
SCOPE	<p>To perform a state-of-the-art analysis about the different methodologies, tools and indicators to assess circularity of general plastic products and specifically EPS/XPS products & applications to:</p> <ul style="list-style-type: none"> ○ Fish boxes and other seafood eps packaging ○ Food packaging (single use such as hamburgers and supermarket food trays) ○ Consumer goods packaging ○ ... 	<p>To perform state of the art analysis of models to improve circularity of products and applications, focusing on the following areas:</p> <ul style="list-style-type: none"> ○ Design & Development processes oriented to recirculation of different product components & materials ○ Industrialization & Manufacturing Processes oriented to closed supply chains 	<p>Methodology to perform a Circularity Assessment of current solutions and alternatives for EPS/XPS products & applications</p>
DELIVERABLE	<p>State of the art Report on the circularity assessment methodologies</p> <p>Annex: Circularity Assessment references Database</p>	<p>State of the art Report on the circular and sustainable design methodologies</p> <p>Annex: Circular and Sustainable Design references Database</p>	<p>Methodology for the Circularity Assessment of EPS & XPS current solutions and alternatives Indicators</p>



Methodology for the Circularity Assessment of EPS/XPS Products and Applications

METHODOLOGY APPROACH

1

OW Challenges

- To prevent EPS/XPS from reaching the marine environment?
- To keep EPS/XPS in the system?

2

CE Principles

1. Regenerate natural systems
2. Keep materials in the system
3. Design out waste and pollution

3

WP6.1 & WP6.2
WP5
WP7

4

SDGs Principles

- People (1-5)
- Planet (6, 12-15)
- Prosperity (7-11)
- Peace (16)
- Alliances (17)

Circularity Assessment Methodology Approach

Orientation

- Life Cycle orientation. Addressing the entire life-cycle of EPS/XPS products & applications
- Circularity is to be Sustainable → Measuring Triple Impact (environment, social and economic)

Characteristics

- Quantitative based on objective criteria
- Applicable to the complete system. Applicable for any potential alternative (material, waste management system improvement, etc)
- Decision-making tool
 - Trade-off analysis (compare material alternatives, product design, waste management systems, etc). Risks & Opportunities identification
 - Identify critical parameters (cost, environmental impact)
 - Perform sensitivity analysis (i.e. raw material cost variation over time) to define sensitivity scenarios according to critical parameters.
- Define Circularity-Sustainability Indicators
- Define optimum scenario for circularity-sustainability



Methodology for the Circularity Assessment of EPS/XPS Products and Applications

METHODOLOGY STEPS

Part 1 EPS/XPS Product/Application Solution Assessment

Part 2 Alternative Solutions Trade-off Analysis

STEP 1

Value Stream Mapping

Life Cycle Mapping

Identification and quantification of:

- Raw materials
- Auxiliary materials
- Resources used (water, energy)
- Waste generated
- Emissions produced



STEP 2

Circularity-Sustainability Indicators

Circularity Indicators Selection

Based on Circular Economy principles:

- P1: Regenerate natural systems
- P2: Keep materials in the system
- P3: Design out waste & pollution

Sustainability Indicators Selection

- Environmental impact
- Cost impact
- Social impact
- SDGs

STEP 3

Circularity-Sustainability Assessment

Circularity Assessment

Measuring and evaluating circularity indicators selected

Sustainability Assessment

Based on LCSA approach

- LCA assessment
- LCC assessment
- SLCA assessment

Overall Sustainability Score

STEP 4

Circularity-Sustainability Critical Parameters

Identification of critical parameters for Circularity & Sustainability

Related to:

- Circularity (P1, P2, P3)
- Environmental impact
- Cost impact
- Social impact

Sensitivity analysis against the most critical parameters

STEP 5

Risks & Opportunities

Identification of risks & opportunities related to:

- Legislation trends (Europe, national, regional)
- Technology trends
- Cost volatility of raw materials & resources
- Market, sector & customer trends

Oriented to impact on:

- Competitiveness
- Circularity
- Sustainability

STEP 6

Alternative Solutions & Scenarios Assessment

Circularity-Sustainability Trade-off analysis

- Different scenarios for the same solution
- Alternative solutions in any phase of the life cycle



Methodology for the Circularity Assessment of EPS/XPS Products and Applications

Part 1 EPS/XPS Product/Application Solution Assessment

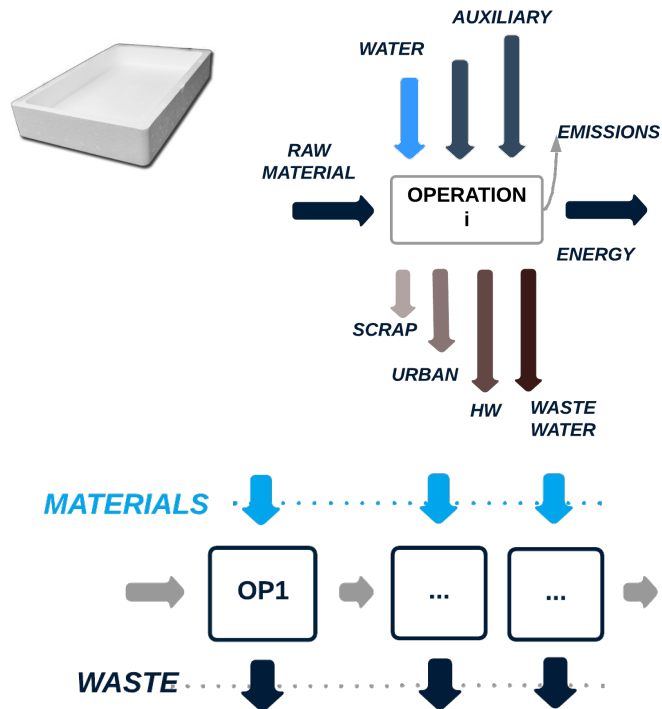
STEP 1 Value Stream Mapping

Life Cycle Mapping

Identification and quantification of:

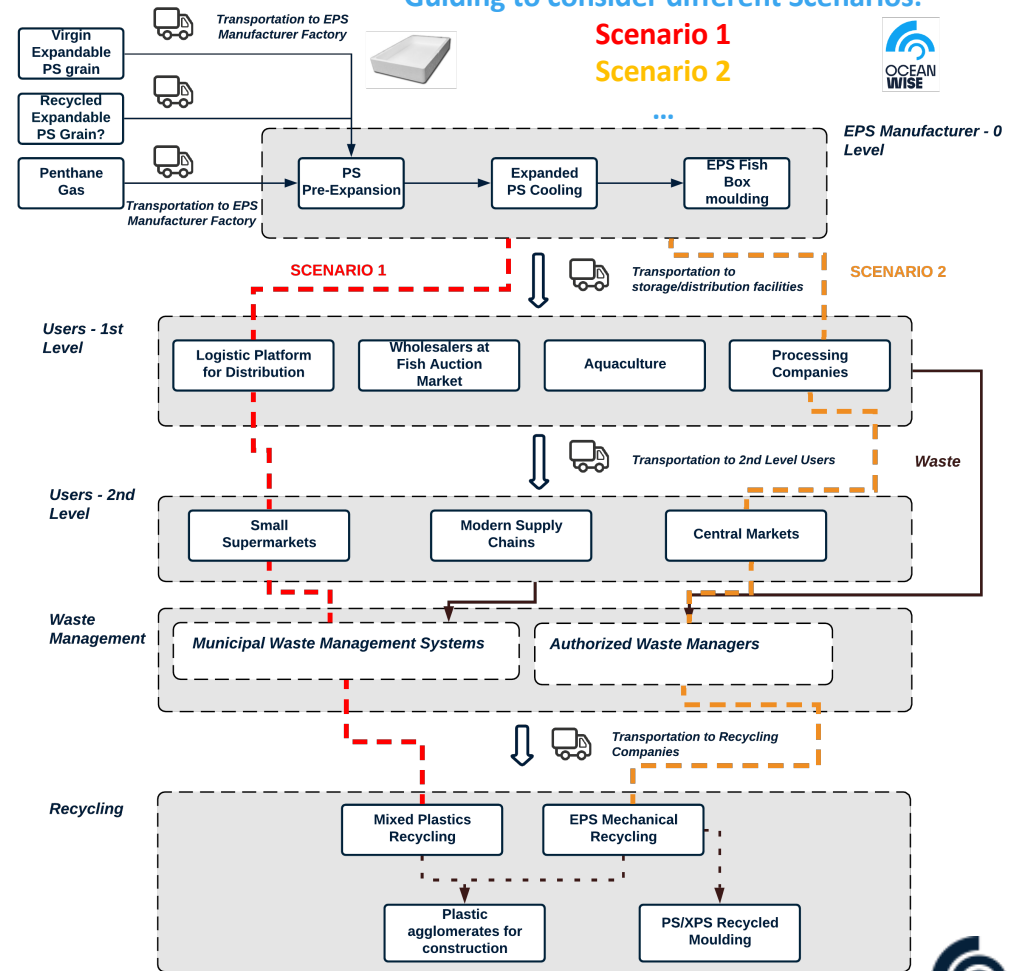
- Raw materials
- Auxiliary materials
- Resources used (water, energy)
- Waste generated
- Emissions produced

Fish Boxes Case Study to develop the methodology



METHODOLOGY STEPS

Guiding to consider different Scenarios:



Methodology for the Circularity Assessment of EPS/XPS Products and Applications

METHODOLOGY STEPS

Part 1 EPS/XPS Product/Application Solution Assessment

STEP 2

Circularity-Sustainability Indicators

Circularity Indicators Selection

Based on Circular Economy principles:

- P1: Regenerate natural systems
- P2: Keep material in the system
- P3: Design out waste & pollution

Sustainability Indicators Selection

- Environmental impact
- Cost impact
- Social impact
- SDGs Targets?

Select a set of representative indicators for the product/application from a predefined set proposed from the methodology

Circularity Indicators

P1. Regenerate natural systems

- % Renewable content in materials (bio-degradables, compostable, etc)
- % Renewable Energy in the whole life cycle
- % Water recirculation in the whole life cycle

P2. Keep materials in the system

- % Materials in the System
 - Recycled Content
 - Recirculations
- % circular equipments, tools, machines

P3. Design out waste & pollution

- Waste Generated (tn) of different types
- Emissions Generated (tn CO2, others)

Sustainability Indicators

Environmental Impact Categories & Indicators (*)

Total Environmental Impact (Pt)

Human Health Impact (Pt)

Ecosystems (Pt)

Natural Resources (Pt)

Life Cycle Costs (€)

Cost Assessment Indicators

BOM Costs (€)

Operation & Maintenance Costs (€)

Manufacturing Costs (€)

End-of-Life Costs (€)

Transportation Costs (€)

Environmental Costs (€)?

Social Impact Assessment Indicators

Total Social Impact (TBD)

Category 1

Category 4

Category 2

...

Category 3

Category n

(*) Endpoint indicators. Unit (Pt) is the total environmental load expressed as a single score (the definition is different for the various impact assessment methods that use single scoring)



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Overall Sustainability Score

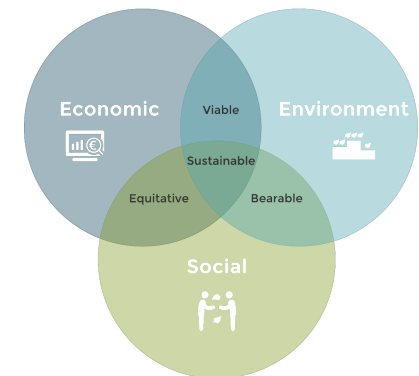
Life Cycle Sustainability Assessment (LCSA) approach

$$LCSA = LCA + LCC + SLCA$$

LCA, (Life Cycle Assessment), a technique used to assess the environmental aspects associated with a product during its life cycle

LCC (Life Cycle Cost Assessment), method of evaluating the cumulative cost of a product in its life cycle

SLCA (Social Life Cycle Assessment), takes into account the social impacts of products / services on the life cycle actors: workers, local communities, consumers and society itself.



Considering:

- ISO 14040, ISO 14025
- Product Category Rules PCR 2018:02 Crates for food, version 1.0
- Best LCA practices in the sector

Considering:

- IEC 60300-3-3 (Life Cycle Costing Guideline)
- Pilot projects findings

Considering:

- UNEP Guidelines for Social Life Cycle Assessment
- Other recognized methodologies (GRI, etc)

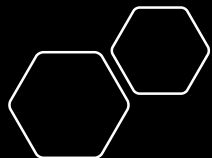


Methodology for the Circularity Assessment of EPS/XPS Products and Applications

METHODOLOGY ADDED VALUE FOR TARGET STAKEHOLDERS

Stakeholder	Role (in this field)	Methodology Added Value
Research Centers	Research about materials, processes or technologies to improve waste management and recycling of EPS/XPS applications	Help assessing circularity and sustainability of application of materials, technologies and processes under investigation
Raw Material Suppliers	Development and supply of raw materials for EPS/XPS products and applications	Help assessing circularity and sustainability of raw materials and their impact throughout EPS/XPS products and applications life cycle
EPS/XPS products Industry	Manufacturing EPS/XPS products and applications	Help assessing circularity and sustainability of the life cycle of EPS/XPS products and applications Helping making decisions about selection of materials, product and process development
Users	1st Level users (distribution, aquaculture, fishing industries, central markets)	Help selecting the most sustainable and circular solutions for EPS/XPS products and applications (or alternatives)
Waste Management Companies	Companies managing waste from users to end-of-life management companies	Help assessing impact of their technologies and processes on circularity and sustainability of EPS/XPS products and applications (or alternatives)
Recycling Companies	Companies recycling EPS/XPS products	
Policy Makers (EU, National, etc)	Public organizations in charge of policies making	To consider the methodology applicability to identify sustainability and circularity hot spots in EPS/XPS products and applications, plastic products and other products in general, to address in future policies development
Public Administrations	Public administrations developing and implementing policies	Help extrapolate the methodology approach to green public procurement policies implementation to other plastic products and other products in general





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**OCEAN
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Thanks a lot for your attention!



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