

PUreSMART Closing Workshop  
Wetteren, 1 December 2022  
Michel Baumgartner, Secretary General



# The EU on a Journey to Circularity

## Anticipated Consequences for the Flexible PU Foam Industry





# About EUROPUR

EUROPUR is the *European Association of Flexible PU Foam Blocks Producers*.

Our members operate PU foam production plants in **28 countries** in geographical Europe and in 4 countries in MEA.

Together, our members operate >70% of the PU foam plants in wider Europe and produce around 1,1 million tonnes of PU foam (+/- 80% of the total production in the region). Some of them also produce mattresses and furniture directly.



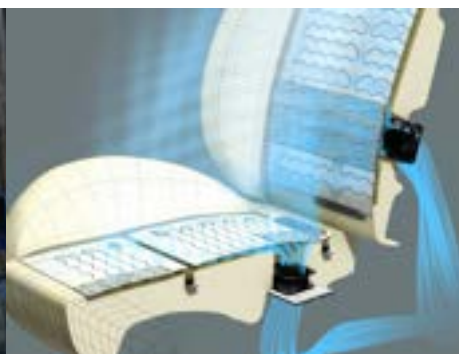


# About EURO-MOULDERS

EURO-MOULDERS is the *European Association of Manufacturers of Moulded PU Parts for the Automotive Industry*.

EURO-MOULDERS's members are Tier 1 and 2 manufacturers of moulded polyurethane parts for the automotive industry, ranging from car seating to acoustic insulation and dashboards.

Our members operate majority of the moulded foam plants for automotive seating in Europe. We also welcome associate members - mainly raw material suppliers to the industry.





# Agenda



- | 1° Regulatory Framework in the EU
- | 2° EPR Schemes in Europe
- | 3° Mechanical Recycling
- | 4° Depolymerisation
- | 5° Thermochemical Recycling and the Mass-balance Approach
- | 6° Conclusions & Open Questions



# Regulatory Framework: Europe's Objectives

35% reduction of CO2 emissions by 2035\*

Climate (CO2) neutrality by 2050



(recast) Waste Framework Directive



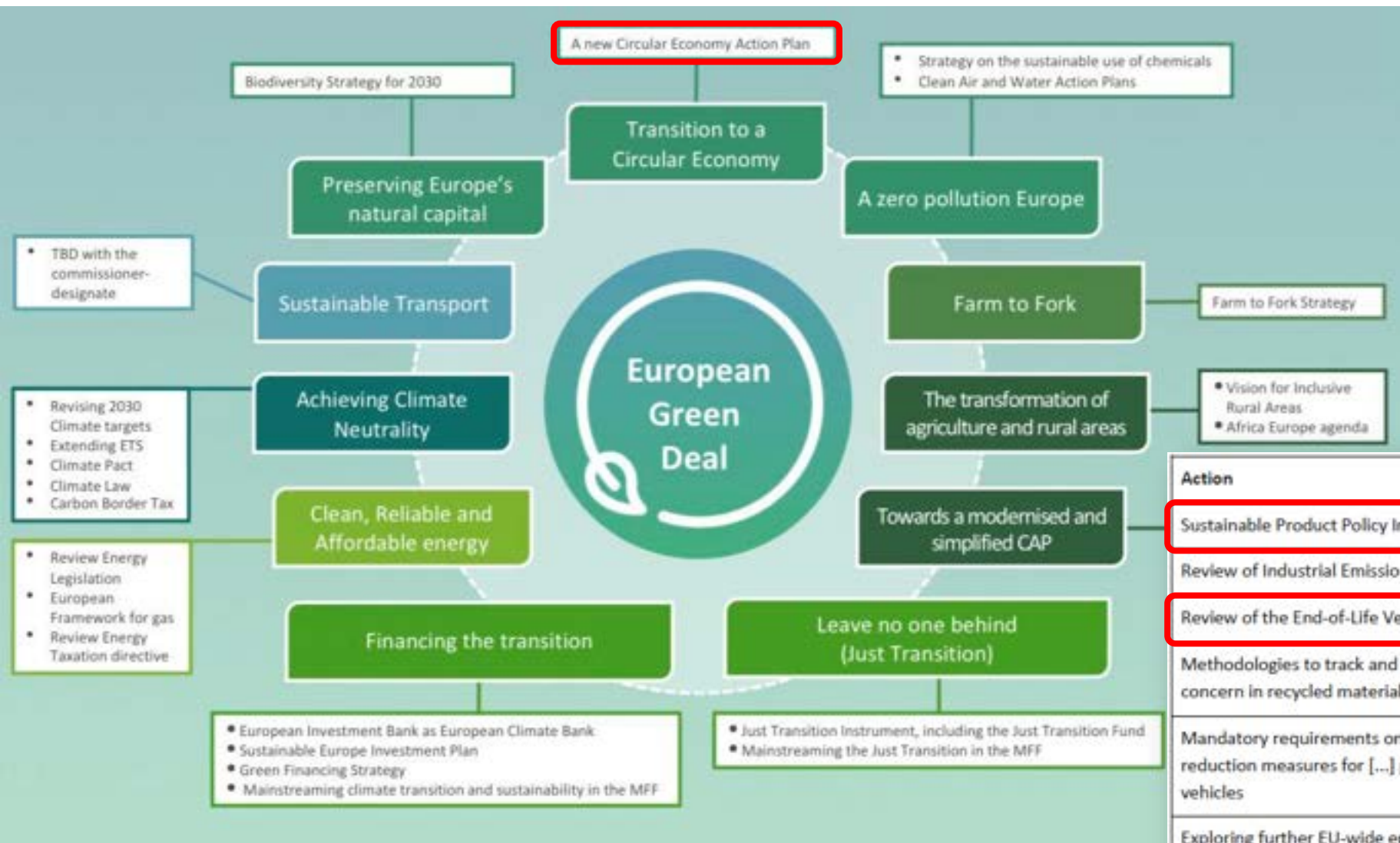
European Green Deal

\*compared to 1990 levels





# Regulatory Framework: European Green Deal



Action	Discussion Start (Year)
Sustainable Product Policy Initiative (Incl. furniture)	2021
Review of Industrial Emissions Directive	2021
Review of the End-of-Life Vehicles Directive	2021
Methodologies to track and minimise the presence of substances of concern in recycled materials and articles made thereof	2021
Mandatory requirements on recycled plastic content and plastic waste reduction measures for [...] packaging, construction materials and vehicles	2022
Exploring further EU-wide end-of-waste and by-product criteria	2021
Review of the rules on waste shipment	2021

Source: European Commission



# The (draft) Ecodesign for Sustainable Products Regulation (ESPR)

- The core of the initiative is to explore the potential of **expanding the scope of the Ecodesign Directive** to non-energy related products and propose additional legislative measures as appropriate.
- It aims at making products placed on the EU market more sustainable.
- The Commission considers addressing the following aspects as part of this legislative initiative:
  - ❖ Improving product **durability, reusability, upgradability** and **reparability**, addressing **the presence of hazardous chemicals**
  - ❖ Increasing **recycled content** in products and enabling remanufacturing and **high-quality recycling**
  - ❖ Rewarding products based on their different **sustainability performance**, including by linking high performance levels to **incentives**



# Our Views on the ESPR

**SCIENTIFIC METHODOLOGY** -> “It is crucial that the European Commission identifies the specific criteria (e.g. durability, traceability, recycled content) it will use to make ecodesign decisions and what measurable and identifiable science backs these criteria.”

**DIGITAL PRODUCT PASSPORT** -> “The information requirements, (...), should not create excessive administrative burdens for companies, especially thinking of the amount of information already shared with consumers and along value chains.”

**RECYCLED CONTENT** -> “(...), the proposed Regulation should also adopt a technology-neutral approach and clarify that sources of recycled content can stem from different waste collection streams.”

**SUBSTANCES OF CONCERN** -> “The proposed Regulation should also refrain from adopting new concepts, such as substance of concern, that do not stem from the European legislative chemical *acquis*.”

**ENFORCEMENT AND CONTROL** -> “The proposed Regulation should include clear rules concerning imports of finished and semi-finished products so to guarantee a level playing field in the European market, irrespective of first origin of a product..”

**CONSISTENCY BETWEEN DIFFERENT PIECES OF LEGISLATION** -> “(...) no overlaps or contradictions”





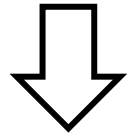


# The End-of-Life Vehicles Directive (2000/53/EC)



# End-of-Life Vehicles [ELV] Directive Revision

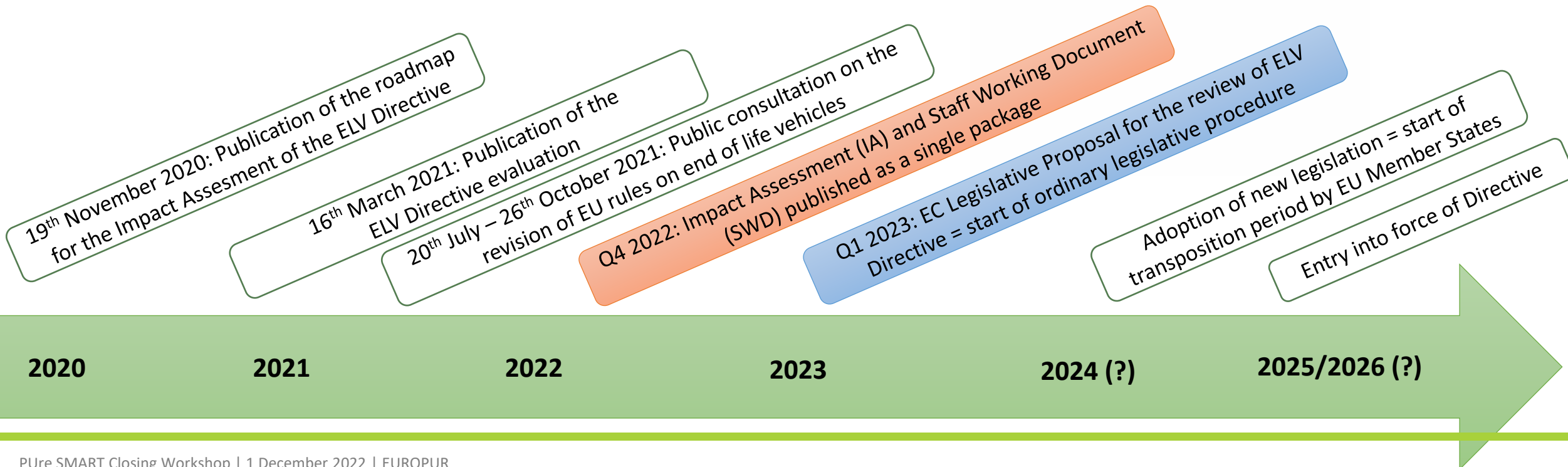
Does not sufficiently address key areas; waste prevention, eco-design of cars to facilitate re-use, repair, remanufacturing and recycling



ELV Directive will contain measures on compulsory fraction of recycled content in plastic in vehicles.



**% of recycled content  
by when**



# ***ELV Directive Revision: Industry's Views on recycled content in plastics fraction***



## **MAIN POINTS:**

- **20%** of recycled content for the plastics fraction of vehicles by **2030** and **25% in 2035** at the level of an OEMs fleet (not single car)
- No targets per type of plastic
- Chemical recycling accepted as recycling technology
- Post-industrial plastics accepted as recycled content
- **Open loop** (recycled content will become too complex if all supply chains start having separate closed loop targets)

## **SUPPORTED BY**







# Conclusions on Regulatory Developments

- Changes will affect the three main markets for PU (upholstered furniture, bedding & automotive)
- Will include increased **recycling** of post-consumer foams and creation of market space for **recyclates**
- Need for increased circulation of information along the supply chain (LCA data, SOC's, ...)
- Requirements for increased openness towards consumers (eg. Digital product passport)
- Potential danger of multiplication of “closed-loops” for materials
- Potential danger of overlap of legislation (REACH, CLP, ESPR, ELV, ...)



**It won't be a walk in the park, but there are many things industry can do already to prepare.**



# EPR Schemes In Europe

(for mattresses and / or furniture)

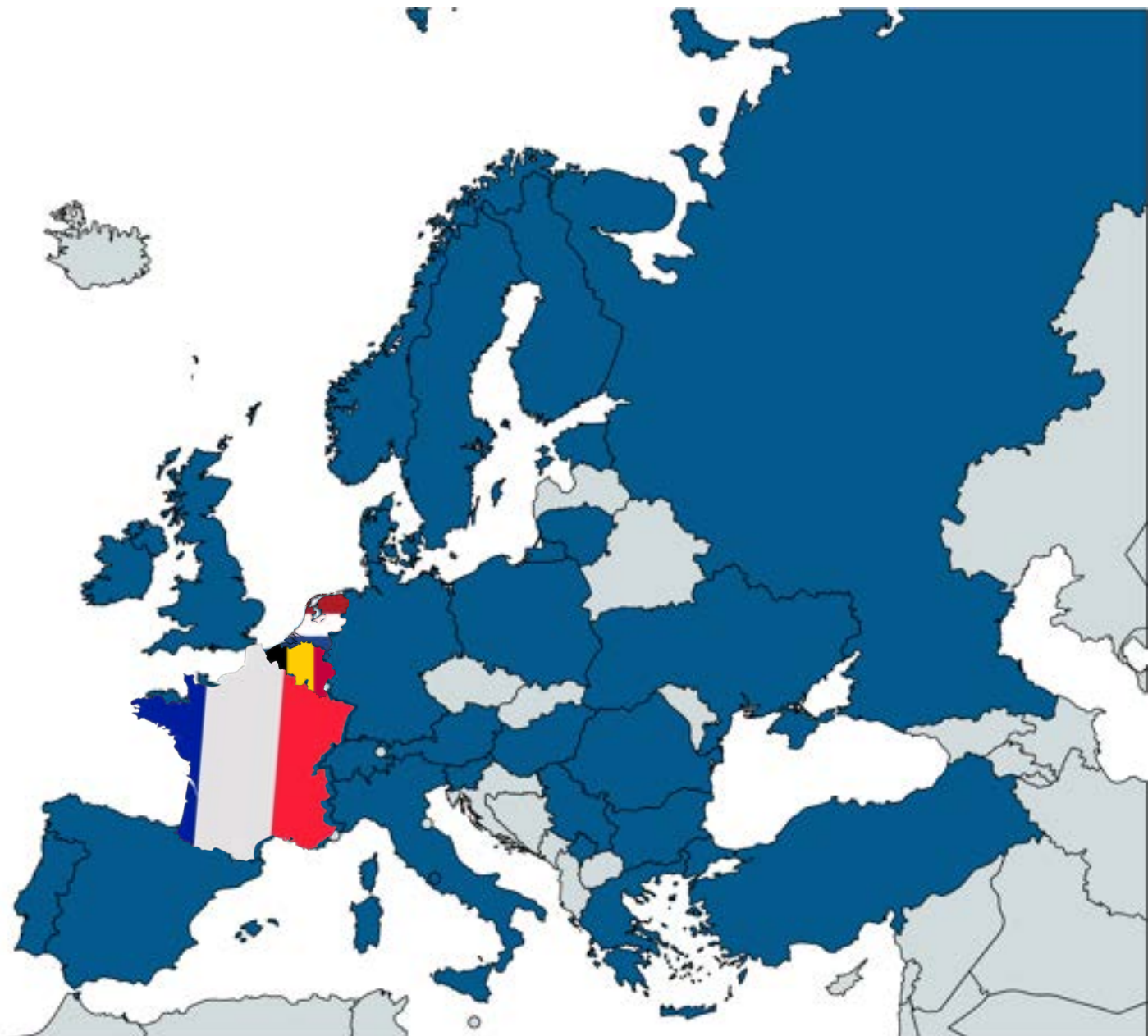


MATRAS  
RECYCLING  
NEDERLAND



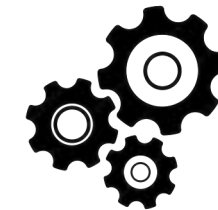
écomobilier

IN DISCUSSION:





# Mechanical Recycling



We estimate that ~**40 million mattresses** reach EoL per year in the wider EU. Other estimate: the potential post-consumer foam volume that could be available for recycling is ~ **240-290 KT** from mattresses and ~**350-400 KT** from furniture.

**RetourMatras can now recycle all mattresses disposed of in the Netherlands**

RetourMatras, a mattress recycling company that Ingka Investments is invested in, has opened their fourth mattress recycling facility in Eindhoven, the Netherlands. The facility was constructed with the support of Ingka.

Source: Ingka.com

**Partnership for circular economy for discarded mattresses**

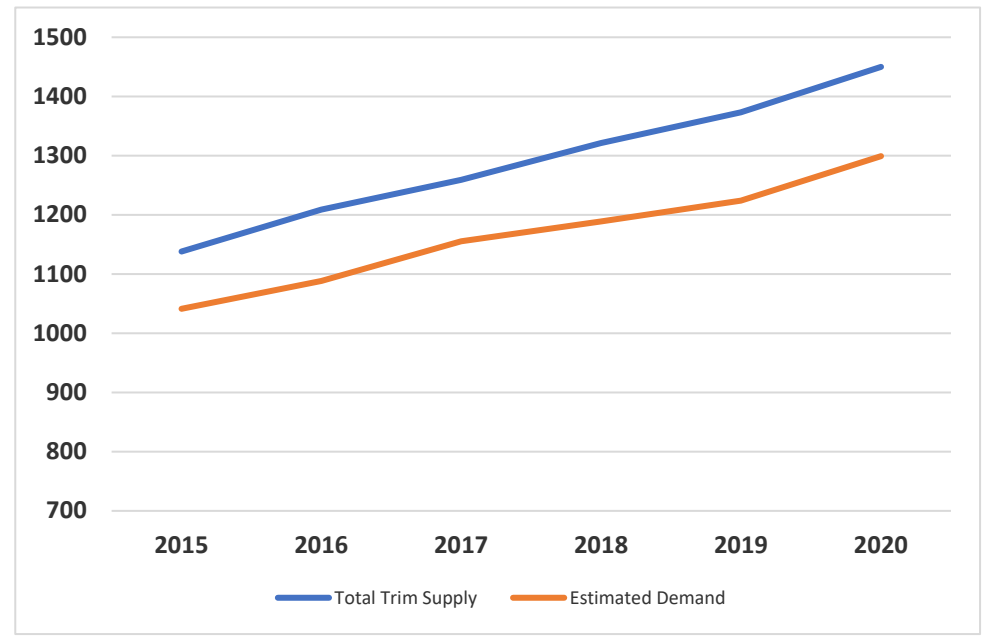
A group of stakeholders across the Danish waste sector and the mattress industry have initiated a collaboration to find circular solutions for discarded mattresses.

Source: [circularcph.cphsolutionslab.dk](http://circularcph.cphsolutionslab.dk)





# Mechanical Recycling in Europe: End-Markets are the limit

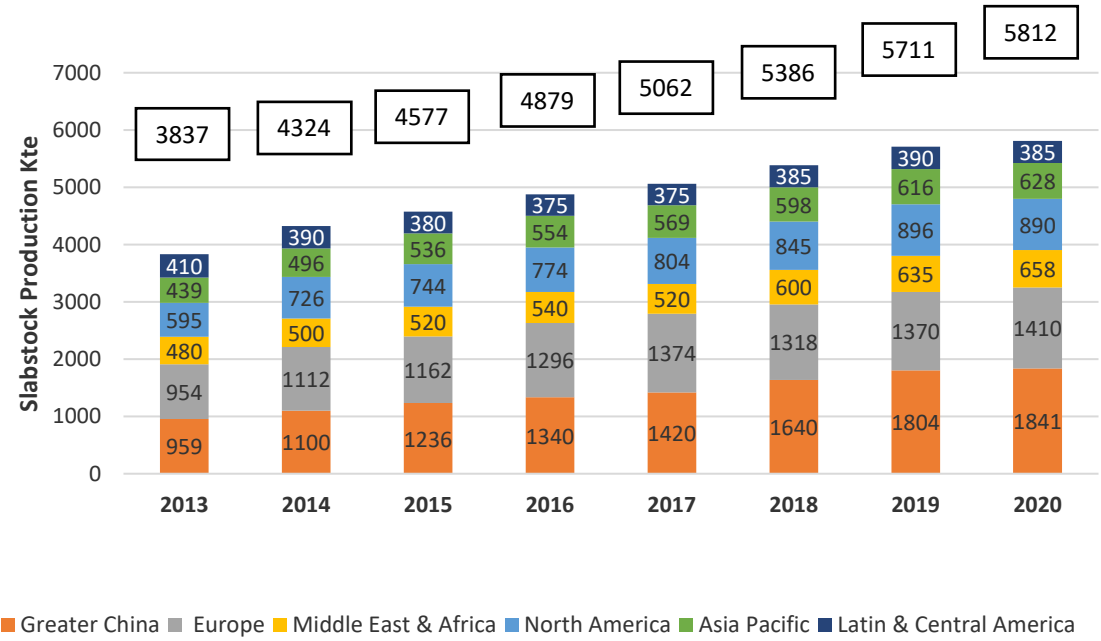


**Estimated Global Supply And Demand For Trim Foam, 2015-2020 (Kte)**

Supply/Demand (Kte)	2015	2016	2017	2018	2019	2020
Post Production	1002	1070	1115	1173	1231	1305
Post Consumer	136	139	144	148	142	145
<b>Total Trim Supply</b>	<b>1138</b>	<b>1209</b>	<b>1259</b>	<b>1321</b>	<b>1373</b>	<b>1450</b>
<b>Estimated Demand</b>	<b>1041</b>	<b>1088</b>	<b>1155</b>	<b>1189</b>	<b>1224</b>	<b>1299</b>
Surplus	97	121	104	132	149	151

Source: Labyrinth Research and Markets Ltd, "Global Supply and Demand for Flexible Polyurethane Slabstock Trim Foam", November 2019. Updated for 2019 & 2020 by Belvedere and Partner Ltd

**Global Flexible PU Slabstock Production (Kte) 2013-2020**



Source: Compilation of data from EUROPUR, CPI, IAL, LRM, CPUIA, PU Daily, Industry interviews by Belvedere and Partner Ltd.

# Depolymerisation



## Recent progress:

- [Orrion Chemicals](#) (FR), in cooperation with Dow: Plant operational since Autumn 2021
- [Repsol](#): chemolysis plant under construction (ES), production to start 2023
- [Retour Matras](#): chemolysis plant under construction (NL), production scheduled to start in 2023
- [Evonik](#): hydrolysis recycling process, announced 2022
- [Triple Helix](#) obtained planning permission for chemolysis plant in the Port of Antwerp in 2021
- [Covestro](#): pilot plant for PU chemical recycling and [cooperation with Eco-Mobilier](#), announced end-2021

## Others:

- Urbanrec: Project Completed.
- [RePURpose](#) (Tempur ea). Project completed.
- [PureSmart](#) (Recticel / Covestro ea) – new type of PU (CAPU) + chemical recycling – Project completed end-2022

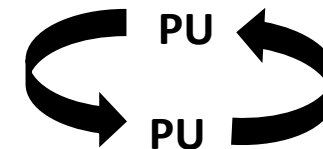


# Providing Recycled Content for Main PU Supply Chains



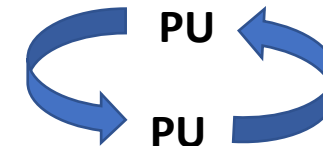
## MECHANICAL RECYCLING

Production cut-offs + EoL from mattresses and furniture are transformed into so called trim (foam flocks) which in turn can become rebounded foam used in numerous applications.



## DEPOLYMERISATION

A process whereby flexible polyurethane foam is broken down into its specific constituent chemical raw materials, which can be used again to make fresh foam.



## THERMO-CHEMICAL RECYCLING + MASS BALANCE APPROACH

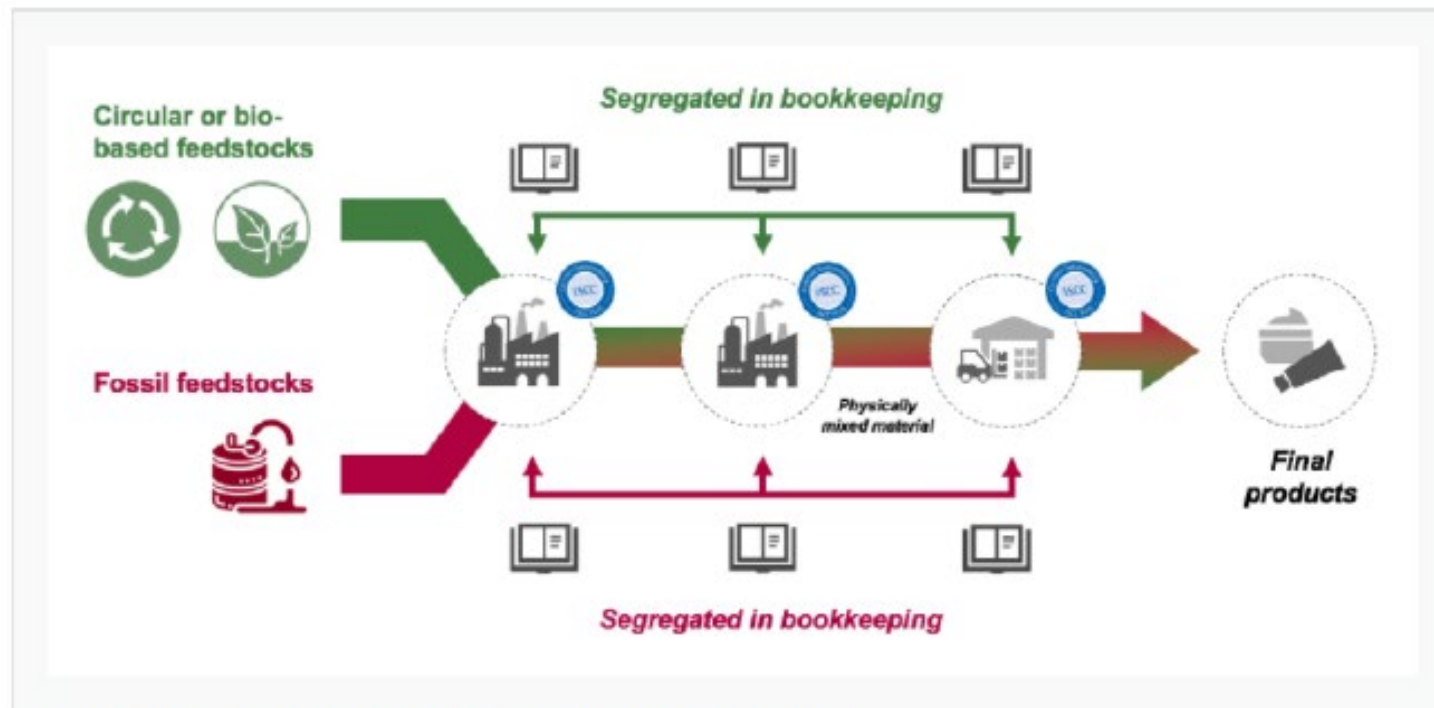
Materials (mostly non-PU) disintegrated at molecular level, creating new raw materials for the petrochemical industry. The three main technologies are pyrolysis, gasification and hydrogenation



# The Mass-Balance Approach

-> up to 100% virgin-equivalent of polyols **and** isocyanates can be used in foam formulations coming from mass balance approach.

-> **properties** of the output from the MBA **are the same** as of the fossil-based RM so there is s no compromising on specifications



Source: ISCC – International Sustainability & Carbon Certification

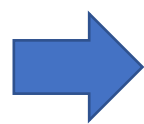
? unknown at the moment is the regulatory fate of thermo-chemical recycling and whether it will accepted as recycling technology

? energy consumption contributing to the overall CO2 footprint





# Foam Recycling, Recyclates and Downstream Markets



*Mattresses and furniture most suitable for PU to PU recycling*

*High specifications in automotive chain require virgin-equivalent raw materials*

Downstream Market	Recycling Situation	Potential Use of Recyclates
<b>UPHOLSTERED FURNITURE</b>	Large volumes but not always easy to dismantle -> hardly recycled today	  
<b>MATTRESS AND BEDDING</b>	Recycling increasing across (North Western) Europe Ongoing challenges: separate dry collection, design-for-dismantling	  
<b>AUTOMOTIVE</b>	Many small pieces and multi-material parts -> dismantling and recycling very difficult -> hardly any recycling today Very high and complex specifications	  

\*with current state of technology available on the market



# Conclusions

Like many other industries, the flexible PU foam supply chain is going to experience **fundamental changes** due to the European Green Deal and pertaining policies in its three main markets (upholstered furniture, bedding and automotive).

The EU's ambitious targets will require:

- Development of collection systems
- **Coexistence** of recycling technologies
- Improved **design-for-dismantling** (and design-for-recycling)
- Amendments to EoL handling of goods



**Easier said than done, there are also plenty of open questions still...**

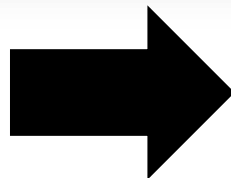


# Open Questions

- ❖ Recycled content vs carbon footprint?
- ❖ What about **bio-based** raw materials?
- ❖ Will OEMs and consumers be willing to **pay a premium** for advanced technologies?
- ❖ Will OEMs be willing to **compromise on specifications**?
- ❖ How can **sorting** be improved to facilitate chemical recycling?



## Back to Realpolitik ?



All the European countries returning to 'dirty' coal as Russia threatens to turn off the gas tap

Source: Euronews.com

EU Lawmakers Remove Last Hurdle to Label Gas, Nuclear as Green

- Parliament votes to approve including gas in taxonomy
- Regulation will most likely enter into force at start of 2023

Source: Bloomberg.com

LEAK: Energy prices will 'remain high and volatile until at least 2023', EU Commission says

Source: Euractiv.com

Eurozone inflation climbed to new record high of 10.7% in October



Source: Euronews.com



***Thank you for your attention***

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