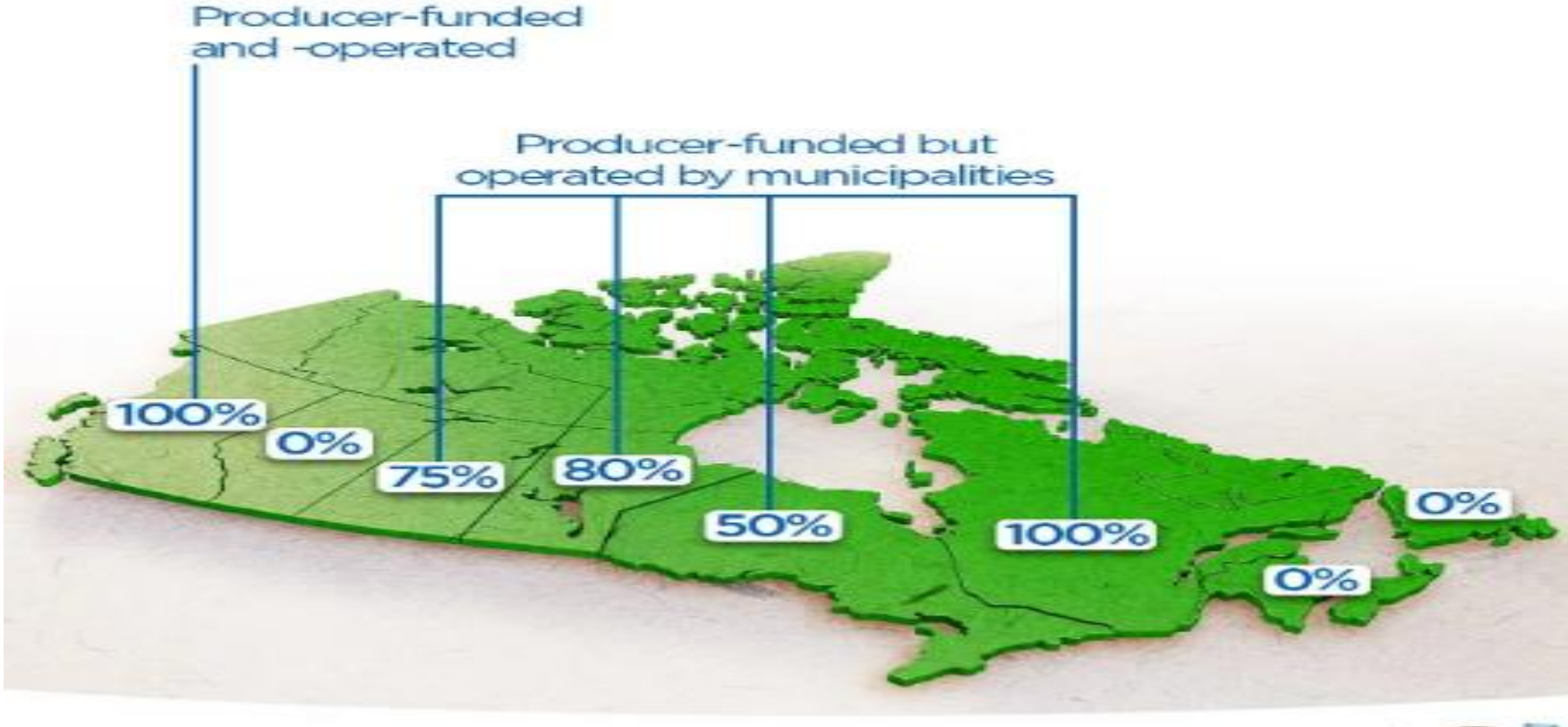
Technologies Innovantes et Meilleures Pratiques pour le recyclage

Extended Producer Responsibility:

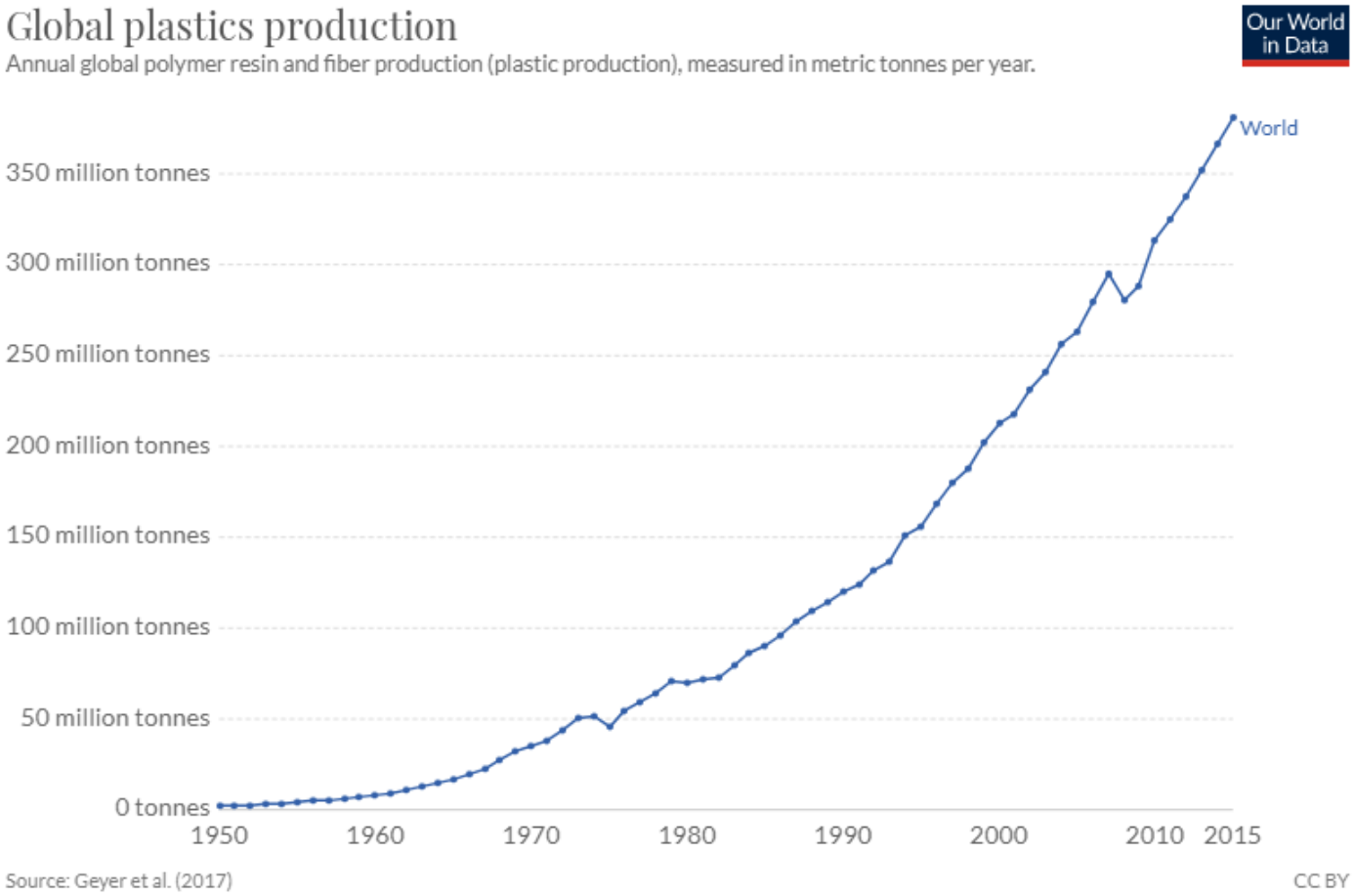
When Producers Pay for Recycling

Who's doing it in Canada?

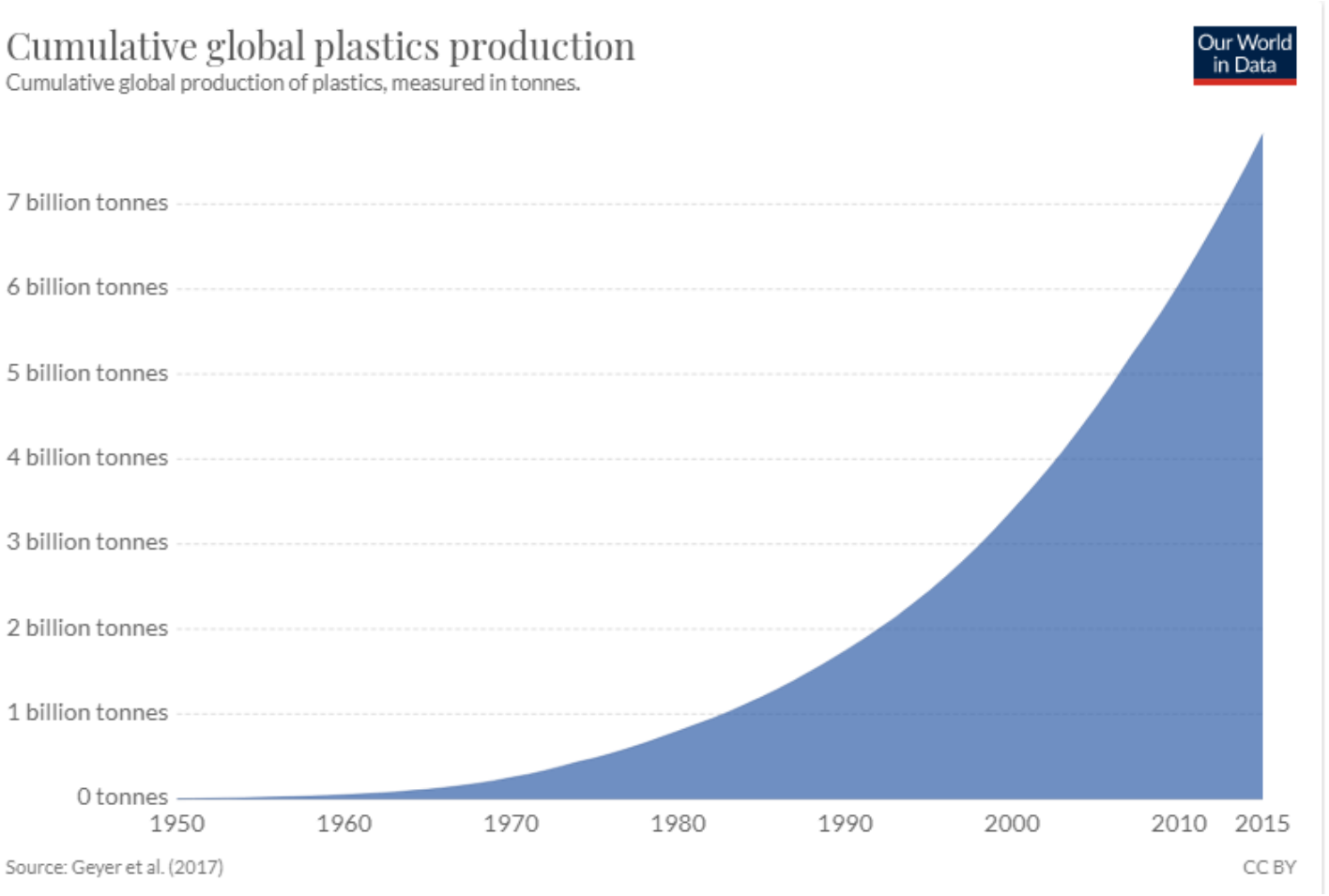


*applies to residential packaging and printed paper recycling

Annual Global Plastics Production



Cumulative Global Plastics Poduction



1 PET		Water and soft drink bottles, salad domes, biscuit trays, salad dressing and peanut butter containers
2 HDPE		Milk bottles, freezer bags, dip tubs, crinkly shopping bags, ice cream containers, juice bottles, shampoo, chemical and detergent bottles
3 PVC		Cosmetic containers, commercial cling wrap
4 LDPE		Squeeze bottles, cling wrap, shrink wrap, rubbish bags
5 PP		Microwave dishes, ice cream tubs, potato chip bags, and dip tubs
6 PS		CD cases, water station cups, plastic cutlery, imitation "crystal glassware", video cases
6 EPS		Foamed polystyrene hot drink cups, hamburger take-away clamshells, foamed meat trays, protective packaging for fragile items
7 OTHERS		Water cooler bottles, flexible films, multi-material packaging

Source: http://green.pidc.org.tw/upload/news/WEF_The_New_Plastics_Economy.pdf

Efficient Bottle Collection in Norway

Norway's Insanely Efficient Scheme ...
sciencealert.com

Radical Approach To Plastic Pollution ...
huffpost.com

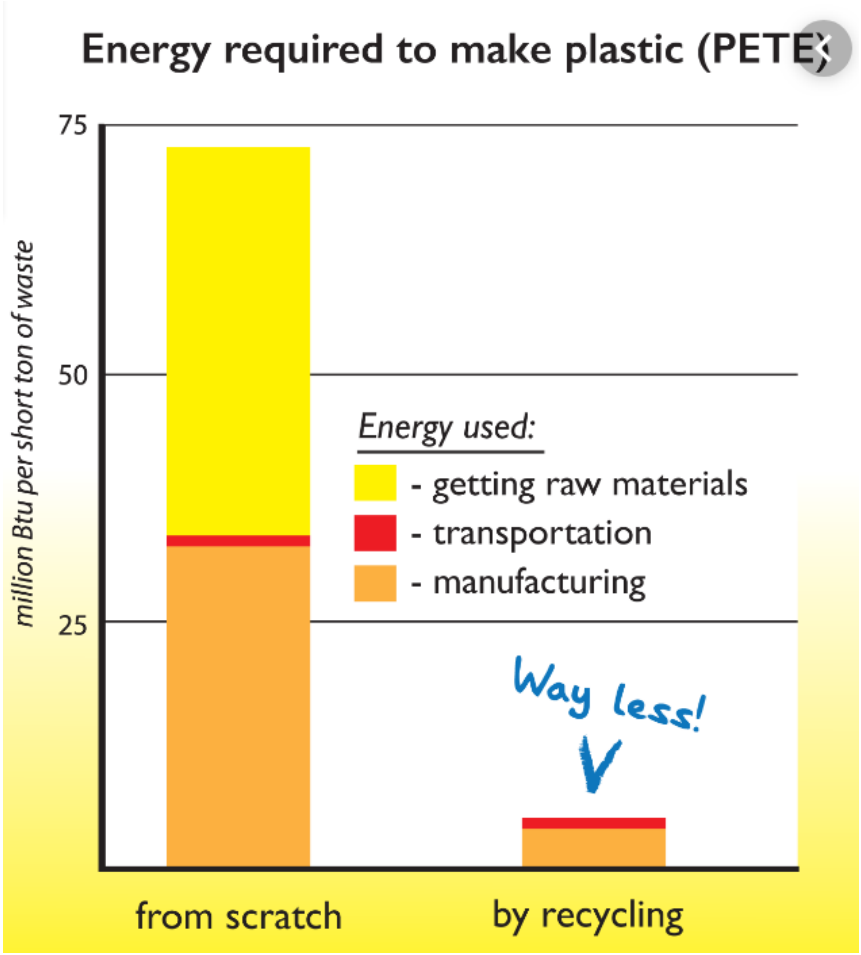
Norway recycles 97% of its plastic ...

Can Norway help us solve the plastic ...

Norway Recycling Plant Fully Automated No manual sorting 40 tons/day 2500 tons PET, PE, PP per year

Everhart says people touring the $234 million facility always notice two things: the smell of the plant and how clean the fiber looks after sorting.

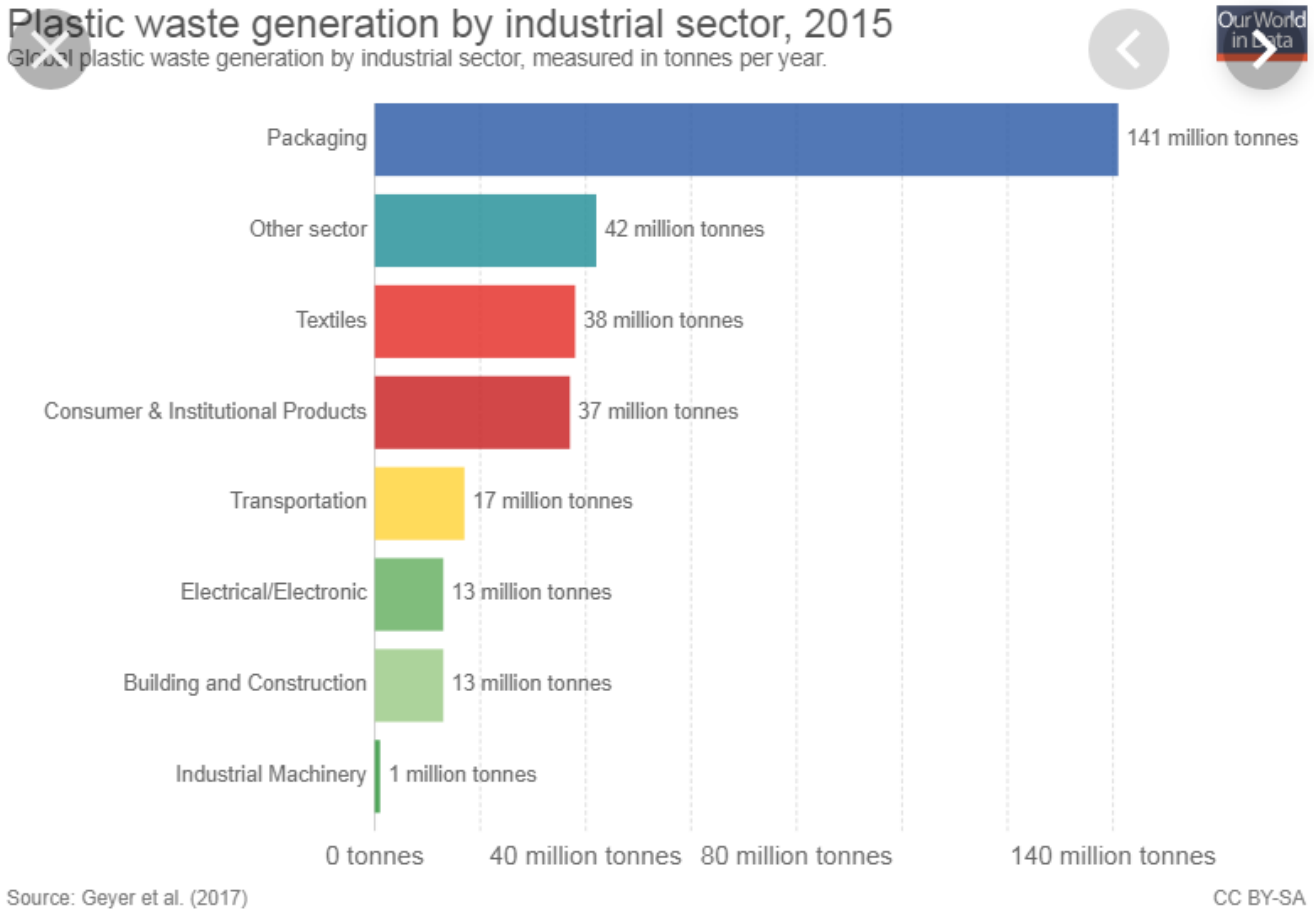
Energy Savings



HDPE Furniture

Synthetic Resin & Plastics

Sources of Plastic Waste



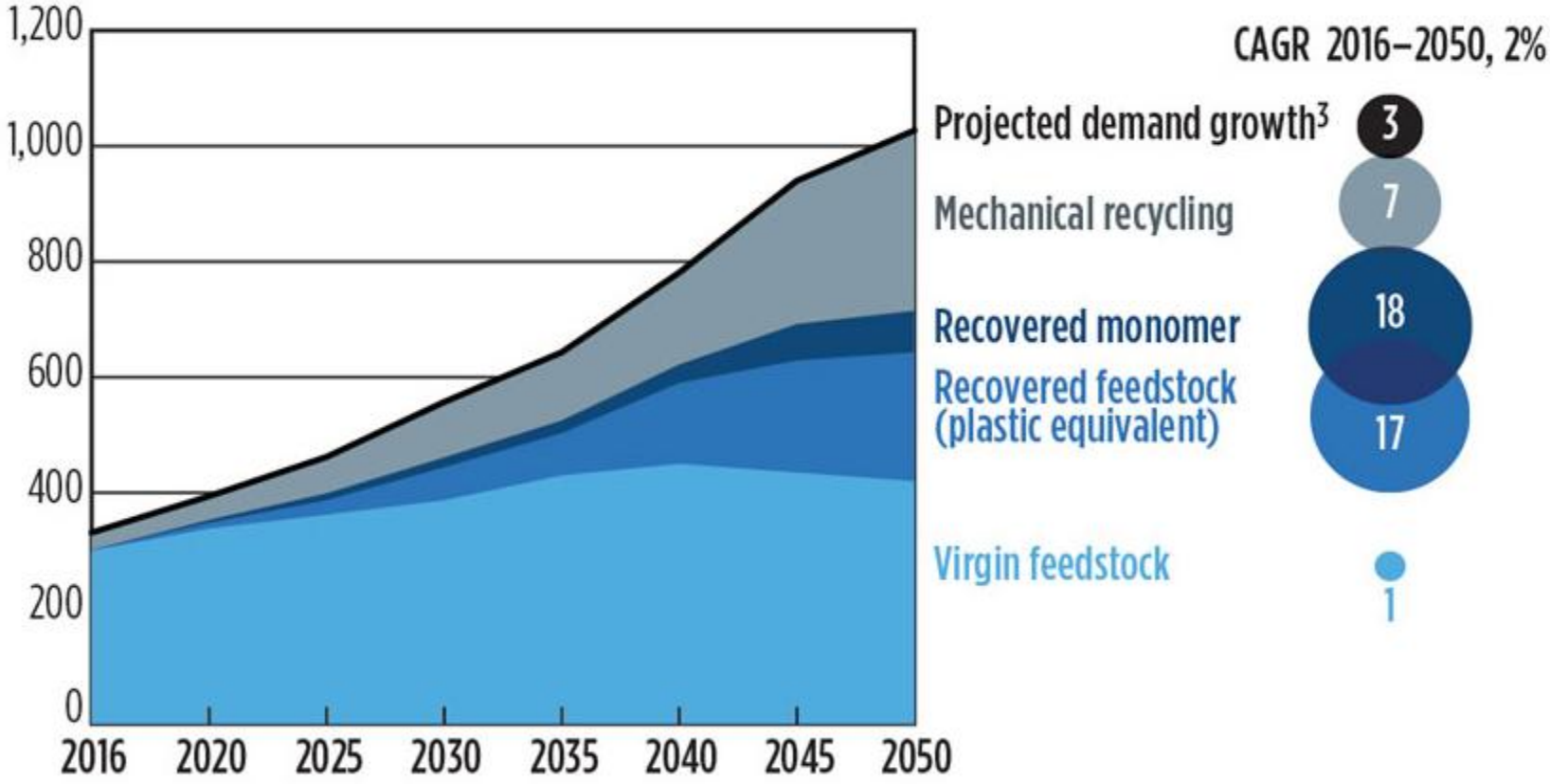
	Original packaging	New packaging	Result
 Bananas	Sold loose	Perforated polyethylene bags	Lasted 15 days unpackaged versus 36 days in bags
 Beef	Polystyrene foam tray with cling wrap	Vacuum packing in oxygen barrier film	Shelf life extended from four days to up to 30 days
 Bell peppers	Sold loose	Modified atmosphere packaging with perforated polypropylene film	Lasted four days sold loose versus 20 days in packaging
 Bread	Paper bag	Biaxially oriented polypropylene film	Food waste reduced from 11.0% to 0.8%
 Cheese	Sliced at counter and wrapped in paper	Polyester tray with a polyethylene and polyester lid	Food waste reduced from 5.00% to 0.14%
 Cucumbers	Sold loose	Polyethylene shrink wrap	Shelf life extended from three days to 14 days
 Grapes	Sold loose	Perforated bags	Bagging leads to a 20% reduction in in-store waste

Reduce plastic packaging

More and more of the food available in the store comes in high-tech plastic packaging such as multilayer films.

Credit: Yang H. Ku/ C&EN

Global polymer demand 2016–2050 and how it could be covered, MMtpy[1]



[1] Scenario based on a multi-stakeholder push to boost recycling, regulatory measures to encourage recycling, consistent progress on technologies, and $75/bbl oil price.

[2] Compound annual growth rate. Mechanical recycling limited by downcycling and applicable materials, monomerization limited by applicability to condensation polymers only, pyrolysis limited by likely rise in input costs.

[3] After demand reduction, assuming annual global GDP growth of 3.1%.

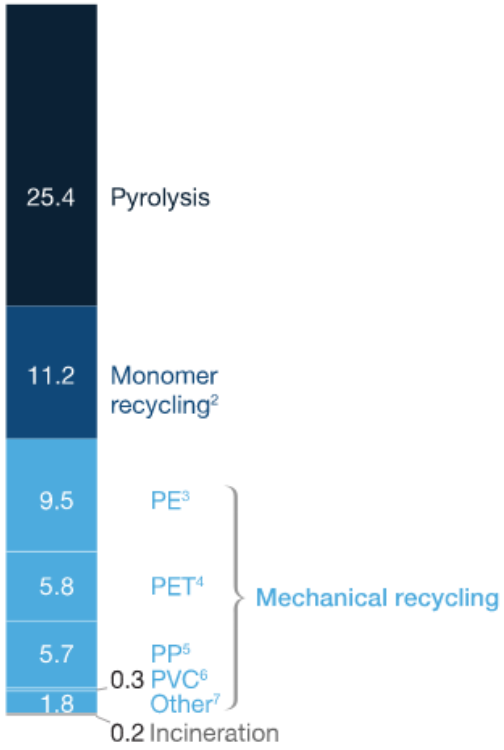
Styrofoam Recycling in Anjou

"We have developed a new chemical process that's very efficient," says Solenne Brouard Gaillot, the founder and CEO of Polystyvert.

Profit from Chemical Recycling

From a technology perspective, pyrolysis and mechanical recycling would generate the biggest profit-pool growth.

Growth in profit pool, $ billion, 2016 to 2030[1]



Pyrolysis for Low Sulfur Diesel

- **Profit from Innovative Recycling**
- **Brightmark Energy closes $260M financing for Indiana plastics-to-fuel facility**
-
- April 2019
- Brightmark Energy recently closed a $260 million financing package to construct a commercial-scale plastics-to-fuel plant in Ashley, Indiana. The deal includes $185 million in state bonds, which were underwritten by Goldman Sachs, and makes Brightmark the controlling owner of RES Polyflow.
- The RES Polyflow technology is designed to process mixed plastics — including single-use, difficult-to-recycle items such as film, flexible packaging, expanded polystyrene foam and children's toys.
- The facility is expected to process 100,000 tons of plastic annually into 18 million gallons of ultra-low sulfur diesel and naptha blend stocks, as well as nearly 6 million gallons of commercial-grade wax. The project will create 136 full-time jobs once the facility is fully operational.

Recommandations

- 1.. Facturer aux clients un dépôt pour les bouteilles d'eau en PET avec de nombreux points de retour (les kiosques, les épiceries installent un système de retour pour augmenter le pourcentage de retour)
- 2. Acheter du matériel pour recycler les plastiques (mécanique, chimique et pyrolyse.
- 3. Installer l'équipment de tri automatique
- 4. Les producteurs devraient payer pour le recyclage. Maintenant, ils subventionnent la collecte et le tri.
- 5. Le plastique à usage unique doit être interdit
- 6. Les exportations de déchets devraient être éliminées progressivement et étroitement surveillées jusqu'à ce qu'elles le soient.
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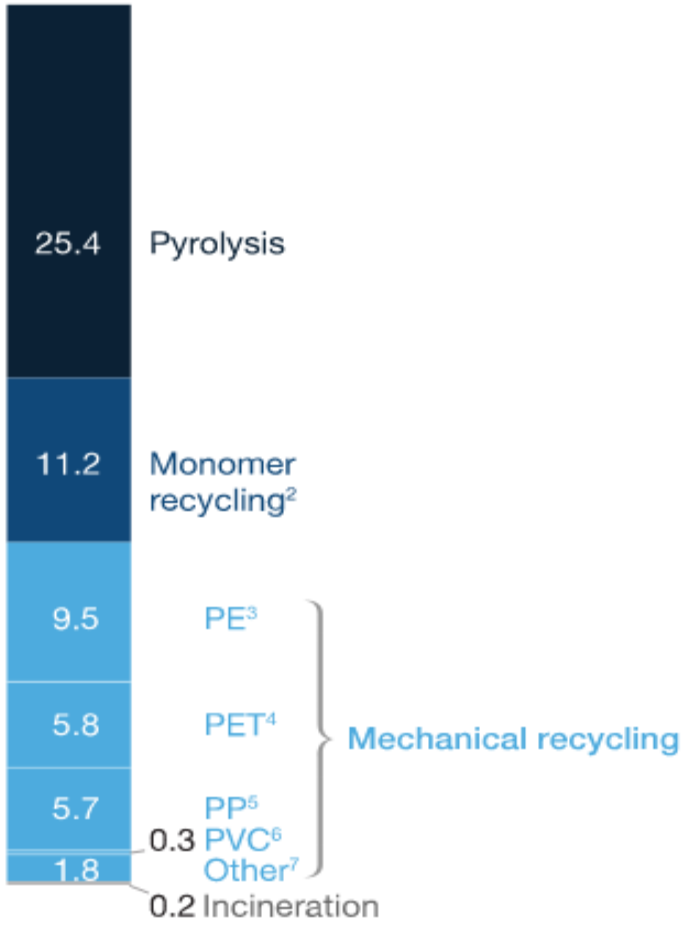
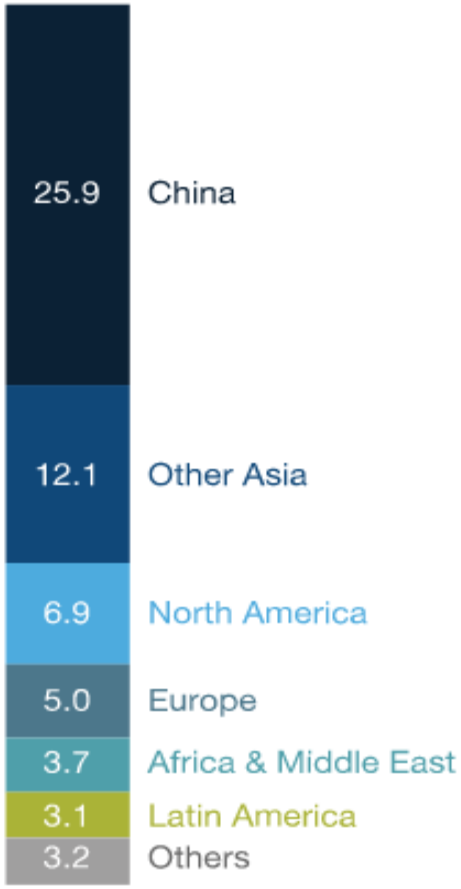
From a technology perspective, pyrolysis and mechanical recycling would generate the biggest profit-pool growth.

Growth in profit pool, $ billion, 2016 to 2030[1]

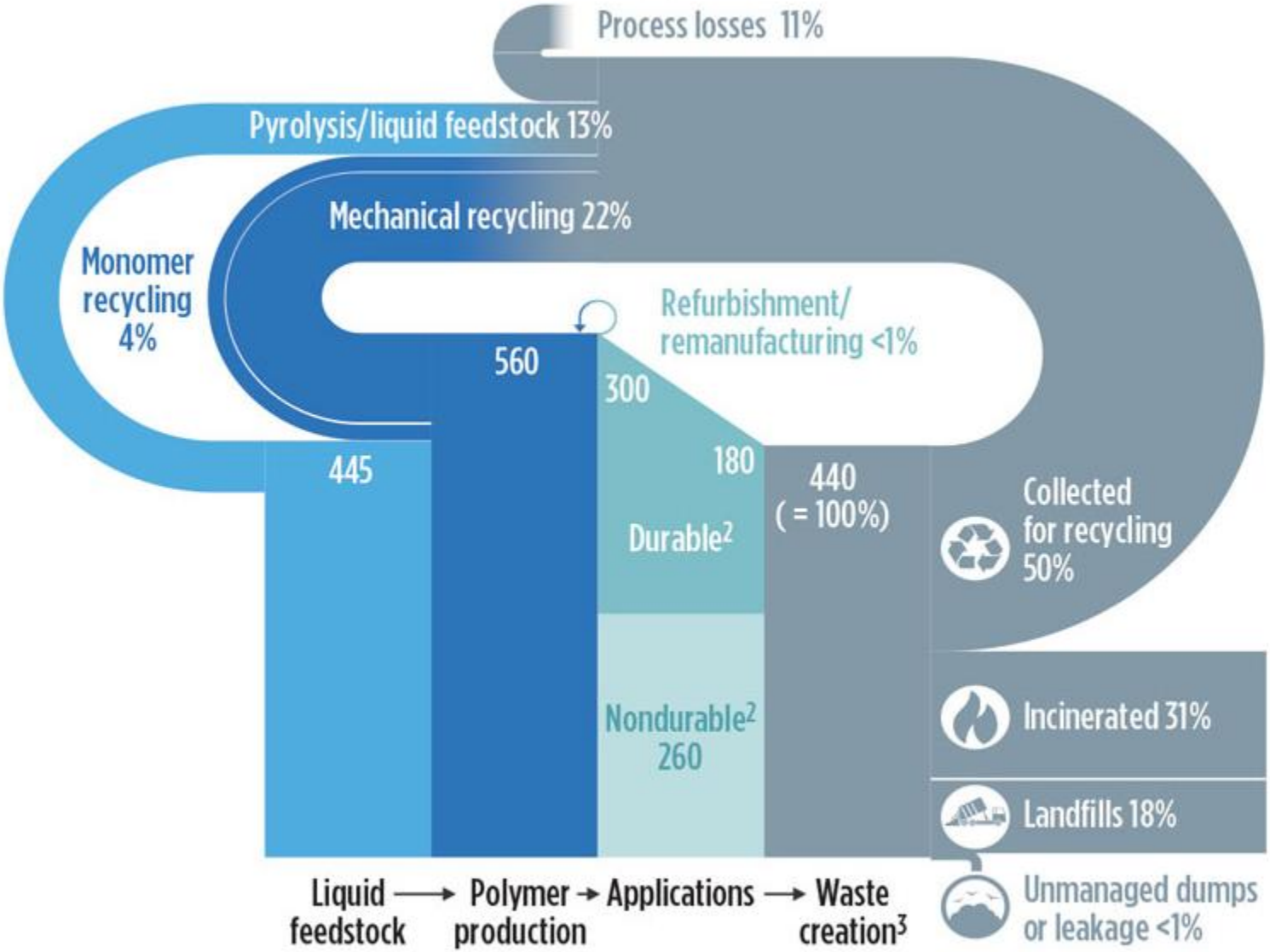


From a geographical perspective, Asia—with China in the lead—would generate the biggest profit-pool growth.

Growth in profit pool, $ billion, 2016 to 2030[1]



Global waste polymer flows in 2030, MMtpy[1]



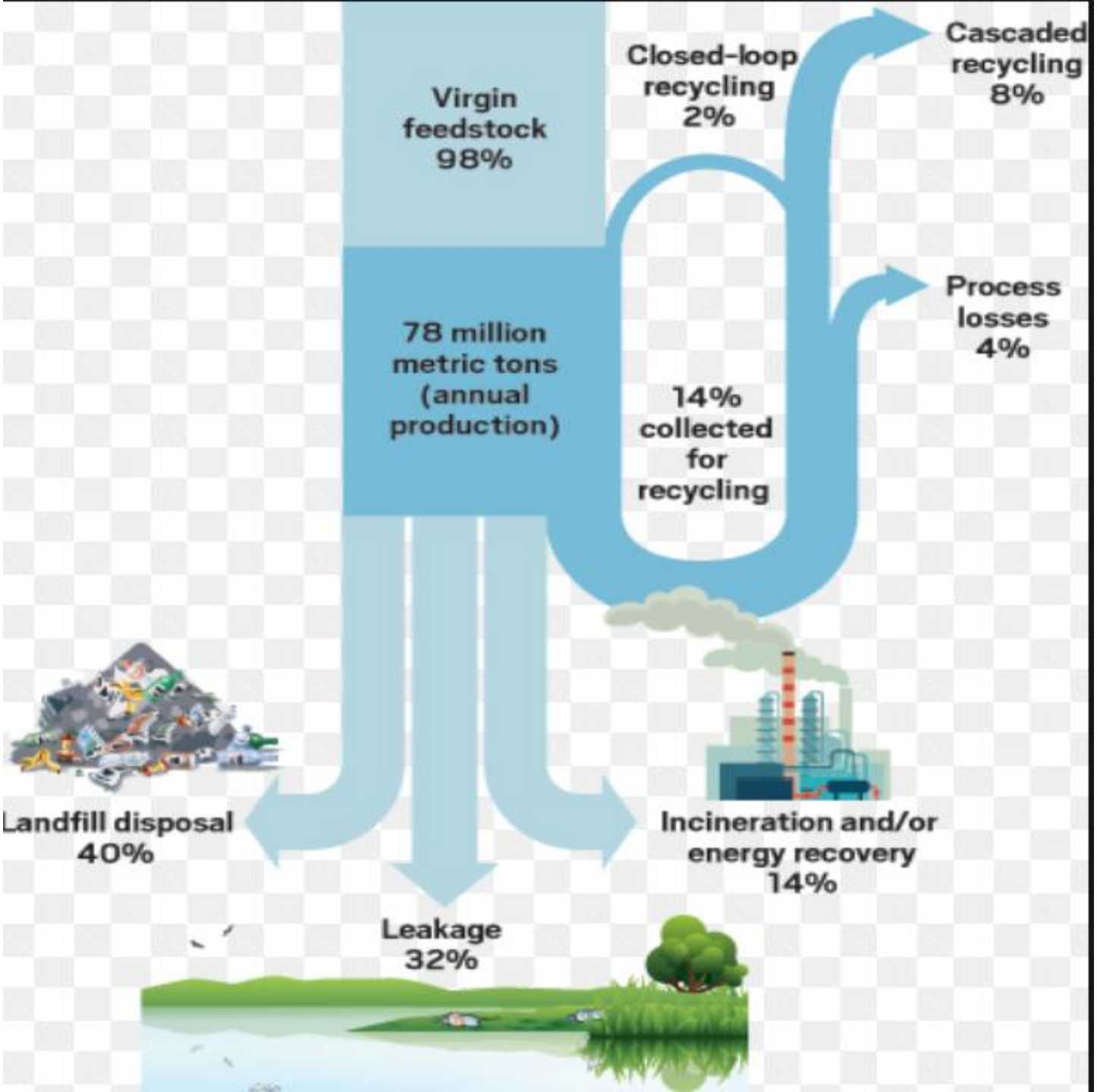
[1] Scenario based on a multi-stakeholder push to boost recycling, regulatory measures to encourage recycling, consistent progress on technologies, and $75/bbl oil price.

[2] Durable applications with an average lifetime >1 year will end up as waste only in later years, while nondurable applications go straight to waste.

[3] 260 million metric tons mixed plastic waste from nondurable applications that end up as waste in same year plus 180 MMt of mixed plastic waste from production in previous years.

This scenario is not a prediction or a recommendation: it is an illustration of what zero plastic waste could look like given current product designs and emerging value recovery technologies. Changes in plastic production and design would open the door to higher value recycling and recovery options.

However, even without such changes, a preliminary comparative analysis (Figure 3) shows that 2030_{T90} would deliver significant benefits to Canada in comparison to business as usual (2030_{BAU}): CA$500 million of annual costs avoided, 42,000 direct and indirect jobs created, and annual greenhouse gas emissions savings of 1.8Mt of CO_2e.


Virgin feedstock 98%
Closed-loop recycling 2%
Cascaded recycling 8%
78 million metric tons (annual production)
Process losses 4%
14% collected for recycling
Landfill disposal 40%
Incineration and/or energy recovery 14%
Leakage 32%

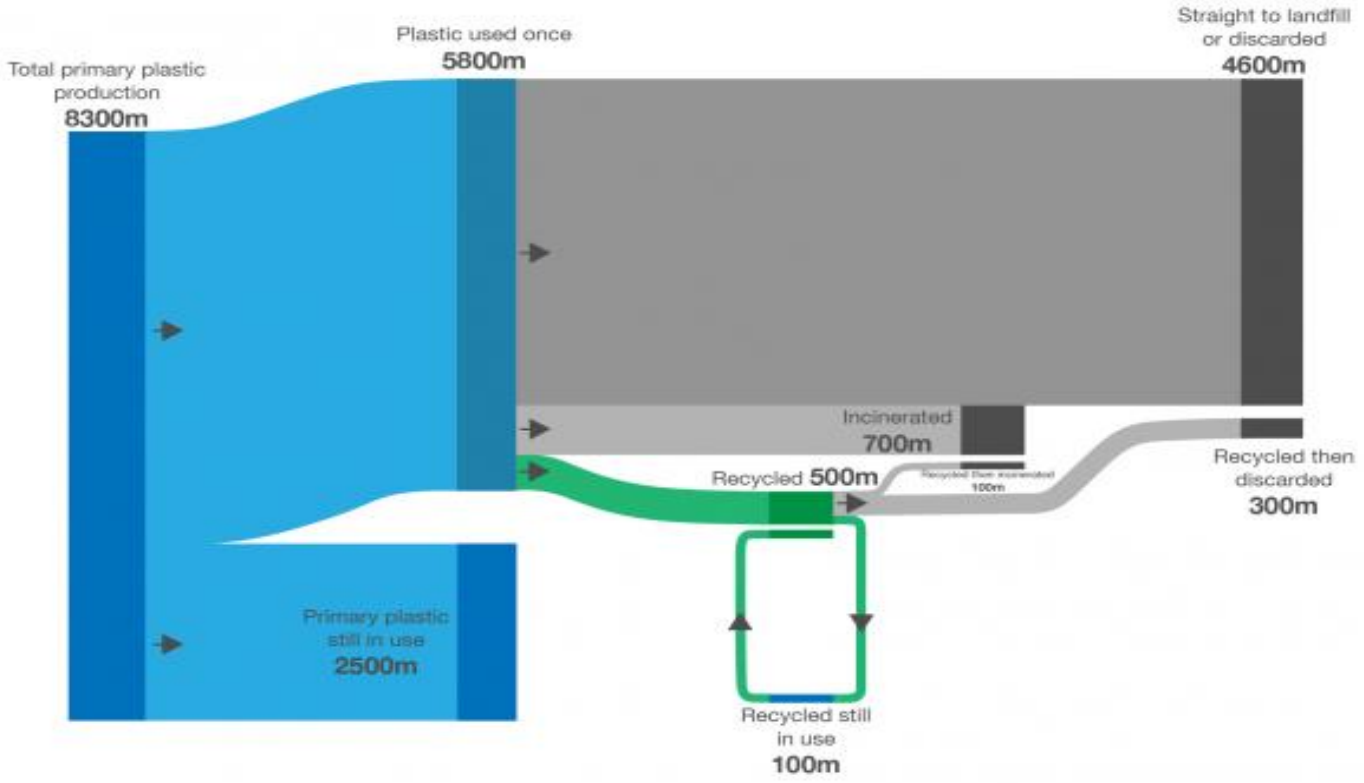
Global plastic production and its fate (1950-2015)

Our World in Data

Global production of polymer resins, synthetic fibres and additives, and its journey through to its ultimate fate (still in use, recycled, incinerated or discarded).
Figures below represent the cumulative mass of plastics over the period 1950-2015, measured in million tonnes.

Balance of plastic production and fate (m = million tonnes)

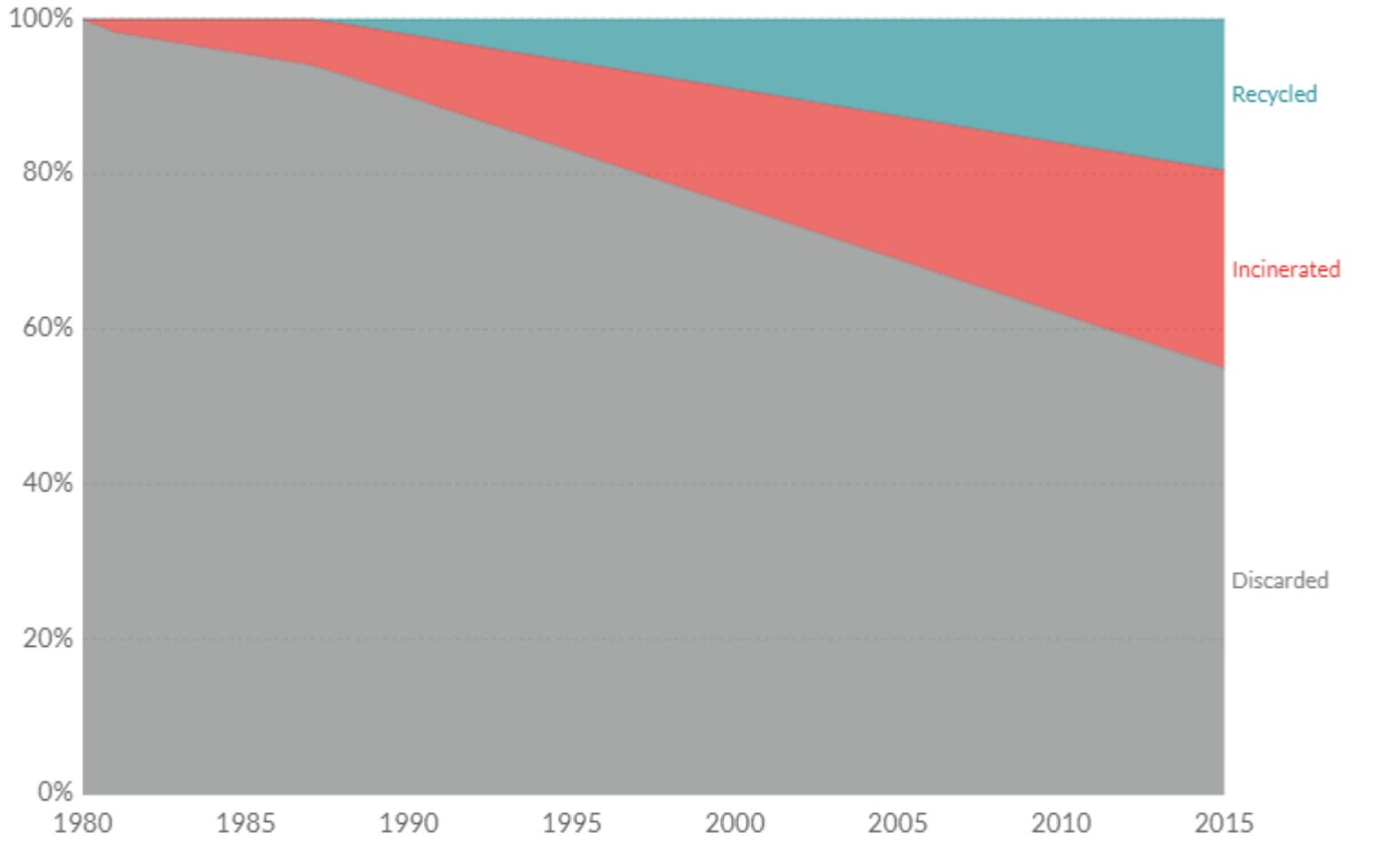
8300m produced → 4900m discarded + 800m incinerated + 2600m still in use (100m of recycled plastic)



Source: based on Geyer et al. (2017). Production, use, and fate of all plastics ever made.
This is a visualization from OurWorldinData.org, where you find data and research on how the world is changing.

Global plastic waste by disposal

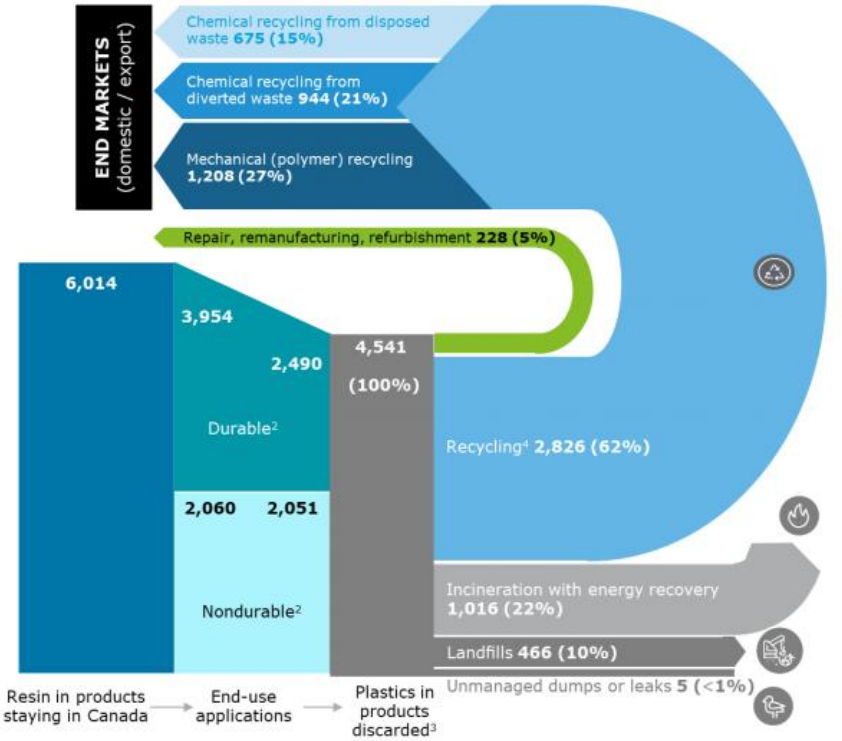
Estimated share of global plastic waste by disposal method.



Source: Geyer et al. (2017)

Canada Recycling Targets 2030

Figure 2: Canadian resin flows in thousands of tonnes per annum, 2030T90 scenario1



[1] Scenario based on a multi-stakeholder push to boost recycling, including investment in new facilities, regulatory measures to encourage recycling, significant progress on technologies and favorable end-markets demand.

[2] Durable applications with an average lifetime >1 year will end up as waste only in later years; given market growth and increase share of plastics in durable applications (e.g., construction, cars) plastics waste generated today is less than what is being put in the market that same year. On the contrary nondurable applications go almost straight to waste.

[3] 2,051 thousand metric tons of mixed plastic waste from nondurable applications plus 2,490 thousand metric tons of mixed plastic waste from production in previous years.

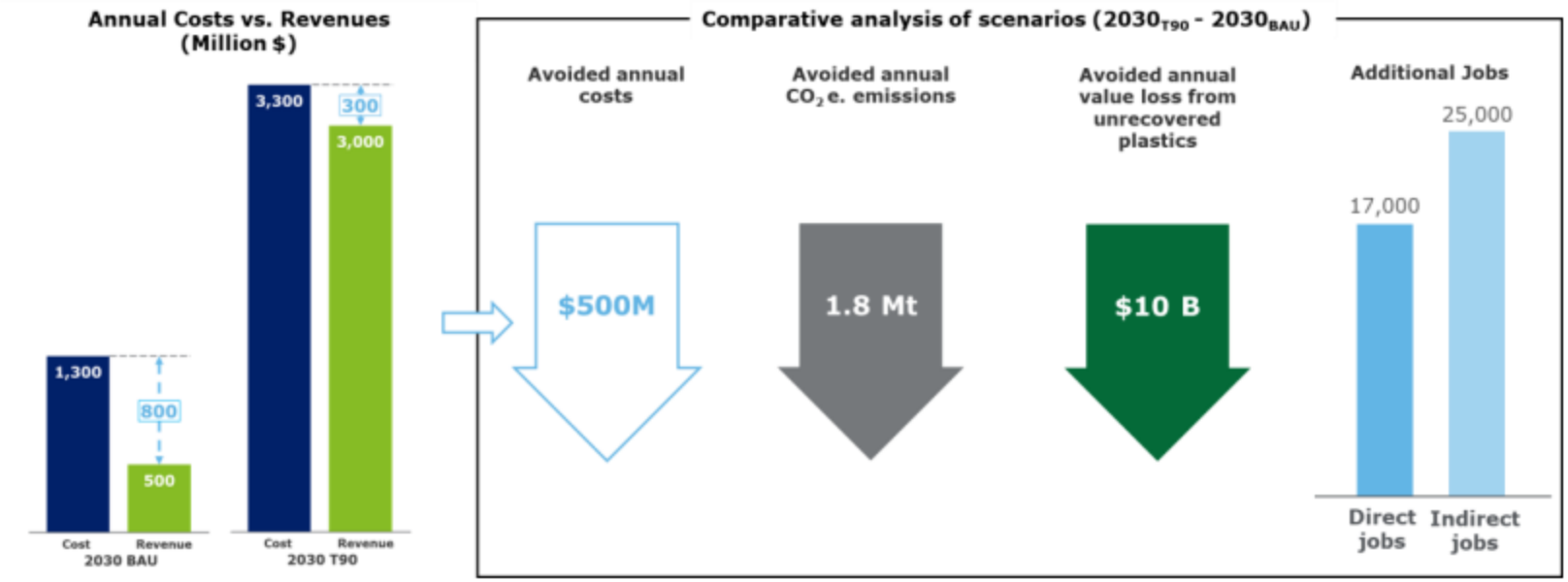
[4] Output recycling rate, after taking into account process losses

Symbol	Abbreviation	Polymer Name	
	PETE or PET	Polyethylene terephthalate also known as polyester.	Suspected cancer causing properties. Acetaldehyde was found to migrate into water. Does not clean well, do not reuse bottles.
	HDPE or PE-HD	High density polyethylene	Little research about these. No evidence of toxicity, endocrine disruption or estrogen mimics. Migration occurs with high temps and especially with fats or oils. HDPE generally exhibits the least migration. There is evidence of migration into food products, even dry foods.
	PVC	Polyvinyl chloride Think Plastic Wrap	Some but not all phthalates found in PVC (polyvinychloride or Vinyl) may be considered harmful to fetuses and young infants in any concentration PVC's are suitable, if at all, only for older children. May have BPA.
	LDPE or PE-LD	Low density polyethylene	Few scholarly studies. No evidence of leaching.
	PP	Polypropylene	Stabilizers used in polypropylene are biologically active (potentially affecting nerve transmission) and tend to leach from the plastic.
	PS	Polystyerene Think convent store coffee cups and picnic plates	Is a mutagen, (carcinogenic or cancer causing effects), neurotoxic, cytogenetic (chromosomal and lymphatic abnormalities)
	OTHER or O	Other plastics, including acrylic, acrylonitrile polycarbonate	Polycarbonate (Lexan) is used extensively in food-contact utensils, including baby bottles, sports water bottles, food containers, and tableware. Its basic monomer is Bisphenol A (BPA), originally synthesized in the 1930's as an estrogen for pharmacological use. Some like PLA have no BPA and are considered safe.

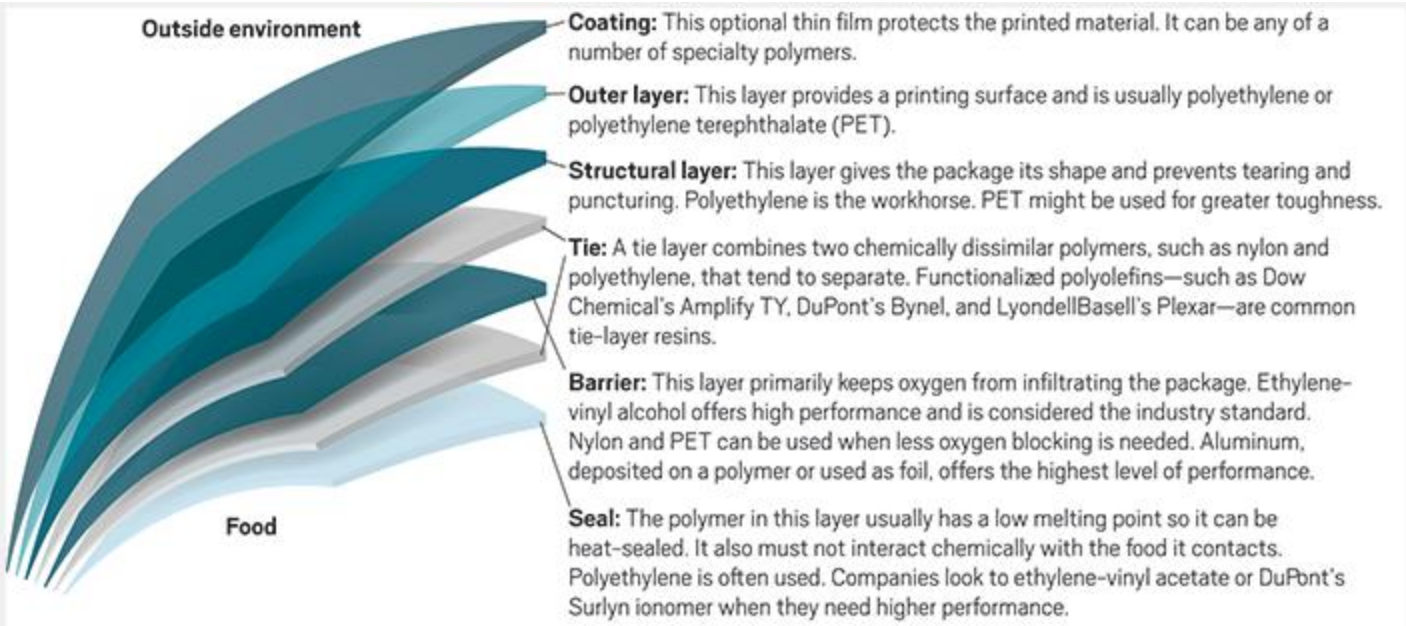
Plastic Impact

Collaboration

Figure 3: Comparative analysis of scenarios



This analysis indicates that zero plastic waste cannot be achieved without concurrent, strategic interventions by government, industry stakeholders and the public across each stage of the plastic lifecycle and targeted at sectors



Highly engineered

Each component of a flexible multilayered package imparts important functions to the overall architecture.
Note: The example is generic. Various products and environments require different arrangements of layers.

Credit: Yang H. Ku/C&EN/Shutterstock

By 2030, it is estimated that Canada's lost opportunity related to unrecovered plastics could rise to CA$11.1 billion, under a business as usual scenario following the same end uses and value recovery performance as the current baseline (Figure 1).

Given current market prices, structures, business models and the low cost of disposal, there is limited direct economic incentive for plastics recycling and value recovery in Canada

Domestically recycled "secondary" plastics output accounted for approximately CA$350 million in sales in Canada in 2016. In comparison with the sales of its primary resin competitor, it is 30 times smaller. The recycling industry focuses on polyethylene terephthalate (PET), high-density polyethylene (HDPE) and polypropylene (PP) and is predominantly located in large end-markets providing easier access to plastic waste feedstock, such as in Ontario, Quebec and British Columbia.

The Canadian virgin "primary" resin domestic output accounts for CA$10 billion annually and is driven by global oil prices and investment in large scale industrial facilities in locations allowing access to advantaged petrochemical feedstock, such as in Alberta or Ontario. Canadian virgin resin production focuses on high-volume resins such as polyethylene. The virgin resin industry has a very high international trade exposure, with 77 percent of its output exported, and 71 percent of the domestic resin demand fulfilled through imports. The United States (US) is the main trading partner, accounting for more than 80 percent of import and export of the industry.

Primary and secondary plastics compete against each other in the same market, based on price and quality of the resins. This competition is difficult for the recycling industry, which struggles with quality due to uneven feedstock composition, and on prices. Secondary plastics producers enjoy lower upfront investment than their virgin competitors do; however, during periods of low oil prices which bring downward prices for virgin resins, secondary resins producers are more exposed than their virgin counterparts as their cost structure is more labor-intensive. This is one reason why many secondary plastics producers ceased operations in 2016 in North America, as oil prices were low.

Advantages and Disadvantages of EPR in Germany

Advantages

- New industry established in collection, dismantling and processing of waste streams
- Better design of products to reduce compliance costs
- Avoidance of unnecessary packaging materials
- Encouragement of high and growing collection and recycling rates
- Development of new systems (implementation of refundable deposit systems)
- Allowance of only compliant products

Disadvantages

- Higher product costs (born by customers)
- Enforcement costs
- Establishment of new collection routine (e.g. additional bin for households etc.)
- Limitations for various products in market entrance

PETStar is the Largest Recycling Plant is Mexico electricity from wind
50,000 tons/year $100 million USD investment

Roads in Mexico made from Recycled Plastic