We all want less marine litter in the Baltic Sea: cooperation is key

Chresten Heide-Anderson, member of the EUMEPS Board of Directors; Manager of the Danish EPS Association

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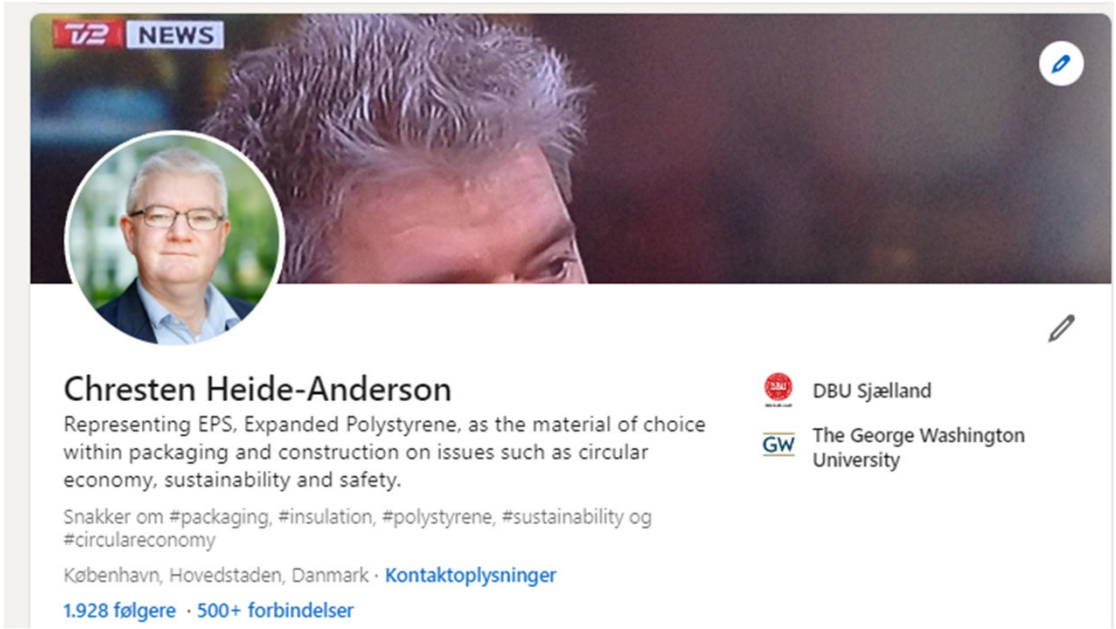
Chresten Heide-Anderson, member of the EUMEPS Board of Directors; Manager of the Danish EPS Association.

Chair of Circular Plastics Alliance WG for Packaging.



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EPS (Expanded polystyrene) and XPS (Extruded Polystyrene).

Two polystyrene foams often associated with beach and marine litter.

Connection to the HELCOM Baltic Sea Action Plan (BSAP)

Segment

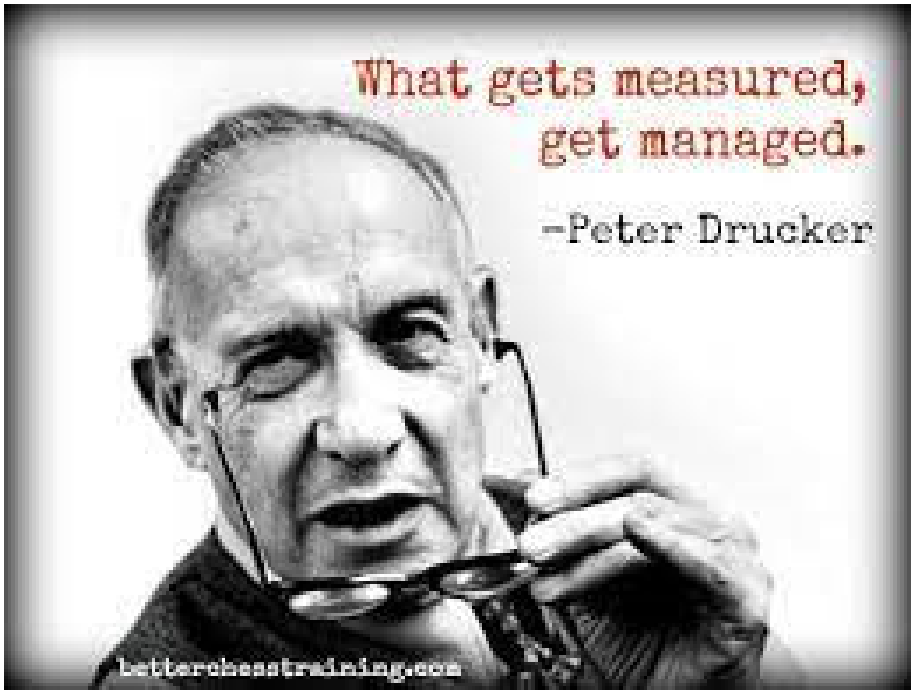
Hazardous substances and marine litter

HELCOM Recommendations

- HELCOM Recommendation 42-43/3 on the Regional Action Plan on Marine Litter (link)
- HELCOM Recommendation 42-42/4 on Reduction of the releases of expanded and extruded polystyrene to the Baltic Sea (link)

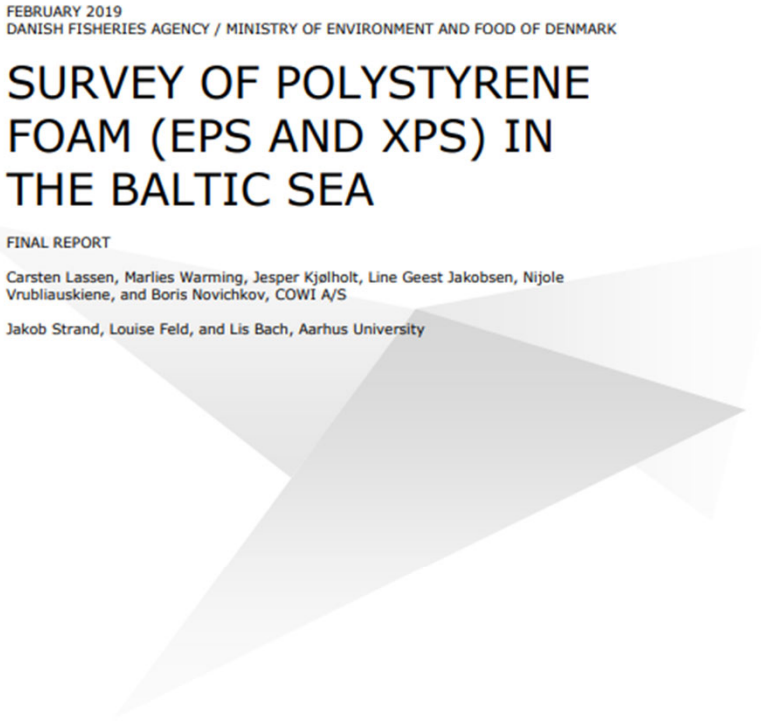
A knowledge-based approach to reducing marine litter in the Baltic Sea

Towards a *healthy Baltic Sea environment*



Clear and Measurable KPI's

Progress towards the strategic target.



- In 2019 COWI and Aarhus University published a report on the leakages of EPS and XPS into the Baltic Sea.

- So we know the volumes and the pathways from where the EPS comes.

- This allows us in the private sector to act and react on this information.

HAV & FISK

European Union
European Maritime and Fisheries Fund

AARHUS UNIVERSITY

COWI

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Using data to set strategic direction

A common goal

Substantial reduction in plastic litter in the Baltic Sea?

Reducing EPS and XPS litter

*RECOGNIZING that **beach litter monitoring indicates** that expanded and extruded polystyrene **(EPS and XPS) accounts for about 10%** of the total sum **of plastic beach litter items**; (my highlights)*

A Few (Other) Facts

From Introduction:

A regional case study focusing on marine plastic leakage into the Baltic Sea, using Geographic Information Systems (GIS).

The **regional Marine Plastic Footprint of the Baltic Basin** is estimated at approximatively **27,000 tonnes year-1**, with a dominance of macroplastics in the leakage (**22,120 tonnes year-1**), followed by **5,452 tonnes of microplastics**.(p. vii)

A Few Facts, revised

- EPS and XPS accounts for **about 10% (12%)** of the total sum of plastic beach litter items in **some countries, e.g. Denmark**, but **less than 1% in Sweden, Estonia, Finland, Germany and Lithuania.**
- The total releases of EPS/XPS are estimated to be less than 100 t/year, or less than 0.02% of total production.
- 27,000 t/year of plastic enter the Baltic.
- = **Less than 0.4%** of the plastic released into the Baltic is EPS/XPS.
- *By comparison EPS accounts for app. 3% of plastic production.*

A Few Facts

Quotes from the report Summary

Due to the low density, **EPS/XPS would likely account for a smaller percentage if expressed in terms of weight**, as has been demonstrated for river transport of plastics where **EPS/XPS accounted for about 1% by weight but 14% of the particles.** (p. 14).

A Few Facts

Quotes from the report Summary

EPS/XPS is buoyant and when released to the aquatic environment it is **easily transported over long distances** by rivers and sea currents. EPS/XPS is like other common plastic types: practically non-biodegradable, but due to the foam structure, **easily fragmented into increasingly smaller pieces, leading to large numbers of EPS/XPS particles**. (p.13.)

Do We Act On The Relevant Data

Remember

Due to the low density, EPS/XPS would likely account for a smaller **percentage if expressed in terms of weight, as has been demonstrated for river transport of plastics where EPS/XPS accounted for about 1% by weight but 14% of the particles.** (p. 14).

A Few Facts

Quotes from the report Summary

The total releases of **EPS/XPS are estimated to be on the order of 10-100 t/year.**

With a typical density of EPS/XPS of 15 - 20 kg/m³, this correspond to 700-5,000 m3 foam. To set it in perspective, the 10-100 t/year would correspond to 2.5-25 million items of a weight of 4 g (typical weight of an EPS coffee cup). (p.16).

A Few Facts

Quotes from the report Summary

The total estimated release of EPS/XPS at 10-100 t/year corresponds to 0.0017- 0.017% of total production (there are some differences in the scope for production in Germany and Russia). (p. 16).

A Few (Other) Facts

Quotes from the Report:

The occurrence of EPS is calculated relative to the total amount of plastic litter items monitored for each individual country.

The results show that the proportion of beach litter dominated by items made of EPS (mainly EPS) is **highly variable amongst the countries.**

(Table 5-2).(p. 69).

A Few Facts

Looking only at the summary

- The total releases of EPS/XPS are estimated to be **less than 100 t/year.**
- The total estimated release of EPS/XPS is **less than 0.02% of total production**.
- EPS and XPS accounts for **about 10%** of the total sum of **plastic beach litter items**.
- There is a difference between item counts and the weight ratio.

A Few Facts

A Few Facts

Quotes from the report Summary

The results of the 2018 surveys show that the proportion of **EPS/XPS of the total sum** of **plastic beach litter items** at six reference beaches **was 11%.** (p. 14).

A Few Facts

Quotes from the report Summary

The **total consumption** of expandable PS for manufacture of EPS/XPS articles in eight of the HELCOM countries (excl. Russia) is **estimated at 599,000 t/year**. (p.11).

Beach litter not equal to marine litter

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 17615

June 2022

Plastics - Environmental Aspects - Vocabulary

FprEN 17615:2022 (E)

3.18
beach plastic litter
subcategory of marine plastic litter found on beaches

Note 1 to entry: Beach plastic litter is not necessarily identical with marine plastic litter. Beach studies may not be representative of marine litter.

A Few (Other) Facts

Quotes from the Report:

In **Denmark** and **Poland, 12%** and **4%**, respectively, of the total plastic beach litter are registered in categories that are dominated by EPS, while in **Sweden, Estonia, Finland, Germany and Lithuania, EPS constitutes less than 1%** (Table 5-2).(p. 69).

FEBRUARY 2019
DANISH FISHERIES AGENCY / MINISTRY OF ENVIRONMENT AND FOOD OF DENMARK

SURVEY OF POLYSTYRENE FOAM (EPS AND XPS) IN THE BALTIC SEA

FINAL REPORT

Carsten Lassen, Marlies Warming, Jesper Kjølholt, Line Geest Jakobsen, Nijole Vrubliauskiene, and Boris Novichkov, COWI A/S

Jakob Strand, Louise Feld, and Lis Bach, Aarhus University

HAV & FISK

European Union
European Maritime and Fisheries Fund

AARHUS UNIVERSITY

COWI

We know the major sources of leakage, allowing us as an industry to address these, and take responsibility.

Construction materials; 3-29 t/year (excl. solid waste management):	**30,0%**	**29,0%**
Production of EPS/XPS articles; 0.5-40 t/year:	**5,0%**	**40,0%**
Solid waste treatment & Recreational activities; 0.9-40 t/year:	**0,9%**	**40,0%**

Industry Action Plan for collaboration

Prevent leakage from production and manufacturing Increased

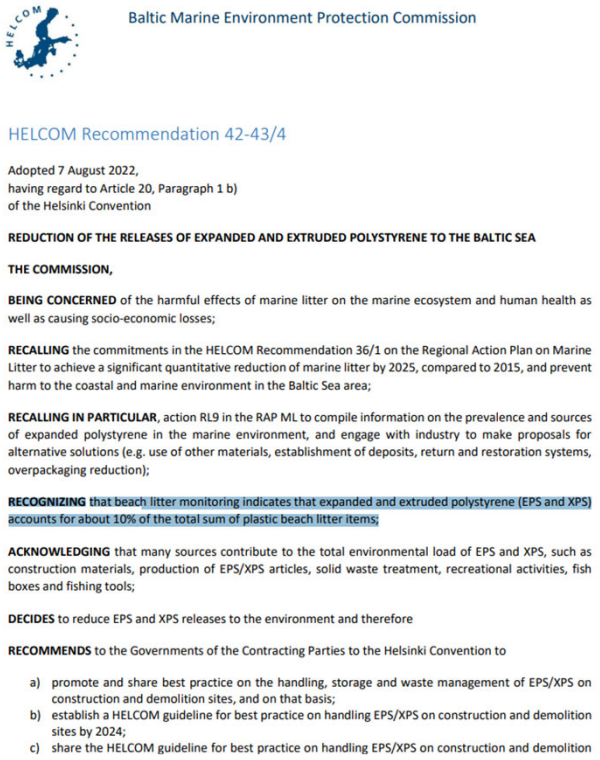
Collaboration on EPS recycling from packaging and construction

Recommendations to construction industry

Fully aligned with Helcom BSAP

- RECOMMENDS to the Governments of the Contracting Parties to the Helsinki Convention to

- **promote and share best practice** on the handling, storage and **waste management of EPS/XPS on construction and demolition sites**, and on that basis;
- establish a **HELCOM guideline for best practice on handling EPS/XPS on construction and demolition sites by 2024**;
- share **the HELCOM guideline for best practice on handling EPS/XPS** on construction and demolition sites with relevant actors through national awareness raising campaigns;
- **improve collection, sorting and recycling of EPS/XPS** e.g. in municipal waste handling, at construction and demolition sites, at recyclers and producers by promoting collection schemes, innovation projects or information campaigns;
- **promote the Operation Clean Sweep** scheme or equivalent certification schemes for EPS/XPS producers and converters aiming at zero pellet loss;



Baltic Marine Environment Protection Commission

HELCOM Recommendation 42-43/4

Adopted 7 August 2022,
having regard to Article 20, Paragraph 1 b)
of the Helsinki Convention

REDUCTION OF THE RELEASES OF EXPANDED AND EXTRUDED POLYSTYRENE TO THE BALTIC SEA

THE COMMISSION,

BEING CONCERNED of the harmful effects of marine litter on the marine ecosystem and human health as well as causing socio-economic losses;

RECALLING the commitments in the HELCOM Recommendation 36/1 on the Regional Action Plan on Marine Litter to achieve a significant quantitative reduction of marine litter by 2025, compared to 2015, and prevent harm to the coastal and marine environment in the Baltic Sea area;

RECALLING IN PARTICULAR, action RL9 in the RAP ML to compile information on the prevalence and sources of expanded polystyrene in the marine environment, and engage with industry to make proposals for alternative solutions (e.g. use of other materials, establishment of deposits, return and restoration systems, overpackaging reduction);

RECOGNIZING that beach litter monitoring indicates that expanded and extruded polystyrene (EPS and XPS) accounts for about 10% of the total sum of plastic beach litter items;

ACKNOWLEDGING that many sources contribute to the total environmental load of EPS and XPS, such as construction materials, production of EPS/XPS articles, solid waste treatment, recreational activities, fish boxes and fishing tools;

DECIDES to reduce EPS and XPS releases to the environment and therefore

RECOMMENDS to the Governments of the Contracting Parties to the Helsinki Convention to

a) promote and share best practice on the handling, storage and waste management of EPS/XPS on construction and demolition sites, and on that basis;
b) establish a HELCOM guideline for best practice on handling EPS/XPS on construction and demolition sites by 2024;
c) share the HELCOM guideline for best practice on handling EPS/XPS on construction and demolition

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Step 1: Clean own house

Before we can ask others to act, we need to ensure we are doing things right ourselves.

Step 1: Clean own house

7.4 Other initiatives

7.4.1 Requirements regarding pellets and dust emission in environmental permits for producers and converters

Requirements regarding pellets and dust emission in environmental permits for producers and converters	
Description	Competent authorities can set requirements in order to reduce loss of plastic pellets and reduce dust emissions in the environmental permits of a given manufacturer working with plastics. The recommendations and requirements as formulated in the industry initiative Operation Clean Sweep may be used as a starting point for such authority requirements. Operation Clean Sweep is an international initiative developed by the U.S. Society of the Plastics Industry and The American Chemistry Council and has been implemented in many companies around the world. The objective of Operation Clean Sweep is to reduce loss of plastic granules from producers to the environment by introducing some rather simple technical controls and adjusted working procedures. Several of the main EPS producers in the HELCOM region already participate in the initiative.
Application	EPS producers and converters
Benefits	Reduction of loss of EPS to the environment
Challenges	Not investigated.
Release reduction potential	The releases from production sites and transport is considered potentially to be reduced to close to zero.
and partners	Competent authorities for environmental permits, industry associations, EPS
Source	https://plast.dk/operation-clean-sweep-undgaa-plastraavarer-ender-havet/

"*The releases from production sites and transport is considered potentially to be reduced to close to zero.*"

Up to 40% of the leakages can be removed, by implementing Operation Clean Sweep according to the Helcom report.

Plastindustrien.
Brancheforeningen for danske plastvirksomheder
AKTUELT

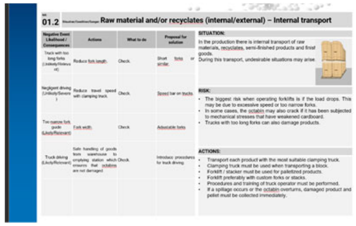
Operation Clean Sweep®

NYHED 26. MARTS 2019

EPS-branchen gør Operation Clean Sweep obligatorisk

Den danske EPS-branche, som er en sektion af Plastindustrien, sætter turbo på forebyggelsen af plast i naturen. Derfor har bestyrelsen besluttet, at det skal være obligatorisk for alle EPS-producenter i branchen at have tilmeldt sig miljøprogrammet Operation Clean Sweep.

DEL:



01.2 Raw material and/or recyclates (internal/external) – Internal transport

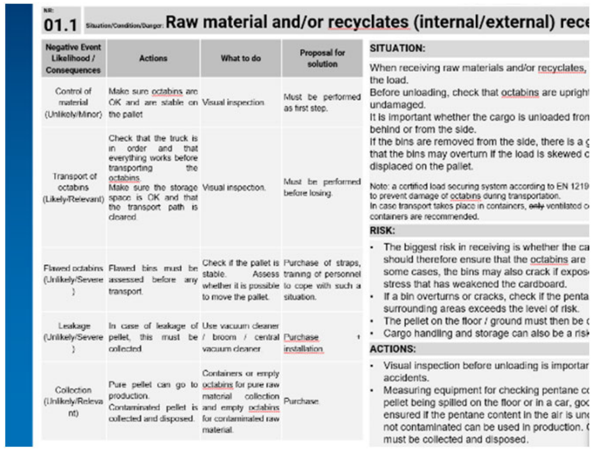
EUMEPS

Guideline to Prevent Microplastics Emission

Good Manufacturing Practice / Operation Clean Sweep

på stranden

Arrangørerne oplevede en stor interesse for at give en hånd med til Nordisk Strandrydder Dag.



NR: 01.1 Situation/Condition/Danger: Raw material and/or recyclates (internal/external) rece

Negative Event Likelihood / Consequences	Actions	What to do	Proposal for solution
Control of material (Unlikely/Minor)	Make sure octabins are OK and are stable on the pallet	Visual inspection	Must be performed as first step.
Transport of octabins (Likely/Relevant)	Check that the truck is in order and that everything works before transporting the octabins. Make sure the storage space is OK and that the transport path is cleared	Visual inspection.	Must be performed before losing.
Flawed octabins (Unlikely/Severe)	Flawed bins must be assessed before any transport.	Check if the pallet is stable. Assess whether it is possible to move the pallet.	Purchase of straps, training of personnel to cope with such a situation.
Leakage (Unlikely/Severe)	In case of leakage of pellet, this must be collected	Use vacuum cleaner / broom / central vacuum cleaner	Purchase installation
Collection (Unlikely/Relevant)	Pure pellet can go to production. Contaminated pellet is collected and disposed.	Containers or empty octabins for pure raw material collection and empty octabins for contaminated raw material.	Purchase

SITUATION:

When receiving raw materials and/or recyclates, the load.

Before unloading, check that octabins are upright undamaged.

It is important whether the cargo is unloaded fron behind or from the side.

If the bins are removed from the side, there is a g that the bins may overturn if the load is skewed c displaced on the pallet.

Note: a certified load securing system according to EN 1219 to prevent damage of octabins during transportation.

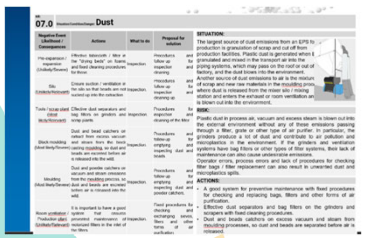
In case transport takes place in containers, ~~only~~ ventilated c containers are recommended.

RISK:

- The biggest risk in receiving is whether the ca should therefore ensure that the octabins are some cases, the bins may also crack if expos stress that has weakened the cardboard.
- If a bin overturns or cracks, check if the penta surrounding areas exceeds the level of risk.
- The pellet on the floor / ground must then be c
- Cargo handling and storage can also be a risk

ACTIONS:

- Visual inspection before unloading is importar accidents.
- Measuring equipment for checking pentane cc pellet being spilled on the floor or in a car, goc ensured if the pentane content in the air is unc not contaminated can be used in production. (must be collected and disposed.



07.0 Dust

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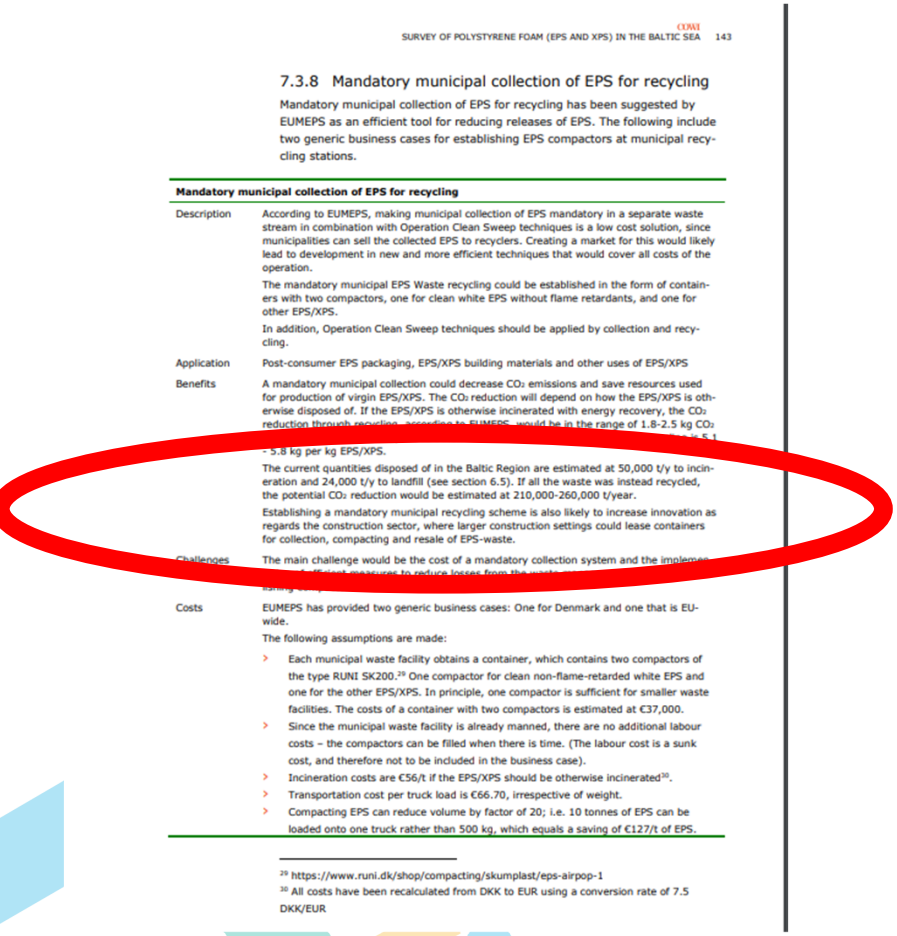
Step 2: Make EPS waste reclyced and valuable.

You don’t throw gold on the street

Step 2:
Make EPS waste reclyced and valuable.



SURVEY OF POLYSTYRENE FOAM (EPS AND XPS) IN THE BALTIC SEA 143

7.3.8 Mandatory municipal collection of EPS for recycling

Mandatory municipal collection of EPS for recycling has been suggested by EUMEPS as an efficient tool for reducing releases of EPS. The following include two generic business cases for establishing EPS compactors at municipal recycling stations.

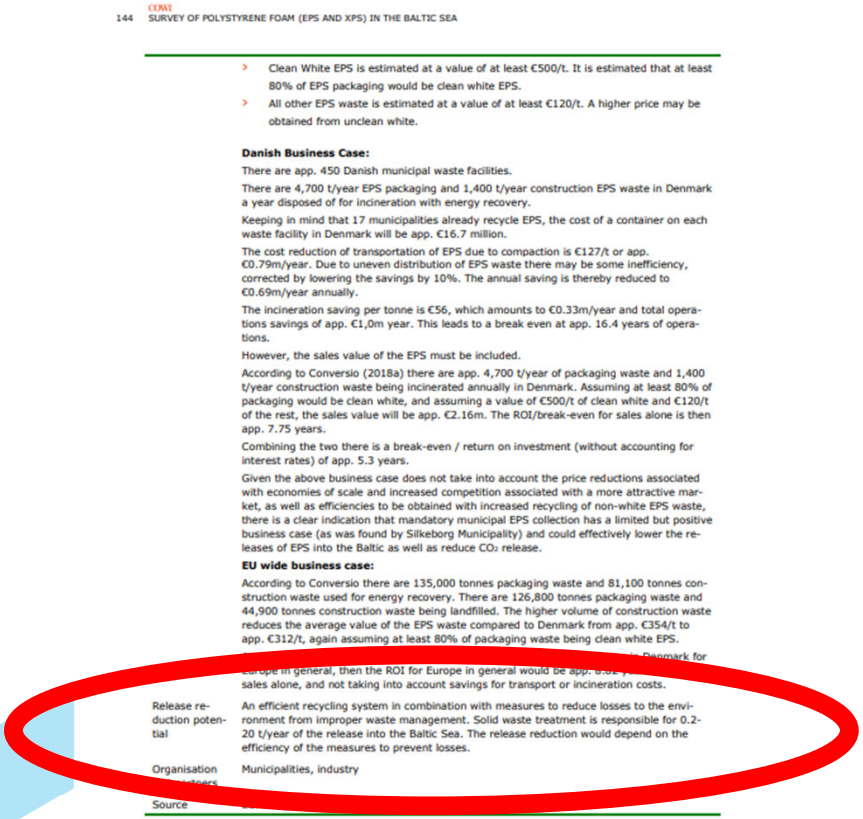
Mandatory municipal collection of EPS for recycling

Description	According to EUMEPS, making municipal collection of EPS mandatory in a separate waste stream in combination with Operation Clean Sweep techniques is a low cost solution, since municipalities can sell the collected EPS to recyclers. Creating a market for this would likely lead to development in new and more efficient techniques that would cover all costs of the operation. The mandatory municipal EPS Waste recycling could be established in the form of containers with two compactors, one for clean white EPS without flame retardants, and one for other EPS/XPS. In addition, Operation Clean Sweep techniques should be applied by collection and recycling.
Application	Post-consumer EPS packaging, EPS/XPS building materials and other uses of EPS/XPS
Benefits	A mandatory municipal collection could decrease CO_2 emissions and save resources used for production of virgin EPS/XPS. The CO_2 reduction will depend on how the EPS/XPS is otherwise disposed of. If the EPS/XPS is otherwise incinerated with energy recovery, the CO_2 reduction through recycling, according to EUMEPS, would be in the range of 1.8-2.5 kg CO_2 - 5.8 kg per kg EPS/XPS. The current quantities disposed of in the Baltic Region are estimated at 50,000 t/y to incineration and 24,000 t/y to landfill (see section 6.5). If all the waste was instead recycled, the potential CO_2 reduction would be estimated at 210,000-260,000 t/year. Establishing a mandatory municipal recycling scheme is also likely to increase innovation as regards the construction sector, where larger construction settings could lease containers for collection, compacting and resale of EPS-waste.
Challenges	The main challenge would be the cost of a mandatory collection system and the implemen[illegible]
Costs	EUMEPS has provided two generic business cases: One for Denmark and one that is EU-wide. The following assumptions are made: › Each municipal waste facility obtains a container, which contains two compactors of the type RUNI SK200.[29] One compactor for clean non-flame-retarded white EPS and one for the other EPS/XPS. In principle, one compactor is sufficient for smaller waste facilities. The costs of a container with two compactors is estimated at €37,000. › Since the municipal waste facility is already manned, there are no additional labour costs – the compactors can be filled when there is time. (The labour cost is a sunk cost, and therefore not to be included in the business case). › Incineration costs are €56/t if the EPS/XPS should be otherwise incinerated[30]. › Transportation cost per truck load is €66.70, irrespective of weight. › Compacting EPS can reduce volume by factor of 20; i.e. 10 tonnes of EPS can be loaded onto one truck rather than 500 kg, which equals a saving of €127/t of EPS.

[29] https://www.runi.dk/shop/compacting/skumplast/eps-airpop-1
[30] All costs have been recalculated from DKK to EUR using a conversion rate of 7.5 DKK/EUR

"The current quantities disposed of in the Baltic Region are estimated at 50,000 t/y to incineration and 24,000 t/y to landfill (see section 6.5). If all the waste was instead recycled, ***the potential CO2 reduction would be estimated at 210,000-260,000 t/year****."*

Step 2:
Make EPS waste reclyced and valuable.



144 SURVEY OF POLYSTYRENE FOAM (EPS AND XPS) IN THE BALTIC SEA

- Clean White EPS is estimated at a value of at least €500/t. It is estimated that at least 80% of EPS packaging would be clean white EPS.
- All other EPS waste is estimated at a value of at least €120/t. A higher price may be obtained from unclean white.

Danish Business Case:

There are app. 450 Danish municipal waste facilities.

There are 4,700 t/year EPS packaging and 1,400 t/year construction EPS waste in Denmark a year disposed of for incineration with energy recovery.

Keeping in mind that 17 municipalities already recycle EPS, the cost of a container on each waste facility in Denmark will be app. €16.7 million.

The cost reduction of transportation of EPS due to compaction is €127/t or app. €0.79m/year. Due to uneven distribution of EPS waste there may be some inefficiency, corrected by lowering the savings by 10%. The annual saving is thereby reduced to €0.69m/year annually.

The incineration saving per tonne is €56, which amounts to €0.33m/year and total operations savings of app. €1,0m year. This leads to a break even at app. 16.4 years of operations.

However, the sales value of the EPS must be included.

According to Conversio (2018a) there are app. 4,700 t/year of packaging waste and 1,400 t/year construction waste being incinerated annually in Denmark. Assuming at least 80% of packaging would be clean white, and assuming a value of €500/t of clean white and €120/t of the rest, the sales value will be app. €2.16m. The ROI/break-even for sales alone is then app. 7.75 years.

Combining the two there is a break-even / return on investment (without accounting for interest rates) of app. 5.3 years.

Given the above business case does not take into account the price reductions associated with economies of scale and increased competition associated with a more attractive market, as well as efficiencies to be obtained with increased recycling of non-white EPS waste, there is a clear indication that mandatory municipal EPS collection has a limited but positive business case (as was found by Silkeborg Municipality) and could effectively lower the releases of EPS into the Baltic as well as reduce CO_2 release.

EU wide business case:

According to Conversio there are 135,000 tonnes packaging waste and 81,100 tonnes construction waste used for energy recovery. There are 126,800 tonnes packaging waste and 44,900 tonnes construction waste being landfilled. The higher volume of construction waste reduces the average value of the EPS waste compared to Denmark from app. €354/t to app. €312/t, again assuming at least 80% of packaging waste being clean white EPS.

Europe in general, then the ROI for Europe in general would be app. … sales alone, and not taking into account savings for transport or incineration costs.

Release reduction potential	An efficient recycling system in combination with measures to reduce losses to the environment from improper waste management. Solid waste treatment is responsible for 0.2-20 t/year of the release into the Baltic Sea. The release reduction would depend on the efficiency of the measures to prevent losses.
Organisation	Municipalities, industry
Source	

"An efficient recycling system in combination with measures to reduce losses to the environment from improper waste management. Solid waste treatment is responsible for 0.2- 20 t/year of the release into the Baltic Sea. ***The release reduction would depend on the efficiency of the measures to prevent losses."***

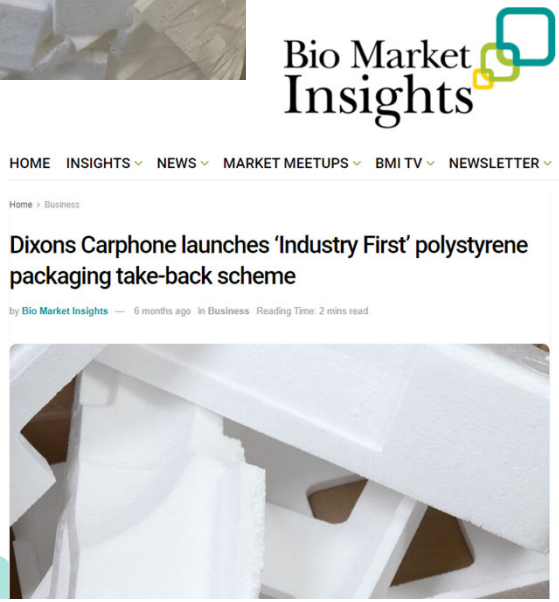
Up to 20% of the leakages can be removed, by implementing making municipal collection of EPS for recycling mandatory according to the Helcom report.

Combined with better waste management, which as a result of increased collection, we may even reach 40%.

Step 2:
Make EPS waste reclyced and valuable.

EPS packaging (and construction cut-offs) are taken back by retailers and converters, utilising reverse logistics, when this makes sense.

Polystyrene recycling: Currys PC World stores to take back TV packaging



Quoting Kierkegaard

If One Is Truly to Succeed in Leading a person to a Specific Place, One must First and Foremost Take Care to Find Him Where He Is and Begin There

This is the secret in the entire art of helping.

Step 2:
Make EPS waste reclyced and valuable.

France

Denmark

Croatia

EPS from households are collected at collection centers and in bulky waste collection schemes across Europe.

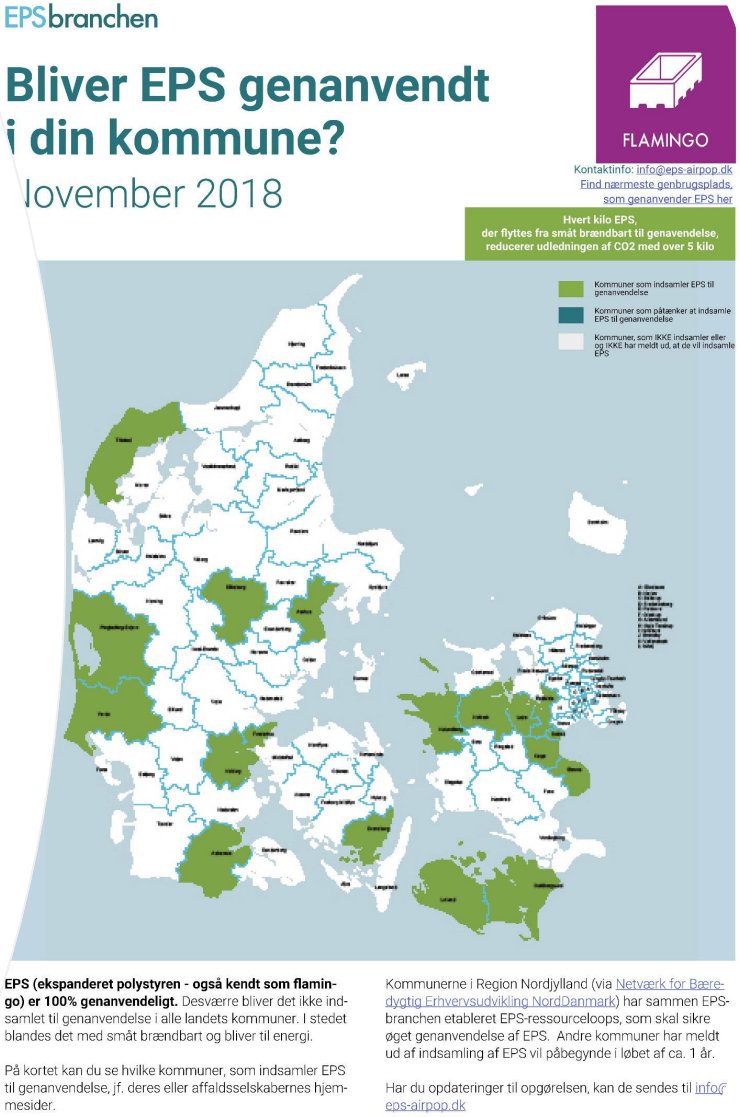
The EPS waste is then send to recyclers, some collection points compress the EPS waste, where as others deliver it uncompressed to the recycler – depending on the distance to the recycler.

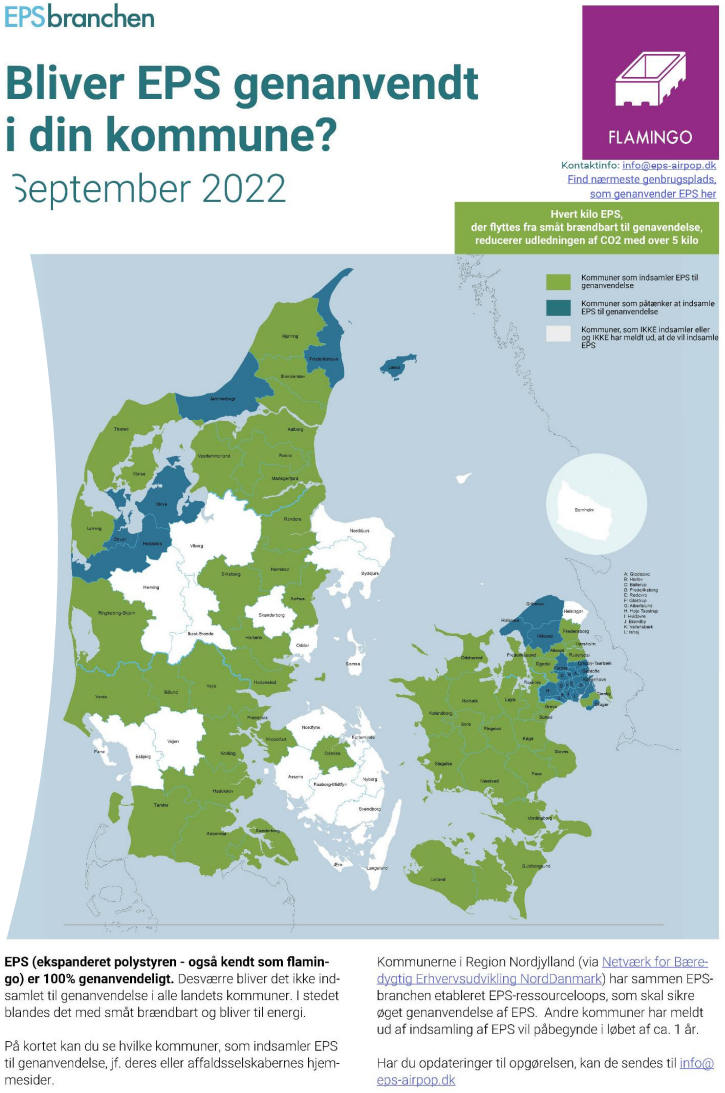
Step 2:

Make EPS waste reclyced and valuable.

- More than 50% of Danish municipalities collect EPS for recycling
- More than 55% of Danish population
- Within a year those numbers are expected to be more than 85% of the municipalities and more than 85% of the Danish population.

- In 2018 the numbers were 17%.





Step 2:
Make EPS waste reclyced and valuable.

Region	Country	Area Type	Population > mio people	Recycling Rate >%	Source Type	Link
Asia	Japan	Country	126 mio.	50%	Government	https://www.meti.go.jp/policy/recycle/main/data/pamphlet/pdf/handbook2021.pdf
Asia	South Korea	Country	51 mio.	60%	Report for Government	https://www.helenmillicer.com/wp-content/uploads/2018/12/2017-18_EPS_PublicReport_OnePlanetConsulting.pdf
Asia	China	Country	1,412 mio.	50%	EPS Industry Association	Report
Europe	UK	Country	67 mio.	50%	EPS Industry Association	https://www.eps.co.uk/recycling/eps_recycling_the_facts.html
Europe	Norway	Country	5 mio.	70%	EPR Scheme	https://www.grontpunkt.no/gjenvinning/eps/
Europe	EU 27*	Region	447 mio.	30%	Government	https://fvm.dk/fileadmin/_migrated/content_uploads/Survey_of_EPS_in_the_Baltic_Sea_final.pdf
Europe	Denmark, Portugal, Austria, Netherlands, Ireland, Belgium. *)	Country	60 mio. *)	50%	EPS Industri Association	*) These six countries, covering 60 mio. people have recycling rates of above 50%. The population isn't included in EU total.
Americas	United States	Country	331 mio.	30%	EPS Industry Association	Report

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Step 3: Prevent leakage from construction

When people know the waste is valuable, they ensure it is collected not dumped.

Step 3:
Prevent leakage from construction

Several EPS-associations have developed guidelines and recommendations to the construction industry to assist in reducing the leakage.

Here some cases from Germany, Norway and Denmark.

There are currently being compared, reviewed to ensure best practice guides across Europe.

Step 3:
Prevent leakage from construction

Better waste management and recycling and take back all supports the strategy of reducing **up to 29% of the EPS leakage!**

BSC 2023

INSPIRING OTHERS

When we have the right data, and we know the causes of marine litter, then we can react.

Getting funding and doing the required research to do this is difficult at the industry / private sector level. Without the report from Helcom, the EPS industry in Europe wouldn't have been able to identify and address the three major action points we could do to reduce the risk of EPS becoming litter in the marine environment.

BSC 2023

INSPIRING OTHERS

40% + 40% + 29% = 109% or

5% + 0,9% + 30% = 35,9% or

Using midrange: 29,5% + 22,5% + 20,45% = 72,45%

BSC 2023

CHALLENGES TO OVERCOME

BSC 2023

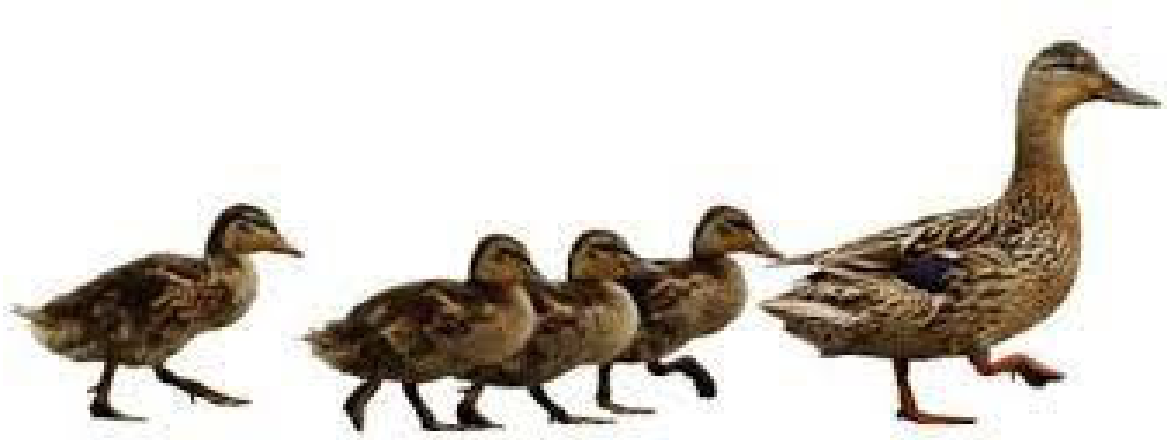
INSPIRING OTHERS

Thank you

HELCOM

BSC 2023

CHALLENGES TO OVERCOME



ALWAYS ROOM FOR IMPROVEMENT

- Helps us find the EPS waste

- Reach out to create circular solutions with us in regard to take back, municipal recycling, or …

- Good guidelines

BSC 2023

INSPIRING OTHERS

Together we can reduce EPS marine litter in the Baltic Sea to be less than 0,1%.

We are ready to take on this challenge and welcome you to join our journey!