

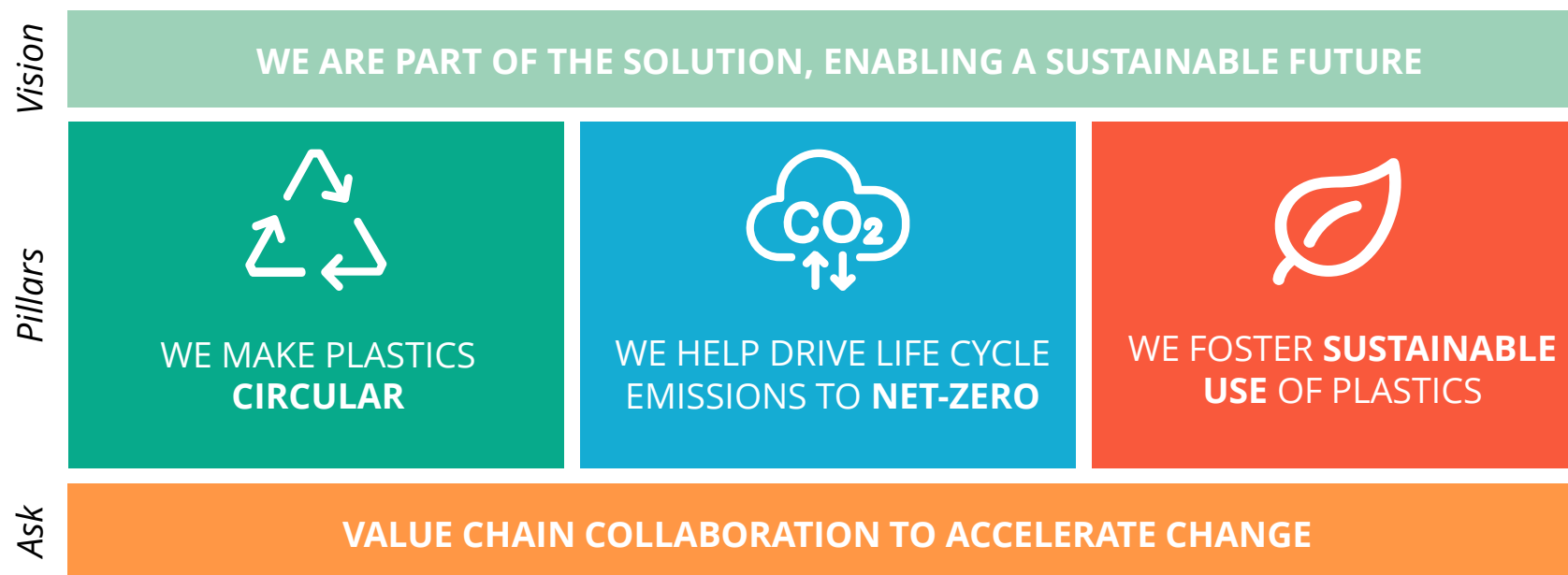
# Plastics Transition Roadmap

## Data and key takeouts

**UNDER EMBARGO UNTIL  
Thursday 26 October 2023 at 12:00  
CET**



**Figure 2:** Plastics Europe has a vision for a sustainable plastics system



# Three essential levers to circularity and net zero emissions



## WE MAKE PLASTICS CIRCULAR BY

- Fostering circular design and business models
- Enhancing mechanical recycling
- Unlocking chemical recycling
- Expanding production from sustainable biomass
- Making plastics from captured carbon



## WE HELP DRIVE LIFE CYCLE EMISSIONS TO NET-ZERO BY

- Leveraging the circular transition
- Maximising energy efficiency
- Using low-carbon fuels (hydrogen, biofuels)
- Electrifying production with low-carbon electricity
- Investing in carbon capture & storage

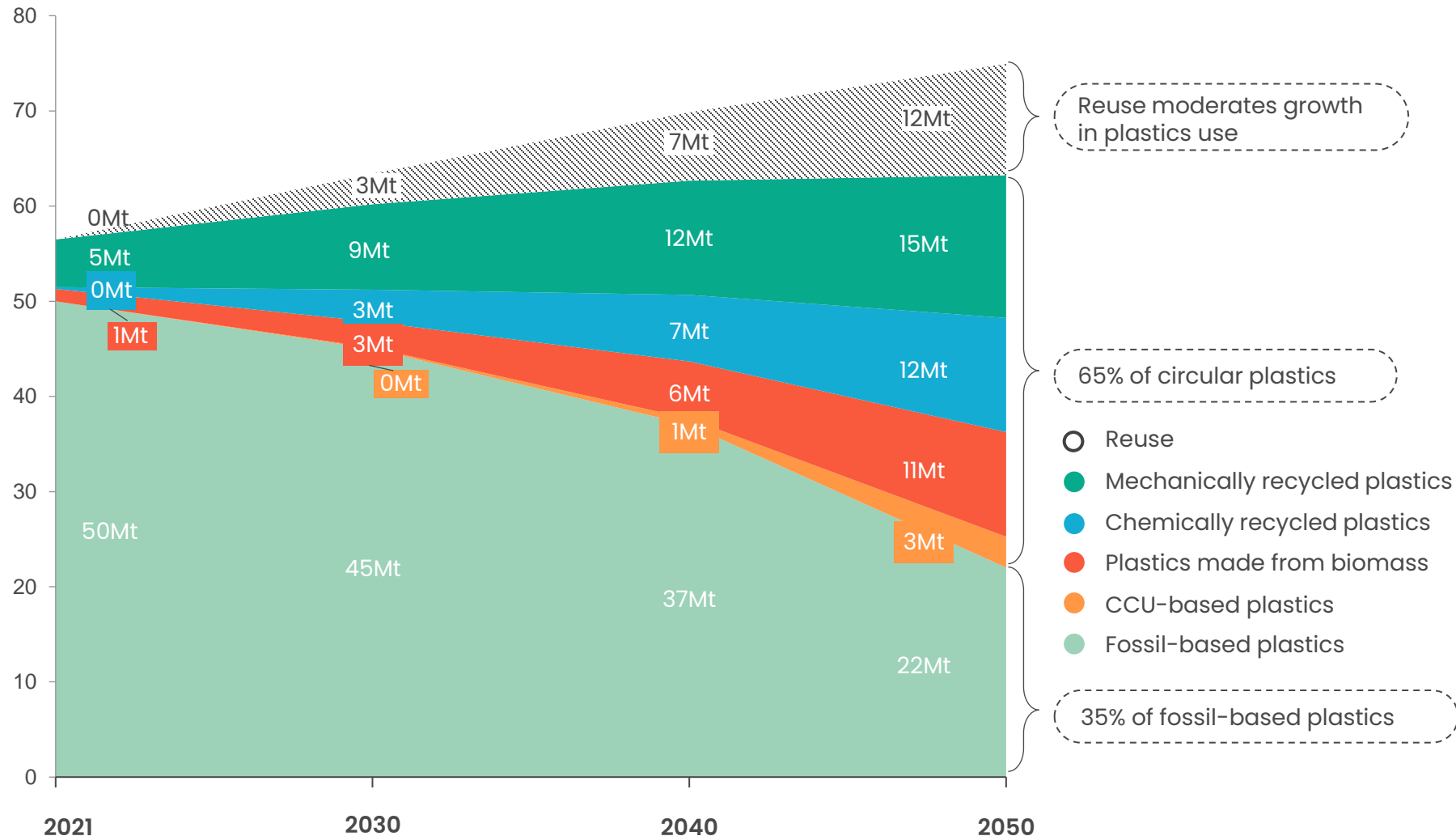


## WE FOSTER SUSTAINABLE USE OF PLASTICS BY

- Managing risks in operations
- Providing further transparency to stakeholders
- Collaborating with value chain partners to prevent leakage

# Circularity – ambitious but achievable

**Circular plastics use by European converters and their feedstock**  
2050, estimates, Mt



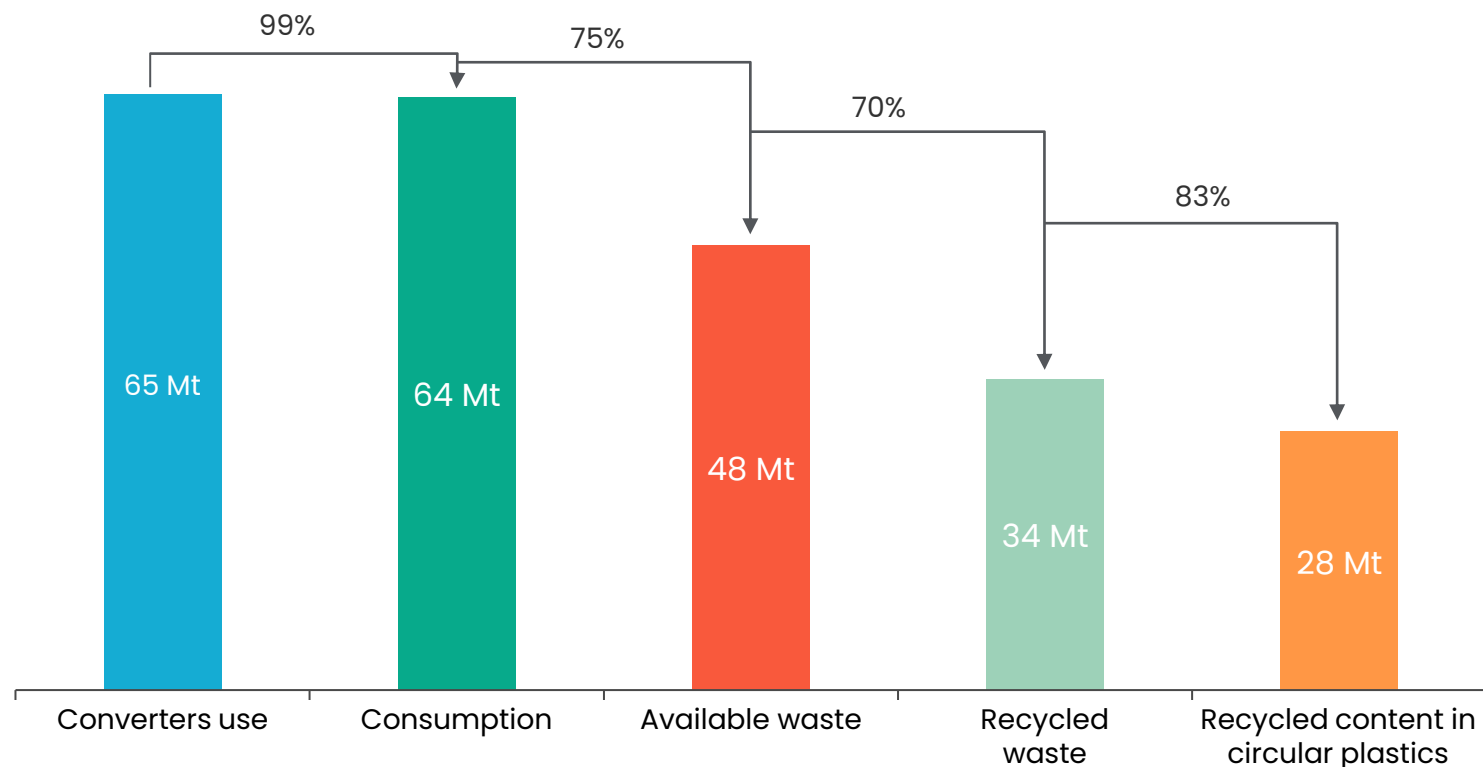
## Key takeaways

- Through reuse, **12 Mt of plastics can be reduced by 2050**
- **Mechanical recycling** has the highest **technological maturity** and cost effectiveness, hence we project that it can steadily grow towards 2050
- **Chemical recycling** is expected to have its **breakthrough by 2030**, and grow exponentially from there towards 2050
- **Plastics made from biomass** will grow steadily until 2040 and will play a **key role** onwards
- While **plastics based on CCU and hydrogen** are poised to **grow towards 2050**, the limited maturity of the technologies and the high costs will not enable it to reach significant quantities

# Improving waste collection and innovation in recycling are key for circularity

## Projected flow of recycled plastic waste

In Mt, 2050 estimates (Deloitte analysis, 2023)



## Key takeaways

- The elements projected in this **figure drive the flow of recycled plastics waste** and constrain the availability of recycled feedstock for circular plastics
- Current converter use is slightly larger than consumption of plastics (factor 1.01), which is **assumed to remain constant over time**<sup>1</sup>
- The **identified streams of plastic waste are probably an underestimation of real amounts**. To account for these 'missing plastics', a waste arising rate of 75% is assumed<sup>2</sup>
- European recycling rates are assumed to rise to 70% in 2050, **more than doubling the current average rate in the EU**, leading to 34 Mt of recycled plastic waste<sup>3</sup>
- Due to **technology improvements, development of more efficient solutions and efficiency gains**, process losses in recycling are estimated to improve to 17%, leading to 28 Mt of recycled content<sup>4</sup>
- Achieving this ambitious projected recycled content goal requires the **combined efforts of many stakeholders**, from partners throughout the value chain to policymakers<sup>5</sup>

<sup>1</sup>Plastics Europe (2021)

<sup>2</sup>Average of ReShaping Plastics (2022) Material Economics (2021), SystemIQ (2022) and OECD (2022),

<sup>3</sup>OECD (2022) and ReShaping Plastics (2022),

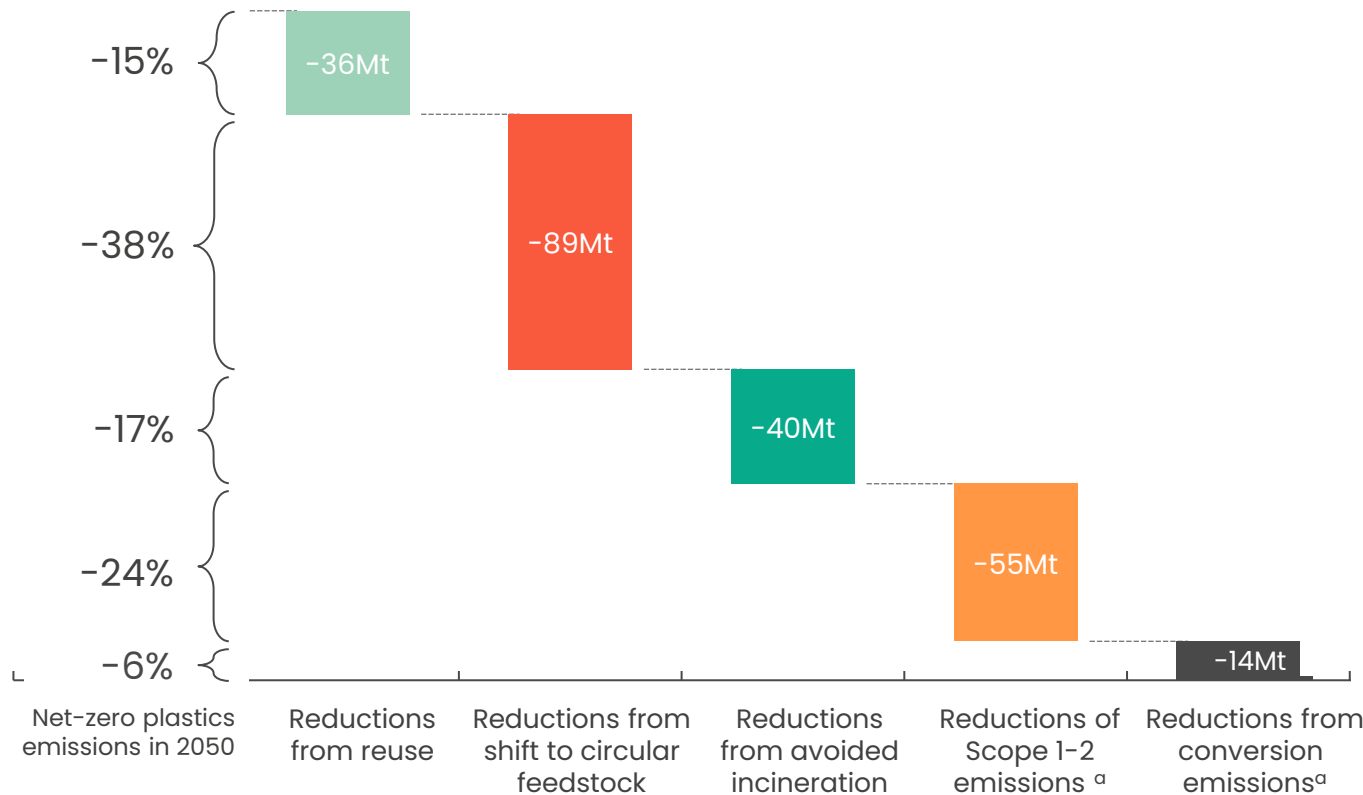
<sup>4</sup>European Commission, TU Denmark (2021), European Commission (2021)

# Reaching net zero by 2050 requires investment all along the plastics life cycle

## Reductions needed to reach net-zero in 2050

In Mt CO<sub>2</sub>e, 2050 (Deloitte analysis, 2023)

Baseline emissions  
in 2050



<sup>a</sup>Reductions through net zero plastics production levers; maximizing energy efficiency, electrifying production with low-carbon electricity, using low-carbon fuels and investing in carbon capture & storage

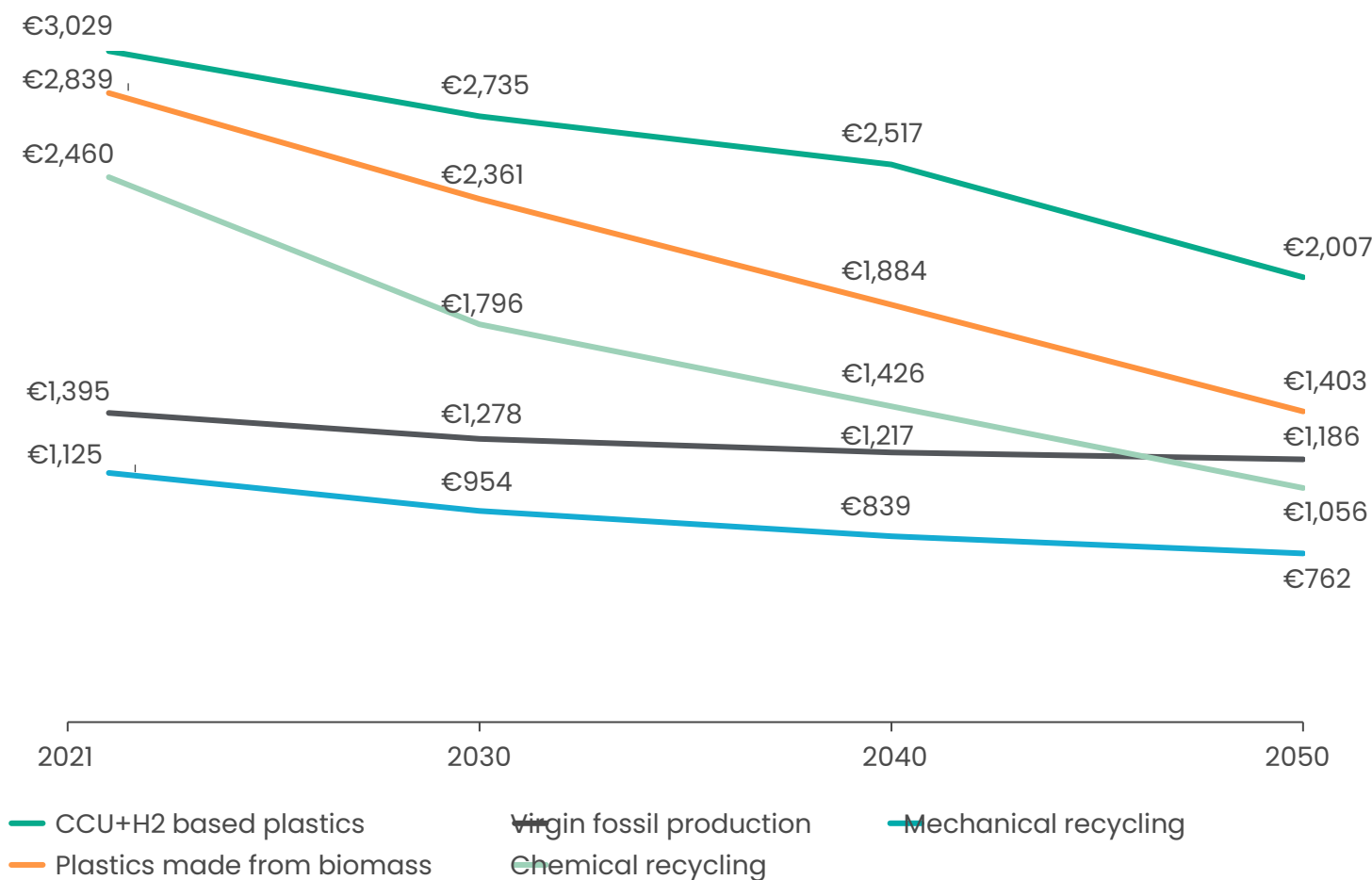
## Key takeaways

- **Without abatement measures** scope 1-2 and 3 up- and downstream GHG emissions will increase to 233 Mt
- Through **reuse**, 36 Mt of CO<sub>2</sub>e emissions are avoided
- **Moving to 65% of circular feedstock** reduces scope 1-2 and 3 upstream emissions by 89 Mt
- 40 Mt of scope 3 downstream emissions are **avoided by plastic waste not going to incineration**
- 55 Mt of scope 1 and 2 emissions are **reduced through energy efficiency, electrification, shifting to low-carbon electricity and fuels and capturing emissions (CCS)**
- 14 Mt of GHG emissions from conversion are avoided by **energy efficiency and shifting to low-carbon electricity**

# Benefits of scale and learning effects lead to cost efficiency improvements

## OPEX evolution of production technologies<sup>2</sup>

In € per tonne produced, 2021-2050 estimates (Deloitte analysis)



## Key takeaways

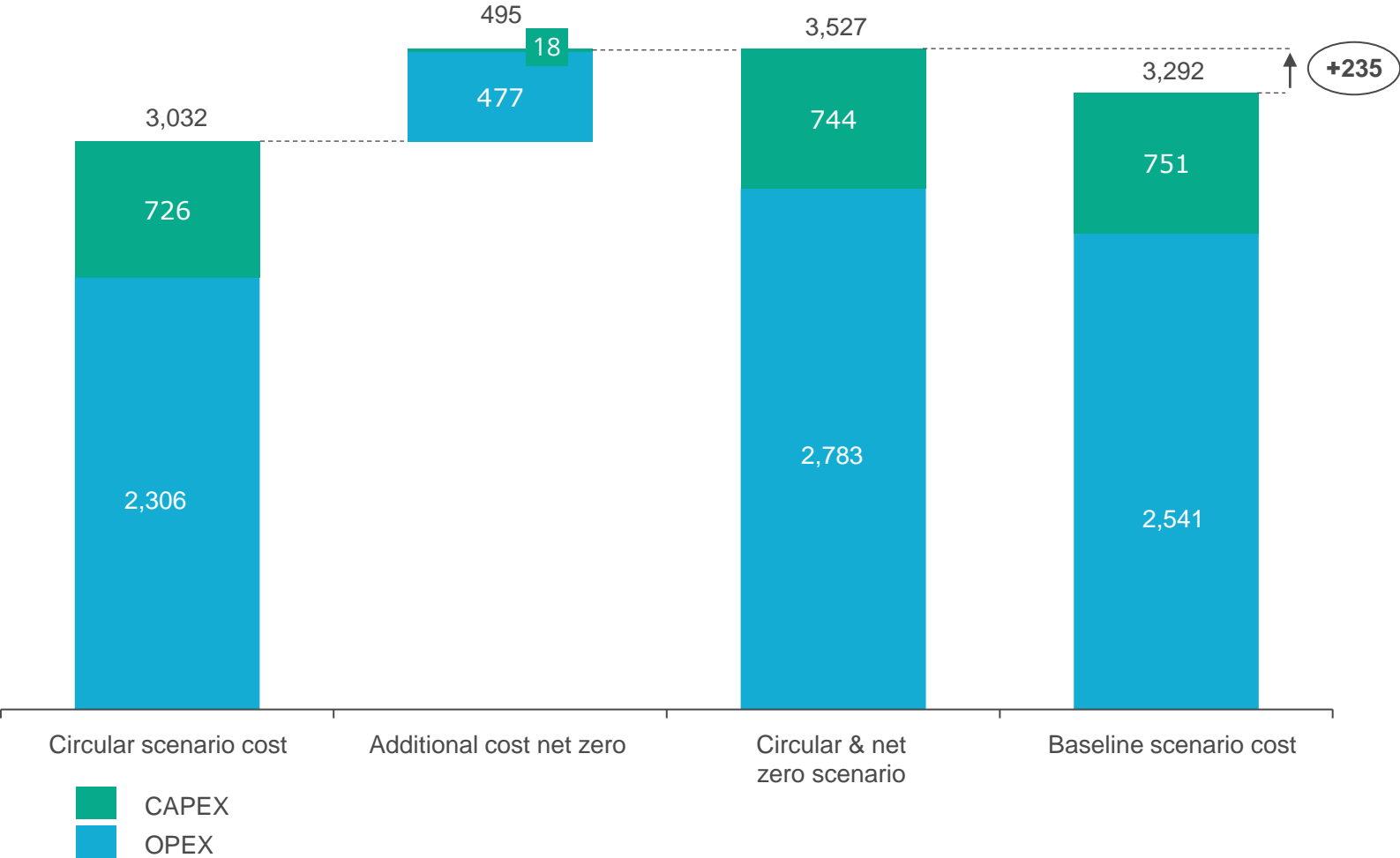
- The OPEX spread between fossil-based and mechanically recycled plastics is expected to increase, with a steady expected cost decline for mechanical recycling of 32% towards 2050
- The operational cost of chemical recycling and plastics made from biomass is expected to become **cost competitive with virgin fossil production by 2050**
- **Plastics from captured carbon are estimated to remain the most expensive technology** in 2050 (with an additional cost of 821 EUR/tonne compared to virgin fossil production)
- **Significant short- and medium-term investments are required to achieve this cost decline**, flagging the need for policy support in transforming the industry and infrastructure

<sup>1</sup>The experience curve states there is a consistent relationship between the cumulative production quantity and the cost of production

<sup>2</sup>Deloitte analysis based on Reshaping Plastics (2022), Includes monomer production, polymerisation and conversion

# Transitioning the plastics system requires an estimated additional system cost of €235 billion

**Additional CAPEX and OPEX of a circular and net-zero plastics scenario compared to baseline**  
In billion € (Deloitte analysis based on Reshaping Plastics, 2022)



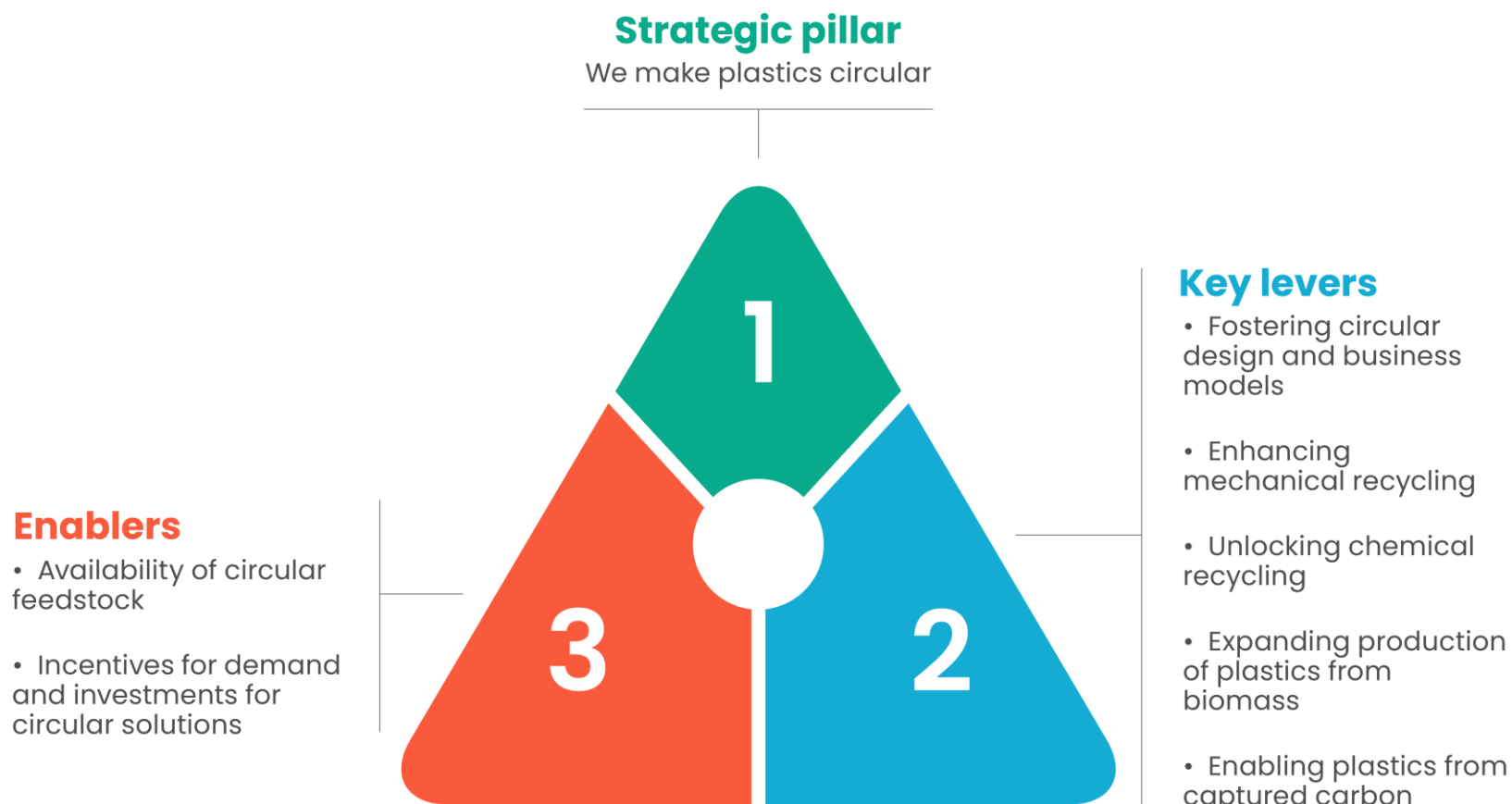
## Key takeaways

- The total cumulated system cost to reach 65% circularity and a net zero plastics lifecycle amounts to **€3.527 billion**
- This equals an additional system cost of €235 billion, **driven by higher operational costs from alternative production technologies**
- The CAPEX of a circular and net zero system roughly equals the one from the baseline scenario, highlighting **the need to repurpose investments towards circular and clean technologies**
- **The projected, additional average system cost-per-tonne of plastics is €290**, stressing the need to support European plastics producers to remain competitive in a global market while pursuing the net-zero vision.

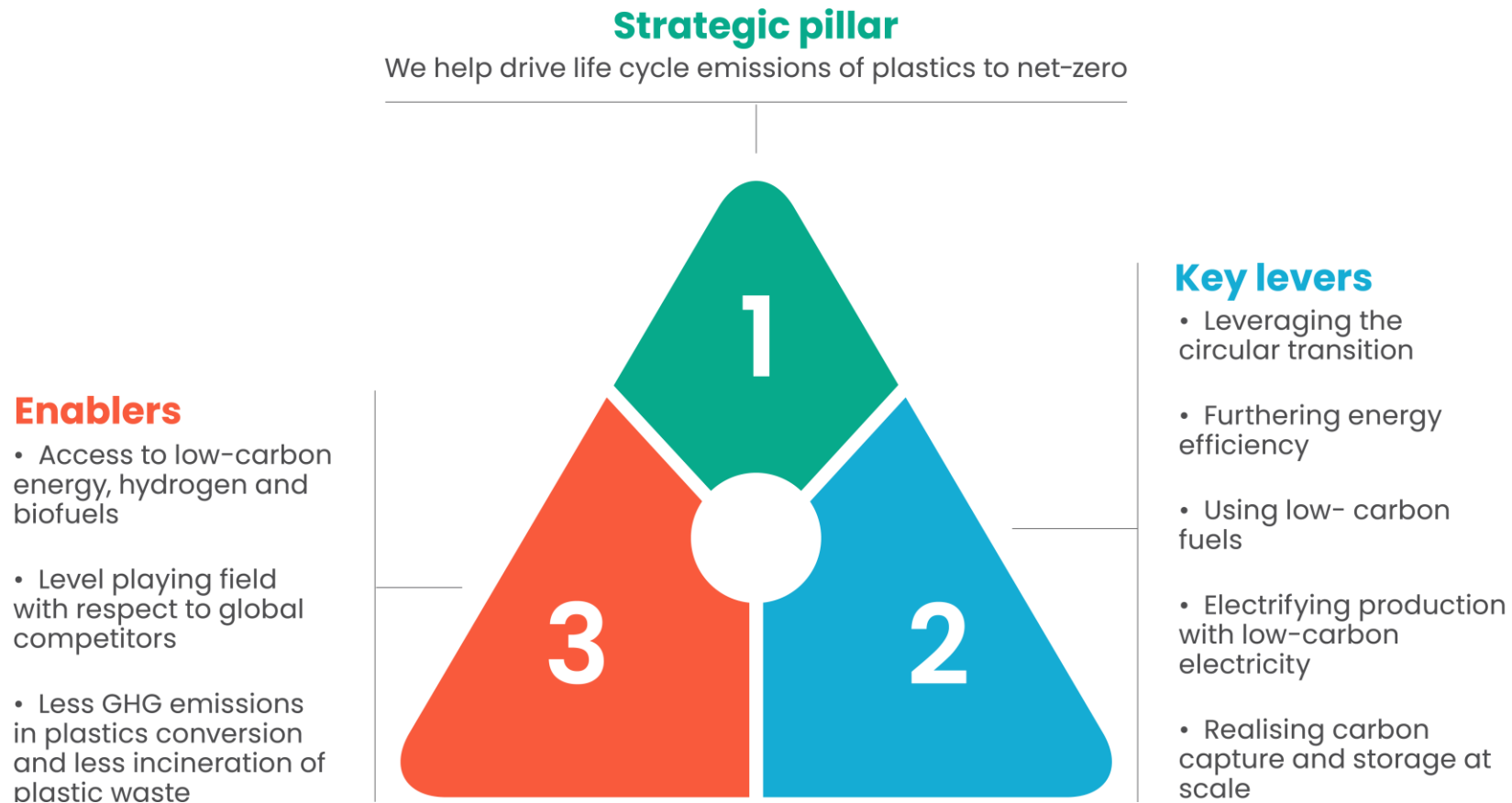
*<sup>1</sup>Includes the additional cost of alternative monomer production technologies (steam crackers powered by renewable fuels, electric crackers and steam crackers with CCS capacity installed) compared to steam cracker*



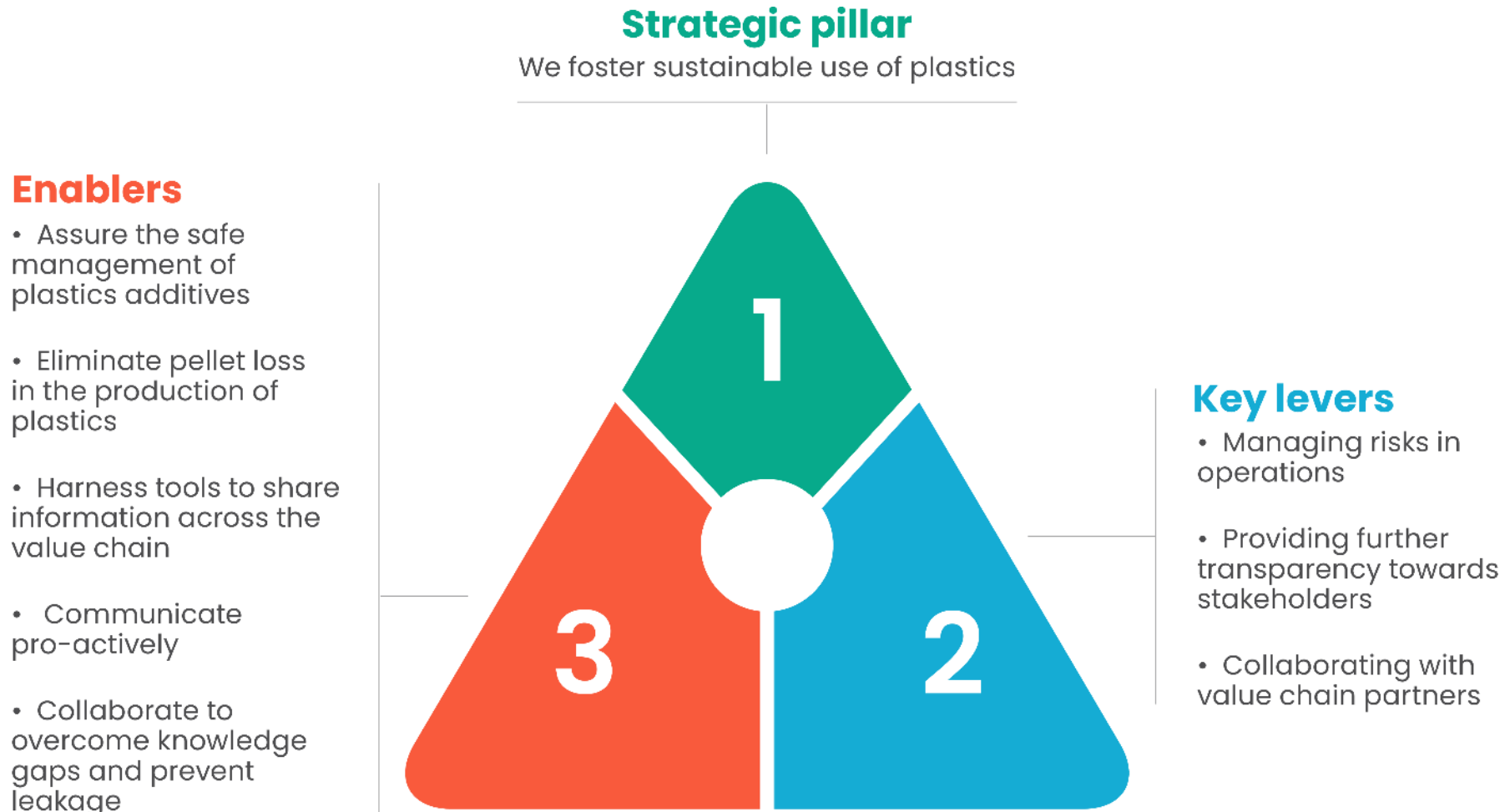
# The levers and enablers to achieve the circular pillar



# Levers for action by the industry and enabling conditions



# Sustainable use: Levers and enablers



# Industry action will be critical

IMMEDIATE 2023 – 2025	SHORT TERM 2026 – 2027	MEDIUM TERM 2028 – 2030
<ul style="list-style-type: none"><li>• Provide stakeholders with aggregated data and insights on the status and solutions to achieve the industry vision</li><li>• Partner with waste management organisations to secure circular feedstock and manage investment risks</li><li>• Invest in new technologies and collaborate to speed up technology development</li><li>• Prevent plastic leakage in the supply chain through compliancy with Operation Clean Sweep® (OCS), and encourage broader value chain adoption</li><li>• Determine minimum requirements for risk management systems for plastics additives</li><li>• Experiment with digital product passports and speed up the development of digital tools to share information in the value chain</li></ul>	<ul style="list-style-type: none"><li>• Bring plastics to the market that are functional and affordable but also easy to recycle or repurpose at the end of their life cycle</li><li>• Shift away from linear practices to circular ones, through new circular business models and technologies such as recycling, plastics from biomass and captured carbon</li><li>• Invest in joint infrastructure for hydrogen, renewable energy and carbon capture and storage (CCS)</li><li>• Lead by example and cooperate with stakeholders and value chain partners to overcome hurdles and knowledge gaps to address plastic leakage</li></ul>	<ul style="list-style-type: none"><li>• Utilise power purchase agreements to accelerate green electricity uptake</li><li>• Further the cooperation with suppliers of sustainably sourced biomass to scale up plastics from biomass</li><li>• Have chemical recycling operational at scale by investing in capacity and partnering with technology providers</li><li>• Maximise energy efficiency and use carbon capture and storage (CCS) to reduce GHG emissions</li><li>• Implement third-party verified risk management systems for plastics additives</li></ul>

## Key takeaways:

- **Partnerships to secure circular feedstock**
- **Explore new technology investments and collaborations**
- **Shift to more circular practices through recycling and better design**
- **Scaling up** chemical recycling, and plastics produced from biomass and carbon capture
- **Investing in capacity and partnering** with technology providers.
- **Maximise energy efficiency and use of carbon capture and storage (CCS)** to reduce GHG emissions.

# Essential steps to success

**URGENT action is needed.** The window of opportunity is rapidly closing.



We need a **harmonised and enforceable EU** policy and regulatory framework.



**“Clean Transition Dialogue”** for the Plastics Industry.



We need to work **more closely with policymakers.**

# Asks to policymakers

IMMEDIATE 2023 – 2025	SHORT TERM 2026 – 2027	MEDIUM TERM 2028 – 2030
<ul style="list-style-type: none"> <li>• Develop an EU equivalent to the US Inflation Reduction Act to make circular plastics production in Europe competitive</li> <li>• Have a material-agnostic view when addressing single-use applications</li> <li>• Codify the fuels-exempt mass balance approach for chemical recycling</li> <li>• Harmonise requirements for recycled content measurement and certification</li> <li>• Impose minimum circular content targets and enforce implementation also for imported plastics</li> <li>• Improve waste collection and sorting and incentivise investments in recycling infrastructure by Extended Producer Responsibility (EPR) and other instruments</li> <li>• Phase out landfilling and incineration of recyclable plastic waste by harnessing instruments such as EU ETS and disposal taxes</li> <li>• Simplify and speed up permitting processes for circular and net-zero infrastructure</li> <li>• Make OCS-like requirements and certification legally binding for all plastics pellets handling actors in the EU</li> </ul>	<ul style="list-style-type: none"> <li>• Promote and enforce design for recycling to improve quality of collected waste</li> <li>• Make shipping of recyclable waste easier within Europe and treat recyclable plastic waste as a secondary raw material destined for recycling, which should be covered by product legislation</li> <li>• Harmonise definitions and improve statistics for plastic waste management</li> <li>• Provide economic incentives to use sustainable biomass as feedstock for plastics and endorse the mass balance approach for bio-attributed plastics</li> <li>• Endorse trustworthy certification systems and standards for the sustainable sourcing of biomass feedstocks</li> <li>• Increase citizens' awareness and leverage public procurement for circularity to create a market pull for circular products</li> <li>• Step up the research for CCU</li> <li>• Include the industry in the impact assessment of the Carbon Border Adjustment Mechanism (CBAM)</li> <li>• Increase renewable energy capacity drastically</li> </ul>	<ul style="list-style-type: none"> <li>• Enhance the quality and quantity of collected biowaste suitable as feedstock for plastics</li> <li>• Provide funding for low-carbon hydrogen production and transportation infrastructure</li> <li>• Create incentives and a legal framework to valorise CO<sub>2</sub> emission savings via CCU</li> <li>• Secure long-term contracts for production of basic chemicals from captured CO<sub>2</sub></li> <li>• Make risk management systems for plastics systems obligatory for the whole plastics sector</li> <li>• Enable the free flow of electricity between EU countries and ensure competitive renewable electricity prices for industry</li> <li>• Reduce CO<sub>2</sub> emissions in plastics conversion</li> </ul>

## We need to:

- **Develop a waste management system fit for a net-zero and circular economy**
- **Develop minimum circular plastic content targets for key plastics applications**
- **Unlock industry investments**
- **Ensure the European plastics system can remain internationally competitive and viable during the transition**
- **A call for a “Clean Transition Dialogue” for the plastics industry.**

# Asks to the value chain

IMMEDIATE 2023 – 2025	SHORT TERM 2026 – 2027	MEDIUM TERM 2028 – 2030
<ul style="list-style-type: none"> <li>• Develop an EU equivalent to the US Inflation Reduction Act to make circular plastics production in Europe competitive</li> <li>• Have a material-agnostic view when addressing single-use applications</li> <li>• Codify the fuels-exempt mass balance approach for chemical recycling</li> <li>• Harmonise requirements for recycled content measurement and certification</li> <li>• Impose minimum circular content targets and enforce implementation also for imported plastics</li> <li>• Improve waste collection and sorting and incentivise investments in recycling infrastructure by Extended Producer Responsibility (EPR) and other instruments</li> <li>• Phase out landfilling and incineration of recyclable plastic waste by harnessing instruments such as EU ETS and disposal taxes</li> <li>• Simplify and speed up permitting processes for circular and net-zero infrastructure</li> <li>• Make OCS-like requirements and certification legally binding for all plastics pellets handling actors in the EU</li> </ul>	<ul style="list-style-type: none"> <li>• Promote and enforce design for recycling to improve quality of collected waste</li> <li>• Make shipping of recyclable waste easier within Europe and treat recyclable plastic waste as a secondary raw material destined for recycling, which should be covered by product legislation</li> <li>• Harmonise definitions and improve statistics for plastic waste management</li> <li>• Provide economic incentives to use sustainable biomass as feedstock for plastics and endorse the mass balance approach for bio-attributed plastics</li> <li>• Endorse trustworthy certification systems and standards for the sustainable sourcing of biomass feedstocks</li> <li>• Increase citizens' awareness and leverage public procurement for circularity to create a market pull for circular products</li> <li>• Step up the research for CCU</li> <li>• Include the industry in the impact assessment of the Carbon Border Adjustment Mechanism (CBAM)</li> <li>• Increase renewable energy capacity drastically</li> </ul>	<ul style="list-style-type: none"> <li>• Enhance the quality and quantity of collected biowaste suitable as feedstock for plastics</li> <li>• Provide funding for low-carbon hydrogen production and transportation infrastructure</li> <li>• Create incentives and a legal framework to valorise CO<sub>2</sub> emission savings via CCU</li> <li>• Secure long-term contracts for production of basic chemicals from captured CO<sub>2</sub></li> <li>• Make risk management systems for plastics systems obligatory for the whole plastics sector</li> <li>• Enable the free flow of electricity between EU countries and ensure competitive renewable electricity prices for industry</li> <li>• Reduce CO<sub>2</sub> emissions in plastics conversion</li> </ul>

## We need:

- **Build on existing initiatives with our value chain partners, e.g., OCS.**
- **Use it as a tool to explore and establish shared positions and partnership opportunities.**
- **Use it to secure the support of over 50,000 companies and 1.5 million people in Europe who make up the rest of the European plastics system.**
- **Ensure that it is seen by value chain as an action plan towards policy makers to supporting their needs.**
- **Used by members as a tool to engage with their customers to secure long-term contracts.**

# Overarching key statistical takeaways



**65%** or 42 Mt of total plastics used by converters will be made from circular feedstocks by 2050.



**43%** of the total plastics used by converters **will be recycled plastics**, with **mechanical (24%) and chemical recycling (19%) massively scaling up**.



**Plastics from biomass will double every decade, reaching 18%** of plastics used by converters in 2050.



**55%** Estimated GHG emissions reductions (129 Mt CO<sub>2</sub>e) **through the shift to circular feedstock and avoided incineration** by 2050.



It will require commitment from all stakeholders to meet the additional investment of **€235 billion additional system cost** (CAPEX + OPEX) compared to business as usual.



# Overarching aspirational key takeaways



The roadmap is our **North Star**, uniting all our members for the first time **behind a common vision**.



This roadmap is not just for our industry, but a **guide to design and inform our transition as a whole plastics system**.



The transformation of a complex and interconnected plastics system is very ambitious but achievable - **Upstream and downstream solutions are complementary and are most effective when deployed together**.



We will be **reporting back on our progress every two years**.



We will **urgently need to enabling policy and regulatory framework** to ensure success and **safeguard our European competitiveness**.