McKinsey & Company

Cross industry opportunities in the circular economy

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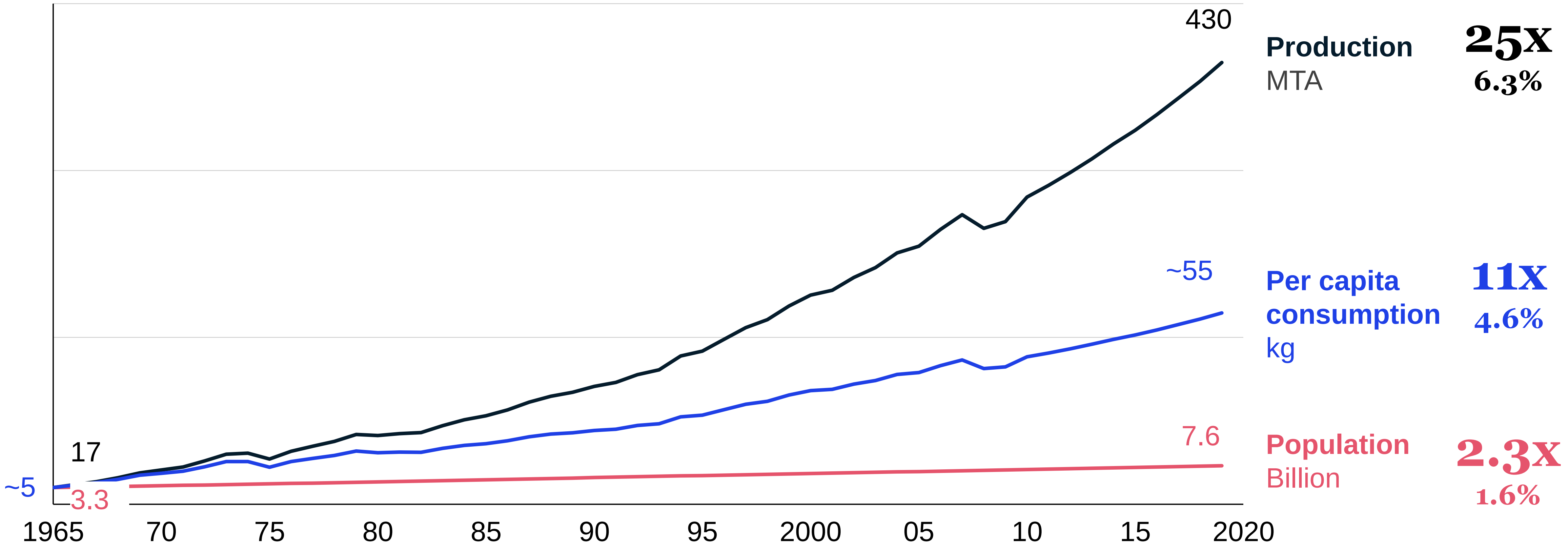
Circular Living Symposium 2020

Long-term plastics growth has been extraordinary in particular driven by its ability to serve a growing number of applications

INDEXED TO 1965

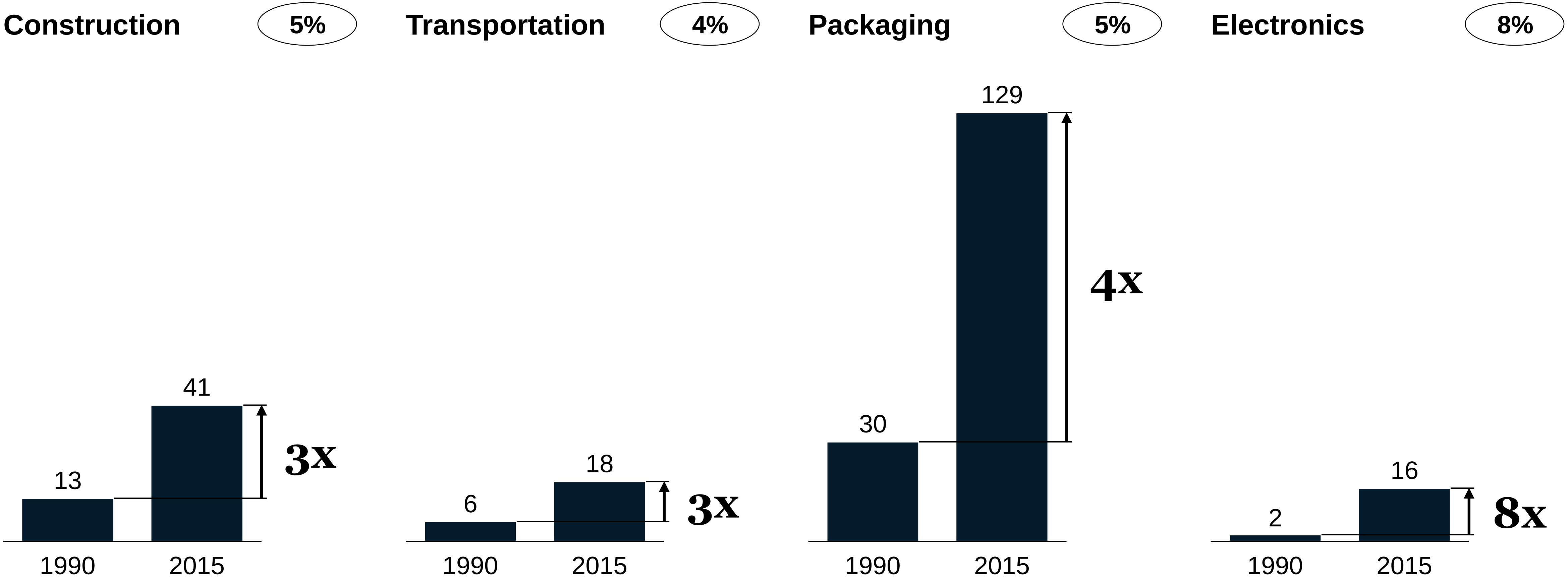


Source: Geyer et al 2017, Worldometers, Plastics Europe, McKinsey analysis

Plastics have consistently outperformed and substituted other materials across a range of industries and applications

xx% CAGR

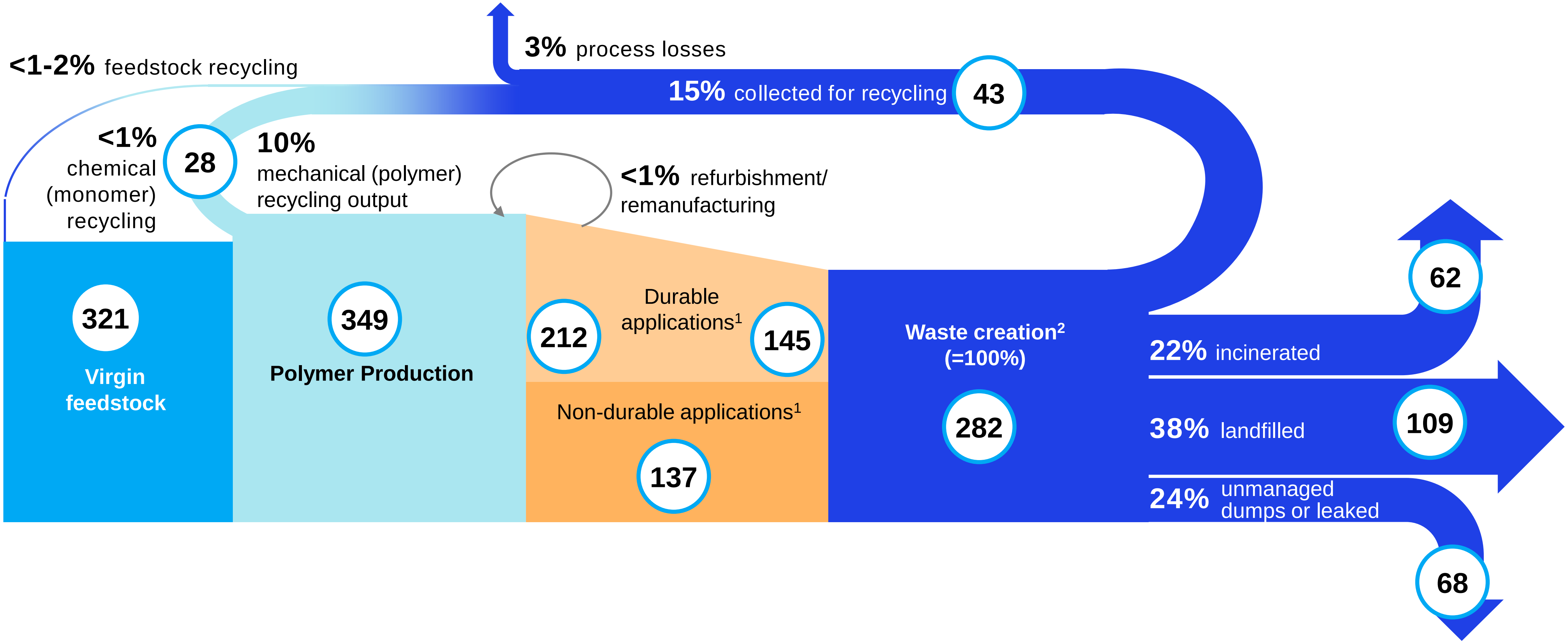
Plastic consumption per industry, MTA, CAGR



Source: McKinsey analysis

Plastic recycling has not kept up with the growth in demand: global recycling rate 10-15%

Global polymer flows 2018, MTA

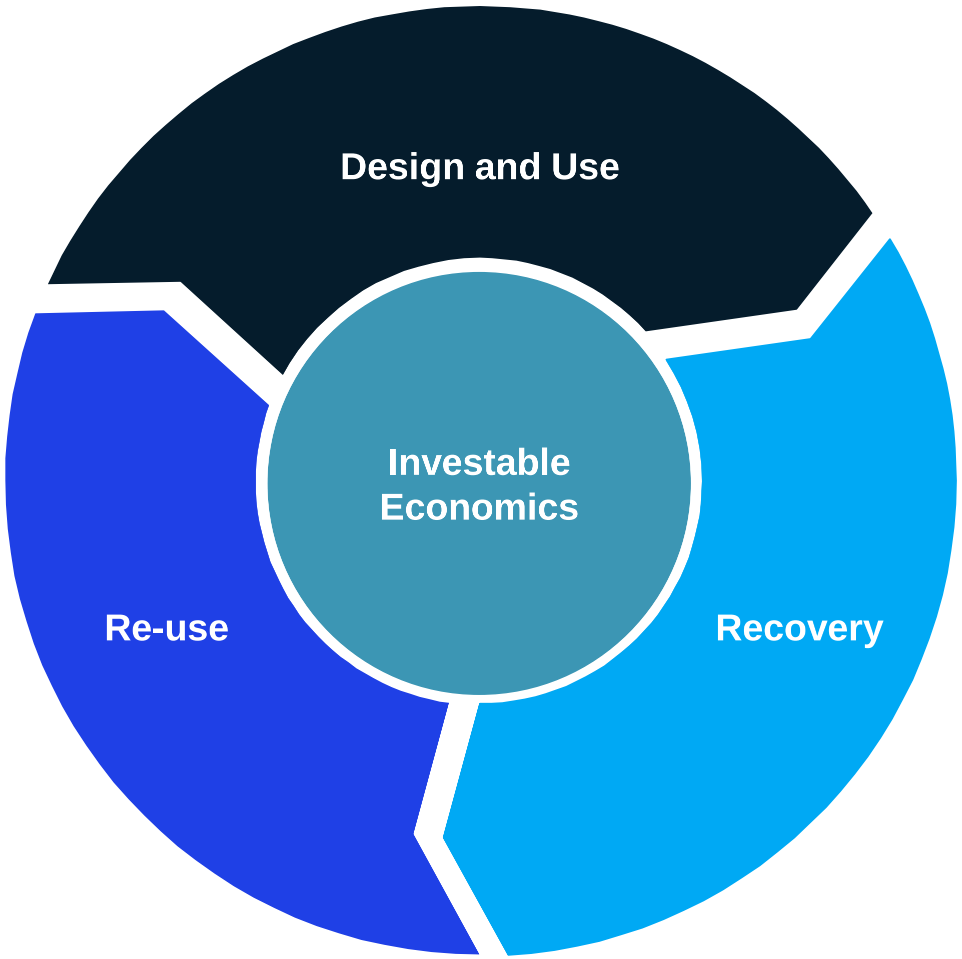


1. Durable applications with an average lifetime >1year will end up as waste only in later years, non-durable applications go straight to waste
2. 150 MT mixed plastic waste from nondurable applications that end up as waste in same year plus 110 MT of mixed plastic waste from production in previous years

Source: McKinsey plastic waste stream model – update June 2020

Correction is possible and requires collaborative and coordinated action at scale

CIRCULAR VALUE CHAIN



Design and use

- Lead the discussion on optimization of plastic applications – simplification, substitution, re-use/reduce
- Engage end-users in playing their role in closing the loop

Recovery (Waste collection and sorting)

- Deeply understand the options to access and afford high quality waste (feedstocks)
- Team-up with waste management companies and closed loop options

Reuse (Recycling)

- Co-develop and mature recycling technologies, especially those with strong fit to existing portfolio
- Invest selectively in high value recycling opportunities – looking for integration with feedstock players and existing O2C assets and products

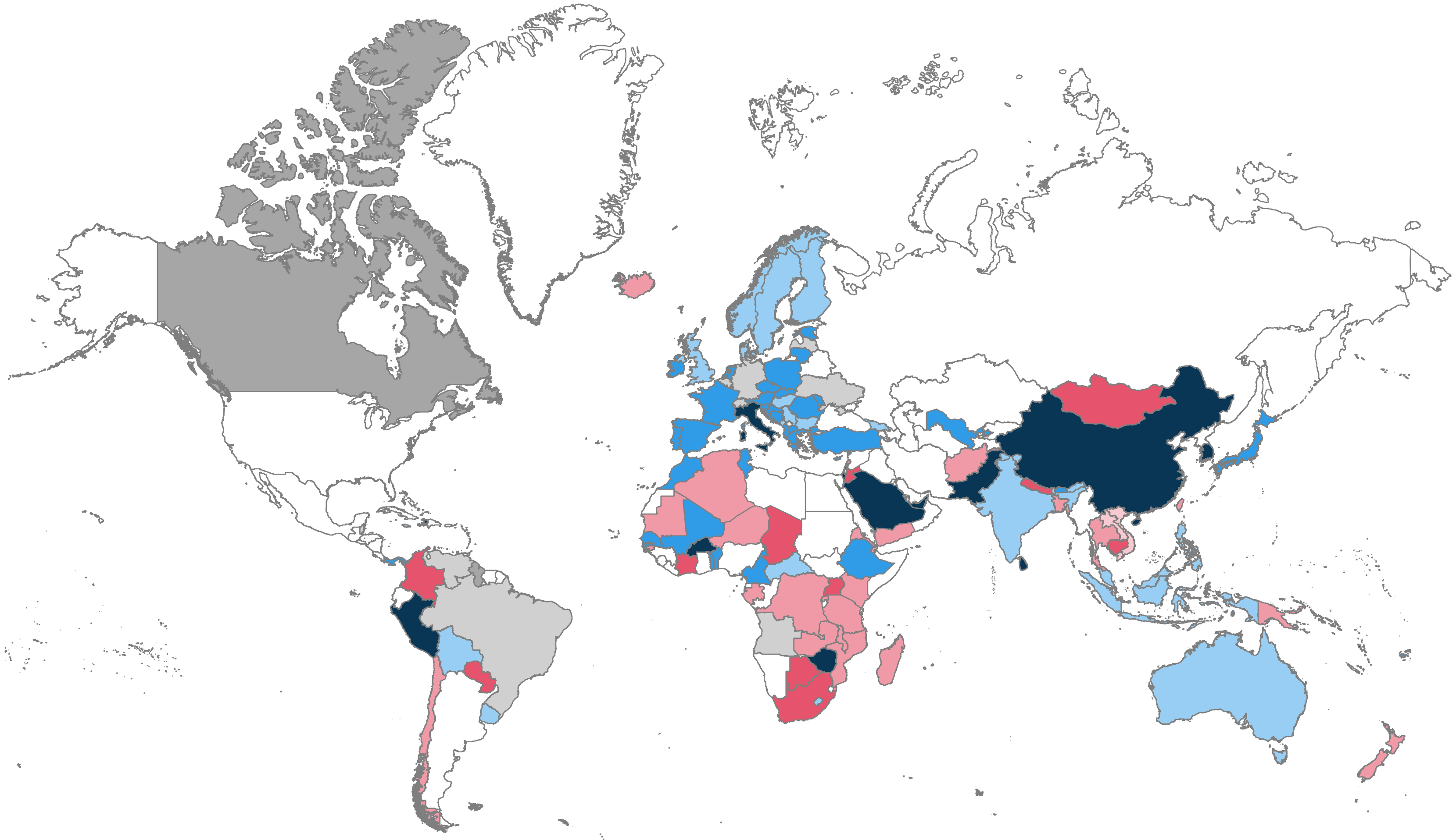
End to End Economics

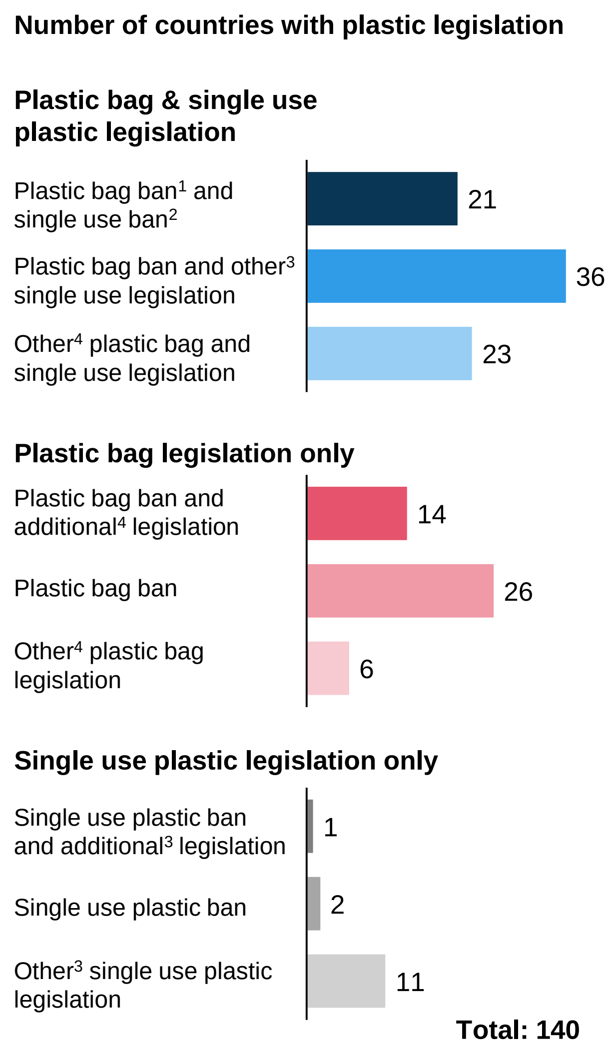
- Understand how regulations and incentives will affect economics – and look for opportunities to leverage these
- Attract infrastructure like and impact investors to co-fund the transition to a circular economy

SOURCE: McKinsey

Majority of countries implemented plastic bag or single use plastic legislation to help address end of life challenges

NOT EXHAUSTIVE





1 plastic bag bans include bans on retail distribution (with and without levy), manufacturing, import and various combinations thereof
2 Single use plastic ban include bans on free distribution (with and without levy), manufacturing, import and various combinations thereof
3 other/additional single use plastic legislation includes taxes, EPR schemes and recycling mandates (requirements, targets or financial incentives)
4 other/additional plastic bag legislation includes taxes, levies (charges to consumers), EPR schemes and recycling mandates

Source: UNEP Legal limits on single-use plastics and microplastics (2018), UNEP Single-Use Plastics: A Roadmap for Sustainability (2018), web search, McKinsey analysis

A majority of brand owners are committing to establishing circular value chain

Pledges set by brand owners, 2025 timeline[4]

Quantitative pledges[2] | Non-quantitative pledges

Main focus areas	Frequency in pledges[1]: Quantitative pledges[2]	Frequency in pledges[1]: Non-quantitative pledges	Frequency in pledges[1]: Total	Typical target[3, 5, 6]
Reducing material	10%	40%	50%	~30%
Recyclability of material	28%	30%	58%	~100%
Increasing recycled content	28%	25%	52%	~50%
Increasing bio or organic waste based content	8%	17%	25%	~80%

1. By 145 segment leaders/252 companies overall across 14 consumer segments
2. Commitments associated with a defined numerical target and timeline
3. Mean quantitative target of quantitative pledge across broad sample
4. Vast majority of targets are committed for 2025 (esp signatories of the EMF NPEC pledge), some already realized today or in the past, few further out than 2025
5. Determining typical reduction targets is complicated by the fact that many companies provide absolute volumes, different base years or seek to eliminate specific applications and/or resins
6. Mean for recycled and renewable content slightly inflated, as pledges for 100% recycled or renewable content were counted as 100% for each

Source: Online research, Expert interviews, McKinsey research

Petrochemical players are setting targets, building partnerships and accelerating investment to enable re-use at scale

Example players – not exhaustive

	Targets & commitments	Investments & ventures
lyondellbasell	MTA recycled/renewable-based polymers by 2030 Increase investment to end plastic waste	Quality Circular Polymers – JV with SUEZ Developing pyrolysis technology, MoReTec
BOREALIS Keep Discovering	Optimize renewable feedstock for PO Explore chemical recycling Target 350 kta (EMF pledge)	Acquisitions of recyclers e.g. MTM Plastics, and Ecoplast With OMV, chemical recycling facility
aramco سابك sabic	Process 200 KTA plastic waste by 2025	Semi-commercial plant to refine pyrolysis oil, online 2021 Off-take agreements: Plastic Energy – pyrolysis oil, Various – renewable naphtha
INDORAMA VENTURES	Ellen Macarthur Plastic Pledge – 750kt PET recycled	Bottle recycling capacity in Mexico, Thailand; bought US recycler Many alliances (EMF, APR, Plastics Recyclers Europe)
INEOS	Signatory to Plastics 2030 - 60% of all plastic packaging recyclable/re-useable by 2030 with the goal of 100% by 2040	Advanced Recycling with Agilyx
GC	High-quality circular rPET and rHDPE plastic resin by 2020 with commercial production in 2021	**Circular Living Symposium** Inspire creativity in increasing value to resources as well as promoting the circular economy concept in daily life to the public.

Source: Company press clippings

A few closing thoughts: core questions and considerations

Drive innovation in materials, applications, recycling technologies and packaging concepts

Make the recycling sector investable – de-risk investments and improve market liquidity

Move towards **international** regulatory frameworks and incentives

Engage, educate and enlist **full stakeholder landscape** towards high impact solutions