

The role of a waste collection system in the recycling value chain and how to improve it

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Collection, for recycling

Remediation

Driven by
space and
health

Commodity
recycling

Driven by
volume

Specificity
recycling

Driven by
value



1975

1990

2005

2020

Mining as a source of raw materials

Utah, US



Katanga,
Congo



Chuquicamata,
Chile



Most of the world's **copper** comes from the **minerals** chalcopyrite and chalcocite. Chrysocolla and malachite also are mined for **copper**. Other **copper**-bearing **minerals** include atacamite, azurite, bornite, brochantite, cuprite, diopside, rosasite and tetrahedrite



Mining as a source of raw materials



<https://www.dailymail.co.uk/news/article-3280872/iPhone-mineral-miners-Africa-use-bare-hands-coltan.html>



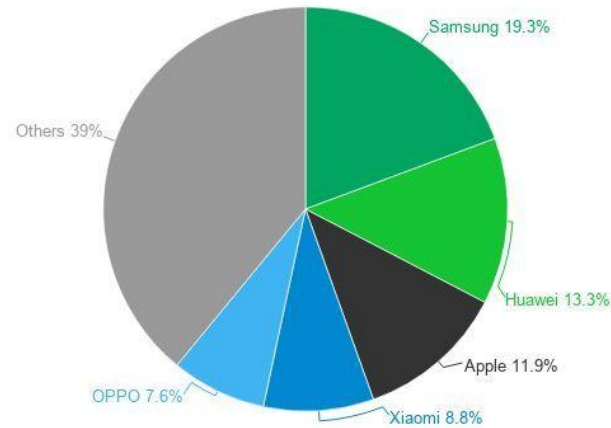
<https://www.dw.com/en/cobalt-mining-conditions-cast-shadow-over-electric-transport-dreams/a-41370039>



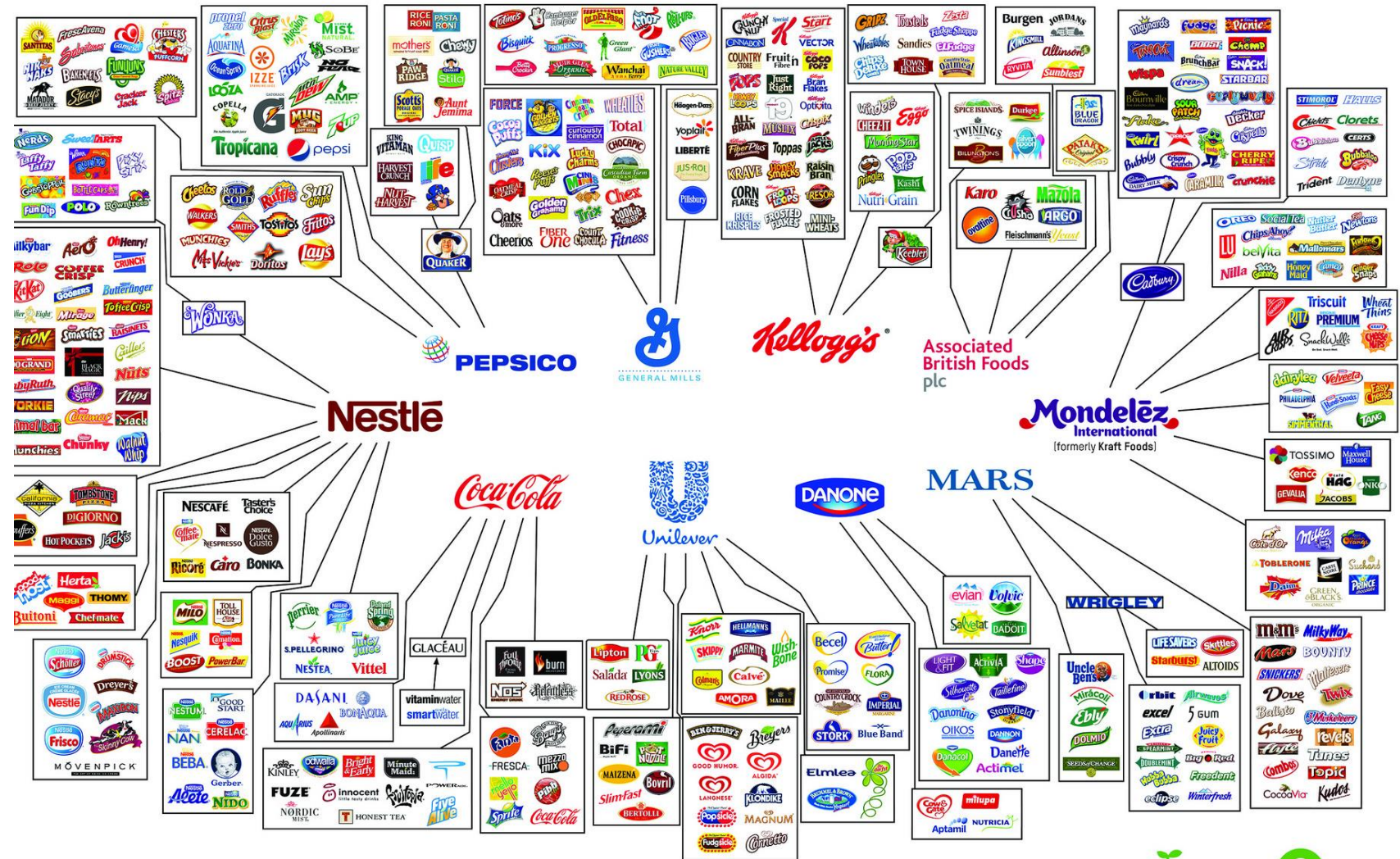
<https://pulitzercenter.org/reporting/childhood-lost-burkina-faso-gold-mines>

One world

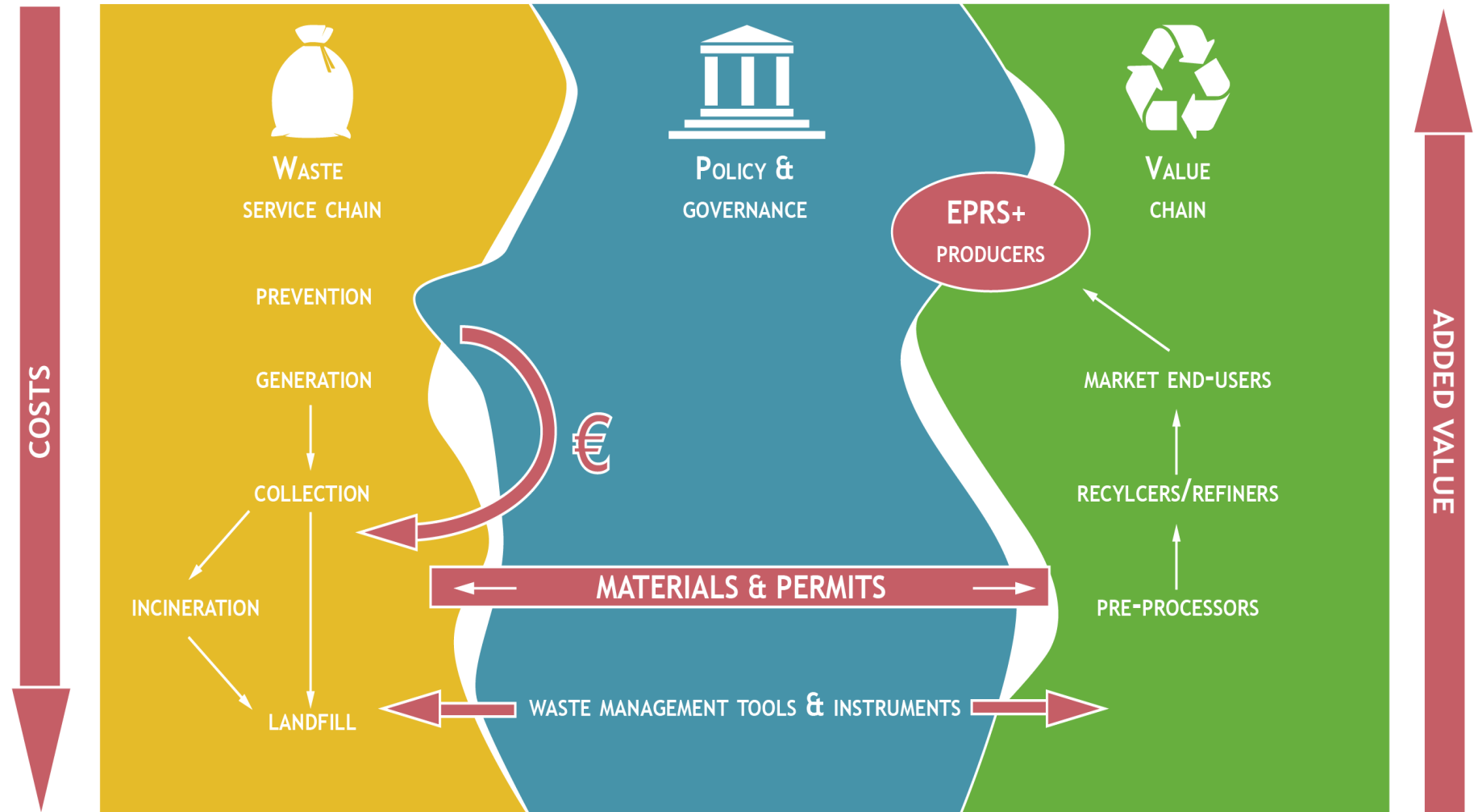
2Q18 Smartphone Market Share



Source: Gartner (August 2018)



Waste management system



Adapted from: Anne Scheinberg, Michael Simpson (2015). A tale of five cities: Using recycling frameworks to analyse inclusive recycling performance. Waste Manag Res, 33(11):975-85.

Fraction	Container glass waste	Paper & cardboard waste	Plastic packaging waste	Steel & aluminium packaging waste					
Collection method	<ul style="list-style-type: none">Door-to-door	<ul style="list-style-type: none">Door-to-door	<ul style="list-style-type: none">Door-to-doorBring pointCASOtherDoor-to-door + bring pointsDoor-to door + CASBring points + CAS	<ul style="list-style-type: none">Door-to-doorBring pointCASOtherDoor-to-door + bring pointsDoor-to door + CASBring points + CAS					
Collection output	Collection of plastic waste								
	Single collection methods								
	10 systems	Door-to-door		Bring points		CAS		Other	
	Systems with 1 collection method	1	10%	4	40%	4	40%	1	10%
	Co-mingled collection methods								
Sorting output	25 systems	Door-to-door		Bring points		CAS		Other	
	Systems with 1 collection method	12	48%	12	48%	0	0%	1	4%
	22 systems	Door-to-door + bring points		Do		Soda-lime-silicate container glass with: Bulk density < 500 kg/m ³ Ferrous metals < 0,3% Coloured glass < 5% (for clear glass only) Ceramics, stones and porcelain < 0,4% Plastic bottles < 2,5% Non-ferrous metals < 0,2% Organic materials < 0,5% Flat glass < 1%			
	Systems with 2 collection method	7	22%						
	Collection target fraction								
Recycling output	<ul style="list-style-type: none">Container glass (flint, brown, green)Insulation mineral wool (short glass fibre)Ceramic sanitary wareFluxing agent in brick manufactureSports turf and related applicationsWater filtration mediaAbrasiveAggregate in construction materialsReflective highway paint	<ul style="list-style-type: none">Other graphic papersCase materialsCarton boardWrappings and other packagingSanitary and householdOther paper and boardConstruction materials (insulation, bricks and furniture)Animal beddings or compostFibre applications in construction and manufacturing (in concrete, asphalt, brake linings)	<ul style="list-style-type: none">Mixed plastic packagingMixed plastic packagingMixed plastic packagingMixed plastic pellets						

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SCRAP SPECIFICATIONS CIRCULAR 2018

Guidelines for Plastic Scrap

PET Bottles

Description: Any whole Polyethylene Terephthalate (PET, #1) bottle with a screw-neck top that contains the ASTM D7611 “#1, PET or PETE” resin identification code and that is clear, transparent green, or transparent light blue. All bottles should be free of contents or free flowing liquids and rinsed.

Product: PET Bottles

Source: Post-Consumer Material

Contamination: Please check with your pet buyer(s) as to their allowances for:

- Other Colored PET Containers
- PET Thermoforms, e.g., microwave trays ,dishes, bakery trays, deli containers, clam shell containers, drink cups

PET Bottle Bale Grade Chart

PET Bale Grade	Grade A	Grade B	Grade C	Grade F
Total PET Fraction by Weight	>94%	93% to 83%	82% to 73%	<72%
Total Amount of Contamination Allowed	6%	7% to 17%	18% to 27%	>28%

“PET fraction” refers to the total weight of PET bottles in a PET bale, inclusive of caps and labels when still attached to PET containers, as a percentage of the total weight of that bale.

Including closures (caps, lids, and rings) on bottles is

Plastic

erials which have been recovered or diverted from the solid waste stream. Does not include materials from and commonly reused within an original ring process.

Plastic

composed of either post-consumer or recovered both.

Plastic

term that refers to hard rigid plastic typically as a chip. Typically consists of material that is the e, color and type. It can be used in extrusion or ocesses.

Plastic Container

(formed or molded container) which maintains its n empty and unsupported.

Plastic

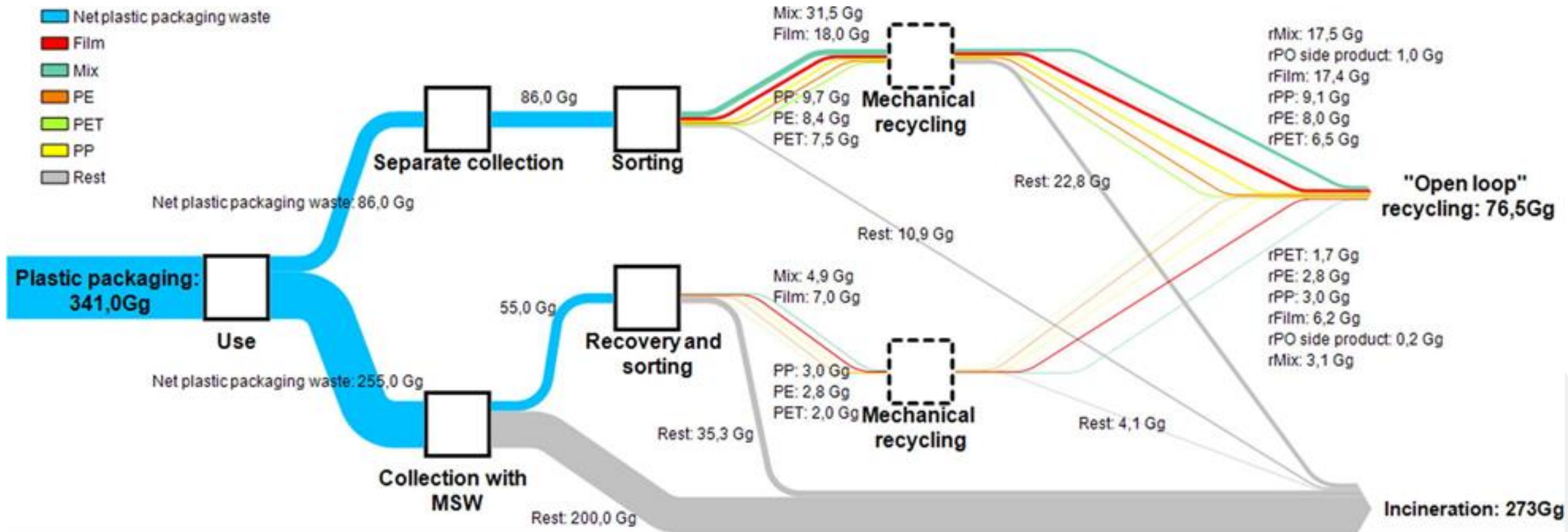
ard material. The typical upper size can be between 3” to 12”, although in some cases the upper size can be as small as about 1”. Size range, characteristics should be agreed to between buyer and seller.

Shredded Plastic

Generic term. Material that contains a high plastic content.

Collection – sorting – recycling outputs: criteria, grades & standards!

What makes a separate collection system successful?

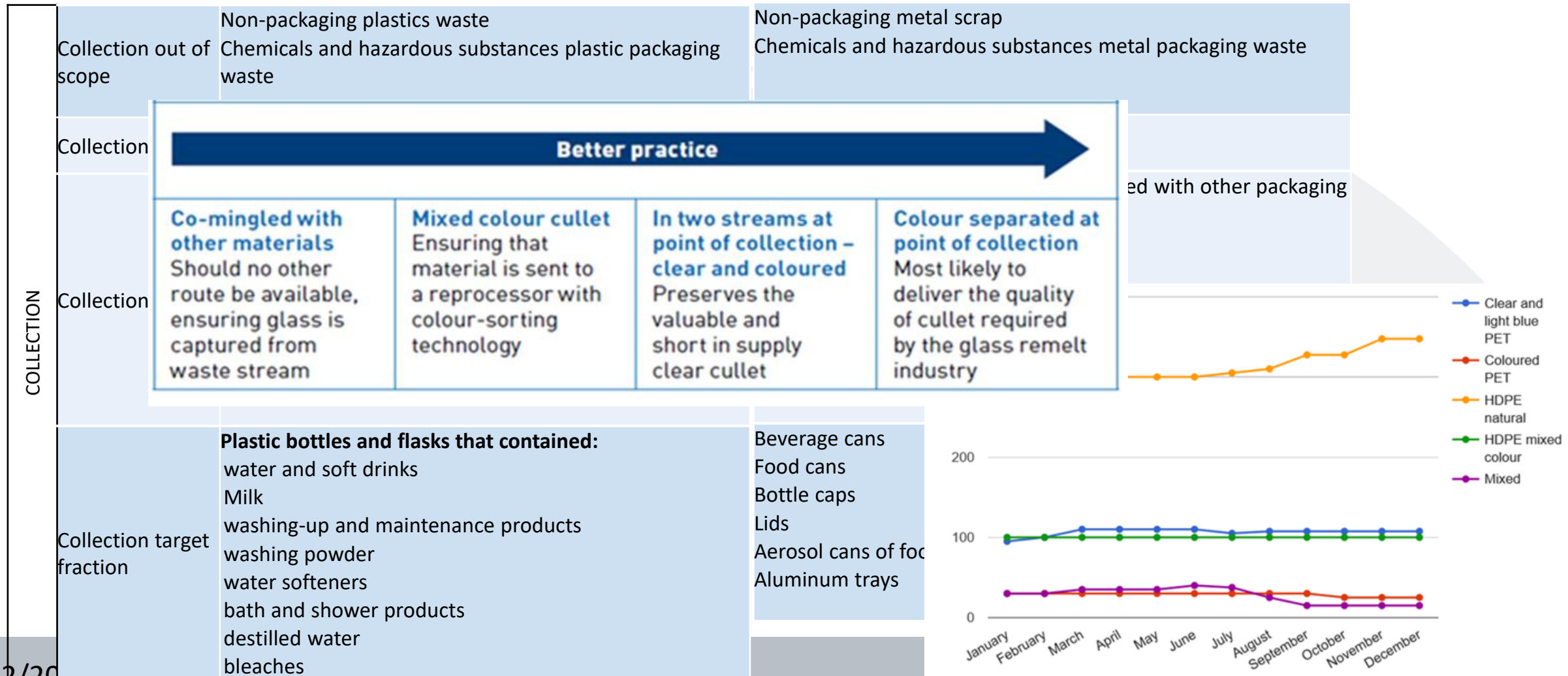


<https://www.sciencedirect.com/science/article/pii/S0956053X17307808>

Disconnection – fragmentation – oversimplification - over expectation

- 135 PPW systems, 'separately' collecting the very same packaging products & materials, within an EU regulatory framework, in a global materials market, but with different scopes, objectives and drivers, operating in different contexts
- Highly fragmented value chains, disconnected from consumers/local authorities
- Collection practices do not link with material value chain drivers → optimization towards material value challenging and waste push based, results in call for minimum recycled content regulations.
- Collection for secondary materials ~ mining for primary materials → resource intensity – cost – environmental impacts
- Yield versus purity tradeoffs rarely considered in WCS design. Technology will solve it all?
- Consumer and local authority expectations? Household waste management always comes with a cost, that can be compensated partly by revenues from secondary material

Collection output → sorting & recycling output value



How to improve your collection system?

- Define what would for you constitute a successful system
- Decide the EoL products' scope of your collection
- Check for existing experiences in other cities (successful and failed)
- Build your own collection – sorting – recycling chain: check possible pathways and available players
- Explore your potential market for collected, sorted, recycled outputs
- Look for opportunities for collaboration and upscaling
- Monitor your results and share them with the world

Connect – defragment – try to understand the complexity – manage the expectations

Let's share!

Contacts

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‘There is nothing quite so useless as doing with great efficiency something that should not be done at all’ (Peter Drucker)

For more info about the project visit the COLLECTORS website at www.collectors2020.eu